Livestock Commercialisation for Pastoralist Communities in North Dakoro Project Effectiveness Review

Adaptation and Risk Reduction

Oxfam GB
Adaptation and Risk Reduction Global Outcome Indicator

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Photo credit: Jennie Matthews

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Executive Summary

Under Oxfam Great Britain's (OGB) Global Performance Framework (GPF), samples of sufficiently mature projects are being randomly selected each year and their effectiveness is being rigorously assessed. The Livestock Commercialisation for Pastoralist Communities project in Niger was one of those selected for an Effectiveness Review under the adaptation and risk reduction (ARR) thematic area in 2011/12. This project has been implemented in partnership with the Association pour la Redynamisation de l'Élevage au Niger (AREN) in the commune of Bermo, located in the Maradi Region of Niger, since 2009. While the project has focused on improving the livelihoods of pastoralist households, particularly through increasing their negotiating power when buying and selling livestock, another one of its important components has been to build resilience in an area prone to severe droughts.

To assess the effectiveness of the programme on reducing risk and promoting adaptive capacity, a quasi-experimental impact evaluation was implemented. This involved administering surveys to 197 households in Bermo commune, as well as 449 households in the neighbouring commune of Gadèbedji, who served as a comparison group. At the analysis stage, the statistical tools of propensity-score matching and multivariate regression were used to control for demographic and baseline differences between the intervention and comparison groups, so that remaining differences in outcome measures can be assumed to reflect the results of the project. As well as collecting data on risk reduction and adaptive capacity, the survey also included questions on livelihoods activities, livestock transactions, and indicators of household wellbeing.

Various difficulties were encountered in carrying out the survey work, which complicated the analysis of the results. However, some conclusions can, nevertheless, be drawn with reasonable confidence. With respect to Oxfam GB's global indicator for adaptation and risk reduction, there is no overall difference between households in the Bermo commune who are supported by this project and comparable households from the Gadèbedji commune. In particular, households in the intervention area did not demonstrate any difference in destocking or migration behaviour, livelihood diversification, or livestock diversity. Despite the project's investment in renovating wells in the Bermo commune, households in the Gadèbedji commune were just as likely to be using a modern cemented well for watering their livestock as those in Bermo.

On the other hand, it is clear that households in the Bermo commune have received a greater level of veterinary support and more training on drought management techniques during 2011 than the comparison households. In line with the primary objective of the project, some beneficiaries – the members of the *Groupement des interêts économiques* (GIE), a local association supported directly by this project – reported having received more training and support in marketing their livestock. This support appears to have had some effect: the prices realised from the sales of cattle and sheep by households in the Bermo commune are systematically higher than those realised in the Gadèbedji commune. Some key interventions were still to be implemented at the time of the survey, including the handover of management of the livestock market in Bermo town to the GIE, as well as the establishment of ten solidarity groups focused on various artisanal products. Unfortunately, however, there is no evidence that the supported households were better off overall as a result of the activities carried out up to December 2011, on any of the various indicators of household income and wellbeing.

Oxfam in general and the Niger country team and partners in particular are encouraged to consider the following points as a follow-up to this effectiveness review:

- Review approaches to promoting key risk reduction activities, including destocking and migration.
- Ensure that monitoring and evaluation systems and processes are fully integrated into programme design and implementation.

1 Introduction and purpose

This report documents the findings of the project effectiveness review, focusing on outcomes related to risk reduction and adaptation to climate change.

Oxfam GB has developed a Global Performance Framework (GPF) as part of its effort to better understand and communicate its effectiveness and enhance learning across the organisation. This framework requires programme/project teams to annually report generic output data across six thematic indicator areas. In addition, modest samples of sufficiently mature projects (e.g. those closing during a given financial year) associated with each thematic indicator area are being randomly selected each year and rigorously evaluated. One key focus is on the extent they have promoted change in relation to relevant OGB global outcome indicators.

The following global outcome indicator was endorsed for the livelihoods support thematic area:

- **Proportion of households with greater ability to minimise risk from shocks and adapt to emerging trends and uncertainty.**

The conceptual underpinnings of this indicator are presented in Section 3 below. The field work for the effectiveness review of the livestock commercialisation project for pastoralist communities in Niger (NGRA36), which took place in December 2011 and January 2012, was part of an effort to assess progress against this indicator.

This report presents the findings of the review. Section 2 provides brief background information on the project and the context in which the support was provided. Section 3, Section 4, and Section 5 present the conceptual framework underlying the indicators, the impact evaluation design pursued, and the methods of data collection and analysis, respectively. Section 6 is the longest section of this document. Its subsections include those related to basic descriptive statistics, intervention exposure, and finally the overall differences between the targeted producers and the producers that were selected as comparators. Section 7 concludes.

2 The Project: Livestock Commercialisation for Pastoralist Communities in North Dakoro

The Livestock Commercialisation for Pastoralist Communities in North Dakoro project aims at strengthening livelihoods in poor pastoralist communities. This project is implemented by Oxfam, in partnership with the Association pour la Redynamisation de l'Élevage au Niger (AREN), in the rural commune of Bermo, to the north of the town of Dakoro in the Maradi Region of Niger.

The project sought to strengthen the livelihoods of pastoralists residing in the Bermo commune.

Oxfam GB's first intervention in the area was a response to the severe drought of 2005, when the livestock herds in the area were devastated. Following this humanitarian intervention, Oxfam and AREN conducted a series of studies on the livelihoods and vulnerabilities of the pastoralist population in 2007–08, which informed the current project. At this time, AREN already had a network of local groups throughout Bermo and neighbouring communes, through which the organisation provides extension support to pastoralists. All or almost all pastoralist households in the area are represented as members of these groups.

In 2008, AREN and Oxfam encouraged representatives of pastoralist communities in the commune of Bermo to form a *groupement des interêts économiques* (GIE, economic interests group) to take a more active role in organising support and representing the interests of pastoralists in the area. While the GIE provides most of its support to its own members (who numbered around 420 at the time of the effectiveness review), its activities are also intended to benefit the pastoralist community more widely. Oxfam and AREN supported the GIE in drawing up a business plan and provided various forms of capacity building for the institution and its members. The GIE's primary objective is to improve the position of pastoralists when they buy or sell livestock. Traditionally pastoralists have conducted transactions in the market through an intermediary (locally known as a *dillali*). To maximize the money they earn from the sale of livestock, the GIE trains its members to avoid using intermediaries and provides them with information about market prices. In early 2012, the GIE was due to take over responsibility for managing the livestock market in the town of Bermo from the municipal authority.

Other project activities, implemented in partnership with the GIE, included setting up three training centres in the commune of Bermo, which was used to carry out training of trainers sessions on improved livelihoods activities, as well as gender issues and HIV/AIDS awareness. Seven wells in the commune were cemented in 2009, making them more durable and reducing the health risk from poor water. Also in 2009, 84 of the most vulnerable women in the commune were identified and each provided with five sheep to start breeding them as an income-earning activity. The GIE has also marketed the sheep on their behalf. Furthermore, since the time of the effectiveness review, ten solidarity groups have been established to support people engage in artisanal production of cheese, leather, or handicrafts.

3 Outcome indicators

3.1 Adaptation and risk reduction outcome indicator

As part of OGB's Global Performance Framework, efforts are being undertaken to develop an innovative approach to measuring the resilience of households to shocks and their ability to adapt to change. This approach involves capturing data on various household and community characteristics falling under five interrelated dimensions presented in Figure 3.1. Scores are allocated for each household depending on how it is fairing on the characteristic in question. A household's overall score, then, is simply obtained by adding all these individual household characteristic scores. These overall scores can be used as a continuous outcome measure in statistical analysis. Alternatively, a binary outcome variable can be created by defining a particular cut-off point in the continuous score, with 1 indicated for households that have surpassed this threshold and 0 for those below it. For OGB's global ARR outcome indicator, the binary version of this indicator is defined as:

The "characteristic approach" assumes that households that are better able to cope with shocks and adapt to change possess particular attributes.

- **The proportion of targeted households demonstrating greater ability to minimise risk from shocks, and adapt to emerging trends and uncertainty.**

The term greater ability appears in the wording of the indicator because of how it is computed in practice. Specifically, a household is coded with 1 if it is above the median of the comparison group and 0 if otherwise. Thus, households demonstrating greater ability are those who are above the typical household of the comparison group.

One reason why measuring concepts such as resilience and adaptive capacity is complicated is that we can only really assess whether a system has successfully coped or adapted after the fact.[1] In other words, we would have to wait until after a disaster has struck and/or climate change has taken place in order to assess the effectiveness of our interventions. Furthermore, in order to do this credibly, we would also need to capture data from households in control or comparison communities that are similar to the intervention communities but did not benefit from our support.

The characteristic approach attempts to get around this issue by hypothesising that there are particular characteristics of households (and even communities, organisations, governments, and so on) that affect how well they are able to cope with shocks and adapt to change. A limitation, of course, is that we do not know for certain how relevant these characteristics actually are; rather, we assume they are important based on common sense, theory, and/or field experience. However, there is nothing preventing them from being informed by stronger empirical evidence, and it is recommended that they be continuously updated, as the body of research on the determinants of resilience and adaptive capacity grows.

The characteristics that inform the ARR indicator fall under the five dimensions presented in Figure 3.1. First, if we think about what a household would need in order to adjust to current and future climatic shocks and variation, a resilient livelihood base is likely one of them. If a climatic shock happens, for instance, a household dependent on just one climate sensitive livelihood activity will likely be more negatively affected than another that has one or more less climate sensitive alternatives to fall back on, *all other things being equal*. In addition, households that are on the margins are less likely to be resilient than their relatively more wealthy

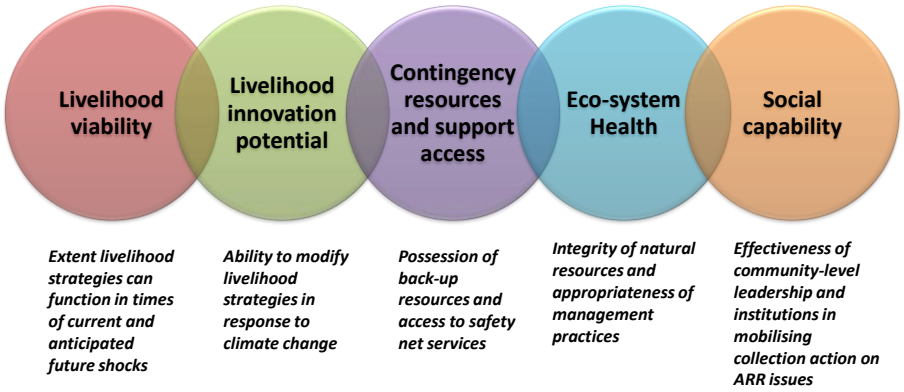
[1] Dodman, D., Ayers, J. and Huq, S. (2009), 'Building Resilience', Chapter 5, in World Watch Institute (ed), *'2009 State of the World: Into a Warming World'*, Washington D.C: World Watch Institute, pp. 151-168.

counterparts. Where longer-term climatic trend prediction information exists, it is also important to assess how viable current livelihood strategies (such as the types of crops grown) would be in the new climatic reality.

