

MANAGING RISKS IN SMALLHOLDER AGRICULTURE

THE IMPACTS OF R4 ON LIVELIHOODS IN TIGRAY, ETHIOPIA FROM 2012 TO 2016

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As part of our commitment to accountability and learning, Oxfam will share conclusions and recommendations from evaluations. Internally we will share with relevant stakeholders, ensuring that they have an opportunity to participate in discussion of those results in meaningful ways. We will also publish the evaluation reports on our website in accessible language.

As a rights-based organization, accountability, particularly to the communities we seek to serve, is of the highest importance to us. For Oxfam, accountability requires Oxfam to regularly and honestly assess the quality of its work, share and learn from its findings with primary stakeholders, and apply that learning in future work.

This is an independent impact evaluation of Oxfam America's R4, Rural resilience program. The program has been operating in Ethiopia since 2009; it was expanded to Senegal in 2013 and more recently, in 2015, to Zambia and Malawi. This evaluation covers the work undertaken between the years 2015 and 2016. It also includes regression analysis, for some variables, for the periods 2009 – 2012 – 2015 – 2016.

The major evaluation activities took place between March 2016 and September 2017. The evaluation was carried out by Malgosia Madajewicz, from Columbia University, through a competitive process and reflects the findings as reported by them, and it was validated with stakeholders. The evaluation was managed by Julio Espinoza, Monitoring, Evaluation and Learning Advisor from Oxfam America, and commissioned by Sophie Romana, Coordinator of the Community Finance department, Oxfam America.

For additional information regarding the evaluation Terms Of Reference, please refer to the report appendices.

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LIST OF ABBREVIATIONS AND ACRONYMS

DA	Development Agent
DRR	Disaster Risk Reduction
DECSI	Dedebit Credit and Savings Institution
FGD	Focus Group Discussion
HARITA	Horn of Africa Risk Transfer for Adaptation project
OA	Oxfam America

PSNP	Ethiopia's Productive Safety Net Program
REST	Relief Society of Tigray
RUSACCO	Rural Saving and Credit cooperative
RWH	Roof Rainwater Harvesting Technology
WFP	World Food Programme

EXECUTIVE SUMMARY

The changing climate is straining agricultural livelihoods around the world, especially for smallholder farmers. Adverse weather events, such as drought, affect crop production directly by damaging crops. They also have indirect effects. First, farmers who lack savings and access to credit sell productive assets during a drought to pay for food. Second, as uncertainty about the crops increases, farmers reduce investments in crop production to maintain cash to cover expenses in case of poor harvests. Both of these behaviors reduce farmers' ability to generate income in good seasons. A drought can launch a descent into poverty, which is difficult to reverse.

The R4 program

This evaluation investigates how an innovative, integrated risk management program, the R4 Rural Resilience Initiative (R4), is impacting food and livelihood security among smallholder farmers in the northern state of Tigray in Ethiopia. Oxfam America (OA) and the World Food Program (WFP) launched R4 in 2011, building on the accomplishments of the Horn of Africa Risk Transfer for Adaptation (HARITA) initiative, which OA, the Relief Society of Tigray (REST) and Swiss-Re implemented in Tigray in 2009. R4 has expanded to reach over 28,000 smallholder farmers in Ethiopia and Senegal. The program integrates four risk management strategies: improved management of natural resources and diversification of livelihoods (risk reduction), weather index insurance (risk transfer), microcredit (prudent risk taking), and savings (risk reserves).

The critical innovation that HARITA pioneered and R4 is continuing is a partnership between weather index insurance and national safety nets, the Productive Safety Net Program (PSNP) in the case of Ethiopia, which allows farmers to pay for the insurance premium with labor on village-level projects that are part of the risk reduction component of R4. The innovation enables cash-poor farmers to purchase insurance, and is responsible for the high demand for index insurance in areas served by R4, which contrasts with relatively low demand for insurance reported in some other contexts.

Program theory in the context of Tigray

Tigray is an arid region that is becoming increasingly drought-prone as the climate changes. Most plots of land are small and cultivation relies almost entirely on rain. Soil is degraded by deforestation and intensive cultivation.

The four components of R4 work together to improve agricultural productivity. The risk reduction activities rehabilitate the degraded soil and help to conserve moisture. Index insurance gives farmers the peace of mind that they will have an

insurance payout if there is a drought and therefore the confidence to invest in production in good seasons. The payout can also obviate the need to sell productive assets to cope with drought, and it may facilitate access to credit by providing cash for repayment in bad seasons. Savings and credit provide additional resources that can be invested in production.

In the Tigrayan environment, diversification of income sources is critical to improving security of livelihoods. Risk reduction projects provide training and develop new income generating opportunities. Savings and credit constitute capital that can be invested in non-farm income generating projects.

The purpose of the evaluation

The objective of the evaluation is to examine the progress of R4 toward the main goals of increased food and income security from 2012 to 2016. The study builds on findings of the first phase of evaluation, which examined the impacts of HARITA between 2009 and 2012. The evaluation serves three purposes:

- Learning how the program is working, who is benefiting, who is not, why, and what can be improved, with the audience being the main stakeholders: OA, WFP, the International Research Institute for Climate and Society, and REST.
- Presenting evidence of program impacts to funders.
- Sharing the knowledge created by R4 about managing risks in smallholder agriculture with development practitioners and the academic community to foster the broad use of that knowledge.

Evaluation methodology

The evaluation takes a mixed method approach, which integrates results from analysis of survey data, focus group discussions conducted separately with men and women, and interviews with key informants. The survey data comprise a two-year panel¹ that documents the 2015 and the 2016 growing seasons, and contains data on selected outcomes in 2014, 2013, and 2012 growing seasons. The sample consists of 294 households in 5 R4 villages in 3 districts, and 165 households in 5 control villages located in the same 3 districts.² We oversampled households who participate in insurance-for-work, for a total of 238 households.

We compare changes in outcomes over time between R4 and control villages. The control villages provide a measure of how outcomes are changing in the districts in the absence of R4, allowing us to estimate the effect of R4 in the

¹ We have data for the same households for both years.

² A few households in our data may have purchased insurance in cash but very few. Only households who purchased insurance through insurance-for-work or with cash have access to the other R4 services in R4 villages.

program villages. Looking at changes over time allows us to control for mean differences between the villages. We compare households who purchased insurance to those who did not for a subset of the analyses.

Summary of the results

The results of this evaluation fall into three themes. First, R4 is helping smallholder households, especially female-headed ones, to reduce the impact of drought on food security while maintaining their productive assets. Second, R4 is supporting food security through (1) increased saving and borrowing, and (2) diversification of income sources away from cereal crops. Third, evidence that R4 is improving agricultural production is limited. One reason may be that R4 villages in two of the three study districts suffered shocks to agricultural production, which did not affect the control villages, the year after the historic drought that occurred in 2015. However, droughts may pose a challenge for improving agricultural production in the absence of irrigation in the region.

R4 reduced the declines in food security that occurred as a result of a severe drought in 2015 that devastated crops. The decline in food security from 2013 to 2016 was 26% smaller for female-headed households in R4 villages than in control villages. The effect was stronger in some districts than in others.

R4 is supporting food security while enabling farmers to maintain and accumulate livestock, which is the most important productive asset among smallholder farmers in Tigray. The effect suggests that farmers are beginning to use more resilient coping strategies. In one district, the program reduced losses of oxen due to the drought by 0.3 animals among female-headed households, relative to control households, compared to a mean of 0.5 oxen among female-headed households before the drought. In the same district, between 2013 and 2016, R4 increased accumulation of all big livestock by 2 animals among female-headed households who participate in insurance-for-work, relative to control households. In a second district, R4 reduced the losses of livestock due to the drought among all households by 1.5 animals relative to control households.

R4 is supporting food security partly by improving savings and access to credit. Amounts saved increased in all three districts among male-headed households, over the entire period of evaluation, 138% more than among control households, while the change among female-headed households was the same as in the control group. Over the same period, the amounts borrowed increased 255% more among female-headed households than among control households in one district. Amounts borrowed also increased during the drought among female-headed households who purchased insurance, relative to control households, in another district. Amounts borrowed and probability of borrowing declined relative to control in the one district that does not have the R4 credit services.

One of the benefits of the saving and credit services that farmers stress is capital for investment in income generating activities, and particularly non-farm activities. Diversification of income may be a critical pathway to improving the security of livelihoods in the drought-prone context of Tigray. Thus far, the program has increased diversification of income sources in R4 villages relative to control villages in the study district, which is most prone to drought.

All components of R4 are contributing to the effects on savings, borrowing, and diversification of incomes, not only the saving and credit services, which were introduced in Tigray only recently, in 2014 and 2015. However, farmers praise the two services as potentially the most impactful components of the program.

Farmers emphasize the importance of risk reduction activities that divert and retain water and conserve the soil because these improve crop production on drought-prone land. Micro gardens, complemented with rainwater harvesting, are among the most valuable activities for female-headed households because the vegetables grown provide a source of income and nutrition, and the price of vegetables is increasing faster than the price of cereal crops.

The above results show an impressive impact of R4 on women's economic empowerment. We do not yet observe differences in women's participation in public or private decision-making between R4 and control villages.

R4's extensive global, national, and local relationships have spawned significant impacts on the practice of risk management for smallholder farmers beyond the reach of the program itself. The program is influencing the design of interventions internationally through organizations such as JICA and CARE. The Ethiopian government is planning to integrate R4 into the national safety net system. R4 informed the government's Disaster Risk Management Strategic Program and Investment Framework. Oxfam and WFP have facilitated the establishment of the Index Insurance Working Group, with the intention of building capacity for weather index insurance in the country. In another initiative, R4 partners are leading training sessions on expanding access to finance among farmers through insurance-for-work programs for local NGOs and insurance companies.

Several limitations of the program emerge from the evaluation. We discuss these in the recommendations below.

Recommendations

DRR activities:

- The program should scale up existing risk reduction activities rather than investing in new ones. Water diversion and retention, compost, micro gardens, rainwater harvesting, and training in income generating activities should receive high priority according to farmers.

- Significant improvements in agricultural production may not be possible without more investment in irrigation in some locations. Irrigation is the exception to the suggested focus on expanding existing investments rather than making new ones. Investments in diversion and retention of rainwater, which R4 is making already, should prioritize specific locations and increase resources in those locations. Farmers request projects such as micro dams or construction of medium sized ponds so that they can reduce their dependence on rainwater.
- If possible, the program should extend training in income generating activities to village residents who do not purchase insurance (through insurance-for-work or cash). Diversification of income may be among the most important pathways to improved security of livelihoods in Tigray.
- The program should address the delays in the flow of funds for payment of insurance premiums. The delays are causing risk reduction activities, which should take place before the growing season begins, to be carried out during the growing season, when farmers are busy in their own fields. The delays are straining the labor available to households.
- Even though farmers have been allowed to participate more in planning risk reduction activities over time, farmers would like to have more input. They feel that they can help to focus the program on activities that are appropriate for their communities. One particular request is that male-headed farmers would like to participate in micro gardens.

Saving and credit services:

- The program should prioritize scaling up saving and credit services to include more villages and more farmers.
- Male farmers would like to have the option to request bigger loans in order to undertake more productive business activities.

Index insurance:

- Progress toward making weather index insurance sustainable is limited. The significance of this concern depends on the outlook for continued donor funding. R4 has increased the portion of the premium that has to be paid in cash somewhat, but few farmers are graduating from paying with labor to paying in cash and the proportion of farmers who pay fully in cash has declined over time. One possible future avenue is to experiment with raising the cash requirement at different rates in different places to identify an appropriate rate of increase. Another is a scaled cash requirement that increases with the household's ability to pay according to transparent criteria.

Engaging wealthier farmers who can pay in cash requires an outreach plan informed by a clear understanding of the needs among wealthier farmers.

- The program should invest more in improving the understanding of index insurance among farmers. Current training should be reviewed to ensure that it is not communicating information in a misleading way. The training should either reach a larger number of farmers in each village rather than focusing on the same small group, who are considered the trainers, each year, or the program should ensure that the trainers have an incentive to disseminate knowledge, and that they are doing so.

Implementation and scaling up:

- The program needs more investment in implementation capacity. REST staff should receive more capacity building relevant to the various components of the R4 program.
- Farmers would like to have a clear, transparent system through which they can communicate feedback to the program and receive responses in order to contribute to improving the program.
- A public-private partnership (PPP) with the Ethiopian government may help to expand R4's reach to the many more farmers who would like to be included in the program, and possibly to expand risk reduction activities. A PPP might achieve closer coordination between components of R4 and government programs, such as between risk reduction activities and activities undertaken by the PSNP, and between R4 and government-supported credit and saving services.

Monitoring and evaluation:

- Evaluation and monitoring need more resources to improve their contribution to the growth of the program and to knowledge about managing risks in smallholder agriculture. The sample size and number of villages included in future evaluations should increase substantially. The small sample inhibits the identification of areas where progress is taking place. The current set of villages is not representative of the range of conditions in Tigray. Also, evaluation needs better planning for baseline data and control villages as the program expands.
- The current monitoring system does not keep track of critical indicators such as retention and dropout rates in the insurance program, and length of time that each farmer has been purchasing insurance. The latter is important for the evaluation. The monitoring system should expand to track selected outcomes on a regular basis in both program and control villages.

INTRODUCTION

The changing climate is straining agricultural livelihoods around the world, especially for smallholder farmers. Longstanding challenges such as lack of savings and limited access to credit exacerbate the impacts of changing seasonal patterns and more intense weather events, endangering livelihoods in new ways.

Adverse weather events, such as drought, affect crop production directly by damaging crops. They also have indirect effects. First, farmers who lack savings and access to credit sell productive assets during a drought to pay for food. Second, as uncertainty about the crop increases, farmers reduce investments in crop production to maintain cash to cover expenses in case of bad weather. Both of these behaviors reduce farmers' ability to generate income in good seasons and can launch a descent into poverty, which is difficult to reverse (Barnett et al 2008).

The R4 program

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The critical innovation that HARITA pioneered and R4 is continuing is a partnership between weather index insurance and national safety nets, the Productive Safety Net Program (PSNP) in the case of Ethiopia, which allows farmers to pay for the insurance premium with labor on village-level projects that are part of the risk reduction component of R4. The innovation enables cash-poor farmers to purchase insurance, and is responsible for the high demand for index insurance in areas served by R4, which contrasts with relatively low demand for insurance encountered in other contexts (Gine and Yang 2009, Cole et al 2013, Morduch 2006).

Program theory in the context of Tigray

Tigray is an arid region that is becoming increasingly drought-prone as the climate changes. Most plots of land are small and cultivation relies almost entirely on rain. Soil is degraded by deforestation and intensive cultivation.

The four components of R4 work together to improve agricultural productivity. The risk reduction activities rehabilitate the degraded soil and help to conserve moisture. Index insurance gives farmers the peace of mind that they will have an insurance payout if there is a drought and therefore the confidence to invest in production in good seasons. The payout can also obviate the need to sell productive assets to cope with drought, and it may facilitate access to credit by providing cash for repayment in bad seasons. Savings and credit provide additional resources that can be invested in production.

In the Tigrayan environment, diversification of income sources is critical to improving security of livelihoods. Risk reduction projects provide training and develop new income generating opportunities. Savings and credit constitute capital that can be invested in non-farm income generating projects.

The purpose of the evaluation

The objective of the evaluation is to examine the progress of R4 toward the main goals of increased food and livelihood security from 2012 to 2016. The study builds on findings of the first phase of evaluation, which examined the impacts of HARITA between 2009 and 2012. The evaluation serves three purposes:

- The evaluation serves as a learning tool, providing the main stakeholders, OA, WFP, the International Research Institute for Climate and Society (IRI), and REST, evidence about how the program is working, who is benefiting, who is not, why, and what can be improved.
- The evaluation presents evidence of program impacts to funders.
- The evaluation shares the knowledge about risk management in smallholder agriculture created by R4 with the community of development practitioners and the academic community to foster the broad use of that knowledge.

Overview of the results

The study finds that R4 is reducing the impact of drought on food security among smallholder farming households in Tigray, especially female-headed ones, even during the extreme drought that devastated crops in 2015. R4 is supporting food security while also enabling farmers to maintain and accumulate productive assets, in particular livestock, which indicates that the program is expanding the use of more resilient coping strategies. R4 is supporting food security by improving accumulation of savings, among male-headed households, and

access to credit, among female-headed households. These improvements in turn are beginning to increase the diversification of income sources away from cereal crops among R4 households relative to control households in one district. All components of R4 are contributing to the effects on savings, borrowing, and diversification of incomes, not only the saving and credit services, which were introduced in Tigray only recently, in 2014 and 2015.

Evidence of improvements in crop production is more muted. One reason may be that R4 villages in two of the three study districts suffered shocks to agricultural production, which did not affect the control villages, the year after the historic drought that occurred in 2015. However, droughts may pose a challenge for improving agricultural production in the absence of irrigation in the region.

EVALUATION DESIGN

KEY EVALUATION QUESTIONS

1. Is R4 improving food security and reducing the need to resort to coping strategies that reduce food intake and/or reduce future productive capacity?
 - a. Changes in household food security
 - b. Changes in coping mechanisms
2. Is R4 improving livelihood security, including increased agricultural productivity and access to credit?
 - a. Changes in households' income and its diversification
 - b. Changes in amount and types of assets owned
 - c. Improvements in yields of major crops
 - d. Changes in savings and credit and knowledge about financial services
3. What roles do index insurance and disaster risk reduction projects play in enabling the impacts discussed under points 1 and 2?
 - a. Role of index insurance
 - b. Changes in knowledge about insurance, savings and credit
 - c. Are the disaster risk reduction projects reducing the impact of climate-related losses and increasing awareness of and engagement with adaptation techniques?
 - d. Changes in knowledge about risk reduction and adaptation
 - e. Changes that have resulted from risk reduction projects
4. Has the policy and institutional environment improved, including strengthened capacity of the private sector and increased engagement of national and local public sector partners to provide risk management services to poor rural communities?
 - a. Changes in the capacity of insurance service providers and delivery channels and implementation capacity
 - b. Government's interest in R4 and willingness to integrate similar initiatives into national strategies and programs
5. Are women becoming more empowered?
 - a. What percentage of women are members of an economic or social group?
 - b. What percentages of women are capable of speaking in public?
 - c. What is the workload of women?
 - d. What is the leisure time of women and what amount of time do they allocate to productive and domestic tasks?

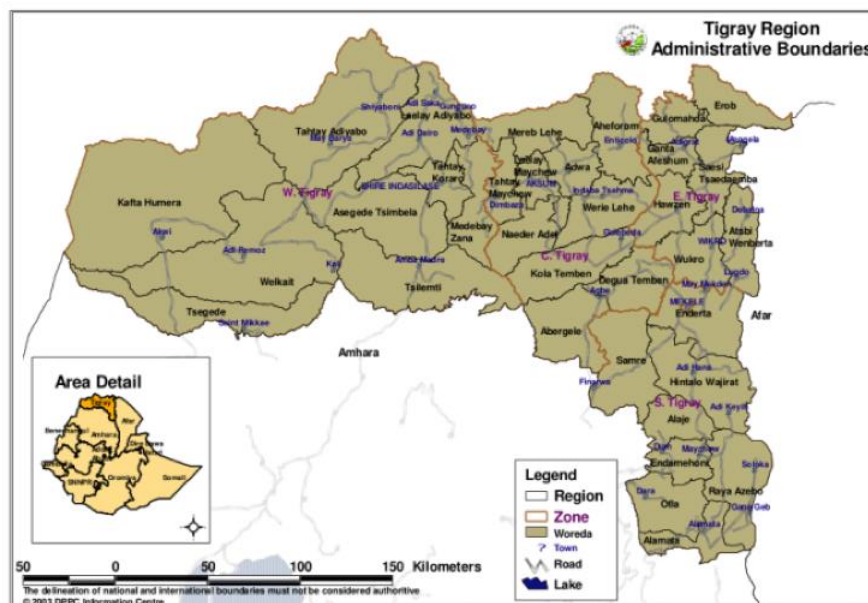
EVALUATION TEAM

Malgosia Madajewicz led the team, oversaw all components of the work, and is the lead author of the report. Asmelash Haile Tsegay oversaw, managed, and executed all data collection. He has also transcribed and summarized all qualitative information from focus group discussions. Ruiwen Lee provided research assistance, cleaning and analyzing the quantitative data and conducting a literature review.

EVALUATION METHODOLOGY

The evaluation takes place in 5 villages in 3 districts in which R4 has been operating since the beginning of the program: Adi Ha and Awet Bikalsi in Kola Temben district, Hade Alga and Genete in Raya Azebo district, and Hadush Adi in Saesi Tsaedaemba district. It also includes 5 control villages: Limat and Hidnet in Kola Temben, Erba and Were Abaye in Raya Azebo, and Tsenkanit in Saesi Tsaedaemba. The R4 program began as HARITA in 2009 in Adi Ha. It expanded to the other 4 villages in this study in 2010, before expanding further in 2011. The map of Tigray in Figure 1 shows the 3 districts.

Figure 1: Map of Tigray



1. Methodology

The approach is a mixed method one. We conduct a quantitative analysis of household survey data, which examines how changes in major outcomes from year to year differ between R4 and control villages. The data are from two household surveys, one that documents the 2015 growing season and a small subset of outcomes for the 2014, 2013, and 2012 seasons, and the second that documents the 2016 growing season. We integrate the findings from the quantitative analysis with information gathered from focus group discussions (FGDs) and interviews with key informants.

The quantitative component compares changes over time in major outcomes between R4 villages and control villages. The approach is similar to a difference-in-difference except that we do not have data for the R4 villages before they joined R4. Therefore, we are analyzing how the evolution of food security and livelihoods over time differs between R4 villages and control villages, not how the change in food security and livelihoods that resulted from the initial introduction of R4 differs between R4 and control villages.

There are two main challenges in identifying changes in outcomes that can be attributed to R4. First, farmers who participate in R4 are likely to be different from farmers who do not in ways that we cannot document in the data. For example, they may be the more entrepreneurial farmers. Their outcomes will differ from outcomes of non-participants because of these other characteristics, and we face the challenge of differentiating the effects of these other characteristics on outcomes from the effects of R4. One way to address the problem is to compare villages that participate in R4 to villages that do not, rather than comparing participating farmers to farmers who do not participate. If populations in the R4 and control villages are sufficiently similar, differences that we observe will be due to R4. However, participating villages may be different from control villages in ways that affect outcomes and that we cannot document in the data.

We analyze the change in outcomes over time because, under some assumptions, looking at differences between years subtracts the effects of characteristics of villages or individuals that affect outcomes from our estimate, leaving just the contribution that R4 makes to the change in outcomes over time. The condition that must hold is that the effect of other characteristics is constant over time or changes at the same rate among participants as among non-participants. Our estimate of the contribution of R4 may be biased if neither of these conditions is satisfied.

We compare the change in outcomes in R4 and control villages because the outcomes may be changing in the wider region for a variety of reasons, such as economic change, climate conditions, or the effect of government programs that

are implemented in the entire region. If we consider only the change in R4 villages then we do not know whether the change is happening in R4 villages because of R4 or whether some of the change is due to factors that are affecting the entire region. For example, when we compare yields in the 2015 and the 2016 seasons, we could mistakenly conclude that yields are increasing very quickly for R4 farmers. However, part of the increase is caused by the good rains in 2016 that followed a severe drought in 2015.

We report two types of estimates of the effect of R4. One is based on the difference between the change in outcomes from year to year in R4 villages and the change between the same years in the control villages.³ The second one is based on comparing the change in outcomes from year to year among those who participate in insurance-for-work and the change between the same years among non-participants in both R4 villages and control villages.⁴ The former estimate includes the effect of R4 on everyone in the R4 village. The latter captures only the effect on the insured.

We conducted focus group discussions, with women and men separately, in each R4 and control village. We transcribed the audio recordings of the discussions and analyzed the information using the questions in the discussion guide, which is in Appendix 5, as a conceptual framework. The information helps to interpret and explain some of the quantitative results, and it provides additional insights with respect to processes through which R4 exerts impacts and how these processes differ for female-headed and male-headed households and in different districts. We also conducted interviews with key informants. These included individual farmers and REST staff.

1.2 Survey data and sample

We conducted one household survey in the summer of 2016 to collect information about the 2015 growing season and data on several outcomes for 2012, 2013, and 2014 growing seasons. The survey collected information about household demographic and economic characteristics, food security, assets, crops grown, inputs into agricultural production, yields, participation in community organizations, and knowledge about and attitudes toward weather index insurance. We asked farmers about sources of income, numbers of livestock, total harvests of the main crops, savings, and amounts borrowed for previous seasons: 2012 for sources of income, and 2014 and 2013 for other variables. We did not ask about other outcomes for the previous seasons because the households would not be able to recall the information accurately.

We ask households to recall amounts borrowed in the 2013 season because households in the study do not take many loans. They rarely take more than one

³ The estimate is known in the econometric literature as the “intention to treat” estimate (Wooldridge 2002).

⁴ This is the effect of “treatment on the treated” in the econometric literature (Wooldridge 2002).

loan in a year and in many years they do not borrow at all. Therefore, the recall period covers only the last 2 to 3 loans taken. Savings do not change considerably from year to year. Households are generally able to reconstruct changes for the past 2 - 3 years with the help of the enumerator. We discuss the limitations imposed by the recall period in more detail in the Limitations section.

The second survey took place in March 2017, to document the 2016 growing season. Most questions remained the same, except for questions about the prior seasons.

Some information in the survey, such as assets, savings, and food consumed vary with the seasons. We asked for the amounts that the household had in March of each year. March is the month of transition from the previous growing season to the next one. We asked about total inputs into production and yields over the growing season, after all agricultural activities had been completed.

We collected data from the same households in both rounds of the survey – resulting in a *panel* data set. Most of the sample that makes up the panel was selected for a previous round of evaluation, discussed in the following section. We did not use any data from the previous round of data collection for reasons that we discuss below; therefore we do not describe the previous surveys. However, we continued the previous panel in order to be able to compare the outcomes of this evaluation to the outcomes of the evaluation conducted in 2012, and to preserve the ability to analyze how the rates at which outcomes change evolve over the course of the program.

Sample selection for that part of the panel, which is preserved from the previous round of evaluation, was conducted in 2010. Sampling was done at the village level. In each R4 village, we randomly selected households who purchased index insurance, with labor or in cash, covering 10% of the insurance purchasers in each village. We oversampled the insurance purchasers in order to have a sufficient number of insurance purchasers for analysis. We randomly sampled non-purchasers, covering 5% of non-purchasers in each R4 village, and we randomly sampled households in control villages, covering 5% of households. The only control village that remains in the sample from the original panel is Were Abaye in Raya Azebo.

For the sample used for this study, we sampled additional households in order to (1) improve our coverage of households who are members of the PSNP, (2) maintain the control group in R4 villages since some of the previously selected households had begun to purchase insurance, and (3) sample new control villages since 2 out of 3 control villages from the previous study had joined R4.

We sampled households for the current study in each village. We sampled randomly only from the population of PSNP participants. In each R4 village, we sampled households who participate in insurance-for-work and those who do not,

from among PSNP participants. We added 4 new control villages, one for each R4 village in the sample. Each control village was chosen to match one R4 village as closely as possible, located in the same district and same agro-ecological zone. We sampled households randomly from among PSNP participants in the control villages.

In this study, we only use households who participate in the PSNP in order to create comparable samples in program and control villages. Almost all insured households participate in insurance-for-work, and only those who are in the PSNP can participate in insurance-for-work. The final sample consists of 294 households in R4 villages (238 households who participate in insurance-for-work in 2016 and 56 households who never purchased insurance), and 165 households in control villages.⁵ For the analyses of those outcomes for which we have retrospective data back to 2012, we include in the group of insurance participants only those households who purchased insurance every year from 2012 to 2016, which number 179, yielding a total of 235 households in R4 villages. The regression analysis uses sampling weights to adjust the weight of each household to its weight in the population.⁶

We analyze whether the effects of R4 differ in each of the three districts and between male-headed and female-headed households. We show the number of observations in each of these subgroups for the sample that includes households who purchased every year from 2012 to 2016 in the table below.

Table 1: Sample size by treatment status and gender for the sample that includes households who purchased insurance every year between 2012 and 2016.

Gender	All woredas combined		Kola Temben		Saesi Tsaedaemba		Raya Azebo	
	R4	Control	R4	Control	R4	Control	R4	Control
Male-headed households	131	93	34	33	27	28	70	32
Female-headed households	104	72	36	28	18	22	50	22
Total	235	165	70	61	45	50	120	54

⁵ Sample sizes for each group were calculated to minimize the size of the effect that we could identify for several outcome variables given the available budget, using data from the previous evaluation to obtain standard errors.

⁶ The use of sampling weights yields the wrong estimators except in the case of a fully saturated regression (Deaton 1997). The main independent variables in our regressions were either binary or could easily be transformed into binary variables. All the regressions were fully saturated in order to produce correct estimates.

1.3 Relationship to previous evaluations

Previous work assessed the progress of HARITA between 2009 and 2012 in the same program villages that are included in this study. The previous study took a mixed method approach, similar to this one, combining a difference-in-difference analysis of program outcomes and impacts based on survey data with evidence from focus group discussions and interviews.

The previous study collected data from most of the same households that are included in the current study in three rounds of surveys. One round documented outcomes in 2009, before the program began in 4 out of 5 of the R4 villages, and two rounds after the program began, one in 2010 and one in 2012. It included one of the control villages from the current study, Were Abaye, in which we also interviewed the same households. The remaining 2 control villages from the study have since joined the R4 program.

