Pakistan's Community-based Disaster Risk Management and Livelihoods Programme – Effectiveness Review
Full Technical Report

Oxfam GB
Adaptation and Risk Reduction Outcome Indicator

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Photo: Caroline Gluck

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Executive Summary

Under Oxfam Great Britain's (OGB) Global Performance Framework (GPF), sufficiently mature projects/programmes are being randomly selected each year and their effectiveness rigorously assessed. Pakistan's Community-based Disaster Risk Management and Livelihoods Programme was randomly selected for an Effectiveness Review under the adaptation and risk reduction (ARR) thematic area. The review focused on the work carried out by two of Oxfam's partner organisations – the Doaba Foundation and the Help Foundation – in Muzaffargarh and Rajanpur districts of Pakistan's Punjab Province. Over 21,700 people residing in 60 villages of these two districts are being reached through the programme. These people are exceptionally vulnerable to extreme flooding events, given that they reside directly on the floodplains of the Indus and Chenab rivers. And the overall aim of the programme is to reduce their vulnerability, particularly by reducing loss of life and assets and promoting livelihood resilience in times of extreme flooding.

To assess the effectiveness of the programme on reducing risk and promoting adaptive capacity in particular, a quasi-experimental impact evaluation design was implemented. This involved administering surveys to representative samples of 341 households residing in 57 villages targeted by the programme and 400 other households residing in 63 similar villages in adjacent areas that were not. Propensity score matching (PSM) and multivariable regression (MVR) were subsequently used in the statistical analysis of the data to reduce bias in the resulting comparison of these two groups. Two key areas of interest were investigated through this process: the extent the supported and unsupported households a) possess characteristics that are assumed important for successfully coping with and recovering from extreme flooding events, as well as adapting to emerging climatic trends and uncertainty; and b) were affected by the extreme floods that hit Pakistan in July to September 2010.

A number of large and positive differences were identified between the supported and unsupported households. Overall, the supported households scored more positively on most of the 'resilience' characteristics. There is also strong evidence that they experienced less asset and related loss during the 2010 floods. One particularly noteworthy finding is that the supported households were actually poorer in terms of asset ownership before the programme began but were found to be better off at the time of the assessment exercise. The respondents from the supported villages were also found to be more aware of their villages' disaster management plans and had participated more in disaster preparedness meetings. There is no indication, however, that the programme positively affected livelihood diversification and motivation among the supported households to pursue alternative livelihood strategies. Nevertheless, there is very strong evidence that the programme generated positive changes in terms of reducing flood-related risk.

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

- Review, document, and share the Doaba Foundation and Help Foundation's approaches to programme implementation and working with the participating villages.
- Explore possible reasons why the programme was unsuccessful in promoting livelihood diversification.
- Assess whether there are differences between the two partners in promoting awareness about climate change.
- Seek ways of integrating climate change adaptation measures into the programme more thoroughly.

1.0 Introduction and Purpose

Oxfam GB has put in place a Global Performance Framework (GPF) as part of its effort to better understand and communicate its effectiveness, as well as enhance learning across the organisation. This framework requires project/programme teams to annually report output data across six thematic indicator areas. In addition, modest samples of 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 review focused on disaster risk reduction work carried out by two partners – the Doaba Foundation and the Help Foundation – in two districts of Pakistan's Punjab Province.

The global outcome indicator for the adaptation and risk reduction (ARR) thematic area is based on the extent households in surveyed villages emulate characteristics assumed important for recovering from shocks and adapting to emerging trends and uncertainty. This indicator is explained further in Section 4.0 below, and the work that took place in Pakistan in December 2012 was part of an effort to capture data on this indicator. The programme randomly selected for the effectiveness review is entitled the Community-based Disaster Risk Management and Livelihoods Programme (PKNB44). The overall aim of this programme is to reduce loss of life and assets, and promote livelihood resilience in times of natural disasters in selected areas of four districts located in the provinces of Punjab, Sindh, and Baluchistan.

However – given time, security, and budget constraints – it proved impractical to carry out the assessment in all three areas of the country where this programme was implemented. Consequently, a decision was made to focus on Punjab Province, given that two out of the programme's four focus districts are located in this province, and there were relatively fewer security issues preventing access to the supported sites. Prior to data collection, two of OGB's partner organisations – the Doaba Foundation and the Help Foundation – had been implementing disaster risk reduction interventions in 60 villages located in two districts, Muzaffargarh and Rajanpur, along Pakistan's Indus and Chenab rivers.

This report presents the findings resulting from a process where data were collected from both villages that were supported through the programme and nearby, similar villages that were not. However, before doing so, Section 3.0 provides background information on the Community-based Disaster Risk Management and Livelihood Programme in Pakistan. Section 4.0, Section 5.0, and Section 6.0 follow by presenting the conceptual framework underlying the indicator, the impact evaluation design that was used, and the methods of data collection and analysis, respectively. Section 7.0 is the longest section of this document. Its subsections present basic descriptive statistics, data on intervention exposure, and finally the overall differences between households in the intervention and comparison villages. Section 8.0 concludes the document with general conclusions and programme learning considerations.

2.0 Background Information on Pakistan's Community-based Disaster Risk Management and Livelihoods Programme in Punjab Province

The review focused on work carried out by two of Oxfam GB's partner organisations – the Doaba Foundation and the Help Foundation – in Muzaffargarh and Rajanpur districts of Pakistan's Punjab Province. (See Figure 2.1 below.) Over 21,700 people residing in 60 villages of these two districts are being supported through the programme. These people are exceptionally vulnerable to extreme flooding events, given that they live directly on the floodplains of the Indus and Chenab rivers.

The households supported by the programme in Punjab Province are highly vulnerable to extreme flooding events.

FIGURE 2.1: Location of Sites for Effectiveness Review in Punjab Province

While the government has constructed large protective earth bunds at some distance from the banks of these rivers to protect the majority of the districts' residents and state owned infrastructure, the homes and agricultural fields of the supported population are situated in areas that are completely unprotected. Given their poor socio-economic status and lack of political power, farming families in this area have no realistic means to relocate to safer locations, and they have had no choice but to adapt to periodic flooding events. However, in recent years, most likely resulting from climate change, these flooding events have changed in two key ways – they have become both significantly more extreme and less predictable.

With the support of OGB through the European Commission, the Doaba Foundation and Help Foundation designed and implemented a programme with an overall aim of reducing loss of life and assets and promoting livelihood resilience in times of extreme flooding. Its main expected results as stated in the programme's proposal include:

The programme aims to reduce loss of life and assets and promote livelihood resilience in times of extreme natural disasters.

- Community-based organisations established and registered as Citizen Community Boards (CCBs), with active decision-making participation of women.
- Increased capacity of communities, local partners and government personnel to plan and implement gender-sensitive disaster preparedness and mitigation measures.
- Reduced incidence of waterborne diseases in disasters.
- Improved livestock and agricultural production, especially for vulnerable women.
- Existing livelihoods base strengthened and alternative income sources developed.
- District, provincial and national government sensitised to the need for disaster preparedness and management strategies.

Its main interventions targeted at the grassroots level include:

- Disaster risk reduction training (including first aid and search and rescue) and village disaster management planning.
- Construction of raised emergency shelters, culverts, water harvesting ponds, and "flood friendly" pit latrines.
- Livelihood, agriculture, and animal husbandry training.
- Distribution of goats and hand pumps to exceptionally vulnerable households.

3.0 The ARR Outcome Indicator and Its Conceptual Underpinnings

3.1 Introducing the ARR 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 climate-related disasters and their ability to adapt to climate 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 against 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 follows:

- **% 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 because 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 climatic change has taken place in order to assess the effectiveness of our interventions. And, 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" assumes that households that are better able to cope with shocks and adapt to change possess particular attributes .

The characteristic approach attempts to get around this issue by hypothesising that there are particular characteristics of households (and even communities, organisations, governments, etc.) that affect how well they are able to cope with shocks and adapt to longer-term climatic changes. 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 3.1.1. 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 counterparts. Where longer-term climatic trend prediction information exists, it is also important to assess how viable current livelihood strategies would be in the new climatic reality.

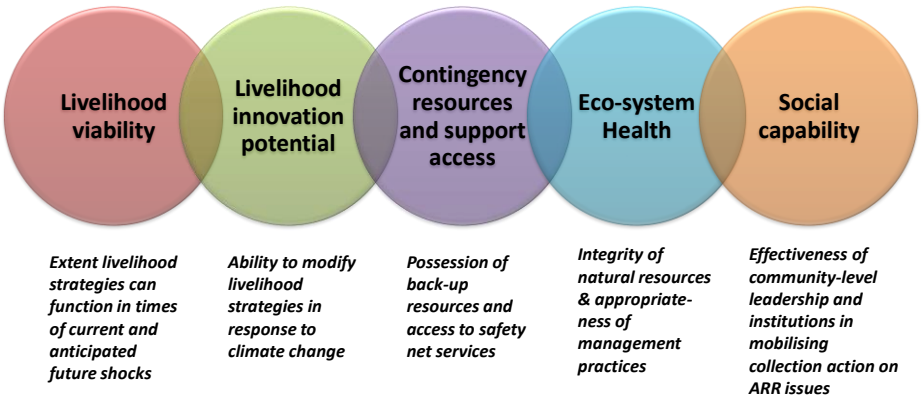
Livelihood innovation potential is different and hence separate, given that it is focused on a household's ability to successfully *modify* its livelihood strategies in response climatic stimuli, whether anticipated or not. We may hypothesise that such potential is dependent on factors such as the knowledge 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.