Livelihood innovation potential is different and hence separate, given that it is focused on a household's ability to successfully modify its livelihood strategies in response climatic stimuli, whether anticipated or not. We may hypothesise that such potential is dependent on factors such as the knowledge and attitudes of relevant household members themselves, their ability to take risks, and their access to weather prediction, market information and relevant technology and resources.

The particular characteristics are specific to each context, but are informed by a framework comprising five dimensions.

Figure 3.1:
Dimensions affecting the ability of households and communities to minimise risks from shocks and adapt to emerging trends and uncertainty



Moreover, there will likely be times when even households with the most "resilient" livelihood strategies will find it tough to get by. Access to contingency resources and external support – such as savings, food and seed reserves, social protection, kin and non-kin support networks, and emergency services – are, therefore, likely to be critical in supporting a household to adjust to climatic shocks and change. It is further recognised that healthy ecosystems are themselves better able to cope or adjust to climatic shocks and change than those that are relatively more degraded. We may reasonably assume – again with all other things being equal – that households whose livelihoods are dependent on healthier ecosystems will be in a better position to adjust to climatic shocks/change than those that are not.

In most, if not all cases, it is necessary to look beyond the household level when examining resilience and adaptive capacity. Indeed, it is reasonable to assume that households are likely better able to successfully adjust to climatic shocks/change when they are part of larger coordinated efforts at the community level and beyond. The social capability dimension, in particular, is concerned with the effectiveness of community-level leadership and institutions in mobilising collective action on ARR issues. In the absence of this capability, we can assume that community-level duty bearers will be less effective in fulfilling their responsibilities in supporting community members to reduce risk and/or successfully adapt.

In terms of the specific characteristics that are believed to influence both resilience and adaptation, no "one size fits all". That is, many of the characteristics appropriate

for a particular population (e.g. slum dwellers in Mumbai) may not be so for another (e.g. Bolivian shifting cultivators). As such, each particular suite of characteristics needs to be adapted to the nature of each population and the climatic hazards and change processes to which it is likely to be subjected.

As well as the adaptation and risk reduction indicators, the survey also collected data relating to livestock transactions, and indicators of household income and wellbeing.

the pastoralist population in the project area, and which could be assessed from household-level surveys.

3.2 ARR Characteristics Used in the Niger Effectiveness Review

A major stage of preparation for the effectiveness review involved reviewing the set of resilience characteristics which were most appropriate to the population associated with the project under review. The set of characteristics selected is shown in Table 3.1. The allocation of scores on a four-point scale to these characteristics was mostly carried out after the survey, using the aggregate data to ensure that the scales generated sufficient variation when applied to the data collected.

It should be noted that the social capability dimension, presented in Section 3.1 above, is not represented in the ARR indicator used in this effectiveness review. This is because there were no clear indicators of social capability which could be identified at a household level, other than participation in AREN's local groups, of which all respondents were members. Ideally, qualitative community-level assessments should have been undertaken in both the intervention and comparison villages to assess community capacity to respond to flooding and support adaptation processes. However, given the level of complexity already involved in the household-level survey, as well as the difficulty of identifying and locating those responsible for the community structures among the highly dispersed population, it was considered infeasible to carry out a community-level survey as part of this review.

3.3 Other outcome measures

As reviewed in Section 2 above, the support provided to the targeted households is intended to bring about a number of other outcomes – particularly in strengthening livelihoods – in addition to greater resilience. To evaluate the success on these other dimensions, data were therefore collected on a number of additional outcome measures.

Herd size and purchases and sales of livestock

Respondents were asked for details of the animals their household currently hold in their herds, as well as all those they had bought and sold over the past six months. This allowed reconstruction of the herd sizes as of mid-2011, before the dry season (and, consequently, any destocking) would have occurred. For the last purchase and/or sale of each type of animal, respondents were asked to state the price for which the animal was purchased or sold, as well as whether they used an intermediary (*dillali)*, which provides a measure of the success of one of the project's key interventions.

Respondents were also asked to recall the numbers of each type of animal they possessed in 2008, to provide a baseline estimate and allow analysis of the change in herd size during the project's lifetime.

Table 3.1: Adaptation and Risk Reduction characteristics assessed in the effectiveness review

Characteristic	Scoring Descriptors			
	0 points	1 point	2 points	3 points
Dimension 1: Livelihood Viability – extent to which the household's livelihood strategies can function in times of current and likely future shocks				
1.1 Livelihood diversification	Two-thirds of household's income is derived from livestock rearing, with no agricultural income.	Two-thirds of household's livelihood is derived from livestock rearing but there is some agricultural income.	Between one third and two thirds of the household's income comes from livestock and/or agriculture.	Less than one third of a household's income is derived from livestock and/or agriculture.
1.2 Livestock herd diversity (as of mid-2011)	Household has no herds or has only one type of animal (not goats).	Household has two types of herd animal.	Household has three types of herd animal.	Household has four types of herd animal.
1.3 Crop diversity	Household does not complement its pastoral activities with any crops.	Household grew one or two crops in 2011.	Household grew three types of crops in 2011.	Household grew four or more types of crops in 2011.
1.4 Use of seasonal forecasting information	Household did not make use of seasonal forecasting information during 2011.	Household used seasonal forecasting information during 2011, but reported problems with availability and reliability.	Household used seasonal forecasting information during 2011, but reported problems with either availability or reliability.	Household used seasonal forecasting information during 2011, and reported no problems with availability or reliability.
1.5 Support in marketing livestock	HH members did not make use of a market information system and did not receive any training or support in marketing livestock during 2011.	Household used the market information system, but received no training or support on marketing livestock during 2011.	Household received training and/or practical support in marketing livestock during 2011.	Household received both training and practical support in marketing livestock during 2011.
1.6 Destocking behaviour	Household has not conducted any destocking in the current dry season.	Household has sold one or two animals in the current dry season.	Household has sold between 3 and 5 animals in the current dry season.	Household has sold more than 6 animals in the current dry season.
1.7 Seasonal migration behaviour	Household did not send herds to the south in 2009/10, has not done so and does not have plans to do so in the current dry season.	Household has plans to migrate herds to the south in the current dry season (or has already done so), but did not do so in 2009/10.	Household has plans to migrate herds to the south in the current dry season (or has already done so), and sent up to 1/3 of the herds to the south in 2009/10.	Household has plans to migrate herds to the south in the current dry season (or has already done so), and sent more than 1/3 of the herds to the south in 2009/10.

Characteristic	Scoring Descriptors			
	0 points	1 point	2 points	3 points
1.8 Access to veterinary services	Household did not make use of any veterinary services during 2011.	Household made use of a veterinary service once during 2011.	Household made use of a veterinary service more than once during 2011, but reported problems with availability.	Household made use of a veterinary service more than once during 2011, and did not report any problems with availability.
1.9 Drought preparedness training	Household did not receive any training on drought preparedness during 2011.	Household received one-off training on drought preparedness during 2011.	Household received training on drought preparedness more than once during 2011, but reported problems with availability.	Household received training on drought preparedness more than once during 2011, and did not report any problems over availability.
Dimension 2: Livelihood Innovation Potential – ability to modify livelihood strategies in response to climate change				
2.1 Attitudes to change and willingness to try new practices	Household members do not recognise the importance of adjusting their livelihood strategies and indicate no willingness to do so.	Household members acknowledge some importance to adjusting their livelihood strategies but indicate only superficial willingness to do so.	Household members acknowledge the importance of adjusting their livelihood strategies. While they indicate a strong willingness to do so, they have not attempted to try anything new.	Household members acknowledge the importance of adjusting their livelihood strategies, demonstrate a strong willingness to do so, and illustrate examples of where they are trying to change.
Dimension 3: Access to Contingency Resources and Support – presence of back up resources and safety net services				
3.1 Possession of convertible assets (other than livestock)	Household possesses no assets other than livestock that could be sold/traded in hard times.	Household possesses a few assets other than livestock that could be sold/ traded in hard times, but this could see it through only a few months of the drought period.	Household possesses some assets other than livestock that could be sold/ traded in hard times, and this could see it through at least half but not the entire drought period.	Household possesses a good number of assets other than livestock that could be sold/ traded in hard times, and this could see it through the entire drought period.
Dimension 4: Natural Resource Access, Management, and Health – ability to access natural resources and promote their sustainable use				
4.1 Access to improved water source for livestock	Household most often uses ponds (*mares*) for watering animals.	Household most often use their own boreholes for watering animals.	Household most often uses traditional wells for watering animals.	Household most often uses modern (cemented) wells for watering animals.

Production and sales of dairy products and crops

Respondents were asked whether they had produced and sold any dairy products in the past six months, and any crops in the past 12 months, as well as to estimate their income from these sales. They were also asked to recall if they produced and sold any dairy products or crops during 2008 (though not the quantities sold or income earned from them).

Self-reported income change

Respondents were asked to make a judgement whether overall their income had increased, remained the same or decreased since 2008.

Ability to meet basic needs

Respondents were presented with the following four descriptions of household economic situations, and asked which matched their own situation most closely:

- *Doing well:* able to meet household needs by your own efforts, and making some extra for stores, savings, and investment.
- *Breaking even:* Able to meet household needs but with nothing extra to save or invest.
- *Struggling:* Managing to meet household needs, but depleting productive assets and/or sometimes receiving support.
- *Unable to meet household needs by your own efforts:* dependent on support from relatives living outside of your household or the community, government and/or some other organisation – could not survive without this outside support.

***Practice of* habanaye**

One factor seen as an important indicator of a household's relative socio-economic status was seen as their participation in the *habanaye* system. In this system, wealthier households support poorer households by loaning livestock to them, allowing the recipient to keep whatever income they generate from those animals. Respondents were therefore asked whether they had lent or received any animals in *habanaye* in the six months prior to the survey.

Household food security

Household food security was measured using six questions adapted from the Household Food Insecurity Access Scale (HFIAS) developed by USAID's Food and Nutrition Technical Assistance (FANTA) Programme.[2] Respondents were asked whether any of the following were true for them or other members of their household in the four weeks before the date of the survey:

- Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?
- Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?
- Did you or any household member have to eat fewer meals in a day because there was not enough food?
- Was there ever no food to eat of any kind in your house because of lack of resources to get food?
- Did you or any household member go to sleep at night hungry because there was not enough food?

