EVALUATION: DECEMBER 2014 PUBLICATION: DECEMBER 2015

RESILIENCE IN THAILAND

Impact evaluation of the climate change community-based adaptation model for food security project

Effectiveness Review Series 2014/15

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ACKNOWLEDGEMENTS

We would like to thank the staff of Oxfam in Thailand and partner organisations for being so supportive during this Effectiveness Review. Particularly thanks to: Kasina Limsamarnphun, Nonthathorn Chaiphet, and Napha Treeratsakulchai from Earth Net Foundation. Particular thanks are due to Rungthong Kramanon, the consultant who managed the fieldwork.

EXECUTIVE SUMMARY

Oxfam GB's Global Performance Framework is part of the organisation's effort to better understand and communicate its effectiveness, as well as enhance learning across the organisation. Under this framework, a small number of completed or mature projects are selected at random each year for an evaluation of their impact, known as an 'Effectiveness Review'. The project 'Development and Scaling Up of a Climate Change Community-Based Adaptation Model for Food Security in Thailand' was one of those selected for an Effectiveness Review in the 2014/15 financial year.

Since 2004, Oxfam has worked with Earth Net Foundation (ENF), a local organisation in Thailand, to promote organic rice farming and fair trade marketing in Yasothorn province.

In 2007, farmers in the province experienced a long drought during the rainy season that made their rice yields drop significantly. Therefore, in 2008 Oxfam and ENF piloted a climate change adaptation project in which 59 farmers participated to test out an adaptation to climate change shocks model. The project provided climate change knowledge to induce farmers to re-plan their rice farming, and established a small grant administered by Oxfam Thailand to encourage farmers to invest in setting up a water management system. Following the successful collaborative effort between Oxfam and ENF, the project 'Development and Scaling Up of a Climate Change Community-Based Adaptation (CC CBA) Model for Food Security in Thailand Project' was developed in 2011, lasting until August 2013.

The objective of this review is evaluating the impact of 'Development and Scaling Up of a Climate Change Community-Based Adaptation (CC CBA) Model for Food Security in Thailand Project', however changes among project participants may be attributable also to previous interventions as the evaluation used as a reference point 2007, the year in which ENF firstly piloted a climate change adaptation project in the area.

The project was funded by the European Union (EU). Other partner organisations that teamed up with Oxfam GB in Thailand and ENF for the implementation of the project were the Healthy Public Policy Foundation (HPPF) and Climate Change Knowledge Management (CCKM). The project was carried out in two provinces: three sub-districts of Yasothorn in the north-east and one sub-district in Chiang Mai in the north.

The project had three specific objectives:

1. Increase the resilience and adaptation capacity of small-scale farmers to weather variability and climate change through the development of a self-sustainable climate change adaptation model.
2. Scale up the model implementation to reach new communities and to support national development of the agenda on climate change adaptation and food security.
3. Foster cooperation among NGOs, CBOs, academics, local and central government, and the private sector to achieve the above objectives.

EVALUATION DESIGN

This Effectiveness Review used a quasi-experimental evaluation design to assess the impact of the project activities typically some time after implementation ended. This review covered a subset of organic rice farmers who were considered as 'pilot rice growers', that would subsequently pass on the knowledge and skills they had learned to other members of their local associations.

With this logic in mind, the Effectiveness Review planned to consider the direct effect of the project among these pilot farmers, (Group A), and the spillover effect among members of other rice farming associations of Group A (Group B). The sample used in the review comprised four groups in the Yasothorn province, derived from the existing farmer organisations in the study sites.

Respondents were randomly selected from within the two categories of intervention groups (Group A and Group B) and from within the two groups (Group C and Group D) assigned as comparison groups. Group C included farmers from Nam Oam group, and Group D included non-organic farmers from the same area.

The exact composition of each group is as follows:

Intervention groups

Group A: Organic farmers

This group included organic farmers who were direct beneficiaries of all project activities; about half of them being farmer leaders or respected senior members of the three organic farmer associations of Group B (see below). Engaging these farmers directly was meant to influence members in Group B to acquire the same benefits of the project through 'the farmer's field school' or via monthly and bi-monthly meetings within their associations.

Group B: CBO members

This group included other members of three organic farmer associations in different sub-districts in the Yasothorn province: Thai Charoen Organic Agriculture Cooperative in Leung Nok Ta Sub-district, Bak Rue Farmer Group in Bak Rue Sub-district, and Na So Farmer Group in Kud Chum Sub-district.

Groups A and B have received technical support from ENF (Earth Net Foundation) for the production of premium organic jasmine rice. This is a special variety best produced in the north-east area, which is persistently hit by prolonged dry spells, and widely known as the 'Weeping Plain'. The area is, however, suitable for growing this jasmine rice variety. Green Net Cooperative, the marketing arm of ENF, does the rice marketing and the International Federation of Organic Agricultural Movements (IFOAM) certification, so the majority of Group A and B's rice production is sold to these cooperatives and exported to Europe and US. According to Green Net, the majority of rice exportation is from this area and from this group.

Comparison groups

Group C: Organic farmers

These are organic farmers of the Nam Om Sustainable Agriculture Community Enterprise. They started about five years ago, similar to Groups A and B, but less organised and less supported in the beginning. They also grow jasmine rice and many other rice varieties that are gaining popularity in Thailand, such as riceberry. This group has received support on technical advice from a few public agencies, such as the National Science and Technology Development Agency.

Group D: Non-organic farmers

This group represents the majority of Thai farmers who use high levels of pesticides and produce rice of lower quality varieties for the mainstream market, which has made Thailand the world's largest rice exporter for years. In this survey, they are small-scale farmers in the Kud Chum Farmer Group.

In Yasothorn, the organic groups covered by this evaluation represent the majority of the organic rice farmers in the province. The Thai policy is striving to turn the idea of growing mass rice for low cost, which only increases farmers' debt, to reducing the area of rice land in order to grow other higher value crops and more quality rice in the rest.

The results of this Effectiveness Review will reflect the impact on the entire group of rice farmers (both 'pilot' and 'spillover' farmers), and also present the results for the pilot farmers separately (Group A and Group C) who were not direct project participants.

The total sample size for this review included 757 rice farmers, of which 311 were organic farmers, and 447 other members of rice cooperatives. At the analysis stage, the statistical tools of propensity-score matching and multivariate regression were used to control for household specific and baseline differences between the rice farming households surveyed in project and comparison groups, to provide additional confidence when making estimates of the project's impact.

RESULTS

Table 1 summarises the results of this effectiveness review by listing the key areas where the project was expected to have an impact, stating whether each of these areas was directly connected to the project activities, and explaining briefly the success or lack of success of the intervention in realising its intended outcomes.

The key reflection that emerges from the Effectiveness Review results is that the project has been largely successful for its direct beneficiaries; the organic rice farming households. There are three areas where there has been no evidence (or mixed evidence) of impact. Firstly, no evidence of project impact was found in terms of the use of weather forecasting services, and intervention farmers' ability to use the service to improve their rice production. Secondly, the project had limited success in increasing total agricultural production. The only clear positive effect in this area was found among overall and organic beneficiaries of the project (the direct beneficiaries of the project) whose fruit production was found to be significantly higher than the comparison group. Thirdly, the project had limited impact in the knowledge area: here the only underlying indicator of success was found to be improved water management practices for project beneficiaries.

The review found strong and compelling evidence of project impact in the overall resilience index. This index was constructed by summing 16 characteristics in which each rice-farming household scored positively (see Table 2). This index was found to be significantly higher on average in the intervention group (for both all rice producers and organic ones only) than among comparison farmers.

There were nine specific indicators of resilience where the project had a particular impact. Rice farmers were able to diversify their crop portfolio, and raise fruit production. Also, compared to the farmers in the non-project sample, intervention farmers had access to a larger number of credit sources, and became more aware of climate change.

The project was found to be successful in all areas of contingency resources and support access: rice farming households in the intervention groups were better off relative to those in the comparison group in accessing savings, diversifying income sources, owning a larger share of livestock, and in cultivating own food garden for self-consumption. The latter set of findings represent a particularly important result, as these indicators are all positively correlated with the resilience potential of rice farmers in case of a negative climate change shock.

The analysis also suggested that all project beneficiaries had better access to water facilities as a result of the project, and that their ability to store water was significantly higher than that of the comparison group thanks to the project impact.

Table 1: Key results of this Effectiveness Review

Outcome area	Connected to project logic	Evidence of positive impact?	Comments
Improved awareness of climate change	Yes	Yes/organic farmers only	Only organic farmers who participated in the project were significantly more aware of climate change; they indicated their knowledge in climate change in nearly all three areas suggested. Organic farmers in the comparison group suggested being aware only in two areas. The difference in knowledge was found to be statistically significant.
Improved weather forecasting information	Yes	No	No evidence of project impact in this area: both intervention and comparison rice farming households were found to be comparable and not significantly different in the use of weather forecasting information.
Use of weather forecasting to plan annual rice production	Yes	No	No evidence of project impact in this area: both intervention and comparison rice farming households were found to be comparable and not significantly different in the use of weather forecasting to plan rice production.
Improved agricultural production	Yes	Mixed	Evidence of significantly higher agricultural production of fruit products for both overall and organic beneficiaries of the project production. No evidence of either higher rice or higher vegetable production.
Improved knowledge	Yes	Mixed	No evidence of change among project beneficiaries in their attitude toward farming practice, but clear positive effect of the project on water management practices.
Increased agricultural diversification	Yes	Yes	Evidence of higher number of crops cultivated by organic farmers and by CBO farmers relative to their comparison beneficiaries.
Improved revenues for selling agricultural products	No	Yes	Rice farming households in the intervention groups generated a total value of all agricultural production that was 92% higher than that of non-project beneficiaries, and their total value of rice production sold was 153% higher than that of non-project beneficiaries.
Access to credit	Yes	Yes/organic farmers only	Organic rice growers that were part of the project have access on average to nearly two sources of credit. Organic growers in the comparison group have access on average only to one source of credit. The difference is statistically significant.

