

RESILIENCE IN BURKINA FASO

Impact evaluation of the 'Resilience, Food
Security and Nutrition' project

Effectiveness Review Series
2016/17



Caption: Rasmata Pafadnam, a member of a women's cooperative in Burkina Faso, waters her vegetable patch. Her group has been working with local partner, ATAD, that was involved with the PRSAN project with the support of Oxfam. Credit: Andy Hall/Oxfam.

ROB FULLER AND ALEXIA PRETARI

OXFAM GB

ACKNOWLEDGEMENTS

We would like to thank the staff of ATAD, ODE and of Oxfam in Burkina Faso for their support in carrying out this Effectiveness Review. Particular thanks are due to Lengani Abdoul Karim, Jean Bazie, Alice Zongo, Elsa Febles, and to all the participants in the launch workshop for the Effectiveness Review held in February 2017. We also thank Frédéric Sanou, Hamidou Koara and Arouna Sama for their excellent leadership of the survey process, and Steff Deprez for all his advice on using SenseMaker.

CONTENTS

Contents	3
Executive Summary	4
1 Introduction	11
2 Project description	13
3 Evaluation design	18
4 Data	20
6 Results	32
7 Conclusions	55

EXECUTIVE SUMMARY

Oxfam GB's Global Performance Framework is part of the organization's effort to better understand and communicate its effectiveness, as well as enhance learning across the organization. Under this Framework, a small number of completed or mature projects are selected each year for an evaluation of their impact, known as an 'Effectiveness Review'.

During the 2016/17 financial year, one of the projects selected for an Effectiveness Review was the Resilience, Food Security and Nutrition Project (*Projet de Résilience, Sécurité Alimentaire et Nutritionnelle*, PRSAN). This project was carried out in the North and Centre-North regions of Burkina Faso between November 2013 and May 2017, by Oxfam and Christian Aid, together with two implementing partners, the Alliance Technique d'Assistance au Développement (ATAD) and the Office de Développement des Églises Evangéliques (ODE). The project was aimed at enabling particularly vulnerable households to increase their resilience and improve their food security and nutritional situation. Project activities included supporting households in crop production, market gardening, processing and household businesses, providing awareness-raising on good nutritional practices, carrying out community-level disaster assessments and establishing early-warning committees, and distributing livestock and cash transfers.

The Effectiveness Review, for which the fieldwork was carried out in March 2017, was aimed at evaluating the success of this project in enabling participants to build their resilience to shocks, stresses and uncertainty.

EVALUATION APPROACH

The Effectiveness Review used a quasi-experimental evaluation design to assess the impact of the PRSAN project among households whose members received support from the project. This involved comparing the households of project participants to households from nearby communities who are thought to have had similar characteristics to the project participants, before the project was carried out. The project participants interviewed were a random sample of households that had been identified as 'poor' or 'very poor' during the project's targeting phase. Project participants were sampled from among all the project communities, with the exception of five large settlements in the North Region that were excluded on the basis that there were no non-project communities that were suitable for comparison to them.

In total, 281 project participants and 519 comparison respondents were interviewed, split evenly between the North and Centre-North regions. The sample was designed to allow analysis by the respondent's gender: 60 percent of respondents were women and 40 percent were men. All the respondents were either heads of household or their spouses. At the analysis stage, the statistical tools of propensity-score matching and multivariate regression were used to control for apparent baseline differences between the households in the project and comparison communities, to increase confidence when making estimates of the project's impact.

The interview was divided into two sections. The first part of the interview was carried out using SenseMaker, a narrative-based method that is intended to provide an understanding of complex change. Respondents were first asked to share a story about a situation that negatively affected their well-being during 2016. Following this, they were asked a pre-defined series of questions relating to that story. Rather than the narrative being coded and interpreted by a researcher after the fact, this approach is designed to enable the interviewees to interpret and analyse their experience themselves.

The second part of the interview was a conventional household questionnaire, which included questions about the household's crop production and other productive activities, housing conditions, ownership of assets, diet, and other demographic characteristics. These data were Resilience in Burkina Faso: Impact evaluation of Resilience, Food Security and Nutrition Project. Effectiveness Review Series 2016–17

used to evaluate the project's impact against the key outcome areas listed in Table 1. In particular, resilience was assessed through examining 21 characteristics that are thought to be associated with the capacity to absorb, adapt or transform in response to shocks, stresses and uncertainty. A list of the resilience indicators and a breakdown of the results for each is shown in Table 2.

RESULTS

The SenseMaker interviews and the household survey data both provide evidence that the PRSAN project has had a significant positive effect on the resilience of participants.

From the household survey data, we find that the households of project participants met the thresholds to score positively in terms of approximately 33 percent of the indicators of resilience, compared to 29 percent among comparison households. The participant households were growing a wider range of crops than the comparison households (largely as a result of many of them being engaged in market gardening), and a higher proportion of them were using improved seeds and applying soil conservation techniques. They were also more likely to be aware of the existence of an early-warning committee in their community, and to say that they make use of rainfall information in their agricultural activities – though the proportion who reported doing so is small, even in the project communities. As a result of the market gardening activities, women in the project communities were much more likely to have some control over decisions in crop production. In addition, in the Centre-North, participation in community groups was higher in the project communities than in the comparison communities, among both women and men.

Table 1: Key findings from the household survey data

Outcome	Evidence of positive impact?	Comments
<i>Adoption of improved farming practices</i>	Yes	Evidence that the project has led to greater adoption of soil conservation techniques and some other modern farming practices – including the use of rainfall information to make decisions on crop production.
<i>Production of staple crops</i>	No	Despite their greater use of improved seeds and other improved farming practices, project participants did not harvest greater volumes of the four main staple crops in 2016 than comparison households. However, rice production is considerably higher, among a subset of the project participants.
<i>Engagement in market gardening</i>	Yes	Twenty percent of households interviewed in the Centre-North and 47 percent in the North engage in market gardening, much higher proportions than among the comparison households. (This appears to be largely the result of ATAD's and ODE's previous projects, rather than being attributable to PRSAN.)
<i>Engagement in processing and household businesses</i>	No	The proportions of households engaging in processing or in running a household business are no different between the project participants and the comparison group.
<i>Food security and dietary diversity</i>	No	No evidence of a difference between project participants and comparison households in the number of meals eaten per day, nor in the diversity of food types consumed – except among woman-headed households.
<i>Household wealth</i>	No	The change in the index of wealth indicators over the project's lifetime was no higher among project participant households than among comparison households.

<i>Resilience</i>	Yes	Households of project participants met the threshold to score positively in terms of 33 percent of the resilience indicators, against 29 percent among the comparison households. The effect of the project is concentrated on indicators of transformative capacity and adaptive capacity, rather than on indicators of absorptive capacity.
-------------------	-----	---

On the other hand, the household survey data do not provide evidence of impact on some of the key outcomes that the project was intended to influence. The volume of production of the main staple crops was approximately the same among the project participants and the comparison households. There was no difference between those two groups in the proportions who were engaged in processing natural products or in running household businesses, and little difference in access to credit.

Although many of the project participants reported receiving goats or poultry over the project's lifetime, the numbers of livestock owned at the time of the survey did not differ between the project participants and the comparison households. One potential explanation for this could be that project participants who had received livestock under PRSAN had been better able to absorb the effects of subsequent crises by selling livestock; if so, then the effects of those crises on their food security or well-being would be reduced. However, we find little evidence of an impact from the project on key indicators of material well-being, whether measured in terms of number of meals consumed, dietary diversity, wealth indicators (such as housing conditions and asset ownership), or expenditure on education and health. The only exception is that the project appears to have had the effect of increasing dietary diversity specifically among woman-headed households – presumably as a result of enabling many of them to engage in market gardening.

The responses to the SenseMaker interview provide a separate indication of how the PRSAN project has affected households' resilience. When asked to discuss details of a situation that negatively affected their household's well-being during 2016, the project participants in the Centre-North generally reported feeling that they were better prepared to deal with the situation than the comparison respondents. They were also more likely to have received support from associations or other community-level institutions than the comparison respondents, while the project participants in the North were more likely to say that they had received support from NGOs.

Men in project participant households in both regions were considerably more likely than men in the comparison group to say that they are better off now than before the situation arose. However, this result does not apply among women in project households. It is not clear whether this is because women tended to describe situations that were more severe than men, whether the project activities have tended to benefit men more than women, or whether men were generally more inclined than women to perceive that their situation had improved.

A key area of enquiry from the SenseMaker analysis is how confident respondents felt that they could manage a similar crisis in the future. Even though it was the project participants in the Centre-North who felt more prepared for the crisis situation they described, it is in the North that the project participants expressed more confidence than comparison respondents that they could manage a similar situation in the future. In both regions, men expressed more confidence than women about being able to deal with crises in the future.

One of the aims of the SenseMaker analysis was to understand to what extent respondents are conscious of, and are seeking to make changes in, the underlying causes of poverty and vulnerability. The results show high levels of awareness of climate change and desertification as key drivers of the crises they faced. Among those who had shared a narrative relating to drought, other weather events, crop production or livestock, 79 percent in the Centre-North and 66 percent in the North mentioned climate change as an underlying cause of the problem. On the other hand, few respondents mentioned other possible causes of the crises they had experienced, such as lack of state services, economic inequalities or gender injustice. The

majority of respondents said that they are able to engage in collective action to address the long-term causes of crises. However, it seems that many of those who responded positively to this question were thinking of taking collective action to adapt to the effects of climate change (such as carrying out soil conservation measures as a community), rather than seeking the kind of change in the 'rules of the game' that underlies Oxfam's concept of transformative capacity.

One important observation is that much of the positive impact discussed here seems to reflect the impact of ATAD's and ODE's earlier interventions in many of the PRSAN communities more than of the PRSAN project itself. Building resilience is, of course, a long-term process, and we should not expect to be able to distinguish clearly the effects of different projects carried out sequentially with (most of) the same participants. However, it is important to be aware in this case that at least some of the positive impact that appears to have occurred on resilience has come about as a result of earlier programme work, rather than of the specific project in which Oxfam was involved.

Table 2: Indicators of resilience examined in this Effectiveness Review

Capacity	Characteristic	Connected to project logic?	Evidence of positive impact?
Absorptive capacity	<i>Availability of seasonal forecasting/ early-warning information</i>	Yes	Yes (North Region only)
	<i>Ownership of livestock</i>	Yes	No
	<i>Vaccination of livestock</i>	Yes	No
	<i>Access to drinking water</i>	No	No
	<i>Improved construction of dwelling</i>	No	No
	<i>Social support networks</i>	No	No
	<i>Dietary diversity</i>	Yes	No
	<i>Livelihood diversification</i>	Yes	No
	<i>Crop diversification</i>	Yes	Yes
	<i>Access to water for agriculture</i>	Yes	Yes
	<i>Remittances or formal earnings</i>	No	No
	<i>Savings</i>	No	No
	<i>Improved agricultural practices</i>	Yes	Yes
	<i>Soil protection measures</i>	Yes	Yes
	<i>Ownership of productive assets</i>	No	No
	<i>Access to credit</i>	Yes	No
Adaptive capacity	<i>Participation in community groups</i>	Yes	Yes (Centre-North only)
	<i>Adoption of innovative practices (other than those promoted by the project)</i>	No	No
	<i>Literacy</i>	No	No
	<i>School attendance</i>	No	No
	<i>Women's decision-making power in agriculture</i>	Yes	Yes
Transformative capacity			

PROGRAMME LEARNING CONSIDERATIONS

Seek to understand the role that artisanal gold mining plays in the economy of households and communities in the Centre-North Region, in order to find approaches to minimize its negative effects on health, school attendance and the local environment.

The Effectiveness Review highlights that large numbers of households in the Centre-North Region engaged in artisanal gold mining during 2016, amounting to 33 percent of households in the comparison group. Surprisingly, the data show that engagement in artisanal mining was even higher in the PRSAN project communities, at 46 percent of intervention group households. At the same time, the respondents who mentioned gold mining during the SenseMaker interview clearly recognized that it is a risky activity, and that it is not reliable as a source of income.

The programme team and partners are encouraged to explore what role artisanal gold mining plays in livelihoods in the Centre-North Region. In particular, it is important to understand how the decision to engage in artisanal mining may be affected by crises and by the opportunities provided by projects such as PRSAN. Given the harmful effects of artisanal mining to those engaging in it directly and to the local environment, such an understanding may inform a strategy by which future projects can help to reduce this harm. This may involve providing alternative activities that can substitute for artisanal mining in household livelihoods, or may involve promoting the adoption of safer practices in artisanal mining. It should be recognized that this is a complex problem and that experience elsewhere has not led to clear or simple solutions, so it will be crucial to work with others who are also seeking to understand and address this issue. Given that these challenges with artisanal gold mining exist in several countries in West Africa, there may be potential for Oxfam programmes across the region to work together, to share experience and learning on this subject.

Explore the reasons why the greater adoption of improved agricultural practices did not have a positive impact on the production of cereal crops in the project communities.

One of the most challenging results presented by the Effectiveness Review is the lack of a difference between the project and comparison communities in their production of staple crops (other than rice). That finding applies at least to crop production in 2016, but there are also indications in the data that the volume of crop production in 2015 differed little between the project and comparison communities. This is in spite of the greater rates of adoption in the project communities of many improved farming practices, such as the use of improved seeds or soil conservation techniques. It is important to review, then, why these improved practices are apparently not leading to significant increases in yields. This may involve investigating, for example, whether participants do not have enough confidence in the improved practices to adopt them at the scale at which they could have greatest effect, whether they are experiencing barriers in applying these techniques according to best practice, or whether some of the practices require favourable weather conditions in order to have an effect. A good starting point for this research may be to identify some producers in each community who have been able to use the improved practices to significantly improve their yields: enquiries could then focus on what has prevented their neighbours from following their example.

Reinforce efforts to link the early-warning committees to the technical services that provide meteorological information, so that they are able to provide useful and timely forecasting information to community members.

One of the objectives of the PRSAN project was to promote the use of meteorological information in informing farming decisions. A key responsibility of the early-warning committees established under the project is to disseminate weather forecasting information throughout their communities. Unfortunately, the project's final evaluation has found that many of the early-warning committees are not linked effectively with state technical services at a commune and higher level, and so they have not been able to provide useful information to community members (Issifou and Aka, 2017). Consistent with this, in the Effectiveness Review survey, the majority of respondents in the project communities did not know of the existence of an early-warning committee in their community, and only small numbers (21 percent of farming households in project communities in the Centre-North and 15 percent in the North) reported that they were making use of weather forecasting information in their farming decisions. However, while these figures are low, it is clear that at least *some* of the committees have enabled a larger share of farmers to access and act on meteorological information. These additional users of meteorological information tend to have lower education and literacy levels than those who have typically been able to make use of this information in the past (as witnessed by the situation in the comparison communities). This suggests that increased efforts to improve the functioning of the early-warning committees could play a valuable role in disseminating meteorological information to those who have not previously made use of it.

Assess how best to identify participants for community-level projects such as this, balancing participation and accountability in the targeting process with the need to accurately identify the most vulnerable.

The participants in the PRSAN project were identified through carrying out a participatory wealth ranking exercise, based on the Household Economy Approach (HEA). Community members were asked to specify criteria that characterize 'very poor', 'poor', 'middle-income', and 'better-off' households in their community, and then to categorize each household according to those definitions. Most of the criteria cited by community members related to ownership of livestock, land or other assets, or to household size. All the households identified as 'poor' and 'very poor' in each of the project communities were selected for participation in the activities of the PRSAN project; these households comprise the intervention group for this Effectiveness Review.

The comparison group was selected at random from across the population of the comparison communities, so it includes households from across the whole range of the four wealth categories as defined through the HEA. Since the comparison group includes 'middle-income' and 'better-off' households, we would expect the comparison households on average to have been wealthier before the project was launched (in 2013) than the intervention group households. However, the Effectiveness Review data provide only limited evidence for this pattern among households interviewed in the Centre-North, and no evidence for this pattern in the North Region. To some extent this may be because 'poor' and 'very poor' households in the PRSAN project communities had already benefited from the earlier interventions carried out by ODE and ATAD, and so were not clearly distinguishable from their (previously wealthier) neighbours. Perhaps of more concern is that there is little difference in the data between the 'poor' and 'very poor' households, in terms of their pre-project wealth levels, the productive activities they were engaged in in 2013, or their demographic characteristics.

It may appear from this that community members were taking considerations other than material poverty into account when identifying 'poor' and 'very poor' households at the start of the PRSAN project. It is possible that community members are using a more nuanced understanding of poverty than can be observed in our data – perhaps, for example, by considering factors such as recent illnesses or bereavements. It would be valuable to explore more closely when carrying out future participatory targeting exercises what factors are being taken into account in these processes. This knowledge may help to improve measurement approaches so that they better reflect participants' conceptions of wellbeing and poverty. On the other hand, it may be that this will highlight a need to change the balance between participation, transparency and objectivity in these selection processes.

1 INTRODUCTION

Oxfam GB's Global Performance Framework is part of the organization's effort to better understand and communicate its effectiveness and to enhance learning across the organization. Under this Framework, a small number of completed or mature projects are selected each year for an evaluation of their impact, known as an 'Effectiveness Review'.

During the 2016/17 financial year, one of the projects selected for an Effectiveness Review was the Resilience, Food Security and Nutrition Project (*Projet de Résilience, Sécurité Alimentaire et Nutritionnelle*, PRSAN). This project was carried out in the North and Centre-North regions of Burkina Faso between November 2013 and March 2017, by Oxfam and Christian Aid, together with two implementing partners, the Alliance Technique d'Assistance au Développement (ATAD) and the Office de Développement des Églises Evangéliques (ODE). The project was aimed at enabling particularly vulnerable households to increase their resilience and improve their food security and nutritional situation. Project activities included supporting households in crop production, market gardening, processing and household businesses, providing awareness-raising on good nutritional practices, carrying out community-level disaster assessments and establishing early-warning committees, and distributing livestock and cash transfers.

The Effectiveness Review, for which the fieldwork was carried out in March 2017, aimed to evaluate the success of this project in enabling participants to increase their resilience to shocks, stresses and uncertainty. This was done through surveying samples of project participants and samples of people from nearby communities where the project was not carried out, as a comparison group. There were two components to the survey: firstly, an interview using SenseMaker, a narrative-based method that is intended to help understand complex change, and secondly a questionnaire about the household's characteristics and productive activities.

This report presents the findings of the Effectiveness Review. Section 2 briefly reviews the activities and intended outcomes of the project, and how the project sites and the individual participants were selected. Section 3 describes the evaluation design used, and Section 4 describes how this design was implemented. Section 5 presents the approach used to measure resilience in the survey. Section 6 presents the results of the analysis of both the household survey data and the SenseMaker interviews. Section 7 concludes with a summary of the findings and some considerations for future learning.

Figure 1.1: Map of Burkina Faso, with the Centre-North and North regions highlighted



2 PROJECT DESCRIPTION

2.1 PROJECT ACTIVITIES

The project under review was conceived in response to the food crisis that affected Burkina Faso and other countries across the Sahel in 2012. Poor harvests and continuing political instability throughout the region in that year led to increases in food prices, meaning that rural households were not able to cover their food needs, even after adopting a range of coping strategies. In response, Oxfam formed a partnership with Christian Aid and with two local NGOs that were already working in the Centre-North and North regions of Burkina Faso – the Alliance Technique d'Assistance au Développement (ATAD) and the Office de Développement des Églises Évangéliques (ODE) – to launch a project that aimed to improve the food security and nutritional situation of particularly vulnerable households in those two regions.

The PRSAN project worked on four different result areas:

1. Improving the capacity of women and men in vulnerable households to engage in agricultural, forestry and livestock production.
2. Enabling those households to increase their revenue from non-agricultural sources.
3. Improving the nutrition of infants aged up to two years old.
4. Increasing the resilience of women and men and their communities.

Under the first of these areas, the project sought to strengthen the production both of staple crops during the rainy season and from market gardens throughout the year. The largest-scale intervention was the provision of improved seeds: at the start of the 2014 farming season, all project participant households were provided with improved seeds for sorghum and cowpea, two of the most important crops in the region. In the North Region, seed replication farms were then established in four communities, in order to provide a supply of high-quality seeds over the longer term. At three locations (two in the Centre-North and one in the North), the project also developed low-lying land to be used for rice production and supported producers with inputs, training and support on farming rice.

In each community, the local producer associations received capacity building in planning, management and accountability, and the producers themselves received training and support in using soil conservation and rehabilitation, in production techniques, and in the construction of silos for storing harvested crops. Communal activities aimed at soil conservation (such as demi-lunes, zaï, and stone cordons) were carried out in several communities.

Promoting production from market gardens was a key element of the project, aimed both at increasing the diversity of food types available in the local communities, and at providing a source of income for producers during the dry season. Sites for market gardening were prepared, or existing sites extended, in 15 communities: this involved enclosing the sites, installing wells, preparing the soil, and allocating plots to women producers. In these communities, and at others where market gardening had already been developed under previous projects, producers were provided with equipment and inputs (seeds and pesticides), as well as training and technical support.

Additional activities carried out under the first result area were the distribution of goats to 1,000 vulnerable households, and the distribution of funds intended for the purchase of chickens to 1,500 others. Volunteers in each commune were trained in the vaccination of poultry and were provided with supplies to carry out vaccinations for one year (with the aim that community members would provide the funds to continue this activity in later years).

Activities under the second results area, relating to non-agricultural activities, were carried out exclusively with women. The project facilitated the formation of local groups, who were provided with training and support in processing natural products, in commercialization of produce from the market gardens, or in running household businesses. The processing activities were carried out in three specific communities, where women were provided with support in producing honey or processing balanites or soumbala (two types of seed that can be processed into products that are commonly used in food preparation). The training on marketing vegetables and on household businesses was carried out in the majority of sites in which the project was implemented. Participants also received training on how to access credit. Credit committees were formed at the community level and at the level of the commune (that is, the district), in order to facilitate linkages to microfinance institutions and enable participants to receive loans.

The third results area involved establishing and training local nutrition committees (cellules villageoises nutritionnelles, CVNs) in each community, which were then responsible for carrying out training within those communities on good nutritional practices for infants and on the preparation of high-nutrition foods from local products. These activities were reinforced by broadcasts on local radio stations, which aimed to promote understanding of good nutritional practices.

The fourth component of the project aimed at promoting overall resilience, and involved two main types of activity. The first was to provide cash transfers during the hunger season to some of the poorest households, many of them female-headed households. Transfers totalling 55,000 francs CFA (approximately \$90) per household were provided in each of the three years of the project in approximately half of the project communities, with the recipient households changing from year to year. Secondly, in the North Region only, the project provided training to community members on natural resource management, facilitated participatory climate vulnerability assessments and established early-warning committees (cellules d'alerte précoce, CAPs). The early-warning committees are responsible for collecting data on the rainfall experienced in the community and passing this on to the state technical services in order to make predictions about the availability of food stocks in the coming months. The committees are then responsible for disseminating the results of this analysis among community members, so enabling households to make informed decisions about their crop production and other productive activities.

2.2 PROJECT LOGIC AND EXPECTED OUTCOMES

Figure 2.1 presents a simplified model of how the activities carried out under the PRSAN project were expected to result in improvements in food security, nutrition and resilience. The main project activities are shown at the bottom of the diagram, with paths showing how those activities were expected to produce intermediate outcomes (in blue) and higher-level outcomes (in green).

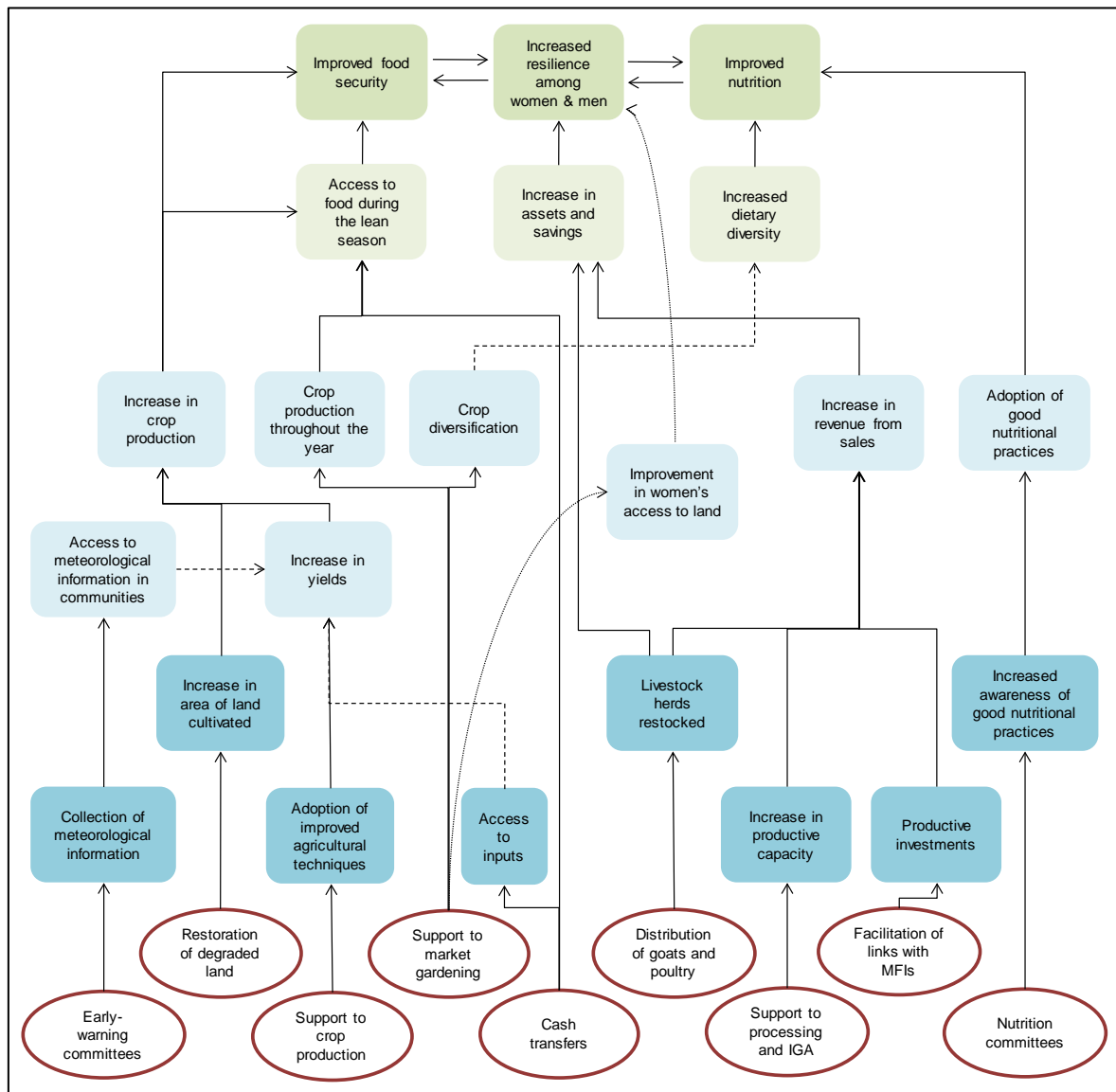
The ultimate aim of the project was to build resilience and reduce vulnerability among woman and men, to improve food security, and to improve nutrition, especially among infants and young children. Resilience, food security and nutrition are, of course, closely connected outcomes: a person who is well-nourished will be in a better position to respond well when a crisis occurs, but, at the same time, how that person responds to the effects of that crisis will affect their and their household's food security and nutritional status in the future. This is the reason for the arrows in the upper part of Figure 2.1 that show connections between these three outcomes.

The various activities in support of staple crop production – such as the provision of improved seeds, training in improved production techniques, the rehabilitation of degraded land and facilitating access to meteorological information – were all intended to promote food security by

increasing crop yields and the total volume of crop production. In a region where most crops are grown for domestic consumption, increased volumes of crop production mean that a household will be able to store a greater volume of grain for consumption over the course of the following year, so reducing the risk of being unable to meet their food needs during the hunger season.

The cash transfers made to some of the most vulnerable households during the hunger season were intended both to provide those households with the means to access food and to enable them to purchase inputs for their own cultivation. Increased use of agricultural inputs should allow the recipients to improve their harvest and hence their food security over the following year.

Figure 2.1: Logic model for the PRSAN project



Promoting market gardening was expected to have an impact on several objectives. Enabling participants to produce crops during the dry season contributes to food security. Providing a means to produce vegetables as well as grains should naturally lead to an increase in the diversity of foodstuffs available in the community. The women participating in market gardening were also given training and support in marketing their produce, thereby providing an additional source of monetary income. In the same manner, supporting other groups of women in investing in the processing of local products and running household businesses was also intended to provide an additional, and dependable, income source. Additional income should naturally result in improvement of food security and other positive well-being outcomes (such as

expenditure on education or health) in the short term – as well as lead to an increase in savings or in ownership of livestock or other assets, and hence an ability to absorb crisis better in the future. Just as important is the enabling women to improve their income independently of other household members, which should have positive effects on both resilience (for example, by diversifying the number of income earners in the household, and by increasing the likelihood that women's priorities are taken into account in decisions on how to respond to a developing crisis) and on women's economic empowerment.

Livestock are a particularly important store of wealth in the project area, and having livestock available to sell is an important way in which households may respond to, and absorb the effects of, crises (as will be seen in the analysis of the SenseMaker interviews, in Section 6.2). Livestock holdings had been negatively affected by the crisis of 2012, as well as by past crises, so the distribution of livestock was intended to make up for this deficit.

Finally, the nutritional committees established in each community were given training in how to demonstrate and disseminate messages about good practices in nutrition for infants and about preparation of high-nutrition foods. Adoption of these practices is intended to lead to improved nutrition in those communities over the long term.

This Effectiveness Review seeks to evaluate the extent to which the PRSAN project had an effect on many of these outcomes. The extent to which the project was successful in building resilience was investigated both through the use of indicators in the household questionnaire and through the SenseMaker interview, which asked respondents about their recent experiences of crises and their perceptions of the causes of those crises. (The approach to measuring resilience is discussed further in Section 5.) The household survey was also designed to investigate the project's effect on many of the intermediate and final outcomes by examining indicators of as many of the steps shown in Figure 2.1 as possible. However, the nutritional situation of infants or other household members is not covered by the Effectiveness Review.

2.3 SELECTION OF PROJECT SITES AND PARTICIPANTS

The PRSAN project was carried out in 32 communities, located in seven communes (that is, districts) in the Centre-North Region and three communes in the North Region. These 32 sites are mostly rural villages, but also include some larger settlements, including, in the North Region, the urban centres of the three communes.

In both regions, the respective partner organizations had each been carrying out projects with similar activities and objectives before PRSAN was launched. These earlier projects were carried out in partnership with Christian Aid, but not with Oxfam.

In the Centre-North, ATAD carried out the project '*Relèvement des Populations suite aux Inondations du 22 juillet 2010*' (REPI) from 2011 to 2013, in response to severe floods in 2010. This project involved providing support in crop production and processing of natural products, training in disaster risk management, and making cash transfers to vulnerable households. The 25 communities included in the REPI project were selected based on their having been particularly affected by the floods. When PRSAN was launched in 2013, the communities in the Centre-North that were included were selected from among those in the REPI project that were found at that time to have particularly high concentrations of poorer households. In addition, three communities from neighbouring communes were added for the PRSAN project, again on the basis of their having large numbers of poor and vulnerable households.

In the North Region, the *Programme de sécurité alimentaire au Passoré* (PSAP) had worked since 2008 in the same 15 communities as were later included in PRSAN (as well as in one

additional community that was not included in PRSAN). It was under the PSAP project that the activities to develop market gardening and improve the production of staple crops were developed. These activities were then extended and strengthened under PRSAN.

The households to be included in PRSAN were identified by carrying out a participatory wealth-ranking exercise at the start of the project. Within each community, the project implementers facilitated a discussion on what factors are considered to define wealth or poverty. Most of the criteria identified were concerned with ownership of livestock or other assets the area of land owned or cultivated, as well as, in some cases, the number of harvests per year, the number of meals consumed per day, or household size. Thresholds were then drawn up in terms of these criteria, which were used to categorize each household in the community as either better-off, middle-income, poor or very poor.

Across the 32 project communities, a total of 8,565 households were identified as 'poor' or 'very poor'. Of these, 27 percent were categorized as 'very poor'. On average, these make up 70 percent of the households in the project communities. In only one community was the proportion of 'poor' and 'very poor' households lower than 50 percent, and in several it was higher than 90 percent.

All of the 'poor' and 'very poor' households were included in the PRSAN project – that is, all of them received, as a minimum, the improved sorghum and cowpea seeds in 2014. The majority of those households are also thought to have participated in training or benefited from the capacity building of the local associations carried out under the project. A large proportion of these households also participated in the other project activities described above. For example, while precise figures are not available, project records suggest that approximately 85 percent of the 'poor' and 'very poor' households in the North Region and 30 percent of those in the Centre-North Region had received goats or funds intended for the purchase of chickens, or hungry-season cash transfers. Within the 'poor' and 'very poor' groups, participation in the specific activities of the project depended on gender (since the market gardening, processing and household businesses were carried out exclusively with women), on willingness and ability to participate in the relevant activities, and with the aim of distributing the interventions equitably among households.¹

In the remainder of this report, we consider the *project participants* or the *intervention group* to be all the households identified as 'poor' or 'very poor' in the 32 project communities.

3 EVALUATION DESIGN

The central problem in evaluating the impact of any project or programme is how to compare the outcomes that resulted from that project with what would have been the case had the project or programme not been carried out. In the case of this Effectiveness Review, information about the situation of households in the project communities was collected through a questionnaire, but clearly it was not possible to know what their situation would have been had the project activities not been carried out. In any evaluation, this 'counterfactual' situation cannot be directly observed: it can only be estimated.

In the evaluation of programmes that involve a large number of units (such as individuals, households or communities), it is possible to make a comparison between units that were subject to the programme and those that were not. As long as the two groups are similar in all respects except for the implementation of the specific project, observing the situation of those where the project was not implemented can provide a good estimate of the counterfactual.

This evaluation focuses on assessing both household- and community-level impacts of the project. Therefore, we aim to compare the households of project participants with similar households in similar non-project communities.

An ideal approach to an evaluation such as this is to select at random the sites in which the project will be implemented, and/or the households who can participate in the project. Random selection minimizes the likelihood of there being systematic differences between the project participants and non-participants, and so maximizes the confidence that any differences in outcomes are due to the effects of the project.

In the case of the PRSAN project, the communities where the project was implemented were not selected at random. As described in the previous section, the sites were selected partly because of ATAD's and ODE's existing relationships in many of the communities, and partly through those communities having a high concentration of poor and vulnerable households. However, it is clear that levels of poverty and vulnerability are high throughout the project area, and that there are many more communities that could have been included in the project. This allowed a 'quasi-experimental' evaluation approach to be adopted, in which the situations of households in communities not included in the project – in so-called 'comparison' sites – were assumed to provide a reasonable estimate of the counterfactual of households who participated in the project.

As discussed in the previous section, the project participant households were selected through a participatory wealth ranking exercise within each of the project communities. All the households that were identified through this process as 'poor' or 'very poor' were included in the project.

To identify a comparison group for the Effectiveness Review, the ideal would have been to carry out a similar participatory wealth-ranking process in the comparison communities. This was not possible, both because of the large investment of time that would be required (both from the evaluation team and from community members), but also because the process would be likely to create the expectation among community members that targeting was being carried out for a new project. Instead, the survey was carried out with a random sample of all households in the comparison communities. Since those interviewed in the project communities came exclusively from households that were identified as 'poor' or 'very poor' at the start of the project, we would therefore expect that those interviewed in comparison communities would have been wealthier, on average, than those in the project communities at that time. For this reason – and to allow for there having been other potential differences between the project and comparison communities in the process for selecting participants – attempts were made at the data analysis stage to improve the appropriateness of the comparison.

The primary method used to improve this comparison was through matching households in the project communities with households in the comparison communities that had similar characteristics prior to the project's implementation. This matching was performed on the basis of a variety of observable characteristics – including household size, education levels, productive activities, and indicators of household wealth (housing conditions and ownership of assets). Since households' productive activities and level of wealth are likely to have changed since the project's launch – perhaps as a result of the project itself – matching was performed on the basis of indicators before the implementation of the project. Although pre-project data were not available, survey respondents were asked to recall some basic information about their household's situation in 2013, before the PRSAN project was implemented. This recalled baseline data is unlikely to be completely accurate. However, it is the best-available proxy for households' pre-project situation, so should enhance the reliability of the comparisons made in this report.

The survey data provided a large number of household characteristics on which matching could be carried out. (The characteristics that were in fact used are listed in Appendix 3.) In practice, it is very difficult to find households in the comparison communities that correspond exactly in all these characteristics to households in the project communities. Instead, these characteristics were used to calculate a 'propensity score' – the conditional probability of the household participating in the project, given particular background variables or observable characteristics. Households in the project and comparison communities were then matched based on this propensity score. After matching, it was possible to test whether the distributions of each baseline characteristic were similar between the two groups. Technical details on this approach are described in Appendix 3.

As a check on the results derived from the propensity-score matching process, results were also estimated using multivariate regression models. Like propensity-score matching, multivariate regression also controls for measured differences between the intervention and comparison groups, but it does so by isolating the variation in the outcome variable explained by being in the intervention group after the effects of other explanatory variables have been accounted for. The regression models tested are described in Appendix 4.

It should be noted that both propensity-score matching and multivariate regression rely on the assumption that the 'observed' characteristics (those that are collected in the survey and controlled for in the analysis) capture all of the relevant differences between the two groups. If there are 'unobserved' differences between the groups – such as individuals' attitudes or motivation, differences in local leadership, weather, or other contextual factors – then estimates of outcomes derived from them may be biased. The potential for there to be systematic differences between the project and comparison communities in the climate-related shocks they were exposed to in recent years is a particular concern in this Effectiveness Review, since many of the outcomes are concerned with agricultural production, or with people's responses to those shocks. However, the fact that both sets of communities were distributed over a similar geographic area provides some reassurance that there are unlikely to be systematic differences between them in the weather they were exposed to. On the other hand, there may well be unobserved factors in the way that communities were selected for inclusion in PRSAN and the predecessor projects. These factors should be borne in mind when interpreting the results in Section 6 of this report.

4 DATA

4.1 RESPONDENTS INTERVIEWED

The PRSAN project was implemented in a total of 32 communities. The Effectiveness Review survey was carried out in 27 of those communities: five large communities in the North Region (including the urban centres of the three communes) were excluded because no communities suitable for comparison against them could be found. The consequence of this is that the results of this Effectiveness Review are representative of the impact of PRSAN across participants in all communities in the Centre-North Region, but only across the smaller communities within the North Region.