[2] http://www.fantaproject.org/publications/hfias_intro.shtml

- Did you or any household member go a whole day and night without eating anything because there was not enough food?

For each question which was answered positively, the respondent was then asked how frequently this situation occurred during the four weeks. A score was generated based on the frequency of these events.

Household wealth indicators and asset ownership

Respondents were asked about their ownership of various assets, which are thought to be good indicators of sustained improvements in household wellbeing. The data collected included ownership of various tools and other productive equipment, household goods, and the condition of the house. The full list of assets and other wealth indicators collected in the survey is shown in Table 3.2.[3] Respondents were asked about their ownership of these assets both at the time of the survey, and to recall the information with respect to 2008.

Data were also collected on a number of household wealth indicators.

Table 3.2: List of assets and other wealth indicators used to derive asset index

Agricultural equipment	***Household goods***	***Condition of house***
Hoe	Watch	Number of rooms
Hilaire/haywa	Table	Material used for walls
Rake	Mattress	Material used for roof
Machete	Lamp (electric or gas)	Material used for floor
Axe	Iron (electric or coal)	Source of drinking water
Shovel	Sewing machine	Source of cooking fuel
Cart	Mobile phone	Type of toilet
Plough	Metal bed	Electricity connection
	Wooden bed	
Vehicles	Mats	
Bicycle	Chairs	
Motorcycle	Radio/cassette/CD player	
Car or motor vehicle	Video/DVD player	
	Solar panel	
	Refrigerator	
	Generator	
	Jewellery	
	Kitchen utensils	

Principal component analysis (PCA) was used to create a weighted index of asset ownership for 2008, and a further index of changes in asset ownership since 2008. PCA is a data reduction technique that narrows in on the variation in household asset ownership, assigning greater weight to those observations better off in those assets associated with this variation. This enables the relative wealth status of the households to be compared.

[3] Note that, unlike in other Project Effectiveness Reviews, livestock were not included in this list of household assets, since possession of livestock is itself important for various outcome measures. Instead, a separate index was constructed for baseline livestock possession for use as a covariate or matching variable.

4 Impact Assessment Design

4.1 Limitations in pursuing the gold standard

The core challenge of a social impact evaluation is to credibly estimate the net effect of an intervention or programme on its participants. An intervention's net effect is typically defined as the average gain participants realise in outcome (e.g. income) from their participation. In other words:

Impact = average post-programme outcome of participants – what the average post-programme outcome of these same participants would have been had they never participated

The pastoralist communities in Bororo-dominated areas of Gadèbedji commune were identified as the most appropriate comparison group for the project participants in Bermo commune.

The evaluation design involved comparing the Oxfam supported producers with non-supported producers, while statistically controlling for observed differences between them.

This formula seems straightforward enough. However, *directly* obtaining data on the latter part of the equation – commonly referred to as the counterfactual – is logically impossible. This is because a person, household, community, etc. cannot *simultaneously* both participate and not participate in a programme. The counterfactual state of a programme's participants can therefore never be observed directly; it can only be estimated.

The randomised experiment is regarded by many as the most credible way of estimating the counterfactual, particularly when the number of units (e.g. people, households, or, in some cases, communities) that are being targeted is large. The random assignment of a sufficiently large number of such units to intervention and control groups should ensure that the two resulting groups are statistically similar similar in terms of a) their pre-programme outcomes (e.g. both groups have the same average incomes); and b) their observed characteristics (e.g. education levels) and unobserved characteristics (e.g. motivation) that affect the outcome variables of interest. In other words, randomisation works to ensure that the *potential outcomes* of both groups are the same. As a result – provided that threats such differential attrition and intervention spill-over are minimal – any observed outcome differences observed at follow-up between the groups can be attributed to the programme.

However, implementing an ideal evaluation design like this is only possible if it is integrated into the project design from the start, since it requires the introduction of some random element that influences participation. To evaluate an ongoing or completed programme – as in this project effectiveness review – or one where randomisation is judged to be impractical, it is therefore necessary to apply alternative techniques to estimate the counterfactual as rigorously as possible.

4.2 Alternative evaluation design pursued

There are several evaluation designs when the comparison group is non-equivalent that can – particularly when certain assumptions hold – identify reasonably precise intervention effect estimates. One solution is offered by matching: find units in an external comparison group that possess the same characteristics, e.g. ethnicity, age, and sex, as those of the intervention group and match them on these characteristics. If matching is done properly, the observed characteristics of the matched comparison group will be identical to those of the intervention group. The problem, however, with conventional matching methods is that with large numbers of characteristics on which to match, it is difficult to find comparators with similar combinations of characteristics for each of the units in the intervention group. The end result, typically, is that only a few units from the intervention and comparison groups get matched up, thereby, not only significantly reducing the size of the sample but also limiting the extent to which the findings can be generalised to all programme participants. (This is referred to as the "curse of dimensionality" in the literature.)

Fortunately, matching on the basis of the propensity score – the conditional probability of being assigned to the programme group, given particular background variables or observed characteristics – offers a way out. The way propensity score

matching (PSM) works is a follows: Units from both the intervention and comparison groups are pooled together. A statistical probability model is estimated, typically through logit or probit regression. This is used to estimate programme participation probabilities for all units in the pooled sample. Intervention and comparison units are then matched within certain ranges of their conditional probability scores. Tests are further carried out to assess whether the distributions of characteristics are similar in both groups after matching. If not, the matching bandwidth or calliper is repeatedly narrowed until the observed characteristics of the groups are statistically similar. Provided that a) the dataset in question is rich and of good quality; b) the groups possess many units with common characteristics (i.e. there is a large area of common support); and c) there are no unobserved differences lurking among the groups, particularly those associated with the outcomes of interest, PSM can produce reliable intervention effect estimates.

Multivariable regression is another approach that is also used to control for measured differences between intervention and comparison groups. It operates differently from PSM in that it seeks to isolate the variation in the outcome variable explained by being in the intervention group *net of other explanatory variables* (key factors that explain variability in outcome) included the model. In this way, multivariable regression controls for measured differences between the intervention and comparison group. The validity of both PSM and multivariable regression are founded heavily on the "selection on observables" assumption, and therefore treatment effect estimates can be biased if there are unmeasured (or improperly measured) but relevant differences existing between the groups. Both PSM and multivariable regression were employed during data analysis.

4.3 Reconstruction of baseline

Propensity-score matching or multivariate regression will work more effectively when individual-level data on the situation of respondents at baseline is available, allowing for time-invariant differences between the groups to be controlled for. In the case of this project, baseline data were not available. Instead, the project effectiveness review attempted to reconstruct baseline data by asking respondents to recall their situation before the project activities commenced in 2008. In order to maximise the accuracy of the recalled data, respondents were asked to visualise their household's situation in the season before the drought of 2009. They were only asked to recall information which they could reasonably be expected to remember with clarity – including the condition of the house, the ownership of assets and livestock, and the variety of crops cultivated in 2008.

Several of the questions asked for information about the household's situation before the project began in 2008. This made it possible to reconstruct a baseline to enable more detailed analysis.

4.4 Selection of comparison group

A key factor in ensuring the validity of any non-randomised impact evaluation design is to employ an appropriate comparison group. This is particularly true for ex-post, cross-sectional designs. Comparators that differ in relation to the baseline status of the outcome variable(s) of interest and/or who are subjected to different external events and influences will likely result in misleading conclusions about programme impact. Identifying a plausible comparison group is therefore critically important in non-experimental evaluations and is, generally speaking, not an easy task.

In this case, the project activities were intended to benefit the whole population of pastoralists within the Commune of Bermo. The selection of a comparison group therefore depended on finding a comparable population in a nearby commune. One clear possibility was drawing the comparison population from Gadèbedji commune, which neighbours Bermo to the east. Oxfam's humanitarian work since the 2005 crisis has covered Gadèbedji as well as Bermo, and AREN has a structure of membership groups in both communes. Oxfam initially proposed to implement the NGRA36 project in Gadèbedji rather than Bermo. AREN chose to implement in Bermo instead, since the ethnolinguistic groups in Bermo better matched AREN's target groups.

In Bermo the population is predominantly Bororo (a subgroup of the Fula or Peulh people), whereas in Gadèbedji the majority of the population is Touareg, with minorities of Bororo and Hausa people. It was clear from initial discussions that comparisons could not be made across ethnic boundaries on the outcomes of interest for assessing adaptation and risk reduction: for example, Touaregs tend to have a different mix of animals in their herds and different traditional ways of responding to drought. However, it appeared that there were sufficient numbers of Bororo communities within Gadèbedji commune to act as a comparison group for this effectiveness review. It was not thought that the Bororo population in Gadèbedji were sufficiently linked with those in Bermo that they would have benefited indirectly to any significant extent from the project's activities and the activities of the GIE in Bermo. Since the other neighbouring communes were composed of populations much less similar to that in Bermo, the decision was taken to use the population in the Bororo-dominated areas of Gadèbedji commune as the comparison group for this effectiveness review.

Respondents were sampled from the membership lists of AREN's local groups in Bermo and in Gadèbedji commune.

5 Methods of Data Collection and Analysis

5.1 Data collection

The effectiveness review team designed a household questionnaire to capture data on both the outcome variables presented in Section 5 above, as well as other key characteristics of the targeted and comparison producers. This questionnaire was tested in pilot communities during the training workshop for the enumerators, and subsequently revised. Potential enumerators were invited to participate in the two-day training workshop, 13 of whom were selected, based on their performance in the practical exercise, to carry out the field work.

5.1.1 Data collection plan

AREN provided detailed membership records for their local groups in the communes of Bermo and Gadèbedji. These lists included names, approximate dates of birth and photographs of group members. In Gadèbedji, informants who know the area well were asked to identify which areas of the commune have a predominantly Bororo population, and groups in those areas were selected for inclusion in the effectiveness review. The local groups were relatively consistent in size (the number of individual members ranged from 27 to 60, with a median of 32 and mean of 35), but even so, proportionate stratified sampling was used to select a sample of interviewees at random from each local group for interview.

Another complicating factor was that, in most local groups, it was clear that multiple members of the same households had been enrolled as members: indeed, a large proportion of the membership of most groups were children. There was no way from the membership lists to identify which group members were members of each household, or even how many households were represented. Enumerators were therefore trained that, when they were given a group member's name as respondent, they should first identify the *household* that individual is a member of (using a standardised definition of household), and then interview the head, or some other senior adult, in that household. This process necessarily meant that a large proportion of those sampled as potential respondents would be members of the same households as other sampled individuals on the list, but of course there would only be one interview per household. It was necessary, therefore, to provide a large number of "replacement" respondents on the lists, to ensure that the targeted sample size could be reached.