Improved water management facilities	Yes	Yes	There is evidence that overall farmers and organic farmers participating in the project made better use of their own water management techniques, but the project farmers have a higher water storage capacity than in the comparison group.
Resilience index	Yes	Yes	Positive impact on resilience index in both organic farmers in the project (Group A) and regular organic farmers (Group C); organic project farmers scored 39 percentage points higher than regular organic farmers in the province.
Overall wealth	No	Yes	Project participants were found to be significantly better off in both the overall sample and in the restricted sample of organic farmers only. This result was obtained using a wealth index that combined different household assets.
Food security	No	Mixed	Direct beneficiaries of the project (i.e. organic rice farmers) were found to have a marginally more diversified diet than the relevant comparison group. No evidence was found of severe food security between any groups.
Investment in education	No	No	There was no evidence at any level that the project had increased directly project households' expenditure in schooling.

Table 2. Results for characteristics of resilience examined in the Effectiveness Review

Dimension	Characteristic	Evidence of positive impact? All rice farmers (Group A+B versus Group C+D)	Evidence of positive impact? Organic farmers (Group A versus Group C)
Livelihood viability	Crop diversification	Yes	Yes
	Improved agricultural production (fruit only)	Yes	Yes
	Use of seeds from own production	No	No
	Access to land	No	No
Innovation potential	Access to credit	No	Yes
	Attitudes towards changing practices	No	No
	Attitudes towards changing practice: water management	No	No
	Awareness of climate change	No	Yes
	Use of weather forecasting to manage rice production	No	No
Contingency resources and support	Savings	Yes	Yes
	Ownership of livestock	Yes	Yes
	Access to off-farming earnings	Yes	Yes
	Food from own production	No	Yes
Integrity of the natural and built environment	Access to irrigation and water pump	Yes	Yes
	Use of improved water management techniques	Yes	Yes
Social and institutional capability	Social cohesion in the community	No	No

PROGRAMME LEARNING CONSIDERATIONS

The review positively shows that most small-scale farmers in Yasothorn province maintain the tradition of growing vegetables for household consumption. It reveals that not only do the project farmers grow a wide variety of vegetables, up to thirty types, but most other farmers in the area do the same. This fact is confirmed by the high food security index among overall farmers.

The project promoted better water management to cope with the prolonged dry spell that affects their main livelihood of rice farming and growing more variety of fruits and vegetables for food security and extra income. The research found that the size of water storage is the key difference between the project farmers and other farmers in the province, and that the water storage impacts on rice, but not on vegetable production. This could be explained by the fact that in the year of data collection there has been regular rain that helped all agricultural produce grow well.

The risks farmers face are not only confined to weather. Most farmers are ageing so the project promoted the growth by farmers of perennial fruit trees as a ‘retirement fund’; hence project farmers grow fruits more than other farmers in the areas. By contrast, growing vegetables in a larger area takes more labour than fruit trees and the constraint of ageing and shortage of labour is the same for all groups. This also explains the lack of evidence of project impact on vegetables.

The report confirms that the direction of the climate change adaptation project is on track to enable Thai farmers in the north-east who have no access to state irrigation to adapt to instances of severe prolonged dry spells. Adaptation in this context is not only about saving the rice field or maintaining the yield, but also looking at long term livelihoods beyond the weather factor. In the case of Thailand, the target farmers look at the market to make the best of what they have. With technical assistance from the project partner and with Oxfam support, rice farmers have changed to grow premium quality jasmine rice certified by IFOAM organic labelling for the export market, which gives them an extra price margin and the potential for extra savings to invest more on farm productivity. Getting the first step right enables them to get the subsequent steps right. The second step is the continuous improvement of productivity, in which the weather variability becomes a key factor alongside the existing factors of bad soil, lack of irrigation, and quality seeds.

The project intervention emphasised the importance of a few things; the need for more precise weather forecasting to inform farmers’ decisions, and more water retention to ensure enough rice for household consumption. The report suggests that farmers have more resilience due to access to water, but perhaps not to weather forecasting.

The following points merit reflection based on the report findings:

- It is important to put the climate change adaptation project in the context of a wider livelihoods resilience programme, which includes improving the trading terms of rice farmers. The project objectives of improving farm productivity and crop diversification is only one part of their resilience plan. Another objective of the programme is to improve the supply chain as a whole.
- Investment in technology is the least successful element of the project. The development of weather forecasting at the district level would be ideal to inform farmers’ decisions about their annual crop planning. As it turns out, the report shows less impact in the

following areas: farmers did not find the forecasting accurate enough, and dissemination of forecasting information to the farmers was not even. The report findings perhaps suggest the need to develop better forecasting technology as well as better analysis of the needs relevant to weather forecasting. For example, some women expressed the desire to receive accurate weather forecasts not just to save the rice crop, but possibly to help them plan and diversify crops, which also suggests that in this context the adaptation of rice farmers includes their willingness to shift cultivation to crops of higher value than rice.

1 INTRODUCTION

Oxfam GB's Global Performance Framework is part of the organisation's effort to better understand and communicate its effectiveness, as well as enhance learning across the organisation. Under this Framework, a small number of completed or mature projects are selected at random each year for an evaluation of their impact, known as an 'Effectiveness Review'. One key focus is on the extent they have promoted change in relation to relevant OGB global outcome indicators.

This Effectiveness Review, which took place in February 2015, was intended to evaluate the success of the project 'Development and Scaling Up of a Climate Change Community-Based Adaptation (CC CBA) Model for Food Security in Thailand Project' in enabling rice-farming households to increase the resilience and adaptation capacity of small-scale farmers to weather variability and climate change.

The project was implemented in two provinces: three sub-districts of Yasothorn in the north-east, and one sub-district in Chiang Mai in the north, between March 2011 and August 2013 by Oxfam in partnership with the Earth Net Foundation (ENF), the Healthy Public Policy Foundation (HPPF) and Climate Change Knowledge Management (CCKM). Due to budgetary and time constraints, survey work was not carried out in Chiang Mai, and so the project's work in that province are not covered by this Effectiveness Review.

Figure 1.1: Map of Thailand

(Yasothorn province highlighted)

The global outcome indicator for the thematic area of resilience is defined as an index combining a number of indicators measuring rice farmers' ability to adapt and respond to climate change events that are relevant to the economic context of the project under analysis. The indicator and its construction are explained in more detail in Section 5.

This report presents the findings of the Effectiveness Review. Section 2 briefly reviews the activities and the intervention logic of the project. Section 3 describes the evaluation design, and Section 4 describes how this design was implemented. Section 5 presents the results of the data analysis, including the descriptive statistics of the population surveyed and the differences in outcome measures between the intervention and comparison groups. Section 6 concludes with a summary of the findings and some considerations for future learning.

2 PROJECT DESCRIPTION

2.1 PROJECT ACTIVITIES

The project selected Yasothorn province in the north-east and Chiang Mai province in the north as implementation sites. Yasothorn is known as a part of the legendary 'Weeping Plain' of dry barren lands. Almost 90 per cent of the population are farmers whose paddies are rain-fed with no access to public irrigation systems. Before the project started, farmers observed that the rainfall in the last decade was delayed each year. This irregular weather also caused more frequent pest attacks, which reduced the quantity and quality of the rice yield. Similar issues happened in Chiang Mai, where the population is concentrated in hilly areas and depend on rain for agriculture. Without any systematic approach, the farmers observed the weather year by year and adjusted the farming calendar according to their predictions.

In 2007, farmers in Yasothorn province experienced the longest drought ever known during the rainy season, which made their rice yields drop significantly. Thus, in 2008 Oxfam and ENF piloted a climate change adaptation project in which 59 farmers participated to test out an adaptation model. The project provided climate change knowledge to induce farmers to re-plan their rice farming, and established a small grant to encourage farmers to invest in a water management system set up through a grant from Oxfam Thailand. The project was subsequently scaled up in 2011 under the project name 'Development and Scaling Up of a Climate Change Community-Based Adaptation (CC CBA) Model for Food Security in Thailand'.

The project was implemented in two provinces: three sub-districts of Yasothorn in the north east and 1 sub-district in Chiang Mai in the north. By the end of the project, 159 organic rice farmers (female 59: male 100) tested the adaptation model on their own farms; 128 in Yasothorn and 31 in Chiang Mai. The benefits of the project were also targeted at all members of four Community-Based Organisations (CBOs).