[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.

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 – e.g. savings, food and seed reserves, social protection, kin and non-kin support networks, emergency services, etc. – 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/adjust to climatic shocks/change than those that are relatively more degraded.[2] 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.

The characteristics are context specific but informed by a framework comprising of five distinct dimensions.

FIGURE 3.1.1:
Dimensions affecting the ability of households and communities to minimise risks from shocks and adapt to emerging trends and uncertainty



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.

Unfortunately, in terms of the specific characteristics that are believed to influence both resilience and adaptation, there is no "one size fits all"; that is, many of the characteristics appropriate for a particular population (e.g. slum dwellers in Mumbai, India) may not be so for another (e.g. Bolivian shifting

[2] 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.

cultivationists). 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. The particular characteristics chosen for the Pakistan Effectiveness Review are presented in the following subsection.

3.2 The Particular ARR Characteristics Used in the Pakistan Effectiveness Review

As mentioned above, there is no one generic set of 'resilience' characteristics that can be applied to all contexts. Given this, efforts were undertaken to specify characteristics relevant to the programme's context. These characteristics are presented in Table 3.2.1 below by dimension.

Characteristics pertaining to four out of the five dimensions were defined.

TABLE 3.2.1:
Specific ARR Characteristics Used for Pakistan's Community-based Disaster Risk Management and Livelihoods Programme

Dimension	Characteristic
Livelihood Viability	• Livelihood diversification • Access to seasonal forecast information • Flood preparedness information • Resilience of household structures
Livelihood Innovation Potential	• Motivation to pursue alternative livelihood strategies • Attitudes about climate change • Credit access • Access to climate trend information • Farming extension support • Access to market information • Access to livelihood innovation support
Access to Contingency Resources and Support	• Social support system • Contingency resources, i.e. savings & "convertible" assets
Social Capability	• Knowledge of disaster management plan • Participation in flood preparation meetings

There are several observations that deserve mention here. First, many of the characteristics falling under the Livelihood Innovation Potential, e.g. farming extension support, should ideally fall under the Livelihood Viability dimension as well. In other words, there are a number of characteristics that are relevant to both the Livelihood Viability and Livelihood Innovation Potential dimensions. Second, the Ecosystem Health dimension is not represented. This is because of the nature of primary disaster to which the people targeted by the programme are subjected – extreme flooding. In particular, while the health of the ecosystem and natural resources on which these people depend are no doubt important, it has little bearing on moderating the impacts of this particular natural disaster. In other words, there is little protection a healthy ecosystem and/or sound natural resource management practices can offer in the face of extreme flooding events experienced in this context.

The other point worth mentioning is that issues pertaining to several of the dimensions are difficult to comprehensively measure with household-level

data. This applies particularly (but not exclusively) to the Social Capability dimension. 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 that the resulting data would be difficult to incorporate into the statistical analysis, this was not carried out.

Scores were given to the interviewed households for each characteristic, depending on their responses to the questions asked. The way the scoring was done is presented in Table 3.2.2. As is apparent, a four-point scoring scale was used. The greater the household in question emulated the characteristic in question, the higher the score it obtained. The scoring descriptor for access to various services and support, e.g. seasonal forecasting information and credit, are the same, so these have been considered together in the table. These raw scores were then added together to derive an overall score and specific scores for each of the four dimensions presented in Table 3.2.1.

TABLE 3.2.2:
Description of How Scores Were Given for Each Characteristic

Characteristic	Scoring Descriptor (4-point Scale)
• Livelihood diversification	Low scores given for HHs with high dependency on limited number of climate dependent livelihood activities; higher scores given for dependency on a greater variety of activities, particularly those that are not dependent on climate/ presence of flooding.
• Access to various services, e.g. seasonal forecasting information	Low scores given for no access or limited uptake; higher scores given with reportedly greater use and service satisfaction.
• Resilience of household structures	HHs given lower scores when structures, such as home, livestock shelter, crop storage facilities, and pit latrines, are not on raised platforms. The more of the home's structures that are raised, the higher the score. Access to raised community emergency shelter in times of extreme flooding is also factored into the score.
• Motivation to pursue alternative livelihood strategies	Households were asked whether they are more interested in strengthening existing livelihoods or pursuing alternative livelihood strategies. Households were given higher scores the more they are interested in pursuing the latter.
• Attitudes about climate change	Households were asked to state their level of agreement/disagreement to a set of eight positive and negative statements relating to climate change. The more positive their responses, the higher the scores.
• Social support system	Higher scores were given for more reported participation in community self-help groups and receipt of support from such groups.
• Contingency resources, i.e. savings & "convertible" assets	Higher scores were given the more months the household reports being able to survive off its savings or through the sale or trading of its "convertible" assets, e.g. mobile telephone
• Knowledge of disaster management plan	Low scores were given if the household reports not knowing whether the village in which it lives has a disaster management plan and/or the contents of this plan; higher scores were given the more reported knowledge the respondent has about the plan.
• Participation in flood preparation meetings	The greater the reported participation in flood preparedness meetings, the greater the score.

3.3 Other Indicators of Interest

In addition to asking the respondents questions relating to the above characteristics, they were also asked about their experiences during the floods that hit Pakistan in July to September 2010. One such question was the number of hours of advanced warning they received before the floods struck their villages. They were also asked how much livestock, grain, and equipment they lost in these floods. If the disaster risk reduction work undertaken in the villages had successfully prepared the households by this time, we would expect that those in the intervention villages would have a) received greater advanced warning of the imminent floods and b) experienced less asset loss than those in the comparison villages. Moreover, if the support had helped them to become truly more resilient, we may even expect that they would be better off in relation to household food security and socio-economic status as well.

4.0 Impact Assessment Design

4.1 Limitations in Pursuing the 'Gold Standard'

The Effectiveness Review attempted to get at what would have happened to the households in the intervention villages had the programme never been implemented.

A social programme's net effect is typically defined as the average gain participants realise in outcome (e.g. reduced asset loss) 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

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 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 statistical attributes of the two resulting groups are similar in terms of a) their pre-programmes 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) relevant to 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 found at follow-up between the groups can be attributed to the programme.

However, implementing an ideal impact assessment design like this is only possible if it is integrated into the programme design from the start, since it

requires the introduction of some random element that influences participation. To evaluate a mature or completed programme – as in this programme effectiveness review – or one where randomisation is judged to be impractical, it is therefore necessary to apply alternative techniques to approximate 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 are made – identify reasonably precise intervention effects. One solution is offered by matching: Find units in an external comparison group that possess the same characteristics, e.g. ethnicity, age, and sex, relevant to the outcome variable as those of the intervention group and match them on the basis of these characteristics. If matching is done properly in this way, the observed characteristics of the matched comparison group will be identical to those of the intervention group.

Two popular methods were used to address selection bias – propensity score matching and multivariable regression.

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. This not only significantly reduces the size of the sample but also limits 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 observable 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 is capable of identifying unbiased intervention effects.

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 in the model. In this way, multivariable regression controls for measured differences between the intervention and comparison group. The validity of

The evaluation design involved comparing households in villages targeted and not targeted by the programme, while using statistical procedures to control for potentially confounding factors.

both PSM and multivariable regression are founded heavily on the "selection on observables" assumption, and, therefore, treatment effect estimates can be biased if unmeasured (or improperly measured) but relevant differences exist between the groups.[3] Both PSM and multivariable regression were used during data analysis, and efforts were made to capture key explanatory variables believed to be relevant in terms of the assessed outcomes, such as sex and age of household head, educations levels, etc. (see Section 6.0 below).

While no baseline data were available, efforts were made, as explained above, to reconstruct it through respondent recall. This method does have limitations, e.g. memory failure, confusion between time periods, and so forth. However, for data that can be sensibly recalled, e.g. ownership of particular household assets, it can serve to enhance the validity of a cross-sectional impact evaluation design. The reconstructed baseline data were used in two ways. First, several of the variables included in the PSM and regression procedures were baseline variables constructed from recalled baseline data. One set of variables, for example, was related to the respondents wealth status at baseline, e.g. whether they were asset rich, asset poor, or somewhere in between. This was done in attempt to control for baseline wealth differences between the intervention and comparison groups.

The second way the reconstructed baseline data were used was to derive pseudo difference-in-differences (double difference) intervention effect estimates. With longitudinal or panel data, this is implemented by subtracting each unit's baseline measure of outcome from its endline measure of outcome (i.e. endline outcome status minus baseline outcome status). The intention here is to control for time invariant differences between the groups. Bearing in mind the limitations associated with recalled baseline data, using PSM and/or regression and the double difference approaches together is considered a strong impact evaluation design.

4.3 The Comparison Population

A key factor in ensuring the validity of any non-randomised "large-*n*" impact evaluation design is to use an appropriate comparison group. This is particularly true for ex-post, cross-sectional designs. Comparators who differ in relevant baseline characteristics 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 and is, generally speaking, not an easy task in non-experimental work.