Difficulties encountered in the field led to the respondents being interviewed who were not drawn from the original sample, some of whom were not suitable for comparison.

Since propensity-score matching gives less weight to the unmatched comparison data than the data from intervention observations, it is good for the sample size of the comparison group to be larger. To that end, the field staff were given a target of interviewing 360 comparison households across 21 communities in Gadèbedji commune, compared to 240 households across 51 communities in Bermo commune.

5.1.2 Data collection work as implemented

The consultant and enumerator team began work on 15 December 2011. In the event, there were deficiencies in how the plan described above was executed. Security restrictions prevented the officer from the Programme Performance and Accountability Team (PPAT) from travelling with the team to Bermo and Gadèbedji, and telephone communications with the team in those areas were also very difficult. This resulted in the locally-contracted consultant effectively having to manage the work independently. The team discovered that the pastoralists are disbursed over a very wide area, and what is represented in the AREN membership lists as a "community" is, in most cases, a well that they visit periodically to water their animals. There were also reports that households had already started their annual migration to the south. (This had not been anticipated by Oxfam or AREN staff, who believed that it was too early in the season for significant migration to have begun.) The survey team attempted to follow the procedure as set out, but it was impossible to locate the majority of the sampled respondents from the lists. Instead, the team carried out interviews with all of the households which were represented by people they could locate at or within realistic reach of the each of the wells. The team succeeded in interviewing representatives of 198 households. Of these, around 150 were taken from the original list or from the list of replacements, and the remainder of interviewees were located haphazardly at the wells.

The progress of the work in Gadèbedji commune was even more problematic. As in Bermo, the team had difficulties in locating the households and individuals who were selected at random from the membership lists. They realised that it would be easier to locate households in the communities further away in the commune, which tended to be composed of Touareg people, rather than Bororo people. They interviewed representatives of a total of 267 households in Gadèbedji commune, of whom only 43 were from the specified communities, before terminating the field work on 23 December 2011. Telephone discussions between the consultant and the PPAT officer in the following days confirmed that the Touareg people who had been interviewed tended to have different herd composition and different livelihoods activities from the overwhelming majority of people in the Commune of Bermo, so that they would not be suitable for comparison. It also became clear that it would have been possible to locate some more respondents in the Bororo-majority communities in Gadèbedji commune if more time had been available. The decision was therefore taken to send the survey team back to Gadèbedji commune to complete the survey with more appropriate respondents. Nine of the original enumerators returned to Gadèbedji to carry out the survey between 6 and 12 January 2012. They were able to survey 182 additional respondents during that time, all of whom were on the original list of randomly-selected respondents and replacements.

5.2 Data analysis

OGB created a data-entry interface in Adobe Acrobat Pro, and temporary staff were employed to carry out the data entry at the Oxfam office in Niamey. The data were imported into Stata for analysis, the results of which are presented in the following sections.

The analyses involved group mean comparisons using *t*-tests, propensity-score matching (PSM) with Stata's psmatch2 module, and various regression approaches. Kernel and nearest-neighbour matching without replacement were the two methods used in implementing PSM. Variables used in the matching process were identified by first using backwards stepwise regression to identify those variables that are correlated with the outcome measure of interest, using a cut-off the *p*-value of 0.2 when analysing results for the general population, and 0.25 when analysing results for the members of the GIE specifically. The short-listed variables were then put into another stepwise regression model to identify those that were correlated with being a member of the intervention group. Covariate balance was checked following the implementation of each matching procedure. When covariate imbalance at *p*-values of 0.20 (or 0.25) or less was identified, the bandwidth or calliper was reduced and the PSM procedure and covariate balance test implemented again. This was continued until all covariates were balanced at *p*-values greater than 0.20 or 0.25. Boot-strapped standard errors enabled the generation of confidence intervals to assess the statistical significance of the effect sizes.

To complement the PSM analysis, regression models were also constructed for the effects of the project on the various outcome measures. Appropriate covariates for these regression models were selected from among those presented in Table 6.1 below.

The fact that the survey work was undertaken in two phases presents problems for interpretation of the results of some of the outcome measures.

It should be noted that, as described in Section 4.4, the members of AREN groups in Gadèbedji commune were selected so as to be as comparable as possible with the general population in Bermo commune. However, there was no structure equivalent to the GIE in Gadèbedji commune, and so there was no way of directly selecting households which were appropriate for comparison with households of GIE members. However, it is of interest to evaluate the project's effects on members of the GIE specifically, as well as on the wider population in Bermo commune. These estimates, then, rely heavily on propensity-score matching to restrict the comparison set only to the appropriate observations. For this reason, the estimates of effects on the GIE members which are generated through PSM should be treated with more confidence than those generated by regression, where all the observations from Gadèbedji commune are used for comparison.

5.3 Problems and constraints encountered

The difficulties encountered in the course of the field work and data entry provide various challenges in analysing the data:

- *Data collection during dry season.* The survey field work was conducted early in the dry season, at a time when respondents were beginning to make decisions on how to respond. Although it was already clear that this would be a particularly difficult dry season in the region, few respondents had at that stage taken any action to manage their risk for the season. However, feedback from the survey team suggested that some of the selected respondents had already migrated south with their herds and household members, meaning that they could not be interviewed. Clearly, only those who remained in the area (or who had senior household members who remained in the area) could be interviewed. It is therefore possible that, to some extent, the sample of project participants who were interviewed was biased towards those who were less likely to migrate – that

is, who had already shown themselves less proactive in responding to an oncoming drought. It is unlikely, however, that the scale of migration, which had occurred by the date of the survey, was significant enough to severely bias the sample.

- *Time delay between the surveys of project participant households and the surveys of the majority of comparison households.* There was a two-week delay between the end of the first phase of field work on 23 December 2011, and the enumerators returning to carry out the surveys of the remaining comparison households in Gadèbedji commune on 6 January 2012. This delay occurred during the period when respondents were formulating and executing their plans to respond to the dry season. There are two potential effects of this. First, if (as discussed in the previous paragraph) the sample was biased to some extent by potential respondents having migrated before the date of the survey, then this bias will be more severe among the respondents in Gadèbedji commune, who were mostly interviewed two to three weeks later. If this is the case, then it will serve to *over*state the impact of the project on participants' risk management capacity. Second, this delay biases the responses to the survey questions about what risk management actions respondents had already taken during the current dry season: clearly, those who were interviewed later were likely to have carried out more risk management activities. Since the comparison respondents had more opportunity to take risk management actions before being interviewed, assessments of these actions therefore probably *under*estimate of the effect of the project. (It should be noted that the survey also asked respondents to specify which risk-management activities they *planned* to carry out during the current dry season, but that there were very few positive responses to any of these questions. Anyway, the responses could potentially suffer from the same type of bias: those who were interviewed later would have been more likely to have made plans to respond.) In practice, the relatively small numbers of respondents who had taken significant risk management action during the dry season, as well as the presumed small numbers who had already begun their annual migration, mean that the extent of such bias is probably small. However, the uncertainty involved does mean that the effects of this project on behaviour would have to be consequently larger to be inferred clearly from the data.

The quality of the survey work was lower than expected, leading to further difficulties in analysis and interpretation of results.

- *Survey respondents were not a random sample of the project participants, and many of the comparison respondents came from communities not properly comparable to the participant communities.* Despite the difficulties, by the end of the field work process there were sufficient numbers of surveys of respondents selected through the random sampling methodology to allow some analysis: around 150 households in Bermo commune and around 200 in Gadèbedji commune. An additional 50 households in Bermo commune were interviewed without being in the original sample, and an additional 216 households in Gadèbedji commune were interviewed but came from inappropriate communities. Unfortunately, the enumerators did not consistently identify which community each respondent came from on the survey forms, nor which respondents were from the original sample and which were not. This meant, firstly, that there was no clear way to identify the respondents from Bermo commune who were outside the original sample in order to exclude them from the analysis; this resulted in the sample being further biased towards those who could be located at the time of the survey. Secondly, it means that there is no way to consistently identify and exclude the inappropriate surveys from the comparison group. The analysis which follows therefore relies heavily on propensity-score matching to a greater extent

than is ideal, to ensure that those observations which are inappropriate for comparison purposes are excluded from the sample.[4]

- *Surveys were generally not conducted in the native language of the population.* The Oxfam and AREN staff tried to recruit enumerators who could speak Bororo (a dialect of Fula/Peulh), the maternal language of the majority of respondents. Unfortunately in the event only two of the 13 enumerators who carried out the work were Bororo speakers: the others carried out the survey in Hausa, the common language of Niger and of the region. While all the respondents could communicate effectively in Hausa, use of a non-native language is likely to have reduced the level of trust in the enumerators and so decreased the accuracy of the responses.

- *Low quality of some of the survey and/or data entry work.* Unfortunately the difficulties described above were compounded by a higher rate of error in the final dataset than is normally to be expected in survey work. The dataset contained many missing items of data, not all of which can be imputed – and this suggests that there are also likely to be significant numbers of errors which cannot be readily identified. The missing data decreases the number of survey observations available for analysis, while the errors in completed data have probably introduced more random variation (or statistical "noise") into the data than should have been the case. Both of these factors decrease the ability to statistically detect the results of the project.

Propensity-score matching and regression were critically important to control for the various measured differences identified between the intervention and comparison groups.

6 Results

6.1 General characteristics

Table 6.1 presents mean statistics for general household characteristics obtained from the survey in both the intervention area (Bermo commune) and the comparison area (Gadèbedji commune). The stars beside the numbers indicate differences between the two groups that are statistically significant at a 90 percent confidence level or greater.

As should be expected from the processes described Section 5, there are large and highly significant differences between the intervention and comparison groups in many respects. For example, it can be seen from Table 6.1 that 79 per cent of the households surveyed in Bermo commune were Bororo, compared to only 54 per cent of those in Gadèbedji commune. Also as expected, the households in Bermo commune were much less likely to be engaged in agriculture than those in Gadèbedji commune. There are also large differences between the intervention and comparison groups in household composition, education level, baseline wealth status, and distance from markets and other facilities.

These large observed differences in the two populations highlight the importance of using matching and regression with appropriate covariates to make estimates of the impact of the project. Estimates which did not control for these differences by using

[4] In fact an attempt was made at the analysis stage to identify those observations in the dataset which were included in the original sample, both in Bermo commune and Gadèbedji commune. This process relied on using circumstantial evidence and interpretations of parts of identification codes which had been missed. The process resulted in a sample of 146 observations in Bermo commune and 193 observations in Gadèbedji commune. The main outcome indicators in Section 7.2 were also analysed using this revised sample, and none of the results changed significantly. In Section 7, the full dataset has been retained to give greater statistical power to the outcome estimates.

appropriate matching variables or covariates would likely provide significantly biased estimates of the differences in outcome measures.