The two project objectives that were looked at as part of this Effectiveness Review were:

1. **To increase resilience and adaptation capacit**y of small-scale farmers to weather variability and climate change through the development of a self-sustainable climate change adaptation model.
2. **To scale up the model** implementation to reach new communities and to support national development of the agenda on climate change adaptation and food security.

Under Objective 1, project activities were directed at pilot farmers. These were informed about the process of climate risk and vulnerability analysis through an explanation of future climate scenarios in their local area. Discussions were held about historical weather risks and their impact, and an assessment made of the sensitivity and vulnerability of their jasmine rice farming.

Pilot farmers received ongoing capacity-building from project staff directly as well as through their CBO's Farmer's Field Schools which gathered all members at least once every quarter. The knowledge included sustainable agriculture and adaptation techniques, food security and local weather forecasting.

Specific adaptation method activities proposed through the project included:

1. on-farm water management, i.e. increase water storage capacity, water use facilities and alternative energy for water pumping system

2. livelihood diversification from rice farming to vegetable gardening, fishing and community marketing

3. local weather forecast dissemination among farmers.

Crop diversification was a significant activity promoted by the project. The requirement was for the pilot farmers to grow at least 30 different types of vegetables they consumed daily in their households. Growing backyard vegetables was an age-old remedy for food security, which had been neglected in order to grow a cash crop. Besides water management and crop diversification, farmers also adopted other methods concurrently including soil improvement with organic fertiliser (i.e. green manure from cow beans and animal manure), seed selection, and changing the dates of planting.

Community weather forecasting centres were established in March 2012 with the objective of being accessible to community farmers to use weekly and daily for their agricultural planning and adjustment. The weather forecasting centres covered the pilot project sites. Farmers were not only the receivers of the weather data; on the contrary, farmer youth volunteers (156 of them) took part in improving the local weather forecasting model by collecting local weather data e.g. daily rainfall, soil moisture and sending it to CCKM to cross check with the result from computer modelling in the Bangkok office.

Under Objective 2, four community based organisations[1] worked closely with the project team in developing a climate change (CC) adaptation model, disseminating the model, and scaling it up to interested small-scale farmers in their own communities and others. In addition, they advocated pushing through policy reforms to support the CC adaptation among farmers at local and national levels. The CBOs were also trained to work on capacity building and technical support to coach their farmer members on CC adaptation and coping with various patterns of climate change after the end of the project.

2.2 PROJECT LOGIC AND INTENDED OUTCOMES

It can be seen from the previous section that the project was intended to have an effect on a broad range of outcomes. The project's theory for this evaluation is reported in Figure 2.1. It illustrates the link between project activities, desired resilience outcomes, and overarching objectives beyond resilience, which the project tried to promote.

According to the project's theory of change the provision of local weather forecasting was expected to improve farmers' information and, combined with workshops to increase awareness on climate change, these two areas of intervention were supposed to help farmers to better plan their annual rice growing. Better management of their own seed use was also expected to increase overall agricultural production, particularly rice production.

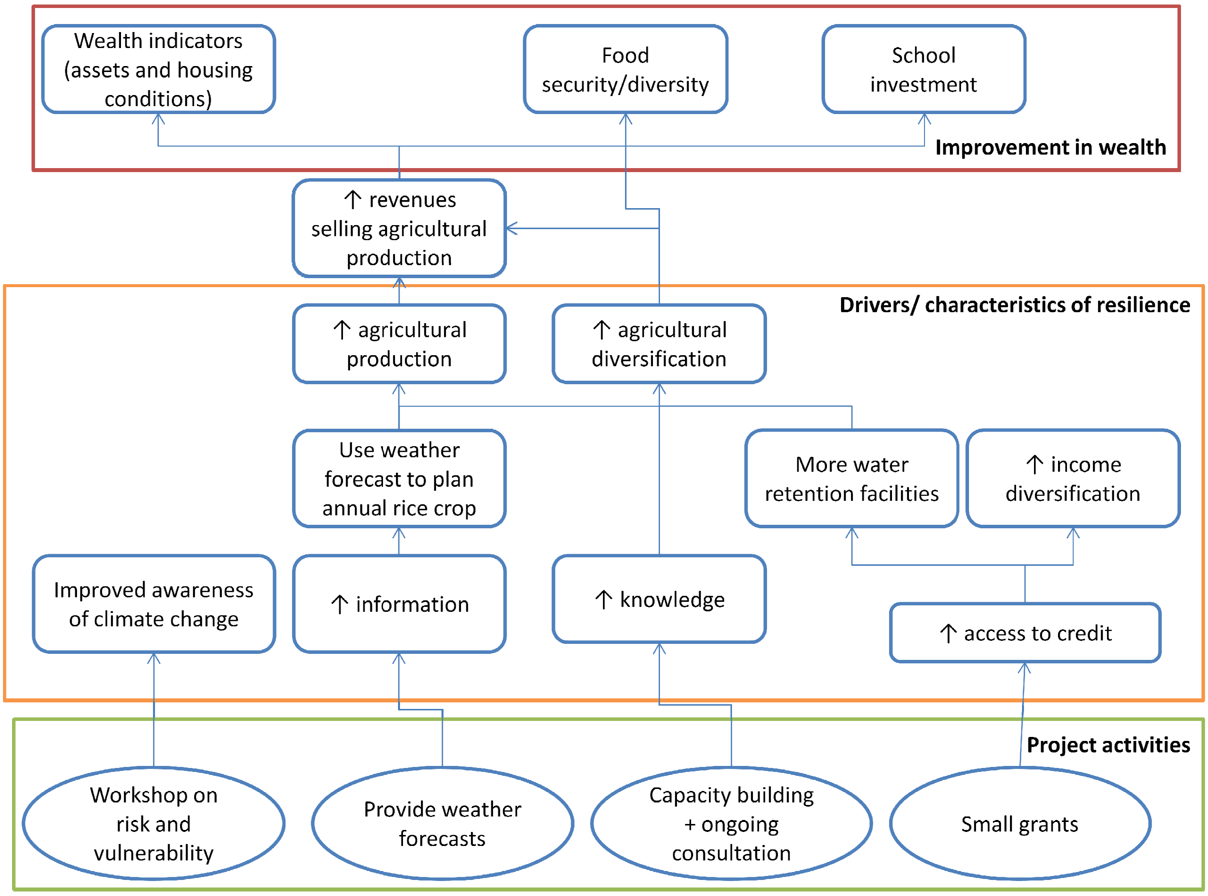
The project also supported farmers by providing small grants to improve access to credit. Better access to credit improves opportunities for income generating activities, as well as facilitating the improvement of water retention facilities for agricultural production. Improved water retention facilities, combined with improved knowledge coming from capacity building workshops and ongoing consultation were expected to improve both agricultural production and agricultural diversification.

Higher agricultural production and diversification were expected to improve revenues coming from selling agricultural products, which were then expected to improve food security, school investments and overall material wealth indicators.

This Effectiveness Review aims to evaluate the project's effects focusing on the dimensions list below, which were derived from the theory of change. The project's impact in each of these outcome areas will be examined in Section 5.3.

- Asset wealth
- Food security
- Investment in education
- Overall resilience to climate change risks as measured by:
    - Livelihood viability
    - Innovation potential
    - Access to contingency resources and support
    - Integrity of the natural and built environment
    - Social and institutional capability

Figure 2.1: Logic model



The set of project activities shown in the bottom box were intended to feed in a list of resilience outcomes shown in the middle box, with the ultimate goal of increasing small-scale farmers' resilience to climate/weather variations, and of promoting a national agenda for food security and investment in schooling to improve the overall wealth of the rice-farming communities.

3 EVALUATION DESIGN

The central problem in the evaluation of any social programme is how to compare the outcomes that result from that programme with *what would have been the case* without that programme having been carried out. In the case of this Effectiveness Review, the situation of rice farming households where the project was implemented was examined through a household questionnaire – but clearly it was not possible to observe what their situation would have been had they not had the opportunity to participate in this project. In any evaluation, that 'counterfactual' situation cannot be directly observed – it can only be estimated.

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

An ideal approach to an evaluation such as this is to select the units in which the programme will be implemented at random. Randomising the selection of sampled observations minimises the probability of there being systematic differences between programme and non-programme participants, and – by implication – maximises the confidence that any differences in outcomes is due to the effects of the programme.

In the case of project examined in this Effectiveness Review, rice farming households in Yasothorn were the units at which the programme was implemented, and these farmers also already belonged existing farming groups.

The selection of farmers and farming groups was not random; however, discussions with the survey staff revealed that there were in fact more farming groups that were considered suitable for the project than could be covered by the project. This enabled the team to adopt a 'quasi-experimental' evaluation design, in which the profile of households in non-project farming groups provided a valid counterfactual for the profile of households in the farming groups involved into the project.