Comparison communities were identified within the same 10 communes where PRSAN was implemented. The identification of communities for comparison purposes proceeded in three stages. Firstly, those communities in which ATAD or ODE had implemented similar interventions were excluded. In particular, this entailed excluding a number of communities where ATAD or ODE were implementing 'high intensity' activities under the 'Building Resilience and Adaptation to Climate Extremes and Disasters' (BRACED) initiative, which involved some similar activities to PRSAN.

Secondly, detailed maps of the relevant communes were used to identify a list of potential comparison communities that had a similar geographic distribution to the project communities. In the Centre-North, the maps were revised in conjunction with the project implementation staff from ATAD, to ensure that the comparison communities selected had similar characteristics – such as the local environment and the productive activities typically engaged in by people in those communities – to the project communities. (In the North Region, the number of likely comparison communities available was limited, so there was little potential for revision.) Finally, data from the 2006 national census on the number of households in each community was used to confirm that the distribution of community size was approximately the same across the intervention and comparison groups in each region.

As can be seen in Table 4.1, the number of project participants was larger in the Centre-North than in the North Region. Nevertheless, an equal number of interviews were carried out in each of the two regions, so as to maximize the potential for making conclusions about the project's effects in each region. In the overall results presented in Section 6 of this report, the results from the two regions have been weighted to reflect the greater representation of the Centre-North Region in the population of project participants.

Within the project communities, comprehensive lists of households were available from the participatory wealth-ranking processes that had been carried out at the start of the project. Samples of households were therefore selected at random from all households identified on those lists as 'poor' or 'very poor', and who therefore subsequently participated in the project. This selection was stratified by community.

Table 4.1: Numbers of project participants and survey respondents

	Centre-North Region	North Region
<i>Number of communes</i>	7	3
<i>Number of project communities</i>	17	15
<i>Number of project communities included in Effectiveness Review</i>	17	10
<i>Households in Effectiveness Review project communities identified as:</i>		
<i>Very poor</i>	2,002	173
<i>Poor</i>	3,547	903
<i>Middle-income or better-off</i>	2,215	670
Total project participants <i>(i.e. total 'poor' and 'very poor' households)</i>	5,549	1,076
<i>Households interviewed in project communities:</i>		
<i>Very poor</i>	45	25
<i>Poor</i>	96	115
Total	141	140
<i>Number of comparison communities</i>	17	15
Households interviewed in comparison communities	258	261

Most people in Burkina Faso live with their extended family in large compounds, and often do not themselves apply the concept of a 'household'. For the purposes of this survey, it was important that the selection of respondents in the comparison communities should follow the same definition of a household as those in the project communities. In identifying households at the start of the project, the implementers specified that households could consist of only two generations. Sons or daughters who were married with their own children were considered to form a separate household, even if they were living within the same compound as their parents. Apart from that restriction, households were defined within the survey as the group of individuals who share at least a part of their income or agricultural production, who share meals, and who recognize the authority of a head of household.

In the comparison communities, no comprehensive list of households was available, and it did not appear feasible to construct one within the time available for the Effectiveness Review. However, the survey team was able to work with local contacts in each community to draw up a comprehensive list of compounds. From this, compounds were selected at random. Interviewers then visited each of the selected compounds and identified and listed the various households within the compound through discussion with the residents. A particular household within that compound was then selected at random from that list. The main drawback with this approach is that households from smaller compounds were expected to be over-represented in the random sample. For this reason, the questionnaire asked interviewers (in project communities as well as comparison communities) to record the number of households in the compound, so that this could be controlled for in the analysis.

The survey team consisted of eight female interviewers and four male interviewers. All interviews were carried out with respondents of the same gender as the interviewer. Within each household, the interview was carried out with either the head of household or with his or her spouse.² In households where the head of household did not have a spouse of the appropriate gender to be interviewed, the interview was conducted instead with a different member of the survey team of the appropriate gender. This occurred in the case of 60 of the 281 households interviewed in the project communities. (The corresponding figure in the comparison households was not recorded.)

In cases where the selected respondent refused to participate in the survey, or was unavailable for interview throughout the survey period (or, in a small number of cases where the selected household could not be identified, or where a respondent from the same household had already been interviewed), an alternative household was selected as a replacement. Replacement households in both project and comparison communities were selected through the same processes as used to select the first list of households for interview. In the event, 57 of the 281 project participant households were drawn from the lists of replacements. (Again, the corresponding figure in the comparison households was not recorded.)³

4.2 INTERVIEW PROCESS

Before the start of each interview, respondents were given some basic information about the purpose of the survey, to help manage their expectations. The interviewers explained that the survey was being undertaken in order to study the resilience of households in the Centre-North and North regions of Burkina Faso, and to evaluate an existing project. It was made clear that no special support would come to households as a result of the answers to questions in the survey.

The interview was conducted in two parts. The first part of the interview was carried out using SenseMaker, a narrative-based method that is intended to provide insight into processes of complex change (Guijt, 2016). In line with the SenseMaker approach, respondents were first prompted to share a story about their recent experience – specifically about a situation that had negatively affected their well-being during 2016. They were prompted to provide as much detail as possible about the situation identified and how they and others responded to it, and what the consequences were, and they were also asked to give a title to the story. Following this, they were asked a pre-defined series of questions relating to that narrative. Rather than the narrative being coded and interpreted by a researcher after the fact, as would be the case in a conventional qualitative interview, this approach is designed to enable the interviewees to interpret and analyse their experience themselves.

The second part of the interview was a conventional household questionnaire, which included questions about the household's composition, their crop production and other productive activities, their housing conditions and ownership of assets, their diet, and some additional questions related to resilience. To ensure that the total interview time (including the SenseMaker component and the household questionnaire) did not normally exceed one hour, the questionnaire did not collect as much detailed information as in most other Effectiveness Review surveys.

The SenseMaker component of the interview was conducted in private with the interviewee. For the second part of the interview, respondents were free to invite other household members to provide information if others were better able to respond than they were.

Responses to both the SenseMaker component and the household questionnaire were collected using mobile devices.

4.3 ANALYSIS

Before analysing the effects of the project on resilience outcomes, project participant households and comparison households were compared in terms of their demographic characteristics, livelihoods activities, and wealth indicators prior to the project being launched in 2013.

The full comparison of project participant households and comparison households in terms of all these characteristics is shown in Appendix 2 (Table A2.1). There are several key differences that we wish to highlight.

Firstly, there are some demographic differences between the project participant and comparison households. For example, in the Centre-North Region, 13 percent of project participant households are female-headed, against only three percent of comparison households. In the North Region, participant households, on average, are larger, and their members are less likely to speak Mooré as their first language. In both regions, the heads of project households and their spouses are older, on average, than those in comparison households.

There are also some important differences in the productive activities in which households were engaged in 2013. For example, almost all of the project participant households (98 percent in the Centre-North and 97 percent in the North) were engaged in crop production in 2013, but slightly fewer in the comparison group (92 percent and 94 percent respectively).

More important are the differences in the proportions that were engaged in market gardening in 2013. In the Centre-North Region, 23 percent of the project participants recalled having been engaged in market gardening, against only five percent of the comparison households. In the North Region, the difference is even greater, at 49 percent against 12 percent. Although larger than expected, these differences are in line with what is known about the activities of the previous projects carried out by ATAD and ODE in many of the project communities: many of the project participants had already been supported to take up market gardening before 2013.

The sizeable difference between the project and comparison households in the Centre-North Region in the proportions saying that they were engaged in processing products in 2013 (14 percent against seven percent) may also reflect the activities of previous projects carried out by ATAD.

Project participant households in both regions were located significantly further from market centres than were comparison households. It is possible that this reflects a tendency to have omitted those located further from the centre of the community when the survey team compiled the list of compounds in the comparison communities.

Finally, it will be recalled from Section 3 that we had expected to find that the project participant households were poorer on average before the project than the comparison households. That is because the project participants represent only those households that were identified as 'poor' or 'very poor' through the participatory wealth-ranking carried out in 2013, whereas the comparison households were a cross-section of the whole community. The figures shown in Appendix 2 do provide some evidence for this pattern in the Centre-North: in particular, 26 percent of the project participant households were in the lowest quintile of the wealth index in 2013, against only 17 percent of the comparison households. However, there is no indication of a similar pattern in the North Region.

It is also important to note that there is no evidence of a difference between the households identified as 'poor' and those identified as 'very poor' in terms of their wealth index in 2013 (figures are shown in Appendix 2, Table A2.2). On average, there appear to be some demographic differences between the 'poor' and 'very poor' households – in particular, 'very poor' households in the Centre-North come from smaller compounds than do 'poor' households, while 'very poor' households in the North are more likely than 'poor' households to be headed by a woman, but (surprisingly) also more likely to have received some education. In general, however, it is difficult to distinguish the 'poor' and 'very poor' households from the data available.

The lack of a difference in wealth status may be partly due to errors in recalling the assets owned or housing conditions from 2013.⁴ However, it seems unlikely that the degree of error in recalling a period from four years previously would be great enough for the difference to be completely eliminated. It appears, therefore, that the concept of wealth that was used for categorizing households in the participatory wealth-ranking was not fully compatible with that derived from the evaluation team's wealth indicators.

As described in Section 3, the main approach used in this Effectiveness Review to control for the baseline differences between the intervention and comparison groups was propensity-score matching (PSM). The variables on which respondents were matched were selected from among the full list detailed in Appendix 2, based on two key factors. Firstly, variables were selected that were thought to be the most significant in influencing respondents' participation in the project. Secondly, variables that could affect potential project outcomes *as well as* the likelihood of participating in the project were preferred. However, importantly, households' engagement in 2013 in market gardening and other activities that are most likely to have been affected by the project (processing and running a household business) were *not* included as matching variables. The list of matching variables selected and the full details of the matching procedure are described in Appendix 3.

After matching, project participant households and comparison households appear to be reasonably well balanced in terms of each of the matching variables. This should provide reassurance that, even if the screening process for the comparison group does not perfectly replicate the procedure that was originally used to select project participants, it does not bias the results for the matched sample. However, in constructing the model for household-level outcomes, six observations from the intervention group in the Centre-North Region and 11 observations from the intervention group in the North Region were dropped because there was not a suitable match for them. The consequence of this is that the estimates of outcomes derived from this model do not fully reflect the sample surveyed, but exclude a non-random minority.

All the results described in Section 6 of the report were tested for robustness by estimating them using alternative PSM and regression models. In particular, an alternative PSM model was constructed that controls for households' engagement in market gardening and other productive activities in 2013. On the assumption that any error in recalling these characteristics is negligible, this alternative model should better represent the effects of the specific project being evaluated, PRSAN, as distinct from ATAD and ODE's earlier interventions. However, the difficulty of matching based on these additional characteristics means that more project participant households (particularly in the North Region) had to be dropped from the analysis, so that the results are less representative of the sample of project households.

The results of these robustness checks are shown in Appendix 4. The few cases where the models produced divergent results are discussed in Section 6, in the text or in endnotes.

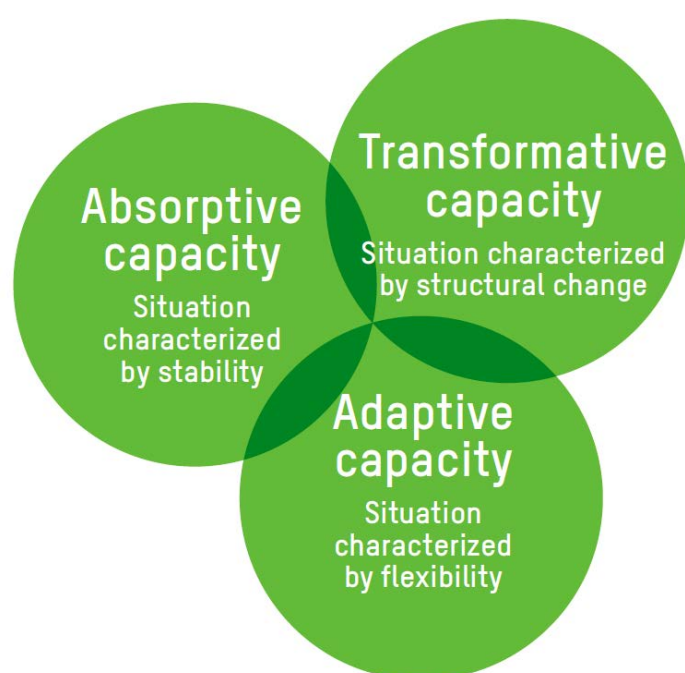
As mentioned in Section 3, PSM and regression models can only control for the baseline differences between project and comparison households for which data was collected in the survey. If there are any 'unobserved' differences between the two groups, then these may bias the estimates of outcomes described in Section 6. Such unobserved differences may arise at the individual or household level (such as differences in motivation, skills, or social connections) or at the community level (such as differences between the project and comparison communities in local leadership, environmental factors, the activities of other projects, or other contextual conditions). The evaluation design and the selection of respondents were intended to minimize any potential for unobserved differences, but this possibility cannot be excluded, and must be borne in mind when interpreting the results.

5 MEASURING RESILIENCE

5.1 OXFAM'S UNDERSTANDING OF RESILIENCE

A key objective of the PRSAN project was to build resilience at the individual, household and community level. Oxfam defines resilience as 'the ability of women and men to realise their rights and improve their well-being despite shocks, stresses and uncertainty'. The approach taken in this Effectiveness Review to understanding resilience draws on *The Future is a Choice* (Jeans *et al.*, 2016), Oxfam's guidelines for the design and implementation of resilience-building programmes. In particular, resilience is considered to consist of three interlinked capacities: to absorb, adapt and transform.

Figure 5.1: Three resilience capacities



Oxfam's understanding of each of these three capacities is described in *Absorb, Adapt, Transform* (Jeans *et al.*, 2017):

Absorptive capacity is the capacity to take intentional protective action and to cope with known shocks and stress. It is needed as shocks and stress will continue to happen, for example due to extreme weather events caused by climate change, protracted conflict, and disasters.

Simply stated this is the capacity to 'bounce back' after a shock. It involves anticipating, planning, coping and recovering from specific, known shocks and short-term stresses. Absorptive capacity is about ensuring stability because it aims to prevent or limit the negative impact of shocks on individuals, households, communities, businesses and authorities. (Jeans *et al.*, 2017, p. 3)

Adaptive capacity is the capacity to make intentional incremental adjustments in anticipation of or in response to change, in ways that create more flexibility in the future. It is necessary because change is ongoing and uncertain, and because intentional transformation takes time and sustained engagement.

Adaptation is about making appropriate changes in order to better manage, or adjust to a changing situation. A key aspect of adaptive capacity is accepting that change is ongoing as well as highly unpredictable. That is why adaptive capacity is about flexibility, and the ability to make incremental changes on an ongoing basis through process of continuous adjusting, learning, and innovation. (Jeans et al., 2017, p. 4)

[T]ransformative capacity is the capacity to make intentional change to stop or reduce the causes of risk, vulnerability, poverty, and inequality, and ensure the more equitable sharing of risk so it is not unfairly borne by people living in poverty or suffering from discrimination or marginalisation.

Transformation is about fundamental changes in the deep structures that cause or increase vulnerability and risk as well as how risk is shared within societies and the global community. Another way to think about this is that transformation is about addressing the underlying failures of development or power imbalances that cause or increase and maintain risk and poverty. Transformation is not about addressing the close or proximate causes of risk and vulnerability but their structural or root causes.

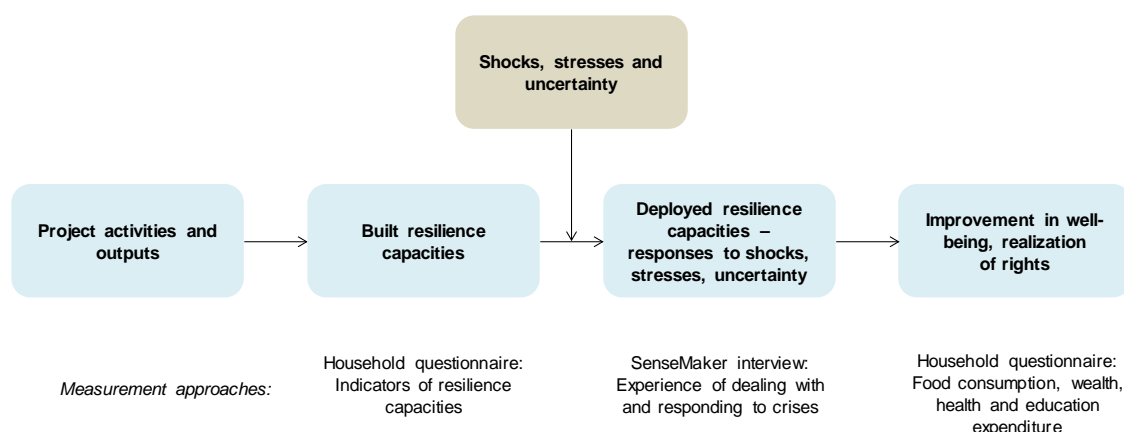
[...] [T]ransformation is a deep change in the very structures that cause and maintain poverty and injustice. Therefore, transformative capacity is the capacity of women and men to generate and engage in deep ongoing change that addresses the root causes of poverty, and injustice, vulnerability and risk. (Jeans et al., 2017, p. 5)

This resilience framework underlines the interaction between individuals, households and the wider context. Resilience is understood as a dynamic capacity that is built at different levels within the system, and in which different levels interact. For example, whether changes made at the individual, household or community level are sustainable depends on the enabling environment. However, PRSAN focused on facilitating those individual-level, household-level and community-level changes; for this reason, this Effectiveness Review focuses on examining change at those levels.

The approach adopted in this Effectiveness Review to understanding resilience is shown in Figure 5.2. The activities and outputs of the PRSAN project were intended to lead to the building of absorptive, adaptive or transformative capacity. In the household questionnaire, data were collected on 21 characteristics that are believed to be indicators of those capacities. When shocks, stresses and uncertainty occur, resilience capacities are put to the test. By asking about survey respondents' recent experience of shocks, stresses and uncertainty, the SenseMaker interview sought to investigate whether – and how – the resilience capacities enabled them to respond. Finally, building resilience implies that over time women and men are better able to realize their rights and improve their well-being. The household questionnaire therefore also included some questions relating to indicators of welfare – in particular, food consumption, wealth indicators, and expenditure on health and education.

During the planning phase for this Effectiveness Review, the evaluation team held discussions with project implementation staff from ATAD, ODE and Oxfam in order to understand the types of shocks, stresses and uncertainty that people in the project area face, and how they typically respond to those stresses. An important element of these discussions was to identify characteristics that they considered important contributors to resilience in the project area.

Figure 5.2: Resilience measurement approach



Two focus groups were then carried out in a community in the North Region, with similar objectives. Separate focus groups were carried out with women and men community members, in order to allow gender specific experiences to emerge. In those focus groups, particular attention was devoted to understanding what transformative capacity means for people in the project area – that is, what elements of the system are perceived as causing the difficulties faced, whether those issues are discussed collectively, and what are perceived as potential ways to bring longer-term changes.

Pilot interviews of the SenseMaker component, as well as of the quantitative questionnaire also allowed the evaluation team to tailor the interview tools.

One constraint faced in this Effectiveness Review was that there were no data available at community, household or individual level on the types, frequency or severity of the shocks and stresses that people were faced with. Our assumption in the analysis in this report is that, overall, members of the project and comparison communities faced similar types of shocks and stresses, with similar severity. The fact that the project and comparison communities are distributed across the same geographic areas provides some confidence that there are unlikely to be systematic differences between them in the types of weather and other climate-related shocks that they experienced.

5.2 ASSESSING RESILIENCE WITH SENSEMAKER

In this Effectiveness Review, the first part of the interview – carried out using the SenseMaker approach – sought to understand how respondents had been affected by and responded to shocks, stresses, and uncertainty during 2016, the year prior to the survey. While 2016 was not a particular crisis year in northern Burkina Faso, it was clear that the harvest was relatively poor, and that many rural people were under strain in meeting their food needs.⁵ It was expected that many people would experience individual or local-level crises, such as illness or death in the family, or having assets stolen or destroyed by fire – and this is what was found in the responses to the interview.

At the start of the SenseMaker interview, respondents were asked to describe a situation that negatively affected their or their households' well-being in 2016. A series of follow-up questions then asked them about the characteristics of the situation they had described, how they and others responded to that situation, and whether they are now better or worse off as a result of what occurred. The aim of these questions was to understand whether the PRSAN project had enabled households to deal better with the situations they faced.

However, understanding survey respondents' experience of shocks, stresses and uncertainty in the recent past is not sufficient to inform about the project's impact on resilience to *future* crises. One reason for this is that people may have responded to previous crises in a way that affects (negatively or positively) the way they will be affected by future crises. (To take a simple example, if a person responded to a crisis by selling off livestock to pay for food or medical care, then the option of raising finance in that way again would not be available to them if a new crisis arose.) An additional complication is that many of the project participants were still receiving support from the PRSAN project during 2016, so that the effects of and responses to crises during this time may not be a good indication of how they will be affected by and respond to crises in the future. As an indication of their resilience to *future* crises, respondents were therefore also asked about how much confidence they had that they would be able to manage a future situation similar to the one that they described.

An important characteristic of the SenseMaker approach is that respondents are free to choose the situation that they describe in the narrative. If we suppose that the project activities had enabled participants to manage crises better, then it is possible that some negative situations were averted that otherwise would have occurred and that project participants would have then referred to in the SenseMaker interview. The consequence of this would be that the project participants were, on average, referring to situations that were less severe than the comparison respondents were. We will return to this point in discussing the results of the SenseMaker analysis in Section 7.

We would expect that asking about the experience of recent crises would reveal the absorptive and adaptive responses made to those crises – and thereby provide some information on how absorptive and adaptive capacity have been influenced by the project. It is less apparent that this approach can provide useful information on the more fundamental, longer-term changes needed to build transformative capacity. Instead, a series of questions included in the SenseMaker interview sought to probe respondents' assessments of the root causes that lie behind the negative situations they described, and whether they feel able to take any collective action to make changes in those underlying causes of vulnerability. This part of the interview attempted to investigate transformative capacity by drawing from respondents' experience in tackling systemic issues.

Finally, experience of and reactions to shocks, stresses and uncertainty may differ by gender, even within a single household. The sampling strategy was purposely designed so that the sample includes women and men, independently of whether they identified themselves as heads of households.

5.3 ASSESSING RESILIENCE IN THE HOUSEHOLD QUESTIONNAIRE

The second component of the Effectiveness Review survey – the household questionnaire – included various questions intended to allow the construction of a complementary measure of resilience. In common with previous Effectiveness Reviews carried out under the resilience theme, this approach was based on the assumption that there are particular characteristics of households and communities that affect how well they are able to cope with shocks and positively adapt to change.

Insofar as there are multiple final well-being outcomes, there should also be a wide range of resilience characteristics. Resilience is understood as operating at many different levels (individual, household, community, and so on) as well as for different shocks with different time horizons. As a consequence, the number of resilience characteristics is potentially very high. A limitation, of course, is that it is not known for certain how relevant particular characteristics actually are; rather, it is assumed that they are important based on common sense, theory, and an understanding of the local context.⁶

The discussions with the project team and the focus groups carried out during the planning phase of the Effectiveness Review led to a list being drawn up of 21 characteristics that are thought to be associated with resilience in the project areas, and for which data could be collected in the household questionnaire (see Table 5.1). Most of the characteristics are thought to be important *drivers* of greater resilience, while some are believed to be associated with resilience without themselves being causes or drivers of increased resilience. (The clearest example of the second type is the adoption of innovative practices by the household: this is thought to demonstrate an ability and willingness to experiment, which is associated with the proactive elements of adaptive capacity – but the adoption of an innovative practice in itself does not necessarily contribute to resilience.)

A small number of additional characteristics of transformative capacity were identified which were not included in the questionnaire either because they could not be readily measured using simple indicators, or because of their sensitivity: examples include the use of family planning and willingness to change cultural practices, such as early marriage and gender norms. The SenseMaker interview created the opportunity for individuals to talk about difficulties they encountered and how they relate to the wider system, including gender inequalities.

It is important to note that while not all characteristics considered in this Effectiveness Review may be directly linked to the project activities, all are thought to be important to a household's overall resilience in the project area. The right-hand column of Table 5.1 shows the characteristics on which the project was expected to have an impact, in line with the project logic discussed in Section 2.2.

Table 5.1: Characteristics of resilience examined in this Effectiveness Review

Capacity	Characteristic	Rationale	Connected to project logic?
Absorptive capacity	<i>Availability of seasonal forecasting/ early-warning information</i>	Enables farmers to prepare for weather conditions when planning their activities, so exposing their crops to less risk of damage.	Yes
	<i>Ownership of livestock</i>	Livestock can be sold to raise funds when needed.	Yes
	<i>Vaccination of livestock</i>	Vaccinated livestock are less prone to disease.	Yes
	<i>Access to drinking water</i>	Improved sources of drinking water lead to improved physical health for household members.	No
	<i>Improved construction of dwelling</i>	Stronger dwellings are less likely to be damaged by flooding or other adverse events.	No
	<i>Social support networks</i>	Social networks can provide practical, financial or moral support in times of crisis.	No
	<i>Dietary diversity</i>	Associated with nutritional balance in the diet, and hence with physical health.	Yes
	<i>Livelihood diversification</i>	Household members have alternative sources of income to rely on if some activities become untenable during a crisis.	Yes
	<i>Crop diversification</i>	Reduces the likelihood that all crops will be lost or damaged by a single cause.	Yes
	<i>Access to water for agriculture</i>	Allows households to continue producing crops (particularly from a market garden) during the dry seasons of the year.	Yes
Adaptive capacity	<i>Remittances or formal earnings</i>	Can provide a dependable source of income in the event of a crisis, or a source of finance for proactive adaptations.	No
	<i>Savings</i>	Can be used to reduce the effects of crisis, or to invest in proactive adaptations.	No
	<i>Improved agricultural practices</i>	Enhances the resistance of crops to adverse weather conditions and to diseases.	Yes
	<i>Soil protection measures</i>	Improves soil fertility, enabling agriculture and livestock-rearing to be more productive over the medium term.	Yes
	<i>Ownership of productive assets</i>	Provides a means of generating income.	No
	<i>Access to credit</i>	Can be used to invest in proactive adaptations.	Yes
	<i>Participation in community groups</i>	Provides a forum for voicing concerns and for engaging in collective action.	Yes
	<i>Adoption of innovative practices (other than those promoted by the project)</i>	Demonstrates an ability and willingness to experiment with making positive adaptations.	No
	<i>Literacy</i>	Enables people to better engage in and inform themselves about process of change at a higher level than the community.	No
	<i>Children's school attendance</i>	Education provides a basis for improved ability to realize rights and improve well-being in the next generation.	No
Transformative capacity	<i>Women's decision-making power in agriculture</i>	Redresses one element of gender injustice, and may lead to women's priorities being better reflected in household decision-making more generally.	Yes

The questionnaire used in the Effectiveness Review included questions relating to each of the characteristics listed in Table 5.1. Data from these various indicators of resilience were aggregated using an approach adapted from Alkire and Foster (2011). For each characteristic, a benchmark was defined based on what it means for a household to be faring reasonably well in relation to the characteristic in question. The particular benchmarks used for each characteristic are detailed in Appendix 1. For example, each household was defined as scoring positively in terms of crop diversity if they farmed at least three different crop types during the 12 months prior to the survey. These cut-offs were developed through conversations with project staff and by checking the summary statistics for each variable to ensure the proposed thresholds were not obscuring important variation in the data. There is, however, inevitably a degree of arbitrariness in defining such cut-offs. Alternative cut-offs and formulations of the indicators were tested as a check on the robustness of the results obtained from applying the cut-offs.

Having used the cut-offs to create a binary variable for each characteristic of resilience, it was then necessary to aggregate across the indicators of resilience. In line with previous Effectiveness Reviews, this index was constructed by counting the proportion of characteristics in which each household scored positively. In this process, each of the resilience indicators are weighted equally.

One issue with creating an overall index for resilience in this way is that it implicitly assumes that the specific resilience characteristics and indeed resilience *capacities* can be easily substituted for one another.⁷ Since the overall resilience index simply takes the average of the resilience characteristics across the three capacities, a slight loss in transformative capacity, say, can be compensated by a slight increase in absorptive or adaptive capacity. To address this issue, we also analyse indices specific to each of the three capacities, to investigate how the different capacities were affected by the project.

The estimates of the project's impact on these resilience indices, as well as on each of the individual indicators, is reported in Section 6.1.7.

6 RESULTS

6.1 ANALYSIS OF HOUSEHOLD SURVEY DATA

This section presents a comparison of the households interviewed in project and comparison communities in terms of various outcome measures relating to the project under review.

This report is intended to be free from excessive technical jargon, with more detailed technical information being reserved for the appendices and endnotes. However, there are some statistical concepts that cannot be avoided when discussing the results. In this report, results will usually be stated as the average difference between the project households (referred to as the ‘intervention group’) and the matched non-project households (named the ‘comparison group’).

In the tables of results on the following pages, statistical significance will be indicated with asterisks, with three asterisks (***) indicating a *p*-value of less than 1 percent, two asterisks (**) indicating a *p*-value of less than 5 percent and one asterisk (*) indicating a *p*-value of less than 10 percent. The higher the *p*-value, the less confident we are that the measured estimate reflects a difference that applies across the entirety of the intervention and comparison groups, rather than being due to random variation in the specific sample surveyed. Results with a *p*-value of more than 10 percent are not considered to be statistically significant.

The results are shown after correcting for observed baseline differences between the households interviewed in the project communities and those in the comparison communities using a propensity-score matching (PSM) procedure. More information about the procedure applied is found in Appendix 3. All outcomes discussed here have also been tested for robustness with alternative statistical models, as described in Appendix 4. Where those alternative models produce markedly different results from those shown in the tables of results, this is discussed in the text or in endnotes.

The figures presented in this section are averages across all the project participant households and comparison households interviewed in each of the two regions. As described in Appendices 5 and 6, we also carry out analysis for some key outcome variables (those relating to food consumption, wealth indicators, and the resilience indices) by the gender of the respondent, by the gender of the household head, and by whether the household was identified as being ‘poor’ or ‘very poor’ at the start of the PRSAN project. In the few cases where these reveal differences in the effects of the project among those particular subgroups, this is discussed in the text.

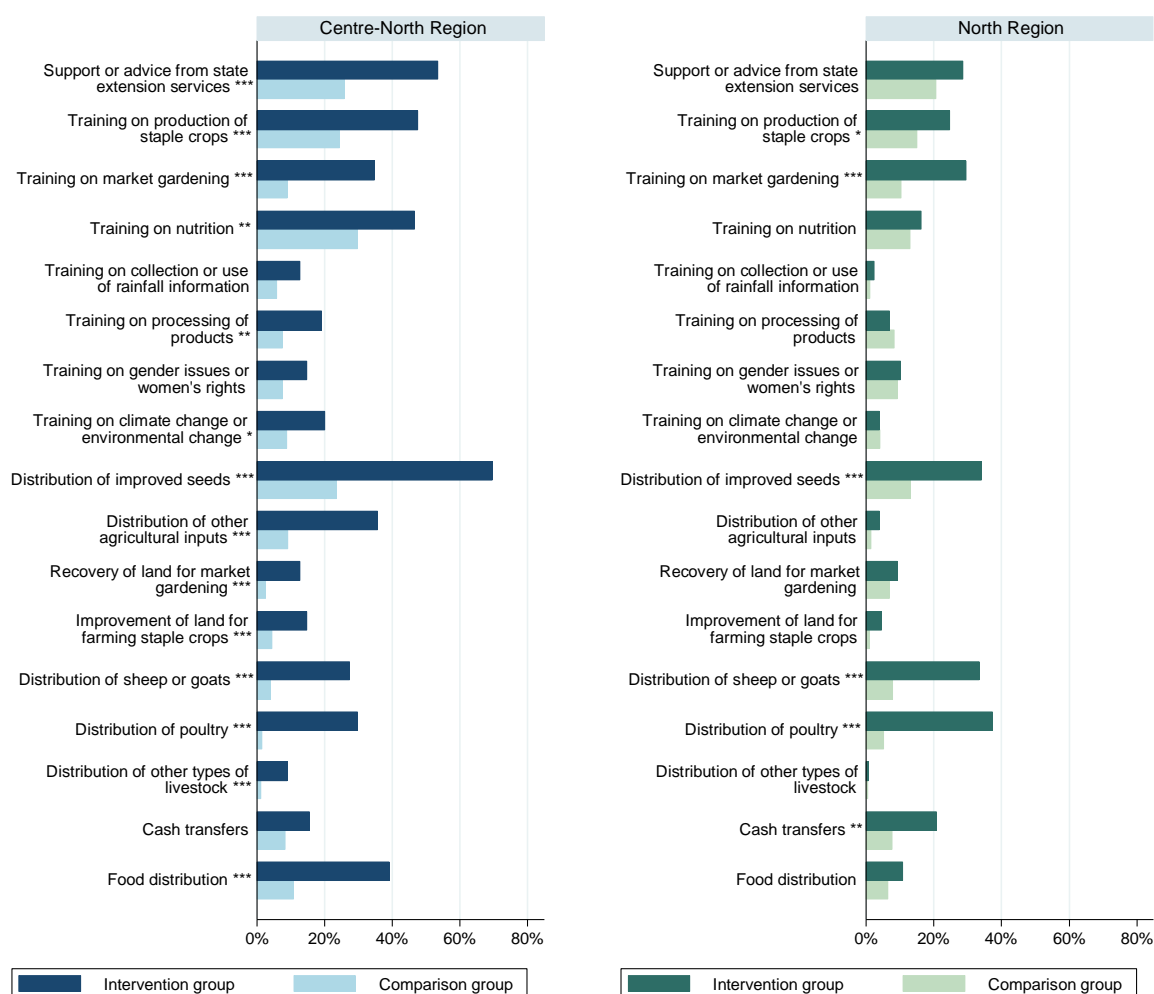
It is important to reiterate that a key limitation of our analysis is that we are not able to control for any unobservable differences between the project participants and comparison households – such as individuals’ attitudes or motivation, differences in local leadership, climate-related shocks, or other contextual conditions. If these unobserved differences also influence the potential outcomes we consider in this section, then our estimates of the projects’ effects will be biased. This possibility must be borne in mind when interpreting the results.

6.1.1 Involvement in project activities

We begin by examining the extent to which both the project participants and the comparison households reported having been involved in activities corresponding to those implemented under the PRSAN project.

Figure 6.1 shows a comparison of the project participant households and the comparison households in terms of the forms of training and support they have received since 2013. It can be seen that, in the Centre-North, more of the project participants than comparison households received each of these forms of training or support, and most of these differences are statistically significant. In the North Region, the proportions reporting that they had received most types of training or support are lower than in the Centre-North, and there are fewer statistically significant differences between the two groups.

Figure 6.1: Proportions of households having received training or support since 2013



* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community.

It should be recalled that the distribution of improved seeds is the only intervention that was provided to *all* of the project participants. The activities promoting market gardens, processing, and non-agricultural businesses, and the distribution of poultry and cash transfers were carried out only in specific communities. The survey respondents' impressions of the activities they have benefited from do not correspond exactly to the known distribution of the activities of the PRSAN project. For example, 40 percent of the project participants who said that they had received cash transfers are from communities where PRSAN did not make cash transfers. Even within the communities where cash transfers were made, more of the households who were identified at the start of the PRSAN project as 'poor' said that they received transfers than did

those who were identified as ‘very poor’ – whereas in fact the transfers were targeted at the ‘very poor’ households. In any case, it is clear that most of the project activities were carried out at higher rates in the PRSAN project communities than in the comparison communities.

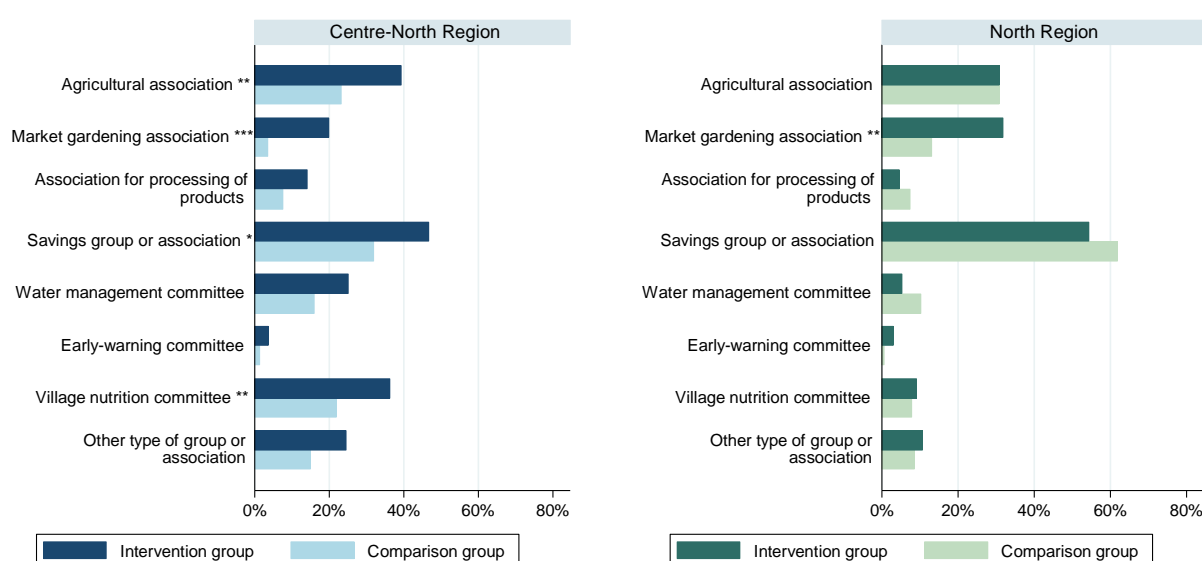
One surprising finding in Figure 6.1 is that 40 percent of the project participants in the Centre-North Region said that they had received food aid during the past four years, against only 10 percent of the comparison respondents. The PRSAN project did not, in fact, carry out any food distribution. This result may reflect aid that was provided in response to the food crisis of 2012 (with errors in recall of the exact period at which that occurred). Alternatively, it may imply that other organizations or programmes have also assessed some of the PRSAN project communities as particularly vulnerable and have therefore targeted them to carry out food distributions.

It should be noted that the results shown in Figure 6.1 are based on simple yes/no questions as to whether any household had received any training from any source since 2013: the data do not tell us whether there was any difference between the project and comparison communities in terms of the quality or intensity of the training or support provided.