Ideally we would take advantage of the data collected between 2009 and 2012 to analyze impacts between 2009 and 2016. However, because most of the control villages from the previous study joined the program, we do not have data for any outcomes prior to the 2013 season for all but one of the control villages included in the current study.

EVALUATION LIMITATIONS

One limitation is the small sample size of our surveys. The reader must keep in mind that we can only detect sufficiently large effects in our survey data because of the sample size. R4 may be improving livelihoods through changes in outcomes that are smaller than we can detect.

The current study does not have a baseline of data on outcomes before the program began. At the same time, we document how R4 changes the evolution of outcomes over a longer period of time than is common in most evaluations, in this case from 4 to 7 years after the program started. Most development programs require time to achieve their potential, and the time frame of this evaluation offers essential evidence on longer-term impacts of R4.

The approach uses differences over time to mitigate selection effects in two different ways: by comparing outcomes in R4 villages to outcomes in control villages and by comparing outcomes for households who participate in insurance-for-work to outcomes for uninsured households in R4 villages and households in control villages. If R4 villages are different from control villages in ways that change over time at different rates, for example there are more

knowledgeable or capable farmers in R4 villages and the effect of their knowledge or skills on outcomes increases faster over time than does the effect of the knowledge or skills among farmers in control villages, then the results will be affected by selection bias. Such selection bias is more likely to affect the comparison between households who participate in insurance-for-work and those who do not rather than the comparison between R4 and control villages. As we documented in the report on the evaluation completed in 2012, those who purchase insurance were substantially different from those who do not purchase insurance before the program began (Madajewicz and Tsegay 2014). On the other hand, R4 villages are not substantially different from control villages as we discuss further below.

The analysis of the change in outcomes between seasons prior to the 2015 season relies on information that farmers had to recall. We only collected data that farmers were able to recall reasonably easily: sources of income, number of animals, total harvests, savings, and amounts borrowed. Values of these variables may become progressively less reliable for years farther back in the past. As long as farmers in control villages do not differ systematically in their ability to recall from farmers in R4 villages, recall problems will reduce the estimates of impacts, reducing our ability to find statistically significant impacts of R4. Therefore, we may be more likely to identify more recent impacts.

The quantitative analysis can only identify the impacts of the overall R4 program rather than of the individual components. An assessment of the individual components would require that each component, and each possible combination of components, be implemented in separate areas so that their impacts can be compared. We draw some qualitative conclusions about how different program components contribute to impacts from the observed impacts and from the qualitative information collected from farmers.

Finally, the results are not necessarily representative for the entire area that R4 covers in Tigray. The evaluation continues to follow the 5 villages in which the program began, which offer a longer-term perspective on the evolution of the program but do not represent conditions in districts, which joined the program after 2010.

CONTEXT

1. Ethiopia and Tigray

In 2016, Ethiopia's agricultural sector contributed an estimated 37.2% of the total GDP.⁷ About 83% of households depend directly or indirectly on agriculture for their livelihoods. Adverse weather conditions pose a major threat to the incomes of farmers. The main weather risk in most of the country is drought, which often affects agricultural productivity and occasionally causes serious famines.

Tigray is a state in the north of the country, bordering on Eritrea. Most of the topography is mountainous, although the southern part of the state has plains. The agricultural season consists of two rainy seasons. The *belg* are short rains that fall between February and April. The main *meher* rains fall between May and September.

2. The three study districts

2.1 Agro-ecological and geographical conditions

Two out of the three districts included in this evaluation, Kola Temben and Saesi Tsaedaemba, are in the sub-moist mid-highland zone according to Mengistu 2003, with an altitude in the 1,500 to 2,300 meter range. Raya Azebo is in the hot to warm sub-moist to arid lowland plain zone with an altitude of 500 to 1,500 meters.

The soil conditions are quite different in the 3 districts. Raya Azebo sits in a plain that has fertile, fluvial soil. Kola Temben is at a higher altitude and more rugged but also has fertile, black soils. The terrain in Saesi Tsaedaemba is rugged and the soil is rocky and sandy. In general, soils in Tigray are highly degraded due to deforestation and excessive cultivation. Soil erosion is particularly severe in Saesi Tsaedaemba's steep, rocky terrain.

2.2 Climate conditions

Droughts pose the main challenge to livelihoods on all three districts, and they are becoming more frequent and intense. Some of the biggest changes in the climate are happening in Raya Azebo, where the growing season is becoming shorter and the most prone to drought of the 3 districts. Kola Temben has the shortest growing season of the 3 districts, but it is also the least prone to drought.

Climate conditions are likely to affect the performance of R4 significantly, and indeed R4 was designed to perform different functions under different climate

⁷World Bank national accounts data, and OECD National Accounts data files
(<http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS>)

conditions. The period of evaluation, from the 2013 growing season to the 2016 growing season, covers a variety of climate outcomes. The 2013 and 2014 seasons had normal rains in all districts. The 2015 season was affected by a historic drought, one of the worst that Ethiopia has experienced. The 2016 season had better rains than 2015, but there were important variations in conditions across the 3 districts, which we discuss in the Evaluation Findings.

2.3 Livelihoods

The great majority of the population are smallholder farmers, whose crop cultivation relies primarily on rainfall. Different crops predominate in the 3 districts, and we focus our analysis on different crops in each of the districts. The primary crops in Raya Azebo are teff and sorghum, and these are the insured crops. The primary crops in Kola Temben are teff and maize (the two insured crops), though people also grow sorghum, niger, and they use irrigation to grow fruit, vegetables, and coffee. In Saesi Tsaedaemba, the main crops are wheat and barley, which are the insured crops, although people also grow teff and chickpea. In all villages, those who have access to irrigation grow fruits and vegetables.

Farmers in all villages suffer from a shortage of land, with families subdividing their small plots among the children with each generation. The problem is particularly severe in Saesi Tsaedaemba, where plots are especially small.

2.4 Infrastructure and administration

Raya Azebo is the most accessible and developed of the three districts. The R4 villages in Raya Azebo are near the administrative center and bustling trading town of Meho. They have nearby schools, a health center, and safe drinking water. There are a number of irrigation wells dug by the government near Hade Alga in Raya Azebo but these are inactive. An OA project constructed an irrigation system in Genete village.

The two study villages in Kola Temben are perhaps the least accessible of the five locations, although a relatively new road has made access much easier. Schools, health facilities, and markets are far away. Irrigation is present in Kola Temben thanks to an extensive OA project that implemented an irrigation system in Adi Ha village.

Hadush Adi in Saesi Tsaedaemba is easily accessible by road though the 2 kilometer long track that connects it to the main road is rough. The administrative center of the woreda is in Frewyni, much farther to the north. The nearest school, health center, and market are all quite far away. There is no irrigation.

THE R4 PROGRAM

The four Rs in the R4 program are risk reduction, risk transfer, risk reserves, and prudent risk taking. The four components combine to help farmers manage risks to their livelihoods. HARITA introduced the first two components in Tigray, which are disaster risk reduction and weather index insurance, in 2009 and 2010. The program became R4 in 2012, and it began to introduce the savings and credit components in some villages in 2014 and 2015. Savings and credit services have not yet begun in the Kola Temben district included in this study.

Disaster risk reduction (DRR) projects are designed to reduce the impact of weather shocks on agricultural production and livelihoods. The R4 team together with district agricultural experts, extension agents and community representatives constitute a design team in each community, which identifies risk reduction activities that will be conducted each year through a Participatory Vulnerability and Capacity Assessment (PVCA). The activities include small-scale water harvesting, increasing soil moisture retention by diverting and holding rainwater, reducing soil erosion with plantings, and other strategies to improve crop production. These measures are designed to restore the fertility and hardness of the degraded soil and its capacity to rebound after shocks. The DRR projects also include training in income generating activities and provision of materials for some of these activities. PVCAs differentiate between strategies that are appropriate for each gender. The design teams, which are responsible for designing, implementing, monitoring, and evaluating risk reduction activities, include two female-headed households.⁸

Risk transfer is the weather index insurance component, which pays farmers who buy insurance if rainfall at a given time of the growing season is below a certain amount. The index insurance component employs a unique insurance-for-work (IFW) model that allows poor farmers who are PSNP beneficiaries or recent graduates from PSNP to pay the insurance premium by working on the DRR projects in their community. All farmers who buy insurance are required to pay at least 15% of the insurance premium in cash. Farmers have the option to pay the entire premium in cash but few farmers do. Only the main crops are covered by insurance, as listed in the previous section for each district.

R4 administers the insurance program through the Rural Savings and Credit Cooperative (RUSACCO) in each village. RUSACCO are cooperatives administered by the Ethiopian government. The farmers pay the RUSACCO for their premium and the RUSACCO disburse any payout when there is insufficient

⁸ We refer to female-headed households as those in which there is no male head of household residing at home. Most often the female head of household does not have a husband but in some cases the husband is away most of the time.

rain. In effect, this means that almost all farmers who buy insurance are members of the RUSACCO in their village.

Risk reserves are the savings component of R4, which R4 began to introduce in Tigray in 2015. R4 is encouraging farmers *who participate in insurance* to form groups and pool their savings into community risk pools, called Village Economic and Saving Associations (VESA). VESAs were designed to address frequent risks to farmers' livelihoods that index insurance does not address. Group savings can be loaned out to help individual households, acting as a self-insurance mechanism for the community. The agreement to use the savings varies among VESAs; some VESAs loan funds to their members with and without interest and others revolve as an *equub*⁹.

In addition to serving as saving and credit services, farmers who are VESA members exchange knowledge and advice. The groups meet every month and discuss social, economic and environmental issues. In some VESAs, members contribute small amounts of cash, which is used as a social fund. Members use the fund to organize events.

The program also uses RUSACCOs as a platform for farmers to save regularly. All VESA members must also save in the RUSACCO in the village. Only those who purchase insurance can be members of a VESA. Any farmer can be a member of and save in a RUSACCO.

Prudent risk taking is the credit component. R4 deposited a revolving fund in the RUSACCO in some villages in 2014 to serve as a source of small loans. The program has issued three phases of loans, in each year from 2014 to 2016. After farmers repay all their loans, the funds are used as a revolving fund to meet the demands of other farmers in the next phase. Only farmers who have savings in the RUSACCO can obtain a loan, and only farmers who participate in insurance can borrow from the revolving fund. The savings serve as a form of collateral.

In principle any farmer who has savings in a RUSACCO can borrow from the pool of savings in a RUSACCO if the RUSACCO offers such loans. Whether or not RUSACCOs lend from their pool of savings varies from village to village.

⁹ Rotating saving and credit association.

PROGRAM THEORY

The program theory provides a conceptual guide for the evaluation by describing how the interventions that compose the R4 program may achieve the intended objectives.¹⁰ The program theory comprises three broad causal mechanisms through which R4 can result in improvements in security of livelihoods. (1) R4 enables farmers to cope with shocks to livelihoods without reducing food consumption, critical expenditures, and future ability to generate income. (2) R4 helps farmers to diversify income sources. (3) R4 helps farmers to improve agricultural production.

We will examine the contribution that the first mechanism makes through quantitative evidence of maintained access to food, productive assets, and qualitative evidence regarding coping strategies. We will identify the second mechanism through quantitative and qualitative evidence of access to non-farm income sources. Evidence of the third mechanism are inputs into crop production and yields. In addition, quantitative and qualitative evidence of accumulation of savings, access to credit, and how households use savings and credit may support any of the three mechanisms.

R4's *risk reduction activities* may activate the first causal mechanism by improving crop yields in seasons that are affected by adverse weather. Water diversion and water retention structures and plantings protect fields from excess water, retain water for dry spells, and rehabilitate degraded and eroded soils. The risk reduction component contributes to the second causal mechanism by training farmers in alternative income generating activities and offering inputs needed for those activities, such as establishing vegetable gardens. The activities that improve farmers' ability to cope with bad weather also improve agricultural production in good seasons, as does training in farming techniques.

Different households may benefit differently from the risk reduction activities depending on where their fields are located, and to what extent the activities address problems that affect their fields. The net benefits of the activities will also depend on how household members are affected by the requirement that they contribute labor. Women and children may be particularly heavily impacted by the labor requirement if the women provide the labor and are still expected to fulfill the remainder of their household responsibilities and/or the children have to help with more of the household chores or fieldwork. The PSNP provides some protection against such negative effects by requiring that a half hour of a woman's work is equivalent to an hour of a man's work. On the other hand,

¹⁰ The program theory chart of R4 is in Appendix 2.

women may benefit by gaining skills and experience when they provide the labor.

Weather index insurance may affect farmers' behavior and the security of livelihoods in two ways (for a discussion of the conceptual framework on which this section is based see Carter and Barrett 2006 and Barnett et al 2008). First, during droughts, weather index insurance may help to protect farmers' food security and production in future seasons. The insurance payout provides cash that farmers can use to purchase food, purchase inputs into production in the following season, and repay loans. The enhanced ability to repay loans may enable farmers to borrow more easily, and therefore improve access to credit to fund food purchases and investments.

Furthermore, insurance payouts in a drought can help to preserve farmers' productive potential in future seasons. Farmers often sell productive assets, such as draught animals, which are oxen in Tigray, in order to feed their families after a drought (Rosenzweig and Wolpin 1993, Tafere et al 2010). Such sales reduce yields and the family's income for many seasons, potentially resulting in a poverty trap. Farmers who receive an insurance payout may not need to sell their animals. Ability to maintain assets may also reduce migration that can result from a drought.

The second potential effect of weather index insurance is greater production in good seasons, which may improve food security and livelihoods in all seasons. The threat of drought may cause farmers to invest less in all seasons and to avoid borrowing to finance investments because farmers worry that investments will be wiped out by drought. The promise of an insurance payout may encourage farmers to buy more inputs, translating into higher yields. Increased production can have feedback effects that further improve production by providing the liquidity that farmers need to purchase even more inputs and by translating into reserves of savings and food during droughts that enable farmers to use more of their cash to purchase inputs in good seasons. Increased production may also reduce migration.

Savings and credit provide cash that can help a household to cope with shocks without reducing consumption or selling productive assets, and they also provide capital that farmers can invest in their crops or in a non-farm business. The ability to diversify incomes may be especially critical to improving livelihoods in the drought-prone environment of Tigray, where nature poses a formidable obstacle to improvements in agricultural production.

In addition to intended outcomes and impacts, R4 may have other positive and negative consequences.

- If basis risk is larger than expected and/or the index is poorly designed and/or based on poor quality data, then the insurance may not reduce the risk that farmers face.

- The program may affect how other organizations function such as government institutions, NGOs, and community organizations. It may erode existing insurance networks if people who are insured perceive less need to rely on others in their communities in times of need and therefore offer less help to community members. However, it may also improve these networks if insured farmers are better able to insure each other against idiosyncratic risks that are not covered by the index insurance.
- If insurance results in greater demand for certain productive inputs, prices of these inputs may rise, with adverse effects on investment. If insured farmers plant more high-value crops, prices of these crops may decline.
- The insurance for labor may affect labor supply and therefore wages.

R4 may also affect the livelihoods and food security of other residents in the village, who are not direct beneficiaries of the program:

- Insured people could help the uninsured weather bad seasons.
- The uninsured may benefit from risk reduction activities and from new information disseminated by R4 since the insured may pass on information to the uninsured.
- The uninsured will be affected by any changes in informal insurance networks, government services, prices, and wages discussed above.

EVALUATION FINDINGS

This evaluation offers an opportunity to assess the medium to long-term potential of the risk reduction and weather index insurance components of the R4 program seven years after their introduction. These innovative, complex components require time to evolve as Oxfam and WFP learn how the approach is working, REST develops responses to implementation challenges, and the participants learn how they can best use the resources that the program offers to improve their livelihoods.

At the same time, the complexity of the program has increased over the last three years as the program has introduced the savings and credit components. These components are in their early stages and are just beginning to have impacts. They have not yet been introduced in one of the study districts, Kola Temben, allowing us to observe the effect of the more mature part of the program in one district and a combination of the mature part and the recently introduced savings and credit in two other districts.

The results of this evaluation fall into three broad themes. First, R4 is helping smallholder households, especially female-headed ones, to reduce the impact of drought on food security while maintaining their productive assets. Second, R4 is supporting food security through (1) increased saving and borrowing, and (2) diversification of income sources away from cereal crops. Third, evidence that R4 is improving agricultural production is limited. One reason may be that R4 villages in two of the three study districts suffered shocks to agricultural production, which did not affect the control villages, the year after the historic drought that occurred in 2015. However, droughts may pose a challenge for improving agricultural production in the absence of irrigation in the region.

As discussed in the methodology section, we compare changes in outcomes over time between villages that participate in R4 and ones that do not. A positive change in a village that participates in R4 may not result from R4 activities if the same change takes place in a non-participating village. For household survey data, we only report differences that are statistically significant, that is the probability that the differences that we discuss occur by chance in the sample that we have chosen is 0.1 or less. If we do not discuss a difference in outcomes for a given variable, a given time period, and/or a given location then those outcomes did not differ between the R4 villages and the control villages enough to be statistically significant.

1. Comparison of R4 and control villages

R4 villages and control villages in each district are very similar to each other based on characteristics that may affect how R4 influences farmers' outcomes.

Therefore, the comparison of the change in outcomes over time that follows in subsequent sections should provide a good estimate of the effect of R4. We compare the values of such characteristics as the percentage of female-headed households, the percentage of farmers who can read and write, average age of the household head, the primary and secondary occupations of household members, for example whether the households members are primarily engaged in agriculture, or in wage labor, or in an agriculture-related or non-agricultural business, and the average amount of land owned. We compare the values of most of these variables measured at the beginning of the evaluation period, in March 2012, but data on land owned are from 2015.¹¹ The results are in Table 2.

In Kola Temben, the R4 villages of Adi Ha and Awet Bikalsi differ from the control villages of Limat and Hidnet in a statistically significant way at the start of the evaluation period only with respect to percentage of farmers who can read and write. More farmers can read and write in the R4 villages than in the control villages. We control for the effect of the ability to read and write on changes in outcomes in the regressions. However, the ability to read and write may be correlated with other traits, such as management ability, that we cannot observe in the data and that may affect outcomes. Such unobservable traits may bias our estimates of the effect of R4 if their effect on outcomes, for example on yields, changes over time at a different rate in R4 villages than in control villages.

In Saesi Tsaedaemba, the only statistically significant difference between the R4 village of Hadush Adi and the control village of Tsenkanit at the start of the evaluation period is that a somewhat higher percentage of households in Hadush Adi have a household head who is older than 65. In Raya Azebo, fewer households in the R4 villages can read and write than in control villages, and households in R4 villages on average own more land. Again, we control for the effects of each of these variables in the regressions, but there may be a bias due to characteristics that we cannot observe.

2. Protection for food-insecure households: food security and coping strategies

2.1 Food security

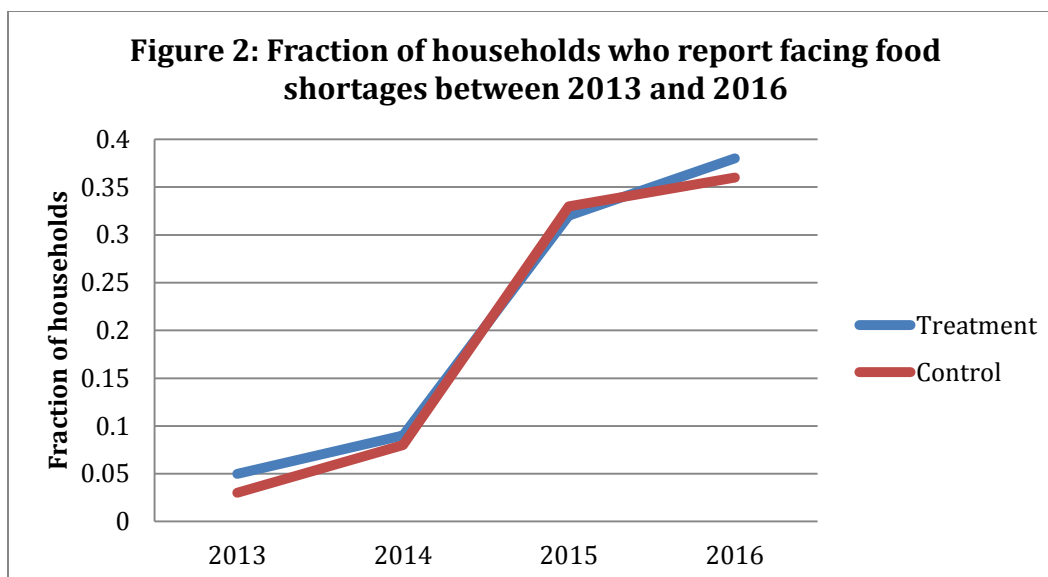
The main goal of R4 is to improve the security of livelihoods of smallholder farmers. The most challenging test of the program occurs during growing seasons that are affected by major shocks to livelihoods, such as the severe drought that occurred in 2015 in Tigray. R4 is achieving the goal of improved food security by reducing the impact of the drought on access to food, mainly for

¹¹ One may worry that the values of these variables may reflect changes in R4 villages that are due to R4 since they are documented 2 years after the program began. However, it is extremely unlikely that the program would have affected outcomes such as ability to read and write among adults 2 years after it began, and we know that it did not affect the primary occupations from the previous round of evaluation. The values of land may pose a larger concern but the market for land is not very active in Tigray.

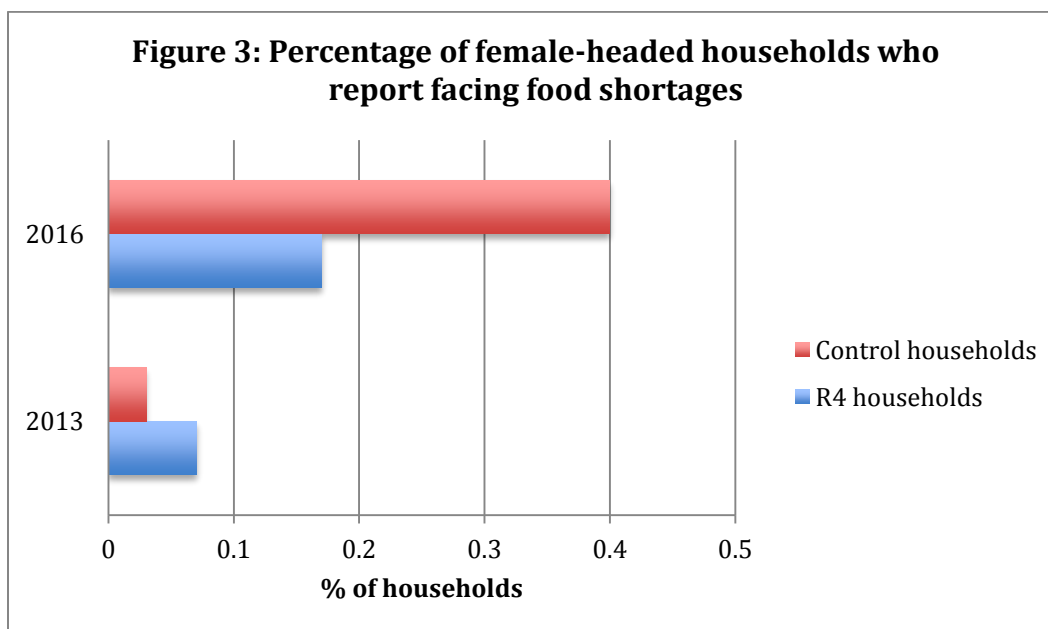
female-headed households, by two measures: whether or not households report facing food shortages and how many meals household members eat per day in the first week of March. The effects of R4 that contribute to smaller declines in food security among households in R4 villages are increases in savings and access to credit, and diversification of income sources, as we discuss in later sections. All the components of R4 contribute to making these effects possible.

The data on food shortages reported by households in the survey spans the period from the beginning of the 2013 growing season to the end of the 2016 growing season. Few households report food shortages during the 2013 growing season: 5% of households in R4 villages and 3% of households in control villages. However, the fraction who report food shortages continues to increase throughout the time span of the evaluation, and the data clearly show the effect of the drought that occurred in 2015. The percent of households who face food shortages increases by 4 percentage points in R4 villages and 5 percentage points in control villages from the 2013 to the 2014 growing season and then by a remarkable 23 percentage points in R4 villages and 25 percentage points in control villages from 2014 to 2015. The average length of time for which households report experiencing food shortages rises from just a few days among control households and a week among households in R4 villages in 2013 to 1.2 months among control households and 1.3 months among R4 households in 2015. The proportion who face food shortages increases again, slightly, from 2015 to 2016, most likely because households face the most severe food shortages after a drought and before the new crop matures. Figure 2 shows the increasing food shortages in R4 and control villages between 2013 and 2016.

The above percentages of households faced food shortages during the drought before receiving emergency food aid; that is with access only to the continuously available programs that include R4. Food aid reduced the percent of households who faced food shortages and the length of time for which they faced shortages. Among those who reported facing food shortages before receiving food aid, the average length of time for which they faced shortages after receiving food aid declined to 0.19 months among control households and 0.15 months among R4 households.



R4 reduced the percent of female-headed households who faced food shortages relative to control households but it did not affect the percent of male-headed households who faced shortages, based on regression analysis of the change in percentage of households who report food shortages between 2013 and 2016. The fraction of female-headed households who face food shortages in R4 villages increases over the time period of the evaluation because of the drought but the increase is 26% smaller than is the increase in control villages.¹² Figure 3 illustrates the larger increase in food shortages in control villages. The full regression results are in Table 3.



¹² The fraction of households who face food shortages over this time period increases by 0.34 in control villages.

The effect of R4 differs across the three districts. The increase over the time span of the evaluation in the percent of female-headed households who face food shortages is 82% smaller in the R4 village in Saesi Tsaedaemba than it is in the control village.¹³ The two most likely mechanisms through which the female-headed households in this district reduced the impact of the drought on their access to food are increased borrowing during the drought, as we discuss in section 3.4.1 below, and DRR activities such as micro gardens.

The evidence is more mixed in Kola Temben, where the proportion of male-headed households who faced food shortages increased less in R4 villages than in control villages during the drought but then increased more the year after the drought, and the experience of female-headed households did not differ from the experience of control households. There is no difference between households in R4 villages and control villages in Raya Azebo.

The effect of R4 on the proportion of households who ate three times per day or more during the first week of March 2016 compared to the first week of March 2017 differs across the three districts. The proportion of households in R4 villages in Kola Temben who ate three times per day increased from a mean of 0.71 in 2016 while the proportion declined in control villages. Full regression results are in Table 3. The positive effect of R4 is much larger among insured female-headed households in Kola Temben than it is for all households in R4 villages in Kola Temben on average.

R4 did not affect the proportion of households who ate three times a day during the first week in March in Saesi Tsaedaemba or Raya Azebo. The most likely reason why we see no effect in Saesi Tsaedaemba on this measure of food security, is that the improvement in that district with respect to reported food shortages occurred between 2013 and 2016, a longer time period than the period for which we have data on the number of daily meals, which is 2015 to 2016. The R4 village in Saesi Tsaedaemba suffered crop losses due to heavy rains in 2016, while the control village did not, and the shock came the year after the 2015 drought. It is not surprising that there was no improvement from 2015 to 2016, and it is impressive that there was an improvement from 2013 to 2016 given that the 2016 season was not a good one in the R4 village.

2.2 Coping strategies

2.2.1 Climate change and its effects

Climate change is apparent to almost all respondents to our survey. About 90% of households in both R4 and control villages report that they have observed changes in temperature over the last 10 – 20 years, and a similar 85% report a

¹³ The difference is just outside the normally accepted significance levels with a p value of 0.11.

decline in the frequency of rainfall. Almost 70% say that their household has been affected by these changes.

Households in all villages report that they adjust to the long-term changes in rainfall primarily by undertaking more soil conservation activities. The second main reported adjustment is tree planting. The main adjustment to long-term changes in temperatures is tree planting and the second main adjustment is soil conservation. Few households report any other adjustment strategies.

Most households in both R4 and control villages report that adaptation to climate change requires more of men's labor or more labor on the part of both men and women. Few report that it requires more of only women's labor or that it requires more hired labor.

We asked survey respondents whether the actions that they are taking to adapt to climate change are affecting the health of the household members, for example by diverting financial resources, requiring more labor, or in other ways. Most households in R4 villages report that adaptation strategies do not have significant impacts on health. Only 15% report that adaptation is affecting health, and of those who think so, about 50% think that it is mostly affecting the health of children. Opinions in control villages are very similar except that among the 15% who think that adaptation strategies are having impacts on health, 43% think that the impacts are mainly on the health of men.

2.2.2 Shocks to household livelihoods

We asked the respondents what were the main shocks to livelihoods that they experienced during the 2015 and 2016 growing seasons. Not surprisingly, almost 98% of households in all villages report that their household was affected by drought during the 2015 growing season.

As in previous droughts, Raya Azebo was the most affected by the drought in 2015. The median household lost 100% of their teff and sorghum crops, the two main and insured crops. Unlike in the other two districts, drought often causes livestock losses in Raya Azebo, and it did so in 2015. Kola Temben was also severely affected by the drought in 2015, with the median household losing 50% of their teff yield and 67% of their maize yield, the two main and insured crops. Saesi Tsaedaemba, which is normally more severely affected by drought than Kola Temben, was somewhat less affected in 2015, with the median household losing 25% of the wheat and barley crop, the main and insured crop. Households in Saesi Tsaedaemba report that even though rainfall was scant, it was well distributed through the season. Their poor, sandy soil does not need or tolerate large amounts of rainfall so the limited, well-distributed rainfall was sufficient.