The challenge we confronted, then, was how to identify villages that could be comparable with those where the Doaba Foundation and the Help Foundation had been implementing the programme. The processes undertaken differed for each partner. For the Doaba Foundation, this proved relatively more

[3] One of the MVR procedures that was used attempted to control for possible unobserved differences between the groups. This is the Heckman Selection Model or 2-step Estimator. Here, efforts are made to directly control for the part of the error term associated with the participation equation that is correlated with both participation and non-participation. The effectiveness of this method, however, depends, in part, on how well the drivers of participation are modelled.

difficult. The villages it initially targeted were considered as the most vulnerable ones located along the Chenab River in Muzaffargarh District, so it was a struggle to identify ones that were comparable. However, using mapping information several were identified, and, through field visitation, Doaba field staff were able to identify the balance. Approximately 10 of the 30 comparison villages came from the same Union Councils – the administrative unit above the village – as the intervention villages, while 20 came from two other neighbouring Union Councils.

In the case of the Help Foundation, the process of comparison village identification was more straightforward. First, there were many similar villages along the floodplain of the Indus River in Rajanpur District where the programme was implemented that had not been targeted. Second, the Help Foundation was planning to implement similar disaster risk reduction activities in another group of over 30 villages in close proximity to those that were already targeted by the programme. Given that these villages were targeted with the same criteria as used for the first group of villages, it was thought sensible to use them for comparison purposes.

5.0 Methods of Data Collection and Analysis

5.1 Data Collection

A household questionnaire was developed by Oxfam staff and translated by the Consultant to capture data on both the characteristics and other outcome measures of interest presented in Section 3.0 above. Data for other key characteristics of the interviewed households were also obtained to implement the evaluation design described in Section 4.0. The questionnaires were pre-tested first by the field staff of the Doaba Foundation and then by the enumerators and revised accordingly.

The 16 enumerators – 10 males and 6 females – that administered the questionnaires were primary university students or recent university graduates, the majority of whom came from the nearby municipality of Multan. Approximately 22 prospective enumerators completed the two-day training course, which was led by the Consultant but also supported by OGB staff. The second day involved a practice run at administering the questionnaires, followed by critically reviewing the performance of the enumerators. Several of them were subsequently disengaged.

Sampling was done in two stages. The first was based on the PPS method, while the latter involved systematic random sampling.

To select interviewees in each of the 120 surveyed villages, a two-stage sampling technique was used. In the first stage, village population statistics were used to identify the number of respondents to be interviewed in each village using the probability proportionate to size (PPS) method.[4] To identify the particular households to be interviewed in each village (the second stage), local informants first mapped out the households that existed in the villages. Systematic randomly sampling was then used to select specific households.

The work of the enumerators was closely monitored and scrutinised by the Consultant and, on the first day of the survey, by OGB staff.

[4] link to PPS document

5.2 Data Analysis

OGB developed data entry tools in Adobe Acrobat Pro, and the Consultant recruited and supervised data entry clerks to enter the data. After identifying and rectifying some minor errors in MS Excel, the data were then imported into Stata for analysis, the results of which are presented in the following sections. Most of the analyses involved group mean comparisons using *t*-tests, as well as PSM with the *psmatch2* module and various regression approaches.

Data analysis was carried out centrally at OGB's head office using five different non-experimental estimation procedures.

Kernel and nearest neighbour matching without replacement were the main 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 treatment indicator at *p*-values of 0.20 or less. Covariate balance was checked following the implementation of each matching procedure. When covariate imbalance at *p*-values of 0.20 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. Boot-strapped standard errors enabled the generation of confidence intervals to assess the statistical significance of the effect sizes. Exact matching within each district was further imposed to avoid comparing intervention and comparison respondents from different districts.

All the covariates, as presented in Table 6.1.1 below, were included in the various regression approaches undertaken, i.e. regression with robust standard errors (to address issues of heteroskedasticity), robust regression (to reduce the influence of outliers), and regression with control functions (to attempt to control for relevant unobserved differences between the intervention and comparison groups). To control for unobservable district influences, fix effect models were used, with the variable "district" specified as a key fixed effect.

5.3 Main Problems and Constraints Encountered

Overall, despite the usual hardships encountered when undertaking such intensive field work, the data collection process went well. However, several challenges were encountered. These included:

- *Observable differences between the intervention and comparison villages*

Despite the efforts made to purposively match the intervention and comparison villages, some observable differences between the households residing in each were identified. While such observable differences are typically expected in non-experimental studies, they do have implications for data analysis and interpretation. This is elaborated upon further in Subsection 6.1 below.

- *Logistical difficulties in accessing villages and households within villages*

During the survey administration process, the villages proved to be further from one another than originally anticipated, and the requisite transport logistics were not initially put in place to address this. In addition, the enumerators often had to walk considerable distances to reach the households sampled in the various villages.

- *Non-existence of several of villages in the comparison areas, necessitating the need for replacement*

Several of the proposed comparison villages earmarked for data collection were found not to exist when attempts were made by the enumerator team to visit them. The partner staff in such cases proved to be instrumental in identifying appropriate replacement villages.

6.0 Results

6.1 General Characteristics

Table 6.1.1 presents statistics for various household characteristics obtained through the administration of the questionnaires to the respondents from both the intervention and comparison villages. The stars beside the number indicate differences between the two groups that are statistically significant at a 95 percent confidence level or greater.

TABLE 6.1.1:
Descriptive Statistics: Intervention and Comparison Respondents Interviewed

	Sample Mean	Inter. mean	Compar. mean	Overall difference	*t*-stat.	Doaba difference	*t*-stat.	Help F. difference	*t*-stat.
# of HHs in village	99.13	64.24	122.93	-58.7***	-3.61	-21.4*	-2.23	-96.2**	-3.10
m of village from dist. Road	7.64	8.16	7.29	0.87	1.87	1.97***	3.72	-0.23	-0.32
km of village from mkt. cen.	14.73	17.09	13.12	3.98***	4.04	5.23**	3.11	2.71**	2.70
km of village from dist. cen.	23.39	23.56	23.27	0.29	0.21	-3.27	-1.55	3.87*	2.13
Respondent head	0.66	0.72	0.62	0.094**	2.85	0.15**	3.27	0.038	0.80
Elderly household	0.01	0.01	0.01	-0.0012	-0.18	0.0077	0.92	-0.010	-0.94
Male headed household	0.95	0.96	0.95	0.017	1.15	0.0010	0.05	0.033	1.62
# of productive adults	3.41	3.20	3.54	-0.34*	-2.32	-0.39*	-2.02	-0.29	-1.30
Number of children	3.33	3.51	3.21	0.30	1.84	0.37	1.67	0.24	0.97
Number of adults	3.48	3.30	3.60	-0.30*	-2.01	-0.32	-1.63	-0.27	-1.23
Household size	6.81	6.81	6.80	0.0054	0.03	0.045	0.15	-0.035	-0.12
Average age of HH head	45.11	43.47	46.24	-2.77**	-2.83	-3.75**	-2.74	-1.78	-1.27
HH ethnic minority	0.06	0.08	0.04	0.044**	2.74	0.060***	3.71	0.028	1.01
HH head secondary or more	0.13	0.18	0.09	0.095***	4.07	0.12**	3.30	0.065*	2.45
# of adults with secondary	0.29	0.38	0.23	0.15***	3.47	0.27***	4.12	0.033	0.59
Asset index baseline	0.00	-0.47	0.32	-0.79***	-4.63	-0.66**	-2.76	-0.92***	-3.77
HH farms (baseline)	0.83	0.88	0.79	0.089***	3.38	0.12**	3.25	0.053	1.48
HH rears livestock (baseline)	0.87	0.89	0.86	0.029	1.27	0.029	0.79	0.030	1.05
HH processes crops (baseline)	0.55	0.63	0.49	0.14***	4.05	0.096	1.96	0.18***	3.79
HH hunts/fishers (baseline)	0.15	0.18	0.13	0.051*	2.00	0.099**	2.80	0.0022	0.06
HH runs off-farm IGA (baseline)	0.07	0.09	0.07	0.022	1.19	0.045	1.50	-0.0011	-0.05
HH does unskilled work (baseline)	0.86	0.84	0.87	-0.029	-1.19	-0.076	-1.90	0.018	0.65
HH does skilled work (baseline)	0.06	0.05	0.07	-0.015	-0.90	-0.057*	-2.26	0.026	1.16
Observations	**841**	**341**	**500**	**841**		**422**		**419**	

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

As is evident, there are some noteworthy differences. These include:

- The comparison villages are, on average, larger in population size
- The intervention villages are further from market centres than the comparison villages
- Household heads were more likely to be interviewed in the intervention villages (Doaba Foundation only)
- The average age of household heads is lower in the intervention villages
- Adults in the intervention villages are more likely to have secondary education or higher

- Households in intervention villages were more likely to be poor at baseline
- Households in the intervention villages were more likely to process crops at baseline

Given that there are differences between the households residing in the intervention and comparison villages, directly comparing them may very well result in biased estimations of the impacts of the disaster risk reduction work that was undertaken. Consequently, it was critical to control for these differences during the analysis of the data.

6.2 Receipt of External Support

The interviewed households were also asked whether they had received particular types of external support since the baseline period in 2008. Many of these relate to the support provided by the programme, while others do not. The particular types of support are presented in Table 6.2.1. This table also presents the results of a comparing the intervention and comparison households in relation to the receipt of this support.