For several of the project activities, participants were encouraged to participate in community-level groups or associations. In the Effectiveness Review survey, respondents were asked about the types of community groups in which they and other members of their household regularly participate. It can be seen in Figure 6.2 that participation in each type of community group was greater among the project participant households than comparison households in the Centre-North. The differences are not all statistically significant, but those linked to some of the main project activities – market gardening, crop production in general, and village nutrition committees – are significant. Participation in savings groups or associations was also found to be more common among project participants than comparison households in

the Centre-North. However, this difference is statistically significant only at the 10 percent level, meaning that we cannot conclude with confidence that the pattern is true across the broader population of project participants, rather than being the case only in the specific sample interviewed for the Effectiveness Review.

Figure 6.2: Proportions of households participating in various types of community group at the time of the survey



* p < 0.1, ** p < 0.05, *** p < 0.01; PSM estimates are bootstrapped with 1000 repetitions and clustered by community.

In contrast, the only type of group on which PRSAN appears to have had an impact in the North Region is market gardening associations.

Few respondents reported that they or other household members were participating in a community-based early-warning committee. This is to be expected, since these committees are composed of only a small number of members in each community. However, we will see in Section 6.1.7 that only a small minority of respondents in the project communities reported being aware of the existence of an early-warning committee.

The participation of survey respondents and other members of their households in community groups is analysed in more detail in Table 6.1. Consistent with the pattern found in Figure 6.2, it can be seen that project households in the Centre-North participate in a significantly greater range of community groups than do comparison households. The difference in participation is particularly concentrated among women rather than among men. However, there is no indication of a difference in group participation (among women or men) in the North Region.

Table 6.1: Participation in community groups

	1	2	3	4	5
	Number of types of group in which household members participate	Households in which any women participate in groups (%)	Number of types of group in which women participate	Households in which any men participate in groups (%)	Number of types of group in which men participate
Overall					
<i>Intervention group mean:</i>	2.00	65.3	1.60	46.0	0.88
<i>Comparison group mean:</i>	1.24	50.1	0.91	35.1	0.50
<i>Difference:</i>	0.76*** (0.26)	15.2** (6.8)	0.69*** (0.24)	10.9* (6.4)	0.38*** (0.14)
<i>Observations (intervention group):</i>	264	264	264	264	264
<i>Observations (total):</i>	783	783	783	783	783
Centre-North Region					
<i>Intervention group mean:</i>	2.10	65.2	1.66	48.1	0.96
<i>Comparison group mean:</i>	1.20	45.9	0.84	35.6	0.52
<i>Difference:</i>	0.89*** (0.31)	19.2** (8.1)	0.81*** (0.28)	12.5* (7.6)	0.43*** (0.16)
<i>Observations (intervention group):</i>	135	135	135	135	135
<i>Observations (total):</i>	393	393	393	393	393
North Region					
<i>Intervention group mean:</i>	1.50	65.9	1.28	34.9	0.49
<i>Comparison group mean:</i>	1.41	71.5	1.25	32.1	0.39
<i>Difference:</i>	0.09 (0.19)	-5.6 (6.3)	0.03 (0.19)	2.8 (6.4)	0.10 (0.12)
<i>Observations (intervention group):</i>	129	129	129	129	129
<i>Observations (total):</i>	390	390	390	390	390

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

6.1.2 Crop production

The bulk of the activities carried out under PRSAN were intended to have an impact on households' crop production. In this sub-section, we compare the project participants and comparison households in terms of some key indicators of their crop production in 2016.

In the first column of Table 6.2, it can be seen that almost all households interviewed cultivated some crops during 2016. During the rainy season, they cultivated an average of 2.9 hectares in the Centre-North and 3.2 hectares in the North, figures that did not differ significantly between the project participant and comparison households (as shown in column 2). On the other hand, there was a clear difference between the two groups in terms of the number of crop types grown: as shown in column 3, the project participants cultivated approximately one crop type more on average than the comparison households did.

Table 6.2: Households' farming activities during the rainy season in 2016

	1	2	3	4	5	6
	Households that cultivated any crops in 2016 (%)	Area farmed during the rainy season ^a (hectares)	Number of crop types cultivated in 2016	Households that engaged in market gardening in 2016 (%)	Area of market garden cultivated in 2016 (hectares)	Households in which women have primary responsibility for at least some decisions on crop production (%)
Overall						
<i>Intervention group mean:</i>	99.4	3.04	8.81	24.4	0.12	27.2
<i>Comparison group mean:</i>	98.3	2.96	7.77	8.5	0.08	16.6
<i>Difference:</i>	1.1 (1.7)	0.08 (0.21)	1.04*** (0.38)	16.0*** (5.1)	0.03 (0.09)	10.6** (5.0)
<i>Observations (intervention group):</i>	264	259	264	264	264	264
<i>Observations (total):</i>	783	757	783	783	783	783
Centre-North Region						
<i>Intervention group mean:</i>	99.3	2.98	8.95	20.0	0.11	23.0
<i>Comparison group mean:</i>	98.0	2.91	7.79	6.1	0.09	12.9
<i>Difference:</i>	1.2 (2.0)	0.07 (0.24)	1.16*** (0.44)	13.9** (5.8)	0.02 (0.10)	10.1* (5.6)
<i>Observations (intervention group):</i>	135	134	135	135	135	135
<i>Observations (total):</i>	393	375	393	393	393	393
North Region						
<i>Intervention group mean:</i>	100.0	3.35	8.09	47.3	0.15	48.8
<i>Comparison group mean:</i>	99.5	3.17	7.66	20.5	0.04	35.4
<i>Difference:</i>	0.5 (0.6)	0.18 (0.20)	0.43 (0.56)	26.8*** (9.9)	0.11* (0.06)	13.5 (9.7)
<i>Observations (intervention group):</i>	129	125	129	129	129	129
<i>Observations (total):</i>	390	382	390	390	390	390

^a Sample size is reduced because the corresponding question was missed in error in 16 interviews.

Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

The greater variety of crop types grown by the project participant households is connected to the factor shown in column 4 of Table 6.2, that considerably more of them were engaged in market gardening than were the comparison respondents. Twenty percent of the project participant households in the Centre-North were engaged in market gardening, and 47 percent of those in the North. The figures for area of land cultivated shown in column 5 of the table look small, but that is because they are averaged over all households, the majority of whom were not engaged in market gardening at all. Among those who were growing from market gardens, the average size was approximately 0.7 hectares in the Centre-North and 0.3 hectares in the North. The project participants in the Centre-North reported having water available for market gardening on average for six months of 2016 and to have harvested crops in two months of that year. In contrast, those in the North had water available for nine months, and produced crops in three months of that year.

It can be seen from the right-hand column of Table 6.2 that women take responsibility for decisions over crop production in project participant households in many more cases than they do in comparison households. This was also a direct consequence of the market gardening activity: there is no difference between the project participants and comparison households in the proportions in which decisions over the production of staple crops are taken mainly by women.

It will be recalled from Section 2.3 that ATAD and ODE had been promoting the adoption of market gardening and supporting other agricultural activities in many of the PRSAN communities under previous projects. It is likely, therefore, that the results shown in Table 6.2 partly reflect the impact of those earlier projects, rather than the effect of PRSAN in isolation. Indeed, after controlling for whether households were engaged in market gardening in 2013 (as well as some other indicators of productive activities they were carrying out in that year), the differences between the intervention and comparison groups shown in Table 6.2 are reduced in size, and most of them are not statistically significant. These revised figures, which are shown in Appendix 4 (Table A4.2) represent the best available estimate of the effects of the PRSAN project alone. We are not able to conclude, therefore, that PRSAN had a significant effect on the adoption of market gardening, or on women's decision-making in agriculture. There is some evidence that PRSAN had a positive effect on the diversity of crops being produced in the Centre-North Region, though this is statistically significant at the 10 percent level only.

Survey respondents were also asked about the farming practices they had used during 2016. The breakdown of results is shown in Figure 6.3. The use of improved seeds was generally higher among the project participant households than the comparison households. The project apparently had an effect on the use of improved seeds not only for sorghum and cowpea (the two crops for which all project participants received a distribution of improved seeds in 2014), but also for other staple crops and vegetables.

The other comparisons in Figure 6.3 show that households in the Centre-North were more likely to be using chemical fertilizer, to leave some of their land fallow, and to apply soil conservation techniques. In the North, there were significant differences between the project participants and comparison households in the proportions who reported using phyto-sanitary products and installing hedgerows or windbreaks.

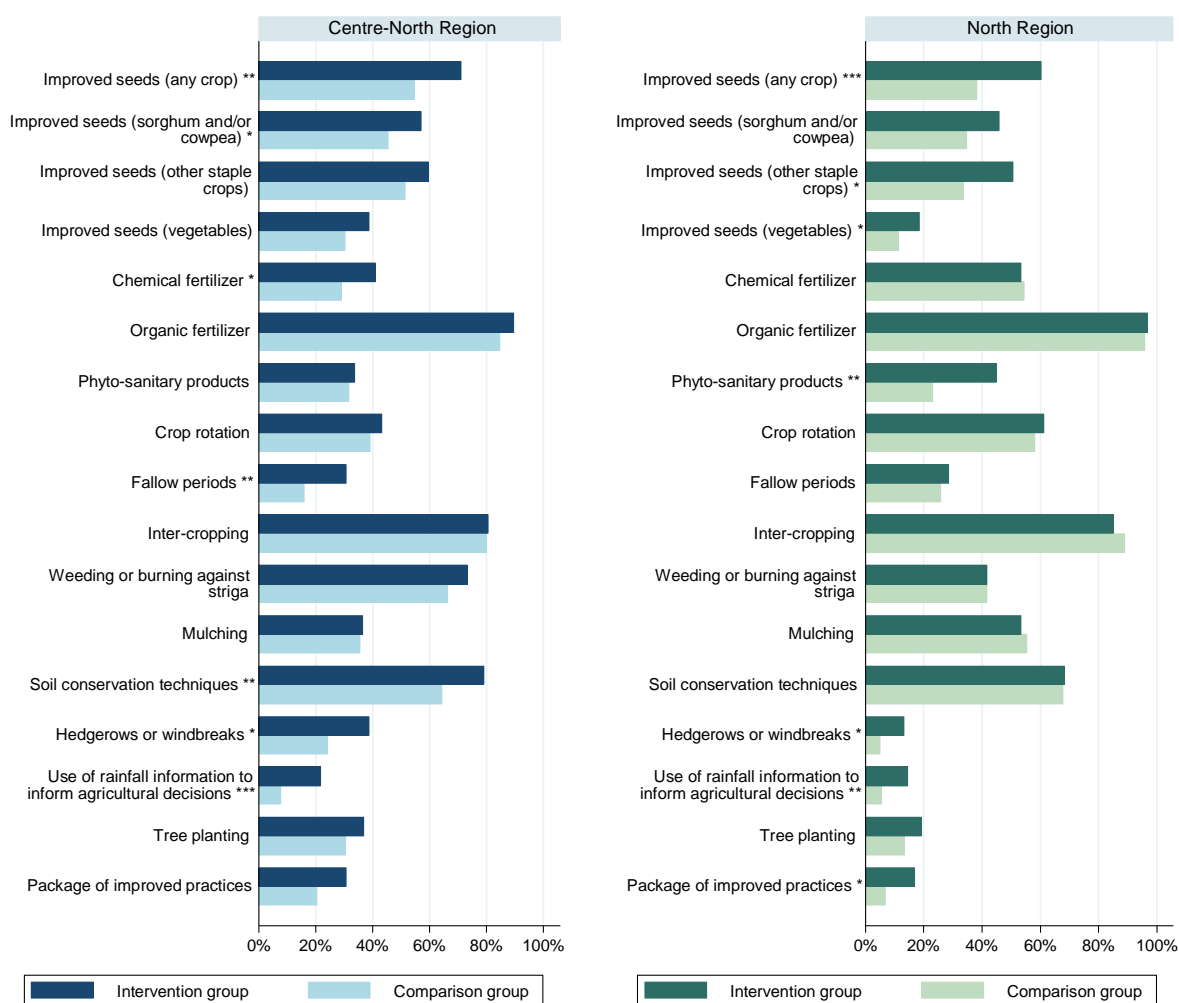
Of particular interest, given that PRSAN established community-level early-warning committees, is that significantly higher proportions of the project participants than comparison respondents reported making use of rainfall information to inform their agricultural decisions. However, the proportion who responded positively to this question was low even among the project participants – 20 percent across the two regions.⁸ This is consistent with the findings of the final evaluation for PRSAN (Issifou and Aka, 2017), which found weaknesses in the functioning of the early-warning committees. In particular, the links between the committees and the technical services at commune level and higher were found not to be functioning in many cases, so they have not been able to provide useful information to those in their communities.

In the Effectiveness Review data, making use of rainfall information is strongly associated with household wealth indicators and with whether the head of household had received any formal education. However, among those who used rainfall information, the project participants were much less likely to have attended school than the comparison group. This suggests that, to the extent that the project has led to an increase in the use of rainfall information in farming decisions, this has occurred among a wider group of community members than have typically made use of this information in the past.

For most of the production techniques listed in Figure 6.3, respondents were also asked for how many years they have applied those techniques.⁹ This allowed an assessment to be made of whether there is a difference between the project participant and comparison households in those who have newly adopted these practices during the lifetime of the project (that is, during the three years prior to the survey). The results of this analysis are largely consistent with those shown in Figure 6.3, though they suggest that the project may also have had an impact on the adoption of organic fertilizer and soil conservation techniques in the North, and that the difference between the intervention and comparison groups in the adoption of chemical fertilizer in the Centre-North pre-dates the project. However, these figures on when the innovations were adopted also suggest that few of the project participants started using rainfall information to inform agricultural decisions during the lifetime of the project. Of course, it is possible that some of these differences may also be due to the effect of ATAD's and ODE's previous interventions in the PRSAN communities.

The bottom row of Figure 6.3 shows the proportions of respondents who said that their household adopted a package of improved practices, consisting of the use of improved seeds (for at least one type of crop), organic fertilizer, intercropping, weeding or burning against striga, and soil conservation techniques. There is a 10 percentage-point difference in the adoption of this package between the project participants and the comparison households in each of the regions, though the difference is statistically significant only in the North Region.

Figure 6.3: Proportion of households using various farming practices in 2016



* p < 0.1, ** p < 0.05, *** p < 0.01; PSM estimates are bootstrapped with 1000 repetitions and clustered by community.

Analysis is carried out among households that cultivated any crops during 2016.

The next question to consider is whether these improved practices led to increases in yields among the project participants. It was not possible to collect detailed data on the production of all crop types in the Effectiveness Review questionnaire. However, respondents were asked about the total volume of some of the main staple crops that they had harvested during 2016. The results are shown in Table 6.3. There is no indication of a difference between the project participants and the comparison households in the quantity harvested of any of these crops except for rice.¹⁰

The greater rates of adoption of improved farming practices among the project participants, then, does not appear to have resulted in larger harvests for the average household. In the underlying data, we can see that households that used improved seeds for millet and maize did tend to harvest larger quantities of these crops than households that did not (even after taking account of the area farmed and other differences between them), but it is less clear that the same applies to the use of improved seeds for sorghum, cowpea and rice. We also find that households that applied either chemical or organic fertilizer had a larger total harvest of the five main staple crops than households that did not. Whether there is a link between applying soil conservation techniques or the 'package' of improved practices discussed above and the volume of production of the five staple crops is less clear (that is, the estimates are positive, but are not statistically significant after controlling for household characteristics). Further, there is little evidence that each of the other practices listed in Figure 6.3 were associated with greater production.¹¹

Interestingly, the project participants who reported producing rice are not particularly concentrated in the three communities where rice production was promoted under the PRSAN project. (One of those three communities was, in any case, excluded from the Effectiveness Review, since it was one of the larger settlements in the North Region for which no comparison could be found.) The significant numbers of respondents in other PRSAN communities who reported cultivating rice may reflect an impact of ATAD's and ODE's previous projects in developing this activity.

Table 6.3: Quantities of staple crops produced during 2016

	1	2	3	4	5	6
	Sorghum (kg)	Cowpeas (kg)	Millet (kg)	Maize (kg)	Rice (kg)	Total of these five crops (kg)
Overall						
<i>Intervention group mean:</i>	440.50	114.43	244.32	127.46	63.16	988.51
<i>Comparison group mean:</i>	459.58	94.43	256.03	133.07	16.04	931.97
<i>Difference:</i>	-19.07 (82.68)	20.00 (18.19)	-11.70 (44.00)	-5.61 (20.35)	47.12*** (16.99)	56.54 (127.76)
<i>Observations (intervention group):</i>	259	259	259	259	259	259
<i>Observations (total):</i>	757	757	757	757	757	767
Centre-North Region						
<i>Intervention group mean:</i>	446.39	116.55	233.19	137.45	46.43	978.38
<i>Comparison group mean:</i>	458.63	99.59	244.92	149.64	14.85	936.23
<i>Difference:</i>	-12.24 (98.35)	16.96 (20.78)	-11.73 (51.28)	-12.19 (24.02)	31.58** (13.69)	42.15 (150.77)
<i>Observations (intervention group):</i>	134	134	134	134	134	134
<i>Observations (total):</i>	375	375	375	375	375	383
North Region						
<i>Intervention group mean:</i>	410.16	103.46	301.76	75.94	149.44	1040.75
<i>Comparison group mean:</i>	464.47	67.79	313.32	47.62	22.16	909.98
<i>Difference:</i>	-54.31 (43.75)	35.66 (32.41)	-11.56 (58.91)	28.32 (18.92)	127.28* (77.17)	130.77 (119.31)
<i>Observations (intervention group):</i>	125	125	125	125	125	125
<i>Observations (total):</i>	382	382	382	382	382	384

Sample sizes are reduced because the corresponding questions were skipped in error in 16 interviews.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

The questionnaire went on to ask respondents for some information about how long the stocks of grain they had harvested lasted. As can be seen in the first column of Table 6.4, significant minorities of households (30 percent in the Centre-North and 13 percent in the North) had exhausted the reserves of grain from the previous harvest by the time of the survey in March 2017. In the Centre-North, the situation seemed to be worse than in 2016, when only 23 percent of households had exhausted their reserves by the end of March. In the North, however, the proportions who said that their reserves were exhausted by March were approximately the

same in 2016 and 2017. On the other hand, 11 percent of those in the Centre-North and 40 percent in the North reported that they still had grain reserves remaining at the end of September 2016, at the start of the new harvest. None of these figures differed significantly between the project participant and comparison households.

Finally, 39 percent of households in the Centre-North and 16 percent in the North reported having sold some of the crops that they had harvested during 2016. Again, this proportion did not differ between the project participant and comparison households.

Table 6.4: Consumption and sale of crops in 2016/17

	1	2	3	4
	Households with grain reserves remaining at the time of the survey in March 2017 (%)	Households with grain reserves remaining at the end of March 2016 (%)	Households with grain reserves remaining at the end of September 2016 (%)	Households that sold any of the crops they produced in 2016 (%)
Overall				
<i>Intervention group:</i>	69.9	77.0	15.7	39.2
<i>Comparison group:</i>	75.3	80.1	15.8	34.3
<i>Difference:</i>	-5.3 (6.3)	-3.1 (5.5)	-0.1 (4.9)	5.0 (6.2)
<i>Observations (intervention group):</i>	259	259	259	259
<i>Observations (total):</i>	757	757	757	757
Centre-North Region				
<i>Intervention group:</i>	66.4	75.4	11.2	43.3
<i>Comparison group:</i>	73.3	78.4	11.0	38.0
<i>Difference:</i>	-6.8 (7.4)	-3.0 (6.5)	0.1 (5.7)	5.3 (7.3)
<i>Observations (intervention group):</i>	134	134	134	134
<i>Observations (total):</i>	375	375	375	375
North Region				
<i>Intervention group:</i>	88.0	85.6	39.2	18.4
<i>Comparison group:</i>	85.6	89.0	40.5	14.9
<i>Difference:</i>	2.4 (4.9)	-3.4 (4.9)	-1.3 (7.2)	3.5 (8.1)
<i>Observations (intervention group):</i>	125	125	125	125
<i>Observations (total):</i>	382	382	382	382

Sample sizes are reduced because the corresponding questions were skipped in error in 16 interviews.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

6.1.3 Livestock ownership

As described in Section 2.1, the PRSAN project distributed sheep or goats to many of the project participants, and distributed cash intended for the purchase of chickens to others. Another activity carried out by the project was to train and equip local volunteers for vaccinating poultry. In Table 6.5 we analyse outcomes relating specifically to these activities.¹² Column 3 of the table provides some indication of an effect from the project on the ownership of poultry, particularly in the Centre-North, though this is less clear when examining the change over time.

We will see in the analysis of the SenseMaker interviews (in Section 6.2.2) that many respondents described having sold livestock in order to deal with the effects of crises that they experienced during 2016. A potential explanation for the lack of a larger difference between the livestock holdings of the project participants and the comparison households at the time of the survey may be that many of the project participants who had received livestock under the project had since sold those livestock in order to deal with crises they faced. There is some support for this argument in that the project participants reported in the SenseMaker interview that they had better post-crisis outcomes than the comparison respondents did.

The proportion of project participant households in which most or all of the poultry were vaccinated in 2016 appear to be higher than among the comparison households. However, these differences are statistically significant only at the 10 percent level, so we cannot conclude with confidence that they represent the whole population of project participants, rather than only the specific sample who were interviewed in the survey. In any case, the volunteer vaccinators who were trained under the project were intended to provide services over a wider area than just a single community, so it is possible that some of those in comparison communities also had their poultry vaccinated by these individuals.

Table 6.5: Ownership and vaccination of livestock

	1	2	3	4	5
	Number of sheep and goats owned by households	Change in number of sheep and goats owned since 2013	Number of poultry owned by households	Change in number of poultry owned since 2013	Households in which most or all poultry were vaccinated in 2016 ^a (%)
Overall					
<i>Intervention group mean:</i>	9.79	-4.30	19.36	-7.06	72.4
<i>Comparison group mean:</i>	11.14	-2.44	15.11	-8.67	61.5
<i>Difference:</i>	-1.35 (1.31)	-1.86 (1.78)	4.25** (2.13)	1.60 (2.99)	10.9* (6.2)
<i>Observations (intervention group):</i>	264	264	264	264	236
<i>Observations (total):</i>	783	783	783	783	712
Centre-North Region					
<i>Intervention group mean:</i>	9.80	-4.55	19.98	-7.10	74.6
<i>Comparison group mean:</i>	11.23	-1.74	15.17	-8.39	62.2
<i>Difference:</i>	-1.43 (1.55)	-2.81 (2.11)	4.81* (2.51)	1.30 (3.55)	12.3* (7.2)
<i>Observations (intervention group):</i>	135	135	135	135	114
<i>Observations (total):</i>	393	393	393	393	350
North Region					

<i>Intervention group mean:</i>	9.72	-2.99	16.15	-6.88	61.5
<i>Comparison group mean:</i>	10.64	-6.04	14.79	-10.07	57.9
<i>Difference:</i>	-0.92 (1.25)	3.05** (1.42)	1.36 (2.13)	3.18 (2.09)	3.6 (8.0)
<i>Observations (intervention group):</i>	129	129	129	129	122
<i>Observations (total):</i>	390	390	390	390	362

^a Among households who owned any poultry at the time of the survey.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

6.1.4 Non-agricultural activities

The second set of results with which the PRSAN project was concerned was the promotion of non-agricultural productive activities, including processing and running household businesses. Again, detailed data about these activities could not be collected in the questionnaire, but respondents were asked whether any member of their household engaged in each of the activities listed in Table 6.6 during 2016.

No difference was found between the project participant and comparison households in the proportions engaging either in processing (column 2) or in running a household business (column 4). This suggests that if the project had significant impact on these activities, it must have been among households that were already engaging in them, rather than encouraging new households to adopt them.

Table 6.6: Households' engagement in non-agricultural productive activities in 2016

	1	2	3	4	5
	Paid agricultural labour (%)	Processing of natural products (%)	Providing a paid service (%)	Running a household business (%)	Artisanal gold mining (%)
Overall					
<i>Intervention group:</i>	10.6	15.2	15.3	25.9	40.6
<i>Comparison group:</i>	8.8	13.0	12.8	26.1	28.3
<i>Difference:</i>	1.8 (4.5)	2.2 (5.0)	2.5 (3.2)	-0.2 (5.3)	12.3** (5.6)
<i>Observations (intervention group):</i>	264	264	264	264	264
<i>Observations (total):</i>	783	783	783	783	783
Centre-North Region					
<i>Intervention group:</i>	8.1	14.1	16.3	23.0	47.4
<i>Comparison group:</i>	6.0	12.1	14.0	22.2	33.2
<i>Difference:</i>	2.1 (5.2)	2.0 (5.9)	2.3 (3.8)	0.7 (6.2)	14.2** (6.7)
<i>Observations (intervention group):</i>	135	135	135	135	135
<i>Observations (total):</i>	393	393	393	393	393
North Region					
<i>Intervention group:</i>	23.3	20.9	10.1	41.1	5.4
<i>Comparison group:</i>	22.8	17.8	6.5	45.9	2.9

<i>Difference:</i>	0.4 (5.8)	3.2 (6.5)	3.5 (3.2)	-4.8 (6.8)	2.5 (2.6)
<i>Observations (intervention group):</i>	129	129	129	129	129
<i>Observations (total):</i>	390	390	390	390	390

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Column 5 of Table 6.6 shows that a large proportion of households in the Centre-North reported engaging in artisanal gold mining. In the course of the SenseMaker interview (discussed in Section 6.2.2), many of these respondents confirmed that they used gold mining as a strategy to cope with crises experienced in 2016, particularly relating to the poor harvest that year. Surprisingly, Table 6.6 shows a large difference between the project participant and comparison households in the Centre-North in the proportions who reported carrying out gold mining. This difference appears in the figures for 2016 even though (as shown in Appendix 3) the groups are balanced in terms of whether they were undertaking artisanal gold mining before the project in 2013. In contrast, those who specifically mentioned gold mining as a way to cope with the crises in the SenseMaker interviews were evenly split between the project and comparison respondents.

One of the ways by which the PRSAN project sought to assist households in developing processing activities and household businesses, as well as market gardening, was by facilitating their access to loans. To assess the project's impact in this area, survey respondents were asked whether they would be able to access a loan of 50,000 francs CFA (approximately \$80) from various sources, if they required it for a business investment. Table 6.7 shows the proportions who responded positively about their ability to access loans from local groups or from formal credit providers.

As shown in the first column of the table, there are no differences between the project and comparison households in terms of their ability to borrow from a group in the community. The second column reports figures for those who said that they would be able to borrow from a formal provider, such as a cooperative, a microfinance institution, or a bank. In the North, none of the project participants responded positively in this respect. In the Centre-North, the proportion of project participants who said that they could access credit from a formal provider was significantly higher than among the comparison households, but was still low, at only four percent. Even though the project is known to have facilitated access to credit from formal institutions in the past, it appears that few respondents have confidence that they could access a loan in the future, at least not as an individual.

Table 6.7: Households that are able to access credit for business investment

	1	2
	Households that have access to credit from a community group (%)	Households that have access to credit from a formal provider (%)
Overall		
<i>Intervention group:</i>	18.8	3.7
<i>Comparison group:</i>	16.9	1.3
<i>Difference:</i>	1.9 (5.5)	2.4* (1.4)
<i>Observations (intervention group):</i>	264	264
<i>Observations (total):</i>	783	783
Centre-North Region		

<i>Intervention group:</i>	17.8	4.4
<i>Comparison group:</i>	15.2	1.4
<i>Difference:</i>	2.6 (6.5)	3.0* (1.7)
<i>Observations (intervention group)</i>	135	135
<i>Observations (total):</i>	393	393
North Region		
<i>Intervention group:</i>	24.0	0.0
<i>Comparison group:</i>	25.8	0.6
<i>Difference:</i>	-1.8 (6.0)	-0.6 (1.0)
<i>Observations (intervention group):</i>	129	129
<i>Observations (total):</i>	390	390

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

6.1.5 Food consumption

If the PRSAN project brought an improvement in the livelihoods of its participants, then we would expect this to be reflected in the quantity and quality of food consumed within households. The project also encouraged households to farm new crop types, partly with the aim of increasing the diversity of foods consumed within households.

Detailed data on food consumption could not be collected in the survey, but two simple proxy measures of the quantity and quality of food consumption were collected. Firstly, survey respondents were asked how many meals per day they and the rest of their household had eaten during the preceding seven days. Column 1 of Table 6.8 shows that just under a third of respondents reported having eaten at least three meals per day. There was no indication of a difference in this respect between respondents in the project participant households and those in comparison households. However, there was a very clear and substantial difference between the two regions: only 12 percent of respondents in the North reported consuming at least three meals per day, against 33 percent in the Centre-North.

Table 6.8: Food consumption in the seven days prior to the survey

	1	2
	Respondents who had consumed at least three meals per day during the past seven days (%)	Dietary diversity score (scale of zero to 105)
Overall		
<i>Intervention group mean:</i>	31.4	27.18
<i>Comparison group mean:</i>	29.2	25.33
<i>Difference:</i>	2.3 (6.3)	1.85 (2.49)
<i>Observations (intervention group):</i>	264	264
<i>Observations (total):</i>	783	783

Centre-North Region		
<i>Intervention group mean:</i>	34.8	29.10
<i>Comparison group mean:</i>	32.8	26.89
<i>Difference:</i>	2.0 (7.5)	2.21 (2.96)
<i>Observations (intervention group):</i>	135	135
<i>Observations (total):</i>	393	393
North Region		
<i>Intervention group mean:</i>	14.0	17.32
<i>Comparison group mean:</i>	10.2	17.29
<i>Difference:</i>	3.7 (4.2)	0.03 (1.34)
<i>Observations (intervention group):</i>	129	129
<i>Observations (total):</i>	390	390

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

The second indicator examined in Table 6.8 is a measure of the diversity of food types consumed. Respondents were presented with a list of 15 food types (such as cereals, legumes, oil seeds, tubers, milk or dairy products, eggs, meat, fish, leafy vegetables, other vegetables, red or orange fruit, other fruit, condiments, fat, and sugar or honey), and were asked for the number of days during the previous seven days on which they had consumed each food type. The responses were converted into a dietary diversity score simply by adding up the number of days on which each respondent consumed each type of food. The respondents in the Centre-North Region were found to have a substantially more diverse diet than those in the North Region, but again there were no differences between respondents in project and comparison households.

It is particularly surprising that these dietary indicators are more positive in the Centre-North than in the North when we recall (from Section 6.1.5) that respondents in the North reported that the stocks of grain from their harvest had lasted longer into the year. We also observed in that section that households in the Centre-North were more likely to have sold some of the crops they produced (39 percent, against 16 percent in the North). Taken together, these results may indicate that producers in the Centre-North tend to be more oriented towards producing for the market than for subsistence, and that this has a positive effect on their income and hence on their diet.

In Appendix 5, we compare the results of women and men respondents in terms of these dietary indicators. We find that women were considerably more likely than men to say that they had typically eaten at least three meals a day during the past seven days. It seems unlikely that this reflects a real difference between women and men in their food consumption. One potential explanation is that women tend to eat a smaller amount more often during the day than men; alternatively, it may simply be that women tended to make more realistic assessments of their consumption than men.

Analysis by household-head gender, also discussed in Appendix 5, reveals that respondents in woman-headed households were consuming significantly less diverse diets than were respondents in other households. However, the same analysis provides evidence that PRSAN has had a particularly positive impact on dietary diversity among woman-headed households, which has corrected somewhat for the imbalance between them and other households in the project communities. This has presumably come about particularly as a result of facilitating project participants (especially poorer women, many of them who are heads of household) to engage in market gardening.

6.1.6 Household wealth

We now consider indicators of the project's impact on households' material welfare. As discussed in Section 2.2, several of the project activities (including the support to market gardening, to the processing of natural products, and to household businesses) were intended to lead to an increase in revenue. Over time, any such increase should be expected to lead to an improvement in wealth indicators such as the ownership of assets or housing conditions. In addition, if participants have increased their resilience as a result of the project, then we would expect them to be able to maintain or increase their ownership of assets and to maintain or improve their housing conditions, in spite of whatever shocks, stresses and uncertainty they may face.

In the questionnaire, respondents were asked to provide information about their household's ownership of various assets (including livestock, productive equipment, and household goods), as well as about the conditions of the family's house, both in 2013 and at the time of the survey. This information on asset ownership and housing conditions was used to generate an index of overall household wealth.

The wealth index was generated under the assumption that, if each of the assets and housing characteristics is an indicator of household wealth, they should be correlated with each other. That is, a household that scores favourably on one particular wealth indicator should be more likely to do so for other wealth indicators. A small number of items that had low or negative correlations with the others were therefore not considered to be good wealth indicators and so were excluded from the index.¹³

A data reduction technique called principal component analysis (PCA) was used to produce two indices of overall wealth, one based on the recalled data from 2013, and one based on the household's situation at the time of the survey. In particular, our wealth index is taken directly from the first principal component.¹⁴ PCA enables us to assign weights to the different assets, to capture as much information as possible from the data. Broadly, PCA assigns more weight to those assets that are *less* correlated with all the other assets, as these carry more information. By contrast, items with *more* intra-correlation are given less weight.

In order to ensure the same weights were applied to assets for both the recalled wealth index and the wealth index for the time of the survey, data from these two time periods were pooled before undertaking the PCA procedure. This means changes in wealth can be more easily compared over time. It should also be noted that the wealth index for 2013 is the measure that has been used throughout this analysis to control for baseline differences in wealth status between project and non-project households.

As might be expected, few households reported changes in their housing characteristics or in their ownership of large assets over the four-year period. However, there are substantial changes during that period in the numbers of livestock owned by households, as well as changes (mostly increases) in ownership of agricultural tools, furniture, mobile phones and solar panels.

Before examining the change in wealth indicators, the wealth index is *standardized* – that is, the value for each household is expressed as the number of standard deviations by which it differs from the mean. This means that the impacts of the project reported can be directly understood as the number of standard deviations by which the project improved wealth.

Table 6.9 gives estimates of the project's impact on wealth in two ways. Column 1 shows wealth for the project and non-project households at the time of the survey. Column 2 shows the differences calculated between wealth at the time of the survey and in 2013, and compares these differences between project and non-project households in the matched sample.¹⁵

Table 6.9: Index of wealth indicators

	1	2
	Wealth index at the time of the survey (standardized)	Change in standardized wealth index since 2013
Overall		
<i>Intervention group mean:</i>	0.04	0.26
<i>Comparison group mean:</i>	-0.07	0.19
<i>Difference:</i>	0.11 (0.08)	0.07 (0.05)
<i>Observations (intervention group):</i>	264	264
<i>Observations (total):</i>	783	783
Centre-North Region		
<i>Intervention group mean:</i>	0.03	0.28
<i>Comparison group mean:</i>	-0.08	0.21
<i>Difference:</i>	0.11 (0.10)	0.07 (0.06)
<i>Observations (intervention group):</i>	135	135
<i>Observations (total):</i>	393	393
North Region		
<i>Intervention group mean:</i>	0.09	0.17
<i>Comparison group mean:</i>	-0.03	0.10
<i>Difference:</i>	0.13 (0.11)	0.06 (0.06)
<i>Observations (intervention group):</i>	129	129
<i>Observations (total):</i>	390	390

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

The results in Table 6.9 do not provide any indication of any difference between the project and comparison households in either their current wealth indicators or in how these indicators have changed since 2013.

As a further indicator of household well-being, respondents were also asked to estimate the total amount that their household had spent on health and on children's education during 2016. Analysis of the resulting figures is shown in Table 6.10. There is no indication of a difference between the project participant and comparison households in either case.¹⁶

The question about spending on education was asked separately in relation to girls' education and boys' education. On average, expenditure on education for girls was about 43 percent of total expenditure on education, a figure that is statistically significantly less than half. This proportion did not differ between project participant and comparison households.

Table 6.10: Households' expenditure on children's education and on health in 2016

	1	2	3	4
	Expenditure on health (francs CFA)	Expenditure on children's education (francs CFA)	Expenditure on girls' education (francs CFA)	Expenditure on boys' education (francs CFA)
Overall				
<i>Intervention group mean:</i>	52,755	34,675	18,110	16,232
<i>Comparison group mean:</i>	57,468	41,096	13,238	28,028
<i>Difference:</i>	-4,713 (17,024)	-6,421 (12,549)	4,872 (5,656)	-11,795 (9,787)
<i>Observations (intervention group):</i>	242	248	250	252
<i>Observations (total):</i>	728	751	758	757
Centre-North Region				
<i>Intervention group mean:</i>	56,086	31,016	16,741	13,957
<i>Comparison group mean:</i>	61,274	37,747	10,805	26,789
<i>Difference:</i>	-5,189 (20,271)	-6,731 (14,856)	5,936 (6,687)	-12,832 (11,585)
<i>Observations (intervention group):</i>	132	128	131	128
<i>Observations (total):</i>	376	382	387	383
North Region				
<i>Intervention group mean:</i>	35,578	53,545	25,174	27,966
<i>Comparison group mean:</i>	37,838	58,367	25,790	34,416
<i>Difference:</i>	-2,260 (7,638)	-4,822 (9,978)	-616 (4,825)	-6,450 (7,873)
<i>Observations (intervention group):</i>	110	120	119	124
<i>Observations (total):</i>	352	369	371	374

Analysis is carried out among respondents who were able to provide estimates of their household's expenditure on the corresponding items, and (in the cases of columns 2 to 4) who have children of the corresponding gender.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

6.1.7 Indicators of resilience

Section 5.3 outlined the approach for measuring resilience from the household survey data. The situation of each household was assessed against each of the 21 indicators identified as proxy measures for the resilience capacities, using the thresholds described in Appendix 1. The number of indicators in which each household reaches the threshold is counted, and the total is divided by the number of indicators. The resulting ratio – the proportion of indicators in which each household scored above the threshold – is defined as the index of resilience.

In the first column of Table 6.11 the project participant and comparison households are compared in terms of this index. It can be seen that the project participants scored positively in terms of 33 percent of the indicators on average. This is four percentage points greater than among the comparison households, a difference that is statistically significantly different from zero. (The result in the North is not statistically significant when examined in isolation, but it is consistent in size with the overall result. This suggests that the overall result applies in each of the two regions.) Put another way, the average project participant household met the thresholds to score positively in terms of approximately 6.8 of the 21 indicators, against 6.0 for the average comparison household.¹⁷ It appears, then, that the project households have significantly greater resilience, according to this measure, than the comparison households.