The rains were good in general during the 2016 season. However, a large percentage of households in R4 villages in Saesi Tsaedaemba and Raya Azebo

report that their households were affected by adverse weather conditions or pests, and these shocks did not affect the control villages. Thus, households in R4 villages in these two districts faced two consecutive shocks, with the second one coming when their resources were already stressed by a severe drought.

In Saesi Tsaedaemba, in 2016 excessive rains destroyed the crops in the R4 village. These rains did much more damage in the R4 village than in the control village because the R4 village has more sandy soils, which are more easily washed away by heavy rains. The control village was affected by pests in 2016 due to heavy rains and high temperatures but the heavy rains affected a greater percentage of households in the R4 village.

In Raya Azebo, in 2016, the R4 villages were affected by pests, which did not affect control villages. The control villages had somewhat less rain than the R4 villages, but the pest problems in the R4 villages affected more households.

2.2.3 Coping strategies including weather index insurance, savings, and credit

In the survey, we asked households what strategies they used to cope with the shocks in 2015 and in 2016. We classify these strategies according to their resilience. Some strategies can harm either the health of the household members or their ability to generate income in the long term, while other strategies maintain livelihoods in the short and longer term. We classify the following strategies as non-resilient: selling livestock or other productive assets, eating less or less preferred food, consuming seed stock, spending less on household necessities such as medicine or schooling, sending children to work, or migrating. Resilient strategies include using savings, loans, insurance, external assistance including food aid, taking an additional job, renting out land, sharecropping, or sharing livestock.

An important caveat applies to the classification above. Livestock sales can be a resilient or a non-resilient strategy. Historically, livestock sales as a result of drought have had a negative impact on livelihoods because farmers have sold animals that they need to plough the land and/or generate other income, such as from sales of milk. Farmers have found it difficult to replace the animals partly because they sold them when prices were low, in a drought, and tried to buy them back when prices were high. Consistently with this view, all households report in FGDs that they prefer to use savings to cope with drought than to sell livestock if they have sufficient savings, except male-headed households in Raya Azebo. The latter note that livestock in their district often die during a drought; therefore they prefer to sell the livestock early during a drought.

However, R4 is promoting income generation through raising and fattening livestock, which can then be sold. Livestock acquired for the purpose of selling can be viewed as a form of savings, which can be used to cope with drought

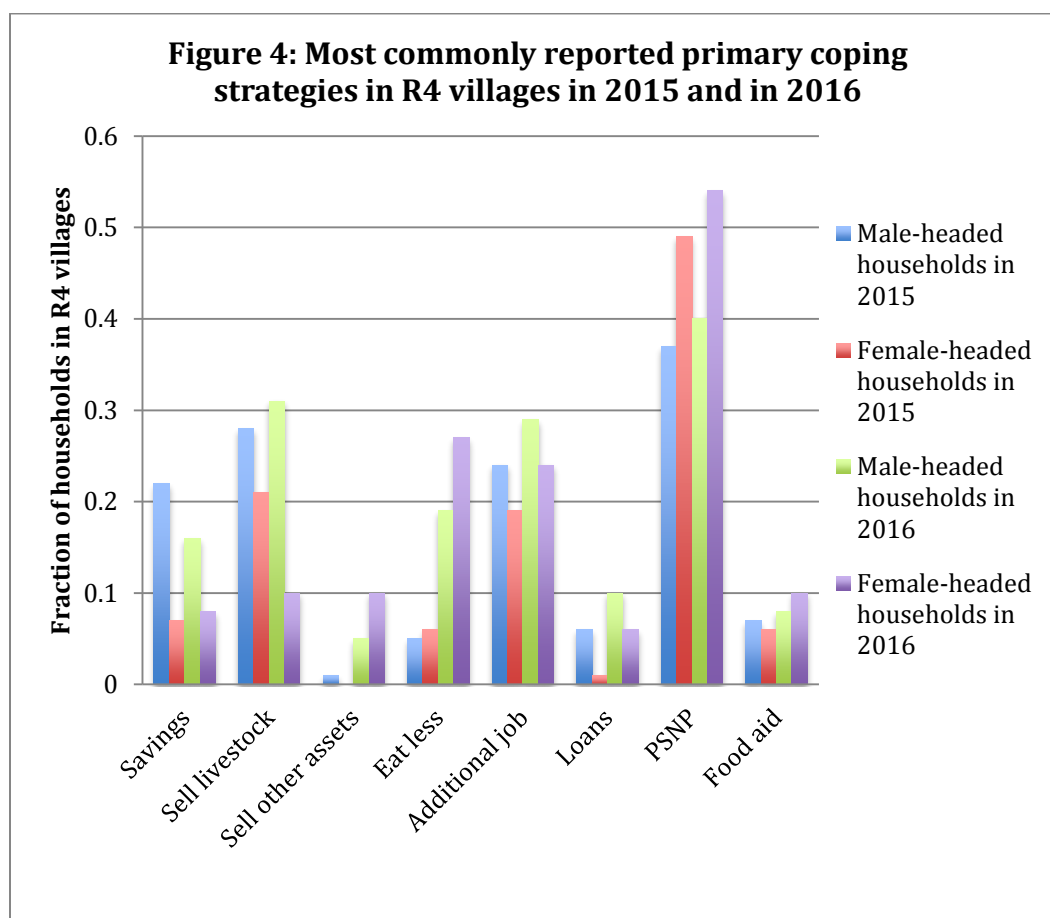
without damaging the long-term productive potential of the household. Perhaps partly as a result of this training, in recent years households in R4 villages have begun to use savings or credit to buy livestock early during the drought, when the prices of livestock are low, in order to trade the animals. They consider this to be a new coping strategy. They may use the animals for production while they are keeping them, and they may fatten them up. They then sell the animals when prices rise. Some respondents in FGDs have reported high profit margins in this activity.

About 31% of households in R4 villages report using the strategies that we have classified as non-resilient as their first coping strategy in 2015, during the drought, 23% use them as a second coping strategy and 17% as a third coping strategy. The numbers are similar in the control villages and the differences are not statistically significant. The difference between the percent of households who use non-resilient strategies as their main coping strategies in R4 and in control villages is also not statistically significant if we classify all livestock sales as a resilient strategy.

While R4 households continue to use non-resilient strategies, other evidence suggests that they are using resilient strategies more intensively than are control households and therefore they have become more resilient overall. As we discuss later in the report, female-headed households in R4 villages are maintaining and accumulating livestock more than are households in control villages, and they are borrowing more both during drought and during good seasons. Male-headed households are accumulating more savings. Some R4 households are also becoming more diversified. Furthermore, the households in R4 villages who report livestock sales may be reporting the new livestock trading that we discussed above, and therefore the “non-resilient” strategies may be more resilient in the R4 villages than in the control villages.¹⁴

A somewhat higher 45% of households in R4 villages report using the non-resilient strategies to cope with shocks faced in 2016, during the year after the drought, as their first coping strategy, 41% as a second strategy, and 22% as a third strategy. The percentages who use non-resilient strategies are also higher in the control villages in 2016 than they were in 2015. In particular, the percentage of households who resort to less preferred foods or reduce food intake increases between 2015 and 2016. This finding underlines the importance of considering resilience to repeated stresses when assessing progress. The drought may have reduced the households’ ability to use more resilient strategies during the year after the drought in both R4 and control villages.

¹⁴ We cannot distinguish livestock sales for the purpose of trading from sales of livestock, which are productive assets, in the data.



In the FGDs as well as in the survey, all participants in both R4 and control villages in Saesi Tsaedaemba and Raya Azebo report that their most important coping mechanism is government support through the PSNP, and this source of support is relatively more important for female-headed households, as shown above in Figure 4. In Kola Temben, participants in FGDs report that insurance is the most important strategy. However, in the survey, no respondents list the insurance payout as one of their top three coping strategies. In Saesi Tsaedaemba and Raya Azebo, participants in FGDs mention the insurance payout as too small to cover expenses by itself but a useful complement to savings and loans. Sixty-four percent of survey respondents report that they used the payout in 2015 to buy food, 8% report using at least some of the money to buy agricultural inputs, and 16% report using it for other expenses.

Based on survey results, livestock sales are the second most important coping strategy in 2015 and 2016, but in 2016 they are used by more male-headed households than female-headed ones. The third most important strategy is getting an additional job. Savings are the fourth strategy among male-headed

households, but using savings is less common among female-headed households.

Households in R4 villages, and especially those who participated in insurance-for-work in 2016, have a greater variety of coping strategies at their disposal than do households in control villages, according to FGD participants. In particular, FGD participants mention that they use savings and credit from the RUSACCO revolving fund, reserved for insurance purchasers, to cover expenditures and to fund off-farm income-generating activities, except in Kola Temben where the revolving fund does not exist. However, participants in Kola Temben also mention off-farm activities. Livestock trading is a major income generating activity during a drought for male-headed households, while female-headed households, especially in Raya Azebo, invest in small shops and tea stalls. Farmers in Kola Temben and in Genete village in Raya Azebo also use irrigation.

FGD participants in Kola Temben and Raya Azebo mention eating less as a coping strategy. Only FGD participants in Saesi Tsaedaemba mention migration.

FGD participants discussed whether they have changed their coping strategies over the last 7 years, since the inception of R4. Participants in the R4 villages overwhelmingly reported a number of changes. They are less reliant on migration as a coping strategy than they were in the past. They still rely on government assistance, but they are now supplementing that assistance with their own savings. They now recognize the importance of saving and they use their increased savings together with the insurance payout to fund non-farm income generating activities. Female FGD participants, and especially insured participants, report that they are now shifting from crop production to high-value vegetable production that uses irrigation from water harvesting structures constructed through DRR activities for micro gardens.

3. Changes in livelihood security

This section presents the impacts that R4 has had on measures of livelihood security, which include diversification of income sources, maintenance of productive assets through droughts, savings, credit, inputs into agricultural production, and yields. These changes in livelihoods are the pathways through which R4 has influenced food security and coping strategies discussed above. The active pathways are diversification of income sources, improved maintenance and accumulation of productive assets, accumulation of savings, and increases in borrowing.

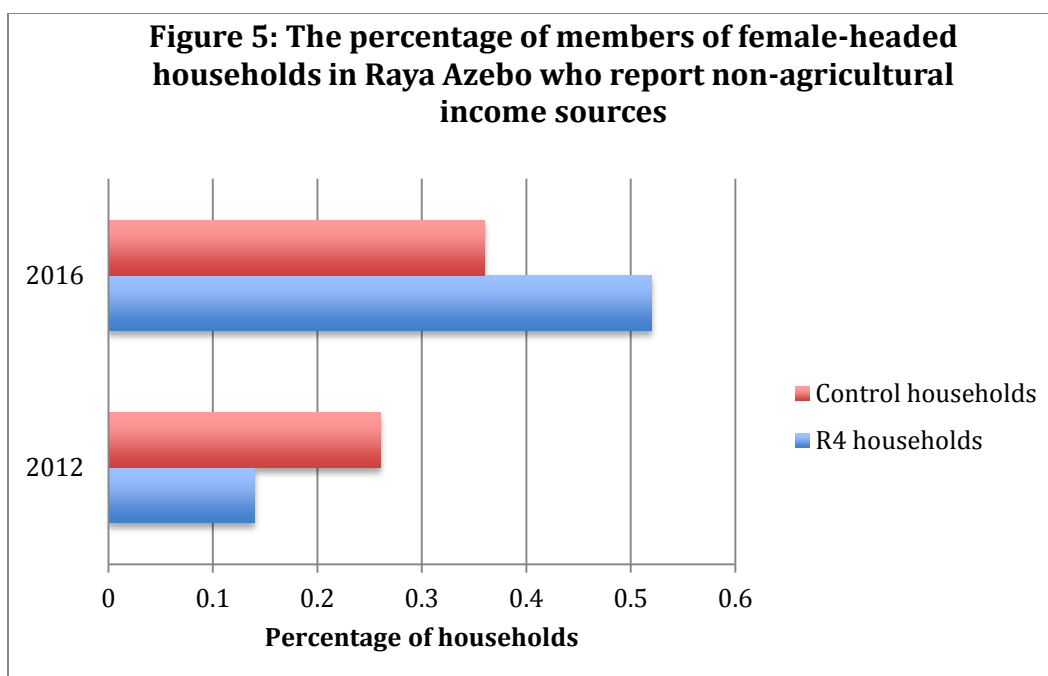
An important question is whether R4 strengthens livelihood security by raising incomes. This study cannot address the question because we did not have sufficient resources to conduct income surveys.

3.1 Diversification of income sources

Households in all three study districts emphasize the constraint that reliance on rainfall places on crop production and the importance of securing additional means of providing moisture to crops, either by diverting and storing rainwater or by using groundwater. The consensus on this point highlights the problem that droughts pose for agricultural production and suggests that non-agricultural income sources may be critical for improving the security of livelihoods in the face of increasing drought risks. Households in the study area are beginning to increase their access to non-agricultural income sources, and R4 may wish to focus on helping to accelerate this process.

Overall, the average fraction of household members who report that they are self-employed in agriculture or herding or employed as hired labor in agriculture as their primary activity has declined over the period of the evaluation, from March 2013 to March 2017, in both R4 and control villages. At the same time the fraction of household members who report non-agricultural employment as their primary activity has increased.

R4 is having a significant impact on diversification of incomes among female-headed households in one district, Raya Azebo, based on a regression analysis of changes in income sources between 2012 and 2016. This effect of R4 is particularly important because Raya Azebo seems to be experiencing the strongest intensification of drought of the three districts in the study. The fraction of household members whose primary activity is non-agricultural employment has increased among female-headed households in R4 villages in Raya Azebo by 380% more than it has increased among control households over the span of the evaluation. Figure 5 illustrates the larger increase among R4 households. The full regression results are in Table 4. Non-agricultural employment can include wage employment and own, non-agricultural business. At the same time, the proportion of household members who report self-employment in agriculture as their primary activity has declined among these female-headed households more than among the control group.



We learn from FGDs that female-headed households in Raya Azebo are using loans to start small businesses such as tea stalls or small shops to supplement their incomes. The proximity to a town may play an important role in providing these opportunities.

The fraction of household members who report non-agricultural employment as their primary activity among male-headed households in Raya Azebo also began to increase relative to control households later in the evaluation period, from 2015 to 2016. The process seems to be less advanced among male-headed households but is beginning. The regression results are in Table 4.

The one potential threat to future diversification in Raya Azebo is that the ban against charging interest among the Muslim population prevents the significant percentage of Muslim households in the district from benefiting from the R4 savings and credit services.

The opposite trend seems to be happening in Saesi Tsaedaemba, based on survey results, where female-headed households report an increase in the fraction of household members whose primary activity is self-employment in agriculture relative to control households, and a decline in the fraction whose primary activity is non-agricultural employment. In FGDs, female-headed households in Saesi Tsaedaemba praise micro gardens for providing them with an alternative source of both income and nutrition, and the increasing focus on agricultural activity may reflect an increase in the proportion of female-headed households who have micro-gardens. Micro gardens are a desirable source of income particularly because prices of vegetables are increasing faster than are prices of cereals, according to the farmers.

The trend among all households in Hadush Adi, the R4 village in Saesi Tsaedaemba, is similar to the trend among female-headed households. There is no decline in the average proportion of household members who engage in crop production or herding and only a tiny increase in the proportion who engage in non-agricultural activities, while there is a more substantial increase in the latter in the control village. Hadush Adi may lack opportunities for diversification into non-farm activities since there is no town nearby, unlike in Raya Azebo. R4 staff may wish to explore if there are any opportunities for non-agricultural activities in Hadush Adi that R4 could support.

In Kola Temben, there is a decline in proportion of household members who engage in crop production or herding and a substantial increase in the proportion who engage in non-agricultural activities but the changes are similar in R4 and control villages.

The FGDs highlight an important improvement in diversification of income sources, which is taking place in R4 villages and not in control villages, and which would not emerge in our survey data. Especially male-headed households are using increased savings and insurance payouts, and credit among some, to engage in livestock trading, as we discussed in section 2.2.3.

FGD participants state that the main sources of support for starting non-farm businesses are the saving and credit services at the VESAs and the RUSACCOs. Since these services are relatively new and are not even present in many communities, it is early to see widespread impacts.

3.2 Changes in ownership of productive assets

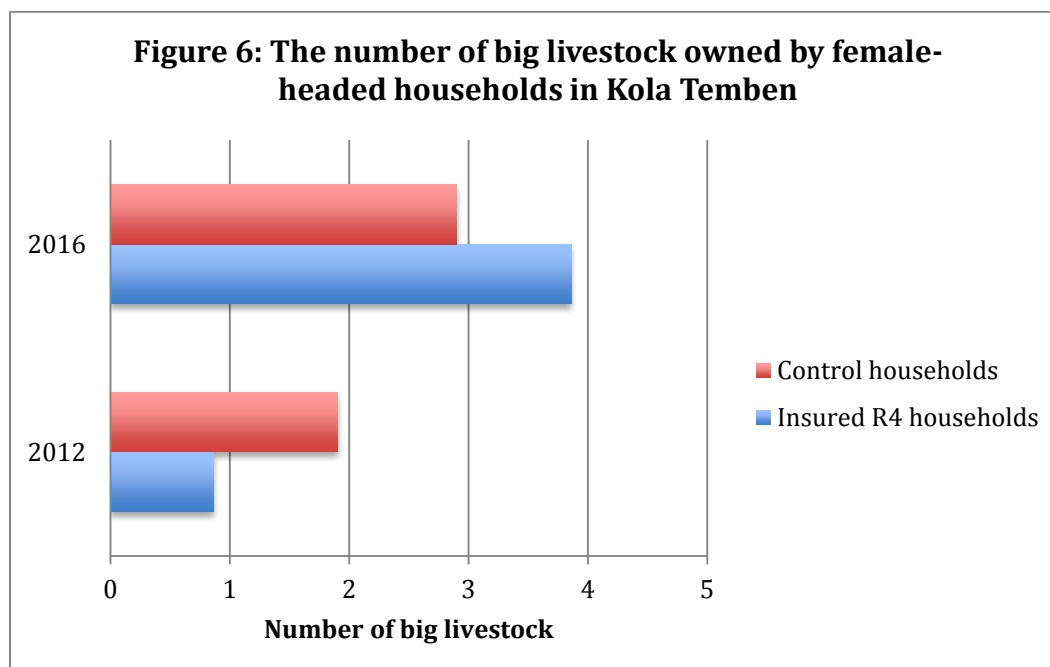
The objective of R4 is to help farmers to increase their holdings of productive assets in good seasons and to maintain them through drought, by providing more resilient ways of coping with drought.¹⁵ We focus on productive assets in this section, of which the most important by far for farmers in Tigray are oxen and other large livestock such as cows and goats. Historically, farmers have relied on sales of large animals to help feed their families through droughts. As discussed earlier, such sales damage the farmers' ability to earn their livelihoods in subsequent seasons, and the animal holdings can be difficult to re-establish.

One of the biggest impacts that R4 has had to date is an improvement in the farmers' ability to accumulate livestock and to maintain the stocks through drought, in two out of the three districts. As in the case of food security, this impact is occurring in a very challenging time period, following a drought that occurred in 2012 and marked by the historic drought in 2015.

¹⁵ Again the caveat here is that the livestock trading in which households in R4 villages have begun to engage recently does not damage the long-term productivity of households, unlike traditional asset sales.

The number of oxen declined for all households in all districts over the time period of the evaluation because of the drought in 2015, the heavy rains in Saesi Tsaedaemba in 2016, and the pest in Raya Azebo in 2016. The numbers of all big livestock generally increased over time despite these shocks.

Evidence for the impact of R4 is particularly strong in Kola Temben district. Female-headed households in R4 villages in Kola Temben retained about 0.3 of an ox more over the entire evaluation period than did households in control villages, which is a 433% smaller decline in the number of oxen. The full regression results are in Table 5. The female-headed households in Kola Temben who participate in insurance-for-work increased the number of all big livestock, such as oxen, cows, and goats, during the same time period by almost 2 animals more than did control villages¹⁶, in which the number of animals increased by 1.5.¹⁷ Figure 6 illustrates the larger increase among R4 households in Kola Temben. We also analyzed the changes in big livestock holdings using Tropical Livestock Units (TLU). The holdings for female-headed households in Kola Temben who participate in insurance-for-work increase 0.71 TLU more than do holdings in control villages.¹⁸



¹⁶ This result is in the third section of Table 5, in which rows are labeled “Insured female-headed households” and “Insured male-headed households.”

¹⁷ The mean number of oxen in R4 villages in March 2013 in Kola Temben was 1, and the mean number of big livestock was 3.

¹⁸ The result in TLUs is only marginally significant at 0.12 level.

R4 also contributed to maintenance of assets through the 2015 drought in a second district. Numbers of livestock declined in all villages in 2015, at least partly because farmers sold livestock to purchase food. However, all households in the R4 village in Saesi Tsaedaemba maintained their big livestock through the drought by about 1.5 big animals more (0.36 TLU) than did households in control villages, on average. Female-headed households maintained 2 animals more (0.4 TLU).¹⁹

From March 2016 to March 2017, when households may have continued to experience repercussions from the drought, the number of oxen recover more among male-headed households in control villages than in R4 villages when we consider all villages together, by about 0.18 of an ox more.

There are differences across the districts during the year that follows the drought. The effects of R4 are positive in Kola Temben, where female-headed households in R4 villages increase number of oxen by a quarter of an animal more than do households in control villages, and they experience a smaller decline in big livestock by about one animal (0.68 TLU). In Raya Azebo, on the other hand, male-headed households in R4 villages see a decline in numbers of oxen while control households maintain or increase numbers, with the difference being about a quarter of an animal. All households in R4 villages in Raya Azebo see a decline in big livestock while households in control villages increase numbers, and the difference is about 1.7 animals (0.52 TLU).

The negative changes in livestock relative to the control group in Raya Azebo during the year after the drought may have occurred because the R4 villages in the district were affected by pests that did not affect the control villages, as discussed in section 2.2.2. It may have been difficult for households who were extremely stressed by the drought to maintain livestock when another shock occurred in the following year.

The negative changes in Raya Azebo may also be an artifact of the male-headed households trading livestock.²⁰ Livestock trading could confound our ability to identify accumulation or loss of livestock among male-headed households in R4 villages during the drought and the year after the drought. It should have less effect on our ability to detect accumulation of livestock over the entire time period of the evaluation since livestock trading was not yet occurring in 2012. It is possible that purchases of livestock to trade just before the survey that documents the 2016 season would hide declines in livestock over the time period from 2012 to 2016. Sales of livestock just before the survey should not affect our ability to detect accumulation of livestock since farmers do not sell their

¹⁹ The mean number of big livestock in the R4 village in Saesi Tsaedaemba at the beginning of the evaluation was 1.76.

²⁰ The livestock trading occurs in all three districts but may have different effects on our results in each district.

productive livestock when they trade, but only the livestock bought for the express purpose of trading.

We have also analyzed changes in other productive assets, such as machines and tools used for agricultural production. The changes in numbers of machines and tools do not differ between R4 and control villages over the evaluation period. Other assets are more similar to savings and we discuss them in the section on savings below.

3.3 The role of savings in livelihood security

The objective of R4 is to help households build up savings in order to have a reserve of funds to maintain consumption during a drought and fund productive investments in good seasons. R4 seems to be achieving this objective over the period of the evaluation, at least for male-headed households.

The program has not yet begun to organize VESAs in one of our study districts, Kola Temben. However, the survey respondents report saving in the RUSACCOs, therefore there are some saving services in the R4 villages in Kola Temben as well. All village residents can save in a RUSACCO, not only those who purchase insurance. We report the performance of the savings component of R4 in Raya Azebo and Saesi Tsaedaemba in Appendix 3, Table A3.1.

3.3.1 The impact of R4 on savings

FGD participants report that the recent introduction of VESAs and mandatory saving in the RUSACCOs for those who participate in insurance, together with the new credit initiatives, are among the most impactful components of R4. The new saving services have facilitated the accumulation of wealth among the insurance beneficiaries, improving availability of capital to start new businesses and cash for essential expenses during bad seasons.

In all three districts combined, male-headed households in R4 villages increased their savings 138% more than did control households over the entire period of the evaluation, from March 2013 to March 2017, based on regression analysis of changes in savings. The full regression results are in Table 6. We also analyzed saving in assets such as gold and silver, and household electronic items such as watches, mobile phones, radios, and tape recorders. There were no differences between R4 households and control households in the amounts of gold and silver. The number of electronic items increased among male-headed households in R4 villages in all districts combined by about half an item more than in control villages between 2013 and 2016.²¹ The number increased among female-headed households in Kola Temben by 0.4 items more than among control households from 2015 to 2016.

²¹ We do not have a reliable measure of the values of these items. Such measures are very difficult to estimate well.

There is some evidence that male-headed households were using more savings in R4 villages than in control villages in good seasons since savings declined more for male-headed households in R4 villages between the 2013 season and the 2014 season than they did in control villages.

The only statistically significant effect among female-headed households is in Raya Azebo, where female-headed households in R4 villages increase their savings more than do households in control villages during the drought. These households could be relying more on profits from their non-farm businesses during the drought rather than on savings, since diversification of income sources increases among this group relative to control households over the period of the evaluation. Also, as Figure 4 illustrates, female-headed households rely much less on savings as a coping strategy than do male-headed households, while they rely more heavily on the PSNP. In FGDs, female-headed households in R4 villages mention that they prefer not to use their savings unless they have an investment opportunity, because savings earn a return at the VESAs and the RUSACCOs.

Participants in FGDs from both R4 and control villages note the importance of savings in improving the security of their livelihoods. All also state that it is much easier to save now than it was 7 years ago, at the time that R4 began, mainly because there are formal institutions in the villages where farmers can locate their savings. In the past, farmers had to travel to town to be able to deposit savings. Women in the control tabia in Saesi Tsaedaemba are the only ones who say that they do not have money to save.

FGD participants in R4 villages report that the introduction of saving services in the village through the RUSACCOs and VESAs has greatly facilitated the accumulation of savings. They ascribe their increased awareness of the importance of savings and the fact that they are saving more both to training received from R4 and to the requirement that those who purchase insurance cannot obtain a loan from the RUSACCO revolving fund unless they have savings there. It is worth noting that the positive effect of R4 on savings among male-headed households in the survey data includes all male-headed households in R4 villages, not just those who participate in insurance-for-work. Those who purchase insurance increase their savings relative to control households only in Kola Temben and in Saesi Tsaedaemba, but not in Raya Azebo. Thus the “culture” of saving seems to be spreading from those who purchase insurance to all in R4 villages.

An important benefit of R4 is that households in R4 villages are more likely to have their savings in a formal institution, such as the VESAs or the RUSACCOs than are households in control villages. Thirty-seven percent of households in R4 villages have savings in a formal institution, while only 23% do in control villages,

and this difference is statistically significant. There is no difference in the proportion of male-headed and female-headed households who have savings in formal institutions. Formal institutions pay interest on the savings, accelerating the accumulation of funds, and they are also safer. Female FGD participants especially mention the interest and dividend paid from the community risk pool as a reason why they do not use their savings unless they have a specific business plan, preferring to allow the funds to accumulate otherwise.

Some FGD participants who are not members of the R4 program have savings at RUSACCOs because they are members of the cooperative. They state that they are benefiting greatly from the savings mainly because they receive dividends from the cooperatives based on the amount they have saved. In addition, they can get a loan easily based on the amount of their savings.

Most households still use their savings to cover expenditures such as food, clothes, medical expenses, and school expenses in all seasons. Based on survey responses, the percentage of households who use savings for productive purposes is still small, though it is somewhat larger in R4 villages in good seasons. Fifteen percent of households in R4 villages and a very similar 12% in control villages used saving for productive purposes during the drought, while in 2016 the percentage was 21% in R4 villages and 13% in control villages. These percentages are similar for male-headed and female-headed households, though in Saesi Tsaedaemba more male-headed households use savings for productive purposes than female-headed households do. However, discussions in FGDs, especially in R4 villages, suggest that farmers are increasingly thinking about savings as a resource that they can use to increase production or supplement an investment in a non-agricultural activity.

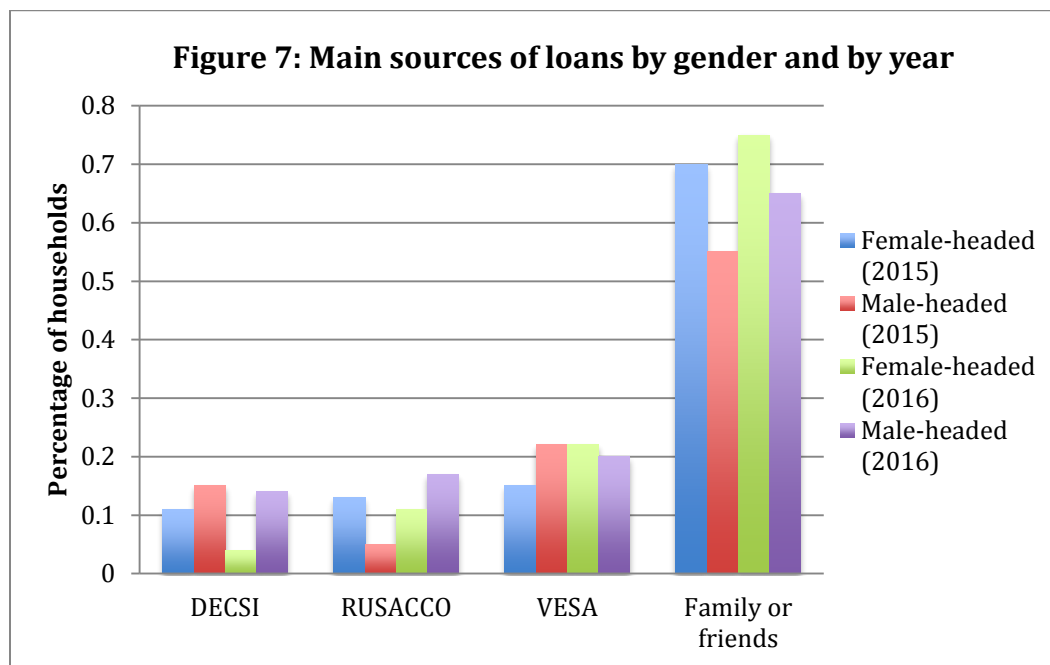
FGD participants in Raya Azebo mention that an additional benefit of the VESAs is that they contribute a small amount every month into a social fund. The fund is becoming an important resource for organizing social events during which they strengthen the relationships between group members and exchange information.