Farmers in intervention groups were 'matched' with farmers with similar characteristics in the non-project (or 'comparison') farming groups. Matching was performed on the basis of a variety of characteristics – the respondent's age and gender, whether the respondent was the head of the household, the distance to the market back in 2007, the share of household members and children in the household involved in farming, whether farming was the main income generating activity in 2007, the water management systems used in 2007, the household median level of education, whether the household cultivated jasmine and sticky rice in 2007, and dummies to indicate the wealth distribution of respondents. Since some of these characteristics may have been affected by the project itself, matching had to be performed on the basis of these indicators *before* the implementation of the project. Since baseline data were not available, survey respondents were asked to recall some basic information about their household's situation from 2007, before the pilot project was implemented. Although this recall data is unlikely to be completely accurate, it should not lead to significant bias in the estimates as long as measurement errors due to the recall data are not significantly different between respondents in the intervention and comparison groups.

The survey data provided a number of household characteristics on which matching could be carried out. One practical problem is that it is very difficult to find households in the comparison groups that correspond exactly in all these characteristics to households in the intervention groups. Instead, these characteristics were used to calculate a 'propensity score', the conditional probability of the household being in an intervention village, given particular background variables or observable characteristics. Farming households in the project and comparison villages were then matched based on their having propensity scores within certain ranges. Tests were carried out after matching to assess whether the distributions of each characteristic were similar between the two groups.

One important qualification about the results of the matching procedure adopted in this review is that propensity-score matching procedure relies on the assumption that the 'observed' characteristics (those that are collected in the survey and controlled for in the analysis) capture all of the relevant differences between the two groups. If there are 'unobserved' differences between the groups, then estimates of outcomes derived from them may be misleading. Unobserved differences between the groups could potentially include differences in attitudes or motivation (particularly important when individuals have taken the initiative to participate in a project), differences in community leadership, or local-level differences in weather or other contextual conditions faced by households.

In addition to a quasi-experimental design this evaluation exploited the fact the data collection was conducted using tablets, which allowed the processing of basic summary statistics instantly and feeding back into communities in order to conduct focus group discussions and collect additional qualitative feedback from project participants.

4 DATA

4.1 SELECTION OF INTERVENTION AND COMPARISON GROUPS

In order to identify a valid comparison group for an ex-post quasi-experimental evaluation it is required to have a clear understanding of the selection process for the project participants. The project sites cover two provinces in two regions in Thailand: three districts in Yasothorn to represent the north-east region, and one sub-district in Chiang Mai to represent the north region.

Given the logistical constrains in arranging fieldwork in two distinct regions, and given the vast predominance of project participants in Yasothorn, the evaluation focused only on this region.

As explained in Section 2, the project worked and engaged directly with 128 organic farmers, from which we randomly selected a sample of 100 farmers referred to as Group A. The characteristics of these farmers are to belong to a farm group and to use organic farming techniques in their rice production.

According to the theory of change of the project, farmers involved directly in the project activities were then supposed to pass the knowledge acquired to other farmers belonging to the same groups. These farmers were also considered direct beneficiaries, although they only received support from the project indirectly. From a total of 1,426 farmers belonging to the same groups where the project was implemented, 150 farmers were randomly selected to represent the indirect project participants, referred to as Group B. Characteristics of these farmers are being involved in a farming group but not being an organic farmer.

To identify a valid comparison group for Group A (organic farmers, belonging to farming groups, and directly involved in the programme), the evaluation identified another organic farming organisation with 732 organic farmers, from which 200 farmers were randomly selected to be interviewed. We refer to this group as Group C.

Finally, in order to identify a comparison group for Group B (non-organic farmers, belonging to farming groups, and indirectly involved into the project) the evaluation performed a stratified random sampling. It identified 55 non-organic farming associations from which it randomly selected 10 groups. It then randomly selected 30 farmers within each farming group from the list of all farmers within each group. We refer to this group as group D.

Organic farming households in Group A were then compared with organic farming households in Group C in order to measure the direct intervention of the project. Non-organic farmers in Group B, who were supposedly receiving the knowledge and skills that Group A should have learned from the project, were then compared with non-organic farmers in Group D.

Table 2.1 illustrates the composition of the sample, reporting the actual number of interviews conducted in each of the four groups.

Table 2.1: Summary sample intervention and comparison groups

	Specific target population	Sample size	Typology of farmer
A	128	101*	Intervention pilot farmers
B	1426	146	Intervention from other members of the associations
C	732	212	Comparison for pilot farmers
D	4000	293	Comparison for other association members
Total sample size		**752**	

* In the econometric analysis below this sample is often reduced by three observations (thus dropping to 98 observations) depending on the combination of variables used to run the analysis for which we found unreplaceable observations.

4.3 QUALITATIVE DATA

In order to enhance the understanding and impact of project activities, a qualitative research component was added to the quantitative survey data collection exercise. Qualitative methods in this effectiveness review consisted of two types of activity: focus group discussions and socialisation with the village leaders. The objectives of the focus group discussion (FGDs) were as follows:

1. To understand the conditions and challenges faced by farmers in the area based on discussions.

2. To explore some key indicators related to resilience gathered during the household survey.

The participants to the FGDs were randomly selected from the sample frame of Groups A, B, C and D. Six to ten farmers were invited to each focus group discussion. The basic structure of any FGD consisted of three steps:

- **Step 1:** Introducing the purposes of the meeting.
- **Step 2:** Discussion of the concept of resilience. The discussion focused on resilience and those indicators that were correlated with the capacity of the household to cope with shocks and uncertainty. The aim of this step was to draw a threshold for what a ‘resilient’ household should look like, terms of dietary diversity, number of meals per day, livestock holdings, ability to send children to school, or some other outcomes.
- **Step 3:** Discussion on water management and weather forecasting. The objective was to present summary statistics in a socialisation event to introduce questions and stimulate discussion around water management and weather forecasting systems.

4.4 ANALYSIS

Rice farming households in project and comparison villages were matched in terms of their demographic characteristics, but also on their livelihoods activities and economic status in 2007. These data were based on information recalled during the questionnaire or reconstructed from the household composition at the time of the survey.

The full comparison is shown in Appendix 2. Some important differences were found between the households in project and comparison villages. For example, a much higher proportion of project group survey respondents were male rice farmers (50 per cent) than in the comparison villages (40 per cent), and this difference in gender composition was further accentuated between intervention and comparison pilot farmers (where male farmers represented 54 per cent of the sample against 35 per cent of female rice farmers).

Even among 'pilot' farmers group – who were all supposed to be adopting organic farming practices – we found significant differences in the use of chemicals for rice production. Whereas only 17 per cent and 9 per cent of project participants reported using fertiliser and pesticide respectively back in 2007, we found that 75 per cent and 35 per cent of the comparison 'pilot' farmers were using the same chemicals prior to the beginning of the project.

The median level of education in intervention groups (both combined and for pilot farmers only) was significantly higher (completed some high school level) than in comparison groups (on average, completed primary school). Moreover, we found that in 2007 only 5 per cent of the comparison rice-farming households were cultivating traditional rice as opposed to 14 per cent (24 per cent when looking at pilot farmers only) of project participants.

Finally, when comparing intervention and comparison farmers by means of a wealth index combining different assets owned by the respondents in 2007, we found a highly significant gap between project and non-project participants. In the bottom two quintiles (where the poorest farmers are grouped) we found that comparison households scored 0.07 points higher in the wealth score than project participants. At the other end of the wealth distribution we found that project farmers scored 0.12 points higher than non-project farmers in the wealth index.

All the differences outlined above, which characterised the sample prior to the inception of the project, are potential concerns for the analytical matching procedure of these reviewing exercises, as they may affect negatively the ability to generate a robust comparative analysis of the project outcomes based on the characteristics of the underlying groups being compared. As described in Section 3, propensity-score matching (PSM) was the main approach used in this Effectiveness Review to control for baseline differences. Full details of the matching procedure applied are described in Appendix 3. After matching, farming households in the project and comparison groups were reasonably well balanced in terms of the recalled baseline data, with few significant differences between them. However, not all of the farming households interviewed in all intervention groups (A and B) could be matched. In particular, 5 of the 247 households surveyed in Groups A and B and 26 of the 98 pilot farming households surveyed in Group A could not be matched to Group C respondents, and were dropped from the analysis.

The resulting estimates of the project's impact are not based on the full sample of rice-farming households, and exclude a non-random minority. The possible consequences of this will be briefly discussed in Section 5. All the results described in Section 5 were tested for robustness by estimating them with several alternative statistical models, including alternative PSM models and linear or probit regression models. Appendix 4 contains more information on these alternative models tested.

It is important to recall, as highlighted in Section 3, that PSM and regression models can control only for the baseline differences between the households in project and comparison communities for which data was collected in the survey. If there are any ‘unobserved’ differences between the two groups – such as individuals’ attitudes or motivation, differences in local leadership, or weather, or other contextual conditions – then these may bias the estimates of outcomes described in Section 5. The evaluation design and the selection of respondents were intended to minimise any potential for unobserved differences, but this possibility cannot be excluded, and must be borne in mind when interpreting the results.

5 RESULTS

This report is intended to be free from excessive technical jargon, with more detailed technical information being restricted to the appendixes and footnotes. However, there are some statistical concepts that cannot be avoided in discussing the results. In this report, results will usually be stated as the average difference between households living in villages where the project was implemented (that is referred to as the ‘intervention group’) and the matched households in villages where the project was not implemented (named the ‘comparison group’). In the tables of results on the following pages, statistical significance will be indicated with asterisks, with three asterisks (***) indicating a *p*-value of less than 10 per cent, two asterisks (**) indicating a *p*-value of less than 5 per cent and one asterisk (*) indicating a *p*-value of less than 1 per cent. The higher the *p*-value, the less confident we are that the measured estimate reflects the true impact. Results with a *p*-value of more than 10 per cent are not considered to be statistically significant.