Table 6.11: Indices of resilience

	1	2	3	4
	Overall resilience index (%)	Index of absorptive capacity (%)	Index of adaptive capacity (%)	Index of transformative capacity (%)
Overall				
<i>Intervention group mean:</i>	32.5	30.2	32.6	23.8
<i>Comparison group mean:</i>	28.9	28.3	27.5	17.2
<i>Difference:</i>	3.6** (1.8)	1.9 (2.0)	5.1** (2.1)	6.6*** (2.2)
<i>Observations (intervention group):</i>	264	264	264	264
<i>Observations (total):</i>	783	783	783	783
Centre-North Region				
<i>Intervention group mean:</i>	32.2	30.0	31.8	22.9
<i>Comparison group mean:</i>	28.7	28.6	26.9	15.6
<i>Difference:</i>	3.5* (2.1)	1.4 (2.3)	4.9** (2.4)	7.3*** (2.6)
<i>Observations (intervention group):</i>	135	135	135	135
<i>Observations (total):</i>	393	393	393	393
North Region				
<i>Intervention group mean:</i>	34.2	31.1	36.7	28.6
<i>Comparison group mean:</i>	30.2	26.5	30.9	25.7
<i>Difference:</i>	4.1* (2.3)	4.6* (2.5)	5.8* (3.1)	2.9 (2.9)
<i>Observations (intervention group):</i>	129	129	129	129
<i>Observations (total):</i>	390	390	390	390

Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Figure 6.4: Histograms of overall resilience index, by region and intervention/ comparison group

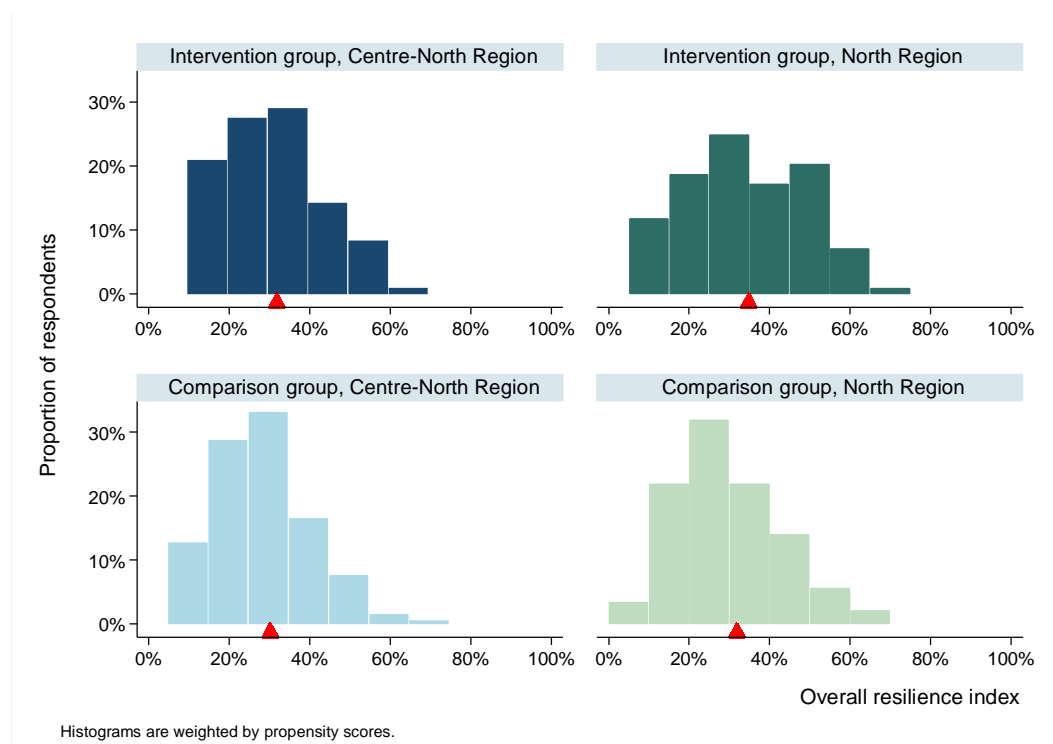


Figure 6.4 shows how the resilience index scores are distributed across the sample of respondents. The red markers on each of the charts represent the average (mean) value of the resilience index. None of the households surveyed have a resilience index greater than 67%; that is, none of them score positively on more than two thirds of the indicators.

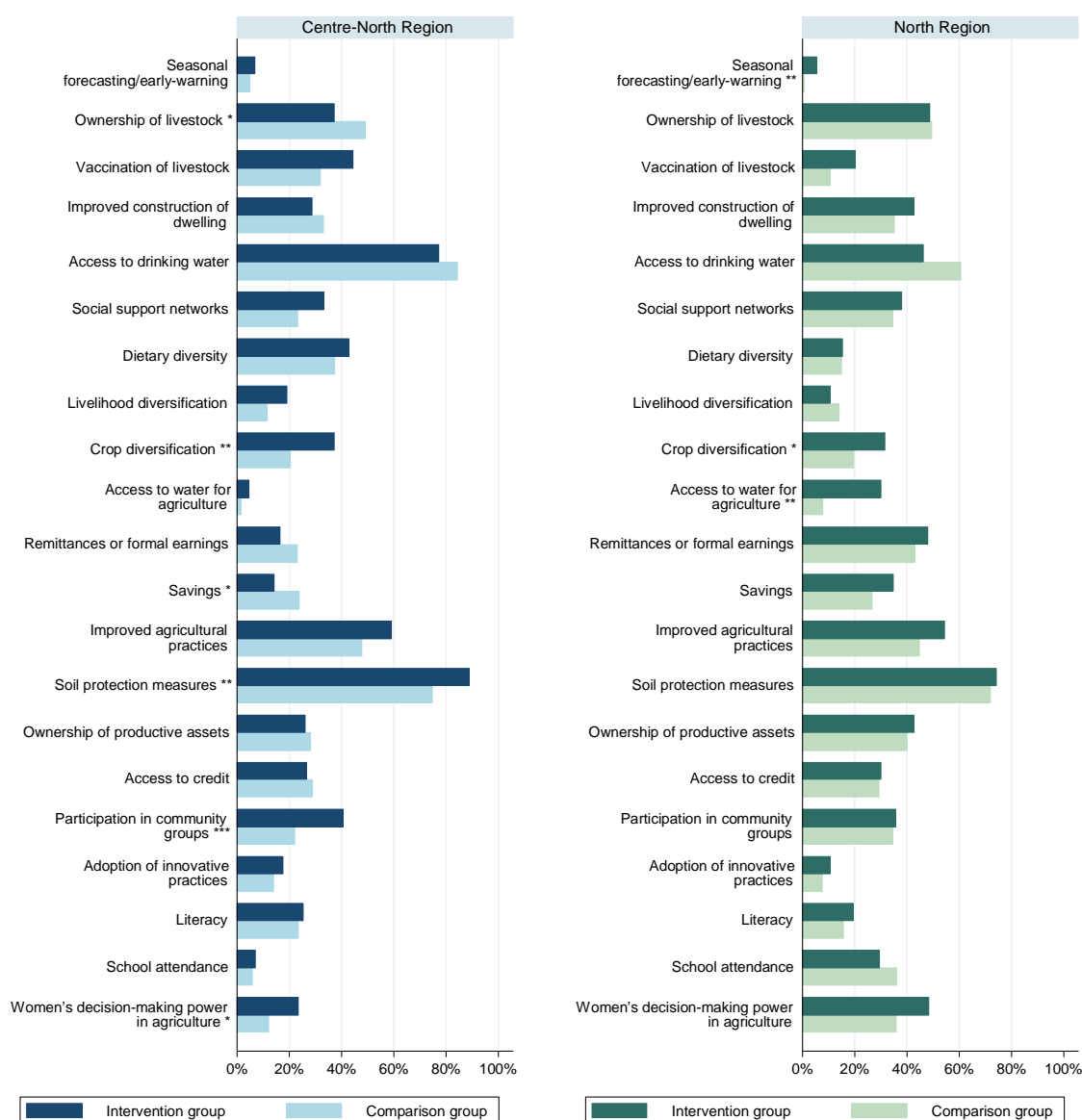
Columns 2 to 4 of Table 6.11 break down these results into indices for each of the three resilience capacities. In each case, the index again represents the proportion of indicators within that capacity in which households reach the threshold. It can be seen that the difference between the project participant households and comparison households is clearest in terms of transformative capacity, but that this difference is probably confined to the Centre-North. In addition, in both regions there appears to be a positive difference in adaptive capacity. In contrast, there is little indication of a difference between the project participants and the comparison households in terms of their absorptive capacity, except perhaps in the North Region.

One important caveat to these results is that under the alternative PSM model that accounts for households' participation in market gardening, processing and other productive activities in 2013 (as discussed in Appendix 4), the differences between project participants and comparison households in terms of the overall index of resilience and the index of adaptive capacity reduce in size and are no longer statistically significant. This alternative model may be seen to better reflect the additional impact of the PRSAN project that has been achieved since 2013, rather than the combined effect of PRSAN with ATAD's and ODE's earlier interventions. However, the lower representativeness of the alternative model (particularly in the North Region) means that these results should be treated tentatively. In any case, there is still a significant difference in terms of transformative capacity in the Centre-North under the alternative model. This suggests that at least some of the progress in terms of promoting participation in community groups and enabling women to take control over decisions in agriculture has occurred since 2013.

To understand the reasons behind the differences in the resilience index, it is necessary to compare project and comparison households in terms of each of the underlying indicators of resilience. This analysis is carried out in Table 6.12 and Figure 6.5. The project participant

households were more likely to reach the threshold for the use of seasonal forecasting or early-warning information (at least in the North), in crop diversification, in the adoption of improved agricultural activities, in participation in community groups, and in women's control over decisions on crop production. The impact on transformative capacity in the Centre-North is driven by these last two indicators (participation in community groups and women's decision-making in agriculture). On the other hand, there was no evidence of a difference between the two groups in terms of some of the outcomes that the project was expected to affect, such as access to credit, livelihood diversification and dietary diversity. More of the comparison households than the project households scored positively against the indicators for livestock ownership and savings, though in each case the difference is statistically significant only at the 10 percent level.

Figure 6.5: Proportion of households scoring positively in terms of each indicator of resilience



* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community.

Table 6.12: Proportion of households scoring positively in terms of each indicator of resilience

	1	2	3	4	5	6	7	8	9	10	11
	Seasonal forecasting/ early-warning information (%)	Ownership of livestock (%)	Vaccination of livestock (%)	Improved construction of dwelling (%)	Access to drinking water (%)	Social support networks (%)	Dietary diversity (%)	Livelihood diversification (%)	Crop diversification (%)	Access to water for agriculture (%)	Remittances or formal earnings (%)
Overall											
Intervention group:	6.5	39.0	40.2	31.1	72.1	34.1	38.5	17.9	36.2	8.6	21.5
Comparison group:	4.1	49.2	28.8	33.4	80.4	25.0	33.6	11.9	20.3	2.6	26.3
Difference:	2.4 (3.3)	-10.2* (5.5)	11.4 (7.6)	-2.3 (4.5)	-8.4 (8.6)	9.1 (6.4)	4.9 (8.1)	6.0 (4.3)	15.9** (6.6)	6.0** (2.6)	-4.8 (4.0)
Observations (intervention group):	264	264	261	264	264	264	264	264	264	264	264
Observations (total):	783	783	770	783	783	783	783	783	783	783	783
Centre-North Region											
Intervention group:	6.7	37.0	43.9	28.9	77.0	33.3	43.0	19.3	37.0	4.4	16.3
Comparison group:	4.8	49.1	32.2	33.0	84.3	23.1	37.3	11.5	20.4	1.5	23.0
Difference:	1.9 (4.0)	-12.0* (6.4)	11.7 (9.0)	-4.1 (5.2)	-7.2 (10.1)	10.2 (7.5)	5.7 (9.6)	7.7 (5.1)	16.6** (7.7)	2.9 (2.5)	-6.7 (4.7)
Observations (intervention group):	135	135	132	135	135	135	135	135	135	135	135
Observations (total):	393	393	386	393	393	393	393	393	393	393	393
North Region											
Intervention group:	5.4	48.8	20.9	42.6	46.5	38.0	15.5	10.9	31.8	30.2	48.1
Comparison group:	0.6	49.5	11.1	35.2	60.8	34.7	14.8	13.9	19.9	8.0	43.1
Difference:	4.9** (2.1)	-0.7 (6.4)	9.8 (6.5)	7.5 (6.0)	-14.3 (8.8)	3.3 (6.2)	0.7 (4.4)	-3.1 (4.7)	11.9* (6.5)	22.2** (9.9)	5.0 (5.3)
Observations (intervention group):	129	129	129	129	129	129	129	129	129	129	129
Observations (total):	390	390	384	390	390	390	390	390	390	390	390

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table 6.12 (continued): Proportion of households scoring positively in terms of each indicator of resilience

	12	13	14	15	16	17	18	19	20	21
	Savings (%)	Improved agricultural practices (%)	Soil protection measures (%)	Ownership of productive assets (%)	Access to credit (%)	Participation in community groups (%)	Adoption of innovative practices (%)	Literacy (%)	School attendance (%)	Women's decision-making power in agriculture (%)
Overall										
<i>Intervention group:</i>	17.5	58.4	86.5	28.6	27.2	39.9	16.7	24.2	10.5	27.0
<i>Comparison group:</i>	24.2	48.7	74.3	30.0	29.1	24.3	13.0	22.1	11.4	16.6
<i>Difference:</i>	-6.8 (4.5)	9.7 (6.6)	12.2** (4.9)	-1.4 (4.7)	-1.8 (6.1)	15.6*** (5.7)	3.7 (4.8)	2.2 (4.2)	-1.0 (3.2)	10.5** (5.1)
<i>Observations (intervention group):</i>	264	263	264	264	264	264	264	264	239	259
<i>Observations (total):</i>	783	772	783	783	783	783	783	783	713	774
Centre-North Region										
<i>Intervention group:</i>	14.1	59.3	88.9	25.9	26.7	40.7	17.8	25.2	6.6	22.9
<i>Comparison group:</i>	23.7	49.4	74.7	28.1	29.0	22.3	14.0	23.3	6.3	13.1
<i>Difference:</i>	-9.7* (5.2)	9.9 (7.8)	14.1** (5.6)	-2.2 (5.5)	-2.3 (7.2)	18.4*** (6.7)	3.8 (5.8)	1.9 (5.0)	0.3 (3.4)	9.8* (5.8)
<i>Observations (intervention group):</i>	135	135	135	135	135	135	135	135	122	131
<i>Observations (total):</i>	393	385	393	393	393	393	393	393	360	388
North Region										
<i>Intervention group:</i>	34.9	53.9	74.4	42.6	30.2	35.7	10.9	19.4	30.8	48.4
<i>Comparison group:</i>	26.9	44.9	72.0	40.0	29.4	34.8	7.5	15.8	38.1	34.6
<i>Difference:</i>	8.0 (5.4)	9.0 (6.2)	2.4 (7.5)	2.7 (6.9)	0.9 (6.3)	0.9 (7.0)	3.4 (2.8)	3.6 (3.6)	-7.4 (8.1)	13.8 (9.6)
<i>Observations (intervention group):</i>	129	128	129	129	129	129	129	129	117	128
<i>Observations (total):</i>	390	387	390	390	390	390	390	390	353	386

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

6.2 SENSEMAKER ANALYSIS

The principle behind the use of SenseMaker is described in Sections 4.2 and 5.2. Respondents were asked to reflect on their own and their household's experiences during 2016, and to describe a situation that negatively affected their well-being during that year. All but 21 of the 800 respondents described such a situation.¹⁸ They were then asked to interpret their own story through a series of follow-up questions relating to the situation they described. It is these follow-up questions that provide a basis for analysis. These questions related broadly to four subjects: firstly, to the situation itself (the type of event that occurred, and the extent to which the respondent felt prepared for it); secondly, to the way in which the respondent and their household and/or other parties responded to it; thirdly, about whether they have confidence that they would be able to manage a similar situation in the future; and finally, about their views of the underlying causes of the situation they faced.

These four areas are discussed in the following four sub-sections. In line with the SenseMaker approach, we first analysed the patterns that can be observed from the closed questions, before seeking greater understanding by examining the underlying narratives.

In the figures and tables in this section, we show the results of the analysis by region and by intervention/comparison group. We also analyse the responses by the respondent's gender, and show disaggregated results where relevant. In addition, we assess whether there are any differences between the situations of – and the project's effect on – woman-headed households and other households (following the approach described in Appendix 5) and between households that were identified as 'poor' or 'very poor' at the start of the PRSAN project (following the approach described in Appendix 6). For the few cases in which we find significant differences in these respects, this is described in the text.

It is important to bear in mind that respondents themselves chose the situation that they talked about during the SenseMaker interview.¹⁹ If we suppose that the project activities had enabled participants to manage crises better, then it is possible that some negative situations were averted that otherwise would have occurred and that project participants would then have talked about in the interview. This would imply that during the survey the project participants would, on average, be referring to situations that were less severe than the comparison respondents were. How this possibility may affect the comparison of outcomes between the project participants and comparison respondents will have to be considered throughout the analysis of findings from the SenseMaker interview.

6.2.1 Characteristics of the situations described in respondents' narratives

The first question asked to all respondents was about the main themes of the narratives they provided. Respondents were given a list of 11 themes to choose from, or were also able to name their own. Multiple selections were permitted, and most respondents selected more than one theme. The proportions of respondents who categorized their story under each of the themes are shown in Figure 6.6.

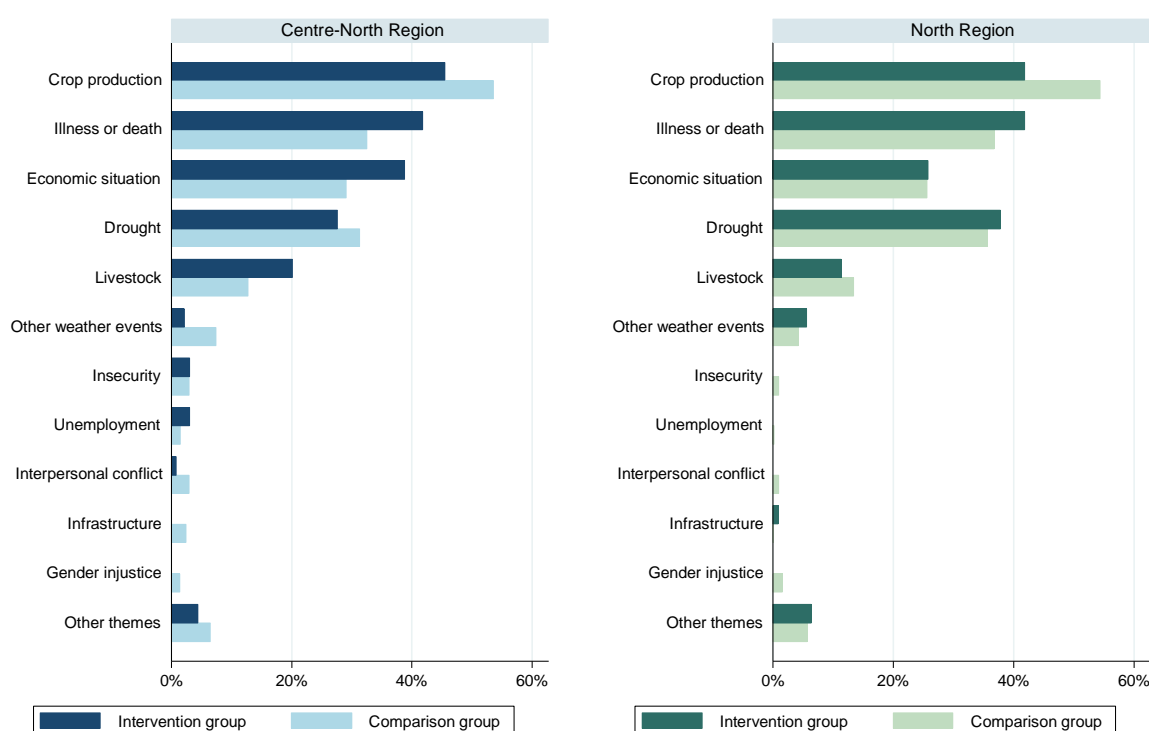
As can be seen, the predominant themes of the situations described by respondents were crop production, illness or death, economic difficulties, and drought. The majority of those who mentioned economic difficulties also listed drought or related issues (other weather events, crop production or livestock) as a theme. Respondents in the North Region were more likely than those in the Centre-North to mention drought as a theme of their narrative, and less likely to mention economic difficulties.²⁰

As might be expected, there were some clear differences in the themes of the narratives provided by women and men. The breakdown by gender is shown in Figure 6.7: women were significantly more likely than men to mention drought or other climate-related challenges as a theme of their narrative, and less likely to mention livestock, insecurity or interpersonal disputes.²¹

Across the two regions, 44 percent of the narratives shared by project participants related to crop production, against 53 percent of those shared by comparison respondents. This may indicate that fewer of the project participants experienced difficulties with their harvest in 2016. However, this would be at odds with the result discussed in Section 6.1.2, that the volume of staple crops produced did not differ clearly between the project participants and comparison households. In any case, the difference in the proportions mentioning crop production as a theme is not statistically significant, so it is not clear that this represents a systematic difference in the nature of the situations faced by the project participants and the comparison group.

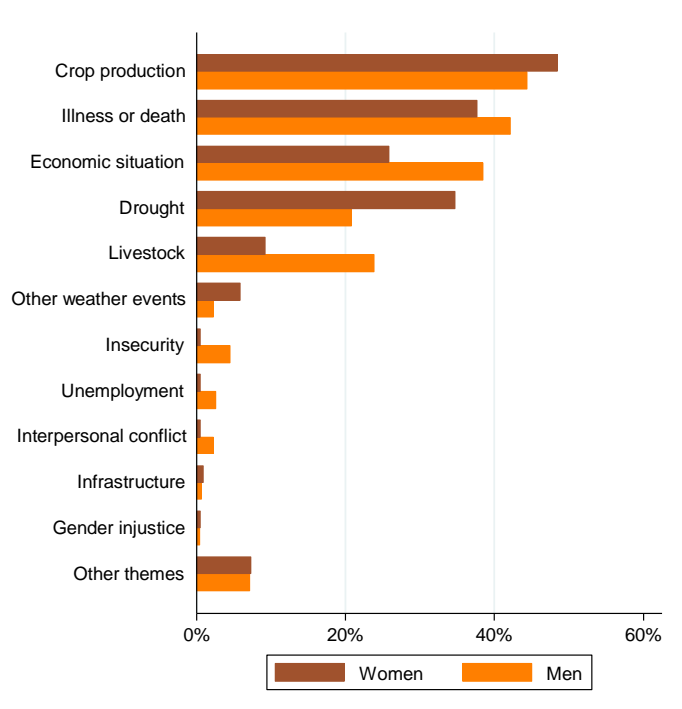
One final difference in the themes of the narratives provided by respondents was between households in the PRSAN communities who were identified as 'poor' or 'very poor' at the start of the project: the 'very poor' households were less likely to mention drought as the theme of their narrative.²² Given that there seem to have been few pre-project differences between the 'poor' and 'very poor' households (as discussed in Section 4.3), it may be reasonable to interpret this difference as indicating that the package of interventions provided to the 'very poor' households enabled them to better cope with the dry season, so that they were more likely to discuss other situations during the interview. However, we find little evidence of any difference between the 'poor' and 'very poor' households in terms of other outcomes assessed in the Effectiveness Review – either in household questionnaire or in the SenseMaker interview.

Figure 6.6: Themes of situations described by respondents



* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community.

Figure 6.7: Themes of situations described by respondents, by gender



Survey respondents were next asked to specify whether the situation described in their narrative was something that developed gradually or arose suddenly. This was done using a 'slider', a bar with those two possibilities marked at either end (shown in Figure 6.8, with the text in French and Mooré). Respondents were asked to mark on the slider the point that corresponds best to the situation they described.

Figure 6.8: Example of a slider used in the SenseMaker interview

* **Votre histoire raconte une situation qui...** ☐ N/A

BOUMB NIGAN YANM SIN TOGSE TOMDA ...

s'est développée peu à peu est arrivée soudainement
 SIINGA BILIF BILFOU YI LIINGRI

The results are displayed in Figure 6.9, with responses divided between the two regions and between the intervention and comparison groups. In each case, the red marker represents the average (mean) response. It can be seen that respondents in the North were more likely to have described a situation that happened suddenly than those in the Centre-North. It appears from the charts that the comparison respondents in the Centre-North were more likely than the project participants to describe a situation that occurred suddenly, but this difference is not statistically significant. As would be expected, the majority of respondents who provided a narrative relating to drought said that the situation developed gradually. Apart from that, there are few differences in the distribution across the gradual/sudden scale according to the theme of the narrative.

Figure 6.9: Histograms of responses as to whether the situation described developed gradually or happened suddenly

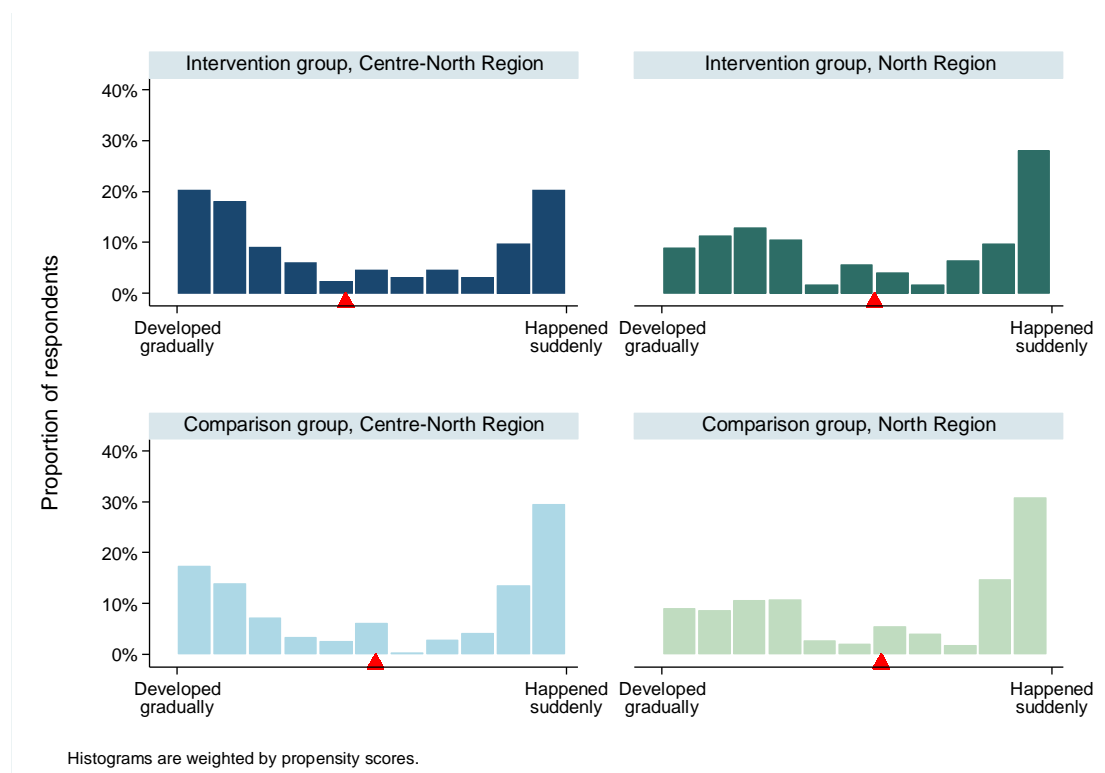


Figure 6.10: Histograms of responses as to whether the situation described developed gradually or happened suddenly, by respondent gender

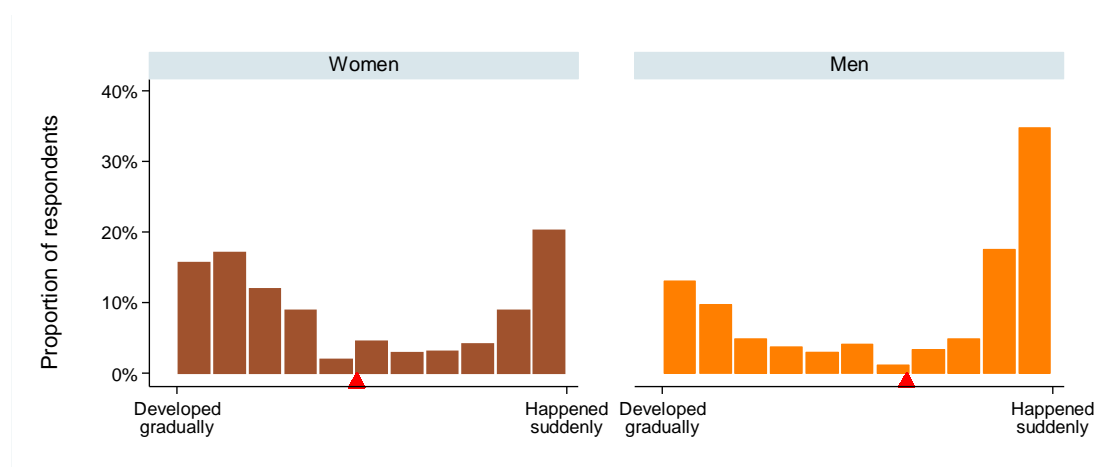


Figure 6.10 shows that women were significantly more likely than men to say that the situation they described developed gradually. This difference is not accounted for simply by differences between women and men in the themes of their narratives.

Respondents were next asked whether they felt prepared to face the situation they described. The responses were again recorded using a slider. The distributions of results for this question are shown in Figure 6.11. It is clear that most respondents felt that they were not prepared for the situation: the markers showing the mean and median responses are on the right-hand side in each of the charts. In the Centre-North, there is a significant difference between the project participants and the comparison respondents: the project participants on average placed themselves about 11 percentage points closer to the 'totally prepared' side on the slider than did the comparison respondents.²³ However, this difference is concentrated among male respondents, and does not seem to apply to women.²⁴ There is no such difference between the project participants and comparison respondents in the North, among either men or women.

From examining the distribution of responses by theme, it appears that the greater feeling of preparedness among the project participants in the Centre-North is confined to those who described a situation relating to drought, crop production, or livestock. In particular, there does not appear to be any difference between project participants and comparison respondents in the degree of preparedness felt by those who provided a narrative relating to the economic situation or to illness or death. This finding is consistent with the hypothesis that the PRSAN project may have improved the preparedness of participants in relation to its key areas of agricultural production and drought risk.

Not surprisingly, there is a connection between whether the situation developed gradually or suddenly and whether the respondent felt prepared for the situation. On average, respondents who gave a response at the extreme left-hand end of the slider in Figure 6.9 (that is, those who said that the situation developed gradually) assessed themselves as having been 24 percentage points better prepared than respondents at the extreme right-hand end of the slider in Figure 6.9 (that is, those who said that the situation arose suddenly).²⁵

There are also interesting differences in the results of these two questions by gender: women (particularly in the North) were more likely to have described a situation that developed gradually than men were. However, as shown in Figure 6.11, women were also significantly less positive than men about whether they were prepared for the situation they described. On average, women placed themselves approximately nine percentage points closer to the 'not at all prepared' side of the slider than men did.

In examining the narratives provided by respondents about the situations they faced, it is not clear what distinguishes those who perceive themselves as having been prepared from those who were not prepared for the situation. The most consistent pattern among those who placed themselves at the left-hand side of the slider (that is, who saw themselves as being highly prepared) seems to be that they either had livestock to sell or were able to rely on support from others when faced with a difficult situation. The following are two examples of narratives provided by respondents who placed themselves at the left-hand side of the scale in Figure 6.11:

We had a poor harvest, because the rain was not enough. Our beans died due to lack of water. There is not enough food. My husband has brothers in Côte d'Ivoire who give us support from time to time. (Woman PRSAN participant from the North Region)

My husband had to have surgery for a hernia. We sold a sheep and a goat to deal with this situation. As a result of the surgery, my husband was not able to cultivate his land, and we did not have a harvest like we've had in other years. We do not have enough to eat this year. (Woman respondent from a comparison community in the Centre-North)

However, many of those who felt 'not at all prepared' also mentioned selling livestock or other assets in order to deal with the situation they faced. In any case, it is apparent from these two examples that being prepared is not sufficient to be able to cope well with a crisis.

Figure 6.11: Histograms of responses as to whether respondents felt prepared to face the situation they described

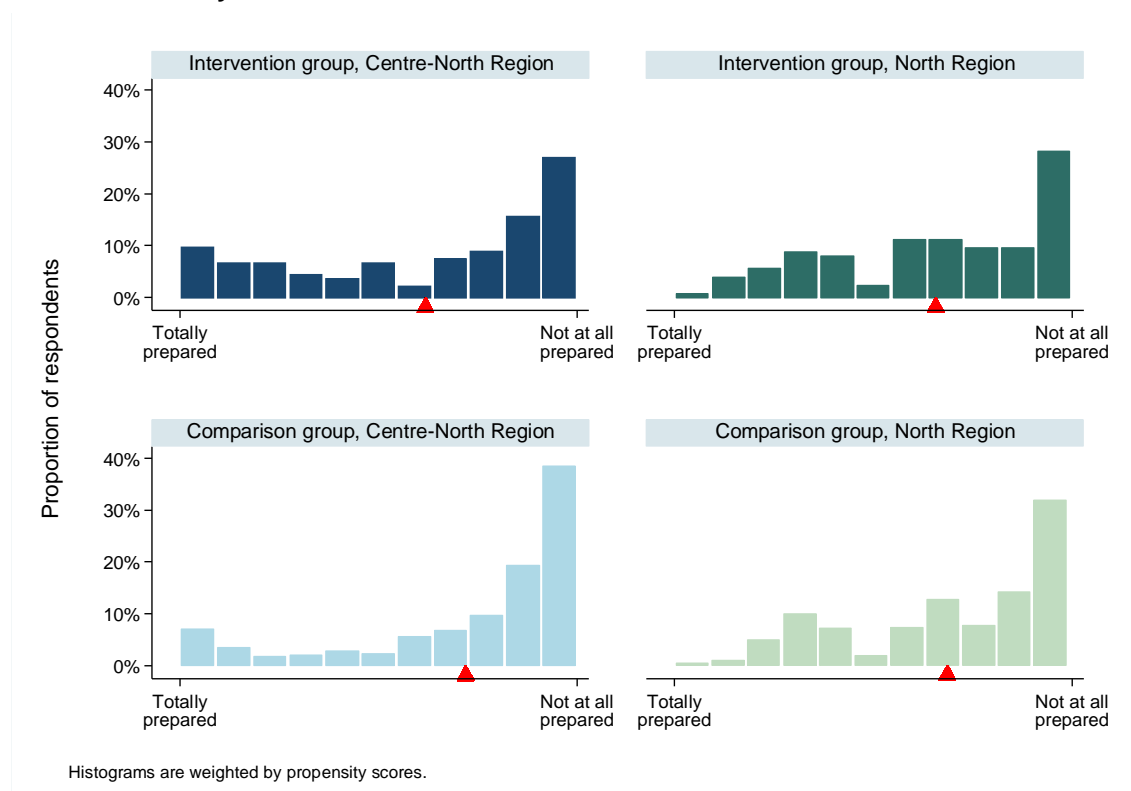
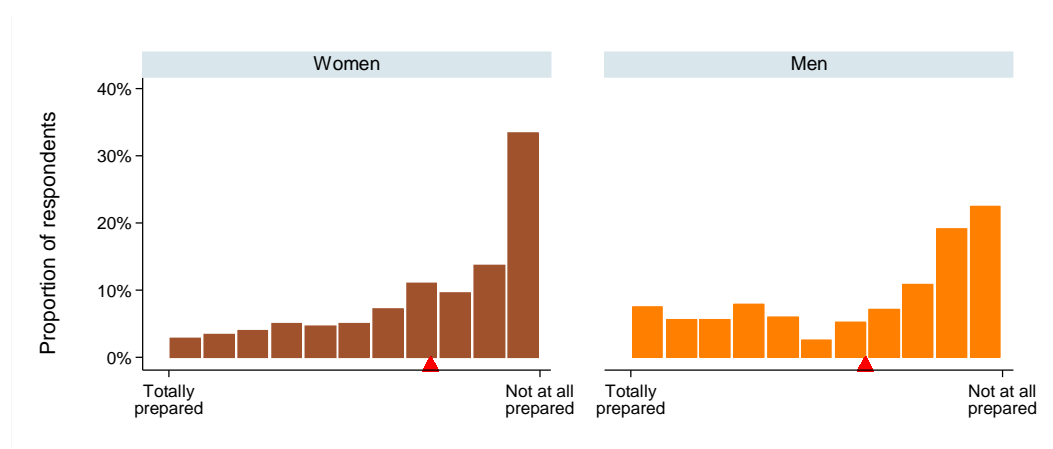


Figure 6.12: Histograms of responses as to whether respondents felt prepared to face the situation they described, by respondent gender



6.2.2 Responses to the situations described in respondents' narratives

In the next section of the SenseMaker interview, respondents were asked about how they had responded to the situation they described, and whether they received any support in doing so from others. In the first question, respondents were asked about the extent to which their response involved each of the three following elements:

- Making changes in productive practices (agriculture, livestock rearing, processing or any other productive practices)
- Selling stored crops, livestock or assets, or using savings or credit
- Reducing consumption of food or other goods.

In order to respond, respondents were presented with a 'triad' with one of these elements at each corner, as shown in Figure 6.13. They were asked to select the point on the triad that best represented how the three elements were balanced in responding to the situation. For example, if the household responded to the situation purely by reducing consumption, then the survey respondent would select the point at the bottom right-hand corner of the triad. If all three types of response were combined in approximately equal proportions, then the respondent would select a point close to the centre of the triad.

Figure 6.13: Example of a triad used in the SenseMaker interview



Figure 6.14 shows how responses were distributed across the triad, each point representing a single respondent. The points are clustered in the bottom left-hand corner of the triad, showing that responses to the crises relied predominantly on sales of crops, livestock or assets, or on using savings or credit. However, there are also significant numbers of responses that involved the other two elements as well.

The type of response, of course, varied with the type of crisis that the respondent faced. Those who had described situations relating to illness or death reported that their responses consisted overwhelmingly of selling crops, livestock or assets, or having recourse to savings or credit. In contrast, those who discussed situations relating to drought or crop production were more likely to have responded in a way that balanced the three dimensions.

It can be seen from comparing the two regions that respondents in the North were more likely than those in the Centre-North to say that their response involved changing productive practices. Only a very small part of this difference is explained by differences in the themes of the narratives shared by respondents in the two regions.

The gender breakdown, shown in Figure 6.15, shows that women's responses were distributed more widely across the triads than men's responses were. That is, women were considerably more likely to say that their response involved reducing consumption and changing productive practices, and correspondingly less likely to say that they sold goods or used savings or credit. Again, these differences are only partly explained by differences in the themes of the situations described by women and men.²⁶ Respondents from woman-headed households were particularly likely to say that they had relied on reducing consumption in their response to the crisis.

We find no significant difference overall in the distribution of responses across the triad between the intervention and comparison groups.