3.4 The role of credit in livelihood security

Access to credit may improve farmers' resilience to drought by providing (borrowed) cash to purchase food, and/or to purchase inputs at the beginning of the following season. Credit can also improve productivity and support diversification of income sources. Weather index insurance may facilitate access to credit by providing a source of funds to repay loans in bad seasons.

At the beginning of the evaluation period, during the 2013 season, a fairly small 23% of households took loans in R4 villages and 10% in control villages. The percentage who borrow increased over time, with a particularly sharp increase during the drought, which suggests that farmers do borrow to maintain livelihoods during a drought. By 2015, 50% borrowed in R4 villages and 47% in control

villages, and the percentages increased again to 54% in R4 villages and 59% in control villages in 2016.



The majority of farmers who took loans in 2015 or 2016, and about two-thirds of female-headed households, report borrowing from family and friends, as Figure 7 illustrates. The second most common source of credit available to farmers in R4 villages is the revolving fund at the RUSACCOs and the VESAs. Farmers in all villages also take loans from DECSI, government programs, and community groups such as the iddir. None of the farmers borrow from commercial banks, and very few borrow from moneylenders. During the drought, 40% of the male-headed households who borrowed report that they used the loan to buy livestock, presumably for the purpose of trading, and a somewhat smaller percentage used the loan for food and other expenses. Sixty percent of female-headed households who borrowed report that they used the loan for food and other expenses during. In 2016, 45% of male-headed households who borrowed and 39% of female-headed households who borrowed report using the loan for agricultural inputs. Only 29% of male-headed households used the loan to buy livestock. Fewer than 10% used the loan for non-farm investments in either year: 7% of female-headed households and 3% of male-headed households.

We report the performance of the credit component in Raya Azebo and Saesi Tsaedaemba, including number of households who borrowed in 2014, 2015, and 2016 in Appendix 3, Tables A3.2 and A3.3. The number of borrowing households is small. For example, 1000 households bought insurance in 2015 just in two villages in Raya Azebo, Hade Alga and Genete, while 220 borrowed from the

revolving fund in 2014 and 2015 combined, and another 237 in 2016, in the entire district, which includes other villages. Furthermore, once loans have been disbursed in a village, another round of credit is not available until the disbursed round has been repaid, two years later. R4 credit services are not available in the Kola Temben district.

3.4.1 The impact of R4 on access to credit

Many FGD participants report that the credit component recently introduced by R4 is the most effective intervention of the program because the component is helping farmers to diversify their livelihoods. The one problem that participants mention is that the program is limited to those who participate in insurance.

Female-headed households in R4 villages in two of the three districts are taking advantage of the potential benefits of credit, based on regression analysis of changes in borrowing. In Saesi Tsaedaemba, female-headed households in the R4 village increase the amount that they borrow by 250% more than do households in control villages and they increase the likelihood that they borrow relative to control households over the entire time period of the evaluation. They also increase the amount that they borrow during the drought relative to control households. The full regression results are in Table 7. The increased use of credit may help to explain the improvement in food security among female-headed households in Saesi Tsaedaemba relative to the control group.

The improvements in borrowing in Saesi Tsaedaemba reinforce a trend that was already present in the evaluation completed in 2012, well before R4 introduced credit services in the district. Saesi Tsaedaemba was the only district in which borrowing increased in the R4 tabia relative to the control tabia under HARITA.

In Kola Temben, female-headed households increase their borrowing during the drought more than do control households, even though there are no R4 credit services in Kola Temben. In Raya Azebo, female-headed households *who participate in insurance* increase the likelihood that they borrow and the amounts they borrow more during the year after the drought, either to help them through the pest problem that the households in R4 villages in Raya Azebo report for that year and that did not affect the control villages or to further increase investment in non-farm businesses or both.

Contrary to the hypothesized role of credit, in all three districts, the likelihood that male-headed households borrow increases less in R4 villages over the time period of the evaluation than in control villages, and the amounts that the male-headed households borrow increase almost 200% less. Somewhat surprisingly, this likelihood increases less in R4 villages even for male-headed households *who participate in insurance* during the drought year.

A smaller percentage of farmers were borrowing at the beginning of the evaluation period in control villages than in R4 villages, while the percentages are the same at the end of the period. The percentage who borrow has increased in both R4 villages and control villages but it has increased more in control villages. Over this period, the amounts borrowed may have increased more in control villages for male-headed farmers because farmers in R4 villages are more likely to borrow from the revolving fund that R4 has placed in the RUSACCOs, and male farmers in FGDs report that the loan sizes issued by the revolving fund are too small, smaller than the loans from DECSI. Farmers are free to continue to borrow from DECSI, but many choose to borrow from the revolving fund because of much simpler and faster loan application and approval procedures and lower interest rates.

Farmers in control villages are most likely to be borrowing from credit groups recently established by the Ethiopian government. These groups offer larger loans than does the revolving fund, though at higher interest rates. Those who participate in insurance do not borrow from these groups because of the higher interest rates.

FGD participants in R4 villages report that access to credit is much easier now than it was at the time when R4 began, 7 years ago, while the responses in control villages are mixed. Participants in R4 villages praise R4 for facilitating access to credit in three ways. First, they now have sources of credit in the village that do not require travel to a town. These sources are the RUSACCOs and the VESAs. Second, a particular benefit to those who participate in insurance is that the loans from the revolving fund at the RUSACCOs and the VESAs are much easier to apply for than are loans from DECSI. The paper work is simpler and the loans do not require collateral, though they do require that the farmer have savings at the institution. A farmer can receive 3000- 5000 birr from the revolving fund for business investment quickly and easily. Third, the interest rate is lower than DECSI charges. The only complaint is that the male-headed farmers consider the loan size to be too small. The female-headed farmers are satisfied with the loan size.

Some female FGD participants have said that profits from their non-farm businesses and increased savings are beginning to reduce their need for credit.

Farmers in control villages have access to fewer sources of credit than do farmers in R4 villages, in the absence of the revolving fund at the RUSACCOs and VESAs. Nevertheless, most farmers in control villages also say that access to credit has become much easier recently, and this opinion is particularly strong among female participants. Women say that the government is prioritizing their access to credit, and application for credit has become much simpler. The main reason is a government program, which encourages farmers to form groups, or cooperatives, which can then receive training and loans to invest in business.

Farmers praise the amount of credit, the terms on which it is provided, and the ease of receiving it. However, some farmers say that forming cooperatives is difficult and therefore the program has not facilitated their access to credit.

R4 may wish to explore the potential for coordination between R4 saving and credit services and the services introduced by the Ethiopian government. Coordination may expand the available resources and the number of farmers who receive the services.

A *limitation* of the R4 program is that the number of beneficiaries of the credit and saving components is small, much smaller than the number who participate in insurance, because of the size of the revolving fund and the small number of farmers organized into VESAs thus far. The benefits discussed above are relevant for a limited proportion of the communities, therefore it is too soon to expect widespread impacts.

3.5 Changes in inputs into production

In addition to maintaining productive capacity through droughts, the R4 program theory includes increases in agricultural productivity during good seasons as a channel through which R4 can improve the security of livelihoods. We explore the evidence for how this channel is operating in Tigray by looking at use of inputs into production in R4 villages, in this section, and harvests, in the next section. Overall, the impacts of R4 on agricultural production have not increased since the previous evaluation period, which covered the years 2009 to 2012. Increases in agricultural production do not seem to be a major channel through which R4 is improving the security of livelihoods thus far, though there may be improvements, which contribute to stabilizing livelihood security during shocks.

We have data on inputs from the 2015 growing season, during which a drought occurred, to the 2016 growing season, which had normal rainfall. We were not able to collect data on inputs for previous years, since farmers would not be able to recall such information accurately.

On average across all three districts, male-headed households in R4 villages increased the amount of fertilizer per tsimad²² of land applied in the fields by 7.8 kg more than did control households between 2015 and 2016.²³ In Kola Temben, female-headed households in R4 villages increased the amount of fertilizer per tsimad of land by about 12 kg more than did control households.²⁴ In Raya Azebo on the other hand, increases in the use of fertilizer per tsimad between 2015 and

²² Tsimad is the most commonly used unit of land in Tigray, equivalent to 0.25 hectares.

²³ The mean amount of fertilizer applied per tsimad in the R4 villages during the 2015 growing season was 9.6 kg.

²⁴ Farmers in Kola Temben applied 18 kg of fertilizer per tsimad on average during the 2015 growing season.

2016 among female-headed R4 households were smaller than they were among the control group.

Since a drought occurred in 2015, the increases in fertilizer may have represented a return to normal after a reduction in fertilizer use during a drought. The results indicate that farmers in R4 villages may have been able to resume increased use of fertilizer after a drought more quickly than farmers who do not have access to R4.

Somewhat surprisingly, the use of compost declined between 2015 and 2016 in all villages and it declined much more in R4 villages than in control villages, though the difference is not statistically significant. One possible reason may be if households used more compost during the drought than they would under normal conditions, because they substituted compost for fertilizer, which burns the roots of the plants in dry conditions. Then in 2016 they returned to normal practice. In FGDs, farmers mention compost as among the most beneficial of the DRR activities, and in the 2009-2012 evaluation, increases in the use of compost were one pronounced impact of the program.

3.6 Changes in crop harvests and yields

The main positive effect of R4 on harvests occurs for one crop in Kola Temben. Male-headed households in R4 villages in Kola Temben have a 134% smaller reduction in total harvests of maize over the entire time period of the evaluation than do control households, with a larger increase from 2013 to 2014 and a smaller decrease due to the drought in 2015. All harvests decline for everyone over the evaluation period because of the large decline that occurs during the drought. Harvests increase in every year except 2014-2015. The positive result in Kola Temben may signal that production in R4 villages was able to recover from the drought faster than it did in control villages.

The second positive effect is that male-headed households *who participate in insurance* have smaller declines in total harvests of sorghum over the time period of the evaluation than do control households, and this effect seems to come mainly from Raya Azebo.

In Kola Temben, the harvests of the two main crops combined, teff and maize, reaped by female-headed households perform worse relative to the control group from 2013 to 2014 and they decline more during the drought, though they recover more after the drought aided by the increased use of fertilizer during the year after the drought discussed above. These households may have been prioritizing investment in livestock over investments in crops from 2013 to 2015, since they experienced the largest gains in livestock numbers relative to the control group out of the entire sample, as discussed in section 3.2.

On average, households in R4 villages experience smaller increases in harvests of major crops, which are teff, maize, wheat/barley, and sorghum, over the good season from 2013 to 2014 relative to the control group and they experience smaller increases in yields per tsimad of the major crops from 2015 to 2016. The former effect seems to be driven mainly by the worse performance of teff harvests in Raya Azebo, while the latter by the performance of wheat/barley in Saesi Tsaedaemba and sorghum among female-headed households in Raya Azebo. We have data on changes in yields per tsimad only for the years 2015 to 2016. Farmers would not be able to recall amount of land planted with particular crops in prior years. We only have data on total harvests for prior years.

The worse performance in R4 villages from 2015 to 2016 may be due to the weather shocks that the R4 villages experienced in 2 districts during that year, which did not affect the control villages. The fact that maize crops increased more in R4 villages than in control villages in Kola Temben, where R4 villages did not suffer an adverse shock relative to control villages in 2016, supports this interpretation. The worse performance during the good 2014 season in Raya Azebo is more difficult to explain, except that R4 households may have already begun to shift resources to livestock trading among male-headed households, and non-agricultural investment among female-headed households.

4. Contribution to impacts and main implementation issues: weather index insurance and disaster risk reduction

The structure of the R4 program does not allow the evaluation to assess the quantitative contribution of each program component to the impacts. Such an assessment would require that each component, and each possible combination of components, be implemented in separate areas so that their impacts can be compared. However, we can infer the qualitative contributions from the observed impacts and qualitative information.

This section discusses how the two components that have comprised the program from the beginning, weather index insurance and disaster risk reduction, have contributed to the observed impacts, how implementation issues may help to explain observed impacts, and how implementation may affect sustainability. The contributions of and implementation concerns associated with the much newer credit and saving services are in the two relevant sections above, the main implementation issue being the limited reach of these services to date.

4.1 *Weather index insurance*

Weather index insurance most likely contributes substantially to all of the impacts discussed above. Arguably, the most sizeable impact of R4 reported in this evaluation is on maintenance and accumulation of oxen and other large livestock between 2013 and 2016, especially among female-headed households. The improvement is not likely to have been possible without the payouts that index

insurance made after the drought in 2012 and the drought in 2015, although savings and credit complemented the payout in 2015. The improved livestock holdings as well as the payout would have helped to reduce the deterioration in food security during the drought, again complemented by savings and credit. Also, the payouts are helping to support diversification of income sources.

Insurance may have also improved access to credit and farmers' willingness to borrow even before R4 began to offer credit services, as shown in the previous round of evaluation (Madajewicz and Tsegay 2014). Anecdotally, farmers report that lenders come to the village on the day of the insurance payout to collect debt.

R4 has been extremely successful in creating awareness and demand for weather index insurance among smallholder farmers in the region. The outreach of the program has increased tremendously over the last 7 years. We report statistics regarding performance in Appendix 3, Tables A3.4 and A3.5. In the remainder of the section, we discuss implementation issues, which may be affecting the performance of the index insurance component now and in the future.

4.1.1 Knowledge about insurance

FGD participants praise the R4 program for improving their understanding of the importance of savings in particular, but also their understanding of insurance and credit, and the roles that these financial instruments can play in improving the security of their livelihoods. All participants credit the program with having developed a “saving culture” among the farmers that was not present before. They say that paying for insurance premiums as well as requiring saving deposits in order to obtain loans contributes to this culture. The farmers now understand how they can use all three financial instruments to invest in off-farm businesses and thereby diversify their sources of income, as well as to increase their investments in crop production.

Educating farmers about index insurance is particularly challenging since insurance is a complex financial instrument. Understanding how it works is important for farmers to use it well and to maintain their trust in the R4 program.

Fifty-seven percent of farmers who bought insurance in 2016 report receiving training about insurance in the past year. Farmers understand better how weather index insurance mitigates climate risk compared to the previous round of evaluation, which covered the period 2009 to 2012. During the previous evaluation, 56% of those who participated in insurance said that most of the time insurance will only cover part of the crop losses incurred. In the survey that documented the 2015 growing season, 91% of the insured respondents gave this correct response. During the 2009-2012 evaluation, only 23% of insured

respondents recognized that index insurance will not offer a payout every time the yields are poor. In the current round, 72% of insured respondents are aware of this fact.

However, important gaps in understanding remain. Sixty-five percent of those who did not buy insurance in 2016 report that they did not buy it because they do not understand it. In the current evaluation, 71% of farmers who purchased insurance replied that weather index insurance offers a payout when yields are poor. Only 33% gave this wrong answer during the 2009-2012 round of evaluation. In the current round, only 23% responded that insurance offers a payout when rainfall is below a certain amount, which is the correct response. We have added new households to the sample in the current evaluation; therefore some of those who gave the wrong answer may not have been part of the group surveyed between 2009 and 2012. However, the great majority of households in our sample are the same. The finding cannot be accounted for entirely on the basis of new households added to the sample.

The misunderstanding may result from the training. Farmers in FGDs generally phrase what they have learned about index insurance in the same way, most likely repeating what they heard in training. They say that insurance compensates them when the harvests are bad and they compensate the insurance program when harvests are good. The misunderstanding is potentially important since disagreements do arise between the farmers and the program about payouts. Some farmers have expressed the concern that they have not received payouts when they should have. The disagreement could arise because of a management problem that a payout did not occur when it should have, or because the farmers have not understood that payouts depend on amounts of rainfall and not on the amounts of harvest.

Other qualitative evaluations carried out recently also mention challenges in terms of farmers not receiving sufficient education about insurance and basis risk and not having a good understanding of these. They have concluded that insufficient financial literacy is putting the sustainability of the insurance program in danger (Tsegay and Tesfaye 2016). The previous evaluation, which covered 2009 – 2012, also raised this concern (Madajewicz and Tsegay 2014).

4.1.2 Disbursement of funding

Another concern that remains from the previous round of evaluation (Madajewicz and Tsegay 2014), the consequence of which were noted again by farmers in FGDs in this round, are the continuing delays in the disbursement of donor funds that pay for the insurance premiums for those farmers who pay for insurance with labor. These delays have several implications:

- The DRR activities are delayed and they begin during the growing season, when farmers are busy in their own fields. The DRR activities should be

completed before the growing season begins. However, they cannot begin until registration for insurance is finished, since the registration determines the number of hours that each farmer should spend on DRR, which depend on how much insurance a farmer is purchasing. REST cannot register farmers for insurance until they have the funds to pay for the premiums for the farmers who pay for insurance in labor. Therefore, the delays in disbursement of funds are putting a heavy burden on the farmers.

- The registration for insurance is pressed for time once funds are disbursed. As a result, farmers do not have sufficient time to register for insurance, and they do not have sufficient time to secure funds necessary to pay the cash portion of the premium.

4.1.3 Retention and drop-out rates

An important measure of the value of insurance for farmers and of the sustainability of the program is farmers' willingness to continue to buy the product. The current record keeping system does not allow us to assess this measure of value since it is difficult to track retention and dropout rates for insurance. The system records farmers who purchase each year, but there is no way to analyze whether any given farmer in any given year continues to purchase insurance after that year and for how long.

We conducted an analysis based on our survey data, which relies on farmers to remember when they purchased insurance and may not be fully accurate. Out of 329 farmers who purchased insurance at some point between 2010 and 2016 in our data, 67 farmers stopped purchasing insurance and did not purchase again for the remainder of the period. This limited measure implies a dropout rate of 20%.

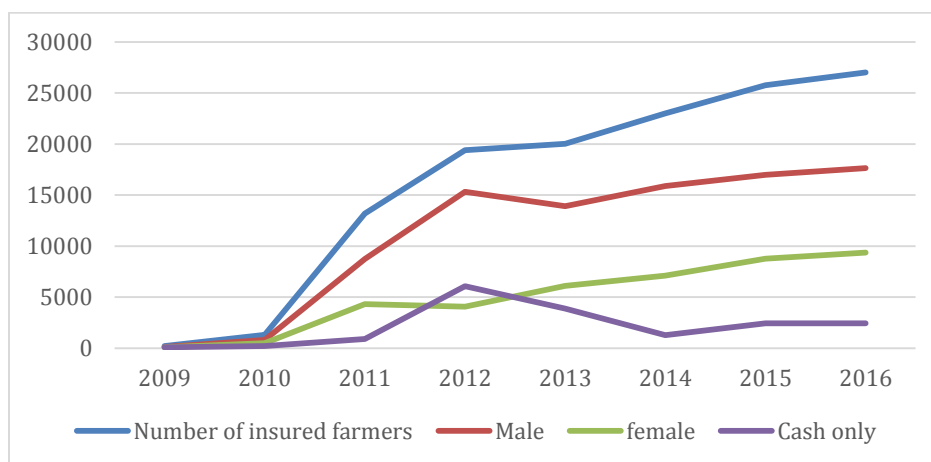
4.1.4 Sustainability of the index insurance component

Insurance-for-work requires donor funding to pay the insurance companies for the premiums. One objective of R4 has been to partner with existing programs, such as the PSNP, to develop the capacity of farmers who participate in insurance-for-work to grow their incomes and begin to pay in cash over time. The program has also considered enrolling an increasing number of purchasers who can pay in cash.

Thus far, the transition to sustainability has been limited to the requirement that farmers pay a percentage of their premium in cash. The percentage was 10% in 2012 and 15% in 2016. Therefore, a somewhat larger proportion of the premium amount was collected in cash in 2016 than in 2012. However, the proportion of farmers who purchase insurance entirely in cash has been declining. The

proportion reached its maximum point of 31% in 2012 and has since declined to 9% in 2016, as Figure 8 illustrates.²⁵

Figure 8: Insurance enrollment over time



Very few farmers are graduating from paying for insurance in labor to paying in cash. The transition is difficult to track because the monitoring system does not follow each enrolled farmer over time. However, participants in FGDs could name very few farmers who had graduated to paying in cash over the life of the program.

Participants described those few who had graduated as outstanding farmers in the communities, as well as ones who have additional sources of income either from off-farm employment or off-farm business, those who have many livestock, who are using irrigation to produce high value crops or vegetables, and those who have substantial cash savings. They recommend that R4 invest in irrigation and in credit and saving programs that can expand off-farm incomes in order to increase graduation rates.

If reducing the reliance of the insurance component on donor funding is critical to sustainability, then R4 may wish to investigate the ability of farmers to pay for insurance in cash more deeply. In the survey, 65% of the survey respondents in R4 villages who bought insurance for labor in 2016 say that they still would have bought insurance if they had to pay the entire premium in cash. This figure should not be taken at face value, since farmers may be communicating the importance of insurance to them as much as their ability to pay. However, in 2012 HARITA offered insurance for cash only in 33 villages, without the option to purchase insurance for labor. The program then introduced the option to pay with labor in those same villages. The evaluation team does not have data on the

²⁵ One reason for the decline may be the fact that HARITA offered insurance in cash only in 33 villages in 2012, and then introduced insurance-for-work in those villages. However, between 2010 and 2012, the proportion of farmers who paid for insurance in cash in villages in which the insurance-for-work option was available declined from 20% to 7% (Madajewicz and Tsegay 2014),

resulting change in purchasing patterns, but the program could learn from the experience. Anecdotally, farmers say that they do not wish to give up the benefit of paying with labor, in order to pay in cash, while that benefit is available to others.

The program could explore two possible approaches. It could require that a different proportion of the premium be paid in cash in different villages and observe the effect on purchasing in order to decide what percentage should be paid in cash. Also, the program could investigate the possibility of establishing transparent rules that determine which farmers should pay what proportion of the premium in cash, based on a transparent assessment of ability to pay. The program could request farmers' participation and assistance with this process, for example eliciting suggestions for how ability to pay should be assessed or proposing a participatory approach to the assessment.

In addition, the program is not enrolling wealthier farmers who can pay in cash. The main reason that farmers and key informants identify is that the program has not reached out to wealthier farmers. Wealthier farmers do not know much about index insurance, they do not understand how it works, and therefore are not willing to buy it. Lack of knowledge was also identified as the main reason in the previous round of evaluation. Quoting from the previous report:

“One FGD commented that the reason why better-off farmers do not buy insurance is “I think this is lack of knowledge. They don't create awareness about the benefit of insurance, I have never heard a promotion or teaching about insurance in social gatherings.” One better-off farmer said of insured farmers “they have paid insurance for the last three years but didn't get any benefit from it. So why do we commit the same mistake. ” In another tabia, farmers also said that better-off farmers “don't trust the program, don't trust that the program will pay.” (Madajewicz and Tsegay 2014)

Some wealthier farmers say that they do not have sufficient liquid funds to pay for premiums in cash. However, some also add that they do not wish to pay in cash when others can pay in labor, and they do not have information about the premium costs.

4.2 Disaster risk reduction

DRR activities contribute directly to most, if not all, of the described impacts. They provide training in and inputs for alternative income generating activities, which support diversification of income sources. Diversification of income in turn contributes to reducing impacts of drought on food security. DRR training in livestock raising and fattening may have contributed to the increased accumulation of livestock among R4 households. DRR may also stabilize agricultural production through the impacts that we observe on yields but also

possibly in more ways than our data detect since the small sample size can identify only large effects.

FGD participants in R4 villages in all districts mention the training that R4 participants receive, which has improved their knowledge about non-agricultural sources of livelihoods, as a principal benefit of the DRR component of the program. The training has also taught them about more productive agricultural practices. Farmers stress that they learn best from direct interaction with other, successful farmers during visits arranged by REST. A *limitation* is that only those who participate in insurance receive the training.

All FGD participants except female-headed participants in Saesi Tsaedaemba rank soil and water conservation among the top two most valuable DRR activities. These activities maintain soil fertility and moisture to improve crop production in the face of recurrent droughts. In addition, the soil and water conservation activities protect the community from floods and erosion of fertile lands. River diversion and roof water harvesting (RWH) for micro gardens are helping the communities to cope with rainfall shocks and to improve harvests.

The second DRR activity most commonly reported among the top two, except in Kola Temben, is compost. Using compost saves farmers money since fertilizer is expensive. Farmers believe that it enhances soil fertility more than do inorganic fertilizers and helps to retain moisture, which is critical for yields in a drought-prone environment. Furthermore, fertilizer has become more difficult to obtain since the government eliminated the program that allowed farmers to obtain fertilizer on credit in 2015.

One *limitation* is that farmers do not have sufficient raw resources to make enough compost. Also, making compost requires many labor hours.

The activity most commonly reported among the top two by female-headed households, except in Kola Temben, is micro gardening. Micro gardens improve nutrition and generate income from the sale of vegetables, the prices of which are increasing faster than are prices of cereal crops. RWH is a valuable complement to micro gardens because it provides water to increase the yields.

A *limitation* is that male-headed households cannot participate in micro garden training and do not receive the materials. R4 focused this activity on women in order to provide women an opportunity to remain close to home, while other DRR activities take place on communal lands. Childcare and other housework pose an obstacle to women spending many hours away from home. However, male FGD participants say that they would like to have access to this activity.

All FGD participants report that DRR structures on communal lands are being well maintained, in accordance with maintenance plans developed by the design committees.

FGD participants recommend scaling up the existing DRR activities rather than introducing new ones. They request that especially DRR activities that maintain moisture on farmland and that provide more access to irrigation be scaled up, specifically water diversion and retention and rain water harvesting activities, that these activities cover more area and more households.

We asked FGD participants in each of the R4 villages to rank the DRR activities implemented in their community based on their benefit to the community. Female FGD participants mention more DRR activities than do the male FGD participants mainly because some of the DRR activities target female-headed households, for example micro gardening.

In Saesi Tsaedaemba:

- Male FGD participants ranked the following DRR activities according to the importance of the benefits, which they provide:
 1. Compost
 2. Soil and water conservation
 3. Gully reclamation
 4. Construction of roof water harvesting technologies
- Female FGD participants ranked the following DRR activities according to the importance of the benefits, which they provide:
 1. Preparing compost
 2. Micro gardening
 3. Construction of toilets²⁶
 4. Soil and water conservation
 5. Construction of roof water harvesting technologies
 6. Water diversion

In Raya Azebo:

- Male FGD participants ranked the following DRR activities according to the importance of the benefits, which they provide:
 1. Soil and water conservation
 2. Compost
 3. Water diversion
 4. Tree planting
 5. Community risk pool²⁷

²⁶ Construction of toilets is not a R4 activity. REST provides toilets as part of its sanitation program, which village residents generally do not differentiate from the DRR activities of R4.

²⁷ Community risk pool refers to the savings that insurance purchasers place in the VESAs and RUSACCOs. It is not a DRR activity but is reported as such by participants in the FGDs.

- Female FGD participants ranked the following DRR activities according to the importance of the benefits, which they provide:
 1. Soil and water conservation
 2. Micro gardening
 3. Compost
 4. Water harvesting
 5. Seed support
 6. Water diversion
 7. Community risk pool

In Kola Temben:

- Male FGD participants ranked the following DRR activities according to the importance of the benefits, which they provide:
 1. Soil and water conservation
 2. Planting trees
 3. Irrigation
 4. Compost
 5. Farm tools for micro gardening
- Female FGD participants ranked the following DRR activities according to the importance of the benefits, which they provide:
 1. Soil and water conservation
 2. Planting trees
 3. Preparing compost
 4. Digging wells

5. Progress toward R4 objectives in each study district

There are differences in the progress achieved in the three districts, which we summarize below.

5.1 Kola Temben

The most important difference between Kola Temben and the remaining districts is the substantial improvement in maintenance of oxen and accumulation of big livestock among female-headed households in R4 villages relative to control villages, despite the severity of the drought in 2015. Increased borrowing by female-headed households relative to control households during the drought may have helped the female-headed households to avoid sales of livestock.

The second most important difference is that Kola Temben is the one district in which there is an improvement in crop production in R4 tabias relative to control tabias, for male-headed households' production of maize. Crop production does not improve among female-headed households relative to the control

households, but the female-headed households may be prioritizing investment in livestock over investment in crops.

The improvement in food security in Kola Temben is more mixed than in Saesi Tsaedaemba but better than in Raya Azebo. Reports of food shortages increased less among male-headed households relative to the control group during the drought but increased more the year after. The proportion of households who ate three times a day during a week in March increased more in R4 tabias relative to control tabias.

Kola Temben is similar to other districts in terms of improvement in savings among male-headed households over the period 2013-2016 and use of fertilizer in 2016 among male-headed households.