Interestingly, one of the few areas where the intervention and comparison groups are well balanced is in their receipt of humanitarian aid. Using the crude measure collected in the survey (the number of months that a particular form of support was provided), the populations in Bermo commune and Gadèbedji commune appear to have received similar levels of humanitarian support over the past three years.

Table 6.1: Descriptive statistics for intervention and comparison respondents

	Comparison based on interviewed respondents				GIE members			
	Intervention mean	Comparison mean	Difference	*t*-statistic	Intervention mean	Comparison mean	Difference	*t*-statistic
Household size	10.949	9.575	1.375***	3.45	13.941	9.311	4.631***	6.18
Number of adults	4.675	3.675	1.000***	4.62	6.137	3.711	2.427***	5.89
Number of children	6.274	5.900	0.374	1.30	7.804	5.600	2.204***	4.23
Number of productive adults	3.822	3.136	0.686***	3.82	5.020	3.247	1.772***	5.10
Number of unproductive adults	0.223	0.160	0.063	1.40	0.392	0.121	0.271***	3.21
Household head female	0.081	0.076	0.005	0.24	0.078	0.047	0.031	0.87
HH head is engaged in some productive activity	0.964	0.955	0.009	0.50	0.941	0.958	-0.016	-0.50
Household head > 60 years old	0.086	0.122	-0.036	-1.35	0.118	0.095	0.023	0.48
Household head < 18 years old	0.005	0.002	0.003	0.60	0.000	0.000	0.000	.
Age of household head	44.521	49.275	-4.754**	-2.22	48.540	45.747	2.793	1.43
Only one adult in household	0.010	0.042	-0.032**	-2.13	0.000	0.042	-0.042	-1.49
No male adults in household	0.081	0.056	0.026	1.23	0.020	0.021	-0.001	-0.06
All household members > 60 years old	0.015	0.016	-0.000	-0.03	0.000	0.005	-0.005	-0.52
HH head is of Bororo/Fula ethnicity	0.790	0.537	0.253***	6.21	0.902	0.947	-0.045	-1.17
HH head is of Touareg ethnicity	0.190	0.319	-0.129***	-3.38	0.098	0.011	0.087***	3.35
HH head is of Hausa ethnicity	0.015	0.142	-0.126***	-4.91	0.000	0.043	-0.043	-1.50
HH head has some primary education	0.391	0.278	0.112***	2.85	0.431	0.168	0.263***	4.12
HH head has some secondary education	0.365	0.261	0.105***	2.71	0.412	0.168	0.243***	3.82
Some HH member has formal employment	0.020	0.013	0.007	0.66	0.020	0.000	0.020*	1.94
Asset index 2008	0.601	-0.274	0.875***	4.16	1.192	-0.791	1.983***	7.39
Asset poorest third in 2008	0.264	0.366	-0.102**	-2.43	0.180	0.461	-0.281***	-3.68
Asset middle third in 2008	0.286	0.356	-0.070*	-1.66	0.200	0.383	-0.183**	-2.44
Asset wealthiest third in 2008	0.451	0.278	0.172***	4.14	0.620	0.156	0.464***	7.37
Livestock index 2008	0.282	-0.123	0.405**	2.32	0.872	0.125	0.747**	2.07
HH produced any milk in 2008	0.689	0.748	-0.059	-1.55	0.706	0.816	-0.110*	-1.72
HH sold any milk in 2008	0.222	0.342	-0.120***	-3.01	0.255	0.497	-0.242***	-3.14
HH farmed any crops in 2008	0.355	0.624	-0.268***	-6.49	0.412	0.458	-0.046	-0.59
Number of crops farmed in 2008	1.036	1.813	-0.777***	-5.88	1.196	1.374	-0.178	-0.71
Number of crops sold in 2008	0.223	0.479	-0.255***	-3.08	0.255	0.253	0.002	0.02
Distance from house to nearest market†	202.619	90.355	112.264***	5.51	153.333	108.646	44.688***	3.81
Distance from house to nearest clinic†	115.482	84.567	30.915***	4.07	97.922	103.175	-5.253	-0.64
Distance from house to drinking water†	21.026	28.462	-7.436**	-2.32	25.580	45.543	-19.963**	-2.52
Number of months in the years 2009–11 in which the household received:								
Food vouchers	1.435	1.455	-0.020	-0.08	2.458	0.929	1.529***	3.31
Food distribution	1.299	1.645	-0.345*	-1.83	1.913	0.911	1.002***	3.15
Distribution of animal feed	0.941	1.158	-0.217	-0.99	0.761	0.637	0.124	0.51
Vouchers for animal feed	1.257	1.272	-0.015	-0.07	1.936	1.011	0.925***	2.73
Cash for work	0.449	0.576	-0.127	-1.12	0.479	0.380	0.099	0.61
Cash distribution	0.332	0.428	-0.096	-1.28	0.565	0.348	0.217	1.56
Livestock distribution	0.296	0.428	-0.131*	-1.69	0.413	0.359	0.054	0.43
Vouchers or discounts for purchasing livestock	0.068	0.082	-0.013	-0.33	0.106	0.022	0.085*	1.93
Intervention buying of livestock	0.197	0.180	0.016	0.16	0.449	0.011	0.438***	3.99
Some HH member is a member of an AREN group	0.949	0.922	0.027	1.25	1.000	0.916	0.084**	2.16
Observations	**197**	**449**	**646**		**51**	**190**	**241**	

* $p<0.1$, ** $p<0.05$, *** $p<0.01$
HH: household
† minutes on foot

6.2 Evidence of impact on outcome measures

6.2.1 Global Indicator for Adaptation and Risk Reduction

From the survey responses, each household was assigned a score for their overall ability to minimize risk from shocks and adapt to climate change, as described in Section 3.1. The results of the analysis of this outcome measure are shown in Table 6.2. The upper section of the table shows the raw unadjusted differences in the Table values. The second section uses two different forms of propensity-score matching, and the third section uses three different regression models, to provide various estimates of the outcome measure.

Although the unadjusted figures in the top section of Table 6.2 show slightly higher scores for households in the intervention area (both among GIE members and for the overall general population in Bermo commune), once propensity-score matching or regression techniques are used to control for measured differences between the groups, the statistically significant of the difference disappears.

There is no significant difference between households in the project area and those in the comparison area in terms of the overall score for adaptation and risk reduction.

Table 6.2: Overall score on ability to minimize risk from shocks and adapt to emerging trends and uncertainty

	Overall	GIE members
Unadjusted:		
Sample mean	0.424	0.439
Intervention mean	0.445	0.508
Comparison mean	0.415	0.420
Unadjusted difference	0.030**	0.088***
	(2.58)	(4.76)
Observations:	602	218
PSM (ATT)		
Post-matching difference (kernel)	0.001	0.012
	(0.04)	(0.38)
Observations:	524	191
Post-matching difference (no replacement)	0.017	0.023
	(1.17)	(0.78)
Observations:	506	194
Multivariable Regression:		
MVR coefficient (robust standard errors)	0.015	0.012
	(1.14)	(0.48)
Observations:	514	202
MVR coefficient (robust regression)	0.013	0.010
	(0.99)	(0.38)
Observations:	513	200
MVR coefficient with control functions (robust SE)	0.009	0.004
	(0.68)	(0.17)
Observations:	511	186

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

Table 6.3: Overall score on ability to minimize risk from shocks and adapt to emerging trends and uncertainty greater than the median of the comparison group

	Overall	GIE members
Unadjusted:		
Sample mean	0.543	0.606
Intervention mean	0.609	0.783
Comparison mean	0.514	0.558
Unadjusted difference	0.094**	0.224***
	(2.15)	(2.80)
Observations:	602	218
PSM (ATT)		
Post-matching difference (kernel)	0.019	0.045
	(0.31)	(0.38)
Observations:	524	191
Post-matching difference (no replacement)	0.042	0.061
	(0.69)	(0.52)
Observations:	506	194
Multivariable Regression:		
Probit coefficient (robust standard errors)	0.116	-0.062
	(0.79)	(-0.19)
Observations:	513	200
Probit coefficient with control functions (robust SE)	0.072	-0.003
	(0.47)	(-0.01)
Observations:	511	186

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

Also as described in Section 3.1, the Oxfam GB global indicator for adaptation and risk reduction is a binary indicator, which is positive (i.e. takes the value 1) when the household's score for adaptation and risk reduction is greater than or equal to the median of the comparison group, and which is zero otherwise. Since Table 6.2 showed no significant differences between the intervention and comparison households in terms of the overall score, it is also not surprising that, as shown in Table 6.3, there is also no difference between these groups in terms of the binary indicator.

There is, then, no evidence that the project has had a positive impact on the overall score for adaptation and risk reduction. However, this score is an aggregation of many different dimensions, and it is possible that there may be indications of positive impact from the project in some of these dimensions. The following sections will examine these dimensions individually.

6.2.2 Dimension 1: Livelihood Viability

Households in the project area are no more likely to have engaged in destocking and have no high levels of diversification in their livelihoods activities than do those in the comparison area.

The results for each of the nine characteristics in the livelihood viability dimension (as described in Table 3.1) are shown in Table 6.4. Although there are substantial differences between the intervention and comparison households in terms of most of these characteristics, most of these differences disappear or are reduced in size once matching or regression techniques are used to ensure that the two groups are comparable.

There is, for example, no significant difference between the intervention and comparison households in terms of the degree of diversification of their livelihoods activities or the diversification of their herds. These conclusions apply whether the considering the general population or the GIE members specifically.

On crop diversification, it appears from Table 6.4 that the supported producers produced a significantly smaller range of crops than comparison producers in 2011. To some extent, this difference probably reflects the underlying differences between the samples interviewed in Bermo and in Gadèbedji. When this measure is examined as the change in the number of crops grown between 2008 and 2011 (the difference in difference; results shown in Table 6.5), the statistical significance is reduced. However, there are still some indications of a reduction in crop diversity in Bermo commune compared to similar households in Gadèbedji commune.

The use of seasonal forecasting information is another area where households in the intervention area scored significantly lower than those in the comparison area (although this time the difference does not apply to the GIE members). Around 60 per cent of the households in Bermo commune reported having referred to seasonal forecasting information in 2011, compared to around 70 percent of comparable households in Gadèbedji.