5.1 INTRODUCTION

This section presents a comparison of the households interviewed in project and comparison villages in terms of various outcome measures relating to the project. In the tables of results, asterisks are used to indicate where the differences are statistically significant at least at the 10 per cent significance level.

The results are shown after correcting for baseline differences between the households interviewed in the intervention groups and those in the comparison groups using a propensity-score matching (PSM) procedure. The details of this procedure are discussed in Appendix 3. All outcomes have also been tested for robustness to alternative statistical models. Where those alternative models produce markedly different results from those shown in the tables in this section, this is discussed in the text or in footnotes.

The results presented in this section consist in average results across two sets of comparable groups:

- The first comparison is Groups A and B (the pilot rice farmers and other members of their associations), versus Groups C and D (the organic and non-organic farmers in the comparison areas). This comparison provides evidence of impact of the overall project, in line with the project’s assumption that there are positive spillover effects between project participants and farmers in the same farming group.

- The second comparison is only between pilot rice organic farmers in the intervention group (Group A) and organic farmers in Group C. This comparison provides evidence of the impact for the project activities directly implemented on the 128 farmers.

Two further points should be raised in interpreting the results presented in this section. Firstly, the statistical estimation procedures used to derive estimates of outcomes are based only on 'observable' baseline characteristics for which information was readily available and measured through a survey. If there are any 'non-observable' differences between the households surveyed in project and comparison villages then these may affect the estimates of outcomes. Secondly, the evaluation design and the selection of respondents were intended to minimise any potential for unobserved differences, but this possibility cannot be excluded and must be borne in mind when interpreting the results.

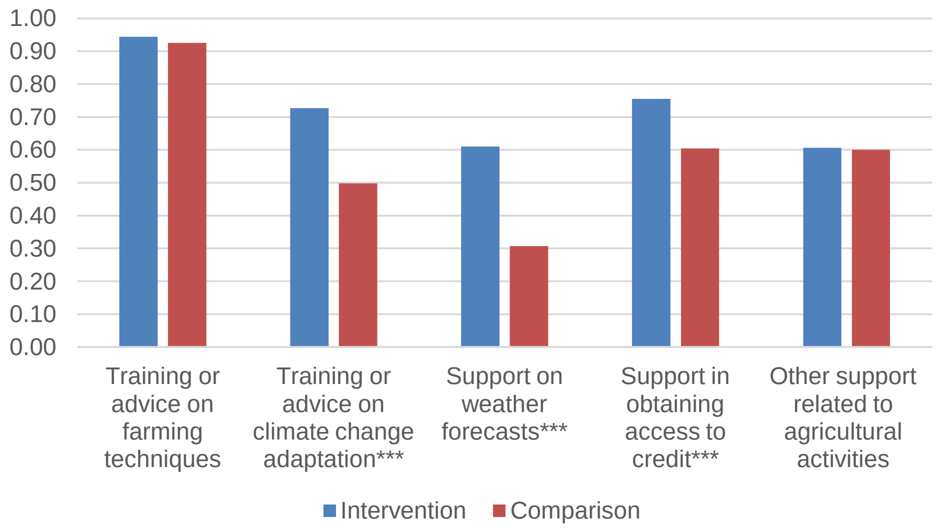
5.2 INVOLVEMENT IN PROJECT ACTIVITIES

Prior to looking at the project's success in effecting its intended outcomes, we examine whether the respondents actually participated in the activities implemented under the project.

As presented in Section 2, the project provided training workshops on risk and vulnerability, weather forecast information, consultation services and capacity building in other agricultural activities, and small grants.

Figure 5.1 compares rice farmers in the two groups that reported receiving training in different areas.

Figure 5.1: Respondents receiving training: All intervention farmers versus all comparison farmers



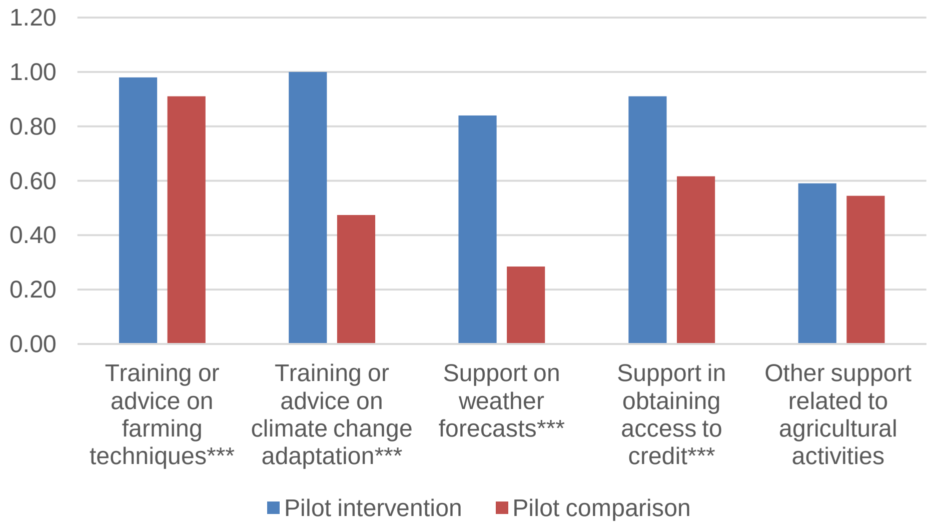
Note: *, **, ** indicate significant levels of statistical difference between intervention and comparison group.

Intervention farmers report having received significantly higher inputs via the project activities on adaptation to climate change, support on weather forecasts, and in obtaining access to credit are areas where the. It appears that a vast proportion of farmers in the intervention as well as in the comparison group received training or advice on farming techniques. Particularly high are the support received on credit, and advice on climate change adaptation.

These figures should be taken into account when interpreting the results, as it appears that farmers from the comparison group received support from other sources as well, providing a challenge in identifying the sole impact of the intervention.

These differences are more pronounced when one restricts the analysis to the pilot organic rice farmers only in the intervention group (Group A) and organic comparison groups (Group C). Here all pilot farmers received advice on climate change adaptation (as opposed to 47 per cent of pilot farmers in the comparison group), 84 per cent of them received support in weather forecasts (against a low 28 per cent in the comparison group), and 91 per cent were supported in accessing credit (against 62 per cent in the comparison group).

Figure 5.2: Respondent receiving training: Organic intervention farmers (Group A) versus organic comparison farmers (Group C)



Note: *, **, ** indicate significant levels of statistical difference between intervention and comparison group.

5.3 ANALYSIS OF OUTCOMES

This section will examine the differences between the sample of farmers involved directly or through CBO participation in the project (Groups A and B) and a matched sample of farmers in the comparison farming groups (C and D) for a number of outcome indicators capturing the project's theory of change discussed in Section 2.

The outcomes measure examined in this section are:

- Asset wealth
- Revenues from agricultural production
- Food security
- Investment in school
- Overall measure for resilience

5.3.1 Revenues from agricultural production

According with the project's theory of change, the channel through which the project aimed to increase income and revenues was via increased revenue from agricultural sales. The survey investigated the quantity of agricultural products sold in the last 12 months by asking the respondents to estimate, from a list of 26 agricultural products, both the quantity produced in the last 12 months, and the quantity sold in the same period.

Table 5.3.1 provides estimates of the total revenues obtained from selling agricultural production in the last 12 months, expressed in THB, and its logarithmic transformation. Columns 3 and 4 in Table 5.3.1 also provide estimates of the revenues from rice production.

The results of this analysis show that the project has had a significant impact on total revenues and on revenues from rice sales for all project beneficiaries: the total value of all agricultural production was 92 per cent[2] higher for rice farming households in the intervention groups than for non-project beneficiaries, and the total value of rice production sold was 153 per cent higher than for non-project beneficiaries; an area of clear success of the project. Although these size differences are substantial, they are in line with the fact that rice farmers in Groups A and B are part of the same associations, and therefore received both the same training in agricultural farming practices, and benefited from the higher market price guaranteed to members of the association. The use of an iPhone certification system and the selling of jasmine rice to the same export market, is consistent with the substantially higher value of rice sold. It must also be noted that these differences are consistent with the project objective to encourage farmers to diversify their crop portfolio in order to raise beneficiaries' overall agricultural production.

Table 5.3.1: Revenues from agricultural production

	1	**2**	**3**	**4**
	Tot crop value **THB**	**Ln (total crop value)**	**Total value of rice sold** **THB**	**Ln(tot value of rice sold)**
Overall **(Groups A+B versus Groups C+D)**				
Intervention group mean:	87,980.08	10.86	70,779.14	10.22
Comparison group mean:	72,370.22	10.21	56,095.93	9.29
Difference:	15,609.86** (7864.14)	0.65*** (0.21)	14,683.21** (6,085.46)	0.93*** (0.31)
Observations (total):	748	748	748	748
Pilot farmers **(Group A versus Group C)**				
Intervention group mean:	83,806.25	11.06	70,078.85	10.87
Comparison group mean:	71,689.97	10.70	68,438.33	10.63
Difference:	12,116.28 (14,687.09)	0.36 (0.25)	1,640.52 (12,902.71)	0.23 (0.26)
Observations (total):	303	303	303	303

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates bootstrapped with 1,000 repetitions.