The improvements in savings among male-headed households and borrowing among female-headed households are notable because Kola Temben is the one district out of the three in which R4 is not yet offering saving and credit services, though farmers can save in the RUSACCOs. The effects of R4 in this district are due to DRR and insurance.

Kola Temben is the only district in which female-headed households do not report micro gardens as one of the most beneficial DRR activities and all households rank compost lower than do households in other districts. The former result may be due to the presence of vegetable and fruit production in Kola Temben facilitated by an irrigation project, which pre-dates R4. All households rank water conservation and tree planting as the most valuable DRR activities.

5.2 Saesi Tsaedaemba

The main difference between Saesi Tsaedaemba and the other two districts is the reduced decline in food security due to the drought among female-headed households, as measured by reported food shortages, relative to the control villages over the time span of the evaluation. Food security may have been supported by the second difference between Saesi Tsaedaemba and the other two districts, that the female-headed households increased the likelihood that they borrow and the amounts that they borrowed relative to control households over the time span of the evaluation. They also increased the amounts that they borrowed during the drought relative to control households.

Saesi Tsaedaemba was also the only district in which borrowing increased in the R4 village relative to the control village under HARITA, before R4 introduced credit and saving services.

Saesi Tsaedaemba is the only district in which all households in the R4 tabia maintained their big livestock through the drought better than did households in the control village.

Saesi Tsaedaemba is also the only district in which the proportion of household members in female-headed households who engage in agriculture or herding as their primary activity has increased over the period of the evaluation relative to the control households, and the proportion engaged in non-farm activities has declined. The trend is similar among male-headed households though the differences with the control village are not statistically significant, and the proportion engaged in non-farm activities is stable over time.

Hadush Adi may lack opportunities for diversification into non-farm activities since there is no town nearby, unlike in Raya Azebo. In the case of female-headed households, micro gardens may account for the increase in focus on agriculture.

The lack of diversification into non-farm activities is a concern in Saesi Tsaedaemba because crop production is not improving relative to the control village. The lack of improvement may be due partly to the fact that the R4 village suffered much worse weather conditions the year after the drought than did the control village. However, conditions are challenging for agriculture in the district, with sandy, rocky soils and increasing droughts. Farmers in Saesi Tsaedaemba emphasize their need for better rainwater diversion and storage and some investment in irrigation.

Saesi Tsaedaemba is similar to other districts in terms of improvement in savings among male-headed households over the period 2013-2016 and use of fertilizer in 2016 among male-headed households.

5.3 Raya Azebo

The main distinguishing characteristic of Raya Azebo is that it experiences the most severe droughts. Raya Azebo is the only one of the three districts in which the 2015 drought wiped out crops entirely, and the previous droughts since the inception of HARITA were more severe in Raya Azebo as well. It is also the one district in which farmers report that livestock die during a drought, therefore male farmers prefer to sell livestock early during a drought rather than use their savings to cope with the drought.

Diversification of incomes and the benefits from DRR activities are impacts of R4 in Raya Azebo. Raya Azebo is the only one of the three districts in which households in R4 villages have diversified their incomes to include greater reliance on non-farm income sources relative to households in control villages. The trend began among female-headed households sooner but also emerged among male-headed households during the year after the drought. The diversification among female-headed households may have been accelerated by increases in borrowing in 2016 among those who participated in insurance relative to control households. Female-headed households in Raya Azebo are

using loans to start small businesses such as tea stalls or small shops. The proximity to a town may play an important role in providing these opportunities.

A potential threat to future diversification is that the ban against charging interest among the Muslim population prevents the significant percentage of Muslim households in the district from benefiting from the R4 savings and credit services.

Raya Azebo is the one district in which households in R4 villages see a bigger decline in livestock during the year after the drought than do control villages. One reason may be because R4 villages experienced a pest infestation that destroyed crops during the year after the drought and that did not affect the control villages. The decline in livestock may also be a result of the livestock trading activities among male-headed households and/or the shift to investment in non-farm activities.

There is no improvement in crop production in R4 villages in Raya Azebo relative to control villages and some crops have performed worse in some years in R4 villages than in control villages. The reasons may be the same as for the declines in livestock above.

Women may face more discrimination in Raya Azebo than elsewhere, as we discuss in Section 7. Women are less comfortable participating in public decision-making relative to men than in other districts.

6. Enabling environment

6.1 The implementation capacity

REST is responsible for implementing R4 in Tigray. The implementation team consists of 3 staff members at the REST head office, 11 staff at the district level, and 11 community facilitators hired from the beneficiary communities to work in those communities that have credit and saving services. The team has managed an expansion from 1 village in 2009 to 81 villages in 2016. In addition to expanding geographically, the program has added two significant components since 2012, which are credit and saving services.

The R4 program may wish to review whether the REST team is sufficient to manage the program in its current complexity. In particular, education about index insurance and the monitoring and evaluation system may require additional capacity, either in the form of personnel or in the form of training. Other recent evaluations have found that expansion has impaired the quality of the program because the very capable and dedicated team at REST does not have sufficient resources to manage the scale of the engagement in Tigray (Tsegay and Tesfaye 2016, Beyene and Tsegay 2015).

6.1.1 Capacity building

For REST staff:

The REST staff meet with the insurance index design team from the IRI, Oxfam and WFP staff to develop the insurance index every year. This meeting provides capacity building for REST staff in the design of the index. The staff do not receive capacity building in any other components of the R4 program. The Senior Officer who leads the implementation team attended a conference at the WFP in 2016.

REST staff do not seem to be receiving sufficient education and capacity building that is required to manage the R4 enterprise, while this enterprise has grown in complexity over the last 4 years. The staff are learning almost entirely from their own experience, except on the topic of insurance index design. This point also appears in other recent evaluations (Tsegay and Tesfaye 2016, Beyene and Tsegay 2015).

For farmers:

REST staff held learning events in 3 zones in Tigray with village chairmen, district partners, zone administrators, and regional partners to discuss understanding of index insurance and the achievements and sustainability of the R4 program. Some of the main points raised in the discussion were:

- **Knowledge:** The awareness and demand for weather index insurance is increasing, but a knowledge gap remains, especially how insurance works.
- **Integration:** Participants requested that the 4Rs be integrated in all project areas in collaboration with government bodies, especially at regional level.
- **Results:** some of the intermediate results forwarded by participants were:
 - ✓ Improved environmental rehabilitation, soil fertility and homestead development.
 - ✓ Enhanced savings.
 - ✓ Increased uptake of loans and agricultural inputs.
 - ✓ Increased crop production.
 - ✓ Developed confidence / reduced fear of drought.
- **Sustainability:** Many participants requested that the project be scaled up throughout the region. Demand is high, but paying for premiums in cash remains difficult for farmers.
- **Challenges:** questions raised and discussed were:
 - ✓ Basis risk.
 - ✓ Delay in claim payments.
 - ✓ The demand for multi-peril crop insurance, DRR materials, and income generating activity packages.

The REST team may require additional resources to expand education of farmers about index insurance. The training reaches a limited number of farmers. Farmers report that the same farmers attend the annual training every year. This

is supposed to be a training of trainers, so participants are supposed to disseminate the knowledge to others in their communities. However, the knowledge dissemination lacks follow-up, and reports from farmers suggest that it is limited. One alternative would be to offer training to different farmers in different years to reach a larger population. Another is to provide incentives and/or follow-up to ensure that the trainers are disseminating knowledge.

Furthermore, some of the information that the training is communicating about index insurance seems to be misleading, as discussed in section 4.1.2. The concern about financial literacy was also noted in the previous round of evaluation that covered the period from 2009 to 2012 and in more recent evaluations (Madajewicz and Tsegay 2014, Tsegay and Tesfaye 2016, Beyene and Tsegay 2015).

On the other hand, the training related to DRR activities and income generation is extensive, well supported, reaches both male-headed and female-headed households and receives much praise from farmers.

6.2 Evaluation of R4

The R4 program in Tigray has undergone several rounds of evaluation. The first evaluation covered the first three years of the program, from 2009 to 2010. The current study is the second round of evaluation that can attribute impacts to R4. There were two interim evaluations, which were not designed to attribute impacts, in 2011 and 2015.

The main shortcomings of the evaluations to date are the small sample size and the limited geographical coverage of the quantitative components. We discuss the effect of these limitations in detail in the Limitations section of the Evaluation Design section.

The program would enhance its contribution to knowledge about managing climate risks in agriculture and improve evidence for donors by investing in a well-designed monitoring and evaluation program. The monitoring and evaluation system could cover a set of villages that are representative of the agro-ecological and socio-economic conditions in Tigray. If there are villages, which were included in the program only recently, then baseline data could be collected in some of these villages through retrospective questions. If the program is planning to expand to new villages in the near future, then it could select a subset of these villages that represents different conditions, and begin to collect baseline data in these villages now. *Baseline data are much more useful if they covers several seasons rather than just one.*

An expansion plan could include identification of appropriate control villages and immediate start of data collection in those villages. As coverage of the program

expands, the number of available control villages will decline. The program may then change the evaluation strategy to analyzing differences in progress over time across different treatment villages in order to continue to identify problems as they emerge.

The monitoring system could collect data on a subset of the most important outcome indicators at regular time intervals, preferably in both treatment and control villages. The program also needs a well-designed system for tracking participation in the insurance, credit, and savings components. The system should allow program staff to observe how many farmers have participated for how long in each component, how the drop-out rate changes over time, and to track changes in type of participation such as number of farmers who switch from paying for insurance in labor to paying with cash.

The monitoring system could include a qualitative component. Farmers should have systematic opportunities to offer feedback and receive a response as part of the monitoring system.

The program should increase the sample size for evaluations substantially. The data collected through monitoring could serve as an input into future evaluations.

6.3 The national environment in Ethiopia

The government of Ethiopia together with its development partners is exerting a significant effort to reduce the impact of climate change on livelihoods and food security. Partly as a result of the relationship with R4, the government of Ethiopia has included weather index insurance in its climate resilience strategy policy document.

The government has also undertaken other initiatives that improve the farmers' ability to manage climate risks. The government began a new credit program, which complements the efforts to increase access to credit undertaken by R4. The program is designed to assist poor and especially landless farmers with developing sustainable income sources and diversifying their sources of income. The program requires farmers to form groups, which then receive training in income generating activities and business skills and receive loans. The budget for the next 5 years for this fund is about 10 billion birr for the whole country and about 3 billion for Tigray. The farmers are praising this program for substantial loan amounts, low interest rates, and straightforward application procedures. However, some farmers say that forming groups is difficult.

Female farmers in particular praise the above program. They say that the government is prioritizing their access to credit, resulting in a greatly simplified and fast application process.

In 2004, the government amended the policy, which created RUSACCOs, to allow the cooperatives to offer saving services. However, the RUSACCO were

focused on providing agricultural inputs and did not have sufficient capacity to expand into saving activities. In 2015, the government suspended the RUSACCOs ability to offer agricultural inputs on credit, and the cooperatives have become more interested in collecting savings and offering loans from the funds collected in savings. The extent to which RUSACCOs offer saving and credit services varies from cooperative to cooperative, but these activities are beginning to complement the saving and credit services offered by R4, which also use the RUSACCO as a platform.

R4 shares many of the same objectives as the government of Ethiopia is pursuing. Progress toward those objectives would benefit greatly from close coordination with the relevant government programs to ensure that the different initiatives complement and build on each other.

6.4 The effect of R4 on the local, national, and international development environment

R4 has successfully cultivated extensive relationships with local, national, and international stakeholders engaged in development, including the government, the private sector, and the non-profit sector. These relationships have spawned significant impacts on the practice of risk management for smallholder farmers beyond the reach of the program itself.

At the local level in Ethiopia, R4 has inspired private insurers to offer weather index insurance as part of their portfolios. Historically, private insurers have been reluctant to offer micro-insurance products because of basis risk, fears about potential for achieving large scale, and concerns about sustainability. However, participation in R4 and in trainings about index insurance for smallholder farmers carried out by the IRI have changed opinions in the private sector. As a result, not only have major national and international financial organizations such as Nyala Insurance and the Africa Insurance Company continued to partner with R4, but also an increasing number of national insurance companies have started to provide index insurance products outside of R4 (Oxfam America 2016).

R4 and partners have also been invited to lead training sessions on expanding access to finance among farmers through insurance-for-work programs for local NGOs and insurance companies (Oxfam America 2016). These initiatives are poised to expand access to index insurance for smallholder farmers in Ethiopia beyond the scale that can be achieved by R4.

On a national level, R4 has been effective in influencing the approach to risk management for smallholder farmers. Thanks to its investment in relationships with government agencies, especially the Ministry of Agriculture, an effort is currently under way to integrate R4 into the PSNP. Furthermore, R4 informed the government's Disaster Risk Management Strategic Program and Investment Framework (Oxfam America 2016).

Oxfam and WFP have facilitated the establishment of the Index Insurance Working Group (IIWG) in Ethiopia, which is building the capacity for weather index insurance in the country (Oxfam America 2016).

International NGOs who are working in Ethiopia, such as JICA and CARE, have requested information about the weather index insurance component of R4. They are piloting efforts that are explicitly modeled on R4 (Oxfam America 2016).

R4 has also had a number of impacts on the global conversation about risk management in smallholder agriculture. These are detailed in Oxfam America 2016.

7. Women's empowerment

Women are not comfortable taking part in public decision-making in many cultures because of the disapproval that such participation elicits from men, and often from other women. In general, this is the case in Tigray, though the difference between the ease with which women and men take part in decision-making varies in the three study districts. On average, female heads of households report less comfort with speaking out in public on subjects such as building infrastructure in the community, proper payment of wages for public projects and similar programs, or protesting against misbehavior by public authorities or elected officials than do male heads of households. On average, about half of the female heads of households report that they are not at all comfortable speaking out on these subjects, a quarter to a half report that they can speak out with a great deal of difficulty or a little difficulty, and a quarter to a half report that they can speak out fairly or very comfortably. There are no statistically significant differences between R4 and control villages.

However, the differences between men and women with respect to speaking out in public are small and not statistically significant in Saesi Tsaedaemba and Kola Temben. They are large and statistically significant in Raya Azebo.

Female heads of households are members of somewhat fewer social and economic groups than male heads of households and they have input into decision-making in fewer groups. We asked survey respondents about participation in the following groups: agricultural cooperative (including marketing groups), water users' group, forest users' group, SACCOs/merry-go-rounds/VESAs/ risk pool group, mutual help or insurance group (*Iddir*), civic groups (improving community), charitable groups (helping others), local government, religious groups, and women's groups. On average, female heads of households in R4 villages are members of 4 groups, about one group less than male heads of households, and they have input into decisions made in 1 group on average, one group less than male heads of households. There are no statistically significant differences between R4 and control villages.

Ability to make decisions about household assets is an important indicator of women's economic power. Women are slightly more likely to make decisions about livestock in all three districts than are men. However, the most common arrangement is that household head and spouse make the decisions jointly. The common decision-making is the reported practice for 77% of households in the case of oxen and 69% of households in the case of all big livestock. The only statistically significant difference between R4 and control villages is that women are more likely to make decisions about oxen in the R4 villages in Raya Azebo than in the control villages.

A recent R4 gender analysis finds that women are proportionally represented with men in the R4 project overall (Oxfam America 2014). The percentage of female-headed households who purchase insurance, 34%, is slightly smaller than is their percentage in the population of PSNP participants, 44%. The same percentage of female-headed and male-headed households participate in the VESAs and RUSACCOs, about 35%. However, a larger percentage of male-headed households receive loans from the revolving fund in the RUSACCOs, 67%, than do female-headed households, 46%. Fifty-three percent of households report that the household head makes decisions about buying insurance, while 45% report that both household head and spouse make this decision together. Women benefit particularly from a number of DRR initiatives. Women are relatively more likely than men to use compost and they are the only ones who have micro gardens.

CONCLUSIONS AND RECOMMENDATIONS

The R4 program in Tigray is eight years old this year, and it is beginning to mature into an important source of support for livelihoods of smallholder farmers. This evaluation, which covers the period from 2012 to 2016, indicates clear progress since the last evaluation in 2012 toward R4 objectives in two of three principal components of the R4 program theory: (1) enabling farmers to cope with shocks to livelihoods without reducing food consumption, critical expenditures, and future ability to generate income; and (2) diversifying income sources to include sources that are more resilient to shocks.

Two results suggest that farmers coped better with the severe drought in 2015 in R4 villages than in control villages at least in two out of the three study districts. First, R4 reduced the impact that the drought had on food security among female-headed households relative to the control villages in two districts over the period of the evaluation. Second, R4 supported better retention of oxen and faster accumulation of all big livestock among female-headed households relative to the control group in the same two districts. Livestock holdings increased by 2 animals among female-headed households relative to the control group, between 2013 and 2016.

The program is laying a foundation both for better coping with shocks and for diversifying income sources by supporting faster accumulation of savings among male-headed households than in the control group and increases in borrowing among female-headed households compared to the control group. Farmers report that savings and credit support resilient coping strategies and are critical for funding investment in non-farm activities, though the percentage of farmers who invest in non-farm activities is still small.

Diversification of income sources is an important pathway to improving the security of livelihoods in an increasingly drought-prone region burdened by decades of soil degradation. R4 households in Raya Azebo are diversifying their incomes faster than is the control group. This finding is particularly important because Raya Azebo is the most drought-prone of the three districts, and maintaining agricultural outputs is becoming difficult without irrigation.

Weather index insurance and disaster risk reduction projects contribute substantially to all of the impacts, including increases in savings and borrowing. Insurance payouts are an important supplement to resources available for purchasing food and investing in income generating activities, whether agricultural or not. Disaster risk reduction activities are training farmers in income

generating activities and business planning as well as providing technologies such as rainwater harvesting and inputs into micro gardens.

The newer credit and saving services are beginning to improve outcomes and promise to have significant impacts over time, as their still limited reach expands. However, their impacts are just beginning to emerge.

The data provide less evidence that R4 is improving security of livelihoods through the third main component of the program theory: increasing production of cereal crops in good seasons. This conclusion remains unchanged from the previous round of evaluation. Farmers are still mainly investing in traditional cereal crops, which are the mainstay of livelihoods in Tigray. Improvements in production relative to control villages may be limited in this study because R4 villages in 2 of the 3 study districts experienced weather shocks and pests in 2016, which did not affect the control villages. Harvests of one main crop improved in R4 villages relative to control in the third district. Also, the study may be missing smaller impacts due to the small sample size. Nevertheless, obstacles to achieving substantial improvements in agricultural production in the region are considerable.

Farmers emphasize that scaling up water diversion and water storage investments to provide more access to irrigation is necessary to improve production. The existing disaster risk reduction projects that manage and conserve water may already be contributing to stabilizing food security. Expanding them may improve impacts.

Several limitations of the program emerge from the evaluation. Credit and saving services do not yet reach many farmers. The sustainability of index insurance is not improving substantially. Education about index insurance still has gaps that may cause misunderstandings between the farmers and the program and poor planning by the farmers. Implementation would benefit from more capacity building. The program should address implementation problems that are continuing since the previous evaluation, which took place in 2012, such as delays in disbursement of funds, and weaknesses of the monitoring system.

RECOMMENDATIONS

DRR activities:

- The program should scale up existing risk reduction activities rather than investing in new ones. Water diversion and retention, compost, micro gardens, rainwater harvesting, and training in income generating activities should receive high priority according to farmers.
- Significant improvements in agricultural production may not be possible without more investment in irrigation in some locations. Irrigation is the exception to the suggested focus on expanding existing investments rather than making new

ones. Investments in diversion and retention of rainwater, which R4 is making already, should prioritize specific locations and increase resources in those locations. Farmers request projects such as micro dams or construction of medium sized ponds so that they can reduce their dependence on rainwater. *This issue was identified in the evaluation in 2012 as well, though investment in this area seems to have increased since.*

- If possible, the program should extend training in income generating activities to village residents who do not purchase insurance (through insurance-for-work or cash). Diversification of income may be among the most important pathways to improved security of livelihoods in Tigray.
- The program should address the delays in the flow of funds for payment of insurance premiums. The delays are causing risk reduction activities, which should take place before the growing season begins, to be carried out during the growing season, when farmers are busy in their own fields. The delays are straining the labor available to households. *This issue was identified in the evaluation in 2012 as well.*
- Even though farmers have been allowed to participate more in planning risk reduction activities over time, farmers would like to have more input. They feel that they can help to focus the program on activities that are appropriate for their communities. One particular request is that male-headed farmers would like to participate in micro gardens. *This issue was identified in the evaluation in 2012 as well, though it has improved.*

Saving and credit services:

- The program should prioritize scaling up saving and credit services to include more villages and more farmers.
- Male farmers would like to have the option to request bigger loans in order to undertake more productive business activities.

Index insurance:

- Progress toward making weather index insurance sustainable is limited. The significance of this concern depends on the outlook for continued donor funding. R4 has increased the portion of the premium that has to be paid in cash somewhat, but few farmers are graduating from paying with labor to paying in cash and the proportion of farmers who pay fully in cash has declined over time. One possible future avenue is to experiment with raising the cash requirement at different rates in different places to identify an appropriate rate of increase. Another is a scaled cash requirement that increases with the household's ability to pay according to transparent criteria. Engaging wealthier farmers who can pay in cash requires an outreach plan informed by a clear

understanding of the needs among wealthier farmers. These issues were identified in the evaluation in 2012 as well.

- The program should invest more in improving the understanding of index insurance among farmers. Current training should be reviewed to ensure that it is not communicating information in a misleading way. The training should either reach a larger number of farmers in each village rather than focusing on the same small group, who are considered the trainers, each year, or the program should ensure that the trainers have an incentive to disseminate knowledge, and that they are doing so. Understanding of index insurance was identified as an issue in the evaluation in 2012 as well.

Implementation and scaling up:

- The program needs more investment in implementation capacity. REST staff should receive more capacity building relevant to the various components of the R4 program.
- Farmers would like to have a clear, transparent system through which they can communicate feedback to the program and receive responses in order to contribute to improving the program. This issue was identified in the evaluation in 2012 as well.
- A public-private partnership (PPP) with the Ethiopian government may help to expand R4's reach to the many more farmers who would like to be included in the program, and possibly to expand risk reduction activities. A PPP might achieve closer coordination between components of R4 and government programs, such as between risk reduction activities and activities undertaken by the PSNP, and between R4 and government-supported credit and saving services.

Monitoring and evaluation:

- Evaluation and monitoring need more resources to improve their contribution to the growth of the program and to knowledge about managing risks in smallholder agriculture. The sample size and number of villages included in future evaluations should increase substantially. The small sample inhibits the identification of areas where progress is taking place. The current set of villages is not representative of the range of conditions in Tigray. Also, evaluation needs better planning for baseline data and control villages as the program expands.
- The current monitoring system does not keep track of critical indicators such as retention and dropout rates in the insurance program, and length of time that each farmer has been purchasing insurance. The latter is important for the evaluation. The monitoring system should expand to track selected outcomes on a regular basis in both program and control villages. *Tracking retention and dropout rates was identified as an issue in the evaluation in 2012 as well.*

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TABLES

Table 2: Comparison of R4 and control villages

Variable	Mean by village treatment status	All woredas combined	Kola Temben	Saesi Tsaedaemba	Raya Azebo
Household head is female	Control mean	0.385	0.427	0.440	0.366
	Treatment mean	0.439	0.436	0.424	0.444
	P-value of mean difference test	0.403	0.912	0.868	0.378
Household head can read and write	Control mean	0.340	0.210	0.440	0.356
	Treatment mean	0.269	0.422	0.401	0.189
	P-value of mean difference test	0.247	0.009***	0.688	0.046**
Household head is older than 50 years	Control mean	0.288	0.371	0.160	0.289
	Treatment mean	0.259	0.249	0.422	0.221
	P-value of mean difference test	0.623	0.137	0.003***	0.394
Land household owns (tsimad)	Control mean	380	386	314	389
	Treatment mean	456	389	318	511
	P-value of mean difference test	0.211	0.960	0.941	0.162
Number of households		459	148	106	205

Asterisks *, **, *** denote significance at 10%, 5%, and 1% respectively.

Table 3: Effect of R4 on food security

Variable	Treatment effects by gender of household head	All woredas combined	Kola Temben	Saesi Tsaedaemba	Raya Azebo
Households faced food shortages, 2013-2016	Female-headed	-0.086* (0.043)	-0.070 (0.165)	-0.278 (0.173)	-0.065 (0.140)
	Male-headed	0.050 (0.107)	-0.044 (0.131)	-0.123 (0.155)	0.158 (0.105)
	Both	-0.006 (0.058)	-0.055 (0.106)	-0.187 (0.116)	0.066 (0.087)
No. of households		398	130	94	174
No. of meals household eats per day in a given week, 2015-2016	Female-headed	0.092 (0.061)	-0.180 (0.164)	-0.084 (0.189)	0.222 (0.154)
	Male-headed	-0.106 (0.095)	-0.208 (0.151)	-0.005 (0.135)	-0.064 (0.111)
	Both	-0.024 (0.062)	-0.197* (0.107)	-0.038 (0.113)	0.054 (0.094)
No. of households		400	131	95	174

The treatment effects are from a fully saturated regression of the dependent variables in the table rows on an indicator for whether or not R4 is present in the village, whether or not the household head is female, whether or not the household head can read and write, whether the household head is older than 50, and interactions of all the control variables with the treatment variable. The regression uses sampling weights that adjust for oversampling of insurance purchasers. The results are consistent with results obtained when the control variables are whether or not the household head is female and an indicator for amount of land owned by the household being greater than the 75th percentile. Standard errors are in parentheses. Asterisks *, **, *** denote significance at 10%, 5%, and 1% respectively.

Table 4: Effect of R4 on diversification of income

Variable	Treatment effects by gender of household head	All woredas combined	Kola Temben	Saesi Tsaedaemba	Raya Azebo
Fraction of household members primarily engaged in agricultural activities, 2012-2017	Female-headed	-0.076 (0.110)	-0.020 (0.199)	0.422** (0.193)	-0.270* (0.150)
	Male-headed	-0.087 (0.056)	-0.043 (0.105)	-0.101 (0.150)	-0.138* (0.083)
	Both	-0.083 (0.056)	-0.033 (0.108)	0.116 (0.122)	-0.193** (0.078)
Fraction of household members primarily engaged in non-agricultural activities, 2012-2017	Female-headed	0.062 (0.124)	-0.066 (0.189)	-0.475** (0.185)	0.277** (0.130)
	Male-headed	0.081 (0.068)	0.050 (0.097)	-0.030 (0.095)	0.131 (0.080)
	Both	0.073 (0.065)	0.002 (0.100)	-0.215** (0.091)	0.192*** (0.071)
No. of households		366	110	88	168
Fraction of household members primarily engaged in agricultural activities, 2016-2017	Female-headed	0.035 (0.100)	0.049 (0.181)	0.346* (0.198)	-0.067 (0.115)
	Male-headed	-0.088 (0.055)	0.010 (0.101)	-0.054 (0.143)	-0.162* (0.087)
	Both	-0.037 (0.069)	-0.026 (0.098)	0.112 (0.117)	-0.123* (0.071)
Fraction of household members primarily engaged in non-agricultural activities, 2016-2017	Female-headed	-0.030 (0.133)	-0.041 (0.180)	-0.551*** (0.179)	0.104 (0.175)
	Male-headed	0.122* (0.059)	0.022 (0.102)	0.050 (0.123)	0.185** (0.078)
	Both	0.059 (0.074)	-0.004 (0.097)	-0.199* (0.100)	0.151* (0.085)
No. of households		386	117	91	168

The treatment effects are from a fully saturated regression of the dependent variables in the table rows on an indicator for whether or not R4 is present in the village, whether or not the household head is female, whether or not the household head can read and write, whether the household head is older than 50, and interactions of all the control variables with the treatment variable. The regression uses sampling weights that adjust for oversampling of insurance purchasers. The results are consistent with results obtained when the control variables are whether or not the household head is female and an indicator for amount of land owned by the household being greater than the 75th percentile. Standard errors are in parentheses. Asterisks *, **, *** denote significance at 10%, 5%, and 1% respectively.