Table 6.4: Scores on dimension 1: Livelihood viability
(all characteristics are scored on a scale of 0 to 3)

	Livelihood diversification		Herd diversity		Crop diversity		Use of seasonal forecasting information		Support in marketing livestock		Destocking behaviour		Seasonal migration behaviour		Access to veterinary services		Drought preparedness training	
	Overall	GIE	Overall	GIE	Overall	GIE	Overall	GIE	Overall	GIE	Overall	GIE	Overall	GIE	Overall	GIE	Overall	GIE
Unadjusted:																		
Sample mean	1.148	0.909	1.598	1.884	1.262	1.154	1.272	1.386	1.242	1.418	0.465	0.575	0.861	1.038	1.502	1.561	0.778	0.784
Intervention mean	1.005	1.059	1.750	1.941	0.827	0.843	1.178	1.549	1.385	1.800	0.586	0.771	1.015	1.020	1.655	1.863	0.944	1.176
Comparison mean	1.210	0.868	1.531	1.868	1.452	1.237	1.313	1.342	1.179	1.317	0.410	0.522	0.793	1.043	1.434	1.479	0.705	0.679
Unadjusted difference	-0.205**	0.190	0.219***	0.073	-0.625***	-0.394**	-0.136	0.207	0.205**	0.483***	0.176**	0.248*	0.222**	-0.023	0.221**	0.384**	0.239***	0.498***
	(-2.32)	(1.31)	(2.61)	(0.57)	(-7.45)	(-2.39)	(-1.40)	(1.20)	(2.36)	(3.17)	(2.40)	(1.69)	(2.08)	(-0.11)	(2.29)	(2.20)	(2.67)	(3.21)
Observations:	643	241	644	241	646	241	644	241	641	239	620	226	639	236	642	239	644	241
PSM (ATT)																		
Post-matching difference (kernel)	0.041	0.172	-0.172	-0.302	-0.490***	-0.647**	-0.323***	-0.007	0.132	0.555*	0.059	-0.011	-0.043	-0.275	0.233*	0.168	0.122	0.170
	(0.43)	(0.83)	(-1.64)	(-1.43)	(-4.36)	(-2.41)	(-2.96)	(-0.02)	(1.12)	(1.94)	(0.60)	(-0.04)	(-0.29)	(-0.78)	(1.88)	(0.60)	(1.01)	(0.81)
Observations:	618	230	540	205	573	224	571	212	566	205	547	199	523	200	567	211	573	229
Post-matching difference (no replacement)	0.070	0.180	-0.197*	-0.310	-0.399***	-0.526**	-0.269**	0.033	0.067	0.564**	0.054	0.125	-0.098	-0.333	0.253**	0.122	0.205*	0.125
	(0.69)	(0.93)	(-1.81)	(-1.58)	(-3.50)	(-2.20)	(-2.29)	(0.11)	(0.56)	(2.32)	(0.51)	(0.55)	(-0.63)	(-1.09)	(2.06)	(0.52)	(1.75)	(0.52)
Observations:	600	230	545	190	562	217	567	201	494	207	541	198	529	200	556	217	569	229
Multivariable Regression:																		
MVR coefficient (robust standard errors)	0.083	0.092	-0.107	-0.221	-0.462***	-0.395*	-0.287**	0.081	0.090	0.459**	0.035	0.107	-0.081	-0.436	0.305**	0.270	0.258**	0.327
	(0.81)	(0.44)	(-1.08)	(-1.25)	(-4.85)	(-1.78)	(-2.31)	(0.36)	(0.78)	(2.07)	(0.37)	(0.50)	(-0.61)	(-1.55)	(2.40)	(1.04)	(2.17)	(1.40)
Observations:	553	225	555	225	555	225	553	225	550	223	530	210	548	220	551	223	553	225
MVR coefficient (robust regression)	0.096	0.117	-0.068	-0.064	-0.476***	-0.323	-0.314**	0.098	0.081	0.507**		0.205	-0.020	-0.416	0.320**	0.310	0.302**	0.375*
	(0.87)	(0.56)	(-0.66)	(-0.41)	(-5.11)	(-1.59)	(-2.41)	(0.39)	(0.69)	(2.42)	–	(1.23)	(-0.15)	(-1.34)	(2.46)	(1.16)	(2.27)	(1.66)
Observations:	553	225	555	225	555	225	553	224	549	223		210	547	220	551	223	552	225
MVR coefficient with control functions (robust SE)	0.084	0.087	-0.161	-0.216	-0.406***	-0.397*	-0.244*	0.042	0.070	0.482**	0.014	0.079	-0.237*	-0.386	0.341**	0.187	0.273**	0.190
	(0.80)	(0.39)	(-1.54)	(-1.20)	(-4.19)	(-1.70)	(-1.85)	(0.18)	(0.59)	(2.09)	(0.15)	(0.37)	(-1.78)	(-1.31)	(2.57)	(0.73)	(2.21)	(0.85)
Observations:	550	208	552	208	552	208	550	208	547	206	527	193	545	204	548	206	550	208

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

Table 6.5: Change in number of crops produced between 2008 and 2011

	Overall	GIE members
Unadjusted:		
Sample mean	0.334	0.394
Intervention mean	0.213	0.078
Comparison mean	0.388	0.479
Unadjusted difference	-0.174	-0.401*
	(-1.51)	(-1.84)
Observations:	646	241
PSM (ATT)		
Post-matching difference (kernel)	-0.279*	-0.411
	(-1.77)	(-1.05)
Observations:	573	208
Post-matching difference (no replacement)	-0.222	-0.462
	(-1.39)	(-1.26)
Observations:	570	208
Multivariable Regression:		
MVR coefficient (robust standard errors)	-0.311**	-0.153
	(-2.03)	(-0.46)
Observations:	555	225
MVR coefficient with control functions (robust SE)	-0.249	-0.146
	(-1.55)	(-0.41)
Observations:	552	208

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

On the positive side, there are good indications of a positive effect on support to livestock marketing: GIE members are much more likely to have received training or practical support in marketing livestock during 2011. This is positive news, since building the capacity of beneficiaries for commercialisation of livestock was the primary objective of the project and the reason for the establishment of the GIE. However, the positive effect does appear to be confined to the GIE: the rest of the population in Bermo commune were no more likely to have received training in this area than comparable people in Gadèbedji. Whether the training and support actually led to households in Bermo commune realising more favourable prices in purchasing and selling livestock (a factor which does not form part of the ARR indicator) will be considered in Section 6.2.6 below.

Two important areas where there is no detectable difference between the intervention and comparison households is in the willingness of households to engage in destocking or annual migration. In particular, AREN had been actively encouraging project participants to decrease their stocks of large animals during the months prior to the effectiveness review field work, with the aim of reducing households' vulnerability to what was clearly going to be a difficult dry season. However, as of the date of the survey, while around a third of respondents had done some destocking, there was no significant difference in this figure between the households in Bermo commune and the comparable households in Gadèbedji commune. The proportion of GIE members who had engaged in destocking was higher, at around 42% to 44%, but this difference is not statistically significant, so cannot be stated with confidence. The number of animals which had been sold was generally small: among those who had engaged in destocking of cattle, the median number sold was two, compared to a median herd size in mid-2011 of eight. (As described in Section 5.3 above, the time delay between the two phases of the survey could potentially introduce bias into this estimate, since most respondents in Gadèbedji had more time to have engaged in

destocking. Any such bias would underestimate the effect which the project had on destocking behaviour.)

As noted in Section 5.3, it is particularly difficult to make inferences about migration behaviour from this dataset, given that some of the population in the area were reported to have begun their annual migration at the time the survey was conducted, so were not available to interview. However, feedback from field staff suggests that this affected only a minority of the population in the area, so the extent of any bias should be limited. The indicator for migration analysed in Table 6.4 is based on whether the household actually sent any of its animals south during the severe dry season in 2009/10, as well as whether it had done so or planned to do so in 2011/12. On this measure, there is no difference between the households in the Bermo commune and those in the Gadèbedji commune.

Households in Bermo commune do appear to have received more drought preparedness training and have better access to veterinary services than do those in Gadèbedji commune.

Two factors for which there is some evidence of a positive effect from the project are the provision of veterinary services and drought preparedness training. Households in the Bermo commune used veterinary services more frequently during the year than did those in the Gadèbedji commune. They also received more intense training on drought preparedness than did comparable households in the Gadèbedji commune. However, in both these cases, the effects apply to the general population, but not specifically to the GIE members: there is little or no evidence that GIE members received more support in these areas than did comparable households in Gadèbedji.

6.2.3 Dimension 2: Livelihood Innovation Potential

Whether respondents have the initiative and willingness to change existing practices and try new practices was assessed by asking whether they agreed or disagreed with a series of eight statements about innovation and planning for the future. These responses were aggregated by allocating higher scores to those statements suggesting higher ability to innovate (and lower scores to agreement with statements suggesting reluctance to innovate) and then adding them to produce an overall percentage score. On the basis of these scores, the respondents were split into four quantiles, in order to allocate each one a score from 0 to 3, consistent with the other ARR dimensions. The analysis of the resulting scores is shown in Table 6.6. There is little indication in these results of any difference in the attitudes scores between the respondents in the Bermo commune and comparable respondents in the Gadèbedji commune. Although there is an indication of higher scores among the GIE members from one of the PSM models, this is corroborated by the other statistical models, so this should not be treated as a meaningful result.

Table 6.6: Score on characteristic 2.1: attitudes to change and willingness to try new practices

	Overall	GIE members
Unadjusted:		
Sample mean	1.387	1.318
Intervention mean	1.413	1.400
Comparison mean	1.376	1.296
Unadjusted difference	0.037	0.104
	(0.38)	(0.59)
Observations:	643	239
PSM (ATT)		
Post-matching difference (kernel)	0.078	0.262
	(0.68)	(1.04)
Observations:	641	218
Post-matching difference (no replacement)	0.112	0.439*
	(0.92)	(1.71)
Observations:	626	217
Multivariable Regression:		
MVR coefficient (robust standard errors)	0.091	0.072
	(0.71)	(0.27)
Observations:	552	223
MVR coefficient (robust regression)	0.092	0.063
	(0.68)	(0.24)
Observations:	552	223
MVR coefficient with control functions (robust SE)	0.092	-0.039
	(0.71)	(-0.15)
Observations:	549	206

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

There are no differences between the project and comparison areas in terms of attitudes to change or willingness to engage in new practices.

6.2.4 Dimension 3: Access to Contingency Resources and Support

As described in Section 3.3, respondents were asked about their ownership of various common types of productive assets and household goods. For the purposes of the ARR dimension of contingency resources, an index was generated reflecting each household's ownership of the types assets which could be sold in the event of need. (These "convertible" assets include those listed as agricultural equipment, vehicles and household goods in Table 3.2, but not the characteristics of the house itself.) Again households were allocated to four quartiles so as to represent their ownership of convertible assets on a scale from 0 to 3. The analysis of the resulting variable is shown in Table 6.7: it can be seen that households in the Bermo commune (whether in the general population or GIE members specifically) do not have asset holdings which are significantly different to those of comparable households in the Gadèbedji commune.