5.3.2 Household wealth

Measuring household income directly is problematic: self-reported measures of total income are generally regarded as unreliable, given the wide variety of endeavours such populations engage in to generate income. Most households were engaged in other livelihood activities; a direct income measure would have had to collect detailed information about the contribution of each of these activities to the household income.

An alternative way to consider income is to investigate asset ownership. Respondents were asked about their ownership of various types of household goods and assets, as well as about their housing conditions. Using a method called Cronbach's alpha,[3] a total of 28 assets were used to construct a wealth index. This index was created applying principal component analysis (PCA), a data reduction technique that narrows the variation in asset ownership, which is assumed to represent wealth status: the more an asset type is correlated with this variation, the more weight it is given to it.

Table 5.3.2: Theory of Change indicators not directly connected to the project activities

	1
	Wealth index
Overall **(Groups A+B vs Groups C+D)**	
Intervention group mean:	0.93
Comparison group mean:	-0.15
Difference:	1.08*** (0.19)
Observations (total):	748
Organic farmers **(Group A vs Group C)**	
Intervention group mean:	1.42
Comparison group mean:	-0.14
Difference:	1.57*** (0.29)
Observations (total):	309

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates bootstrapped with 1,000 repetitions.

Table 5.1 shows a substantial and statistically significant difference in the wealth index between the intervention and comparison groups for the whole sample, as well as when comparing pilot farmers only. The estimates suggest that on average rice farming households in the intervention groups have an overall material wealth that is significantly higher than for rice farmers in the comparison group. This difference is large and statistically significant in the samples.

5.3.3 Food security

Improvement of food security was another intended outcome for project beneficiaries as an expected by-product of agricultural diversification.

We first looked at the **food diversity score**. Respondents were asked about their food consumption during the seven days before the survey. Food items were grouped into three: proteins, leafy vegetables, and other vegetables. If respondents answered that they had protein food items for at least four days, leafy vegetables for at least three days and other vegetables for at least three days (so each food group for the given minimum number of days over the last seven days preceding the survey), then they scored 1 in the food security diversity score, zero otherwise.

The estimate in the first column of Table 5.3.3 suggests high levels of food diversity among all respondents of the survey, with each group (overall and direct beneficiaries, and overall and direct comparison group households) scoring very close to 1 (implying a fully diversified diet). However no significant difference in dietary diversity was found between overall intervention and comparison households. We then disaggregated the food diversity index to check if there was less diversity in some food groups among project and non-project beneficiaries. Even at this level of disaggregation, we found highly diversified diets across all groups, with organic farmers (Group A) only scoring a significantly higher diversified diet in the case of leafy vegetables relative to non-project organic farmers (Group C).

Table 5.3.3: Food security

	1	**2**
	Food security diversity	**Severity of food security**
Overall **(Groups A+B vs Groups C+D)**		
Intervention group mean:	0.97	0.02
Comparison group mean:	0.96	0.03
Difference:	0.01 (0.02)	-0.004 (0.014)
Observations (total):	748	748
Organic farmers **(Group A vs Group C)**		
Intervention group mean:	1.00	0.04
Comparison group mean:	0.97	0.02
Difference:	0.03** (0.02)	0.02 (0.03)
Observations (total):	309	303

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates bootstrapped with 1,000 repetitions.

These results are plausible in light of the fact that most rice farmers have a second occupation that supplements their income during the drought months and makes it possible for all to have access to food at all times.

Column 2 reports the score for severity of food security. This was computed as a binary variable equal to 1 if during the 12 months preceding the survey households had reduced the size of their meals in any of the following ways: 1. Had fewer meals in a day than normal, 2. Had less preferred food, 3. Reduced the amount eaten in order to feed children in the household, 4. Borrowed food, 5. Went to sleep hungry, or 6. Went for a whole day without eating *at least sometime, a few times, or at least once or twice with no food in a day*, and zero otherwise.

Even in this area we found no evidence of project impact and groups scored very low values of severe food insecurity. This result is again not surprising given that the whole survey area has no history of severe food insecurity.

5.3.4 Investment in school

Finally, the project logic expected an impact on farmers' investment in education as a result of an increase in revenue from selling more agricultural produce. To measure this investment choice, we built in an education expenditure variable that included households' investment in transport to and from school, school fees, and expenses in books and school materials.

Estimates in Table 5.3.4 suggest that there is no statistically significant difference between intervention and comparison groups in household school expenditure.

Table 5.3.4: Education expenditure

	1	2
	Expenditure in education (THB)	**Ln (educ. exp)**
Overall **(Groups A+B vs Groups C+D)**		
Intervention group mean:	7,791.90	4.764
Comparison group mean:	10,113.23	4.717
Difference:	-2,321.33	0.046
Observations (total):	(3,494.79)	(0.432)
	748	748
Organic farmers **(Group A vs Group C)**		
Intervention group mean:	4,596.92	4.149
Comparison group mean:	4,968.25	5.446
Difference:	-371.332	-1.297
Observations (total):	(1,749.22)	(1.002)
	303	303

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates bootstrapped with 1,000 repetitions.

This result is not surprising given that investment in education is a high priority as no one wants their children to remain rice farmers.

5.3.5 Indicators of resilience

The project under review was specifically aimed at increasing rice-farming households' resilience to climate change effects on their livelihoods and food security.

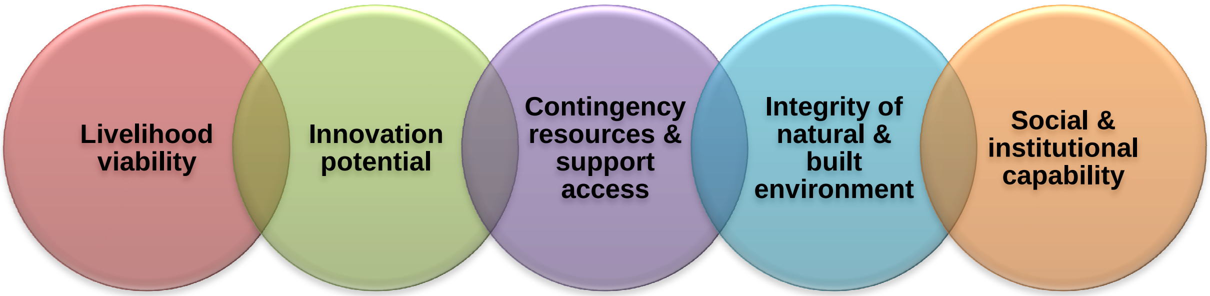
As part of Oxfam GB's Global Performance Framework, an innovative approach has been developed to measuring the resilience of households to shocks and stress and their ability to adapt to change.[4] This approach involves capturing data on various household and community characteristics falling under the five interrelated dimensions presented in Figure 5.1.

One reason why measuring resilience is challenging is that we can only really assess whether a system has successfully coped or adapted after the fact. A full understanding of resilience needs to consider all the various types of shocks and stresses that an individual, household or community may undergo.

The approach to resilience measurement is based on the assumption that there are particular characteristics of households and communities that affect how well they are able to cope with shocks and positively adapt to change. 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 an understanding of the local context.

The characteristics that inform the overall measure of resilience fall under the five dimensions presented in Figure 5.1.

Figure 5.1: Dimensions affecting the ability of households to minimise risks from shocks and adapt to emerging trends and uncertainty



Livelihood viability:
1. Crop diversification
2. Improved agricultural production
3. Use of seeds from own production
4. Access to land

Innovation potential:
1. Access to credit
2. Attitudes towards changing practices
3. Awareness of climate change
4. Use of weather forecasting to manage rice production

Contingency resources & support access:
1. Savings
2. Income diversification (access to off-farming earnings)
3. Ownership of livestock
4. Food own production

Integrity of natural & built environment:
1. Access to irrigation
2. Access to water pump.
3. Use of improved water management techniques

Social & institutional capability:
1. Social support networks

First, if we think about what a household would need in order to cope with current and future shocks, stresses, and uncertainly, a viable livelihood is likely to be one of them. If a shock happens, for instance, a household dependent on just one precarious livelihood activity is likely to be more negatively affected than another that has one or more less sensitive alternatives to fall back on, *all other things being equal*. In addition, households that are on the margins of survival 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 given the range of likely future climatic scenarios.

Innovation potential focuses on a household's ability to positively adjust to change, whether anticipated or not. We can 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.

Moreover, there will likely be times when even households with the most ‘resilient’ and adaptive 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 – are, therefore, likely to be critical in supporting households in coping with shocks and positively adjust to change.

It is further recognised that the integrity of natural and built environment are essential resources for farmers to be able to cope with shortages of water through a sound knowledge and proven experience in manageing water facilities, water stores, and accessing different water tools.

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 to be 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 and institutional capability dimension, in particular, is concerned with the effectiveness of informal and formal institutions in reducing risk, supporting positive adaptation, and ensuring equitable access to essential services in times of shock/stress. 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.