TABLE 6.2.1:
Comparison of Intervention and Comparison Households in Relation to Receipt of External Support

	Sample Mean	Inter. mean	Compar. mean	Overall difference	*t*-stat.	Doaba difference	*t*-stat.	Help F. difference	*t*-stat.
Cattle	0.11	0.14	0.08	0.057**	2.62	0.071*	1.99	0.042	1.83
Goats	0.13	0.24	0.06	0.18***	8.08	0.26***	7.34	0.11***	3.91
Agricultural Inputs	0.09	0.14	0.05	0.098***	5.04	0.11***	5.24	0.088**	2.70
Food Aid	0.62	0.73	0.55	0.18***	5.50	0.19***	3.95	0.18***	4.60
Cash grants	0.28	0.30	0.26	0.038	1.21	-0.058	-1.40	0.13**	2.90
Cash for work/food	0.17	0.24	0.11	0.13***	5.11	0.19***	7.03	0.075	1.77
Home building support	0.35	0.43	0.29	0.13***	4.04	0.20***	4.76	0.063	1.28
Agricultural training	0.22	0.47	0.05	0.41***	16.18	0.52***	16.34	0.30***	7.72
Livestock training	0.25	0.57	0.03	0.54***	22.82	0.58***	18.19	0.50***	14.29
Kitchen garden support	0.25	0.58	0.03	0.55***	23.24	0.59***	18.52	0.51***	14.59
IGA training	0.16	0.40	0.01	0.39***	17.49	0.37***	12.07	0.41***	12.66
First aid training	0.22	0.43	0.08	0.35***	13.09	0.39***	11.15	0.31***	7.69
Emer. rescue training	0.20	0.47	0.01	0.46***	20.30	0.41***	13.16	0.52***	15.68
Observations	**841**	**341**	**500**	**841**		**422**		**419**	

As indicated in the table, significantly greater proportions of intervention households reported receiving all but one (i.e. cash grants) of the specific forms of support on the list as compared with the comparison households. In some cases the differences are very large, and many of these large differences are related to the specific types of support provided by the programme, e.g. agricultural, livestock, income generating activity (IGA), first aid, and emergency rescue training, kitchen garden support, and goat distribution. There are also some differences that are not related directly to the programme, such as cash for work/food and home building support. There is strong evidence, then, that the intervention villages have benefited from external support to a more significant degree than the comparison villages. This is primarily, but not exclusively, in relation to the activities spearheaded under the programme.

6.3 Differences Between the Intervention and Comparison Households on the Outcome Measures

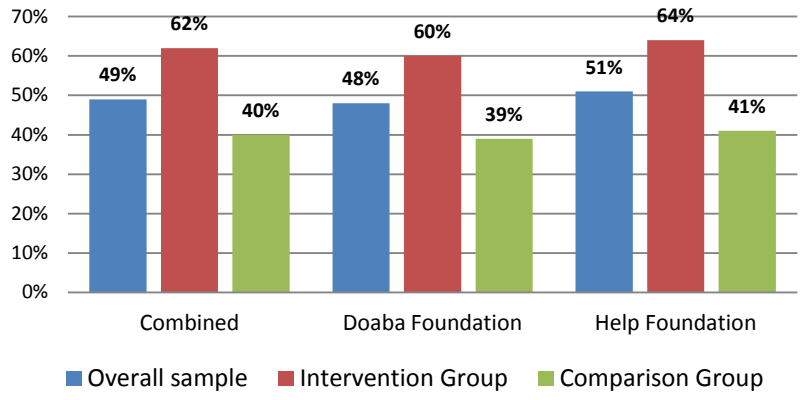
This subsection presents the results of analyses that compared the respondents from the intervention and comparison villages in relation to the outcome measures presented in Subsection 3.3.

6.3.1 The Overall ARR Outcome Measure

The first analysis involved comparing the intervention and comparison households in relation to how they fair, overall, on the characteristics presented in Section 3.0. If the programme was successful in supporting the households in the intervention villages to reduce risk and/or adapt to emerging climatic trends and uncertainty, we would expect the intervention households to be better off in relation to these characteristics – *all other things being equal*. Figure 6.3.1.1 presents the results of a direct comparison of the two groups of households. There are a total of 15 characteristics, and, given that the maximum score obtainable for each characteristic is four, the maximum total possible score is 60. This maximum score was divided into the actual score computed for each household to derive percentage scores. These particular scores, then, reveal how well the households fair in relation the characteristics.

Households in the intervention villages achieved significantly higher scores in relation to all the characteristics combined.

FIGURE 6.3.1.1:
Comparison of Internvention and Comparison Communities in Relation to Overall Percentage Score (Unadjusted)



As indicated in the graph, the intervention households obtained higher scores for both partner organisations. Table 6.3.1.1 presents the results of various statistical procedures that were used to test the significance of these differences. As is evident, all the unadjusted, PSM, and MVR effect estimates are highly statistically significant, clearly revealing that the intervention households obtained higher overall scores. And in all cases – whether overall or at partner level – the difference is at least 20 percent.

There is strong evidence that programme has positively affected a good number of the 'resilience' characteristics .

TABLE 6.3.1.1:
Comparison of Intervention and Comparison Sites: Overall "Resilience" Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	0.49	0.48	0.51
Intervention mean:	0.62	0.60	0.64
Comparison mean:	0.40	0.39	0.41
Unadjusted difference :	0.223***	0.214***	0.232***
	(30.72)	(22.05)	(21.84)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	0.221***	0.214***	0.228***
(kernel)	(24.37)	(16.29)	(18.51)
Observations:	**824**	**411**	**413**
Post-matching difference:	0.220***	0.213***	0.229***
(no replacement)	(24.29)	(17.40)	(18.06)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	0.213***	0.210***	0.220***
	(24.58)	(16.63)	(17.88)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; rreg):	0.247***	0.209***	0.267***
	(37.72)	(23.74)	(29.91)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	0.213***	0.212***	0.217***
with control functions	(24.29)	(16.53)	(17.14)
Observations:	**841**	**422**	**419**

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

TABLE 6.3.1.2:
Comparison of Intervention and Comparison Sites in Relation to Oxfam's Global ARR Indicator: *% of supported households demonstrating greater ability to minimise risk from shocks and adapt to emerging trends & uncertainty*

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	0.74	0.73	0.76
Intervention mean:	0.95	0.95	0.95
Comparison mean:	0.60	0.57	0.62
Unadjusted difference :	0.3571***	0.3835***	0.3305***
	(11.03)	(8.19)	(7.40)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	0.363***	0.380***	0.346***
(kernel)	(10.28)	(7.13)	(8.50)
Observations:	**824**	**411**	**413**
Post-matching difference:	0.375***	0.419***	0.348***
(no replacement)	(12.24)	(8.85)	(8.34)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	0.3562***	0.3726***	0.3445***
	(10.28)	(7.03)	(7.37)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	0.3542***	0.3616***	0.3395***
with control functions	(10.25)	(7.50)	(7.23)
Observations:	**841**	**422**	**419**

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

Table 6.3.1.2 presents the results of the analyses of the same data in binary form, where households in the sample were coded with 1 if they were above the median of the comparison households and 0 otherwise. This, in fact, is Oxfam GB's global outcome indicator – *percentage of households demonstrating greater ability to reduce risk and adapt to emerging trends and uncertainty*. For this particular measure, the differences between the intervention and comparison communities are also very large and highly statistically significant, with the percentage point difference between the two groups being at least 33% for all the statistical adjustment procedures.

There appears, then, to be considerable evidence that the programme promoted positive change in relation to the characteristics assessed. However, given that the data are non-experimental and cross-sectional in nature, it is possible that these results may be biased. Perhaps, for instance, the intervention groups were already better off in relation to characteristics to begin with, and the results are simply reflective of these initial baseline differences. Given this possibility, it is good practice in non-experimental studies such as this to carry out sensitivity analysis. This type of analysis asks: How much bias would be required in order to "explain away" the treatment effect estimate in question? The more of such bias that would be needed, the more we can be confident the that effect estimate identified something meaningful and vice-versa in cases where only a small amount of bias would render the effect estimate insignificant.

The overall PSM non-replacement effect estimate is exceptionally robust to unobserved bias.

TABLE 6.3.1.3:
Results of Rosenbaum Sensitivity Analysis Where Unobserved, Positive Bias is Assumed to Exist a Various Odds Ratios Among the Intervention Population

Log Odds Ratio of Hidden Bias	*p*-value of effect estimate with bias	Estimated effect estimate with bias	95% confidence level – two tailed CI+	CI−
1	0	0.225	0.208333	0.241667
2	0	0.175	0.158333	0.291667
3	1.40E-15	0.15	0.125	0.316667
4	1.60E-11	0.133333	0.108333	0.333334
5	4.30E-09	0.116667	0.091666	0.35
6	1.80E-07	0.1	0.075	0.358334
7	2.60E-06	0.091666	0.066666	0.366667
8	0.000019	0.083333	0.058333	0.375
9	0.000088	0.075	0.05	0.383334
10	0.0003	0.075	0.041666	0.391666
11	0.000815	0.066666	0.033333	0.4
12	0.001868	0.058333	0.025	0.4
13	0.00375	0.058333	0.016667	0.408333
14	0.006784	0.05	0.016666	0.408333
15	0.01129	0.05	0.008333	0.416666
16	0.017559	0.041666	4.20E-07	0.416666
17	0.025823	0.041666	-4.20E-07	0.425
18	0.036249	0.041666	-0.00833	0.425
19	0.048927	0.033333	-0.00833	0.425
20	0.063872	0.033333	-0.01667	0.433333

Rosenbaum sensitivity analysis is a popular method for carrying out sensitivity analysis for effect estimates derived through PSM one-to-one matching. It was implemented during the analysis of the data, and the results are presented in Table 6.3.1.3. These results pertain to the combined PSM no-replacement estimates presented in Table 6.3.1.1 above. As indicated in Table 6.3.1.3, the PSM effect estimate in question is exceptionally robust to hidden bias: Such bias would need to be present in favour of the intervention population at a log odds ratio of over 19 in order to render the effect estimate

statistically insignificant. In other words, the unobserved differences between the intervention and comparison groups would need to exceptionally large to explain away the identified treatment effect. We can, consequently, be significantly confident that the programme impacted a good number of the 'resilience' characteristics.