Table 5: Effect of R4 on accumulation of livestock

Variable	Treatment effects by gender of household head	All woredas combined	Kola Temben	Saesi Tsaedaemba	Raya Azebo
No. of oxen, 2012-2016	Female-headed	-0.087 (0.190)	0.309* (0.188)	-0.026 (0.178)	-0.172 (0.211)
	Male-headed	-0.147 (0.154)	0.115 (0.255)	0.209 (0.219)	-0.382* (0.209)
	Both	-0.122 (0.151)	0.195 (0.173)	0.112 (0.155)	-0.295* (0.151)
No. of big livestock, 2012-2016	Female-headed	-1.171* (0.569)	1.277 (0.899)	0.341 (1.039)	-2.337 (2.096)
	Male-headed	-0.904 (1.153)	1.178 (1.390)	1.716 (1.082)	-2.476* (1.345)
	Both	-1.014 (0.854)	1.219 (0.929)	1.147 (0.766)	-2.419** (1.212)
No. of households		400	131	95	174
No. of big livestock, 2012-2016	Insured female-headed	0.150 (0.841)	1.784* (0.938)	0.335 (1.028)	-0.862 (1.521)
	Insured male-headed	0.468 (1.127)	1.435 (1.399)	1.846 (1.070)	-1.279 (1.260)
	Both	0.337 (0.965)	1.579* (0.934)	1.221 (0.759)	-1.106 (0.971)
No. of households		401	132	95	174
No. of oxen, 2014-2015	Female-headed	-0.038 (0.143)	-0.081 (0.227)	-0.033 (0.101)	-0.036 (0.133)
	Male-headed	0.224 (0.207)	-0.055 (0.163)	-0.086 (0.197)	0.092 (0.173)
	Both	0.051 (0.089)	-0.066 (0.139)	-0.064 (0.133)	0.039 (0.120)
No. of households		400	131	95	174

No. of big livestock, 2014-2015	Female-headed	0.975 (0.560)	-0.100 (0.979)	1.826* (0.960)	1.017 (1.071)
	Male-headed	-0.117 (0.521)	0.290 (1.118)	1.394 (0.990)	-0.320 (0.699)
	Both	0.335 (0.379)	0.129 (0.786)	1.573** (0.728)	0.234 (0.629)
No. of households		393	127	94	172
No. of oxen, 2015-2016	Female-headed	0.002 (0.080)	0.255* (0.134)	-0.077 (0.149)	-0.007 (0.114)
	Male-headed	-0.206** (0.090)	-0.125 (0.239)	0.033 (0.179)	-0.286* (0.157)
	Both	-0.120* (0.058)	0.032 (0.155)	-0.012 (0.124)	-0.171 (0.107)
No. of households		400	131	95	174
No. of big livestock, 2015-2016	Female-headed	-0.989 (0.662)	1.252* (0.692)	-1.941* (1.083)	-1.694* (0.961)
	Male-headed	-0.946 (0.618)	-0.552 (1.626)	-0.072 (0.814)	-1.672* (0.848)
	Both	-0.964* (0.457)	0.195 (1.058)	0.845 (0.581)	-1.681*** (0.628)
No. of households		399	131	95	173

The treatment effects are from a fully saturated regression of the dependent variables in the table rows on an indicator for whether or not R4 is present in the village, whether or not the household head is female, whether or not the household head can read and write, whether the household head is older than 50, and interactions of all the control variables with the treatment variable. The regression uses sampling weights that adjust for oversampling of insurance purchasers. The results are consistent with results obtained when the control variables are whether or not the household head is female and an indicator for amount of land owned by the household being greater than the 75th percentile. Standard errors are in parentheses. Asterisks *, **, *** denote significance at 10%, 5%, and 1% respectively.

Table 6: Effect of R4 on accumulation of savings

Variable	Treatment effects by gender of household head	All woredas combined	Kola Temben	Saesi Tsaedaemba	Raya Azebo
Log savings, 2012-2016	Female-headed	0.098 (0.629)	-1.218 (1.479)	0.293 (1.259)	0.564 (0.965)
	Male-headed	1.381*** (0.235)	1.340 (1.201)	1.336 (1.302)	1.167 (0.870)
	Both	0.850** (0.279)	0.282 (0.934)	0.905 (0.924)	0.918 (0.655)
No. of households		364	126	83	155

The treatment effects are from a fully saturated regression of the dependent variables in the table rows on an indicator for whether or not R4 is present in the village, whether or not the household head is female, whether or not the household head can read and write, whether the household head is older than 50, and interactions of all the control variables with the treatment variable. The regression uses sampling weights that adjust for oversampling of insurance purchasers. The results are consistent with results obtained when the control variables are whether or not the household head is female and an indicator for amount of land owned by the household being greater than the 75th percentile. Standard errors are in parentheses. Asterisks *, **, *** denote significance at 10%, 5%, and 1% respectively.

Table 7: Effect of R4 on borrowing behavior

Variable	Treatment effects by gender of household head	All woredas combined	Kola Temben	Saesi Tsaedaemba	Raya Azebo
Household borrowed money, 2013-2016	Female-headed	-0.041 (0.083)	-0.371** (0.153)	0.362* (0.189)	-0.010 (0.149)
	Male-headed	-0.267*** (0.053)	-0.376** (0.156)	-0.174 (0.178)	-0.279** (0.134)
	Both	-0.173** (0.059)	-0.374*** (0.111)	0.047 (0.133)	-0.168* (0.101)
Log of amount borrowed, 2013-2016	Female-headed	-0.352 (0.595)	-2.908** (1.119)	2.555* (1.362)	-0.078 (1.025)
	Male-headed	-1.984*** (0.567)	-3.397*** (1.268)	-1.105 (1.551)	-1.993** (0.996)
	Both	-1.309** (0.529)	-3.195*** (0.878)	0.410 (1.082)	-1.201 (0.735)
No. of households		400	131	95	174
Household borrowed money, 2014-2015	Female-headed	-0.015 (0.063)	0.228 (0.145)	0.090 (0.208)	-0.073 (0.165)
	Male-headed	0.012 (0.084)	-0.402** (0.155)	0.185 (0.210)	0.100 (0.145)
	Both	0.001 (0.058)	-0.141 (0.108)	0.145 (0.159)	0.028 (0.110)
Log amount borrowed, 2014-2015	Female-headed	-0.093 (0.474)	1.732* (0.995)	0.687 (1.545)	-0.506 (1.157)
	Male-headed	0.190 (0.697)	-3.237** (1.276)	1.539 (1.678)	1.029 (1.096)
	Both	0.073 (0.465)	-1.181 (0.845)	1.186 (1.236)	0.394 (0.812)
No. of households		400	131	95	174

The treatment effects are from a fully saturated regression of the dependent variables in the table rows on an indicator for whether or not R4 is present in the village, whether or not the household head is female, whether or not the household head can read and write, whether the household head is older than 50, and interactions of all the control variables with the treatment variable. The regression uses sampling weights that adjust for oversampling of insurance purchasers. The results are consistent with results obtained when the control variables are whether or not the household head is female and an indicator for amount of land owned by the household being greater than the 75th percentile. Standard errors are in parentheses. Asterisks *, **, *** denote significance at 10%, 5%, and 1% respectively.

APPENDIX 1: TERMS OF REFERENCE

We expect to document and generate data at least on the following key variables/indicators, with proper analysis:

1. Protection for food insecure households from unavoidable drought risk and reduced need to resort to negative coping strategies
 - i. Changes in household (HH) food security level as measured by WFP's Food Consumption Score. If there is differences between men and women in terms of level of food security? This analysis will rely on comparing female headed and male headed households in the survey and in data from focus group discussions (FGDs). What role do men and women play with regards to food security of family members? Analysis will rely on data from FGDs. Changes in food security level overtime? Food security: WFP's Food Consumption Score and Coping Strategy Index will be used to measure food security and household's resilience.
 - ii. Changes in coping mechanisms - What do men and women perceive as risk due to changes in climate and what are the coping strategies they apply? Analysis will rely on comparing female headed and male headed households in the survey and in data from FGDs. Are households better protected from drought risks? What adaptation mechanisms/practices do they apply? What are the implications of a given adaptation strategy on men's and women's use of time and labor and on their health? How has this changed over time? Information on the last 3 questions will come mainly from FGDs.
 - iii. What is the role of index insurance in protecting households from drought risk and resorting to negative coping strategies?
 - iv. Changes in knowledge - households' understanding of insurance, savings and credit
2. Reduced impact of climate-related losses faced by food-insecure communities and communities' increased awareness of and engagement with adaptation techniques.
 - i. Change in knowledge - Do R4 households' exhibit improved knowledge of DRR activities? Are they employing more adaptation techniques? Information about adaptation techniques will come mainly from FGDs.
 - ii. What have been the changes in the environment as a result of R4 DRR work? Changes in vegetation cover, current status of sustainable agronomic practices and others to show degrees of soil and water conservation work and its results in those sampled sites? What is the differential engagement of women and men in improved resource management (both participation and decision making)? Analysis will rely primarily on data from FGDs.
3. Improved food and livelihood security for participants, including increased agricultural productivity and readily available credit facilities.

- i. Changes in the level of households' income and its diversification; who brings in the income; what are the major household expenditures; who makes decisions on expenditures²⁸. The survey data will provide information on changes in agricultural yields and assets, and on diversification of income. Information about impacts on income and expenditures will be qualitative, coming from FGDs.
 - ii. Changes in amount and types of assets owned; women's ownership of assets²⁹; women's access/control over resources (purchase, sale or transfer of assets) – land, water, financial resources including saving, credit etc. Analysis will rely on comparing female headed and male headed households in the survey and on data from FGDs. Information about women's access/control over resources will come only from FGDs.
 - iii. Improvement in yield per hectare (productivity) of major crops (crops selected for insurance) in the area; yield per hectare of major crops for female-headed-households (FHHs); women's autonomy in production³⁰; what is the level of input women have regarding productive decisions? Information on the last two questions will come only from FGDs.
 - iv. Changes in savings and credit (and the average size of both)? Awareness/knowledge of financial services? For what purpose do they use their savings and also the credit they take? What are their sources of credit? Are their sufficient credit and saving facilities? What is their repayment performance (are they indebted)? What is the differential engagement of women and men in microcredit³¹ and savings. Analysis will rely on comparing female headed and male headed households in the survey and on data from FGDs. All information on awareness/knowledge of financial services and whether there are sufficient credit and saving facilities will come from FGDs.
4. Improved enabling environment, including strengthened capacity of the private sector and increased engagement of national and local public sector partners to provide risk management services to poor rural communities. All information on this objective will come from interview data collected in December 2015.
 - i. Changes in the capacity of insurance service providers and delivery channels; Stakeholders' capacity in implementing R4 (will help us assess whether R4 capacity building trainings are effective): staff experience, skills and knowledge, organizational capacity and experience
 - ii. Government's interest in R4 and willingness to integrate similar initiatives into national strategies and programs

5. Women's empowerment.

²⁸ WEAI indicator

²⁹ WEAI indicator

³⁰ WEAI indicator

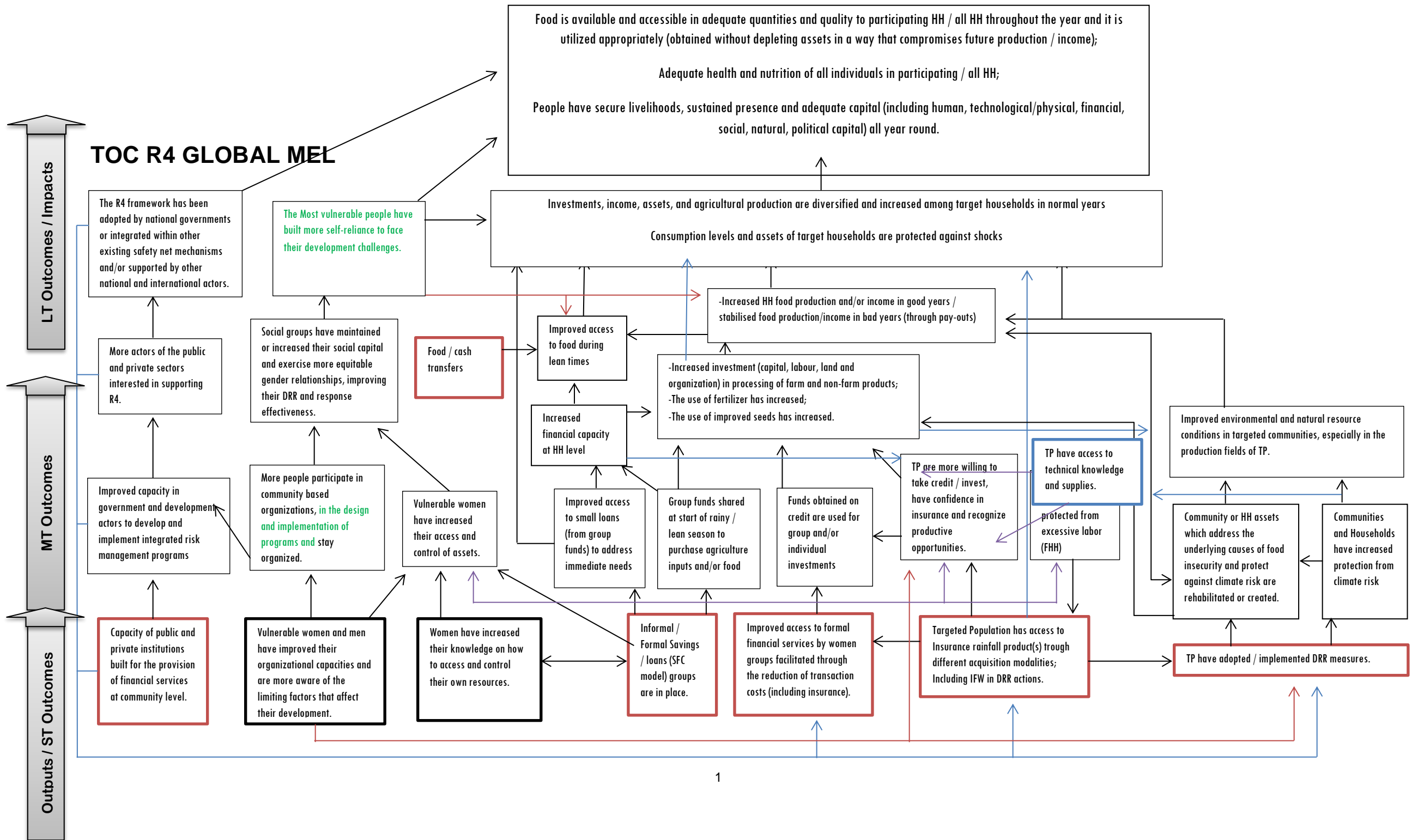
³¹ WEAI indicator

- i. What percentage of women are members of an economic or social group?³²
- ii. What percentages of women are capable of speaking in public?³³
- iii. What is the workload of women?
- iv. What is the leisure time of women and what amount of time do they allocate to productive and domestic tasks?
- v. Analysis will rely on comparing female headed and male headed households in the survey and on data from FGDs. All information on points iii and iv will come from FGDs.

³² WEAI indicator

³³ WEAI indicator

APPENDIX 2: THEORY OF CHANGE



APPENDIX 3: PERFORMANCE OF R4 COMPONENTS

The performance of the savings component of R4 (Risk reserve/Risk pool)

During the 2016 growing season the program organized 2,845 insurance beneficiaries, of whom 1022 were female household heads, into 137 VESAs. As a result, 2,408 farmers were able to save ETB 341,762. Four hundred twenty-one relatively poor farmers in VESAs borrowed ETB 158, 801 without interest and 98 farmers borrowed ETB 27,500 with an interest rate that is lower than the one charged by the RUSACCOs, which in turn charge lower interest rates than does DECSI. The farmers will pay the loans back in 4 to 5 months.

All the 2,845 farmers who joined VESAs are now members of RUSACCOs, and have regular saving ETB 1,306,423.00. As members, they continue saving every month per the bylaw of their respective cooperatives. Regular savings in RUSACCO ranges from ETB 11 to 28 per month.

Table A3.1: Savings at RUSACCOs and VESAs

District	# of HHs	Total amount saved in RUSACCO		VESA Savings							
				Total amount saved in VESA		Revolved as a loan without interest		Revolved as a loan with interest		Loan Repaid to VESA	
		Amt per month	Birr	# of VESAs	Birr	# of HHs	Amt (Birr)	# of HHs	Amt (Birr)	# of HHs	Amt (Birr)
Atsbi	500	14	102834	25	68100	87	35420	66	19500	15	4000
K/Awlaelo	920	20-50	793051	41	84866	348	84866			0	0
S/ts/emba	548	11-20.5	117910	29	75830	30	16605	4	2000	0	0
R/azebo	220	20	131600	10	34344	59	21,910			10	4200
Ahferom	220	18	161028	12	32102	28	6,000			0	0
Total	2408	52	1306423	117	341762	421	158801	98	27500	25	8200

Source (REST Annual report 2016)

The performance of the credit component of R4

Since its inception in 2014, the revolving fund component of the R4 program, which operates through the RUSACCOs, has loaned a total of ETB 8,535,000.00 to 2,845 relatively poor farmers, of whom 1,041 are female-headed households, in three phases in 2014, 2015 and 2016. The loans have funded the following income generating activities: 1958 shoat (sheep and goat) rearing projects, 263

shoat fattening projects, 189 petty trade projects, 78 cattle fattening projects, 78 bee keeping projects, 54 poultry projects, 181 dairy projects, and 23 irrigation projects.

Table A3.2: Amount of loan provided in five districts since 2014

District	2014		2015		2016		Total		# Of villages
	# of HHs	Loan provided (Birr)	# of HHs	Loan provided (Birr)	# of HHs	Loan provided (Birr)	# of HHs	Loan provided (Birr)	
K/Awlaelo	120	360,000.00	800	2400000		0	920	2,760,000	8
S/ts/emba		-	548	1644000		0	548	1,644,000	8
Atsbi		-	500	1500000		0	500	1,500,000	5
Ahferom	120	360,000.00	100	300000	200	600000	420	1,260,000	3
R/Azebo	120	360,000.00	100	300000	237	711000	457	1,371,000	3
Total	360	1,080,000	2,048	6,144,000	437	1,311,000	2,845	8,535,000	27

There is no fixed loan repayment agreement between RUSACCO and the borrowers. The repayment arrangement and period differs from district to district and village to village depending on the internal regulations of the RUSACCO in the village. In most villages the agreement is to repay half of the loan with interest after a year and the remainder at the end of two years. The repayment rate in the first three phases has been 88%. Delays in repayment occurred in areas affected by the most severe drought.

Table A3.3: Loan repayment plan versus achievement

District	# of HHs received loan			Loan Repayments					
	M	F	T	Re-payment plan (Birr)	# of HHs repaid	Repaid amount (Birr)	# of HHs with outstanding loan	Out-standing loan (Birr)	Re-payment Rate (%)
Atsbi W.	284	216	500	750000	420	670500	285	79500	89
K/Awlaelo	665	255	920	1380000	561	1067283	359	312717	77
S/Ts/Emb a	364	184	548	612000	398	598250	10	13750	98
R/Azebo	250	207	457	330000	219	336630	1	0	102
Ahferom	241	179	420	330000	213	333000	7	0	101
Total	1804	1041	2845	3402000	1811	3005663	662	405967	88

The performance of the weather index insurance program (Risk Transfer)

The number of farmers who purchase insurance has grown from 200 in Adi Ha village 27,024 farmers in 81 villages during the 2016/17 growing season, of whom 24,574 purchase insurance for labor and 2450 pay in cash. Almost 35%, or 9369 purchasers, are female-headed households.

Table A.3.4: Enrollment and payment of cash for the premium in 2016/17

S/ N	Description		Total number of enrolled farmers	Number enrolled	
				Male	Female
1	Number of enrolled households	Labor	24,574	15837	8737
		Full cash	2,450	1818	632
		Total	27,024	17655	9369
2	Cash collection (Birr)	15% cash	1,357,323.5		
		Full cash	358,518.82		
		Total	1,715,842.32		

Table A3.5: Enrollment of farmers by district

S/N	District	Total number enrolled by type				
		Labor	Full cash	DFAP Labor ³⁴	Total	
1	Adwa	2273	0	0	2273	82.3
2	Ahferom	1723	199	142	2064	134.1
3	Atsbi Wenberta	1861	0	0	1861	74.1
4	Kilte Awlalo	2576	22	60	2658	143.3
5	Kola Tembien	2557	195	142	2894	106.2
6	Raya Alamata	1937	668	0	2605	94.7
7	Raya Azebo	2947	714	142	3803	97.9
8	Saharti Samre	1724	117	123	1964	102.6
9	Saesie Tsaedaemba	2748	299	0	3047	98.3
10	Tanqua Abergele	2049	115	148	2312	108.2
11	Werie Leke	1280	121	142	1543	103.3
	Total	23,675	2,450	899	27,024	101.3

Disaster Risk Reduction

³⁴ Non R4 program beneficiaries (USAID program)

REST reports that the following DRR activities were implemented in the program villages during the 2016 planting season:

- **Catchment treatment:** The program implemented both physical and biological soil and water conservation measures to protect downstream areas from excessive run-off, reduce erosion of fertile soil, improve soil moisture, and prevent further expansion of gullies. During the 2016 growing season the program constructed 44km of deep trenches (1m width*1m depth*4m length), excavating 44,219 m³ of soil. It constructed 94 ponds (by excavating 912 m³ of soil), which enhance moisture availability and increase ground water recharge in the lower catchment areas. The program planted 317,573 different seedlings to support the trenches with biological measures.
- **Gully reclamation:** The program reshaped gullies and constructed gabion - supported loose rock check dams, in order to combat the extensive invasion of farmlands by gullies and stabilize channel gradients. During the 2016 growing season the program rehabilitated 10 km of gullies by constructing 2030 m³ of loose and 439 m³ gabion check dams supported by 159,063 cuttings of vetiver, elephant grass and populus. This intervention helps to maintain and expand farm lands, improve spring and ground water discharges, and increases availability of feed for animal, thereby supporting the diversification of household incomes.
- **Spate irrigation/simple flood diversion:** Spate irrigation is a simple flood harvesting and management system, which diverts the flow of water from heavy rainfall with earthen canals and bunds constructed from stones, sand, gabions, and masonry, on the beds of normally dry creeks or river channels that run into farmland. During the 2016 season, the program constructed 28 km of diverting canals by excavating 24,314 m³ of soil on 862 hectares of land to support rain-fed agriculture with supplementary irrigation, directly benefiting 5,030 farmers. The achievement reflects the priority given to supplementing the availability of moisture for rain-fed crops to minimize the drought risks.
- **Micro-gardening:** Female-headed households typically own smaller farming plots and have less labor available than their male-headed counterparts. Many of these households rent small plots for crop-sharing. DRR activities promote micro-gardening to improve the use of small backyard plots by female-headed households. The program trained 1,198 female-headed households in micro-gardening and these households have planted vegetables such as cabbage, lettuce, tomato and onion on 2.4 hectares of land. The production provides vegetables for household consumption, and generates cash if households sell part of the produce.
- **Planting cactus pear:** *Cactus* is a drought resistant plant with various economic and environmental benefits. It plays a crucial role in feeding humans and livestock during droughts. It serves as a live fence, and helps to conserve soil and water. Farmers sell the fruit for supplemental cash. The

program distributed 185,100 pads of cactus, which farmers have planted in backyards as well as on communal lands, benefiting 3000 farmers.

- **Soil fertility management (compost pit making):** Compost is essential for increasing crop production. It rebuilds soil nutrients and improves moisture retention in the soil. One thousand three hundred sixty-one households, of whom 1190 are female-headed, have prepared 2017 compost pits, and 91% of the households have received training in soil fertility management. Farmers will use the compost for growing vegetables in their backyard plots and for growing crops.
- **Oxen-driven mold board:** Four hundred farming households, of whom 30 are female-headed, have received oxen-driven mold boards and training about its benefits and method of installation. The mold board enhances soil fertility and helps to conserve moisture.
- **Water-harvesting check dam pond:** The ponds harvest water by capturing spring water base-flow during the dry season for the purpose of irrigation. They improve the downstream ground water table, enhance springs, help reclaim gullies, and increase productivity. They also increase access to irrigation.
- **Roof water harvesting technologies (RWH):** RWH is a reliable alternative source of drinking water in locations where surface and groundwater are either unavailable or unsafe. RWH particularly suitable for communities and households with severe drinking water constraints. Such communities are often located on mountain tops, along ridges, or in dry plains with deep water tables that are too costly to explore. The rapidly growing number of houses that use corrugated iron sheets provides an opportunity for RWH. The RWH not only improves the supply of drinking water but also reduces the workload of women and female children by reducing the need to carry water from far away, and helps to develop backyard micro-gardens. A RWH system can deliver 7,200 or 9,000 litre per year if operated at 130% capacity (by filling-using-refilling during the rainy season), which represents 20-25 litre of drinking water per day year-round.

Twenty-three RWH technologies were constructed in 23 households, of whom 19 are female-headed, in areas that have scarce water and high demand for micro gardening. Farmers provide local materials during the construction. Farmers are very interested in this technology and would like R4 to implement it on a large scale.

A photographic image of each DRR activity is in Appendix 6.

Capacity building among participating farmers.

During the 2016 production season, the team at REST has provided training in DRR and income generating activities to 2,692 farmers, 201 DAs, and 27 agricultural experts. The types of training were:

- 1,092 farmers, all of whom were female-headed households, 81 DAs, and 11 experts received training in micro gardening and have also received vegetable seeds.
- 1,190 farmers, of whom 808 were female-headed households, and 81 DAs received training in composting and other soil fertility management practices.
- 410 farmers, of whom 30 were female-headed households, and 39 DAs in five districts (Ahferom, Adwa, W/Leke, Raya Azebo, and Alamata) received oxen-driven mold board and training in its installation and usage.

In general, before a farmer can receive a loan from the revolving fund at a RUSACCO, s/he receives training in income generating activities, such as shoat rearing and fattening, petty trade, cattle fattening, bee keeping, poultry, dairy, and irrigation. They also receive training in business skills.

REST also organizes visits by farmers to other locations where they can observe individuals and groups who have substantial experience with practicing particular DRR and income generating activities, as well as with saving groups. The visits enable farmers to share their experiences and learn from each other. REST conducted regional exposure visits in 3 zones in Tigray, in which a total of 95 farmers, district and regional REST experts, and development agents, of whom 22 were female, participated. Seventy experts, of whom 3 were female, participated in a second round of regional exposure visits to share experiences with DRR activities.

REST organized “training of trainers” (TOT) events at the district level in index insurance and financial literacy, in which the participants were 3,242 (1185FHHs) farmers, of whom 1,185 were female heads of households, 81 DAs, and 11 experts. The participants were supposed to disseminate the knowledge they gained to others in their communities.

REST also trained 990 farmers, of whom 467 were female, and who were composed of 437 farmers who took loans from RUSACCOs, 84 RUSACCO leaders, 336 VESA leaders, and 27DAs in business management skills, developing a business plan, income generating activities, and management practices at the district level.

REST organized learning events in 3 zones in Tigray. The objective was to build local capacity in insurance concepts, regulations, and consumer protection and to discuss the achievements and sustainability of the project. There were 291 participants, of whom 22 were female, including 112 village chairmen, 137 district partners, 8 zone administrators, and 32 regional partners. REST staff gave presentations, which were followed by discussion.

In response to a suggestion from the farmers, REST organized a Tigrigna radio program, which covered such topics as implementation of R4, impacts, perceptions, women empowerment, trust and transparency, sustainability,

lessons and challenges encountered. The program aired for 15 minutes every Sunday for a total of 7 months on *Dmtsi Weyane Tigray (DWET)*. In addition, there were 10 minute broadcasts once a week for 20 weeks through Fana FM radio based in Mekelle, and 85 second advertisements on TV in Tigrigna transmitted every Friday and Sunday for 4 months through the Tigray Mass Media Agency.

APPENDIX 4: BASELINE QUESTIONNAIRE

Impact Evaluation of the R4 program In Tigray

May 2016

Please make sure that the household head and head's spouse are BOTH available for the interview if the household head has a spouse. The spouse may have information that the household head does not have.

Please fill in answers to questions 1 – 7 prior to the interview. Please fill in the household id on all pages of the survey. After the interview tear off the page with the respondent's name and contact information and throw it away.

Please do not prompt the respondent for answers. If the respondent takes time to answer, wait until s/he begins to talk. Do not suggest answers.

Unless I indicated otherwise, you can choose more than one response option. However, please be sure to rank the choices in order of importance as indicated by the respondent. Ask the respondent what is the most important reason or which answer is most significant. Put #1 in the brackets for that option, put #2 in the brackets for the second most important option and so on. Options can have the same rank if none of them are more important than others.

The code RA stands for "refused to answer," DK stands for "don't know," and NA stands for "not applicable." Please mark RA if the respondent is unwilling to provide an answer to a question. Mark DK only if the respondent really does not know the answer, not if s/he is unwilling to respond. Mark NA when the question does not apply to the respondent, for example because the question asks how the respondent used money from a loan but the respondent did not take any loans.