Figure 6.14: Distribution of survey responses across the triad for type of response to the situation described

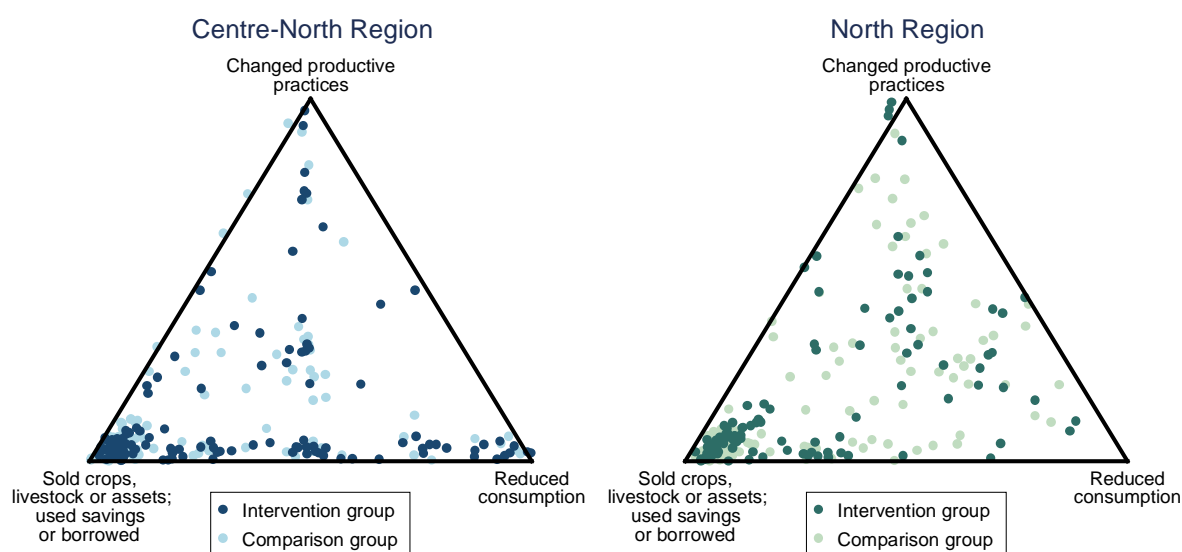
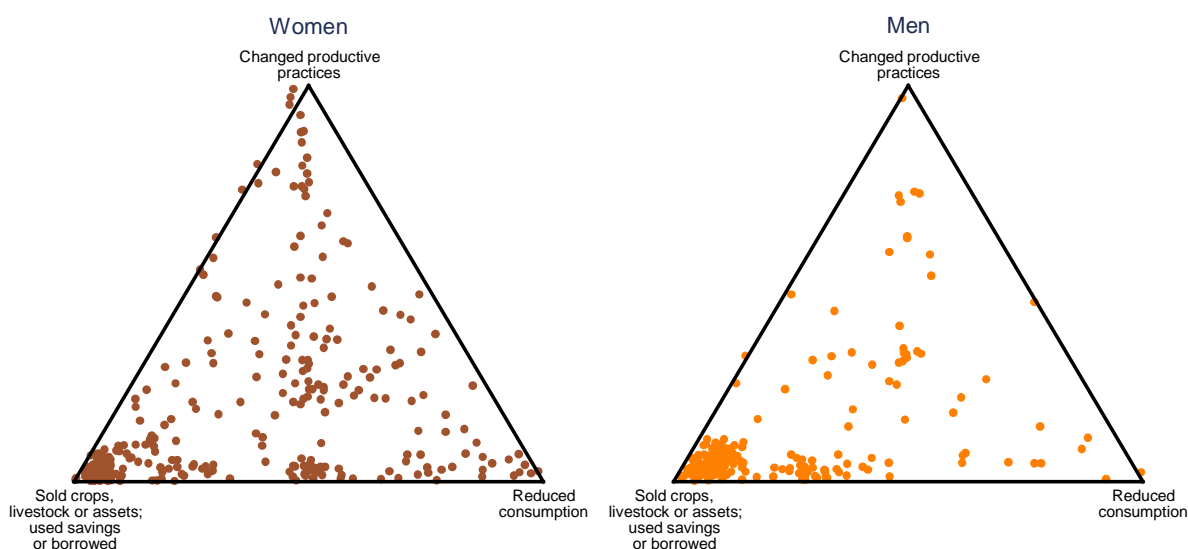


Figure 6.15: Distribution of survey responses across the triad for type of response to the situation described, by respondent gender



Among those who said that their response to the situation primarily involved sales or borrowing (that is, those who placed themselves in the lower left-hand corner of the triad), sales of livestock – usually sheep or goats – was the action mentioned most often. However, there are also many respondents who reported relying on revenue from small household businesses. The following example is typical:

Last year our children had a lot of health problems. [...] We paid for the medicines that were prescribed. To pay for these expenses, we sold our livestock and used the savings that we have from a household business. Now it's OK: the children have recovered. But I remain worried because there is nothing left. If somebody else falls ill, I don't know what I will do. (Female respondent from a comparison community in the North Region.)

Even if selling stocks of cereals would be a common response to crisis in a normal year, that seems to have been less applicable in 2016, since the harvest was particularly poor.

Among those who responded to the situation mainly by adapting their productive practices (that is, those who placed themselves near the top of the triad in Figure 6.14), engaging in artisanal gold mining was the strategy mentioned most often in the Centre-North. However, many of these respondents also mentioned that the income that can be generated from gold mining is meagre. For example:

We have cultivated our land, but the harvests have not been good. [...] I had to do gold panning in spite of the risks, in order to hope to be able to feed my children. But finding something out there [at the gold panning site] is getting more and more difficult. (Female respondent from a comparison community in the Centre-North Region.)

Around 12 percent of respondents in the Centre-North mentioned artisanal gold mining in their narrative, a figure that did not differ between the project participants and the comparison households. We observed earlier (in Section 6.1.4) that, in the Centre-North, more project households than comparison households appear to have taken up gold mining since 2013.

Several respondents, most of whom were PRSAN project participants, mentioned taking up (or investing more in) market gardening as a response to the poor harvest. Among those who reported that they adapted their productive activities as part of a mixed response to the situation (that is, those near the centre of the triad), the activity that was mentioned most often was engaging more in small household businesses.

Respondents were next asked about what support they had received in responding to the situation they described. Specifically, they were asked whether they received support from associations or other community-level institutions, from government services, or from NGOs. The responses to these questions are shown in Table 6.13. It can be seen that in the Centre-North, many more of the project participants than the comparison respondents reported receiving support from community-level institutions (7.2 percent against 0.4 percent). In the North there was no difference in this regard, but the project participants were much more likely to report having received support from NGOs (11.6 percent, against only 0.9 percent among the comparison group).

Women – and particularly those from woman-headed households – were less likely than men to report having received support from government services. However, woman-headed households in the project communities were more likely to have received support from government services and from NGOs than woman-headed households in comparison communities. Woman-headed households were also generally more likely than other households to have received support from community-level institutions. In addition, respondents from ‘very poor’ households were less likely than ‘poor’ households to report having received support from government services.

Overall, respondents who described a situation relating to illness or death in the family were particularly likely to have received support from community-level institutions. In contrast, those who described a situation relating to crop production or to drought were significantly more likely to say that they had received support from NGOs.

Table 6.13: Proportion of respondents having received support from external actors in responding to the situation they described

	1	2	3
	Associations or other community-level institutions (%)	Government services (%)	Non-governmental organizations (%)
Overall			
Intervention group:	6.9	7.9	6.3
Comparison group:	1.3	6.6	3.2
Difference:	5.6*** (2.1)	1.3 (2.6)	3.0 (2.4)
Observations (intervention group):	260	260	260
Observations (total):	760	760	760
Centre-North Region			
Intervention group:	7.4	8.8	5.1
Comparison group:	0.5	7.4	3.7
Difference:	6.9*** (2.4)	1.4 (3.1)	1.4 (2.9)
Observations (intervention group):	136	136	136
Observations (total):	386	386	386
North Region			
Intervention group:	4.8	3.2	12.1
Comparison group:	5.9	2.4	0.8
Difference:	-1.0 (3.0)	0.9 (2.4)	11.3*** (3.4)
Observations (intervention group):	124	124	124
Observations (total):	374	374	374

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Even among those who said that they received some form of support from the institutions mentioned in Table 6.13, very few had referred to those sources of support when they were originally describing the crisis they faced and their response to it. This suggests that the external support received was generally not a salient factor when people were recalling these experiences. For example, only two respondents mentioned any community-level associations in their narratives (in both cases, these were *tontines*, local savings groups). The respondents who had described receiving support from state services mostly seem to have been referring to treatment in hospitals or health centres. (On the other hand, approximately 90 percent of those who described seeking treatment in a hospital or health centre during their narrative did *not* subsequently answer positively when asked if they had received support from state services. For many of them the cost of the treatment was described as a major difficulty.)

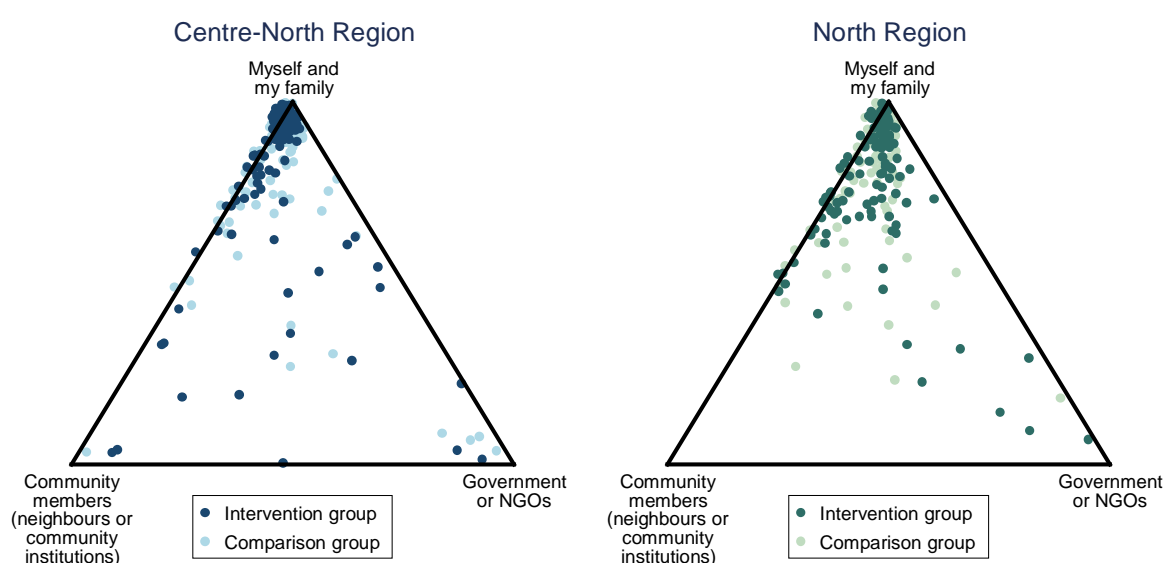
Only five respondents specifically mentioned in their original narrative that they received support from an NGO. Of these, four were located in the PRSAN project communities. One example is the following:

I did not eat enough last year. Our stock of millet was almost exhausted. We ate a lot of leaves mixed with a little flour. A project gave us money: my household received 25,000 francs. This allowed me to buy two bags of millet. (Male PRSAN participant in the Centre-

North Region; however, the respondent's household does not appear to have received cash transfers under PRSAN, according to the project records.)

The next question was aimed at understanding the *extent* to which different actors were involved in the response to the crisis situation described by the respondent. Another triad was used to investigate this. The results, shown in Figure 6.16, largely confirm those already implied by Table 6.13 – few respondents reported receiving any support from outside the family. In the triads, there is no detectable difference between the responses provided by project participants and comparison respondents, nor between the two regions. Women generally put significantly less weight on the response from community-level institutions and from government or NGOs, and correspondingly more weight on their own actions. However, those in woman-headed households in the project communities seem to have access to more support than did woman-headed households in the comparison communities, and so were less dependent on their own resources (that is, the points they selected were significantly further from the top of the triad).

Figure 6.16: Distribution of survey responses across the triad for the actors who were involved in responding to the situation described



The low proportions of respondents reporting that they had received support from the community – and the low degree of importance put on this support even by those who did receive it – is consistent with the findings of the household questionnaire. The indicator of ‘social support networks’, included in the list of indicators of resilience discussed in Section 6.1.7, shows that fewer than a third of households had helped or received any support from other households in the community more than once during 2016.

Of course, it is important to consider whether, in general, support was not provided because it was not required, or whether no support was available. To some extent, this can be investigated by considering the relationship between the questions about the way in which the household responded and the questions about the receipt of support. On the assumption that reducing consumption implies that households were particularly severely affected by the crisis, we may expect to see those households say that they were more likely to receive support from others. The data do, in fact, show a relationship between the extent to which the respondent said that they responded to the situation by reducing consumption and the probability of receiving support from NGOs. However, there was no such connection between reducing consumption and the receipt of support from others in the community, nor from government services.²⁷ It appears, then, that the low levels of support received by respondents does not imply a lack of need. This is borne out by examining the narratives, particularly of those who said that they had reduced their consumption. For example, a woman in one of the PRSAN communities who

reported that she and her household had not received any support from others had provided the following narrative at the start of the interview:

Last year was very tough. It did not rain, and the harvest was bad. We suffered a lot for that reason. We sold groundnuts and sesame to buy food, but this was not enough for a large family like ours. We are making sure that this will keep us going until the next harvest. In any case it is not easy for us. (Female PRSAN participant in the Centre-North Region.)

The next question asked to respondents was about whether they felt in control of the response to the situation they had described. The intention with this question was to understand whether respondents felt that they were the ones with agency in responding to the situation, rather than it being outside actors that took the initiative and the decisions.

Responses to this question were again recorded on a slider: the distributions of responses are shown in Figure 6.17. In the Centre-North, the majority reported feeling that they were in control of the response, but respondents in the North were much more ambivalent about their degree of control. This does not seem to imply that external actors took away agency from respondents: the degree of control does not differ between those who received support from other actors and those who did not. Rather, the positions selected on the slider seem to suggest that, in many cases, respondents felt that the response to the crisis was not under control at all. In any case, it is difficult to detect any systematic differences in the narratives provided by those who said that they were in control of the response and those who said that they were not.

It can be seen in Figure 6.18 that women were considerably less positive about their degree of control over the response to the situation than men were. This was particularly the case among respondents in woman-headed households. However, the project appears to have had a positive impact among this latter group: respondents from woman-headed households in the project communities were much more positive about their degree of control over the response than those from woman-headed households in the comparison communities.

The next interview question simply asked respondents to state whether their situation was now better or worse than before the situation they described, or had not changed since that time. The breakdown of results is shown in Table 6.14. These figures provide some evidence that the project participants were more likely to say that their situation had improved, particularly in the North Region – although this result is not corroborated by all the alternative statistical models described in Appendix 4. However, there is a strong gender difference in these results. Men in the intervention group in both regions were considerably (approximately 20 percentage points) more likely than those in the comparison group to say that their situation now is better than before. Among women, on the other hand, there was no difference in responses between the intervention and comparison groups. Women in both the intervention and comparison groups were anyway much less likely than men to say that their situation had improved since the crisis, and more likely to say that it had deteriorated.

Figure 6.17: Histograms of responses as to whether respondents felt that they were in control of the response to the situation they described

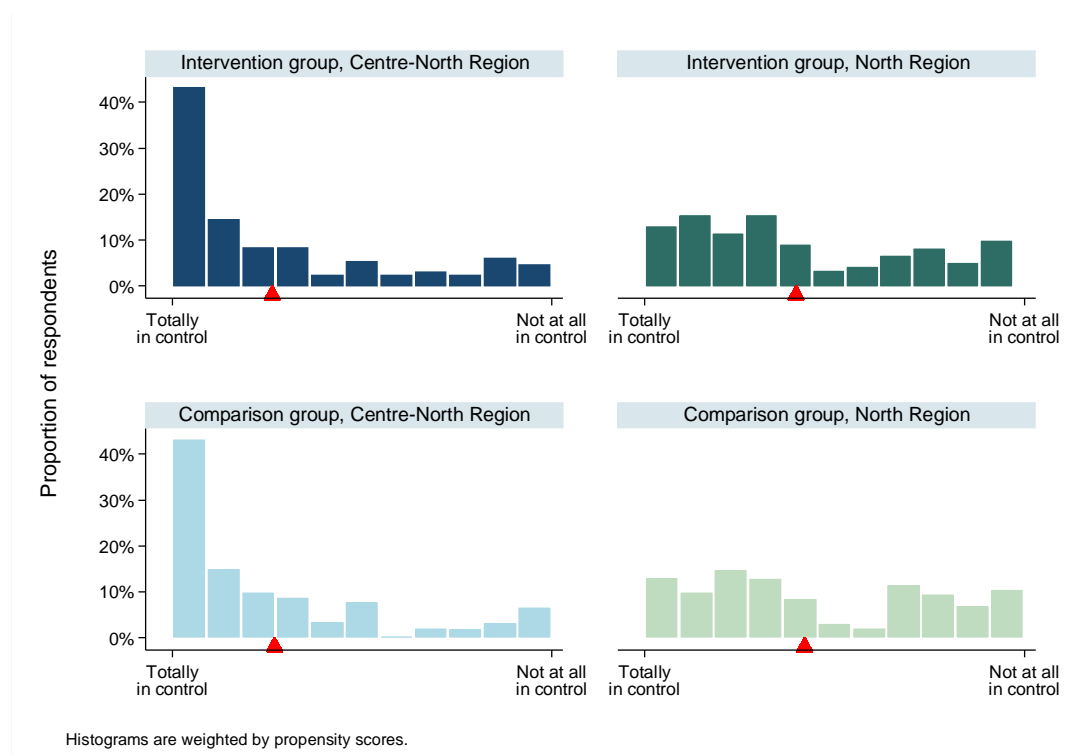
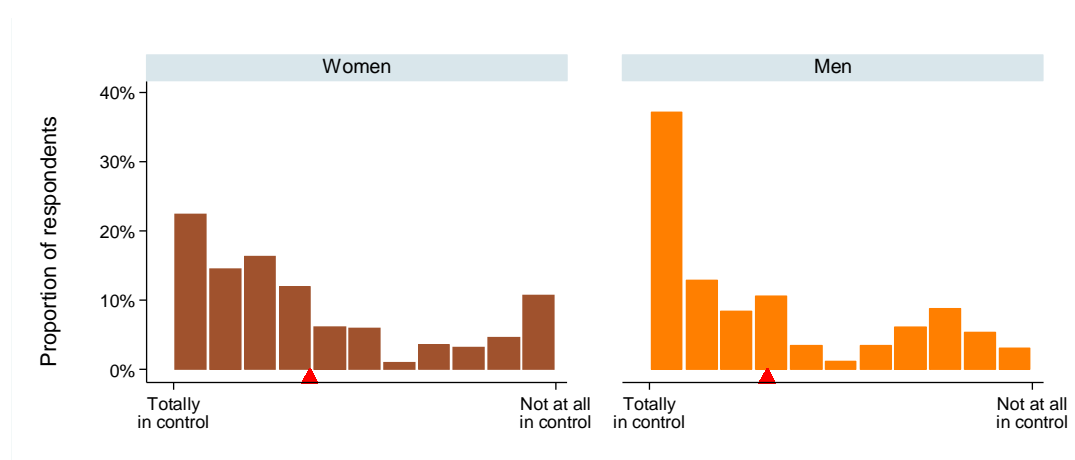


Figure 6.18: Histograms of responses as to whether respondents felt that they were in control of the response to the situation they described, by respondent gender



As would be expected, respondents who said that they were better prepared for the situation were more likely to say that their outcome afterwards was better than before. However, there was no clear connection between having control over the response and the final outcome.²⁸

In examining the narratives themselves, it is difficult to understand in most cases what respondents are referring to in saying that their situation has improved. In some cases, the situation described was an illness from which the individual has now recovered. In other cases, the narrative discussed a crisis (most often related to the harvest), with no improvement being mentioned. There are no clear cases in the narratives of an adaptation or transformation in the respondent's or household's situation leading to a better outcome than would have been achieved without the crisis.

It seems likely, then, that many respondents interpreted this question to be about whether their situation has improved since the time of the crisis that they were referring to, rather than since *before* that crisis. That is, the responses probably reflect whether the respondent has been able

to recover from the crisis. The positive difference between the project participants and comparison respondents shown in Table 6.14 anyway reflects positively on the PRSAN project.

Recalling the discussion from the beginning of Section 6.2, it seems that there are two possible interpretations of the positive difference between the project participants and comparison respondents in terms of their post-crisis outcomes. The first is that the PRSAN activities (combined with ATAD's and ODE's previous interventions) had led to the impact of shocks and stresses being reduced among the project participants. If the negative consequences of the crises that the project participants discussed during the interview were generally less severe than those described by the comparison respondents, then they would naturally be able to recover from them more quickly. The second possibility is that there was no difference in the severity of the crisis situations faced by the two groups of respondents, but that the project activities enabled participants to recover more quickly. Of course, it is possible that the pattern we observe in Table 6.14 is due to a combination of these two effects.

Table 6.14: Proportion of respondents reporting that their situation is now better than before, or no worse than before, the event described in their narrative

	1	2
	Situation is better than before (%)	Situation is no worse than before (%)
Overall		
<i>Intervention group:</i>	21.4	37.0
<i>Comparison group:</i>	14.1	34.6
<i>Difference:</i>	7.4* (4.1)	2.4 (5.2)
<i>Observations (intervention group):</i>	261	261
<i>Observations (total):</i>	764	764
Centre-North Region		
<i>Intervention group:</i>	22.2	37.0
<i>Comparison group:</i>	14.7	35.7
<i>Difference:</i>	7.5 (4.8)	1.3 (6.1)
<i>Observations (intervention group):</i>	135	135
<i>Observations (total):</i>	387	387
North Region		
<i>Intervention group:</i>	17.5	36.5
<i>Comparison group:</i>	10.5	28.7
<i>Difference:</i>	7.0* (3.7)	7.8 (5.5)
<i>Observations (intervention group):</i>	126	126
<i>Observations (total):</i>	377	377

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

6.2.3 Confidence in dealing with crises in the future

The next question asked to respondents was about whether they have confidence that they would be able to manage a situation similar to the one they described if it arose again in the future. Responses were again collected using a slider, and the distribution is shown graphically in Figure 6.19.

There is no significant difference between the confidence felt by project participants and comparison households in the Centre-North.²⁹ However, project participants in the North expressed significantly more confidence that they would be capable of managing such a situation in the future. The difference was approximately seven percentage points along the scale from 'totally capable' to 'not at all capable'.

There is also some evidence (though statistically significant only at the 10 percent level) that respondents in households identified at the start of the project as 'very poor' felt more confident than did those in 'poor' households about coping with a similar situation in the future.³⁰

Again, it is possible that the project participants had generally described crisis situations that were less severe than those described by comparison respondents, and that this is the reason for their greater confidence that they could cope with a similar situation in the future. Whether or not this is the case, these results imply a positive effect from the project on resilience in the North Region.

Confidence in ability to cope with a similar situation in the future is strongly associated with whether the respondent had felt prepared for the first situation described, and (less strongly, but still significantly) with whether they felt they had control over the response. In addition, those who had responded to the crisis by reducing their consumption were less likely to have confidence in their ability to deal with such a situation in the future.³¹ It is not clear whether this is because those who had to reduce their level of consumption had faced more severe crises than the others, or whether the severity of the crises were similar, but their vulnerability was greater. However, it should be noted that this relationship holds when controlling for the index of household wealth described in Section 6.1.6, which is likely to be correlated with vulnerability. This suggests that the former explanation – that those who had reduced their consumption had generally experienced worse crises – may be the more important one. If so, then the responses to the question about confidence in dealing with a similar crisis in the future may be telling us more about the nature of the crisis that was faced than about resilience to future crises.

As shown in Figure 6.20, women were generally less confident than men in their ability to manage in the future. The data also provide some evidence that this was particularly true of respondents in woman-headed households – that is, that they felt even less confident than did other women respondents.³²

Figure 6.19: Histogram of responses as to whether respondents feel able to manage a situation similar to the one described, if it were to occur again in the future

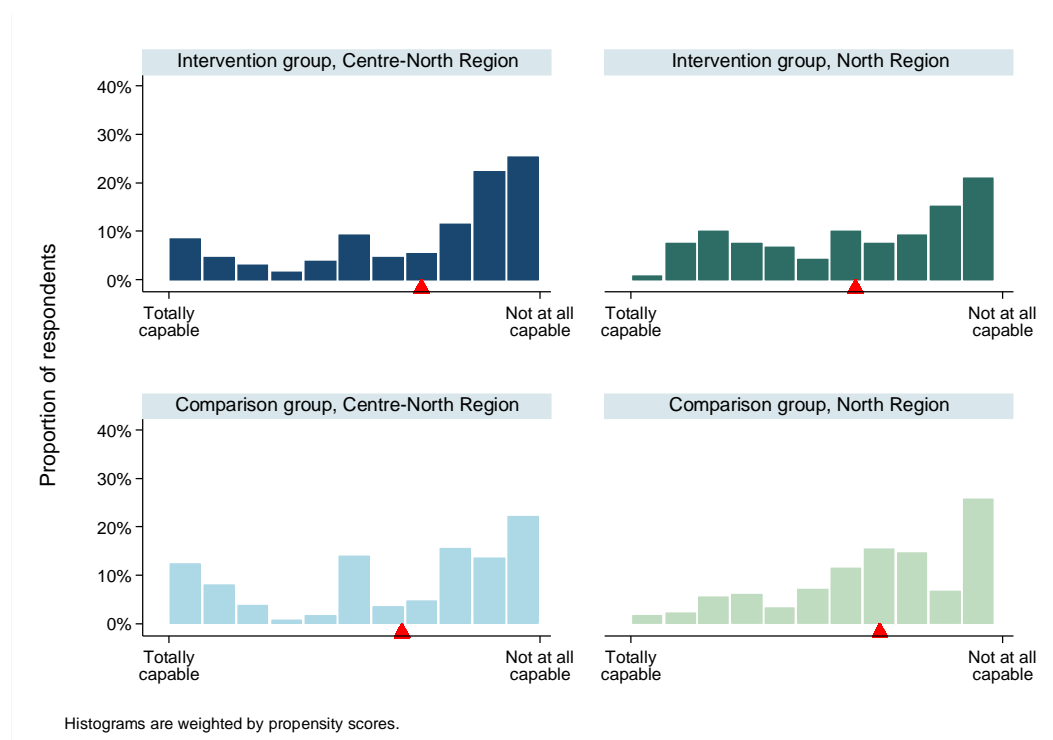
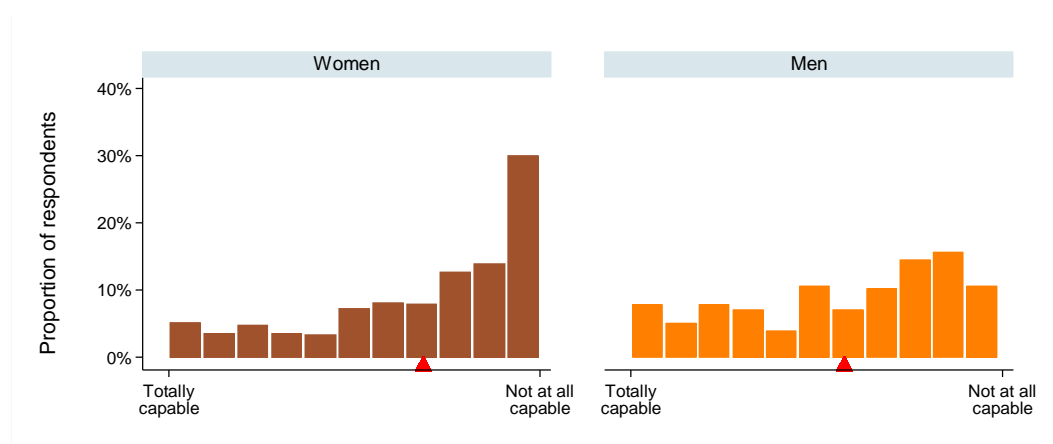


Figure 6.20: Histogram of responses as to whether respondents feel able to manage a situation similar to the one described, if it were to occur again in the future, by respondent gender



6.2.4 Underlying causes of the situation described

The final section of the SenseMaker interview sought to investigate respondents' perceptions of the underlying factors that led to the situation they described, and whether they are able to take any action to address these factors. As described in Section 5.2, these questions were intended to examine whether the project has built transformative capacity, as well as to better understand people's awareness of and perspective on the systemic causes of the shocks and stresses they faced.

The first question asked was about whether a situation similar to that described is likely to affect others in the coming years, or whether the situation was something *ad hoc* that is not likely to happen to others. This question was aimed at assessing whether the type of situation experienced by the respondent was a collective problem that has systemic causes. As can be seen in Figure 6.21, most respondents thought that situations similar to theirs were likely to

affect others in the future. (Many of those who gave responses in the middle of the scale had provided narratives about illness or death of family members, cases in which it was less clear what the appropriate response to this question was.) There is little difference in the distribution of these responses across regions or between the intervention groups – with the exception that women in the intervention group were less likely than women in the comparison group to say that the situation they described will affect others in the future.

Respondents were then asked directly what they believed to be the underlying causes that led to the situation they described. It was particularly difficult to frame this question in a way that would reveal people's level of awareness of and beliefs about these underlying causes without imposing a framework that did not align with their own perceptions. The approach adopted was to suggest to respondents several possibilities for the underlying causes (as listed in Figure 6.22), but also to invite respondents to provide their own explanation. Multiple responses were allowed.

The breakdown of results in Figure 6.22 shows that almost half of the respondents (53 percent in the Centre-North, 41 percent in the North) stated that changes in the climate or seasonal patterns was one of the underlying causes of the situation they had described. Many also mentioned desertification. Among those who had shared a narrative relating to drought, other weather events, crop production or livestock, 79 percent in the Centre-North and 66 percent in the North mentioned climate change as a root cause of the problem. (As expected, among those who shared a narrative on some other subject, fewer than five percent mentioned climate change as a root cause.) The project participants, at least in the Centre-North, were less likely than the comparison respondents to mention climate change as a cause, but this difference is mostly accounted for by differences in the themes of the narratives shared by the project participants and comparison respondents.

Figure 6.21: Histogram of responses as to whether a similar situation is likely to affect others in the coming years

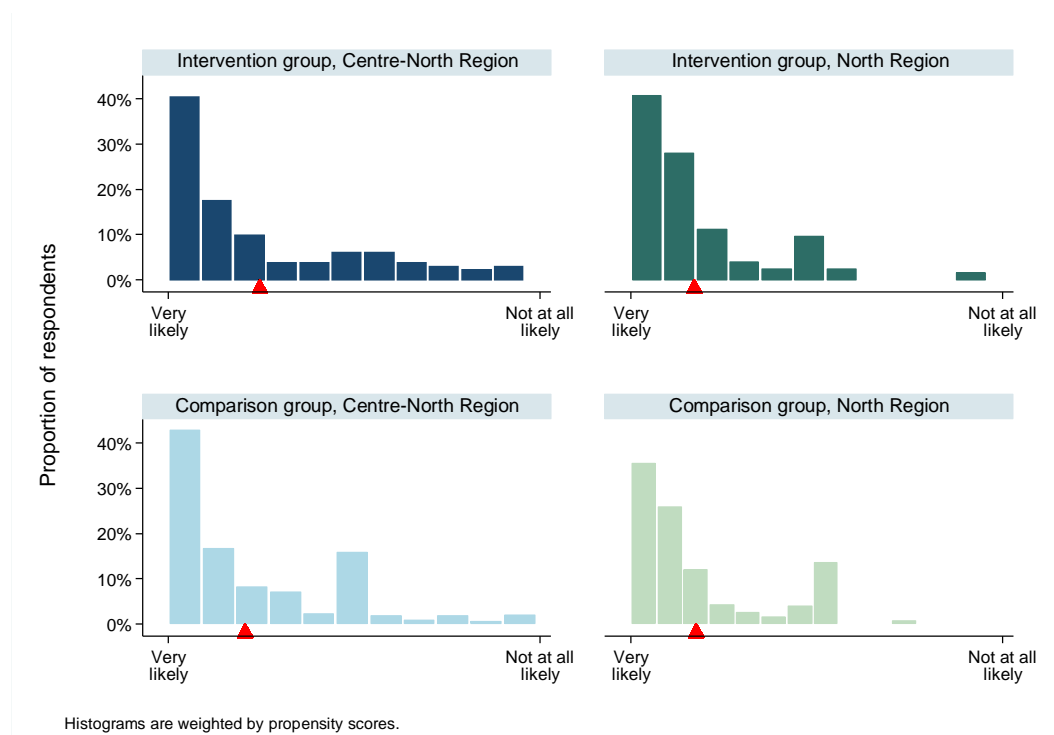


Figure 6.22: Underlying causes of the situation described

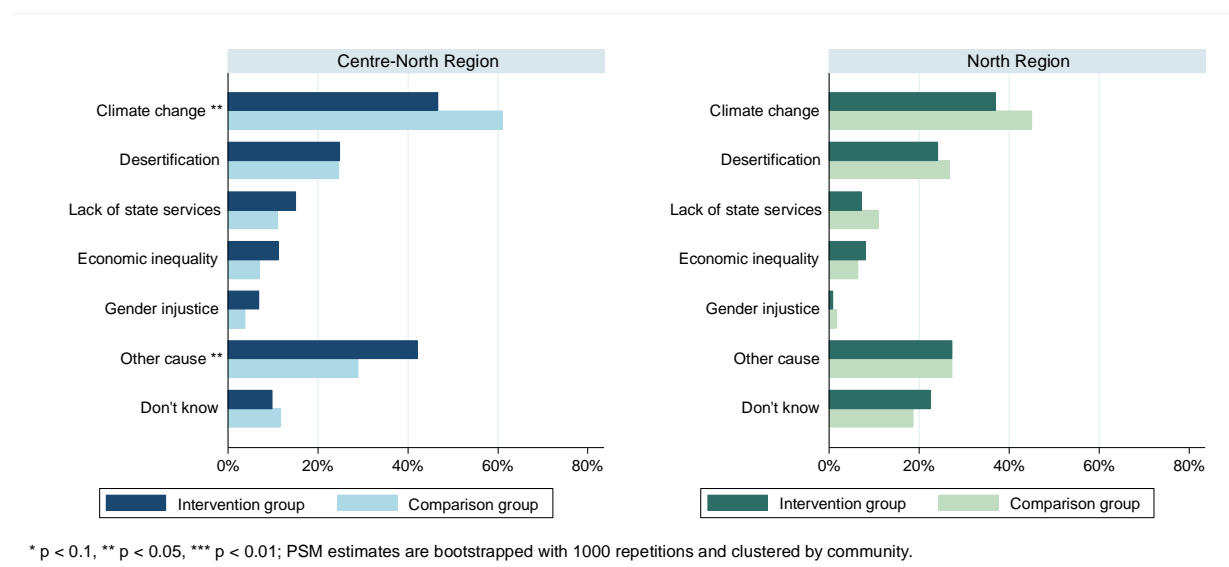
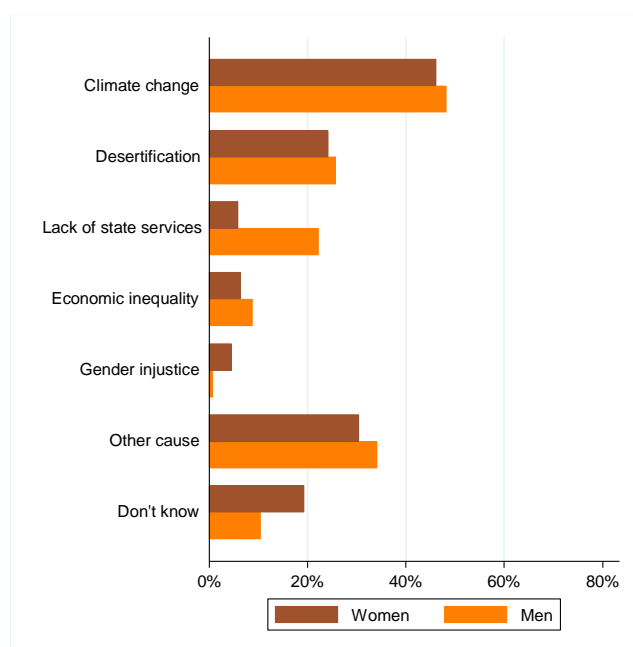


Figure 6.23 Underlying causes of the situation described, by respondent gender



Only small numbers of respondents mentioned lack of state services, economic inequality or gender injustice as root causes of the problems they cited. However, there are important gender differences in these respects. In particular, 22 percent of men mentioned the lack of state services as a cause, against only six percent of women. In contrast, 23 of the 25 respondents who mentioned gender injustice were women.

Of those who mentioned 'other' underlying causes of the situation described in the narrative, most cited what we would consider to be *intermediate* causes of the problems they faced, such as 'illness', 'mosquitos', or 'lack of food'. Other respondents raised idiosyncratic issues, or cited God's will as a cause, or said that the root causes are known only to God. Since few of these 'other' responses related to underlying causes of vulnerability as understood within Oxfam's resilience framework, we can take those who gave one of the first five responses listed in Figure 6.22 as approximately corresponding to those who have a good awareness of those underlying causes. This applied to 61 percent of the respondents interviewed, and did not differ significantly between the project participants and the comparison respondents, nor by region or gender. Not surprisingly, few of those who said that the situation they described is unlikely to

occur to others in the future (that is, those with responses on the right-hand side in Figure 6.21) cited an underlying cause.

The remaining questions in the SenseMaker interview were aimed at understanding whether respondents felt themselves to have any power to make changes in the underlying causes of the situation they faced. The first indicator considered was whether they had ever discussed the underlying causes with others in their community, with the answer being recorded simply as 'yes' or 'no'. As can be seen in the first column of Table 6.15, just over half of the respondents answered positively, but there are no differences between the intervention or comparison groups, or between regions. There was, however, a very large gender difference in responses to this question: 74 percent of men said that they had discussed the root causes with others, against only 40 percent of women.

Another triad was used to elicit respondents' views as to what type of change they believe is needed in order to address the underlying causes of the situation that affected them. Specifically, respondents were asked to what extent changes were needed in people's attitudes in behaviour, in community-level organization, or in government policy. The distribution of results is shown in Figure 6.24. Those in the Centre-North were more likely to say that changes are required at a policy level, while those in the North were more likely to say that the required change is needed in individual attitudes and behaviour. Women also gave slightly more emphasis than men to the need for individual-level changes. There were no significant differences between the project participants and comparison respondents in the distribution of these responses.