While the five dimensions of resilience described here provide an overall framework, the challenge in creating a measure of resilience is to identify specific characteristics that are appropriate to the local context. For this Effectiveness Review, the team prepared a number of focus group discussions with a subset of farmers from each of the four groups to better understand the conditions and challenges faced by farmers in the area and to discuss at more length some of the resilience dimensions with local farmers both involved and not involved in the project.

This process leads to a set of characteristics of resilience being identified, listed in Table 5.3.2 below. It is important to note at this stage that while not all characteristics considered in this Effectiveness Review may be directly linked to the project activities, all are deemed to be important to a household’s overall resilience in this particular context. Table 5.3.2 shows on which resilience indicator the project activities may be expected to have an impact.

Table 5.3.2: Characteristics of resilience examined in this Effectiveness Review and project impact

Dimension	Characteristic	Overall Difference (A+B vs C+D)	Organic farmers Difference (A vs C)
Livelihood viability	Crop diversification	0.21***	0.40***
	Improved agricultural production^	1.12***	1.84***
	Use of seeds from own production	0.002	-0.03
	Access to land	0.12	0.28
Innovation potential	Access to credit	0.12	0.30*
	Attitudes towards changing practices	0.11	0.24
	Attitudes towards changing water management practices	-0.03	0.06
	Awareness of climate change	0.12	0.35*
	Use of weather forecasting to manage rice production	0.01	2
Access to contingency resources and support	Savings	0.42***	0.47**
	Ownership of livestock	0.08*	0.30**
	Access to off-farming earnings	0.12***	0.24***
	Food own production	0.07	0.13**
Integrity of the natural and	Access to irrigation and water pump	0.04***	0.26***
	Use of improved water-management techniques	0.13***	0.18*
	Social cohesion in the community	-0.07	-0.009
Global Indicator of resilience		0.05***	0.11***

Note: *, **, ** indicate significant levels of statistical difference between intervention and comparison group. Starred figures show indicators where a statistically significant impact of the project was found.

The questionnaire used in the Effectiveness Review included questions relating to each of the characteristics listed above. Some of these indicators have already been discussed in earlier sections of this report.

Data from these various indicators of resilience were aggregated using an approach known as the Alkire-Foster method, adapted from that used by the Oxford Poverty and Human Development Institute for measuring multidimensional constructs, such as poverty and women's empowerment. For each characteristic, a benchmark was defined, based on what it means for a household to be faring reasonably well in relation to the characteristic in question. The particular benchmarks used for each characteristic are detailed in Appendix 1.

There is inevitably a degree of arbitrariness in defining such cut-offs. In many cases, alternative cut-offs and alternative formulations of the indicators were tested, as a check on the robustness of the results obtained from applying the cut-offs.

A measure of overall resilience was then derived by counting the proportion of characteristics in which the household scored positively. We refer to this measure as the base resilience index. This measure also represents Oxfam GB's 'Global Indicator' for resilience effectiveness reviews which is defined as the change in ability of supported households to minimise risk from shocks and adapt to emerging trends and uncertainty (as measured by an index of characteristics believed to be associated with resilience in each context).

Table 5.3.3: Overall indices of resilience

	1	2
	Global Indicator – Base resilience index	**Resilience index** **(% respondents with over 2/3 score of base index)**
Overall **(Groups A+B vs Groups C+D)**		
Intervention group mean:	0.61	0.41
Comparison group mean:	0.56	0.24
Difference:	0.05*** (0.012)	0.17*** (0.05)
Observations (total):	741	741
Organic Farmers **(Groups A vs Groups C)**		
Intervention group mean:	0.65	0.56
Comparison group mean:	0.55	0.17
Difference:	0.11*** (0.02)	0.39*** (0.08)
Observations (total):		

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates are bootstrapped with 1,000 repetitions, with standard errors clustered by community.

Table 5.3.3 compares the project participant and comparison households in terms of each of these two indices of resilience: there is clear indication of a significant difference between respondents' across groups in both indices: intervention farmers scored positively in 61 per cent of the dimensions, whereas comparison farmers scored positively in 56 per cent of the dimensions. The difference was found to be statistically significant suggesting that the project has succeeded in enabling higher levels of resilience among its beneficiaries. Similar qualitative results were found in the restricted sample of pilot farmers, where project farmers were resilient in 65 per cent of the areas explored, as opposed to comparison farmers who were found to be more resilient in 55 per cent of the indicators considered.

To examine more closely whether the project has had any impact on resilience, it is important to compare the project and comparison households in terms of the underlying indicators. The next sections review the outcome of project participation in each of the five dimensions of resilience accounted for.

DIMENSION 1: LIVELIHOOD VIABILITY

Four indicators of resilience falling under the 'livelihood viability' dimension were examined in this Effectiveness Review. The first indicator was crop diversification.

The first two columns in Table 5.4.1 show respectively the proportional change in the number of crops grown between 2007 and 2014 (column 1), and the share of respondents who have increased the number of crops grown over the same period (column 2). In both instances – and even when looking at the restricted sample of organic farmers only – we found that project beneficiaries have diversified crop production far more than comparison rice-farming households. In particular we see from column 2 that 40 per cent more organic rice-farming households in the intervention group have increased the number of crops grown over time relative to non-project beneficiaries.

A second indicator of livelihood viability was an indication of **improved agricultural production** across three different types of products: rice, fruit and vegetables. Columns three, four and five illustrate estimates on rice, fruit and vegetable production in the intervention and comparison groups for the 12 months prior to the survey. The values reported are in natural logarithms as these numerical transformations reduce the effect of irregular distribution problems of continuous variables, which are likely to be affected by the presence of out-of-range values and measurement errors. Estimates suggest that whereas there are no statistically significant differences between intervention and comparison groups in rice and vegetable production, the production of fruit crops has increased dramatically for project beneficiaries. The estimates indicate a 200 per cent and a 530 per cent higher production of fruit respectively for all project beneficiaries and for organic beneficiaries. These differences are very high, but are found to be realistic. The population of rice famers is ageing and thus the project promotes the growing of perennial fruit trees as a retirement fund – hence project beneficiaries grow fruit more than non-beneficiaries. Intervention farmers also grow more fruits (mostly perennial) because the project supported this as a guarantee for ageing farmers with limited labour. With the irregular rain, it is also no surprise that rice production is not found to be significantly different between the groups.

Another important area of vulnerability, particularly for rice crop producers, is the **availability of seeds** from their own rice production across the seasons. Rice-farming households scored positively in this area, where the share of seeds used from own production in the total share of seeds used in the previous 12 months was positive. As can be seen in column 6 of Table 5.4.1, we found no evidence of a difference in this indicator between the project and comparison households. Even after restricting the sample to organic households only (i.e. Groups A and C) we found no difference in this indicator, with both groups using between 85 per cent and 90 per cent of their own rice seeds from last season. However, as it is a local practice for rice farmers to save their own seeds, the lack of significant impact of the project in this area was not surprising. The last indicator of livelihood viability was a measure of **access to land**, measuring the number of respondents cultivating at least 10 rai of land. Although the size of the estimated coefficient was quite different between intervention and comparison groups (with 13 and 31 per cent of respondents respectively in the overall and in the organic intervention groups satisfying this condition, in contrast to as low as 2 and 4 per cent of the comparison respondents in the equivalent groups), these difference were not found to be statistically significant. Once again the apparent lack of impact of the project in this area is not entirely surprising given that access to land has not change for at least 20 years.

Table 5.4.1: Livelihood viability

	1	2	3	4	5	6	7
	Crop diversification (% change in # crops since 2007)	**Crop diversification (% respondents who had positive crop div. over time)**	**Log (kgs rice production)**	**Log (kgs fruit production)**	**Log (kgs vegetables)**	**Use of seeds from own production (share of seeds used from own production)**	**Access to land (% respondents who had at least 10 rai of land)**
Overall (Groups A+B vs Groups C+D)							
Intervention group mean:	0.23	0.44	8.58	5.48	7.20	0.85	0.13
Comparison group mean:	0.01	0.24	8.59	4.37	7.37	0.85	0.02
Difference:	0.22** (0.09)	0.21*** (0.045)	-0.0 (0.10)	1.12*** (0.24)	-0.17 (0.30)	0.002 (0.03)	0.12 (0.08)
Observations (total):	743	748	748	748	748	741	737
Organic farmers (Group A vs Group C)							
Intervention group mean:	0.51	0.60	8.61	5.82	7.21	0.88	0.31
Comparison group mean:	-0.01	0.20	8.70	3.98	6.68	0.91	0.04
Difference:	0.52** (0.26)	0.40*** (0.09)	-0.10 (0.19)	1.84*** (0.44)	0.53 (0.76)	-0.03 (0.04)	0.28 (0.26)
Observations (total):	308	309	303	303	303	309	309

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates are bootstrapped with 1000 repetitions.

Figures 5.4.1 and 5.4.2 show the difference in rice production between the overall intervention and comparison groups, and between organic farmer intervention and comparison groups only to further explain the lack of project impact in rice production. These figures show a significantly higher production of traditional rice among all beneficiaries (Groups A and B) and also among organic rice farmers only (Group A) relative to their comparison group, whereas jasmine rice production was found to be higher among organic farmers in the comparison group (i.e. farmers in Group C).