Table 6.7: Score on characteristic 3.1: possession of convertible assets other than livestock

	Overall	GIE members
Unadjusted:		
Sample mean	1.498	1.357
Intervention mean	1.660	2.078
Comparison mean	1.428	1.163
Unadjusted difference	0.232**	0.915***
	(2.44)	(5.80)
Observations:	646	241
PSM (ATT)		
Post-matching difference (kernel)	0.052	-0.083
	(0.41)	(-0.38)
Observations:	558	211
Post-matching difference (no replacement)	0.123	0.133
	(0.96)	(0.58)
Observations:	548	213
Multivariable Regression:		
MVR coefficient (robust standard errors)	0.083	0.109
	(0.85)	(0.54)
Observations:	555	225
MVR coefficient (robust regression)	0.042	-0.109
	(0.44)	(-0.64)
Observations:	554	225
MVR coefficient with control functions (robust SE)	0.080	0.033
	(0.79)	(0.17)
Observations:	552	208

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

Households in the project area to not have significantly greater ownership of convertible assets than do those in the comparison area.

6.2.5 Dimension 4: Natural Resource Access and Management

The sole characteristic which was identified to assess under the natural resource access and management dimension was the water source which the household uses for watering animals. An important intervention of the project was the improvement of seven wells in Bermo commune. The results of the four-point scale for the type of well most often used for watering animals in each household is shown in Table 6.8. Again there are no significant differences between the households in Bermo commune and comparable households in Gadèbedji commune. Around a third of respondents in both areas reported using a modern, cemented, well as the most common sources for watering their livestock.

Table 6.8: Score on dimension 4.1: access to water for productive use

	Overall	GIE members
Unadjusted:		
Sample mean	2.354	2.349
Intervention mean	2.213	2.157
Comparison mean	2.416	2.400
Unadjusted difference	-0.203***	-0.243**
	(-4.03)	(-2.60)
Observations:	646	241
PSM (ATT)		
Post-matching difference (kernel)	-0.039	-0.079
	(-0.68)	(-0.57)
Observations:	623	229
Post-matching difference (no replacement)	-0.067	-0.041
	(-1.12)	(-0.31)
Observations:	622	229
Multivariable Regression:		
MVR coefficient (robust standard errors)	0.031	0.049
	(0.84)	(0.50)
Observations:	555	225
MVR coefficient with control functions (robust SE)	0.039	0.058
	(1.00)	(0.58)
Observations:	552	208

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

About 30 per cent of households in both areas most often use a modern cemented well for watering their livestock.

6.2.6 Income from livestock activities

The project under review sought not only to reduce pastoralists' vulnerability to weather shocks and to climate change but also improve household incomes through enabling them to generate better returns when marketing livestock, as well as through encouraging adoption of alternative or additional livelihoods activities.

We found in Section 6.2.2 above that GIE members reported receiving more training on marketing livestock than comparison households did, in line with the objectives of the project (although there was no evidence of an effect in the wider population in Bermo commune). It remains now to assess what effect this training has had on the incomes of households. To that end, Table 6.9 examines the prices which respondents reported receiving for their last sale of various types of animals. These figures refer only to sales made during the six months prior to the survey, and not all respondents made sales during this period. The numbers of transactions reported for other animal types (camels, donkeys, horses, and male goats) were too small to allow for statistical analysis of the price, as were the numbers of transactions reported by GIE members specifically. Similarly, very few respondents reported having purchased any livestock in the six months prior to the survey, so the prices paid cannot be analysed.

Table 6.9 does provide some evidence that households in the intervention area have realised higher prices on average for sales of cattle and sheep. This is particularly clear for sales of male cattle, where the various statistical tests all estimate that households in Bermo commune realised prices which were 40 to 50 per cent higher on average than comparable households in Gadèbedji commune. For female cattle and for sheep, the estimates of the differences are smaller and not always statistically

significant, but the evidence does suggest overall that those in Bermo commune sold their animals for systematically higher prices.

Table 6.9: Price realised the last time an animal was sold (natural logarithm of price in francs)

	Female cattle	Male cattle	Female sheep	Male sheep	Female goats
Unadjusted:					
Sample mean	11.537	11.539	10.121	10.287	9.761
Intervention mean	11.612	11.720	10.185	10.318	9.729
Comparison mean	11.465	11.328	10.085	10.257	9.776
Unadjusted difference	0.147	0.391***	0.099	0.061	-0.047
	(1.42)	(3.20)	(1.21)	(0.52)	(-0.52)
Observations:	175	121	245	125	243
PSM (ATT)					
Post-matching difference (kernel)	0.325**	0.422***	0.124	0.295**	-0.127
	(2.08)	(3.42)	(1.34)	(2.06)	(-0.98)
Observations:	172	112	235	116	238
Post-matching difference (no replacement)	0.142	0.431***	0.166*	0.171	-0.131
	(1.13)	(2.86)	(1.66)	(1.20)	(-1.02)
Observations:	171	112	235	116	231
Multivariable Regression:					
MVR coefficient (robust standard errors)	0.211*	0.491**	0.257***	0.246	-0.167
	(1.76)	(2.59)	(2.76)	(1.41)	(-1.50)
Observations:	161	106	219	112	217
MVR coefficient (robust regression)	0.090	0.516***	0.120	0.227	-0.057
	(0.92)	(3.20)	(1.64)	(1.37)	(-0.69)
Observations:	161	106	219	111	217
MVR coefficient with control functions (robust SE)	0.214*	0.473**	0.212**	0.204	-0.188
	(1.80)	(2.46)	(2.29)	(1.06)	(-1.65)
Observations:	161	106	217	110	217

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

Households in Bermo commune do appear to be realising higher prices when selling cattle and sheep than those in Gadèbedji commune, though the use of intermediaries continues.

The results in Table 6.9 raise the question of how these apparent higher prices have been realised. One aspect of the training conducted under this project was in encouraging pastoralists not to conduct their transactions via an intermediary (dillali) in the market. The survey asked respondents whether their last purchase and last sale of each animal type (during the six months previous to the survey) had been conducted through such an intermediary. In fact, almost all respondents reported using an intermediary for all of their transactions. Only eight of the 437 respondents who made some sales of livestock during the six-month period reported not having used an intermediary, while only four of the 44 respondents who made purchases during that period did not use an intermediary. There was, then, no sign of an impact from the project on the use of intermediaries. However, the main project activity, which was expected to have an effect on this, was the GIE's takeover of management of the livestock market in Bermo town. This had not yet occurred at the time of the effectiveness review field work. Consequently, its impact on the use of intermediaries and on pastoralists' incomes could not be assessed.

The survey also asked households about their production and sales of animal products, including milk, cheese, eggs and leather. Table 6.10 shows the results of this analysis: only 13 per cent of the respondents reported having made sales of any of these products during 2011, with no clear difference between the intervention and

comparison households. For completeness, the right-hand columns of Table 6.10 show the results of analysing the value of sales, though the high number of zero-entries for this variable makes analysis difficult. As expected, there are also significant differences between intervention and comparison households on this measure.

Households in the project area were no more likely to have made sales of animal products – including milk, cheese, eggs and leather – during 2011 than households in the comparison area.

Table 6.10: Sales of animals products during 2011

	Sold any animal products during 2011		Average value of sales (natural logarithm of 1 + value, in francs per month)	
	Overall	GIE members	Overall	GIE members
Unadjusted:				
Sample mean	0.129	0.156	0.992	1.216
Intervention mean	0.139	0.114	1.163	1.002
Comparison mean	0.125	0.167	0.922	1.272
Unadjusted difference	0.013	-0.053	0.241	-0.270
	(0.44)	(-0.87)	(0.96)	(-0.54)
Observations:	604	224	596	222
PSM (ATT)				
Post-matching difference (kernel)	0.006	-0.224**	0.324	-1.092
	(0.15)	(-2.07)	(1.00)	(-1.22)
Observations:	523	203	519	197
Post-matching difference (no replacement)	0.014	-0.139	0.377	-1.190*
	(0.34)	(-1.32)	(1.11)	(-1.67)
Observations:	523	200	499	204
Multivariable Regression:				
MVR/probit coefficient (robust standard errors)	-0.008	-0.045	0.067	-0.585
	(-0.23)	(-0.81)	(0.19)	(-0.84)
Observations:	504	198	498	202
MVR/probit coefficient with control functions (robust SE)	-0.011	-0.068	0.109	-0.718
	(-0.30)	(-1.21)	(0.30)	(-0.89)
Observations:	502	181	495	187

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

6.2.6 Household income and wellbeing

Survey respondents were asked whether their overall level of household income had increased, decreased, or remained the same since 2008. Table 6.11 presents the proportion who reported that their income had remained approximately the same or increased since 2008. As can be seen, only 32 per cent of the sample responded positively; that is, 68 per cent reported that their overall household income had decreased since 2008. There were no significant differences found between either of the intervention groups (the overall population in Bermo commune or the members of the GIE specifically) than the comparison group. The estimates from the regression models even indicate that GIE members are less likely to have maintained or increased their level of income than comparable households in Gadèbedji commune. However, as noted previously, the method of selection suggests that the PSM estimates (which show no statistically-significant difference) should be treated with more confidence.

Table 6.11: Household income remained approximately the same or increased since 2008

Around two thirds of respondents reported that their household income had decreased since 2008, with no significant differences between the groups.

	Overall	GIE members
Unadjusted:		
Sample mean	0.319	0.329
Intervention mean	0.337	0.286
Comparison mean	0.311	0.341
Unadjusted difference	0.026	-0.055
	(0.62)	(-0.72)
Observations:	605	234
PSM (ATT)		
Post-matching difference (kernel)	0.010	-0.085
	(0.17)	(-0.82)
Observations:	501	201
Post-matching difference (no replacement)	-0.007	-0.188
	(-0.13)	(-1.51)
Observations:	495	201
Multivariable Regression:		
Probit coefficient (robust standard errors)	-0.022	-0.218**
	(-0.35)	(-2.22)
Observations:	383	177
Probit coefficient with control functions (robust SE)	-0.028	-0.295***
	(-0.42)	(-3.20)
Observations:	380	151

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

A second subjective measure included in the questionnaire was a question asking respondents whether their income is sufficient to meet its basic needs, without resorting to selling assets or relying on assistance from others. The results from analysing this indicator are shown in Table 6.12. Again, there is no indication that households in Bermo commune (either in the population overall or among GIE members in particular) are more likely to be able to support their basic needs from household income than are comparable households in Gadèbedji commune.