Interestingly, those who cited climate change or desertification as underlying causes of the problem put more emphasis than others on changes being needed at a community level. These respondents were presumably referring to local-level measures that can be taken to adapt to or to reduce the effects of climate change (such as soil conservation measures).

Figure 6.24: Distribution of survey responses across the triad for what types of change are necessary in order to change the root causes of the situations faced by respondents

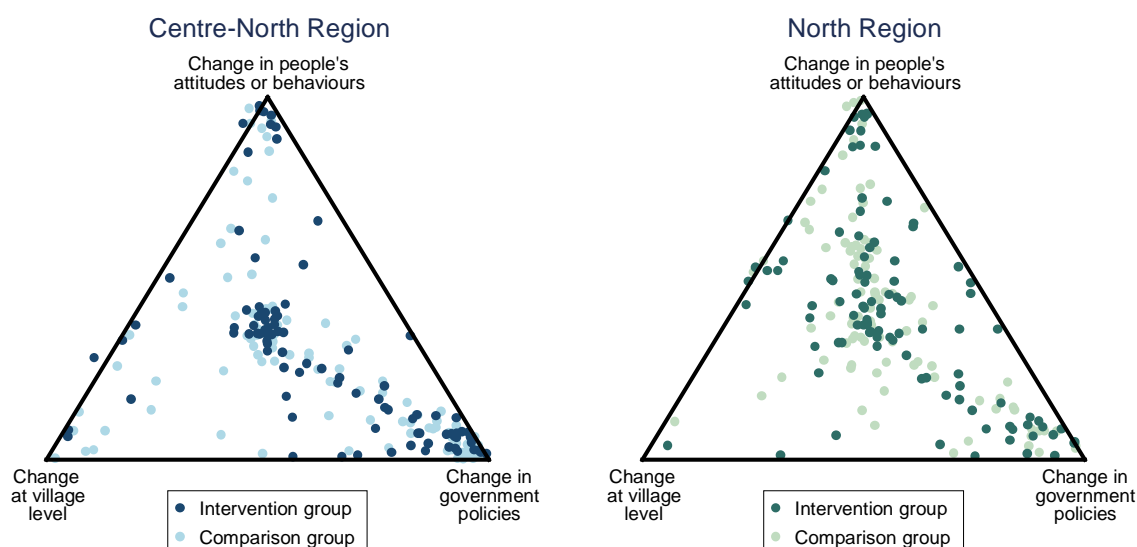


Table 6.15: Proportion of respondents reporting that they have discussed the root causes of the situation they described with others in the community, or have taken collective action to address the underlying causes of vulnerability

	1	2
	Discussed the underlying causes with others (%)	Able to take collective action to address the underlying causes (%)
Overall		
<i>Intervention group:</i>	49.6	59.5
<i>Comparison group:</i>	50.7	55.8
<i>Difference:</i>	-1.2 (6.2)	3.7 (6.2)
<i>Observations (intervention group):</i>	253	243
<i>Observations (total):</i>	743	725
Centre-North Region		
<i>Intervention group:</i>	50.4	60.5
<i>Comparison group:</i>	52.0	55.7
<i>Difference:</i>	-1.6 (7.3)	4.8 (7.3)
<i>Observations (intervention group):</i>	127	119
<i>Observations (total):</i>	370	356
North Region		
<i>Intervention group:</i>	45.2	54.0
<i>Comparison group:</i>	44.3	56.3
<i>Difference:</i>	0.9 (7.2)	-2.2 (8.6)
<i>Observations (intervention group):</i>	126	124
<i>Observations (total):</i>	373	369

Samples are restricted to those who provided a response to each of the corresponding questions.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Finally, respondents were asked whether they are able to take any collective measures to address the underlying causes they mentioned. As can be seen in the second column of Table 6.15, the majority answered positively. Table 6.15 shows the figures among all those who answered this question. When restricted to those who had cited one of the first five underlying causes listed in Figure 6.22, 74 percent said that they have some ability to take collective action. This proportion did not differ between the project participants and comparison respondents overall, nor by region or gender.

What type of collective action respondents were thinking of was, in general, not recorded. The only examples in the narratives that seem to relate to this are communal actions around soil conservation, such as the construction of *zaï*. The evaluation team had intended to ask about the underlying causes and about the potential for collective action as a way to assess the level of transformative capacity – the capacity to affect change in the ‘rules of the game’. However, to the extent that people’s primary concerns are related to climate, the potential for them to take collective action to address the underlying causes is of course limited. For that reason, it seems natural that many respondents interpreted these questions as asking about their potential to take action to collectively build capacity to adapt to and absorb the effects of climate change.

7 CONCLUSIONS

7.1 CONCLUSIONS

This Effectiveness Review provides evidence that the PRSAN project has had a significant positive effect on the resilience of participants.

This evidence comes from two sources. Firstly, analysis of data from the household survey shows that the households of project participants met the thresholds to score positively in terms of approximately 33 percent of the indicators of resilience, compared to 29 percent among comparison households. The participant households were growing a wider range of crops than the comparison households (largely as a result of many of them being engaged in market gardening), and a higher proportion of them were using improved seeds and applying soil conservation techniques. They were also more likely to be aware of the existence of an early-warning committee in their community, and to say that they make use of rainfall information in their agricultural activities – though the proportions who reported doing so are small, even in the project communities. As a result of the market gardening activities, women in the project communities were much more likely to have some control over decisions in crop production. In addition, in the Centre-North, participation in community groups was higher in the project communities than in the comparison communities, both among women and among men.

On the other hand, the household survey data do not provide evidence of impact on some of the key outcomes that the project was intended to influence. The volume of production of the main staple crops was approximately the same among the project participants and the comparison households. There was no difference between those two groups in the proportions that were engaged in processing natural products or in running household businesses, and little difference in access to credit.

Although many of the project participants reported receiving goats or poultry over the project's lifetime, the numbers of livestock owned at the time of the survey did not differ between the project participants and the comparison households. One potential explanation for this could be that project participants who had received livestock under PRSAN had been better able to absorb the effects of subsequent crises by selling livestock; if so, then the effects of those crises on their food security or well-being would be reduced. However, we find little evidence of an impact from the project on key indicators of material well-being at the time of the survey, whether measured in terms of number of meals consumed, dietary diversity, wealth indicators (such as housing conditions and asset ownership), or expenditure on education and health. The only exception is that the project appears to have had the effect of increasing dietary diversity specifically among woman-headed households – presumably as a result of enabling many of them to engage in market gardening.

The responses to the SenseMaker interview provide a separate indication of how the PRSAN project has affected households' resilience. When asked to discuss details of a situation that negatively affected their household's well-being during 2016, the project participants in the Centre-North generally reported feeling that they were better prepared to deal with the situation than the comparison respondents. They were also more likely than the comparison respondents to have received support from associations or other community-level institutions, while the project participants in the North were more likely to say that they had received support from NGOs.

Men in project communities in both regions were considerably more likely than men in the comparison communities to say that they are better off now than before the situation arose. However, this result does not apply among women in project communities. It is not clear whether this is because women tended to describe situations that were more severe than men,

whether the project activities have tended to benefit men than women, or whether men were generally more inclined than women to report that their situation had improved.

A key indicator from the SenseMaker analysis is how confident respondents felt that they could manage a similar crisis in the future. Even though it was the project participants in the Centre-North who felt more prepared for the crisis situation they described, it is in the North that the project participants expressed more confidence than comparison respondents that they could manage a similar situation in the future. In both regions, men expressed more confidence than women about being able to deal with future crises than women.

One of the aims of the SenseMaker analysis was to understand to what extent respondents are conscious of, and seeking to make changes in, the underlying causes of poverty and vulnerability. The results show high levels of awareness of climate change and desertification being key drivers of the crises they faced. Among those who had shared a narrative relating to drought, other weather events, crop production or livestock, 79 percent in the Centre-North and 66 percent in the North mentioned climate change as an underlying cause of the problem. On the other hand, few respondents mentioned other possible causes of these crises, such as lack of state services, economic inequalities or gender injustice. The majority of respondents said that they are able to engage in collective action to address the causes of the crises. However, it seems that many of those who responded positively were thinking of taking collective action to adapt to the effects of climate change (such as by engaging in communal soil conservation measures), rather than seeking to change the 'rules of the game' that underlies Oxfam's concept of transformative capacity.

An important factor to bear in mind when considering the results of the SenseMaker analysis is that respondents had an open choice about the situation that they discussed in the interview, as long as it had occurred during 2016. If we suppose that the project activities had enabled participants to manage crises better, then it is possible that some negative situations were averted that otherwise would have occurred and that project participants would have referred to in the interview. This would imply that during the survey the project participants were, on average, referring to situations that were less severe than the comparison respondents. The findings that project participants in the Centre-North felt more prepared for the crisis situation they described, and that those in the North were more confident about dealing with a similar situation in the future, are consistent with this hypothesis. On the other hand, if the project participants had generally been describing less severe situations, we would not expect that they would have received support from external actors at higher rates than the comparison respondents, as we see in the responses. Whichever of these situations is the case, the finding that the project had some positive effect on respondents' resilience still holds.

It is important to make one final observation in relation to the results of this Effectiveness Review. In the analysis we have attempted to compare the project participant households to comparison households who were as similar as possible in 2013 – that is, in the year before the PRSAN project was launched. However, it seems that the results to some extent reflect the impact of ATAD's and ODE's earlier project work in many of the same communities. When we control for more variables relating to households' activities in 2013 (as in done in the first robustness check report in Appendix 4), most of the significant differences between the project participants and comparison households are eliminated. This includes the positive effect on the resilience index and all the differences found in the SenseMaker analysis – although the positive effects on group participation and arguably on crop diversity are retained. This latter set of results may arguably provide a better reflection of the impacts of the PRSAN project in isolation from the partners' earlier interventions.

Building resilience is, of course, a long-term process, and we should not expect to be able to distinguish clearly the effects of different projects carried out sequentially with (most of) the same participants. However, it is important to be aware in this case that at least some of the positive impact that appears to have occurred on resilience has come about as a result of earlier programme work, rather than of the specific project in which Oxfam was involved.

7.2 PROGRAMME LEARNING CONSIDERATIONS

Seek to understand the role that artisanal gold mining plays in the economy of households and communities in the Centre-North Region, in order to find approaches to minimize its negative effects on health, school attendance and the local environment.

The Effectiveness Review highlights that large numbers of households in the Centre-North Region engaged in artisanal gold mining during 2016, amounting to 33 percent of households in the comparison group. Surprisingly, the data show that engagement in artisanal mining was even higher in the PRSAN project communities, at 46 percent of intervention group households. At the same time, the respondents who mentioned gold mining during the SenseMaker interview clearly recognized that it is a risky activity, and that it is not reliable as a source of income.

The programme team and partners are encouraged to explore what role artisanal gold mining plays in livelihoods in the Centre-North Region. In particular, it is important to understand how the decision to engage in artisanal mining may be affected by crises and by the opportunities provided by projects such as PRSAN. Given the harmful effects of artisanal mining to those engaging in it directly and to the local environment, such an understanding may inform a strategy by which future projects can help to reduce this harm. This may involve providing alternative activities that can substitute for artisanal mining in household livelihoods, or may involve promoting the adoption of safer practices in artisanal mining. It should be recognized that this is a complex problem and that experience elsewhere has not led to clear or simple solutions, so it will be crucial to work with others who are also seeking to understand and address this issue. Given that these challenges with artisanal gold mining exist in several countries in West Africa, there may be potential for Oxfam programmes across the region to work together, to share experience and learning on this subject.

Explore the reasons why the greater adoption of improved agricultural practices did not have a positive impact on the production of cereal crops in the project communities.

One of the most challenging results presented by the Effectiveness Review is the lack of a difference between the project and comparison communities in their production of staple crops (other than rice). That finding applies at least to crop production in 2016, but there are also indications in the data that the volume of crop production in 2015 differed little between the project and comparison communities. This is in spite of the greater rates of adoption in the project communities of many improved farming practices, such as the use of improved seeds or soil conservation techniques. It is important to review, then, why these improved practices are apparently not leading to significant increases in yields. This may involve investigating, for example, whether participants do not have enough confidence in the improved practices to adopt them at the scale at which they could have greatest effect, whether they are experiencing barriers in applying these techniques according to best practice, or whether some of the practices require favourable weather conditions in order to have an effect. A good starting point for this research may be to identify some producers in each community who have been able to use the improved practices to significantly improve their yields: enquiries could then focus on what has prevented their neighbours from following their example.

Reinforce efforts to link the early-warning committees to the technical services that provide meteorological information, so that they are able to provide useful and timely forecasting information to community members.

One of the objectives of the PRSAN project was to promote the use of meteorological information in informing farming decisions. A key responsibility of the early-warning committees established under the project is to disseminate weather forecasting information throughout their communities. Unfortunately, the project's final evaluation has found that many of the early-warning committees are not linked effectively with state technical services at a commune and higher level, and so they have not been able to provide useful information to community members (Issifou and Aka, 2017). Consistent with this, in the Effectiveness Review survey, the majority of respondents in the project communities did not know of the existence of an early-warning committee in their community, and only small numbers (21 percent of farming households in project communities in the Centre-North and 15 percent in the North) reported that they were making use of weather forecasting information in their farming decisions. However, while these figures are low, it is clear that at least *some* of the committees have enabled a larger share of farmers to access and act on meteorological information. These additional users of meteorological information tend to have lower education and literacy levels than those who have typically been able to make use of this information in the past (as witnessed by the situation in the comparison communities). This suggests that increased efforts to improve the functioning of the early-warning committees could play a valuable role in disseminating meteorological information to those who have not previously made use of it.

Assess how best to identify participants for community-level projects such as this, balancing participation and accountability in the targeting process with the need to accurately identify the most vulnerable.

The participants in the PRSAN project were identified through carrying out a participatory wealth ranking exercise, based on the Household Economy Approach (HEA). Community members were asked to specify criteria that characterize 'very poor', 'poor', 'middle-income', and 'better-off' households in their community, and then to categorize each household according to those definitions. Most of the criteria cited by community members related to ownership of livestock, land or other assets, or to household size. All the households identified as 'poor' and 'very poor' in each of the project communities were selected for participation in the activities of the PRSAN project; these households comprise the intervention group for this Effectiveness Review.

The comparison group was selected at random from across the population of the comparison communities, so it includes households from across the whole range of the four wealth categories as defined through the HEA. Since the comparison group includes 'middle-income' and 'better-off' households, we would expect the comparison households on average to have been wealthier before the project was launched (in 2013) than the intervention group households. However, the Effectiveness Review data provide only limited evidence for this pattern among households interviewed in the Centre-North, and no evidence for this pattern in the North Region. To some extent this may be because 'poor' and 'very poor' households in the PRSAN project communities had already benefited from the earlier interventions carried out by ODE and ATAD, and so were not clearly distinguishable from their (previously wealthier) neighbours. Perhaps of more concern is that there is little difference in the data between the 'poor' and 'very poor' households, in terms of their pre-project wealth levels, the productive activities they were engaged in in 2013, or their demographic characteristics.

It may appear from this that community members were taking considerations other than material poverty into account when identifying 'poor' and 'very poor' households at the start of the PRSAN project. It is possible that community members are using a more nuanced understanding of poverty than can be observed in our data – perhaps, for example, by considering factors such as recent illnesses or bereavements. It would be valuable to explore more closely when carrying out future participatory targeting exercises what factors are being taken into account in these processes. This knowledge may help to improve measurement approaches so that they better reflect participants' conceptions of wellbeing and poverty. On the other hand, it may be that this will highlight a need to change the balance between participation, transparency and objectivity in these selection processes.

APPENDIX 1: THRESHOLDS FOR CHARACTERISTICS OF RESILIENCE

Capacity	Characteristic	Threshold: a household scores positively if...	Connected to project logic?
Absorptive capacity	Availability of seasonal forecasting/ early-warning information	Respondent is aware of an early-warning committee or some other committee in the community that is dedicated to disseminating information on rainfall or seasonal forecasts, and reports having received information from that committee during 2016.	Yes
	Ownership of livestock	Household members own at least four cattle, donkeys or horses, 12 sheep, goats or pigs, or 50 poultry.	Yes
	Vaccination of livestock	Most or all of the household's holdings of each type of livestock were vaccinated and/or de-parasitized in 2016. <i>(This indicator is omitted in households that do not own any livestock.)</i>	Yes
	Access to drinking water	Household uses an improved source (a private tap, borehole or a covered well) as the main source of drinking water, and water is available from that source throughout the year.	No
	Improved construction of dwelling	House has an iron, concrete or wooden roof and a cement floor.	No
	Social support networks	Household members gave support to and/or received support from others in the community at least twice during 2016.	No
	Dietary diversity	During the last seven days, respondent consumed a carbohydrate source every day, a protein source on at least three days, and some fruit or vegetables on at least three days.	Yes
	Livelihood diversification	Women and men in the household both engaged during 2016 in some activity other than agriculture or rearing livestock that can be maintained to at least some extent in the case of drought. ^a	Yes
	Crop diversification	Household cultivated at least 10 different crops during 2016.	Yes
	Access to water for agriculture	Household engaged in market gardening during 2016, had water available for at least six months of 2016, and produced crops during at least two months during 2016.	Yes
Adaptive capacity	Remittances or formal earnings	Household had at least one member working in formal employment or received regular remittances during 2016.	No
	Savings	Respondent reports that the household would be able to fund unexpected medical expenses primarily from their savings, or that they could fund investment in a business opportunity of 50,000 francs CFA (approximately \$80) from their savings.	No
	Improved agricultural practices	Household used at least five of the following during 2016: improved seeds, composting/organic fertilizer, phyto-sanitary products, crop rotation, leaving land fallow, inter-cropping, weeding and burning of striga, mulching. <i>(This indicator is omitted in households that did not farm any crops in 2016.)</i>	Yes
	Soil protection measures	Household has planted any trees on its agricultural land since 2016, or applied soil conservation techniques (such as installing hedges, windbreaks, <i>zaï</i> , <i>demi-lunes</i> or <i>cordons pierreux</i>) during 2016.	Yes
	Ownership of productive assets	Household owns at least four of the following: cart, plough, dehusker, motor pump, bicycle, tricycle, motorcycle, other vehicle, sewing machine, solar panel, generator.	No
	Access to credit	Respondent reports that the household would be able to borrow 50 000 francs CFA to invest in a business opportunity, from a moneylender, a community association or group, or from a formal financial institution.	Yes
	Participation in community groups	Women and men in the household both participate in some association or other group in the community. ^a	Yes
	Adoption of innovative practices (other than those promoted by the project)	Household has adopted any innovations since 2013 that were <i>not</i> instigated based on the advice of a government service or an NGO.	No
	Literacy	The head of household and/or his or her spouse can read and write a simple letter, in any language.	No
	School attendance	At least two thirds of all the girls and two thirds of all the boys in the household aged between three and 16 years attended school on at least some days during the previous four weeks. <i>(This indicator is omitted in households with no children aged between three and 16 years.)</i>	No
Transformative capacity	Women's decision-making power in agriculture	Women in the household are said to be mainly responsible both for the decisions made on agricultural production and the use of the proceeds from that production, in terms of conventional (wet season) agriculture, market gardening, or both. <i>(This indicator is omitted in households with no women members.)</i>	Yes

^a In households in which there are no adult women or no adult men, these indicators are assessed only among men or only among women, respectively.

APPENDIX 2: BASELINE STATISTICS BEFORE MATCHING

Table A2.1: Comparison of intervention and comparison households in terms of descriptive statistics before matching

	Centre-North Region				North Region			
	Intervention mean	Comparison mean	Difference	Standard error	Intervention mean	Comparison mean	Difference	Standard error
<i>Number of households in the compound</i>	4.07	3.95	0.12	0.46	3.56	2.37	1.20***	0.23
<i>Number of household members^a</i>	9.09	8.98	0.10	0.44	7.76	8.33	-0.57	0.44
<i>Proportion of household members who are children (%)</i>	53.53	55.56	-2.03	1.99	46.27	50.74	-4.47**	2.20
<i>Respondent is female (%)</i>	65.25	67.44	-2.19	4.95	66.43	66.28	0.15	4.96
<i>Respondent's age (years)</i>	46.52	40.25	6.27***	1.55	50.87	46.51	4.37**	1.74
<i>Respondent's first language is Mooré (%)</i>	85.11	81.01	4.10	3.99	96.43	99.62	-3.19**	1.26
<i>Respondent has any education (%)</i>	19.86	27.91	-8.05	4.53	10.71	14.18	-3.46	3.52
<i>Respondent has any formal education (%)</i>	5.67	10.47	-4.79	2.96	6.43	8.81	-2.38	2.84
<i>Respondent can read and write a simple letter (%)</i>	13.48	15.50	-2.03	3.73	10.00	12.26	-2.26	3.34
<i>Household head is female (%)</i>	12.77	3.49	9.28***	2.60	20.00	15.71	4.29	3.96
<i>Head of household's age (years)</i>	52.01	47.35	4.66***	1.48	54.42	53.05	1.38	1.62
<i>Household head's first language is Mooré (%)</i>	86.52	77.52	9.01**	4.12	92.86	99.62	-6.76***	1.68
<i>Household head has any education (%)</i>	24.11	29.07	-4.96	4.67	16.43	18.01	-1.58	3.99
<i>Household head has any formal education (%)</i>	4.96	11.63	-6.66**	3.03	9.29	14.18	-4.89	3.46
<i>Household head can read and write a simple letter (%)</i>	21.99	22.87	-0.88	4.39	13.57	16.48	-2.90	3.79
<i>Household cultivated staple crops in 2013 (%)</i>	97.87	92.25	5.62**	2.43	97.14	94.25	2.89	2.23
<i>Area cultivated with staple crops in 2013 (hectares)</i>	2.69	2.71	-0.01	0.24	3.18	3.34	-0.16	0.22
<i>Household cultivated a market garden in 2013 (%)</i>	23.40	5.43	17.98***	3.26	49.29	11.88	37.41***	4.14
<i>Area of market garden cultivated in 2013 (hectares)</i>	0.11	0.05	0.06	0.04	0.16	0.02	0.14***	0.03
<i>Some household member engaged in paid agricultural labour in 2013 (%)</i>	4.96	3.10	1.86	1.99	24.29	24.90	-0.62	4.53
<i>Some household member engaged in processing natural products in 2013 (%)</i>	14.18	6.98	7.21**	3.06	21.43	17.62	3.80	4.11
<i>Some household member engaged in providing a paid service to others in 2013 (%)</i>	16.31	12.40	3.91	3.61	6.43	10.73	-4.30	3.03
<i>Some household member engaged in a household business in 2013 (%)</i>	16.31	22.09	-5.78	4.19	38.57	44.44	-5.87	5.18

	Centre-North Region				North Region			
	Intervention mean	Comparison mean	Difference	Standard error	Intervention mean	Comparison mean	Difference	Standard error
<i>Some household member engaged in artisanal gold mining in 2013 (%)</i>	43.26	35.66	7.60	5.09	7.14	5.36	1.78	2.49
<i>Some household member had regular salaried employment in 2013 (%)</i>	0.00	1.55	-1.55	1.04	1.43	1.92	-0.49	1.38
<i>Household received regular remittances in 2013 (%)</i>	14.18	14.34	-0.16	3.67	42.14	47.51	-5.37	5.22
<i>Distance of dwelling from the closest local market in 2013 (kilometres)</i>	4.56	3.45	1.12***	0.37	1.76	1.67	0.09	0.22
<i>Distance of dwelling from the closest large market in 2013 (kilometres)</i>	8.60	7.48	1.13	0.72	5.06	4.10	0.95***	0.30
<i>Household was in the lowest quintile of the wealth distribution in 2013 (%)</i>	25.53	17.05	8.48**	4.18	21.43	19.54	1.89	4.22
<i>Household was in the second quintile of the wealth distribution in 2013 (%)</i>	22.70	18.60	4.09	4.20	20.71	19.54	1.17	4.20
<i>Household was in the third quintile of the wealth distribution in 2013 (%)</i>	21.28	19.38	1.90	4.20	20.71	19.54	1.17	4.20
<i>Household was in the fourth quintile of the wealth distribution in 2013 (%)</i>	14.89	22.87	-7.97*	4.18	16.43	21.84	-5.41	4.19
<i>Household was in the highest quintile of the wealth distribution in 2013 (%)</i>	15.60	22.09	-6.49	4.17	20.71	19.54	1.17	4.20
<i>Observations</i>	141	258	399		140	261	401	

^a Household size is censored at 19, the maximum size allowable in the survey interface. 21 households (15 in the Centre-North Region and six in the North Region) were recorded with this maximum size, implying that some of them in reality have a larger number of members.

The construction of the wealth index is described in Section 6.1.6.

Variables dated 2013 are estimates, based on recall data.

* p < 0.1, ** p < 0.05, *** p < 0.01

Table A2.2: Comparison of intervention group households in terms of descriptive statistics, by 'poor' or 'very poor' designation

	Centre-North Region				North Region			
	'Poor' households	'Very poor' households	Difference	Standard error	'Poor' households	'Very poor' households	Difference	Standard error
<i>Number of households in the compound</i>	4.57	3.00	1.57**	0.73	3.70	2.92	0.78	0.63
<i>Number of household members^a</i>	9.06	9.13	-0.07	0.80	7.81	7.52	0.29	0.92
<i>Proportion of household members who are children (%)</i>	55.14	50.10	5.04	3.40	45.72	48.80	-3.08	5.01
<i>Respondent is female (%)</i>	65.63	64.44	1.18	8.66	62.61	84.00	-21.39**	10.34
<i>Respondent's age (years)</i>	45.56	48.56	-2.99	2.90	51.04	50.08	0.96	3.92
<i>Respondent's first language is Mooré (%)</i>	84.38	86.67	-2.29	6.48	95.65	100.00	-4.35	4.11
<i>Respondent has any education (%)</i>	21.88	15.56	6.32	7.24	11.30	8.00	3.30	6.87
<i>Respondent has any formal education (%)</i>	6.25	4.44	1.81	4.21	6.09	8.00	-1.91	5.45
<i>Respondent can read and write a simple letter (%)</i>	16.67	6.67	10.00	6.15	11.30	4.00	7.30	6.64
<i>Household head is female (%)</i>	10.42	17.78	-7.36	6.04	21.74	12.00	9.74	8.85
<i>Head of household's age (years)</i>	50.52	55.20	-4.68*	2.65	54.67	53.28	1.39	3.46
<i>Household head's first language is Mooré (%)</i>	84.38	91.11	-6.74	6.19	93.04	92.00	1.04	5.72
<i>Household head has any education (%)</i>	28.13	15.56	12.57	7.71	13.91	28.00	-14.09*	8.15
<i>Household head has any formal education (%)</i>	5.21	4.44	0.76	3.95	6.96	20.00	-13.04**	6.35
<i>Household head can read and write a simple letter (%)</i>	25.00	15.56	9.44	7.49	11.30	24.00	-12.70*	7.54
<i>Household cultivated staple crops in 2013 (%)</i>	41.57	44.00	-2.43	2.66	47.49	46.80	0.69	3.78
<i>Area cultivated with staple crops in 2013 (hectares)</i>	77.89	79.07	-1.18	7.64	92.04	96.00	-3.96	5.76
<i>Household cultivated a market garden in 2013 (%)</i>	14.74	11.63	3.11	6.37	8.85	4.00	4.85	6.02
<i>Area of market garden cultivated in 2013 (hectares)</i>	5.26	2.33	2.94	3.77	4.42	4.00	0.42	4.54
<i>Some household member engaged in paid agricultural labour in 2013 (%)</i>	8.42	4.65	3.77	4.79	7.96	4.00	3.96	5.76
<i>Some household member engaged in processing natural products in 2013 (%)</i>	49.94	54.24	-4.30	2.97	53.32	51.59	1.73	3.83
<i>Some household member engaged in providing a paid service to others in 2013 (%)</i>	83.72	91.89	-8.17	6.80	94.44	90.91	3.54	5.80
<i>Some household member engaged in a household business in 2013 (%)</i>	31.40	18.92	12.48	8.79	15.56	31.82	-16.26*	9.24

	Centre-North Region				North Region			
	'Poor' households	'Very poor' households	Difference	Standard error	'Poor' households	'Very poor' households	Difference	Standard error
<i>Some household member engaged in artisanal gold mining in 2013 (%)</i>	5.81	5.41	0.41	4.59	8.89	22.73	-13.84*	7.57
<i>Some household member had regular salaried employment in 2013 (%)</i>	26.74	13.51	13.23	8.22	13.33	22.73	-9.39	8.56
<i>Household received regular remittances in 2013 (%)</i>	96.88	100.00	-3.13	2.61	96.52	100.00	-3.48	3.69
<i>Distance of dwelling from the closest local market in 2013 (kilometres)</i>	2.52	3.06	-0.53	0.36	3.27	2.76	0.51	0.45
<i>Distance of dwelling from the closest large market in 2013 (kilometres)</i>	23.96	22.22	1.74	7.70	52.17	36.00	16.17	11.03
<i>Household was in the lowest quintile of the wealth distribution in 2013 (%)</i>	0.12	0.09	0.02	0.08	0.18	0.06	0.12	0.11
<i>Household was in the second quintile of the wealth distribution in 2013 (%)</i>	3.13	8.89	-5.76	3.92	23.48	28.00	-4.52	9.52
<i>Household was in the third quintile of the wealth distribution in 2013 (%)</i>	13.54	15.56	-2.01	6.35	22.61	16.00	6.61	9.10
<i>Household was in the fourth quintile of the wealth distribution in 2013 (%)</i>	15.63	17.78	-2.15	6.72	6.09	8.00	-1.91	5.45
<i>Household was in the highest quintile of the wealth distribution in 2013 (%)</i>	16.67	15.56	1.11	6.72	40.00	32.00	8.00	10.80
<i>Observations</i>	96	45	141		25	115	140	

^a Household size is censored at 19, the maximum size allowable in the survey interface. Six of the households in the intervention group (five in the Centre-North Region and one in the North Region) were recorded with this maximum size, implying that some of them in reality have a larger number of members.

The construction of the wealth index is described in Section 6.1.6.

Variables dated 2013 are estimates, based on recall data.

* p < 0.1, ** p < 0.05, *** p < 0.01

APPENDIX 3: METHODOLOGY USED FOR PROPENSITY-SCORE MATCHING

The results presented in Section 6 of this report were estimated using propensity-score matching (PSM). PSM is a statistical technique that allows us to estimate the effect of an intervention by accounting for the covariates that predict receiving the intervention, or ‘treatment’. The idea behind PSM is to match similar individuals in the intervention group to those in the comparison group, based on observed characteristics at baseline. After each participant is matched with a non-participant, the average treatment effect on the treated (those who benefited from the intervention) is equal to the difference in average outcomes of the intervention and the comparison groups after project completion. This appendix describes and tests the specific matching procedure employed in this Effectiveness Review. Our approach follows the guidance provided by Caliendo and Kopeinig (2008).

Estimating propensity scores

Finding an exact match for treated individuals, based on various baseline characteristics would be very hard to implement in practice. Rosenbaum and Rubin (1983) demonstrated that a ‘propensity score’ could summarize all this information in one single variable. The propensity score is defined as the conditional probability of receiving the intervention given background variables. Specifically, propensity scores are calculated using a statistical probability model (e.g. probit or logit) to estimate the probability of participating in the project, conditional on a set of characteristics.

Tables A3.1 and A3.2 show the variables used to estimate the propensity score. Here, we report the marginal effects at the mean, and the corresponding standard errors. Following Caliendo and Kopeinig (2008), only variables that influence the participation decision, but which are not affected by participation in the project, were included in our matching models. In the tables, the dependent variable corresponds to whether or not an individual received the intervention – it is equal to one if the household belongs to one of the communities that benefited from the project activities, and zero otherwise. The coefficients in the tables correspond to the marginal effects, i.e. the change in the probability of receiving the intervention if the independent variable is increased by one.

Defining the region of common support

After estimating the propensity scores, we need to verify that there is a potential match for the observations in the intervention group with those from the comparison group. This means checking that there is *common support*. The area of common support is the region where the propensity score distributions of the intervention and comparison groups overlap. The common support assumption ensures that each ‘treatment [intervention] observation has a comparison observation “nearby” in the propensity score distribution’ (Heckman *et al.*, 1999). Figures A3.1 and A3.2 show the propensity score density plots for both groups. We observe that, although the distributions of propensity scores are clearly different between the intervention and comparison groups in each case, there is a reasonably good area of overlap between the groups. However, in constructing the model for household-level outcomes, six observations from the intervention group in the Centre-North Region and 11 observations from the intervention group in the North Region were dropped because there was no suitable match for them in the comparison group. The consequence of this is that the estimates of outcomes derived from this model do not fully reflect the sample surveyed, but exclude a non-random minority.

Table A3.1: Estimating the propensity score: Centre-North Region

	Marginal effect	Standard error	p-value
<i>Number of households in the compound</i>	0.01	0.01	0.24
<i>Number of household members</i>	0.02*	0.01	0.02
<i>Proportion of household members who are children</i>	-0.20	0.17	0.22
<i>Respondent is female (1=Y, 0=N)</i>	0.01	0.06	0.91
<i>Respondent's age (years)</i>	0.01**	0.00	0.00
<i>Respondent's first language is Mooré (1=Y, 0=N)</i>	0.11	0.07	0.13
<i>Respondent has any formal education (1=Y, 0=N)</i>	-0.07	0.11	0.52
<i>Respondent can read and write a simple letter (1=Y, 0=N)</i>	0.02	0.08	0.78
<i>Household head is female (1=Y, 0=N)</i>	0.26*	0.12	0.03
<i>Household cultivated staple crops in 2013 (1=Y, 0=N)</i>	0.28*	0.14	0.05
<i>Area cultivated with staple crops in 2013 (hectares)</i>	-0.01	0.01	0.60
<i>Some household member engaged in providing a paid service to others in 2013 (1=Y)</i>	0.12	0.07	0.10
<i>Some household member engaged in artisanal gold mining in 2013 (1=Y, 0=N)</i>	0.10	0.05	0.06
<i>Some household member had regular salaried employment or received regular remittances in 2013 (1=Y, 0=N)</i>	0.03	0.07	0.72
<i>Distance of dwelling from the closest local market in 2013 (kilometres)</i>	0.02**	0.01	0.00
<i>Distance of dwelling from the closest large market in 2013 (kilometres)</i>	-0.00	0.00	0.77
<i>Household was in the lowest quintile of the wealth distribution in 2013 (1=Y, 0=N)</i>	0.27**	0.10	0.01
<i>Household was in the second quintile of the wealth distribution in 2013 (1=Y, 0=N)</i>	0.24**	0.09	0.01
<i>Household was in the third quintile of the wealth distribution in 2013 (1=Y, 0=N)</i>	0.20*	0.09	0.02
<i>Household was in the fourth quintile of the wealth distribution in 2013 (1=Y, 0=N)</i>	0.05	0.09	0.57
<i>Observations</i>	399		

The construction of the wealth index is described in Section 6.1.6. Variables dated 2013 are estimates, based on recall data.

Dependent variable is binary, taking 1 for project participant households, and 0 otherwise.

* p < 0.1, ** p < 0.05, *** p < 0.01

Table A3.2: Estimating the propensity score: North Region

	Marginal effect	Standard error	p-value
<i>Number of households in the compound</i>	0.06***	0.01	0.00
<i>Number of household members</i>	0.00	0.01	0.90
<i>Proportion of household members who are children</i>	-0.23	0.14	0.09
<i>Respondent is female (1=Y, 0=N)</i>	0.04	0.06	0.47
<i>Respondent's age (years)</i>	0.00	0.00	0.05
<i>Respondent's first language is Mooré (1=Y, 0=N)</i>	-0.42	0.25	0.09
<i>Respondent has any formal education (1=Y, 0=N)</i>	-0.01	0.12	0.96
<i>Respondent can read and write a simple letter (1=Y, 0=N)</i>	0.01	0.10	0.90
<i>Household head is female (1=Y, 0=N)</i>	0.00	0.08	0.98
<i>Household cultivated staple crops in 2013 (1=Y, 0=N)</i>	0.19	0.14	0.17
<i>Area cultivated with staple crops in 2013 (hectares)</i>	-0.01	0.01	0.57
<i>Some household member engaged in providing a paid service to others in 2013 (1=Y)</i>	-0.09	0.09	0.34
<i>Some household member engaged in artisanal gold mining in 2013 (1=Y, 0=N)</i>	0.05	0.11	0.67
<i>Some household member had regular salaried employment or received regular remittances in 2013 (1=Y, 0=N)</i>	-0.09	0.05	0.08
<i>Distance of dwelling from the closest local market in 2013 (kilometres)</i>	0.01	0.01	0.67
<i>Distance of dwelling from the closest large market in 2013 (kilometres)</i>	0.02**	0.01	0.01
<i>Household was in the lowest quintile of the wealth distribution in 2013 (1=Y, 0=N)</i>	0.00	0.10	0.98
<i>Household was in the second quintile of the wealth distribution in 2013 (1=Y, 0=N)</i>	0.05	0.09	0.57
<i>Household was in the third quintile of the wealth distribution in 2013 (1=Y, 0=N)</i>	0.01	0.09	0.94
<i>Household was in the fourth quintile of the wealth distribution in 2013 (1=Y, 0=N)</i>	-0.07	0.08	0.40
<i>Observations</i>	401		

The construction of the wealth index is described in Section 6.1.6. Variables dated 2013 are estimates, based on recall data.