A. Respondent name and address

1. Respondent id _____
2. Name of household head (capital letters) _____
3. Woreda in which the respondent lives
 1. Kola Temben
 2. SasieTseadaEmba
 3. Raya Azebo
4. Tabia in which the respondent lives _____ (1. Genete 2. Hade Alga
3. Hadush Adi 4. Awet Bekalsi 5. Adi Ha 6. Werebaye 7. New village 1
8. New village 2)

5. Name of kushet in which respondent lives (capital letters)

6. Name of interviewer we will give ID to the interviewers after we hired them

Date of interview: (in Gregorian calendar) DD____ MM____ YEAR ____e
7. Starting time of interview (Hour:Minute) ____ : ____
8. Ending time of interview (Hour:Minute) ____ : ____
- 8b. if the household is an insurance beneficiary in whose name is the insurance registered _____

B. Household characteristics

9. Please tell us the following information about each household member who lived in the household in March 2012. Please provide answers that describe the situation in March 2012. **MAKE A COMPLETE LIST OF ALL INDIVIDUALS WHO NORMALLY LIVED AND ATE THEIR MEALS TOGETHER IN THIS HOUSEHOLD in 2012, STARTING WITH THE HEAD OF HOUSEHOLD.**

HH ID	9.1 Name of household member	9.2 Did this person still live in the household, in March 2016? 0. No 1. Yes DK, RA	9.3 Gender 1. Female; 2. Male; RA	9.4 Age in March 2016 # of years; RA; DK	9.5 RELATIONSHIP TO HEAD:	9.6 What was this person's primary daily activity in March 2012?	9.7 What was this person's secondary daily activity in March 2012?	9.8 What was this person's primary daily activity in March 2016? CODE	9.9 What was this person's secondary activity in March 2016? CODE	9.10 Did the person earn income for the family during the past 12 months? 0. no, 1 yes Miazia2007-megabit2008

Codes for relationship with the head

HEAD 1 WIFE/HUSBAND 2 CHILD/ADOPTED CHILD. . 3 GRANDCHILD 4

NIECE/NEPHEW 5 FATHER/MOTHER. 6 SISTER/BROTHER 7 SON/DAUGHTER-IN-LAW. . 8

BROTHER/SISTER-IN-LAW .9 GRANDFATHER/MOTHER. . 10 FATHER/MOTHER-IN-LAW. 11 OTHER RELATIVE. . . . 12

OTHER NON-RELATIVE. . 13 OTHER (SPECIFY) . . . 16

Codes for main daily activity of the person

1. Paid work in agriculture, 2. Paid work in non-agriculture, 3. Self-employed: business 4. Self-employed: agriculture or herding 5. In education 6. Not born 7. Unemployed and actively looking for a job 8. Unemployed, wanting a job, but not actively looking 9. Permanently sick/disabled

10. Retired 11. In community/military service 12. Doing housework 13. Children younger than school age

14. Family worker/helper 15. Other (specify)

B. Household characteristics

HH ID	9.11 Highest grade completed. Write in highest class if it is less than 10; 11. Prepa-ratory; 12. TVET;	9.12 Can the person read and write? 1. Can read and write; 2. Can read but not write;	9.13 Did the child attend school this past school year, 2015/2016? (for school age children only: age between 6-18)	9.14 If “no” to Q 9.13 what was the main reason for not registering for school during this school year?	9.15 Did the child miss days of school in order to work outside the home or help with chores in the home since September of 2015?
----------	--	---	---	---	---

	13. College diploma (non-TVET); 14. Uni-versity degree; 15. Reli-gious education; 16. adult education 17 alternative basic education (ABE) 18. others specify 0 - Illiterate DK; RA	3. Can-not read or write; RA; DK	0. No 1. Yes; RA; DK	(Use codes below)	0. No 1. Yes RA; DK; NA

Codes for reasons of not attending school

- 1 Family needs child's income schooling 2. Family needs child to help with chores 3. School is too expensive 4. Had enough schooling
- 5 Does not want to go to school any more level of education. 6. Marriage 7. Is too sick to go to school 8. Failed (not promoted) to next level of education.
9. Other, please describe _____ 79 RA 99 DK 88 NA

C. Community level activities

10. Are any members of your household aware of the R4 (DirkiWushina/Insurance) Program?
0. No 1. Yes [] RA [] NA
11. What activities do you know that the R4 (DirkiWushina/Insurance) Program has undertaken in this community other than offering index insurance in the 2015 growing season? Please tell us about the activities undertaken by people who are paying with labor for insurance if you know about them and any other R4 (DirkiWushina/Insurance) Program activities that you know about.
1. Building irrigation infrastructure and water diversion structures
 2. Planting trees
 3. Building/improving roads
 4. Soil and water conservation activities such as stone bunds or trenches
 5. 'Horeye' or Borehole digging for crop production and livestock
 6. Compost preparation (Composting)
 7. Toilet Construction
 8. Organizing a community risk pool (*nay mahbereseb/kebabiequaar*)
 9. None 10. Other, please describe _____
12. Did your household benefit from any of these R4 (DirkiWushina/Insurance) Program activities in the 2015 growing season?
0. No 1. Yes [] DK [] RA [] NA

If the answer for #12 is Yes, ask #13 otherwise skip to #14.

13. From which activities of the R4 (DirkiWushina/Insurance) Program did your household benefit during the 2015 growing seasons?

1. Building irrigation infrastructure and water diversion structures
2. Planting trees
3. Building/improving roads
4. Soil and water conservation activities such as stone bunds or trenches
5. 'Horeye' or Borehole digging for crop production and livestock
6. Compost preparation (Composting)
7. Toilet Construction
8. Organizing a community risk pool (*nay mahbereseb/kebabiequaar*)
9. None
10. Other, please describe _____

14. Did anyone in the household receive direct support transfers from the safety net program at any time during the last 4 years, from 2012 until now, including 2012?

0. No 1. Yes []DK []RA

If yes to 14

15. In how many years since 2012 did anyone in your household receive direct support transfers from the safety net program, including 2012? _____ # of years DK RA

16. Has your household participated in the PSNP program (public work component of productive safety net program) at any time during the last 4 years, from 2012 until now, including 2012?

0. No-->> Q20 1. Yes []DK []RA

17. IF 16 is yes How many days was your household assigned to work for the PSNP in 2015?

[]# of days assigned to work []DK []RA []NA

18. How many days was your household *assigned* to work for the PSNP in 2014?

[] # of days assigned to work []DK []RA []NA

19. How many years since 2012, including 2012, has your household worked for the following activities?

[] # of years on the insurance for work program []DK []RA []NA

[] # of years on the PSNP program []DK []RA []NA

G. Networks and services

20. Please tell us about all the loans that your household received over the past year from April 2015 to March 2016. Please include all the loans: loans for fertilizer from the farmers' cooperative, loans from the PSNPplus program, loans from relatives and friends, loans with no interest. Please be sure to include all loans for farming inputs for this past season.

S. N	1 Loan sources	2 have you received loan from [loan source]?	3. Is this loan in Kind or in cash	4 What was the loan amount?	5 How much collateral did you have to give for the loan?	6 what was the repayment amount (interest + principal)	7 How much time do you have to repay the loan?	8 Have you or will you repay the loan on time?	9 What did you use the loan for?
		0. No 1.Yes>>Next	1. in cash 2. in kind 3. Both	In birr If the loan was in kind, try to estimate the value	in birr		in months	1. On time 2. Late 3. Not at all (or didn't start paying)	
1	DECSI								
2	Farmers' cooperative								
3	Bureau of Agriculture								
4	PSNP plus program								
5	Commercial bank								

6	Community credit association								
7	Moneylender								
8	Family or friends								
9	Community risk pool								
10	Other – please describe								

Codes for Q.9: Use of loan: 1. Farming inputs 2. Buying livestock 3. Non-agricultural business inputs 4. Food 5. Medical needs 6. School expenses and/or school fees 7. Marriage 8. Burial 9. Other ceremonial 10. Repay another loan 11. Other specify -----

21. Please tell us about the total amount that you took out in loans in each year since 2013.

Year	Total amount borrowed In birr, DK, RA (if Zero skip to next)	Sources from which borrowed (can be more than one)		
April 2014 – March 2015				
April 2013 – March 2014				

Code for sources from which borrowed: 1. DECSI, 2. Farmers' cooperative, 3. Bureau of Agriculture; 4. PSNP plus program; 5. Commercial bank; 6. Community credit association; 7. Moneylender; 8. Family or friends; 9. Community risk pool; 10. Other – please describe; DK; RA

22. Are you aware of community risk pool (Credit and saving services by RUSACCO's) given to insurance beneficiaries being offered in your tabia any time since March 2014?
0. No >> to Q29 1. Yes DK RA
23. Are you or any member of your household a beneficiary from this service?
0. No >> to Q29 1. Yes DK RA
24. When did you start part participating in the community risk pool (RUSACCO)?
Year _____
25. Did you have savings in the community risk pool (RUSACCO) in March of this year?
0. No 1. Yes DK RA
26. How much saving (in Ethiopian Birr) did you have in the community risk pool (RUSACCO) in March of this year? amount _____
27. Have you received any credit/ loan from the community risk pool (RUSACCO) since you have become a member?
0. No >> to Q29 1. Yes DK RA
28. How much loan in total (in Ethiopian Birr) have you received from the community risk pool (RUSACCO) since you have become a member?
amount _____
29. Are you aware of any education about fertilizer being offered in your tabia any time since March 2014?
0. No >> to Q33 1. Yes DK RA
30. Who has been offering the education about fertilizer?
1. Government; 2. REST or DECSI; 3. NGO; 4. Other – specify; DK; RA; NA
31. Did you receive any education about fertilizer since March 2014?
0. No >> to Q33 1. Yes DK RA
32. For how many years have you been receiving education about fertilizer?
[]# of years DK RA NA
33. Please tell us about the cash savings that your household had in March of this year.
Interviewer: If the respondent does not want to say where the savings are held but is willing to tell us the total amount then please fill in the total amount in row 7 of the table below and fill in NA in the other rows. If the respondent is willing to tell us the full amount and where they hold their savings, but not how much they hold in each place, then please fill in the total in row 7 and write yes instead of an amount for each savings place in which they hold savings. If the household does not have any cash savings then please fill in 0s in the table.

33.1 Place where the savings are held.	33.2 How much saving did your household have in March of this year in the following saving places? In birr
1. DECSI or other microfinance institution	
2. Private Commercial bank	
3. Government bank	
4. Equub or community savings group	
5. Community risk pool (record the amount the farmer has <i>contributed</i> to the pool)	
6. Not at any institution – can be at home or another informal place	
7. Any place not mentioned so far – or for the total of savings where the respondent does not want to reveal the place	
8. Other, please describe _____	

34. For what purpose do you mainly use your savings (CODES):
 1. Purchase of inputs 2. Consumption during critical times 3. School fees
 4. Social activities 5. Health expenses 6. Other (Please specify) _____

35. Did you have more or less or the same amount in savings in March 2015 compared to March 2016?

1. More 2. Less 3. The same -> to Q 37 DK RA

If more or less then

36. How much more or less did you have in savings in March 2015 Compared to March 2016? _____ Birr

37. Did you have more or less or the same amount in savings in March 2014 compared to March 2015?

1. More 2. Less 3. The same -> to Q 39 DK RA

If more or less then

38. How much more or less did you have in savings in March 2014 compared to March 2015? _____ Birr

39. Did you have more or less or the same amount in savings in March 2013 compared to March 2014?

- 1. More 2. Less 3. The same -> to Q 41 DK RA

If more or less then

40. How much more or less did you have in savings in March 2013 compared to March 2014? _____ Birr

41. How much did your household receive in remittances from outside the household between April 2015 and March 2016?

[] in birr [] DK [] RA

42. Did the amount that you received in remittances over the past year (i.e. 2015) increase or decrease compared to the amount that you received over the year before (i.e. 2014)?

1 Increased 2 Decreased 3 Stayed the same -> to Q 44

[] DK [] RA [] NA

43. If the answer to 42 is increased or decreased, then by how much has the amount that you receive in remittances changed in this year compared to the year before?

[] in birr [] DK [] RA

44. By local standards, do you consider your household to be:

1 Habtam (rich) 2 Maekelai (average) 3 Dika (poor) 4 Betek (very poor)

[] DK [] RA

45. By local standards, which of the following did you consider your household to be in March 2013:

1 Habtam (rich) 2 Maekelai (average) 3 Dika (poor) 4 Betek (very poor)

[] DK [] RA

I. Shocks and coping mechanisms

46. We would like to know if your household was affected by the following shocks between April 2015 and March 2016. Please also tell us how your household coped with the hardship(s) that you encountered during this time. Please fill in the following table.

S N.	1 Shocks	2 Was your household affected by any of the following [SHOCK] between April 2015 and March 2016? 0. No >>Next Shock 1. Yes	3 How did your household cope with the hardship? Please number the coping strategies in order of their importance for your household.			4 Who in your household was most affected when coping with the hardship? (e.g. because they had least to eat or most work)
			1 st coping method	2 nd coping method	3 rd coping method	
1	Crop failure due to poor rains					
2	Crop failure due to sources other than poor rains (pests, hail floods etc)					
3	Death of livestock					
4	Illness in the family					
5	Death in the family					
6	Lack of access to inputs					
7	Large increase in input prices					
8	Conflicts and disputes					
9	Rising food prices					
10	Divorce separations and abandonments					
11	Theft or distraction of assets or livestock					
12	Other – please describe					

Codes for coping mechanism: Q 46 no. 3			Codes for affected member of households: Q 46 no. 4
Self-insure 1. Use own funds, savings 2. Re-sow 3. Sow another crop later 4. Sell livestock 5. Sell other assets 6. Rent out land 7. Eat less preferred food 8. Consume seed stock 9. Eat less 10. Spend less on clothing 11. Spend less on medicine 12. Spend less on school 13. Defer expenses 14. Get additional job 15. Send children to work 16. Migrate	Community-based 17 Share livestock 18 Sharecrop 19 Donations from relatives, friends and private persons 20 Donations from community organizations 21 Loans with interest from relative, friends, private persons 22 Loans with interest from community organizations 23 Loans without interest from relatives, friends, private persons 24 Loans without interest from community organizations	External 25 Work for PSNP 26 Emergency food aid 27 Assistance from farmer's cooperative 28 Assistance from government 29 Assistance from NGOs 30 Loans from banks 31 Insurance payout 32 Other – please describe	1. Female children 2. Male children 3. Working age females 4. Working age males 5. Elderly females 6. Elderly males 7. All members equally 8. Other – please describe:

47. Have you noticed any long term changes in the mean temperature (increase in the temperature) over the last 10-20 years
1) Yes 0) No

48. Has the number of rainfall days stayed the same, increased, or declined over the last 10-20 years
1. Stayed the same 2. Increased 3. Declined

49. Has your household been affected by change in climate (long term change in temperature and rainfall) Yes---1 No---0 >> to Q 53

50. What does this imply for household labor demand?
1) More male labor needed 2) More female labor needed 3) more of both labor needed 4) family needed to hire labor 5) other (please specify)_____

51. Is there any health related effects as a result of adaptation strategies followed due to the change in climate
Yes----1 No----0

52. If yes which member of the household was affected by the health impact of adaptation strategies
1) Adult male members 2) adult female members 3) children under 15
NA

If yes to 47 or 2 or 3 to 48:

53. What major adjustments in your farming have you made to these long-term shifts in rainfall?

A. Main Adjustment: _____

B. Second main adjustment: _____

- 1. Soil conservation 2) Tree planting 3) Early planting 4) late planting
- 5) Changing crop varieties 6) Irrigation 7) Migrated to urban area
- 8) Changing farm type: crop to livestock 9) Sold livestock
- 10 Adopted new technologies 11) Buy insurance 12) Find off farm jobs 13) Leas your land 14) Other (please specify)

•

54. What major adjustments in your farming have you made to these long-term shifts in temperature?

A. Main Adjustment: _____

B. Second main adjustment: _____

- 1. Soil conservation 2) Tree planting 3) Early planting 4) late planting
- 5) Changing crop varieties 6) Irrigation 7) Migrated to urban area
- 8) Changing farm type: crop to livestock 9) Sold livestock
- 10 Adopted new technologies 11) Buy insurance 12) Find off farm jobs 13) Leas your land 14) other (please specify)

•

K. Food Security

55. During the first week of March, how many times a day do your household members eat?

- 1. Only one 2. Two times 3. Three times 4. More than 3 times 4. Not even one time

56. Food consumption of the households in the last 7 days (Write numbers from 0-7 on the **frequency column as applicable**)

S/ N	Food Group	Weight	Frequency	Did this food come from food aid? 0. No, 1. yes	How was the consumption frequency when compared to first week of march 1. More frequently now 2. the same as first week of march 3. Less frequently now	Did this food come from food aid in the first week of March? 0. No, 1. yes
1	Cereals , potato, sweet potato and cassava	• 2				
2	Beans, peas, groundnut	• 3				
3	Vegetables	• 1				
4	Fruits	• 1				
5	Beef, shoat, poultry, egg and fish	• 4				
6	Milk and milk products except butter	• 4				
7	Sugar and sugarcane	• 0.5				
8	Oil, fat and butter	• 0.5				

57. Have you faced food shortage between April 2015 and March 2016?

1 Yes 0 No (*If no, ask #59*)

If yes to Q58 then

58. In which month/s did you face food shortage and in which months did you receive food aid? Please tell us when you were short of food even accounting for the food aid you received, so the food aid was not sufficient.

Month	Did you face food shortage and so needed	Did you receive food aid in this	Did you face food shortage even after receiving

	food aid in this month? Yes – 1 No - 0	month? 1. Yes 2. no → next month	food aid in this month? 1. Yes 2. no , NA if did not receive food aid
List months in this column			

59. Have you faced food shortage and needed food aid between April 2014 and March 2015? 1) Yes 2) No (*If no Q69*)

60. If yes to Q 59, for how many months did you face food shortage during this period? (Choose only one)
 ____ # of months

61. For how many months did you receive food aid between April 2014 and March 2015?

- ____ # of months. If none then write 0 **then skip to 63**

62. For how many months did you face food shortage even though you were receiving food aid between April 2014 and March 2015?

- ____ # of months. If none then write 0.

63. Have you faced food shortage between Aprils 2013 and March 2014? 1) Yes 2) No (*If no skipped to Q66*)

63b. If yes to Q 63, for how many months did you face food shortage during this period? (Choose only one)

____ # of months

64. For how many months did you receive food aid between April 2013 and March 2014?

- ____ # of months. If none then write 0 **then skip to 63**

65. For how many months did you face food shortage even though you were receiving food aid between April 2013 and March 2014?

- ____ # of months. If none then write 0.

•

I. . Land, crops, and inputs

66. How many timad of land did your household rent out in 2015?

[]timad []DK []RA if 0 skip to 68

67. How much did your household receive in rent for this land in 2015?

[]birr []DK []RA

68. How many timad of land did your household rent out in 2014?

[]timad []DK []RA RA if 0 skip to 70

69. How much did your household receive in rent for this land in 2014?

[]birr []DK []RA

70. How many timad of land did your household rent in 2015?

[]timad []DK []RA RA if 0 skip to 72

71. How much did your household pay in rent for this land in 2015?

[]birr []DK []RA

72. How many timad of land did your household rent in 2014?

[]timad []DK []RA RA if 0 skip to 74

73. How much did your household pay in rent for this land in 2014?

[]birr []DK []RA

74. How many timad of land that your household owns was cultivated by a sharecropper in 2015?

[]timad []DK []RA RA if 0 skip to 76

75. How much did you receive from the sharecropper in 2015?

Crop	Amount received	Units

76. How many timad of land that your household owns was cultivated by a sharecropper in 2014?

[]timad []DK []RA RA if 0 skip to 78

77. How much did you receive from the sharecropper in 2014?

Crop	Amount received	Units

•

78. How many timad of land did your household cultivate as a sharecropper in 2015?

[]timad []DK []RA RA if 0 skip to 80

79. How much of your yield did you have to pay to the land owner in 2015?

Crop	Amount Paid	Units

80. How many timad of land did your household cultivate as a sharecropper in 2014?

[]timad []DK []RA RA if 0 skip to 82

81. How much of your yield did you have to pay to the land owner in 2014?

•

Crop	Amount received	Units

•

•

82. Please tell us about all the plots that you owned, shared in/out, or rented in/out in the 2015 growing season. Please report every plot (whether planted or left fallow). *[Interviewer, please add rows to the table if necessary.]*

Q82 A. Plot characteristics and input use

Plot code (number starting with one next to residence)	Plot location name (as called by farmer)	plot size (timad)	plot ownership	Soil type	Irrigation Codes F	Was plot planted during the last growing season? 0=No 1=Yes → to Q 8	If the plot was not planted, then why not?	Intercropped? 0=No; 1=Yes	Main Crop grown in the last growing season	Seed varieties Code H	Quantity of seed used In KG	Did you broadcast or did you use row planting or another sowing technique? Code I
	1	2	3	4	5	6	7	8	9	10	11	12

Codes A		Codes B	Codes C	Codes D	Codes E		Codes F	Codes G	Code H
1. Owned	4. Shared-in	1. Good	1. Gently slope (flat)	1. Shallow	1. Hutsa/Leptosol	4Keyih/Luvisol	1. Irrigated	1. Wanted to let land lie fallow	1. Traditional seed
2. Rented in	5.Shared-out	2. Medium	2. Medium slope	2. Medium	2. Baekel/Cambisol	5. Mixed type	2. Rainfed	2. Was afraid of drought	2. high yield variety
3. Rented out	6. Other, specify....	3. Poor	3. Steep slope	3. Deep	3. Walka/Vertisol	6. Other, specify		3. Other - specify	

Codes for crops: 1. Maize; 2. Wheat; 3. Barley; 4. Teff; 5. Sorghum; 6. Millet; 7. Sesame; 8. Flax; 9. Pepper, 10. Banana; 11. Orange; 12. Chaat; 13. Vegetables; 14. Peas 15. Lentil 16. Chick peas 17. 'Entatie' 18. Wheat and barley (hanfets) Other – describe: _____

Code J: 1 Broadcast 2 row planting 3 Other technique – please describe _____

Q82 B: Input use in the 2015 growing season							Q82 C: Crops Harvested in the 2015 growing season			
Plot code	Fertilizer		Compost		Pesticide/herbicide		Total harvested per plot (kg)	Did you suffer a crop failure during this planting cycle (2015) on this plot? 0. No>> Next 1. Yes	What percentage of each of the crops sown on this plot did you lose as a result of the shock in the 2015 growing season?	If yes, what was the reason for the crop failure in the 2015 growing season? 1. poor rain 2. Flood 3. pests 4. Disease 5. Hail/Snow 6. Other - specify
	Amount of DAP (Kg)	Amount of Urea etc (Kg)	own	Bought	Amt	Unit				
			kg	Kg						
13	14	15	16	17a	17b	18	19	20	21	

Q82 D. How much of your 2015 crop harvest did you sell, consume, and save by March 2016

Crop	How much did you sell by March 2016?	How much did you receive from this sale? birr	How much did you consume by March 2016	How much did you save by March 2016?
	Amount in KG		Amount in KG	Amount in KG

Q Q82 E. Source of and cost of seeds

Type of seed used in 2015 (crop and seed variety (1. regular, 2. HYV)		How much of the seed bought? Kg If 0 skip to next crop	How much did the seed cost? birr	How obtained the seed? (can enter multiple options) Code seed (Code I) Multiple	Codes I 1. Own saved 2. Gift from family/neighbor 3. Farmer to farmer seed exchange 4. Provided free by NGOs/govt 5. Govt subsidy program 6. Other source of free inputs 7. Purchased and Paid in full, with own-savings 8. Purchased on credit 9. Purchased Part own-savings, part on credit 10. Had to sell assets or grain reserves or reserves of another farm output to purchase it 11. Other, specify
Crop	Variety				

Q82 F: Source and cost of inputs

Input	How much of this input did you buy?	How much did this input cost? In birr	How did you get this input? Can enter multiple options Code I	Codes I 1. Own saved 2. Gift from family/neighbor 3. Farmer to farmer seed exchange

	Amount (if 0 Skip to next)	Units 1. kg 2. liter 3. No.			4. Provided free by NGOs/govt 5. Govt subsidy program 6. Other source of free inputs 7. Purchased and Paid in full, with own-savings 8. Purchased on credit 9. Purchased Part own-savings, part on credit 10. Had to sell assets or grain reserves or reserves of another farm output to purchase it 11. Other, specify
DAP					
Urea					
Compost					
Pesticide					
Hired labor					
Hired oxen					

Q82 G. What was your total harvest for the 2014 agricultural season, so what you reaped in Oct/Nov 2014?

Crop	Total amount harvested (kg)

83. What was your total harvest for the 2013 agricultural season, so what you reaped in Oct/Nov 2013?

Crop	Total amount harvested (kg)

84. Did you start sowing a new seed or more of a seed that you used to sow only a little of any time during the last three years, that is in 2013, 2014, or 2015?
0. No → skip to Q 86 1.Yes DK RA

85. If the answer to 84 was yes, then please tell us about these new seeds that you started planting more of.

1 Type of new seed that you started planting more of (use crop code in this column and indicate in the next column if it is traditional or HYV)	2 Is this seed traditional or HYV? 1. traditional 2. HYV	3 In which month and year did you begin planting more of it? Month, year		4 How many timad of your land did you plant with this seed in 2015?	5 Why did you start planting this seed or more of this seed?
		Month	Year		

Code for 33.5: 1. Because it brings a higher price; 2.Because it grows better in drought; 3.Because it is cheaper to grow; 4.Because I started growing a seed that I was experimenting with before; 5.Because I have insurance; 6. Other, please specify; DK; RA; NA

86. Are you using as much fertilizer as you want to use?
0. No 1.Yes>> Q88 DK RA

87. What is the main reason why you are not using as much fertilizer as you want to use?
1. Price;
 2. Not enough supply available for purchase;
 3. Can't get a loan;
 4. Place where buy it is too far away;

- 5. Risk of drought
- 6. Risk of other shock such as flood or pests
- 7. others specify

DK; RA; NA

88. Are you planting the quantity of HYV seeds that you want to plant?

0. No 1. Yes >> Q90 DK RA

89. If not, then what is the main reason why you are not planting the quantity of HYV seeds that you want to plant?

1. Price; 2. Not enough supply available for purchase; 3. Can't get a loan; 4. Place where buy it is too far away; 5. Risk of drought

6. Risk of other shock such as flood or pests

7. Other - specify; DK; RA; NA

90. Were the growing seasons in 2015 typical growing seasons or unusual?

1 Typical 2 Unusual [] DK [] RA

If the answer to #90 was "Typical" then mark NA in question 91, and skip to question 92.

91. If the growing seasons in 2015 were unusual, then why were they unusual?

1 Belg rains came late 2 Belg rains came early 3 Belg rains ended early

4 Belg rains were poor 5 Belg rains were more plentiful than usual

6 No Belg rains

7 Meher rains came late 8 Meher rains came early 9 Meher rains ended early

10 Meher rains were poor 11 Meher rains were more plentiful than usual

12 Pest infestation/invasion

10 Other – please describe _____

[] DK [] RA [] NA

A1. Wealth status

92. Please tell us about the number and value of assets that your household owns.

1 Type of a +sset	2 Did your household own this [TYPE OF ASSET] in March of this year? YES-1 NO-0>> skip to Q6	3 Quanti ty	4 Quantity Unit 1. number 2.KG 3. Colony 4.Gram 5. Tsimad 6. Metres Squared 7. Others (Please Specify]	5 Who in the househo ld have major or ownersh ip control over the Asset	6. Quantity the HH had in March 2015	7. Quantity the HH had in March 2014	8. Quantity the HH had in March 2013
Household assets							
Homestead land (in tsimad)							
Animal Shelter (separate from where human family members live)							
Kefo/Godo							
Radio							
Tape recorder							
Gold							
Silver							
Watches							
Mobile							
Productive assets							
Plough (mahresha- mesere'a)							

Axe, spade, Martello, etc.							
Bee hive (traditional)							
Bee hive (modern)							
Triddle pump (stina)							
Drip irrigation (tebtebta)							
Cart, wheel barrow, donkey cart/ Cart							
Type of House							
Own "GoJo BET(hat)" house							
Rented "GoJo BET(hat)" house							
Family inherited "GoJo BET(hat)" house							
Own "Korkoro" House							
Family inherited "Korkoro" House							
Rented "Korkoro" House							
Own "Hidmo" House_							
Rented "Hidmo" House_							
Family inherited "Hidmo" House_							
Other Assets , please describe _____							

Codes for Q5. And Q93, number 5

1. Female children 2. Male children 3. Working age females 4. Working age males
5. Elderly females 6. Elderly males 7. All members equally 8. Other – please describe:
9. Husband and wife

A1. Livestock Ownership

93. Please tell us about the number and value of livestock that your household owns.

1 Type of Livestock	2 Did your household own this [TYPE OF Livestock] in March 2016? YES-1 NO-0>> skip to Q6	3 Number of Livestock the HH had in March 2016	4 Value at market prices. in birr (i.e. if you were to sell these items in March 2016, how much would you have sold them for in birr)? Please record the aggregate value over all units	5. Who in the household have major or ownership control over the Asset Use code in page 17	6. Number of Livestock the HH had in March 2015	7. Number of Livestock the HH had in March 2014	8. Number of Livestock the HH had in March 2013
Livestock							
Ox							
Cow							
Heifer (arhi)							
Bull (tefin)							
Calf (mirakut)							
Sheep							
Goat							
Donkey							
Mule							
Horse							
Camel							
Poultry							
Bee							

94. Please tell us about the type and amount of grain that your household had on reserve at the beginning of March 2016. (From all sources including own production/purchase and gift)

Type of grain	Had on reserve at the beginning of March 2016 []kg

95. Please tell us about the type and amount of grain that your household had on reserve at the beginning of March 2015. (From all sources including own production/purchase and gift)

Type of grain	Had on reserve at the beginning of March 2015 one year ago []kg

**H. Index insurance section - for all HARITA program tabias only
(Genete, hadealga, hadush adi, adiha, awet bikalsi)**

96. Has anyone in your household heard of weather index insurance?
0. No 1. Yes [] DK [] RA
97. Has anyone in your household heard that index insurance is being offered in your tabia? *(If the respondent answers yes then please just mark the first*

option. Mark the second option only if the respondent him/herself mentions games. Do not ask about the games)

1 I heard about regular index insurance

2 I did not hear about any index insurance

[]DK []RA

98. Who provides index insurance in your tabia?

1 Nyala Insurance 2 Africa Insurance 3 REST 4 DECSI
5 Oxfam 6 community insurance group 7 other, please
specify _____

[]DK []RA

99. Did anyone in your household receive education about insurance during the last year?

0. No 1. Yes []DK []RA []NA

We'd like to ask you a few questions about the index insurance.

100. When does index insurance give you a payout?

1 When your yields are poor

2 When rainfall is below a certain level according to rain gauge or satellite

3 When rainfall is below a certain level on your field

4 Other – please describe _____

[]DK []RA

101. Will you receive a payout every time your yields are poor?

0. No 1. Yes []DK []RA

102. If you receive an index insurance payout, will the payout cover all of your losses or only a part of your losses?

1 The index insurance will cover all of my losses

2 Most of the time the index insurance will cover only part of my losses

3 Other – please describe _____

[]DK []RA

103. Would you ever receive a refund of your premium?

0. No 1. Yes []DK []RA

104. Did any member of your household buy index insurance in 2015?

0. No >> Q110 1. Yes []DK []RA

105. If the answer to 104 was yes, then did you receive a payout in 2015?

0. No >> Q109 1. Yes []DK []RA

106. How much did you receive in payout? _____ birr

107. If the answer to 105 was yes, then how did you use (or how do you intend to use) your payout? Please rank your answers by the amount of money you will spend on each (with the option you will spend the most on being #1, the option you will spend the second most on being #2, etc.).