Comparing the intervention and comparison households in the relation to the overall characteristic score gives an indication of how the programme performed overall. However, given that the data of each characteristic were pooled together, it is difficult to know in which particular areas the programme generated impact and those in which it did not. The following subsections then disaggregate the results, first by dimension and then by each specific characteristic.

6.3.2 Livelihood Viability Dimension 1:

As per the framework depicted in Section 3.0, the first dimension examined was livelihood viability. To what extent is there evidence that households in the intervention villages possess livelihoods that are more resilient to shocks than the comparison households? In other words, to what extent are they better off in relation to the characteristics assessed under the livelihood viability dimension? Table 6.3.2.1 presents the results of the relevant comparison. As indicated in this table, overall, all the adjusted effect estimates are large and highly statistically significant. Overall, a 19 to 20 percentage point difference was identified in favour of the households residing in the intervention villages.

There is also strong evidence that the programme positively affected the specific characteristics under the livelihood viability dimension

TABLE 6.3.2.1:
Comparison of Intervention and Comparison Sites in Relation to Livelihood Resilience Percentage Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	0.56	0.55	0.56
Intervention mean:	0.68	0.69	0.67
Comparison mean:	0.47	0.46	0.49
Unadjusted difference :	0.204***	0.226***	0.182***
	(22.49)	(18.35)	(13.72)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	0.200***	0.218***	0.182***
(kernel)	(16.86)	(11.61)	(12.17)
Observations:	**824**	**411**	**413**
Post-matching difference:	0.198***	0.217***	0.180***
(no replacement)	(17.87)	(13.88)	(12.33)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	0.191***	0.213***	0.174***
	(19.36)	(14.59)	(12.72)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; rreg):	0.207***	0.232***	0.194***
	(22.81)	(17.76)	(14.99)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	0.190***	0.213***	0.170***
with control functions	(19.10)	(14.12)	(12.12)
Observations:	**841**	**422**	**419**

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

Again, one may wonder whether the households in the intervention villages were already better off in relation to the livelihood viability characteristics to begin with. A stronger evaluation design would have involved collecting baseline data on both the intervention and comparison households and assessing whether the former experienced greater change in relation to the characteristics than the latter. This impact evaluation design is known as the difference-in-difference or double difference design.

*Respondents were asked to recall information about the baseline period to assess whether the **magnitude of change** experienced by the intervention and comparison households differs.*

The double difference design could not be implemented in its pure form, given that baseline data on the assessed characteristics were not collected. However, efforts were made to obtain these data through respondent recall. In particular, the respondent was first asked to provide information relevant to the characteristic in question, e.g. the number of livelihood activities their household is involved in. Using historical markers, the household was then asked what the situation was like during the baseline period, e.g. the number of livelihood activities the household was involved in this particular year. There are limitations to this method, of course, with measurement error resulting from recall bias being the key one. And the method is assumed to work better for some characteristics (e.g. livelihood diversification), as opposed to others (e.g. access to credit). However, even where the reliability of the recalled data is more suspect, the approach is assumed to measure at least the respondent's perceptions on how things have changed over time in relation to the characteristic in question.

TABLE 6.3.2.2:
Comparison of Intervention and Comparison Sites in Relation to Follow-up Livelihood Viability Score Differenced From Baseline Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	1.81	1.56	2.05
Intervention mean:	3.35	3.20	3.50
Comparison mean:	0.75	0.44	1.07
Unadjusted difference :	2.595***	2.757***	2.432***
	(18.72)	(14.07)	(12.58)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	2.514***	2.666***	2.366***
(kernel)	(14.60)	(10.11)	(10.50)
Observations:	**824**	**411**	**413**
Post-matching difference:	2.401***	2.453***	2.341***
(no replacement)	(14.15)	(9.35)	(10.31)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	2.451***	2.709***	2.269***
	(15.22)	(10.69)	(10.39)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; rreg):	2.464***	2.140***	2.549***
	(17.88)	(11.82)	(12.23)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	2.439***	2.717***	2.179***
with control functions	(15.11)	(10.53)	(9.89)
Observations:	**841**	**422**	**419**

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

For each characteristic, the difference between the baseline and endline scores was computed. The households of the intervention and comparison villages were then compared in relation to the differenced data. Table 6.3.2.2 presents the computed double difference effect estimates for the livelihood viability dimension. As indicated, highly statistically significant and positive differences between the two groups were indentified across all the statistical adjustment procedures and for both partners.

It is of further interest to look at each of the four characteristics under the livelihood viability dimension separately. Given the number of characteristics, only one statistical adjustment procedure was implemented – PSM kernel. Table 6.3.2.3 presents the results. Positive and highly statistically significant differences were found for the characteristics relating to access to seasonal forecasting and disaster preparedness information. And this was the case for both partners. The overall difference identified for the household structure score characteristic is statistically significant, but there are differences at the partner level. In particular, a difference was found for the Doaba Foundation but not for the Help Foundation. Finally, none of the adjusted effect estimates for the livelihood diversification characteristic are significant at the 95 percent level.

The programme significantly increased access to seasonal forecasting and disaster preparedness information, but did little to diversify livelihoods or improve the resilience of household structures.

TABLE 6.3.2.3:
HH Characteristic Scores: Livelihood Viability (by characteristic)

	Livelihood diversification	Access to seasonal forecast info.	Access to disaster preparedness info	HH Structure Score
Pre-matching				
Sample Mean	2.51	1.93	2.11	2.35
Intervention Mean	2.60	2.69	3.11	2.43
Comparison Mean	2.44	1.41	1.42	2.29
Difference	0.159***	1.275***	1.690***	0.138*
	(3.63)	(19.70)	(29.08)	(2.06)
Observations:	**841**	**841**	**841**	**841**
Matching – kernel				
Difference:	0.0936	1.239***	1.670***	0.192*
	(1.77)	(15.36)	(24.96)	(2.34)
Observations:	**824**	**824**	**824**	**824**
Matching – kernel:				
Double Difference:	0.00540	1.010***	1.293***	0.206**
	(0.14)	(13.13)	(18.50)	(2.79)
Observations:	**824**	**824**	**824**	**824**
Matching – kernel (Doaba Foundation):				
Difference:	0.139	1.292***	1.770***	0.282*
	(1.84)	(10.81)	(17.44)	(2.02)
Observations:	**411**	**411**	**411**	**411**
Matching – kernel (Doaba Foundation):				
Double Difference:	0.0556	0.874***	1.248***	0.488***
	(0.86)	(7.43)	(11.85)	(4.91)
Observations:	**411**	**411**	**411**	**411**
Matching – kernel (Help Foundation):				
Difference:	0.0489	1.188***	1.572***	0.103
	(0.70)	(11.59)	(17.09)	(1.06)
Observations:	**413**	**413**	**413**	**413**
Matching – kernel (Help Foundation):				
Double Difference:	-0.0436	1.142***	1.337***	-0.0697
	(-1.03)	(11.35)	(13.92)	(-0.74)
Observations:	**413**	**413**	**413**	**413**

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.3.3 Livelihood Innovation Potential

Recall from Section 3.0 that data were obtained on a number of characteristics that fall under the livelihood innovation potential dimension. Several of these characteristics also naturally fall under the livelihood viability dimension but were, nevertheless, examined under this particular dimension. Recall that these particular characteristics include:

Characteristics Under the Livelihood Innovation Potential Dimension

- Motivation to pursue alternative livelihood strategies
- Attitudes about climate change
- Credit access
- Access to climate trend information
- Farming extension support
- Access to marketing information
- Access to livelihood innovation support

There is strong evidence that the programme has positively affected one or more of the characteristics falling under the livelihood innovation potential dimension as well.

As was the case with the livelihood viability dimension, the scores for each of the characteristics were pooled together and used to compute percentage scores. Table 6.3.3.1 presents the results of the comparisons that were made between the intervention and comparison households. As indicated, overall, there is approximately a 16 percentage point difference between the intervention and comparison households across the various statistical adjustment procedures. While the differences for both partners are statically significant, the effect sizes estimated for the Help Foundation are larger. An interaction test carried out with multivariable regression confirmed that this difference is statistically significant (p<0.01).

TABLE 6.3.3.1:
Comparison of Intervention and Comparison Sites in Relation to Livelihood Innovation Potential Percentage Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	0.47	0.45	0.49
Intervention mean:	0.57	0.53	0.60
Comparison mean:	0.40	0.40	0.41
Unadjusted difference :	0.161***	0.130***	0.192***
	(19.97)	(11.48)	(17.41)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	0.158***	0.133***	0.183***
(kernel)	(15.54)	(8.67)	(13.90)
Observations:	**824**	**411**	**413**
Post-matching difference:	0.160***	0.134***	0.184***
(no replacement)	(16.15)	(9.35)	(14.01)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	0.155***	0.131***	0.181***
	(16.41)	(9.28)	(14.05)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; rreg):	0.158***	0.126***	0.199***
	(19.00)	(10.14)	(18.13)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	0.155***	0.133***	0.179***
with control functions	(16.29)	(9.28)	(13.65)
Observations:	**841**	**422**	**419**

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

The double difference effect estimates provide additional strong evidence that the programme did well against this dimension.