Dependent variable is binary, taking 1 for project participant households, and 0 otherwise

* p < 0.1, ** p < 0.05, *** p < 0.01

Figure A3.1 Histogram of propensity scores in the intervention and comparison groups: Centre-North Region

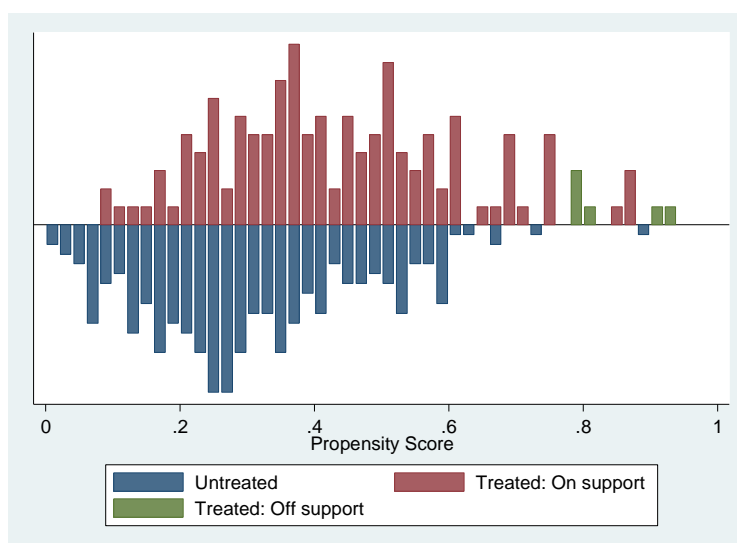
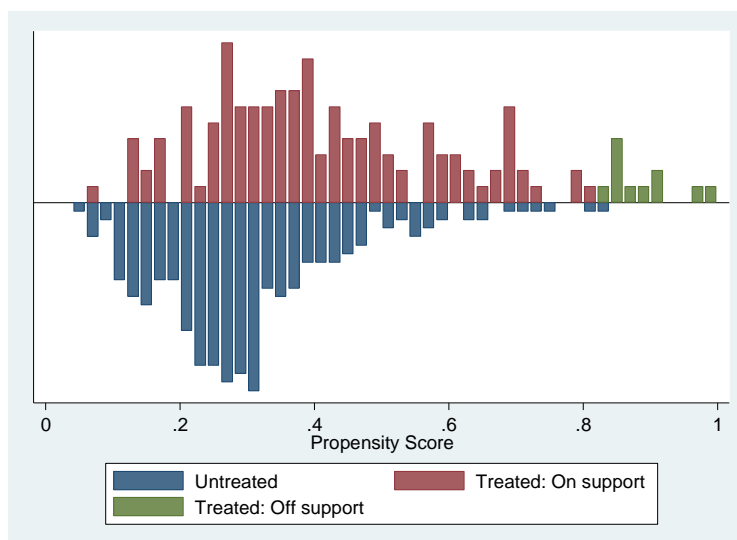


Figure A3.2 Histogram of propensity scores in the intervention and comparison groups: North Region



Matching intervention and comparison households

Following Rosenbaum and Rubin (1983), households were matched on the basis of their propensity scores, using a kernel matching algorithm. Kernel matching assigns more weight to the closest comparison group observations that are found within a selected 'bandwidth'. Thus 'good' matches are given greater weight than 'poor' matches. We use the *psmatch2* module in Stata (Leuven and Sianesi, 2003) with a bandwidth of 0.06 and restrict the analysis to the area of common support. When using PSM, standard errors of the estimates were bootstrapped using 1,000 repetitions to account for the additional variation caused by the estimation of the propensity scores, and were clustered at the community level.³³

Checking balance

For PSM to be valid, the intervention group and the matched comparison group need to be balanced. In other words, the intervention and comparison groups need to be similar in terms of their observed characteristics. The most straightforward method of doing this is to test whether there are any statistically significant differences in baseline covariates between both groups in

the matched sample. The balance of each of the matching variables after kernel matching is shown in Table A3.3. There are no statistically significant differences between the intervention and comparison groups in the matched sample for any of the matching variables. For most of these variables, the *p*-values for the difference in means tests are larger than 0.2. (The only exception is over whether respondents in the North Region were native speakers of Mooré, for which the value in the matched intervention group is 100 percent.)³⁴

We also consider whether the sample is balanced in terms of the demographic variables and recalled baseline variables listed in Appendix 2 that were not *used* for matching. This analysis should provide a check on how successful the matching model balances household characteristics other than those specifically used as matching variables. The comparisons in terms of these variables are shown in Table A3.4.

It can be seen that there are few statistically significant differences between the matched intervention and comparison groups in terms of these remaining variables. The main exceptions are over whether respondents were engaged in market gardening or processing of products in 2013. It has already been observed (in Section 4.1) that there are large differences in these respects between households in the project and comparison communities, probably as a result of ATAD and ODE's earlier project interventions in some of the PRSAN project communities. In Appendix 4 we check the robustness of our results by constructing an alternative PSM model that includes indicators of engagement in these activities in 2013 as additional matching variables.

With those exceptions, it appears that the intervention and comparison groups are well matched both in terms of the matching variables listed in Table A3.3 and the additional variables listed in Table A3.4. We can therefore conclude that we have found satisfactory matches for the *observable* household characteristics in our sample.

Aggregating results across regions

The resulting matching models were used to estimate the effects of the PRSAN project on the outcome measures within each of the two regions. These estimates were then aggregated using fixed-effects meta-analysis to provide an overall estimate of the project's effects. In this aggregate, the estimates from each region were weighted by the size of the intervention group in that region (that is, the number of 'poor' and 'very poor' households in the project communities that were included in the Effectiveness Review survey, as listed in Table 4.1). The fixed effects approach assumes that the project effect to be estimated was of the same size in each of the two regions (Borenstein *et al.*, 2009). Meta-analysis is carried out using the *metan* module in Stata (Harris *et al.*, 2007).

Table A3.3: Balancing test on matching variables

	Centre-North Region			North Region		
	Intervention group mean	Comparison group mean	p-value	Intervention group mean	Comparison group mean	p-value
<i>Number of households in the compound</i>	3.93	4.03	0.85	3.12	3.18	0.83
<i>Number of household members</i>	9.16	8.88	0.59	7.99	7.98	0.99
<i>Proportion of household members who are children (%)</i>	54.01	53.85	0.95	47.09	47.47	0.89
<i>Respondent is female (%)</i>	63.70	66.66	0.61	65.89	65.05	0.89
<i>Respondent's age (years)</i>	45.77	46.89	0.58	50.08	48.49	0.46
<i>Respondent's first language is Mooré (%)</i>	85.19	86.13	0.83	100.00	97.88	0.10
<i>Respondent has any formal education (%)</i>	5.93	5.21	0.80	6.98	7.76	0.81
<i>Respondent can read and write a simple letter (%)</i>	13.33	11.55	0.66	10.08	10.30	0.95
<i>Household head is female (%)</i>	10.37	10.19	0.96	17.83	15.32	0.59
<i>Household cultivated staple crops in 2013 (%)</i>	97.78	97.95	0.92	96.90	96.55	0.88
<i>Area cultivated with staple crops in 2013 (hectares)</i>	2.77	2.76	0.96	3.23	3.13	0.71
<i>Some household member engaged in providing a paid service to others in 2013 (%)</i>	16.30	13.61	0.54	6.20	6.58	0.90
<i>Some household member engaged in artisanal gold mining in 2013 (%)</i>	44.44	39.72	0.43	7.75	5.80	0.54
<i>Some household member had regular salaried employment or received regular remittances in 2013 (%)</i>	14.07	13.37	0.87	40.31	38.44	0.76
<i>Distance of dwelling from the closest local market in 2013 (kilometres)</i>	4.44	4.31	0.79	1.85	1.77	0.78
<i>Distance of dwelling from the closest large market in 2013 (kilometres)</i>	8.55	8.34	0.81	5.05	4.61	0.28
<i>Household was in the lowest quintile of the wealth distribution in 2013 (%)</i>	22.96	23.65	0.90	21.71	20.65	0.84
<i>Household was in the second quintile of the wealth distribution in 2013 (%)</i>	22.22	24.47	0.66	21.71	23.17	0.78
<i>Household was in the third quintile of the wealth distribution in 2013 (%)</i>	22.96	21.09	0.71	19.38	20.70	0.79
<i>Household was in the fourth quintile of the wealth distribution in 2013 (%)</i>	15.56	16.34	0.86	17.83	17.10	0.88

The construction of the wealth index is described in Section 6.1.6.

Variables dated 2013 are estimates, based on recall data.

* p < 0.1, ** p < 0.05, *** p < 0.01

Table A3.4: Balancing test on remaining demographic and recalled baseline variables

	Centre-North Region			North Region		
	Intervention group mean	Comparison group mean	p-value	Intervention group mean	Comparison group mean	p-value
<i>Respondent has any education (%)</i>	20.00	22.51	0.62	11.63	13.36	0.68
<i>Head of household's age (years)</i>	51.33	52.59	0.51	53.58	54.49	0.64
<i>Household head's first language is Mooré (%)</i>	86.67	77.29	0.05	96.12	97.88	0.41
<i>Household head has any education (%)</i>	24.44	23.63	0.88	16.28	15.75	0.91
<i>Household head has any formal education (%)</i>	5.19	6.49	0.65	9.30	12.19	0.46
<i>Household head can read and write a simple letter (%)</i>	22.22	19.63	0.60	13.18	13.15	0.99
<i>Household cultivated a market garden in 2013 (%)</i>	24.44	3.86	0.00	47.29	12.20	0.00
<i>Area of market garden cultivated in 2013 (hectares)</i>	0.11	0.04	0.09	0.15	0.02	0.00
<i>Some household member engaged in paid agricultural labour in 2013 (%)</i>	5.19	3.37	0.46	23.26	21.98	0.81
<i>Some household member engaged in processing natural products in 2013 (%)</i>	14.07	6.40	0.04	18.61	20.73	0.67
<i>Some household member engaged in a household business in 2013 (%)</i>	17.04	16.48	0.90	38.76	42.63	0.53
<i>Some household member had regular salaried employment in 2013 (%)</i>	0.00	0.56	0.39	1.55	1.64	0.96
<i>Household received regular remittances in 2013 (%)</i>	14.07	13.07	0.81	39.54	37.13	0.69

The construction of the wealth index is described in Section 6.1.6.

Variables dated 2013 are estimates, based on recall data.

* p < 0.1, ** p < 0.05, *** p < 0.01

APPENDIX 4: ROBUSTNESS CHECKS

In order to assess the robustness of the results presented in Section 6, a series of checks were carried out to determine whether the main findings of this report are sensitive to the estimation procedure – propensity-score matching with the kernel method – that was used to control for observable differences between the intervention and comparison group. This appendix presents five types of robustness checks.

1 PSM kernel model with additional recalled baseline characteristics

In constructing the PSM model described in Appendix 3, we omitted recalled variables relating to households' activities in 2013 that seemed likely to reflect the activities of the implementing partners' previous activities in the PRSAN project communities.

Here we test whether the results derived in Section 6 are sensitive to this assumption by constructing an alternative matching model that includes additional recalled characteristics on households' productive activities in 2013. Specifically, the revised model includes all the matching variables included in the model described in Appendix 3, as well as recalled data on:

- a. Whether any household members engaged in market gardening in 2013
- b. The size of any market garden cultivated in 2013
- c. Whether any household member engaged in paid agricultural labour in 2013
- d. Whether any household member engaged in processing natural products in 2013
- e. Whether any household member participated in a household business in 2013.

These variables were used to construct additional PSM kernel models, following a similar procedure to that described in Appendix 3. Bandwidths of 0.20 and 0.12 were applied in the Centre-North and North regions respectively. In the Centre-North Region, four of the 141 intervention group observations were dropped as being outside the area of common support. In the North Region, 26 of the 140 intervention group observations were dropped, which means that the model is less representative of the whole intervention sample interviewed than is the matching model described in Appendix 3.

In the tables below, we report the estimated differences between the intervention and comparison group.

2 PSM nearest neighbour model

The nearest neighbour matching algorithm matches each observation from the intervention group with an observation from the comparison group that is closest in terms of their propensity score. In this robustness check, we use the propensity scores derived in Appendix 3 and apply nearest neighbour matching 'without replacement', meaning that comparison observations can be matched to intervention observations only once.³⁵ In the Centre-North Region, a caliper of 0.53 is applied, to provide a limit on the difference in propensity scores over which pairs of observations are matched. Two of the 141 intervention group observations in the Centre-North were dropped as being outside the area of common support. In the North Region, no caliper was applied, but 11 of the intervention group observations are dropped as being outside the area of common support.

Again, in the tables below, we report the estimated differences between the intervention and comparison groups.

3 Linear regression

We also test the robustness of our outcome estimates by estimate the impact of project participation using ordinary least squares (OLS) regressions. The idea behind OLS is to isolate the variation in the outcome variable that is due to the intervention status – the project's impact – by controlling directly for the influence that observable differences between the intervention and comparison groups have on outcomes. To do this, we estimate Equation 1.³⁶

$$Y_i = \alpha + \beta_1 \tau_i + X_i' \delta + \varepsilon_i \quad (1)$$

Here, Y_i is the dependent variable (the outcome) and X_i is a column vector of the matching variables listed in Tables A3.1 and A3.2. The intervention status is given by a dummy variable (τ_i), which takes the value one if the household participated in the project, and zero otherwise. The key difference between this OLS regression model and the propensity-score matching procedure used in the main report is that the OLS regression estimates a direct parametric relationship between the covariates in X_i and the dependent variable Y_i . This means that it is possible to include the observations that were excluded due to being off common support in Section 6 by extrapolating the relationship between X_i and Y_i . It should be borne in mind, however, that extrapolating in this way may bias the results if the covariates are distributed very differently between the intervention and comparison groups (Rubin, 2001). However, in the case of our data, it appears that the covariates are sufficiently balanced for OLS regression methods to be valid.³⁷ In the tables that follow, only the estimate of β_1 will be reported.

4 Linear regression with propensity-score weighting

Following the example of Hirano and Imbens (2001) we also estimate an alternative set of OLS regressions that apply the same model as in Equation 1, but weighting the observations according to the propensity score. Observations are assigned weights equal to one for the intervention households and $\hat{P}(X_i)/(1 - \hat{P}(X_i))$ for the comparison households. The variable $\hat{P}(X_i)$ represents the probability of a household being in the intervention group, given their observable characteristics, measured through the vector of matching variables X_i – this was estimated in the probit regressions in Appendix 3. We report the estimates of β_1 in the same way as the standard OLS regressions.

In the remainder of this appendix, we report the results for each of these four robustness checks for the main results presented in the main body of the report. In each case, the estimates of the overall project effects are derived by using fixed-effects meta-analysis to aggregate the results across the two regions, weighting by the size of the intervention group in each region, as described in Appendix 3.

Table numbers in this appendix correspond to those in Section 6 of the report: Table A4.1 reports analysis of the same outcomes as Table 6.1, Table A4.2 reports analysis of the same outcomes as Table 6.2, and so on.

It is important to note that, as with the PSM methods used in the main body of the report, these alternative PSM and OLS models can only account for observable differences between the intervention and comparison groups. Unobservable differences may still bias the results.

Table A4.1: Participation in community groups

	1	2	3	4	5
	Number of types of group in which household members participate	Households in which any women participate in groups (%)	Number of types of group in which women participate	Households in which any men participate in groups (%)	Number of types of group in which men participate
Kernel matching with additional baseline matching variables					
<i>Centre-North</i>	0.75** (0.33)	19.6** (8.9)	0.77*** (0.29)	9.8 (7.9)	0.34** (0.17)
<i>North</i>	-0.04 (0.17)	-10.3 (6.8)	-0.08 (0.16)	3.6 (5.7)	0.12 (0.11)
<i>Overall</i>	0.62** (0.28)	14.7* (7.5)	0.63*** (0.24)	8.8 (6.7)	0.30** (0.14)
<i>Observations</i>	770	770	770	770	770
Nearest-neighbour matching					
<i>Centre-North</i>	0.66** (0.32)	11.5 (8.4)	0.62** (0.30)	7.9 (8.3)	0.34** (0.17)
<i>North</i>	0.09 (0.20)	-5.4 (6.8)	0.03 (0.18)	2.3 (7.0)	0.10 (0.12)
<i>Overall</i>	0.57** (0.27)	8.8 (7.1)	0.52** (0.26)	7.0 (7.1)	0.30** (0.15)
<i>Observations</i>	787	787	787	787	787
Linear regression					
<i>Centre-North</i>	0.84*** (0.27)	17.1** (7.1)	0.77*** (0.25)	12.4* (7.0)	0.42*** (0.14)
<i>North</i>	0.09 (0.15)	-7.8 (5.0)	0.04 (0.14)	3.5 (5.6)	0.12 (0.09)
<i>Overall</i>	0.72*** (0.22)	13.1** (6.0)	0.65*** (0.21)	11.0* (6.0)	0.37*** (0.12)
<i>Observations</i>	800	800	800	800	800
Linear regression with propensity-score weighting					
<i>Centre-North</i>	0.77*** (0.25)	17.8** (7.0)	0.73*** (0.23)	8.7 (6.2)	0.36*** (0.12)
<i>North</i>	0.10 (0.14)	-8.4* (5.0)	0.04 (0.14)	3.9 (4.9)	0.11 (0.09)
<i>Overall</i>	0.66*** (0.21)	13.5** (6.0)	0.62*** (0.19)	8.0 (5.3)	0.32*** (0.10)
<i>Observations</i>	800	800	800	800	800

Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.2: Households' farming activities during the rainy season in 2016

	1	2	3	4	5	6
	Households that cultivated any crops in 2016 (%)	Area farmed during the rainy season ^a (hectares)	Number of crop types cultivated in 2016	Households that engaged in market gardening in 2016 (%)	Area of market garden cultivated in 2016 (hectares)	Households in which women have primary responsibility for at least some decisions on crop production (%)
Kernel matching with additional baseline matching variables						
<i>Centre-North</i>	1.2 (2.0)	-0.03 (0.24)	0.77* (0.41)	4.3 (6.0)	-0.03 (0.10)	7.6 (6.0)
<i>North</i>	0.8 (0.9)	0.33 (0.25)	-0.30 (0.60)	11.6 (8.1)	0.01 (0.06)	4.5 (7.8)
<i>Overall</i>	1.1 (1.7)	0.03 (0.20)	0.60* (0.36)	5.5 (5.2)	-0.02 (0.09)	7.1 (5.1)
<i>Observations</i>	770	747	770	770	770	770
Nearest-neighbour matching						
<i>Centre-North</i>	0.7 (1.6)	0.13 (0.21)	1.24*** (0.43)	13.7** (6.2)	0.01 (0.11)	14.4*** (5.4)
<i>North</i>	0.0 (0.8)	0.10 (0.24)	0.13 (0.61)	27.9*** (9.4)	0.10 (0.07)	14.7 (9.8)
<i>Overall</i>	0.6 (1.4)	0.12 (0.18)	1.06*** (0.37)	16.0*** (5.4)	0.02 (0.09)	14.4*** (4.8)
<i>Observations</i>	787	757	787	787	787	787
Linear regression						
<i>Centre-North</i>	0.9 (1.2)	0.11 (0.10)	1.24*** (0.37)	14.5*** (5.5)	0.04 (0.08)	10.1** (4.4)
<i>North</i>	0.8 (0.5)	0.16 (0.13)	0.28 (0.47)	27.2*** (9.6)	0.11** (0.05)	13.2 (9.1)
<i>Overall</i>	0.9 (1.0)	0.11 (0.08)	1.08*** (0.32)	16.5*** (4.9)	0.05 (0.07)	10.6*** (3.9)
<i>Observations</i>	800	772	800	800	800	800
Linear regression with propensity-score weighting						
<i>Centre-North</i>	1.1 (1.5)	0.09 (0.10)	1.10*** (0.35)	13.0*** (5.0)	0.03 (0.07)	9.8** (4.1)
<i>North</i>	0.5 (0.3)	0.25* (0.14)	0.42 (0.44)	28.7*** (9.1)	0.12** (0.05)	12.6 (8.7)
<i>Overall</i>	1.0 (1.2)	0.12 (0.08)	0.99*** (0.30)	15.6*** (4.5)	0.04 (0.06)	10.2*** (3.7)
<i>Observations</i>	800	772	800	800	800	800

^a Sample size is reduced because the corresponding question was missed in error in 16 interviews.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.3: Quantities of staple crops produced during 2016

	1	2	3	4	5	6
	Sorghum (kg)	Cowpeas (kg)	Millet (kg)	Maize (kg)	Rice (kg)	Total of these five crops (kg)
Kernel matching with additional baseline matching variables						
<i>Centre-North</i>	-204.14 (133.78)	1.05 (25.11)	-71.32 (84.39)	-8.56 (23.15)	20.67* (12.41)	-288.20 (202.25)
<i>North</i>	-48.21 (50.87)	15.28 (38.45)	-40.38 (56.16)	20.20 (18.37)	88.30 (54.77)	46.44 (94.98)
<i>Overall</i>	-178.81 (112.36)	3.36 (21.94)	-66.29 (71.27)	-3.88 (19.62)	31.65** (13.68)	-233.85 (170.10)
<i>Observations</i>	747	747	747	747	747	758
Nearest-neighbour matching						
<i>Centre-North</i>	-17.30 (84.99)	15.34 (23.14)	-47.65 (58.37)	-23.92 (25.73)	35.16** (14.22)	-12.15 (148.03)
<i>North</i>	-52.14 (51.16)	35.31 (32.32)	-67.64 (59.14)	38.55* (21.29)	128.95 (78.84)	85.85 (130.39)
<i>Overall</i>	-22.96 (71.67)	18.58 (20.08)	-50.90 (49.83)	-13.77 (21.82)	50.40*** (17.49)	3.77 (125.78)
<i>Observations</i>	757	757	757	757	757	768
Linear regression						
<i>Centre-North</i>	-33.75 (72.20)	15.88 (18.27)	-30.93 (41.87)	-7.73 (20.22)	25.41** (11.74)	-25.44 (117.17)
<i>North</i>	-73.01*** (26.78)	20.95 (25.28)	-18.43 (42.68)	26.78 (17.12)	108.01* (58.27)	67.71 (84.24)
<i>Overall</i>	-40.12 (60.63)	16.71 (15.85)	-28.90 (35.75)	-2.13 (17.16)	38.82*** (13.65)	-10.31 (99.09)
<i>Observations</i>	772	772	772	772	772	784
Linear regression with propensity-score weighting						
<i>Centre-North</i>	-37.59 (77.88)	12.65 (17.36)	-7.66 (41.80)	-9.66 (19.30)	29.83** (12.69)	-7.91 (119.59)
<i>North</i>	-65.11** (29.25)	34.39 (25.18)	-21.89 (41.46)	22.95 (14.73)	121.50** (56.61)	94.28 (85.62)
<i>Overall</i>	-42.06 (65.41)	16.18 (15.10)	-9.97 (35.66)	-4.36 (16.34)	44.72*** (14.05)	8.69 (101.13)
<i>Observations</i>	772	772	772	772	772	784

Sample sizes are reduced because the corresponding questions were skipped in error in 16 interviews.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.4: Consumption and sale of crops in 2016/17

	1	2	3	4
	Households with grain reserves remaining at the time of the survey in March 2017 (%)	Households with grain reserves remaining at the end of March 2016 (%)	Households with grain reserves remaining at the end of September 2016 (%)	Households that sold any of the crops they produced in 2016 (%)
Kernel matching with additional baseline matching variables				
<i>Centre-North</i>	-6.9 (7.4)	-4.0 (6.1)	1.3 (5.7)	1.2 (7.9)
<i>North</i>	0.1 (5.0)	-4.8 (5.5)	-4.3 (7.5)	-0.1 (7.6)
<i>Overall</i>	-5.7 (6.3)	-4.1 (5.2)	0.4 (4.9)	1.0 (6.7)
<i>Observations</i>	747	747	747	747
Nearest-neighbour matching				
<i>Centre-North</i>	-4.5 (7.4)	-1.5 (6.0)	1.5 (6.3)	3.7 (7.1)
<i>North</i>	4.8 (4.8)	-5.6 (5.1)	-4.8 (6.9)	4.0 (7.6)
<i>Overall</i>	-3.0 (6.3)	-2.2 (5.1)	0.5 (5.4)	3.8 (6.1)
<i>Observations</i>	757	757	757	757
Linear regression				
<i>Centre-North</i>	-5.6 (6.5)	-2.8 (5.6)	-2.3 (5.6)	6.7 (5.7)
<i>North</i>	2.4 (3.5)	-4.6 (4.5)	-2.3 (5.6)	2.7 (6.3)
<i>Overall</i>	-4.3 (5.5)	-3.1 (4.7)	-2.3 (4.8)	6.0 (4.9)
<i>Observations</i>	772	772	772	772
Linear regression with propensity-score weighting				
<i>Centre-North</i>	-4.7 (6.3)	-2.0 (5.5)	0.5 (5.6)	6.5 (5.8)
<i>North</i>	3.0 (3.9)	-4.1 (4.3)	-5.7 (5.7)	4.3 (7.0)
<i>Overall</i>	-3.5 (5.3)	-2.3 (4.6)	-0.5 (4.8)	6.1 (5.0)
<i>Observations</i>	772	772	772	772

Sample sizes are reduced because the corresponding questions were skipped in error in 16 interviews.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.5: Ownership and vaccination of livestock

	1	2	3	4	5
	Number of sheep and goats owned by households	Change in number of sheep and goats owned since 2013	Number of poultry owned by households	Change in number of poultry owned since 2013	Households in which most or all poultry were vaccinated in 2016 ^a (%)
Kernel matching with additional baseline matching variables					
<i>Centre-North</i>	-3.27** (1.65)	-4.16** (1.95)	0.21 (3.41)	2.59 (4.35)	8.8 (7.5)
<i>North</i>	-1.79 (1.53)	2.18 (1.54)	2.14 (2.07)	7.01** (3.22)	-2.1 (8.3)
<i>Overall</i>	-3.03** (1.41)	-3.13* (1.65)	0.52 (2.88)	3.31 (3.68)	7.0 (6.4)
<i>Observations</i>	770	770	770	770	704
Nearest-neighbour matching					
<i>Centre-North</i>	-2.91* (1.58)	-2.38 (2.22)	4.25 (2.74)	2.12 (3.76)	16.7** (7.5)
<i>North</i>	0.23 (1.46)	3.29** (1.62)	2.54 (2.28)	4.25 (2.64)	5.7 (8.0)
<i>Overall</i>	-2.40* (1.35)	-1.46 (1.88)	3.97* (2.32)	2.46 (3.18)	14.9** (6.4)
<i>Observations</i>	787	787	787	787	712
Linear regression					
<i>Centre-North</i>	-1.96 (1.23)	-1.97 (1.87)	4.59* (2.38)	1.92 (3.06)	12.7** (6.4)
<i>North</i>	-0.61 (1.08)	3.64*** (1.27)	1.64 (2.02)	4.79** (1.87)	1.7 (6.4)
<i>Overall</i>	-1.74* (1.05)	-1.06 (1.58)	4.11** (2.02)	2.39 (2.58)	10.9** (5.4)
<i>Observations</i>	800	800	800	800	736
Linear regression with propensity-score weighting					
<i>Centre-North</i>	-1.87* (1.10)	-2.10 (1.74)	4.65** (2.02)	2.15 (2.76)	10.5 (6.7)
<i>North</i>	-1.22 (0.96)	3.72*** (1.17)	1.32 (1.78)	4.39*** (1.68)	0.7 (6.4)
<i>Overall</i>	-1.77* (0.94)	-1.16 (1.47)	4.11** (1.71)	2.51 (2.33)	8.9 (5.7)
<i>Observations</i>	800	800	800	800	736

^a Among households who owned any poultry at the time of the survey.

Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.6: Households' engagement in non-agricultural productive activities in 2016

	1	2	3	4	5
	Paid agricultural labour (%)	Processing of natural products (%)	Providing a paid service (%)	Running a household business (%)	Artisanal gold mining (%)
Kernel matching with additional baseline matching variables					
<i>Centre-North</i>	1.0 (4.0)	-4.4 (4.9)	2.7 (4.4)	-1.8 (5.8)	14.4** (6.3)
<i>North</i>	0.5 (5.1)	2.8 (6.1)	2.7 (3.7)	3.1 (5.9)	0.4 (3.1)
<i>Overall</i>	0.9 (3.5)	-3.2 (4.2)	2.7 (3.7)	-1.0 (4.9)	12.1** (5.3)
<i>Observations</i>	770	770	770	770	770
Nearest-neighbour matching					
<i>Centre-North</i>	4.3 (3.7)	1.4 (5.4)	0.7 (3.5)	-1.4 (6.3)	10.8 (6.9)
<i>North</i>	-4.7 (5.7)	-3.1 (6.3)	4.7 (3.5)	-7.8 (6.6)	2.3 (2.5)
<i>Overall</i>	2.9 (3.2)	0.7 (4.6)	1.4 (3.0)	-2.5 (5.4)	9.4 (5.8)
<i>Observations</i>	787	787	787	787	787
Linear regression					
<i>Centre-North</i>	3.8 (3.5)	1.2 (4.5)	0.1 (2.3)	-0.3 (5.6)	8.4* (4.9)
<i>North</i>	-1.8 (4.7)	4.3 (5.6)	4.3 (2.8)	-5.6 (5.2)	2.0 (1.9)
<i>Overall</i>	2.9 (3.0)	1.7 (3.9)	0.8 (1.9)	-1.2 (4.7)	7.3* (4.1)
<i>Observations</i>	800	800	800	800	800
Linear regression with propensity-score weighting					
<i>Centre-North</i>	-1.1 (5.0)	1.3 (4.3)	0.2 (2.1)	-1.4 (5.1)	12.8** (5.2)
<i>North</i>	1.9 (4.6)	6.2 (5.4)	4.6 (3.0)	-4.3 (5.0)	2.4 (2.0)
<i>Overall</i>	-0.6 (4.3)	2.1 (3.7)	0.9 (1.9)	-1.9 (4.3)	11.1** (4.3)
<i>Observations</i>	800	800	800	800	800

Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.7: Households that are able to borrow for business investment

	1	2
	Households that could access credit from a community group (%)	Households that could access credit from a formal provider (%)
Kernel matching with additional baseline matching variables		
<i>Centre-North</i>	4.8 (6.3)	2.7 (1.9)
<i>North</i>	-0.1 (7.0)	0.5 (1.0)
<i>Overall</i>	4.0 (5.4)	2.4 (1.6)
<i>Observations</i>	770	770
Nearest-neighbour matching		
<i>Centre-North</i>	1.4 (6.7)	3.6* (2.0)
<i>North</i>	-4.7 (5.8)	-0.8 (0.9)
<i>Overall</i>	0.4 (5.7)	2.9* (1.7)
<i>Observations</i>	787	787
Linear regression		
<i>Centre-North</i>	1.4 (6.2)	2.9* (1.7)
<i>North</i>	-5.8 (4.4)	-0.2 (0.4)
<i>Overall</i>	0.3 (5.3)	2.4* (1.4)
<i>Observations</i>	800	800
Linear regression with propensity-score weighting		
<i>Centre-North</i>	3.0 (5.7)	3.0* (1.6)
<i>North</i>	-3.8 (4.4)	-0.1 (0.3)
<i>Overall</i>	1.9 (4.9)	2.5* (1.3)
<i>Observations</i>	800	800

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.8: Food consumption in the seven days prior to the survey

	1	2
	Respondents who consumed at least three meals per day during the past seven days (%)	Dietary diversity score (scale of zero to 105)
Kernel matching with additional baseline matching variables		
<i>Centre-North</i>	-4.2 (8.4)	0.75 (2.68)
<i>North</i>	-5.3 (5.0)	-0.30 (1.30)
<i>Overall</i>	-4.3 (7.0)	0.58 (2.25)
<i>Observations</i>	770	770
Nearest-neighbour matching		
<i>Centre-North</i>	-1.4 (7.6)	1.20 (2.99)
<i>North</i>	4.7 (4.3)	0.36 (1.33)
<i>Overall</i>	-0.4 (6.4)	1.07 (2.51)
<i>Observations</i>	787	787
Linear regression		
<i>Centre-North</i>	0.5 (6.0)	1.29 (2.83)
<i>North</i>	1.4 (3.3)	0.12 (1.03)
<i>Overall</i>	0.6 (5.1)	1.10 (2.38)
<i>Observations</i>	800	800
Linear regression with propensity-score weighting		
<i>Centre-North</i>	-1.8 (6.2)	1.81 (2.59)
<i>North</i>	0.9 (3.6)	0.09 (1.02)
<i>Overall</i>	-1.4 (5.3)	1.53 (2.18)
<i>Observations</i>	800	800

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.9: Index of wealth indicators

	1	2
	Wealth index at the time of the survey (standardized)	Change in standardized wealth index since 2013
Kernel matching with additional baseline matching variables		
<i>Centre-North</i>	-0.05 (0.11)	0.01 (0.07)
<i>North</i>	0.08 (0.10)	0.12* (0.06)
<i>Overall</i>	-0.03 (0.09)	0.03 (0.06)
<i>Observations</i>	770	770
Nearest-neighbour matching		
<i>Centre-North</i>	-0.03 (0.11)	0.03 (0.07)
<i>North</i>	0.12 (0.11)	0.08 (0.06)
<i>Overall</i>	-0.01 (0.09)	0.04 (0.06)
<i>Observations</i>	787	787
Linear regression		
<i>Centre-North</i>	0.06 (0.07)	0.06 (0.06)
<i>North</i>	0.13** (0.06)	0.08* (0.04)
<i>Overall</i>	0.07 (0.06)	0.06 (0.05)
<i>Observations</i>	800	800
Linear regression with propensity-score weighting		
<i>Centre-North</i>	0.04 (0.06)	0.07 (0.05)
<i>North</i>	0.11** (0.06)	0.07 (0.05)
<i>Overall</i>	0.06 (0.06)	0.07 (0.05)
<i>Observations</i>	800	800

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.10: Households' expenditure on children's education and on health in 2016

		1	2	
	Expenditure on health (francs CFA)	Expenditure on children's education (francs CFA)	Amount spent on girls' education (francs CFA)	Amount spent on boys' education (francs CFA)
Kernel matching with additional baseline matching variables				
<i>Centre-North</i>	-3,349 (18,339)	-16,690 (12,419)	698 (6,335)	-17,571* (9,847)
<i>North</i>	-108 (7,125)	-6,570 (11,492)	-3,147 (5,562)	-4,365 (8,529)
<i>Overall</i>	-2,823 (15,404)	-15,046 (10,568)	74 (5,382)	-15,426* (8,363)
<i>Observations</i>	721	745	754	752
Nearest-neighbour matching				
<i>Centre-North</i>	-2,890 (19,649)	-6,029 (17,767)	5,932 (7,110)	-7,847 (14,068)
<i>North</i>	1,148 (7,662)	-10,215 (11,815)	-8,226 (5,153)	-8,328 (8,193)
<i>Overall</i>	-2,234 (16,505)	-6,709 (15,005)	3,632 (6,014)	-7,926 (11,858)
<i>Observations</i>	727	759	764	764
Linear regression				
<i>Centre-North</i>	-8,813 (17,097)	-11,453 (13,605)	5,618 (6,151)	-16,996 (10,791)
<i>North</i>	-4,919 (5,232)	-8,714 (9,647)	-1,310 (4,415)	-8,035 (7,417)
<i>Overall</i>	-8,181 (14,345)	-11,008 (11,503)	4,493 (5,202)	-15,541* (9,118)
<i>Observations</i>	740	767	775	773
Linear regression with propensity-score weighting				
<i>Centre-North</i>	-8,608 (15,527)	-8,938 (11,675)	4,672 (5,496)	-13,705 (9,086)
<i>North</i>	-196 (5,504)	-9,094 (8,581)	-2,493 (3,585)	-7,063 (6,912)
<i>Overall</i>	-7,242 (13,036)	-8,963 (9,878)	3,509 (4,640)	-12,626* (7,693)
<i>Observations</i>	740	767	775	773

Analysis is carried out among respondents who were able to provide estimates of their households' expenditure on the corresponding items, and (in the cases of columns 2 to 4) who have children of the corresponding gender.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.11: Indices of resilience

	1	2	3	4
	Overall resilience index (%)	Index of absorptive capacity (%)	Index of adaptive capacity (%)	Index of transformative capacity (%)
Kernel matching with additional baseline matching variables				
<i>Centre-North</i>	1.7 (1.8)	-0.9 (2.3)	3.1 (2.6)	6.6*** (2.5)
<i>North</i>	1.7 (2.3)	2.1 (2.3)	3.4 (3.0)	-0.4 (2.9)
<i>Overall</i>	1.7 (1.6)	-0.4 (1.9)	3.1 (2.2)	5.5** (2.2)
<i>Observations</i>	770	770	770	770
Nearest-neighbour matching				
<i>Centre-North</i>	2.3 (2.1)	0.1 (2.3)	3.5 (2.6)	6.5** (2.6)
<i>North</i>	3.4 (2.3)	4.0 (2.6)	4.9 (3.1)	3.0 (2.9)
<i>Overall</i>	2.5 (1.8)	0.7 (2.0)	3.7* (2.2)	6.0*** (2.2)
<i>Observations</i>	787	787	787	787
Linear regression				
<i>Centre-North</i>	3.1* (1.8)	0.8 (2.1)	5.0** (2.3)	6.8*** (2.4)
<i>North</i>	3.5* (1.9)	3.9** (2.0)	4.8** (2.4)	3.2 (2.4)
<i>Overall</i>	3.1** (1.6)	1.3 (1.8)	5.0** (2.0)	6.2*** (2.0)
<i>Observations</i>	800	800	800	800
Linear regression with propensity-score weighting				
<i>Centre-North</i>	3.2* (1.7)	1.2 (2.0)	4.5** (1.9)	5.9** (2.4)
<i>North</i>	4.3** (1.8)	5.0*** (1.9)	5.8*** (2.2)	3.4 (2.4)
<i>Overall</i>	3.4** (1.4)	1.8 (1.7)	4.8*** (1.7)	5.5*** (2.1)
<i>Observations</i>	800	800	800	800

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.12: Proportion of households scoring positively in terms of each indicator of resilience

	1	2	3	4	5	6	7	8	9	10	11
	Seasonal forecasting/early-warning information (%)	Ownership of livestock (%)	Vaccination of livestock (%)	Improved construction of dwelling (%)	Access to drinking water (%)	Social support networks (%)	Dietary diversity (%)	Livelihood diversification (%)	Crop diversification (%)	Access to water for agriculture (%)	Remittances or formal earnings (%)
Kernel matching with additional baseline matching variables											
<i>Centre-North</i>	2.7 (3.7)	-20.8*** (6.3)	16.9* (9.0)	-6.8 (5.2)	-8.8 (10.7)	10.8 (7.1)	2.8 (8.8)	3.0 (4.7)	9.6 (8.3)	0.0 (2.9)	-8.2 (5.7)
<i>North</i>	3.3 (2.6)	-4.6 (6.6)	9.0 (6.9)	7.2 (6.8)	-16.7* (9.9)	1.3 (7.4)	0.6 (4.8)	-1.7 (5.3)	1.9 (7.1)	15.1 (10.3)	1.7 (6.4)
<i>Overall</i>	2.8 (3.2)	-18.2*** (5.4)	15.7** (7.6)	-4.6 (4.5)	-10.0 (9.1)	9.3 (6.1)	2.4 (7.4)	2.2 (4.0)	8.3 (7.1)	2.5 (2.9)	-6.6 (4.9)
<i>Observations</i>	770	770	753	770	770	770	770	770	770	770	770
Nearest-neighbour matching											
<i>Centre-North</i>	1.4 (3.5)	-20.1*** (6.1)	16.5* (8.9)	-6.5 (5.8)	-5.8 (9.7)	7.2 (7.4)	2.9 (9.9)	7.2 (4.9)	15.1* (8.1)	2.2 (2.5)	-2.9 (4.6)
<i>North</i>	3.9* (2.3)	3.9 (6.6)	10.1 (6.7)	7.8 (6.6)	-18.6** (9.2)	2.3 (5.8)	0.0 (4.3)	0.0 (5.0)	8.5 (6.1)	20.9** (9.5)	3.1 (5.3)
<i>Overall</i>	1.8 (3.0)	-16.2*** (5.2)	15.5** (7.5)	-4.2 (5.0)	-7.8 (8.3)	6.4 (6.3)	2.4 (8.3)	6.0 (4.2)	14.0** (6.8)	5.2** (2.6)	-1.9 (3.9)
<i>Observations</i>	787	787	771	787	787	787	787	787	787	787	787
Linear regression											
<i>Centre-North</i>	1.2 (2.9)	-17.6*** (4.8)	19.3** (7.9)	-4.5 (4.2)	-10.1 (9.6)	9.0 (6.7)	2.2 (9.0)	5.4 (3.7)	17.0** (7.1)	3.3 (2.1)	-2.3 (3.2)
<i>North</i>	5.0** (2.2)	1.2 (4.9)	7.6 (5.2)	5.5 (5.2)	-14.9* (8.0)	3.2 (4.8)	0.7 (3.6)	-3.1 (4.1)	10.1* (5.2)	22.3** (9.3)	1.6 (3.3)
<i>Overall</i>	1.8 (2.5)	-14.5*** (4.1)	17.4*** (6.6)	-2.9 (3.6)	-10.9 (8.1)	8.1 (5.7)	2.0 (7.6)	4.0 (3.2)	15.9*** (6.0)	6.4*** (2.3)	-1.6 (2.8)
<i>Observations</i>	800	800	784	800	800	800	800	800	800	800	800
Linear regression with propensity-score weighting											
<i>Centre-North</i>	1.2 (3.0)	-15.0*** (5.1)	13.7 (8.4)	-4.7 (3.6)	-4.3 (9.9)	10.3 (6.5)	5.1 (8.2)	5.8 (3.5)	13.4* (7.3)	2.7 (2.0)	-3.0 (3.5)