1 to repay loans; 2 to buy food;

3 to buy production inputs; 4 for other expenditures;

5 other – please specify;

DK; RA; NA

108. How would your life have been different if you did not receive the payout? Please rank your answers by the ways your life has been MOST affected (i.e. the most important factor is #1, the second most important factor is #2, etc.).

1 would have had to sell livestock;

2 would have had to reduce savings;

3 would have had to reduce amount of food consumed;

4 would have had to pull children out of school;

5 would have had to reduce other expenditures;

6 would have to reduce the amount invested in my crops

7. There would not have been any difference

8 other – please specify; DK; RA; NA

109. If the answer to 105 was no, Do you think that you should have received an index insurance payment in 2015?

0. No 1. Yes []DK []RA

110. Did any member of your household buy index insurance in 2014?

0. No >> Q116 1. Yes []DK []RA

111. If the answer to 110 was yes, then did you receive a payout in 2014?

0. No >> Q115 1. Yes []DK []RA

112. How much did you receive in payout? _____ birr

113. If the answer to 111 was yes, then how did you use your payout? Please rank your answers by the amount of money you will spend on each (with the option you will spend the most on being #1, the option you will spend the second most on being #2, etc.).

1 to repay loans; 2 to buy food;

3 to buy production inputs; 4 for other expenditures;

5 other – please specify_____

DK; RA; NA

114. How would your life have been different if you did not receive the payout?
Please rank your answers by the ways your life has been MOST affected (i.e. the most important factor is #1, the second most important factor is #2, etc.).
1 would have had to sell livestock;

2 would have had to reduce savings;

3 would have had to reduce amount of food consumed;

4 would have had to pull children out of school;

5 would have had to reduce other expenditures;

6. would have to reduce amount invested in my crops

7 there would not have been any difference

8 other – please specify;

DK; RA; NA

115. If the answer to #111 was no then do you think that you should have received an index insurance payment in 2014?
0. No 1. Yes ☐ DK ☐ RA

116. Did any member of your household buy index insurance in 2013?
0. No 1. Yes ☐ DK ☐ RA

117. To what extent is your food security situation changed since you joined the HARITA program
1. Improved 2, no change 3. Get worse

If respondent answered “Yes” to purchasing index insurance in all 3 years 2013, 2014, and 2015, then skip the following 4 questions:

118. Have you ever wanted to buy index insurance in any of the past three years (i.e. 2013, 2014, or 2015) but were unable to buy?
0. No >> Q121 1. Yes

119. If yes, then in which years did this happen?
☐ 2013 ☐ 2014 ☐ 2015 ☐ RA

120. If yes, then why were you unable to buy?
1. Missed the sign-up period
2. Attended the sign-up but was refused
3. Other -- specify

121. If the respondent chose not to buy index insurance in any of the past three years (2013, 2014, 2015) – i.e. they deliberately chose not to buy it – they why did they not buy it?
1. Don't need insurance;
 2. have other insurance;
 3. Don't understand index insurance;
 4. don't trust that the insurer will pay;
 5. Don't trust that index insurance will offer a payment when i need one;
 6. I'm not eligible for work for insurance and cannot afford to pay cash;
 7. I don't want to work extra hours to pay for insurance;
 8. I bought insurance before and did not find it helpful;
 9. I don't see others benefiting from insurance;
 10. I don't grow the insured crops or I don't like other terms of the insurance
 11. other – specify;
- DK; RA; NA

122. Are you happy that you bought index insurance (if you purchased insurance in ANY of the past three years)?

0. No 1. Yes []DK []RA

123. If the respondent answered yes to #122, then how does s/he think that the index insurance benefited her/his household? [If the respondent answered "I got higher yields" please ask why/how s/he got higher yields and mark the appropriate option in addition to the "I got higher yields" option.]

1. I had the peace of mind that I will not have to sell livestock in case of drought
2. I had the peace of mind that I will not have to sell other assets in case of drought
3. I had the peace of mind that I will not have to reduce consumption in case of drought
4. I consumed more
5. I saved more
6. I used more fertilizer on my crops
7. I used better/more seeds
8. I used different cropping techniques (e.g. row planting)
9. I made other investments in my crops

10. I got higher yields
11. I planted more land
12. I did not share out my land but planted it myself
13. I applied for a loan that I would not have applied for if I did not have insurance
14. I got a loan that I think I would not have gotten if I did not have insurance
15. I could send my kids to school
16. Other – please describe _____

DK [] RA [] NA

124. If the respondent answered no to #122, then why was s/he unhappy with the index insurance?

1. I think the premiums are too expensive
2. I am not satisfied with the rules for when the insurance makes a payment
3. I am not satisfied with the rainfall measurement
4. I changed my mind about needing insurance
5. I am not interested in any insurance scheme
6. I don't want to work extra days for the insurance
7. I don't have time to work extra days for the insurance
8. I have to pay in cash while others allowed to pay in labor
9. I didn't benefit from the insurance in any way
10. Other, please specify _____

[] DK [] RA [] NA

125. Would your household have purchased insurance if you had to pay only with cash?

0. No 1. Yes [] DK [] RA

126. Was there a crop that you wanted to purchase insurance in 2015 but not covered in 2015?

0. No >> Q128 1. Yes [] DK [] RA [] NA

127. If yes to Q 126 which crops do you like to be covered in 2016

1. Maize; 2. Wheat 3. Barley; 4. Teff; 5. Sorghum; 6. Millet; 7. Sesame; 8. Flax;
9. Pepper, 10. Banana; 11. Orange; 12. Chaat; 13. Vegetables; 14. Peas 15. Lentil 16.

Chick peas 17. 'Entatie' 18. Wheat and barley (Hanfest) 19 Other – describe: _____

☐]DK ☐]RA

128. Would you prefer that the insurance cover a different period of time than was covered in 2015?

0. No >> Q130 1. Yes ☐]DK ☐]RA ☐]NA

129. If yes to Q 28 which period of time would you prefer to be covered in 2013?

1. Belg rains 2. Late start to main rains 3. Early end to main rains

4. Dry spells 5. Frost/Ice falls

6. Other – please describe: _____

☐]DK ☐]RA

130. Are you satisfied with the use of satellite rainfall data for determining whether the insurance should pay out or not?

0. No 1. Yes ☐]DK ☐]RA ☐]NA

131. Who in your household makes decisions about purchasing insurance?

1. Household head 2. Spouse 3. Both 4. Other male household members 5. Other female household members ☐]DK ☐]RA

I. Index insurance section - for control tabias (Worabaye, Tsenkanit, Erba)

132. Has anyone in your household heard of weather index insurance?

0. No --134 1. Yes ☐]DK ☐]RA ☐]NA

133. From whom did your household hear about weather index insurance?

1. Oxfam America staff 2. REST or DECSI staff
3. Nyala Insurance staff 4. Africa insurance staff
5. NGO 6. government staff
7. Agricultural extension worker 8. Community or religious organization

9. by word of mouth from someone I know 10. Radio, TV, or newspaper

11. Other – please describe _____

☐]DK ☐]RA ☐]NA

134. Do you know that index insurance is being offered in some nearby tabias?

0. No 1. Yes ☐]DK ☐]RA ☐]NA

135. Would you want to purchase index insurance if it was offered to you?

0. No to 137 1. Yes []DK []RA []NA

136. What benefits would you expect from buying index insurance?

1. Would make me feel more secure
2. Would give me easier access to loans
3. Would give me cash during a bad year
4. Would allow me to consume more
5. Would allow me to save more
6. Would allow me to invest more in my crops
7. I would not have to sell livestock or other assets during a tough time
8. None
9. Other – please describe _____

[]DK []RA

137. If you would not want to purchase index insurance, then why not?

1. I do not understand index insurance
2. I cannot afford the premium
3. I do not grow crops
4. Crop loss does not occur very often
5. My household already has other means to cope with crop loss
6. I don't think insurance will allow me to increase production
7. I prefer to put the money in my own savings account
8. I prefer to put the money in community savings
9. I don't believe that the index insurance will make a payment when I need it
10. I do not like the terms of the index insurance
11. I do not trust any bank or insurance company
12. I have irrigation
13. Other – please describe _____

[]DK []RA []NA

MODULE E: Individual leadership and influence in the community

Enumerator: The purpose of this module is to get an idea about men's and women's potential for leadership and influence in the communities where they live.

Ask these questions only to the household head

Respondent (household head ID) _____

Q.No.	Question	Response	Response options/Instructions
140	Do you feel comfortable speaking up in public to help decide on infrastructure (like small wells, roads, water supplies) to be built in your community?		No, not at all comfortable 1
141	Do you feel comfortable speaking up in public to ensure proper payment of wages for public works or other similar programs?		Yes, but with a great deal of difficulty 2
142	Do you feel comfortable speaking up in public to protest the misbehavior of authorities or elected officials?		Yes, but with a little difficulty 3
			Yes, fairly comfortable 4
			Yes, very comfortable 5

Group membership	Is there a [GROUP] in your community? Yes.....1	Was this group in the community in 2012? Yes.....1 No0	Are you or anyone else in your household an active member of this [GROUP] now?	How much input do you have in making decisions in this [GROUP]? (>> 146)	Why are you not a member of this [GROUP]? (next group)	How many times over the past year has someone in your household received help from this organization?	Were you or anyone else in your household a member of this group in 2012? 1. Yes	CODE 1: Control over decisions No input.....1
------------------	--	--	--	--	---	---	---	---

		No0>> next group		Yes 1 No..... 0>>146	Code 1	Code 2	Enter 0 if did not receive help.	0. No	Input into very few decisions.....2 Input into some decisions.....3 Input into most decisions.....4 Input into all decisions.....5
	Group Categories	143		144	145	146	147	149	CODE 2: Why not member of group Not interested.....1 No time.....2 Unable to raise entrance fees.....3 Unable to raise reoccurring fees.....4 Group meeting location not convenient.....5 Family dispute/unable to join.....6
1	Agricultural cooperative (including marketing groups)								
2	Farmers' association								
3	Water users' group								
4	Forest users' group								
5	SACCOs/Equub/ VSLAs/ Risk pool group								
6	Mutual help or insurance group (Iddir)								

7	Civic groups (improving community) or charitable group (helping others)								Not allowed because of sex.....7
8	Livestock sharing group								Not allowed because of otherreason.....8
9	Theft prevention group								Other, specify.....9
10	Local government								
11	Religious group								
12	Women's association								
13	Youth association								
14	Other (specify)								

APPENDIX 5: FOCUS GROUP DISCUSSION AND INTERVIEW GUIDE

Focus group discussion guide

1) Questions for farmers

Categories of FGD participants

- 1) Men who bought and who did not buy insurance. Those who bought should include individuals who have been buying for different numbers of years. Those who did not buy should include those who never bought and those who bought and dropped out.
- 2) Women who bought and who did not buy insurance. Those who bought should include individuals who have been buying for different numbers of years. Those who did not buy should include those who never bought and those who bought and dropped out.
- 3) Men in control villages
- 4) Women in control villages

Name of File: _____

1) ID of Community: _____

2) Group Interview Number FGD with farmers who bought insurance _____

3) Date of interview: _____ Time: _____

4) Researchers:

1. Facilitator _____

3. Note Taker _____

FGD participants

No	Name	Age	Educational level	Bought insurance in 2016?	# of years in which bought insurance before 2016

1.1 Questions for farmers in R4 villages

Please organize the seating in such a way that you can identify responses from respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance. It will be important to note differences in the ways that these 3 groups respond.

In questions that have the note “Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance,” the note applies to all parts of the question! So if the question has parts a, b, c ... the note applies to those as well.

- 1) How was the planting season in 2015/16?
 - a) What were the main challenges that you faced during the planting season in 2015/16? **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**
Follow up: Please rank the challenges in terms of severity and number of people affected.
 - b) How did the yields of your main crops compare to yields that you would get in a normal rainfall year?
- 2) How did you cope with the top three challenges that you faced during the 2015/16 season? **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**
Follow up:
Please keep in mind that we particularly want to know how people coped with the 2015/16 drought – very specifically. Did they have to sell livestock or other assets? If not, how were they able to put food on the table without selling livestock? Did they eat less?
How did you feed your families? What specific strategies did you use?

Did people get any help?

What were the main sources of help?

Are there organizations and/or services in the community that helped?

What exactly did they do?

a) What characteristics define households that coped better with the drought? Please be specific and explain how these characteristics helped to cope with the drought.

b) Have the ways that people cope with drought been changing over the last 7 years and how?

c) Did the insurance payout help to cope with the drought?

Follow up:

How did it help – what did people do (or not do) that they could not have done without it?

If it didn't help then why not?

3) How was the planting season in 2016/17 compared to the year before?

a) What were the main challenges that many people faced during the planting season in 2016/17? **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**

Follow up:

Please rank the challenges in terms of severity and number of people affected.

b) How have these challenges been changing over the last 7 years?

c) How did the yields of your main crops compare to yields that you would get in a normal rainfall year?

4) How did you cope with the top three challenges that you faced during the 2016/17 season? **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**

Follow up:

How did you feed your families? What specific strategies did you use?

Did people get any help?

What were the main sources of help?

Are there organizations and/or services in the community that helped?

What exactly did they do?

a) What characteristics define households that coped better with these challenges?

b) Have the coping strategies been changing over the last 7 years and how?

Follow up:

If people mention R4/HARITA as a reason for changing coping mechanisms then probe to find out what difference R4/HARITA made.

Did insurance, risk reductions, or the risk pool make the difference or a combination of these and how did each one help specifically? Do not mention R4/HARITA or any of its components if participants do not mention them.

- 5) Do you find that how community organizations help community members to cope with challenges, for example with drought or other challenges, has been changing over the last 7 years? **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**

Follow up:

Which organizations have been changing how they help and how have they been changing?

Why do you think they have been changing?

- 6) Is it easier for you to save money in a normal rainfall year now than it was 7 years ago? **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**

Follow up:

If yes, then why is that?

- a) How do you use your savings?

Follow up:

Do you use them differently in a drought year than in a good year?

What is the difference?

Do you prefer to use savings to cope with drought or to sell livestock?

- b) Do you think that having insurance has affected how you use savings?

Follow up:

Explain how you use your savings differently because you have insurance.

- 7) Is it becoming easier or harder to get the loans that you would like? **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**

Follow up:

If it is becoming easier or harder, why do you think that is?

- a) Do you think that having insurance affects whether or not a lender is willing to give you a loan and how so?

- b) Do you think that having insurance affects how much you borrow and how so?

- 8) What were your main reasons for buying insurance or not buying insurance last year (in 2016)?

- a) For those who bought insurance in 2016, what reasons would you give to a friend why the friend should buy or not buy insurance?

- b) For those who bought insurance before but did not buy in 2016, why did you stop buying insurance? What reasons would you give to a friend why the friend should buy or not buy insurance?
 - c) For those who never bought insurance, why have you never bought insurance? What reasons would you give to a friend why the friend should buy or not buy insurance?
 - d) Do you see any differences between the people who buy insurance and the people who don't, in terms of who is more likely to buy insurance in the first place? What characteristics, other than participation in the PSNP, make a person more likely to buy insurance?
- 9) How many people do you all know who were able to graduate from paying for insurance with labor to paying with cash? How are people able to graduate from paying with labor to paying in cash? Please give specific examples if you know any.
- Follow up:
- What changes in livelihoods enable people to graduate?
- What actions that people take bring those changes about?
- Does insurance help to bring the changes in livelihood that enable people to graduate? If yes, then how exactly does insurance help?
- a) For those of you who are paying with labor, would you rather continue to pay with labor or would you rather graduate to paying in cash? Why?
 - b) What can you do or what help would you need to enable you to graduate to paying with cash? Is there something specific that R4 could do to help?
- 10) What risk reduction activities is R4/HARITA doing in this village? Please rank these activities in terms of how beneficial they are to the community and how many people benefit. **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**
- a) What are the benefits of each of these activities?
 - b) If some activities are not benefiting the community much, what are the reasons why?
 - c) Is the community maintaining any structures built as part of risk reduction activities?
 - Follow up:
 - What are the challenges to maintenance?
 - How do you think these challenges can be overcome?
 - d) What other activities would be beneficial and what are the reasons why you recommend them? Rank the potential benefits of these activities relative to the activities that are being done now.
- 11) How is the risk pool benefiting or not benefiting members of this community? **Please note down differences in responses between respondents who are now buying insurance, those who bought insurance in the past but are not buying now, and those who never bought insurance.**
- Follow up:

Probe to ask if the risk pool has any unexpected negative consequences for any of the community members.

12) Do you have any suggestions for improving R4/HARITA – either the weather index insurance or the risk reduction or the risk pool part of the program?

13) What are your main reasons for participating or not participating in the PSNP?

a) Do you think that participation in R4/HARITA helps people to graduate from the PSNP and if so then how?

14) How have R4/HARITA activities affected your livelihoods up to now? Please be specific about the change that you think has happened because of R4/HARITA.

a) Is R4/HARITA reducing poverty in this community?

b) Is R4/HARITA addressing the main obstacles to people in this community improving their livelihoods?

Follow up:

Which obstacles is R4/HARITA addressing?

Which obstacles is R4/HARITA not addressing?

c) Is there something specific that you think would help people in this community deal with drought and reduce poverty in addition to what R4/HARITA is doing?

15) What are the main programs other than R4/HARITA that are helping to improve livelihoods in this community?

1.2 Questions for farmers in control villages

1) How was the planting season in 2015/16?

a) What were the main challenges that you faced during the planting season in 2015/16?

Follow up: Please rank the challenges in terms of severity and number of people affected.

b) How did the yields of your main crops compare to yields that you would get in a normal rainfall year?

2) How did you cope with the top three challenges that you faced during the 2015/16 season?

Follow up:

Please keep in mind that we particularly want to know how people coped with the 2015/16 drought – very specifically. Did they have to sell livestock or other assets? If not, how were they able to put food on the table without selling livestock? Did they eat less?

- How did you feed your families? What specific strategies did you use?
 Did people get any help?
 What were the main sources of help?
 Are there organizations and/or services in the community that helped?
 What exactly did they do?
- a) What characteristics define households that coped better with the drought? Please be specific and explain how these characteristics helped to cope with the drought.
 - b) Have the ways that people cope with drought been changing over the last 7 years and how?
- 3) How was the planting season in 2016/17 compared to the year before?
- a) What were the main challenges that many people faced during the planting season in 2016/17?
 Follow up:
 Please rank the challenges in terms of severity and number of people affected.
 How have these challenges been changing over the last 7 years?
 - b) How did the yields of your main crops compare to yields that you would get in a normal rainfall year?
- 4) How did you cope with the top three challenges that you faced during the 2016/17 season?
 Follow up:
 How did you feed your families? What specific strategies did you use?
 Did people get any help?
 What were the main sources of help?
 Are there organizations and/or services in the community that helped?
 What exactly did they do?
- a) What characteristics define households that coped better with these challenges? Please be specific and explain how these characteristics helped to cope with the drought.
 - b) Have the coping strategies been changing over the last 7 years and how?
- 5) Do you find that how community organizations help community members to cope with challenges has been changing over the last 7 years?
 Follow up:
 Which organizations have been changing how they help and how have they been changing?
 Why do you think they have been changing?
- 6) Is it easier for you to save money in a normal rainfall year now than it was 7 years ago?
 Follow up:
 If yes, then why is that?
- a) How do you use your savings?
 Follow up:
 Do you use savings differently in a drought year than in a good year?

What is the difference?

- 7) Is it becoming easier or harder to get the loans that you would like?
Follow up:
If it is becoming easier or harder, why do you think that is?
- 8) What are your main reasons for participating or not participating in the PSNP?
- 9) Is there any source of insurance in your village (please include any informal sources)? If yes, what is it?
Follow up:
Please tell us exactly how it works.
Who has the insurance?
When does the insurance make payouts?
Who benefits from the insurance and who does not? Why?
- 10) Does your village do any communal activities to catch and store rainwater, keep soil from blowing away, or improve the productivity of the soil? If yes, what activities does your village do? Please rank these activities in terms of how beneficial they are to the community and how many people benefit.
 - a) Who organizes these activities?
 - b) Who works on these activities?
 - c) Who benefits from these activities and who does not? Why?
- 11) Does your village have a risk pool (explain what a risk pool is)? If yes, how does a risk pool work in your village?
Follow up:
Who participates in the risk pool?
Who benefits from the risk pool and who does not? Why?
- 12) What are the main obstacles to people in this community improving their livelihoods?
- 13) What are the main programs that are helping to improve livelihoods in this community? Is there something specific that you think would help people in this community deal with drought and reduce poverty in addition to what these programs are doing?

Interview guide for key informants

Respondents [to be complete]

- 1) Development agent
- 2) Dedebit Credit and Saving Institute
- 3) Insurance representative
- 4) OXFAM USA
- 5) WFP

Expected outputs for each respondent:

- **A brief observation note and commentary**
- **full session recorded voice**

Messages to field researcher

1. introduce yourself
2. Briefly explain why you are interested in talking to them and the main question areas you want to explore the interview.
3. Read the consent form and ask the respondents to sign?
4. Record in voice the file name
5. Thank the participants at the end of the discussion.

1) Name of File: _____

2) Date of interview: _____ Time: _____

3) Field Researcher: _____

1. Questions for staff of lending organizations (just DECSI?)

At the woreda level:

- 1) What role do you think credit plays in improving agricultural livelihoods in your woreda?
- 2) Who is able to borrow in your woreda and who does not? Why?
- 3) Do you have any plans to expand your lending activity? Why yes or why no?
- 4) Do you know about the R4/HARITA program?
- 5) What do you see as the main benefits of the R4/HARITA program?
- 6) Do you know who has weather index insurance from the R4/HARITA program?
- 7) If you know who has insurance, then does the fact that a person has insurance influence the decision whether or not to lend to them? If yes, then

- how exactly does it influence the decision and why? If no, then do you have any plans to start taking insurance into account in the lending decision? What are your thoughts about why this would be a good or a bad idea?
- 8) Why do you think most people who buy insurance are PSNP participants? Why aren't wealthier farmers buying insurance in greater numbers? What would R4/HARITA have to add to its insurance program or change about its insurance program to attract wealthier farmers?

2. Questions for development agents

- 1) Do you think that there is scope to improve agricultural outcomes in this tabia? What are the main changes that need to take place to improve agriculture in this tabia?
- a) How have agricultural outcomes in this tabia changed over the last 7 years?
- b) Have there been any significant trends in the prices of seeds for the main crops, fertilizer, and other inputs in the local markets?
Follow up:
What have been the main trends?
What effect have these trends had on farmers?
- c) What do you think are the main obstacles to improving agriculture in this tabia?
- 2) What is the development program doing in this tabia? Who do you think benefits from this program? Who does not benefit very much? Why?
- 3) Do you know about the R4/HARITA project? What benefits of the R4/HARITA project do you see? Follow up:
Do you see any specific effects that R4/HARITA has had on farmers' livelihoods over the last 7 years? What are these effects?
Is it helping farmers to get through droughts? If yes, then how is it helping exactly? Is it reducing sales of livestock in a drought?
How do you see farmers using their insurance payouts?
- 4) Do you see any specific effects that R4/HARITA may be having on farmers' production decisions?
- a) Are farmers planting different crops, or using more or different inputs, or making any other changes because they are insured or because of the risk reduction activities? If yes, then please explain what you see farmers doing differently and why.
- b) Do you think the farmers are getting higher yields because of HARITA? If yes, then what parts of R4/HARITA are enabling them to get higher yields?
- c) Do you make any recommendations to farmers about how or what they should plant differently if they have insurance? If yes, then what

recommendations do you make? What would you do differently as a farmer if you bought insurance?

- 5) What determines if farmers buy insurance or not? Why do some stop buying insurance? Why do some never buy insurance at all?
- 6) What characteristics determine if farmers' graduate from paying for insurance with labor to paying with cash?
 - a) Is there something specific that R4/HARITA can do to help farmers graduate from paying with labor to paying in cash?
 - b) Why do you think most people who buy insurance are PSNP participants? Why aren't wealthier farmers buying insurance in greater numbers? How would R4/HARITA have to change its insurance program to attract wealthier farmers?
-
- 7) Most of the farmers who purchase insurance are PSNP participants. Do you see any evidence that the R4/HARITA project may be helping farmers to graduate from the PSNP? Why do you think so?
 - a) Do you think that the purchasers are the more food insecure or the better off among the PSNP participants?
 - b) What characteristics, other than participation in the PSNP, make a farmer more likely to buy insurance?
- 8) Do you think that the R4/HARITA project is helping farmers to get access to credit? If yes, then what is the evidence that makes you think so?

Follow up:

Are lenders more willing to lend to farmers who have insurance?

Do they make loans on better terms to farmers who have insurance?
- 9) What benefits do you see of the risk reduction activities? Please rank the risk reduction activities being done in this tabia in terms of their benefits.
 - a) If some risk reduction activities are not benefiting the community much, what are the reasons why?
 - b) Is the community maintaining any structures built as part of risk reduction activities?
 - Follow up:
 - What are the challenges to maintenance?
 - How do you think these challenges can be overcome?
 - c) What other activities would be beneficial and what are the reasons why you recommend them? Rank the potential benefits of these activities relative to the activities that are being done now.
- 10) Do you see any challenges for HARITA? If yes, then please explain what these challenges are. How might R4/HARITA deal with these challenges? Do you see any ways to improve R4/HARITA?

- 11) What are the other main programs that are improving agricultural outcomes in this tabia? Are they improving farmer livelihoods as well? What do you think is most needed to improve agricultural outcomes and farmers' livelihoods in this tabia that is not yet being done?

3. Questions for insurance agency staff

Staff responsible for field operations:

- 1) What have been the main strengths of the weather index insurance program or R4/HARITA over the last 7 years? What have been the main challenges?
 - a) How do you plan to build on the strengths?
 - b) How can you address the challenges?
 - c) What would you change about the program? Why?
- 2) Is there enough demand for weather index insurance to make it profitable to offer it to smallholder farmers? Who does the demand come from?
 - a) Would you do anything to increase demand? What would you do exactly?
 - b) Are you planning to expand the supply of insurance to smallholder farmers? Why yes or why no?
 - c) Are you interested in selling insurance to wealthier farmers? Why yes or no?
 - d) Why do you think wealthier farmers are not buying weather index insurance? How do you think insurance would need to be offered differently to attract wealthier buyers?
- 3) Is the weather index insurance of R4/HARITA sustainable? Why yes or why no?

4. Questions for REST staff

At the woreda level:

- 1) Please tell us about the R4 implementation in Adi Ha, Awet Bikalsi, Genete, Hade Alga, and Hadush Adi in 2016.
 - a) How many people were involved in implementing R4 in these 5 tabias in 2016? What roles did they play?
 - b) Who were your partners for each of the activities that you implemented?
 - c) For each of these 5 tabias, can you please tell us the timeline of the main activities: insurance education, when the planning of risk reduction activities took place, dates between which farmers were working on the risk reduction activities, dates of the roll-out of insurance, dates of any payouts.
 - d) What main differences did you see between the 5 tabias?

- Follow up:
 - What went well in each tabia?
 - What challenges did you encounter in each tabia?
 - How did you overcome these challenges or how do you think you can overcome them in the future?
- 2) What determines if farmers buy insurance or not? Why do some stop buying insurance? Why do some never buy insurance at all?
 - 3) What characteristics determine if farmers' graduate from paying for insurance with labor to paying with cash?
 - a) Is there something specific that R4/HARITA can do to help farmers graduate from paying with labor to paying in cash?
 - b) Why do you think most people who buy insurance are PSNP participants? Why aren't wealthier farmers buying insurance in greater numbers? How would R4/HARITA have to change its insurance program to attract wealthier farmers?
 - 4) What do you think works well about R4/HARITA? How would you improve R4/HARITA to fully achieve its objectives?

At the headquarters level:

- 1) What have been the main strengths of R4/HARITA over the last 7 years? What have been the main challenges? How do you plan to build on the strengths? How do you plan to address the challenges?
- 2) What are your main goals for R4/HARITA for the next 5 years?
Follow up:
Do you need to change R4/HARITA in any way to accomplish those goals? What changes are you planning to make?
- 3) What do you think are the most important things that need to be done to improve resilience to drought and agricultural livelihoods in the program areas? Is R4/HARITA accomplishing those things or does it need to expand its scope? How so?

APPENDIX 6: PHOTOGRAPHS OF DRR ACTIVITIES

1. Catchment treatment



2. Spate Irrigation/Simple flood diversion



Flood diversion, Genete, Raya Azebo and Debreget, Adwa
3. Micro-gardening:



4. Cactus Pears Plantation



W/ro Tadelesh H/mariam Microgarden, Mesanu, Kiltawlaelo

5. Soil fertility management (compost pit making)

6. Oxen Driven mold board



Figure 1 Compost Pit preparatio,K/Awlaelo



Provision of Mould Board

7. Water Harvesting Check Dam pond



Check dam pond Ruba feleg, Atsbiwenberta

8. Roof Water Harvesting Technologies (RWH)



W/ro Elsa Araya Roof Water Harvesting, Rubafeleg Atsbi

(Photo: Credit to

REST annual report and Asmelash Haile)

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