Double difference estimates were also computed using the recalled baseline data. Two of the characteristics, however – motivation to pursue alternative livelihood strategies and attitudes towards climate change – were not included in the construction of the differenced scores, given that recalling such data was considered inappropriate. Table 6.3.3.2 presents the resulting double difference estimates. As is evident, the differences are, yet again, highly statistically significant across the various statistical adjustment procedures, both overall and for each of the partners.

TABLE 6.3.3.2:
Comparison of Intervention and Comparison Sites in Relation to Follow-up Livelihood Innovation Potential Score Differenced From Baseline Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	1.91	1.60	2.21
Intervention mean:	4.10	3.56	4.64
Comparison mean:	0.42	0.27	0.56
Unadjusted difference :	3.681***	3.290***	4.073***
	(21.03)	(13.62)	(16.37)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	3.693***	3.449***	3.931***
(kernel)	(16.61)	(10.81)	(13.07)
Observations:	**824**	**411**	**413**
Post-matching difference:	3.635***	3.284***	3.951***
(no replacement)	(16.35)	(10.18)	(12.65)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	3.517***	3.356***	3.799***
	(16.99)	(11.06)	(13.03)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; rreg):	1.054***	0.980***	3.327***
	(11.69)	(7.96)	(14.45)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	3.533***	3.447***	3.743***
with control functions	(16.91)	(11.23)	(12.65)
Observations:	**841**	**422**	**419**

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

How do the results differ for each of the specific characteristics that fall under the livelihood innovation potential dimension? Table 6.3.2.3 presents the results of the various analyses that were undertaken. Statistically significant differences were found between the intervention and comparison households for all the characteristics, save for motivation to pursue alternative livelihood strategies and attitudes towards climate change. While statistically significant, the effect estimates for the credit access characteristic are much smaller than those of the other characteristics as well.

It is also interesting to note that respondents from the intervention villages of the Doaba Foundation were found to have slightly poorer attitudes towards climate change than their comparators. The reverse is the case for the Help Foundation: The respondents from its catchment area were found to have much better attitudes.

There is evidence that the programme positively affected five out of the seven characteristics that fall under the livelihood innovation dimension.

TABLE 6.3.2.3:
HH Characteristic Scores: Livelihood Innovation Potential (by characteristic)

	Motivation to pursue alternatives	Attitudes to climate change	Credit access	Climate trend information	Agricultural extension support	Access to marketing information	Access to livelihood innovation support
Pre-matching							
Sample Mean	3.19	2.49	1.33	1.56	1.53	1.60	1.46
Intervention Mean	3.28	2.48	1.52	2.21	2.18	2.24	2.05
Comparison Mean	3.12	2.50	1.21	1.12	1.09	1.17	1.05
Difference	0.160*	-0.0181	0.311***	1.083***	1.096***	1.072***	0.999***
	(2.43)	(-0.23)	(5.97)	(19.17)	(19.67)	(17.94)	(17.85)
Observations:	**841**	**833**	**841**	**841**	**841**	**841**	**841**
Matching – kernel							
Difference:	0.0773	0.0324	0.315***	1.077***	1.099***	1.009***	0.989***
	(1.01)	(0.33)	(5.03)	(15.19)	(16.77)	(13.00)	(14.24)
Observations:	**824**	**816**	**824**	**824**	**824**	**824**	**824**
Matching – kernel:							
Double Difference:	n/a	n/a	0.241***	0.996***	1.005***	0.857***	0.594***
			(3.90)	(14.52)	(14.65)	(12.25)	(13.81)
Observations:			**824**	**824**	**824**	**824**	**824**
Matching – kernel (Doaba Foundation):							
Difference:	0.0459	-0.402*	0.225*	0.979***	1.178***	0.869***	0.809***
	(0.39)	(-2.57)	(2.53)	(9.82)	(12.68)	(7.70)	(8.74)
Observations:	**411**	**409**	**411**	**411**	**411**	**411**	**411**
Matching – kernel (Doaba Foundation):							
Double Difference:	n/a	n/a	0.163	0.872***	1.041***	0.871***	0.501***
			(1.86)	(8.74)	(11.31)	(8.07)	(8.10)
Observations:			**411**	**411**	**411**	**411**	**411**
Matching – kernel (Help Foundation):							
Difference:	0.108	0.461***	0.403***	1.172***	1.022***	1.146***	1.165***
	(1.13)	(3.78)	(4.77)	(12.60)	(11.17)	(11.20)	(11.31)
Observations:	**413**	**407**	**413**	**413**	**413**	**413**	**413**
Matching – kernel (Help Foundation):							
Double Difference:	n/a	n/a	0.317***	1.116***	0.969***	0.843***	0.686***
			(3.67)	(11.63)	(9.85)	(7.82)	(11.65)
Observations:			**413**	**413**	**413**	**413**	**413**

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.3.4 Access to Contingency Resources and Support

As explained in Section 3.0, only two characteristics were examined under this dimension – strength of social support system and access to contingency resources. Table 6.3.4.1 presents the results of a comparison of the intervention and comparison groups for aggregated percentage scores of these two characteristics. The differences again across all the estimation procedures are highly statistically significant for both partners. The effect sizes also appear to be larger in the case of the Help Foundation. However, a statistical interaction test was undertaken, and this difference was found just short of being statistically significant at the 95 percent level.

Recalled baseline data were also used to compute double difference effect estimates. The results are presented in Table 6.3.4.2 below. These results are, again, highly statistically significant across the various estimation procedures and partners.

There is yet again strong evidence that the programme positively affected one or more of the characteristics under the access to contingency resources and support dimension.

TABLE 6.3.4.1:
Comparison of Intervention and Comparison Sites in Relation to Access to Contingency Resources and Support Percentage Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	0.43	0.41	0.46
Intervention mean:	0.56	0.52	0.60
Comparison mean:	0.35	0.34	0.36
Unadjusted difference :	0.208***	0.178***	0.238***
	(16.90)	(10.24)	(13.98)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	0.219***	0.185***	0.252***
(kernel)	(14.67)	(7.77)	(13.30)
Observations:	**824**	**411**	**413**
Post-matching difference:	0.215***	0.188***	0.255***
(no replacement)	(13.98)	(8.62)	(13.48)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	0.207***	0.184***	0.233***
	(15.32)	(9.19)	(12.11)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; rreg):	0.197***	0.146***	0.241***
	(15.87)	(7.89)	(14.12)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	0.208***	0.188***	0.232***
with control functions	(15.21)	(9.19)	(11.75)
Observations:	**841**	**422**	**419**

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

TABLE 6.3.4.2:
Comparison of Intervention and Comparison Sites in Relation to Follow-up Contingency Resources and Support Differenced From Baseline Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	0.81	0.64	0.97
Intervention mean:	1.79	1.50	2.08
Comparison mean:	0.14	0.06	0.22
Unadjusted difference :	1.649***	1.433***	1.865***
	(19.79)	(13.73)	(14.65)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	1.576***	1.347***	1.800***
(kernel)	(15.74)	(9.60)	(12.81)
Observations:	**824**	**411**	**413**
Post-matching difference:	1.631***	1.365***	1.860***
(no replacement)	(15.93)	(10.81)	(12.84)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	1.554***	1.316***	1.767***
	(15.96)	(10.17)	(12.29)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; rreg):	0.651***	1	1.652***
	(13.92)	(.)	(13.20)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	1.553***	1.322***	1.753***
with control functions	(15.88)	(10.00)	(12.16)
Observations:	**841**	**422**	**419**

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

The intervention and comparison households were also compared in relation to the two characteristics that fall under the access to contingency resources and support dimension, and the results are presented in Table 6.3.4.3. Here, the results are considerably different for each characteristic: The effect sizes for the social support system characteristic are large and highly statistically significant. This is not the case for the contingency resources characteristic. Here, the effect estimates are only consistently significant for the Help Foundation.

The programme affected the social support system characteristic much more than the contingency resources characteristics.

TABLE 6.3.4.3:
HH Characteristic Scores: Contingency Resources and Support (by characteristic)

	Social Support System	Contingency Resources
Pre-matching		
Sample Mean	1.65	0.84
Intervention Mean	2.49	1.00
Comparison Mean	1.08	0.73
Difference	1.415***	0.275
	(25.08)	(1.62)
Observations:	**841**	**841**
Matching – kernel		
Difference:	1.402***	0.391
	(20.85)	(1.87)
Observations:	**824**	**824**
Matching – kernel:		
Double Difference:	1.310***	0.291*
	(18.95)	(2.43)
Observations:	**824**	**824**
Matching – kernel (Doaba Foundation):		
Difference:	1.378***	0.362
	(15.27)	(0.95)
Observations:	**411**	**411**
Matching – kernel (Doaba Foundation):		
Double Difference:	1.309***	0.135
	(13.63)	(0.71)
Observations:	**411**	**411**
Matching – kernel (Help Foundation):		
Difference:	1.426***	0.420**
	(14.86)	(2.63)
Observations:	**413**	**413**
Matching – kernel (Help Foundation):		
Double Difference:	1.312***	0.443**
	(13.70)	(2.83)
Observations:	**413**	**413**

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6.3.5 Social Capability

As was the case for the access to contingency resources and support intervention, only two characteristics were examined under the social capability dimension – *knowledge of village disaster management plan* and *participation in flood preparation meetings*. The scores for each of these characteristics were also pooled, and a percentage score was computed. Table 6.3.5.1 presents the results of a comparison between the intervention and comparison household in relation to this score. As is evident from the table, the intervention households scored more highly – 78 percent, on average, compared with 29 percent for the comparison households. This difference is highly statistically significant and holds across all the various estimation procedures. Here, the effect estimates

are different for the two partners, but this time in favour of the Doaba Foundation. However, this difference was also found to be just shy of being statistically significant.