Table 6.12: Household is able to meet its basic needs from household income

	Overall	GIE members
Unadjusted:		
Sample mean	0.408	0.406
Intervention mean	0.429	0.412
Comparison mean	0.398	0.404
Unadjusted difference	0.030	0.008
	(0.72)	(0.10)
Observations:	628	239
PSM (ATT)		
Post-matching difference (kernel)	0.042	-0.059
	(0.90)	(-0.47)
Observations:	575	188
Post-matching difference (no replacement)	0.050	-0.118
	(0.92)	(-0.91)
Observations:	575	188
Multivariable Regression:		
Probit coefficient (robust standard errors)	0.007	-0.352***
	(0.12)	(-2.84)
Observations:	401	170
Probit coefficient with control functions (robust SE)	0.023	-0.349**
	(0.33)	(-2.31)
Observations:	399	154

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

On the self-reported measure of income being adequate to meet the household's basic needs, there is again no difference between the project and comparison areas.

As will be recalled from Section 3.3, respondents were asked in the survey about their possession of various forms of asset wealth, both at the time of the survey and in 2008. The possession of convertible assets was already examined as one of the resilience characteristics in Section 6.2.4 (Table 6.6), and no difference was found between the respondents in Bermo commune and those in Gadèbedji commune. For completeness, Table 6.13 shows the results of analysis of how households' possession of the full range of assets has changed since 2008. Positive figures in this table represent an above-average change, while negative figures represent a below-average change. Again, there is little indication of a difference between households in Bermo commune and those in Gadèbedji.

Table 6.13: Change in asset index since 2008 (first principle component; does not include livestock)

	Overall	GIE members
Unadjusted:		
Sample mean	0.000	-0.360
Intervention mean	-0.066	-0.328
Comparison mean	0.029	0.032
Unadjusted difference	-0.095	-0.360
	(-0.61)	(-1.61)
Observations:	636	238
PSM (ATT)		
Post-matching difference (kernel)	-0.003	-0.634
	(-0.01)	(-1.43)
Observations:	583	211
Post-matching difference (no replacement)	-0.118	-0.652
	(-0.57)	(-1.56)
Observations:	572	211
Multivariable Regression:		
MVR coefficient (robust standard errors)	-0.227	-1.089**
	(-1.03)	(-2.29)
Observations:	451	188
MVR coefficient (robust regression)	-0.077	0.014
	(-0.80)	(0.10)
Observations:	451	187
MVR coefficient with control functions (robust SE)	-0.226	-1.298**
	(-1.07)	(-2.51)
Observations:	446	173

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

There was also no difference between the project and comparison areas in terms of the households' relative change in asset ownership since 2008.

Because of the central importance of livestock to this population, the possession of livestock was not included in the general asset index analysed in Table 6.13. Instead, a separate livestock index was created, using principle factor analysis to weight each animal type to focus on variation in the data. The figures in Table 6.14 show in the change in households' livestock possession since 2008: again there is no indication that households in Bermo commune differ significantly from comparable households in Gadèbedji commune in this respect.

Table 6.14: Change in index of livestock ownership between 2008 and mid-2011 (first principle component)

	Overall	GIE members
Unadjusted:		
Sample mean	0.000	-0.220
Intervention mean	-0.127	-0.574
Comparison mean	0.056	-0.125
Unadjusted difference	-0.183	-0.449
	(-1.09)	(-1.22)
Observations:	644	241
PSM (ATT)		
Post-matching difference (kernel)	0.161	0.188
	(0.67)	(0.19)
Observations:	615	218
Post-matching difference (no replacement)	0.198	-0.132
	(0.85)	(-0.20)
Observations:	626	218
Multivariable Regression:		
MVR coefficient (robust standard errors)	0.441	0.395
	(1.51)	(0.62)
Observations:	410	181
MVR coefficient (robust regression)	-0.095	-0.259
	(-0.70)	(-0.70)
Observations:	410	181
MVR coefficient with control functions (robust SE)	0.565	
	(1.63)	–
Observations:	406	

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

Similarly, there was no difference between the groups in the change in ownership of livestock since 2008.

Table 6.15 uses the survey questions on food security to derive an alternative measure for impact on household wellbeing. Note that in this table, zero is the food security level of the average respondent and higher figures represent *lower* food security. As would be expected in this population, levels of food security are generally poor, with large proportions of respondents reporting that their households had missed meals and/or eaten smaller meals than they wished during the four weeks prior to the survey. Table 6.15 shows that there are no observable differences in terms of food security between the general population in Bermo commune and the comparable households in Gadèbedji commune. Unfortunately, the estimates imply a worse food security situation among members of the GIE than among comparable households in Gadèbedji commune.

Table 6.15: Food security score (first principle component; higher values represent lower food security)

	Overall	GIE members
Unadjusted:		
Sample mean	0.000	0.133
Intervention mean	-0.084	0.524
Comparison mean	0.039	0.028
Unadjusted difference	-0.123	0.496
	(-0.71)	(1.61)
Observations:	552	217
PSM (ATT)		
Post-matching difference (kernel)	0.186	1.080**
	(0.80)	(2.12)
Observations:	494	196
Post-matching difference (no replacement)	0.100	0.805*
	(0.44)	(1.79)
Observations:	492	196
Multivariable Regression:		
MVR coefficient (robust standard errors)	-0.246	0.934**
	(-0.97)	(2.12)
Observations:	365	163
MVR coefficient (robust regression)	-0.214	0.698*
	(-0.82)	(1.66)
Observations:	365	162
MVR coefficient with control functions (robust SE)	-0.239	0.898
	(-0.90)	(1.56)
Observations:	363	147

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

Estimates suggest that household food security is actually lower among GIE members than among the corresponding comparison households.

The final wealth indicator to be considered is whether the household had lent or received any animals as *habanaye* during the six months prior to the survey. Around a quarter of households reported having lent out animals in *habanaye* during that period and slightly more had received animals. However, the majority of those who had lent animals had also received animals and vice versa, which undermines the significance of this variable as a wealth indicator. Nevertheless, the results are shown in Table 6.16. By some measures, households in Bermo commune engaged more in the practice of *habanaye* than otherwise comparable households in Gadèbedji commune. However, if this measure is not a wealth indicator, it is not clear whether this result has any significance for the project.

Table 6.16: Household gave out or received any animals in* habanaye *in the 6 months prior to the survey

	Lent out animals		Received animals	
	Overall	GIE members	Overall	GIE members
Unadjusted:				
Sample mean	0.269	0.320	0.300	0.340
Intervention mean	0.340	0.353	0.391	0.490
Comparison mean	0.238	0.311	0.261	0.300
Unadjusted difference	0.102***	0.042	0.130***	0.190**
	(2.70)	(0.57)	(3.35)	(2.57)
Observations:	646	241	646	241
PSM (ATT)				
Post-matching difference (kernel)	0.046	-0.066	0.064	0.056
	(1.11)	(-0.65)	(1.13)	(0.42)
Observations:	638	219	574	175
Post-matching difference (no replacement)	0.046	-0.114	-0.008	0.071
	(1.04)	(-1.03)	(-0.13)	(0.55)
Observations:	638	222	525	175
Multivariable Regression:				
Probit coefficient (robust standard errors)	0.154***	-0.028	0.156***	0.153
	(2.86)	(-0.20)	(2.74)	(1.06)
Observations:	409	162	396	158
Probit coefficient with control functions (robust SE)	0.144***	-0.196	0.152***	0.204
	(2.59)	(-1.32)	(2.60)	(1.07)
Observations:	406	154	393	152

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
PSM estimates bootstrapped 1000 repetitions.
Coefficients for covariates used are not presented.

7 Conclusion and Programme Learning Considerations

7.1 Conclusions

The difficulties in carrying out the survey work for this effectiveness review and problems over the quality of the resulting data have made it more difficult to evaluate the effects of the project in Bermo commune. Nevertheless, some conclusions can be drawn with reasonable confidence.

Overall, the results show little effect from the project other than on the provision of veterinary services, marketing support, and drought preparedness training. veterinary services.

Using Oxfam GB's global indicator for adaptation and risk reduction, there is no overall difference between households in Bermo commune who had been supported by this project (even those who were members of the GIE itself) than comparable households from Gadèbedji commune. In particular, supported households did not demonstrate any difference in destocking or migration behaviour, in the diversification of income sources in their households, or in the diversity of their herds. There are some indications that households in Bermo commune were less likely to be engaged in agriculture than those in Gadèbedji commune, even after controlling for differences in engagement in agriculture at baseline in 2008. Comparable households in Gadèbedji commune were just as likely to be using a modern cemented well for watering their livestock as those in Bermo commune.

On the other hand, it is reasonably clear that households in Bermo commune have received a greater level of veterinary support and more training on drought management techniques during 2011 than comparison households. In line with the primary objective of the project, GIE members (but not the wider population) report having received more training and support in marketing their livestock. This training appears to have had some effect: there are reasonably clear indications that prices realised for sales of cattle and sheep by households in Bermo commune have been systematically higher than those realised in Gadèbedji commune. Unfortunately,

using the various indicators of overall household income and wellbeing, there is no indication that households in Bermo commune are yet any better off as a result of this project than those in Gadèbedji commune.

It should be noted that Oxfam and AREN have provided extensive humanitarian assistance in both Bermo and Gadèbedji communes since 2008. The data collected in this effectiveness review does not make an assessment of the impact of that humanitarian assistance, but only of the *additional* support provided by the livestock commercialisation project.

7.2 Programme Learning Considerations

- **Review approaches to promoting key risk reduction activities, including destocking and migration.**

Despite the emphasis which was being given by Oxfam and AREN staff at the time of the effectiveness review to encourage pastoralists to destock their herds and take other steps to prepare for the dry season, there is no evidence that the supported households were any more likely to have taken these steps than the comparison households. Consideration should be given to whether the means by which these messages are delivered to households could be strengthened. In particular, we recommend engaging with the Programme Policy Team in order to learn from good practice in encouraging behaviour change among pastoralists in other programmes.

- **Ensure that monitoring and evaluation systems and processes are fully integrated into programme design and implementation.**

The inaccessibility of the project area and the security risks involved in operating there have probably made it particularly difficult to monitor implementation of this project closely. However, these factors make it all the more important to conduct regular reviews of progress. The monitoring system should include periodic interviews with small numbers of pastoralists in Bermo commune, particularly to check how well the project's messages about livestock marketing and risk reduction are reaching them and are understood and being followed. If the project does appear to have been successful in generating higher gains to pastoralists from their livestock transactions – as the results of this effectiveness review suggest – then it will be important to track whether and how these gains eventually translate into improvements in food security or improvements in the welfare of household members.