<i>North</i>	4.6** (1.9)	-3.4 (5.5)	11.3*** (4.3)	8.5* (4.9)	-15.2** (7.7)	6.6 (5.2)	1.5 (3.6)	-2.1 (3.9)	12.7** (5.3)	22.0*** (8.1)	3.9 (3.3)
<i>Overall</i>	1.8 (2.5)	-13.1*** (4.4)	13.3* (7.0)	-2.5 (3.1)	-6.1 (8.4)	9.7* (5.5)	4.5 (6.9)	4.5 (3.0)	13.3** (6.2)	5.9*** (2.1)	-1.9 (3.0)
<i>Observations</i>	800	800	784	800	800	800	800	800	800	800	800

Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.12 (continued): Proportion of households scoring positively in terms of each indicator of resilience

	12	13	14	15	16	17	18	19	20	21
	Savings (%)	Improved agricultural practices (%)	Soil protection measures (%)	Ownership of productive assets (%)	Access to credit (%)	Participation in community groups (%)	Adoption of innovative practices (%)	Literacy (%)	School attendance (%)	Women's decision- making power in agriculture (%)
Kernel matching with additional baseline matching variables										
<i>Centre-North</i>	-9.9** (4.8)	5.2 (8.0)	14.6** (7.0)	-6.7 (6.4)	1.6 (6.7)	20.1*** (6.3)	4.4 (5.6)	-1.0 (4.8)	0.8 (3.0)	8.3 (6.1)
<i>North</i>	8.4 (6.4)	8.6 (6.5)	-2.6 (7.5)	3.9 (7.1)	1.2 (7.2)	0.4 (7.0)	-0.1 (4.2)	0.9 (4.2)	-7.0 (9.4)	2.6 (8.2)
<i>Overall</i>	-6.9* (4.2)	5.8 (6.8)	11.8** (6.0)	-5.0 (5.5)	1.5 (5.7)	16.9*** (5.4)	3.7 (4.8)	-0.7 (4.1)	-0.5 (3.0)	7.4 (5.3)
<i>Observations</i>	770	757	770	770	770	770	770	770	708	764
Nearest-neighbour matching										
<i>Centre-North</i>	-15.1*** (5.7)	4.4 (7.4)	15.1*** (5.1)	-7.9 (5.3)	1.4 (7.5)	12.9* (7.2)	4.3 (5.2)	-3.6 (5.1)	0.8 (3.6)	15.3*** (5.6)
<i>North</i>	7.0 (5.8)	6.3 (6.4)	1.6 (7.7)	3.1 (6.9)	-1.6 (6.2)	1.6 (7.3)	3.1 (3.2)	3.1 (4.1)	-7.7 (8.8)	14.8 (9.9)
<i>Overall</i>	-11.5** (4.9)	4.7 (6.3)	12.9*** (4.5)	-6.1 (4.6)	1.0 (6.4)	11.1* (6.2)	4.1 (4.4)	-2.5 (4.3)	-0.6 (3.3)	15.2*** (4.9)
<i>Observations</i>	787	773	787	787	787	787	787	787	720	780
Linear regression										
<i>Centre-North</i>	-11.6** (4.8)	7.0 (6.3)	15.3*** (4.3)	-2.7 (4.1)	0.5 (6.8)	19.1*** (6.5)	4.1 (4.5)	-0.2 (3.7)	-0.2 (2.9)	11.1** (4.5)
<i>North</i>	8.3* (4.8)	9.9** (4.6)	2.5 (7.1)	2.4 (5.8)	-3.4 (4.3)	0.3 (5.8)	2.5 (2.5)	4.8* (2.5)	-4.8 (7.6)	12.9 (9.3)
<i>Overall</i>	-8.4** (4.1)	7.5 (5.3)	13.3*** (3.8)	-1.9 (3.6)	-0.1 (5.7)	16.0*** (5.5)	3.8 (3.8)	0.6 (3.1)	-1.0 (2.7)	11.4*** (4.1)
<i>Observations</i>	800	788	800	800	800	800	800	800	729	793

Linear regression with propensity-score weighting										
<i>Centre-North</i>	-9.7** (4.5)	13.1** (6.2)	13.8*** (4.7)	-3.9 (4.2)	0.3 (5.8)	16.2*** (5.7)	1.3 (5.2)	-0.1 (3.3)	0.6 (3.0)	10.6** (4.3)
<i>North</i>	9.9** (4.7)	10.1** (4.6)	2.1 (6.4)	2.2 (5.3)	-0.7 (4.6)	0.5 (5.1)	3.1 (2.5)	5.0** (2.1)	-4.3 (7.0)	12.1 (8.8)
<i>Overall</i>	-6.5* (3.8)	12.7** (5.3)	11.9*** (4.1)	-2.9 (3.6)	0.2 (5.0)	13.7*** (4.8)	1.6 (4.4)	0.8 (2.8)	-0.2 (2.7)	10.8*** (3.8)
<i>Observations</i>	800	788	800	800	800	800	800	800	729	793

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.13: Proportion of respondents having received support from external actors in responding to the situation they described

	1	2	3
	Associations or other community- level institutions (%)	Government services (%)	Non- governmental organizations (%)
Kernel matching with additional baseline matching variables			
<i>Centre-North</i>	6.3*** (2.3)	2.0 (3.1)	0.6 (2.9)
<i>North</i>	-1.7 (3.5)	1.2 (2.1)	12.8*** (3.9)
<i>Overall</i>	5.0** (2.0)	1.9 (2.6)	2.6 (2.5)
<i>Observations</i>	748	748	748
Nearest-neighbour matching			
<i>Centre-North</i>	6.6** (2.6)	-0.7 (3.5)	0.7 (3.0)
<i>North</i>	0.0 (2.9)	1.6 (2.1)	10.5*** (3.8)
<i>Overall</i>	5.5** (2.3)	-0.3 (3.0)	2.3 (2.6)
<i>Observations</i>	761	761	761
Linear regression			
<i>Centre-North</i>	5.8*** (2.0)	0.8 (2.9)	0.8 (2.3)
<i>North</i>	-1.1 (2.3)	0.9 (1.7)	12.0*** (3.3)
<i>Overall</i>	4.7*** (1.7)	0.9 (2.4)	2.6 (2.0)
<i>Observations</i>	775	775	775
Linear regression with propensity-score weighting			
<i>Centre-North</i>	6.2*** (2.0)	1.1 (2.3)	0.8 (2.5)
<i>North</i>	-0.8 (2.4)	1.3 (1.9)	11.7*** (2.9)
<i>Overall</i>	5.1*** (1.8)	1.1 (2.0)	2.6 (2.2)
<i>Observations</i>	775	775	775

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.14: Proportion of respondents reporting that their situation is now better than before, or no worse than before, the event described in their narrative

	1	2
	Situation is better than before (%)	Situation is no worse than before (%)
Kernel matching with additional baseline matching variables		
<i>Centre-North</i>	6.8 (5.1)	1.8 (6.7)
<i>North</i>	3.3 (6.6)	5.2 (7.7)
<i>Overall</i>	6.2 (4.4)	2.3 (5.8)
<i>Observations</i>	752	752
Nearest-neighbour matching		
<i>Centre-North</i>	5.8 (5.1)	-1.4 (6.7)
<i>North</i>	6.3* (3.7)	8.7 (5.7)
<i>Overall</i>	5.9 (4.3)	0.2 (5.7)
<i>Observations</i>	767	767
Linear regression		
<i>Centre-North</i>	5.6 (4.3)	0.6 (5.9)
<i>North</i>	7.6*** (2.8)	7.4* (4.2)
<i>Overall</i>	6.0* (3.6)	1.7 (5.0)
<i>Observations</i>	779	779
Linear regression with propensity-score weighting		
<i>Centre-North</i>	7.4* (4.1)	1.0 (5.3)
<i>North</i>	8.4*** (2.7)	8.6** (4.2)
<i>Overall</i>	7.6** (3.4)	2.3 (4.5)
<i>Observations</i>	779	779

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A4.15: Proportion of respondents reporting that they have discussed the root causes of the situation they described with others in the community, or have taken collective action to address the underlying causes of vulnerability

	1	2
	Discussed the underlying causes with others (%)	Able to take collective action to address the underlying causes (%)
Kernel matching with additional baseline matching variables		
<i>Centre-North</i>	1.6 (7.2)	5.5 (8.4)
<i>North</i>	-1.4 (8.9)	-1.5 (9.3)
<i>Overall</i>	1.1 (6.2)	4.4 (7.2)
<i>Observations</i>	729	712
Nearest-neighbour matching		
<i>Centre-North</i>	1.6 (7.1)	0.0 (7.6)
<i>North</i>	-1.6 (6.7)	-1.6 (7.9)
<i>Overall</i>	1.1 (6.0)	-0.3 (6.5)
<i>Observations</i>	744	728
Linear regression		
<i>Centre-North</i>	-0.1 (5.7)	3.7 (5.9)
<i>North</i>	1.7 (5.3)	0.0 (6.7)
<i>Overall</i>	0.2 (4.9)	3.1 (5.1)
<i>Observations</i>	757	740
Linear regression with propensity-score weighting		
<i>Centre-North</i>	1.1 (5.7)	7.8 (5.5)
<i>North</i>	0.5 (5.5)	-1.4 (6.7)
<i>Overall</i>	1.0 (4.8)	6.3 (4.8)
<i>Observations</i>	757	740

Samples are restricted to those who provided a response to each of the corresponding questions.

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; PSM estimates are bootstrapped with 1000 repetitions and clustered by community. Overall results are estimated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

APPENDIX 5: ANALYSIS BY RESPONDENT GENDER AND BY HOUSEHOLD HEAD GENDER

It was important to consider whether there are any differences between women and men in the outcome measures considered in this Effectiveness Review, as well as whether there are differences between women and men in the apparent impact from the project on these outcomes.

Both of these questions are assessed by means of regression models, based on that used for the third robustness check described in Appendix 4. We modify the regression models described there by separating out a dummy variable identifying women respondents (W_i) from the set of covariates (X_i), and reporting the coefficient on this variable, as well as the coefficient on the interaction of that variable with intervention status. The regression model estimated is:

$$Y_i = \alpha + \beta_1 \tau_i + \beta_2 (\tau_i \times W_i) + \beta_3 W_i + X_i' \delta + \varepsilon_i \quad (2)$$

If the coefficient β_3 is statistically significant, this suggests that there are systematic differences in the outcome measure between women and men – or at least that women and men differ systematically in the way they responded to the survey questions on this measure. The coefficient β_2 represents the difference in the project's effect between women and men in terms of that outcome measure. It should be reiterated that the vector of covariates (X_i) includes other observable variables relating to the respondent (such as age and literacy) and the household structure (in particular, whether the head of household is a woman). The coefficients β_2 and β_3 therefore represent the effects of respondent gender on the outcome measures, and on the project's impact on those outcomes, after controlling for those characteristics.

The estimates of the three coefficients β_1 , β_2 and β_3 for some key outcomes from the household survey data are shown in Tables A5.1 and A5.2.

Table A5.1: Differences in estimates on food consumption or the wealth index, by respondent gender

	1	2	3	4
	Respondents who consumed at least three meals per day during the past seven days (%)	Dietary diversity score (scale of zero to 105)	Wealth index at the time of the survey (standardized)	Change in standardized wealth index since 2013
<i>Coefficient on intervention variable (β_1)</i>	5.5 (7.4)	1.34 (2.83)	0.12 (0.09)	0.06 (0.06)
<i>Coefficient on intervention × woman respondent interaction variable (β_2)</i>	-7.7 (9.0)	-0.38 (2.95)	-0.08 (0.12)	-0.01 (0.07)
<i>Coefficient on woman respondent variable (β_3)</i>	14.9*** (3.9)	-1.23 (1.76)	-0.13 (0.12)	-0.12** (0.05)
<i>Observations</i>	800	800	800	800

Standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Results are estimated within each region, and then aggregated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

The first two columns of Table A5.1 analyse the data relating to food consumption. Unlike most of the other data collected in the household survey, the data relate to the respondent's own personal consumption, rather than that of the household in general. The large and highly significant estimate of β_3 reported in the first column of the table suggests that women were considerably more likely than men to say that they were eating at least three meals a day. It seems unlikely that women in the project area are better nourished than men. One explanation for the pattern found is that women tend to eat smaller amounts than men, but more frequently during the day. Alternatively, it may simply be that women made more realistic assessments when responding to this survey question than men did.

The fourth column of Table A5.1 suggests that women respondents were living in households that had experienced, on average, less of an improvement in their wealth indicators since 2013 than men were. This is unlikely to be the case in reality. It should be recalled (from Section 4.1) that the gender of the respondent was selected largely at random in each household (except where there were no adult women or men in a household who could respond to the survey), so there should not be any systematic differences between the characteristics of the households in which women were interviewed and the households in which men were interviewed. It appears, then, that the estimate of β_3 shown in the fourth column of the table represents a systematic difference in how women and men responded to the questions on asset ownership and housing conditions.

Since the resilience indices were also household-level measures, we would not expect to find any differences between women and men respondents in either the estimates of the resilience indices, or in the impact on the resilience indices. This expectation is borne out by the results shown in Table A5.2.

Table A5.2: Differences in estimates on resilience indices by respondent gender

	1	2	3	4
	Overall resilience index (%)	Index of absorptive capacity (%)	Index of adaptive capacity (%)	Index of transformative capacity (%)
<i>Coefficient on intervention variable (β_1)</i>	3.1 (2.1)	2.3 (2.0)	5.0* (3.0)	6.3*** (2.1)
<i>Coefficient on intervention \times woman respondent interaction variable (β_2)</i>	0.1 (1.7)	-1.6 (2.0)	-0.1 (3.0)	-0.2 (2.8)
<i>Coefficient on woman respondent variable (β_3)</i>	0.9 (1.1)	-0.5 (1.5)	2.2 (2.0)	1.4 (1.8)
<i>Observations</i>	800	800	800	800

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Results are estimated within each region, and then aggregated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

It is also of interest to assess whether there are any differences in outcomes between woman-headed households and other households. The number of woman-headed households interviewed was small (they made up only 10 percent of households surveyed in the Centre-North, and 17 percent in the North), so the statistical power available for detecting specific effects among these households is limited. Nevertheless, we investigate the evidence for differences between them and other households using a similar approach to that described above. We modify equation 2 by replacing the dummy variable identifying women respondents (W_i) with a dummy variable representing woman-headed households (H_i). (The respondent's gender is now included in the vector of other covariates, X_i .) The resulting estimation model is:

$$Y_i = \alpha + \beta_1 \tau_i + \beta_2 (\tau_i \times H_i) + \beta_3 H_i + X_i' \delta + \varepsilon_i \quad (3)$$

Again, the coefficient β_3 represents the size of the difference in the outcome measure between woman-headed households and other households, while β_2 represents the difference in the project's effect on woman-headed households as opposed to other households.

The estimates of the three coefficients β_1 , β_2 and β_3 for the key outcomes of interest from the household survey data are shown in Tables A5.3 and A5.4.

Table A5.3: Differences in estimates on food consumption or the wealth index, by household-head gender

	1	2	3	4
	Respondents who consumed at least three meals per day during the past seven days (%)	Dietary diversity score (scale of zero to 105)	Wealth index at the time of the survey (standardized)	Change in standardized wealth index since 2013
<i>Coefficient on intervention variable (β_1)</i>	1.4 (5.1)	0.72 (2.38)	0.07 (0.06)	0.06 (0.05)
<i>Coefficient on intervention x woman-headed household interaction variable (β_2)</i>	-15.2 (13.5)	4.91** (2.28)	0.07 (0.15)	0.06 (0.08)
<i>Coefficient on woman-headed household variable (β_3)</i>	-4.1 (12.6)	-7.35*** (1.94)	-0.18 (0.12)	-0.14* (0.08)
<i>Observations</i>	800	800	800	800

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Results are estimated within each region, and then aggregated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

The estimates in column 2 of Table A5.3 imply that respondents in woman-headed households were consuming a less diverse diet on average than respondents in other households. However, the project seems to have corrected this imbalance somewhat, by having a positive impact on dietary diversity specifically among woman-headed households.

The coefficient of the change in the wealth index among woman-headed households shown in column 4 of Table A5.3 is statistically significant only at the 10 percent level, and it is not significant under an alternative estimation method (that is, when observations are weighted by the propensity scores, as described in the fourth robustness check in Appendix 4). It is therefore not clear that this represents a meaningful difference between woman-headed households and others.

Table A5.4: Differences in estimates on resilience indices by household-head gender

	1	2	3	4
	Overall resilience index (%)	Index of absorptive capacity (%)	Index of adaptive capacity (%)	Index of transformative capacity (%)
<i>Coefficient on intervention variable (β_1)</i>	3.2* (1.7)	1.2 (1.8)	5.3** (2.1)	6.8*** (2.2)
<i>Coefficient on intervention x woman-headed household interaction variable (β_2)</i>	0.4 (3.7)	3.2 (3.5)	-3.7 (6.2)	-7.4* (4.4)
<i>Coefficient on woman-headed household variable (β_3)</i>	0.8 (2.7)	-3.3 (2.7)	-0.9 (5.0)	14.8*** (3.1)
<i>Observations</i>	800	800	800	800

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Results are estimated within each region, and then aggregated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

The estimate of β_3 in the fourth column of Table A5.4 shows that woman-headed households have significantly higher values for the index of transformative capacity than do other households. The reason for this is that the indicator of women's decision-making power (which is one of only five indicators included in the index of transformative capacity) is automatically positive in households in which there are no adult men, but which are doing some crop production. This also implies that it is not possible for the project to have an impact on this indicator among woman-headed households: this is the reason behind the negative estimate of β_2 in the same column.

The methods described in this appendix have also been applied to the analysis of differences between women's and men's responses in the SenseMaker interview, and to the analysis of differences between respondents in woman-headed households and other households. Where important differences were found, these are discussed at the appropriate points in Section 6.2.

APPENDIX 6: ANALYSIS BY ‘POOR’ OR ‘VERY POOR’ STATUS

It will be recalled from Section 2.3 that the participants in the PRSAN project – the intervention group for this evaluation – consisted of all those households that were identified as ‘poor’ or ‘very poor’ in a participatory community-level wealth ranking exercise at the start of the project in 2013. Of the 281 project participant households interviewed for the Effectiveness Review, 70 were classified as ‘very poor’ and 211 as ‘poor’. As discussed in Section 4.3, few differences were found between these two sets of households in terms of their demographic characteristics or their wealth level in 2013. The two groups are combined in the main analysis of outcomes presented in Section 6 of this report.

Here we analyse whether there is any evidence of a difference between the ‘poor’ and the ‘very poor’ households in the effect of the project on some of the key outcome measures.

To this end, we adapt the OLS regression models used to evaluate project impact as the third robustness check in Appendix 4. We define a new dummy variable, V_i , which takes the value one for intervention group households that were identified as ‘very poor’, and zero for all other households (including intervention group households that were defined as ‘poor’, and all households in the comparison group). We then introduce into the regression model a term to account for the interaction between intervention status and the ‘very poor’ designation. The resulting regression model is shown in Equation 3.

$$Y_i = \alpha + \beta_1 \tau_i + \beta_2 (\tau_i \times V_i) + X_i' \delta + \varepsilon_i \quad (3)$$

If the coefficient β_2 is statistically significant, this suggests that there are systematic differences in the effects of the project between ‘poor’ and ‘very poor’ households.

This analysis has been carried out for key indicators of welfare (food consumption and wealth) and for the resilience indices, in Table A6.1 and A6.2.

Table A6.1: Differences in estimates of project impact on food consumption or the wealth index, by ‘poor’ or ‘very poor’ household designation

	1	2	3	4
	Respondents who consumed at least three meals per day during the past seven days (%)	Dietary diversity score (scale of zero to 105)	Wealth index at the time of the survey (standardized)	Change in standardized wealth index since 2013
<i>Coefficient on intervention variable (β_1)</i>	-1.6 (4.9)	1.59 (2.23)	0.06 (0.06)	0.05 (0.05)
<i>Coefficient on intervention × ‘very poor’ interaction variable (β_2)</i>	6.6 (6.5)	-1.68 (1.65)	0.02 (0.10)	0.04 (0.06)
<i>Observations</i>	800	800	800	800

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Results are estimated within each region, and then aggregated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

Table A6.2: Differences in estimates of project impact on resilience indices by ‘poor’ or ‘very poor’ household designation

	1	2	3	4
	Overall resilience index (%)	Index of absorptive capacity (%)	Index of adaptive capacity (%)	Index of transformative capacity (%)
<i>Coefficient on intervention variable (β_1)</i>	3.7** (1.5)	1.7 (1.8)	5.5*** (2.0)	6.6*** (2.2)
<i>Coefficient on intervention \times ‘very poor’ interaction variable (β_2)</i>	-2.1 (1.5)	-1.6 (1.7)	-2.4 (2.5)	-1.4 (2.1)
<i>Observations</i>	800	800	800	800

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Results are estimated within each region, and then aggregated through fixed-effects meta-analysis, weighted by the size of the intervention group in each region.

In none of the outcomes considered in Tables A6.1 and A6.2 is there statistically significant evidence that the project had a larger effect among either the ‘poor’ or the ‘very poor’ households.

Similar analysis was carried out in relation to each of the variables included in the SenseMaker interview. Only in the cases of two outcomes is any evidence found of a difference in the project’s effect between the ‘poor’ and ‘very poor’ households: these are discussed at the appropriate points in Section 6.2.

REFERENCES

- Abadie, A. and G. W. Imbens. (2008). *On the Failure of the Bootstrap for Matching Estimators*. *Econometrica*, 76(6), 1537–57.
- Alkire, S. and J. Foster. (2011). *Counting and Multidimensional Poverty Measurement*. *Journal of Public Economics*, 95(7–8), 476–87.
- Bland, M. and D. G. Altman (1997). *Statistics Notes: Cronbach's Alpha*. *British Medical Journal*, 314(7080), 572.
- Borenstein, M., L.V. Hedges, J.P.T. Higgins and H. Rothstein. (2009). *Introduction to Meta-Analysis*. Chichester: Wiley.
- Caliendo, M. and S. Kopeinig. (2008). *Some Practical Guidance for the Implementation of Propensity Score Matching*. *Journal of Economic Surveys*, 22(1), 31–72.
- Filmer, D. and L. H. Pritchett. (2001). *Estimating Wealth Effects without Expenditure Data – Or Tears: An Application to Educational Enrollments in States of India*. *Demography*, 38(1), 115–32.
- Fuller, R. and J. Lain. (2015). *Measuring Resilience: Lessons Learned from Measuring Resilience in Oxfam's Large-N Effectiveness Reviews*. Discussion Paper. Retrieved 14 August 2017, from <http://policy-practice.oxfam.org.uk/publications/measuring-resilience-lessons-learned-from-measuring-resilience-in-oxfams-large-583601>
- Guijt, I. (2016). *Innovation in Evaluation: Using SenseMaker to Assess the Inclusion of Smallholder Farmers in Modern Markets*. In S. Bell & P. Aggleton, eds. *Monitoring and Evaluation in Health and Social Development: Interpretive and Ethnographic Perspectives*. Abingdon: Routledge, pp. 187–202.
- Harris, R. J., M. Bradburn, J. Deeks, R. M. Harbord, D. Altman, T. Steichen and J. Sterne. (2007). *METAN: Stata Module for Fixed and Random Effects Meta-Analysis*. Version 3.04. Retrieved 20 April 2017, from <https://ideas.repec.org/c/boc/bocode/s456798.html>
- Heckman, J. J., R. J. LaLonde and J. A. Smith. (1999). *The Economics and Econometrics of Active Labor Market Programs*, *Handbook of Labor Economics*, 3(A), 1865–2097.
- Hirano, K. and G. W. Imbens (2001). *Estimation of Causal Effects using Propensity Score Weighting: An Application to Data on Right Heart Catheterization*. *Health Services & Outcomes Research Methodology*, 2(3), 259–78.
- Hughes, K. and H. Bushell. (2013). *A Multidimensional Approach to Measuring Resilience*. Working Paper. Retrieved 14 August 2017, from <http://policy-practice.oxfam.org.uk/publications/a-multidimensional-approach-to-measuring-resilience-302641>
- Issifou, I. S. and Aka N., (2017), *Rapport d'évaluation du Projet de Résilience, Sécurité Alimentaire et Nutritionnelle des ménages pauvres et très pauvres dans les régions du Nord et du Centre-Nord affectés par la crise alimentaire de 2012 (PRSAN Nord-Centre et Nord)*. Ouagadougou: Ingénierie Internationale en Décentralisation et Développement locale.
- Jeans, H., S. Thomas and G. Castillo. (2016). *The Future is a Choice: The Oxfam Framework and Guidance for Resilient Development*. Retrieved 14 August 2017, from <http://policy-practice.oxfam.org.uk/publications/the-future-is-a-choice-the-oxfam-framework-and-guidance-for-resilient-developme-604990>
- Jeans, H., G. Castillo and S. Thomas. (2017). *Absorb, Adapt, Transform: Resilience Capacities*. Retrieved 14 August 2017, from <http://policy-practice.oxfam.org.uk/publications/absorb-adapt-transform-resilience-capacities-620178>
- Leuven, E. and B. Sianesi. (2003). *PSMATCH2: Stata Module to Perform Full Mahalanobis and Propensity Score Matching, Common Support Graphing, and Covariate Imbalance Testing*. Version 4.0.11. Retrieved 20 April 2017, from <https://ideas.repec.org/c/boc/bocode/s432001.html>
- Rosenbaum, P. R. and D. B. Rubin. (1983). *The Central Role of the Propensity Score in Observational Studies for Causal Effects*. *Biometrika*, 70(1), 41–55.
- Rubin, D. B. (2001). *Using Propensity Scores to Help Design Observational Studies: Application to the Tobacco Litigation*. *Health Services & Outcomes Research Methodology*, 2(3), 169–88.

NOTES

- 1 In some cases, there were not enough households who fell into 'poor' or 'very poor' categories but who were qualified and willing to participate in particular activities of the project – especially the replication of improved seeds. In these cases, members of households that were originally identified as 'middle-income' were also included in the project activities. However, these cases are thought to be few in number. No members of middle-income households were interviewed for this Effectiveness Review.
- 2 In polygamous households in which a woman was to be interviewed, the interview was carried out with the most senior wife.
- 3 In one of the project communities in the Centre-North Region, one additional household from the replacement list was interviewed by mistake. Data from this interview has been retained in the analysis, since it has little effect on the representativeness of the results.
- 4 Classical measurement error tends to attenuate effect sizes – including for basic *t*-tests – towards zero.
- 5 That the harvest in 2016 was worse than that of 2015 can be observed from the results of Section 6.1.2, Table 6.5: a larger proportion of households had exhausted their reserves from the 2016 harvest at the time of the survey in March 2017 than had exhausted their reserves at a similar period in the previous year.
- 6 This approach to measuring resilience is discussed further in Hughes and Bushell (2013) and Fuller and Lain (2015).
- 7 In fact, since we use an arithmetic mean to create the indices of resilience, all of the characteristics and, indeed, all of the capacities are effectively considered as perfect substitutes in the economic sense.
- 8 Given the low proportion of women who said that they are responsible for decisions over crop production, we investigated whether women are less aware than men of whether rainfall information was used in making these decisions. The results in the Centre-North Region are consistent with this hypothesis: analysis similar to that discussed in Appendix 5 shows that women respondents were approximately 18 percentage points less likely than men to report that rainfall information had been used in decision-making (statistically significant at the five percent level). However, in the North, the results are the opposite: women were seven percentage points *more* likely to say that rainfall information had been used in agricultural decision making – although this difference is statistically significant only at the 10 percent level.
- 9 These questions were not asked in relation to the use of improved seeds or tree planting.
- 10 In order to reduce the influence in these calculations of observations with particularly large recorded production quantities, the analysis shown in Table 6.3 was repeated after carrying out inverse hyperbolic sine transformation. No statistically significant differences in production quantities between the project participant and comparison households were found after carrying out this transformation, for any of the crops other than rice.
- 11 These comparisons are made by regressing production of the relevant crop types (both in terms of raw figures and after applying the inverse hyperbolic sine transformation) on the farming practice in question, controlling for the total area of staple crops farmed in 2016, the index of household wealth at the time of the survey, and observable household characteristics.
- 12 Data on households' ownership of livestock (including sheep and goats, poultry, and other types of livestock) is also included in the index of wealth indicators discussed in Section 6.1.6.
- 13 We ensure the item-rest correlation for each asset is greater than 0.1. We also ensure that Cronbach's alpha is at least 0.7, following the guidance of Bland and Altman (1997).
- 14 This follows the guidance in Filmer and Pritchett (2001). The first principal component captures sufficient variation in the data.
- 15 These results present something similar to a difference-in-differences specification. However, the baseline data is recalled rather than measured at baseline.
- 16 This analysis was repeated after carrying out an inverse hyperbolic sine transformation on the expenditure data, in order to reduce the impact of any outliers. The conclusion that there is no significant difference in expenditure between the project participant and comparison households is unaffected by this transformation.
- 17 These figures are not strictly correct, since, as described in Appendix 1, some of the 21 indicators are not defined for some of the households in the sample. For example, in a household that does not own any livestock and has no school-aged children, the resilience index is composed of 19 indicators, rather than 21. Nevertheless, expressing the resilience index in terms of a number of indicators may provide a useful intuitive guide to its meaning.

- 18 Data from one SenseMaker interview was lost, apparently due to a technical problem with the survey equipment. Seventeen respondents indicated that they had not experienced a negative situation that they could describe, and three respondents described situations that were unequivocally positive.
- 19 From examining the narratives, it appears that most respondents described the *most serious* threat to their well-being that they had faced during 2016, although this was not required by the prompt question. If all or most respondents chose to describe the most serious situation they had faced during 2016, this would strengthen the argument in this paragraph.
- 20 This was assessed by regressing dummy variables indicating whether each theme was mentioned by each respondent on a dummy variable indicating whether the respondent was in the North Region (as opposed to the Centre-North), on intervention status and other observable household-level and individual-level characteristics. The differences mentioned in the text are statistically significant at at least the 10 percent level, under both OLS and probit regression.
- 21 This analysis is carried out by regressing dummy variables indicating whether each theme was mentioned by each respondent on a dummy variable indicating whether the respondent was female, while also controlling for the region, intervention status, and on other observable household-level and individual-level characteristics.
- 22 This is assessed using the approach described in Appendix 6. The larger proportion of respondents from 'very poor' households citing drought as a theme is statistically significant at the five percent level under both OLS and probit estimation.
- 23 This difference is estimated using the PSM kernel model used to estimate other outcomes in this report, and is statistically significant at the five percent level. The magnitude and statistical significance of this estimate are supported by the robustness checks described in Appendix 4.
- 24 This is assessed using the approach described in Appendix 5.
- 25 This was calculated by regressing the response to the 'preparedness' question (measured on a scale of zero to one) on the response to the 'gradual or sudden' variable (also measured on a scale of zero to one) and on a list of covariates (specifically, participation in the project and the matching variables listed in Appendix 3). The regression model was weighted by the sampling frame in each region, and standard errors were clustered at the community level. The resulting coefficient on the 'gradual or sudden' variable was 0.24, with a standard error of 0.04.
- 26 These differences in responses by region and by respondent gender were assessed by regressing the distance of the response from each apex of the triad on a dichotomous variable representing the region and/or gender and on a list of covariates (participation in the project and the matching variables listed in Appendix 3). Again, regression models were weighted by the sampling frame in each region, and standard errors were clustered at the community level. The relationships discussed in the text are all statistically significant with *p*-values of less than 0.05.
- 27 These relationships are evaluated through regression models similar to that described in the previous endnotes: the probability of receiving support from each of the institutions listed in Table 6.13 was regressed on the importance of reducing consumption as provided in the response to the triad question, as well as on the standard list of covariates. In predicting the probability of receiving support from NGOs, the coefficient on the variable representing the reduction of consumption in the response varied between five and 10 percentage points (depending on the exact specification of the model and whether linear or probit regression was used), with a *p*-value consistently less than 0.05. However, the corresponding coefficient was not statistically significantly different from zero when predicting the probability of receiving support from others in the community or from government services.
- 28 Again these findings are evaluated using regression models similar to that described in the previous endnotes. In regressions for the two forms of the 'outcome' variables listed in Table 6.12, the coefficient on the 'preparedness' variable varied between 19 and 28 percentage points (depending on the exact specification of the model and whether linear or probit regression was used), and the *p*-value was consistently less than 0.01.
- 29 Since it appears from Figure 6.18 that the distribution of responses about coping in the future may be different between the intervention and comparison groups in the Centre-North Region, additional dummy variables were constructed that identified those who gave responses close to each end of the scale. No statistically significant differences were found between the intervention and comparison groups in the proportions of respondents that were identified by those dummy variables.
- 30 This is identified by applying the approach described in Appendix 6.
- 31 In a similar manner to that described in previous endnotes, these relationships are assessed by regressing the respondent's level of confidence about coping in the future (the measure shown in Figure 6.14) on the predictors of interest (for example, in the case of the reduction of consumption, the variable is the distance from the lower right-hand corner of the triad shown in Figure 6.10), as well as on the standard list of covariates. Each of the three relationships described here are strongly statistically significant, with *p*-values of less than 0.000.
- 32 This was assessed using the approach described in Appendix 5. The relationship detected is statistically significant only at the 10 percent level.

- 33 We tested the model both with and without clustering at the community level, and found that the standard errors were larger in the model with clustering, in spite of the small number of clusters in our data.
- 34 Some of the outcome measures discussed in Section 6 – particularly those taken from the SenseMaker interview – are evaluated among a restricted sample. A new set of propensity scores was generated among each of these restricted samples, and the balance of the matching variables was checked after matching.
- 35 Choosing whether to match with and without replacement involves a trade-off between bias and variance. If we allow replacement, the average quality of matching will increase and the bias will decrease, especially when the distribution of the propensity score is very different in the intervention and comparison group. However, allowing for replacement increases the variance of the estimates because, in effect, the number of distinct comparison observations is reduced (Caliendo and Kopeinig, 2008).
- 36 It should be noted that, for all these regression techniques, we report robust standard errors. However, the standard errors are not bootstrapped as in the main results in Section 6.
- 37 We are able to test whether the covariates are distributed sufficiently similarly for the intervention and comparison group using Rubin's (2001) tests. For the matching variables used in this report, with the kernel matching algorithm, Rubin's *B* statistic is 22.7 for the model used for the Centre-North and 18.9 for the model used for the North Region, while the corresponding Rubin's *R* statistics are 0.79 and 2.12 respectively. In the case of the Centre-North Region, both statistics are within the bounds that Rubin recommends to ensure that covariates are sufficiently balanced for OLS regression methods to be valid. In the North Region, Rubin's *R* statistic is just outside those bounds.

Oxfam Effectiveness Reviews

For more information, or to comment on this report, email policyandpractice@oxfam.org.uk

© Oxfam GB May 2018

This publication is copyright but the text may be used free of charge for the purposes of advocacy, campaigning, education, and research, provided that the source is acknowledged in full. The copyright holder requests that all such use be registered with them for impact assessment purposes. For copying in any other circumstances, or for re-use in other publications, or for translation or adaptation, permission must be secured and a fee may be charged. Email policyandpractice@oxfam.org.uk.

The information in this publication is correct at the time of going to press.

ISBN: 978-1-78748-246-3

DOI: 10.21201/2018.2463

Oxfam GB, Oxfam House, John Smith Drive, Cowley, Oxford, OX4 2JY, UK.

OXFAM

Oxfam is an international confederation of 20 organizations networked together in more than 90 countries, as part of a global movement for change, to build a future free from the injustice of poverty. Please write to any of the agencies for further information, or visit www.oxfam.org.

Oxfam America (www.oxfamamerica.org)

Oxfam Australia (www.oxfam.org.au)

Oxfam-in-Belgium (www.oxfamsol.be)

Oxfam Brasil (www.oxfam.org.br)

Oxfam Canada (www.oxfam.ca)

Oxfam France (www.oxfamfrance.org)

Oxfam Germany (www.oxfam.de)

Oxfam GB (www.oxfam.org.uk)

Oxfam Hong Kong (www.oxfam.org.hk)

Oxfam IBIS (Denmark) (<http://oxfamibis.dk/>)

Oxfam India (www.oxfamindia.org)

Oxfam Intermón (Spain) (www.oxfamintermon.org)

Oxfam Ireland (www.oxfamireland.org)

Oxfam Italy (www.oxfamitalia.org)

Oxfam Japan (www.oxfam.jp)

Oxfam Mexico (www.oxfammexico.org)

Oxfam New Zealand (www.oxfam.org.nz)

Oxfam Novib (Netherlands) (www.oxfamnovib.nl)

Oxfam Québec (www.oxfam.qc.ca)

Oxfam South Africa (<http://www.oxfam.org.za/>)



www.oxfam.org.uk/effectiveness

OXFAM