Households in the intervention villages scored significantly better in relation to the characteristics that fall under the social capability dimension.

TABLE 6.3.5.1:
Comparison of Intervention and Comparison Sites in Relation to Social Capability Percentage Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	0.49	0.48	0.51
Intervention mean:	0.78	0.79	0.78
Comparison mean:	0.29	0.27	0.32
Unadjusted difference :	0.491***	0.520***	0.462***
	(37.36)	(32.85)	(22.16)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	0.484***	0.519***	0.451***
(kernel)	(30.16)	(26.12)	(18.81)
Observations:	**824**	**411**	**413**
Post-matching difference:	0.482***	0.509***	0.457***
(no replacement)	(30.14)	(24.96)	(19.10)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	0.466***	0.509***	0.434***
	(28.49)	(23.68)	(17.37)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	0.465***	0.512***	0.426***
with control functions	(28.07)	(23.96)	(16.72)
Observations:	**841**	**422**	**419**

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

Table 6.3.5.2 presents the results of the double difference estimates, and these are also highly statistically significant across the estimation procedures and partners. Table 6.3.5.3 follows by presenting disaggregated results for each of the two characteristics. The differences are highly significant for both characteristics across all the estimation procedures and for both partners. It is clear that the households in the intervention villages reported knowing much more about their villages disaster management plans and having had participated more extensively in flood preparedness meetings in their communities.

Respondents in the intervention villages indicated better knowledge about their villages' disaster management plans and higher participation in flood preparedness meetings.

TABLE 6.3.5.2:
Comparison of Intervention and Comparison Sites in Relation to Follow-up Social Response Capability Score Differenced From Baseline Score

	Overall	Doaba Foundation	Help Foundation
Unadjusted:			
Sample mean	1.60	1.53	1.68
Intervention mean:	3.70	3.73	3.68
Comparison mean:	0.17	0.03	0.32
Unadjusted difference :	3.527***	3.697***	3.355***
	(32.55)	(25.29)	(21.02)
Observations:	**841**	**422**	**419**
PSM (ATT)			
Post-matching difference:	3.436***	3.619***	3.258***
(kernel)	(25.73)	(19.32)	(17.34)
Observations:	**824**	**411**	**413**
Post-matching difference:	3.401***	3.527***	3.299***
(no replacement)	(24.22)	(18.42)	(17.58)
Observations:	**812**	**399**	**413**
Multivariable Regression:			
MVR coefficient (fe; robust):	3.321***	3.582***	3.129***
	(24.65)	(19.12)	(16.02)
Observations:	**841**	**422**	**419**
MVR coefficient (fe; robust):	3.308***	3.580***	3.057***
with control functions	(24.29)	(19.02)	(15.52)
Observations:	**841**	**422**	**419**

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

TABLE 6.3.4.3:
HH Characteristic Scores: Contingency Resources and Support (by characteristic)

	Knowledge of Village Disaster Management. Plans	Participation in Flood Preparedness Meetings
Pre-matching		
Sample Mean	2.01	1.93
Intervention Mean	3.17	3.11
Comparison Mean	1.21	1.13
Difference	1.953***	1.976***
	(29.58)	(36.05)
Observations:	**841**	**841**
Matching – kernel		
Difference:	1.931***	1.942***
	(25.35)	(27.75)
Observations:	**824**	**824**
Matching – kernel:		
Double Difference:	1.725***	1.711***
	(22.38)	(23.56)
Observations:	**824**	**824**
Matching – kernel (Doaba Foundation):		
Difference:	2.121***	2.028***
	(21.22)	(22.15)
Observations:	**411**	**411**
Matching – kernel (Doaba Foundation):		
Double Difference:	1.838***	1.781***
	(16.17)	(17.47)
Observations:	**411**	**411**
Matching – kernel (Help Foundation):		
Difference:	1.745***	1.859***
	(15.25)	(17.82)
Observations:	**413**	**413**
Matching – kernel (Help Foundation):		
Double Difference:	1.615***	1.643***
	(14.65)	(16.10)
Observations:	**413**	**413**

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

6.3.4 Other Findings of Interest

Given that the households in both the intervention and comparison villages live between the banks of the Indus and Chenab rivers and the protective earth bunds constructed by the local authorities, they were all obviously negatively affected by the 2010 floods that hit Pakistan in July to September 2010. However, we would expect that – *if the support provided through the programme and partners was truly effective* – the households residing in the intervention villages should have coped better, all other things being equal. Given this, a number of questions were incorporated into the questionnaire to assess the experiences of the intervention and comparison households during this extreme event.

Households in the intervention villages received significantly greater advanced warning about the coming of the imminent 2010 floods. They also lost less livestock, grain, and farm tools.

Table 6.3.4.1 presents the results. The respondents, in particular, were asked about the number of hours of advanced warning they received before the floods struck their local area, as well as whether they lost any livestock, grain, and farm equipment/tools. As indicated in the table, the intervention households received, on average, about two-days advanced warning in contrast to the comparison households who received about a day of advanced warning. The intervention households therefore had more time to prepare themselves. While both the intervention and comparison households reported considerable loss of livestock, grain, and tools, the former reported losing less. However, when the data are disaggregated by partner, the effect estimates are only statistically significant for the Help Foundation.

TABLE 6.3.4.1:
HH Characteristic Scores: Livelihood Viability (by characteristic)

	Number hours warning	Livestock lost	Grain lost	Tools lost
Pre-matching				
Sample Mean	33.22	0.33	0.54	0.17
Intervention Mean	48.89	0.26	0.50	0.12
Comparison Mean	22.54	0.37	0.57	0.20
Difference	26.35***	-0.119***	-0.0744*	-0.0818**
	(7.67)	(-3.64)	(-2.13)	(-3.12)
Observations:	**841**	**841**	**841**	**841**
Matching – kernel				
Difference:	23.56***	-0.112**	-0.112**	-0.0804**
	(5.34)	(-2.85)	(-2.90)	(-2.86)
Observations:	**824**	**824**	**824**	**824**
Matching – kernel (Doaba Foundation):				
Difference:	18.43**	-0.0662	-0.0723	-0.0262
	(3.15)	(-1.20)	(-1.19)	(-0.73)
Observations:	**411**	**411**	**411**	**411**
Matching – kernel (Help Foundation):				
Difference:	28.57***	-0.156**	-0.151**	-0.133**
	(4.31)	(-2.86)	(-3.23)	(-2.77)
Observations:	**413**	**413**	**413**	**413**

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
PSM estimates bootstrapped 1000 repetitions

It is also interesting to examine how the intervention and comparison households fair in relation to other measures of welfare. To this end, the respondents were also asked questions pertaining to their ability to meet household needs, household food security, and asset ownership (which is a reputable way of measuring relative household wealth status). For the perceived ability to meet household needs measure, the respondents were asked the following:

Which of the following statements best reflects your household's ability to meet its basic needs over the past 12 months?
"Doing well: able to meet household needs by your own efforts, and making some extra for stores, savings, and investment."
"Doing just OK/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."

The results are presented in the second column of Table 6.3.4.2. As indicated, statistically significant differences were identified in favour of the intervention group, both overall and for each of the two partners.

Households in the intervention villages were more likely to report being in a better position to meet household needs.

TABLE 6.3.4.2:
HH Characteristic Scores: Livelihood Viability (by characteristic)

	Perceived ability to meet HH needs	HH food security score	Current HH asset index	HH asset index differenced
Pre-matching				
Sample Mean	2.85	-0.00	-0.00	0.00
Intervention Mean	2.93	0.01	0.02	0.48
Comparison Mean	2.79	-0.01	-0.01	-0.33
Difference	0.135**	0.0195	0.0340	0.803***
	(3.06)	(0.14)	(0.20)	(5.97)
Observations:	**839**	**841**	**841**	**841**
Matching – kernel				
Difference:	0.198***	-0.109	0.568**	0.814***
	(3.32)	(-0.57)	(2.95)	(5.09)
Observations:	**822**	**824**	**824**	**824**
Matching – kernel (Doaba Foundation):				
Difference:	0.275**	-0.256	0.569	0.985***
	(2.86)	(-0.85)	(1.76)	(3.38)
Observations:	**410**	**411**	**411**	**411**
Matching – kernel (Help Foundation):				
Difference:	0.124*	0.0338	0.567**	0.647***
	(1.99)	(0.13)	(2.89)	(4.38)
Observations:	**412**	**413**	**413**	**413**

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

For the household food security measure, the respondents were asked the following seven questions, as per the Food, Agriculture, and Nutrition Technical Assistance (FANTA) project's Household Food Insecurity Access Scale (HFIAS):

1. In the past four weeks, did you worry that your household would not have enough food?
2. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
3. In the past four weeks, did you or any household member have to eat a limited variety of foods due to lack of resources?
4. In the past four weeks, did you or any household member have to eat some foods you really did not want to eat because of a lack of resources to obtain other types of foods?

5. In the past four weeks, did you or any household member have to eat a smaller meal than was needed because there was not enough food?
6. In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?
7. In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?

If the respondent answered in the affirmative to any one question, s/he was then asked:

How often did this happen?

- Rarely – once or twice in the past four weeks
- Sometimes – three to 10 times in the past four weeks
- Often – more than 10 times in the past four weeks

The respondent was given no points if they answered No to a question, 1 point if the answer to the follow up question was rarely, 2 points for sometimes, and 3 points for always. The higher the score, then, the more significant the food security problems the respondent's household is deemed to have. PCA was also used on the scores for each question to accentuate the differences in reported food insecurity among the interviewed households.

There is no evidence that the programme has positively affected household food security. However, the prevalence of reported food insecurity is low.

The results of a comparison between the intervention and comparison households in relation to this measure are presented in the third column of Table 6.3.4.2. As is evident, no difference was identified between the intervention and comparison households, either overall or for either of the two partners. However, it deserves mentioning that 75 percent of interviewed households reported not having any problems at all with respect to meeting household food needs in the last four weeks. Given this, there was not a significant degree of variation in the data; the vast majority of respondents reported experiencing no or few problems in terms food shortages. To complement the analysis, a binary variable was created, with 1 indicating some food insecurity (5 or more points out of the possible 21 points) and 0 otherwise. With this measure, 14 per cent of the respondents from the intervention villages indicate some food security problems, in comparison with 18 per cent in the comparison villages. However, this four percentage point difference is not statistically significant.

TABLE 6.3.4.3:
List of Assets Used to Construct Household Asset Index

1. Electricity	16. Hand pump well	31. Gas stove
2. Lamps (electric, paraffin, etc.)	17. Tube well	32. Fodder cutter
3. Televisions	18. Peter engine	33. Seed bank
4. Radio	19. Tractor	34. Gold jewellery
5. Cassette/CD player	20. Tractor wagon	35. Home respondent lives in
6. DVD/video player	21. Sewing machine	36. Agricultural land
7. Table	22. Electric fan	37. Fuel used for cooking
8. Iron	23. Refrigerators/freezer	38. Toilet facility type
9. Bed	24. Plough (plow)	39. Material used for HH floor
10. Mattress	25. Ox/horse/ donkey/bull cart	40. Material used for HH walls
11. Telephones or mobile phone	26. Buffalo/bull	41. Material used for HH roof
12. Bicycle	27. Cow	42. Number of rooms in HH
13. Motorcycle/motor scooter	28. Goat/sheep	43. Acres of land used for farming
14. Wheel borrow	29. Donkey/horse	
15. Car, truck/other motor vehicle	30. Milling machine	

The intervention households were found to be richer in asset wealth than the comparison households, despite being worse off at baseline.

Data were additionally collected on household asset possession as a measure of household wealth status. The particular basket of assets included those listed in Table 6.3.4.3. For each item, the respondent was first asked whether their household had/owned it. For non-binary items, a follow-up question was asked on the precise number possessed/owned. The respondent was then asked whether their household possessed/owned the item in question in the baseline period and then the precise number, if relevant. This was done to ascertain the household wealth status at baseline.

The number of non-binary items owned/possessed for each household was then divided into three quantiles for each time period. Principal component analysis (PCA) was then run on these variables, as well as the binary items, to construct asset indices for each time period. In Table 6.1.1 in Subsection 6.1 above, a comparison of the households in the intervention and comparison villages in relation to the baseline household asset index reveals that the households supported through the programme were actually poorer, on average, at the baseline period. However, as revealed in the fourth column of Table 6.3.4.2, at the follow-up period – i.e. when the data collection exercise was carried out – these same household were found to be relatively richer than the comparison households.

The final column of this table presents double difference estimates. To carry out this analysis, the baseline score for each item was subtracted from the follow-up score. PCA was then carried out on the differenced scores to capture variation in changes in asset ownership over time. The intervention and comparison households were then compared in relation to this differenced index. The results reveal that the intervention households fared better: They experienced more positive change in relation to household asset ownership over time vis-à-vis their comparators.

Complementary analyses were further carried out to identify the key assets that influenced these results. The intervention households, in particular, experienced more positive change in relation to the ownership of particular farm assets (ploughs, fodder cutters, wheel borrows, and grain banks), livestock (cattle, goats, donkeys, and buffalo), and household items (radios, mattresses/beds, flash lights, and sewing machines, as well as improved toilets and roofing material). They also managed to cultivate more land over time. Interestingly, the comparison households experienced more positive change in relation to television, fan, fridge, and tractor wagon ownership. Despite this, it is clear that the intervention households went from being poorer, on average, in comparison to the comparator households, to being relatively richer, on average, over the lifespan of the programme.

7.0 Conclusions and Learning Considerations

7.1 Conclusions

There is very convincing evidence that the support provided by both the Doaba Foundation and Help Foundation to the people targeted by the Community-based Disaster Risk Management and Livelihoods Programme has brought about significant benefits. The supported households emulate

In many ways, the Disaster Risk Management and Livelihoods Programme should be considered a success story.

characteristics assumed important for reducing risk associated with extreme flooding events and, to a certain extent, adapting to emerging climate trends and uncertainty to a far greater extent than the comparison households surveyed under the study. This is true for each of the four dimensions assessed – livelihood viability, livelihood innovation potential, access to contingency resources and support, and social capability.

Moreover, there is evidence that the households coped better during the extreme flooding event that struck Pakistan in July to September 2010: They received significantly more advanced warning about the coming of the floods and lost less livestock, grain, and tools/equipment. Moreover, the supported households reported being in a better position to meet household needs and went from a position of being relatively poorer to the comparison households at baseline to being relatively richer at the time of the data collection exercise.

However, there is no evidence that the support has promoted livelihood diversification, which was one of the programme's expected results. In addition, overall, the supported households are not more likely to have their homes, toilet facilities, livestock enclosures, and grain storage facilities constructed on raised platforms than the comparison households. That being said, households supported by the Doaba Foundation were found slightly more likely to have such raised structures. In addition, there is strong evidence that the programme, particularly for the Help Foundation, resulted in the households having better toilet facilities than the comparison households (p-value < 0.001).

There are two other characteristics that the programme appears not to have affected, at least overall: motivation to pursue alternative livelihood activities and climate change attitudes. In particular, both the respondents in the intervention and comparison villages, on average, expressed about an equal interest in strengthening existing livelihood activities on the one hand and trying out alternative livelihood strategies on the other. There was no difference between the two groups. The story is different for attitudes towards climate change. Interestingly, the population targeted by the Help Foundation appear to have better attitudes than their comparators. For the Doaba Foundation, however, the respondents in the intervention villages were actually found to possess poorer attitudes towards climate change.

7.2 Programme Learning Considerations

The Community-based Disaster Risk Management and Livelihoods Programme clearly represents a success story for Oxfam GB in general and the Doaba Foundation and Help Foundation in particular. Not only did the supported households score significantly higher on most of the 'resilience' characteristics that were assessed, but also there is evidence that they were less affected by the 2010 floods that hit Pakistan in July to September 2010. There are definitely a number of important programme learning considerations here that Oxfam and the partners are encouraged to reflect on:

- **Review and document the Doaba Foundation and Help Foundation's approaches to programme implementation in general and approaches to working with the participating villages in particular.**

Understanding the key factors underlying the programme's success is critical so that similar results can be replicated in other contexts.

It is likely that the success of the Community-based Disaster Risk Management and Livelihoods Programme was dependent on more than simply the nature of the various activities that were implemented. It is suspected that much of the success boils down to how the partner field staff are carrying these activities out and engaging with the communities. How does their particular approach to programme implementation and working with the participating villages differ from other partners? Is there anything that is unique and stands out? What makes this programme different from other Oxfam disaster risk reduction initiatives carried out in Pakistan and elsewhere? What can others learn about the approaches undertaken by the Doaba Foundation and the Help Foundation?

- **Explore possible reasons why the programme was unsuccessful in promoting livelihood diversification.**

There is no evidence that the programme increased the number of livelihood activities upon which the households in the intervention villages depend. What are the likely explanations for this? Given that livelihood diversification is an important component of resilience, it is worth holding focus group discussions and/or in-depth interviews with the programme beneficiaries to explore why this is the case. What prevented the households from pursuing alternative livelihood strategies? Are they really interested in doing so? Are there viable alternatives that can be realistically pursued?

- **Assess whether there are differences between the two partners in promoting awareness about climate change.**

As noted above, the Help Foundation appears to have done better in promoting more positive attitudes and knowledge about climate change. Did they carry out any activities there were different from the Doaba Foundation? What possible reasons could there be for this difference? If there are differences in approaches, it would be worth replicating the Help Foundation's approaches in the Doaba Foundation's programme catchment area.

- **Seek ways of integrating climate change adaptation measures into the programme more thoroughly.**

The Community-based Disaster Risk Management and Livelihoods Programme was not explicitly designed to address issues relating to climate change adaption. However, there is evidence that it has positively affected many characteristics assumed important for placing the supported households in a better position to adapt to emerging climatic trends and uncertainty. That being said, there is certainly more scope for strengthening and expanding the scope of this work. If there is interest in doing this, it is recommended that this be carefully researched and thought through. This would inevitably involve ascertaining the likely climate change scenarios to which the targeted populations will be subjected in the future, and then ensuring that any livelihoods diversification and other relevant support takes this into account.