Figure 5.4.1: Rice production between Groups A+B and Groups C+D (in kilograms)

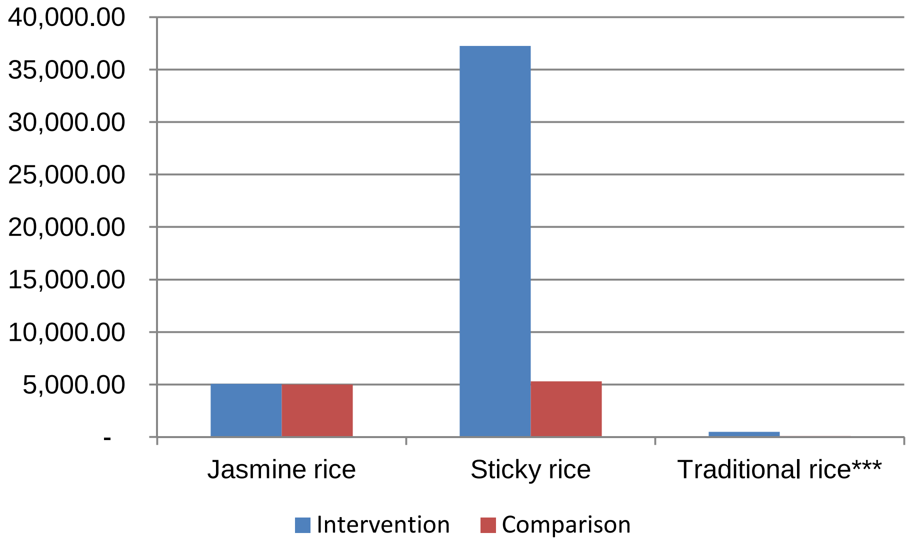
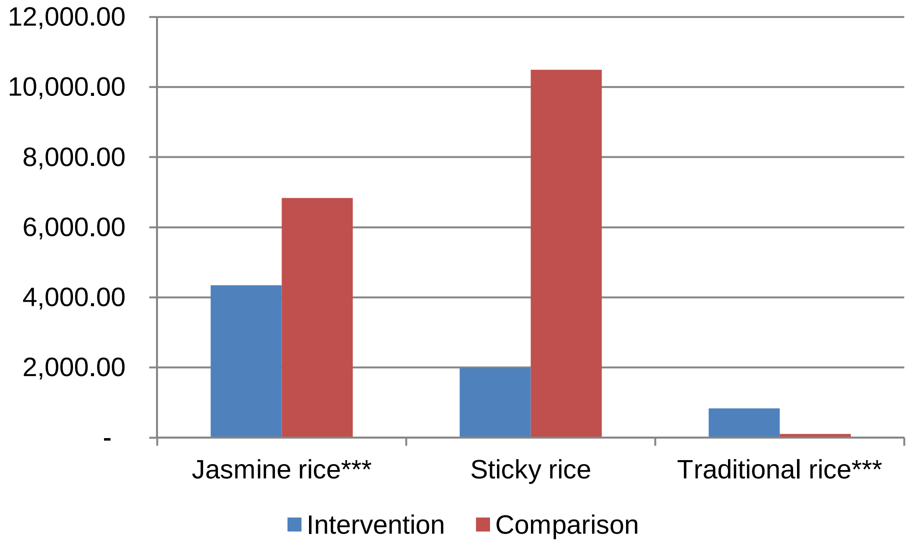


Figure 5.4.2: Rice production between Group A and Group C (in kilograms)



This lack of project impact on rice production could be explained as follows. Firstly, for the situation for this year, from April 2015 – this was a bad year for drought. Farmers are not pumping water to irrigate rice fields. They say it is not worth it as they don't know when the next rain will come, so if they use up all the water they might be left without any water, which they need to conserve for the vegetables in order to have income every month.

Their approach is to secure rice production for home consumption, and diversify into vegetable production for income.

DIMENSION 2: INNOVATION POTENTIAL

Four characteristics of rice farming households' 'innovation potential' were examined in this Effectiveness Review. Firstly, respondents' **access to credit**: column 1 of Table 5.4.2 shows that both intervention and comparison groups had access on average to approximately under two sources of credit out of five, where possible sources were:

1. Relatives or neighbours in the community
2. Private/institutional moneylender
3. CBOs/savings groups
4. Microfinance institutions
5. Other possible sources.

The disaggregation by sources of credit shows that CBOs and saving groups were the sources of credit where direct beneficiaries had statistically significantly higher access being used by 70 per cent of organic farmers in the intervention group in contrast to only 48 per cent of organic farmers in the comparison group. This was one of the intended objectives of the project, therefore suggesting its successful impact in this area.

The next three indicators of innovation potential, **awareness to climate change**, **attitudes towards changing farming practice** and **attitudes towards water management practices**, are to be considered the central areas of the desired impact of the project. These were measured by counting – for each group – the number of areas where respondents stated being aware of and/or open to changes in rice farming related practices. Columns 2, 3 and 4 suggest project impact only in the first of these areas and only for organic rice farmers; where intervention group respondents were aware of climate change instances in nearly three possible areas as opposed to organic rice farming respondents in the comparison groups, who were only aware of climate change symptom on average in two out of three areas. This difference was found to be statistically significant.

Looking at the areas underlying these awareness indicators, we found that the positive impact of the project was achieved in the area of attitude towards changing practices, where 22 per cent more respondents in the direct beneficiary group (Group A) declared being willing to try new farming practices in response to variations in the weather relative to the comparison group.

No project impact was found in either the aggregate awareness indicators towards changing farming practices and water management. It may be possible that this lack of impact resulted from respondents misunderstanding the wording of the questionnaire during fieldwork: when asked these questions, respondents may not necessarily have been thinking about their changing attitudes in relation to the project activities, but rather thinking about the whole environment and not specifically about the risk vulnerability exercise specific to the project.

When disaggregating the questions on attitudes towards changing practices, we found that both intervention groups (i.e. A+B) and direct project beneficiaries only (i.e. Group A) were significantly more progressive than their respective comparison groups in the area of '*trying to do things differently from the way they have always done them'.*

Similarly, in the area of attitudes towards water management, when disaggregating the questions used to generate this indicator we found that both intervention groups (i.e.

A+B) and direct project beneficiaries only (i.e. Group A) were significantly more progressive than their respective comparison groups in the area of '*Not wanting to reduce the land dedicated to water storage to improve rice production'*.

Disaggregating the data, therefore, provides a more nuanced picture of areas where project beneficiaries have changed their attitudes towards farming and water management practices.

Table 5.4.2: Innovation potential

	1	**2**	**3**	**4**	**5**
	Access to credit (Number of sources out of five)	**Awareness of climate change (Number of areas aware out of three)**	**Attitudes towards changing practices (Number of areas aware out of two)**	**Attitude towards changing practices Water management (Number of areas aware out of two)**	**Use weather forecasting for rice production (% respondent s received it since 2011)**
Overall (Groups A+B vs Groups C+D)					
Intervention group mean:	1.72	2.50	0.50	0.48	0.91
Comparison group mean:	1.60	2.39	0.40	0.52	0.89
Difference:	0.12 (0.08)	0.12 (0.06)	0.11 (0.06)	-0.03 (0.05)	0.01 (0.03)
Observations (total):	748	748	748	748	748
Organic Farmers (Group A vs Group C)					
Intervention group mean:	1.68	2.63	0.71	0.51	0.93
Comparison group mean:	1.38	2.28	0.47	0.46	0.91
Difference:	0.30* (0.17)	0.35* (0.11)	0.24 (0.16)	0.06 (0.11)	0.02 (0.04)
Observations (total):	309	309	309	309	309

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates bootstrapped with 1,000 repetitions.

The last resilience indicator in this dimension was a measure of respondents' use of weather forecasting for rice production since 2011. A very large share of households in the whole sample (approximately 90 per cent across groups) reported receiving and using weather forecast, but no statistically significant difference between intervention and comparison groups was found to suggest a positive impact of the project. Weather forecasting information was openly disseminated to all rice farmers, so this is one element explaining the lack of project impact in this area. Moreover, it is important to bear in mind that weather forecasting is only one element of project beneficiaries' resilience attitude with regard to rice production: as weather forecasting has not traditionally been a reliable instrument against weather shock, it is plausible to assume that the time required to learn from the simulation effect of weather forecasting will be of least two years, therefore making this area of intervention potentially premature for impact assessment.

Focus group discussion held on this thematic area pointed to the fact that weather forecasting is generally available for a very large area, often too remote – and therefore inaccurate – for farmers residing within the project area. This is very likely to make weather forecasting often inaccurate or untimely for farmers to usefully take it into account.

DIMENSION 3: ACCESS TO CONTINGENCY RESOURCES AND SUPPORT

Four indicators of a household's ability to access contingency resources and support were examined in this Effectiveness Review: households' modalities of savings, income diversification, ownership of livestock and production of own food.

Table 5.4.3: Contingency resources and support access

	1	2	3	4
	Savings (modality of savings out of 5)	**Income diversification (respondents for whom sources of income have grown over time)**	**Ownership of livestock (% respondents with # livestock larger than the median in comparison group)**	**Food own production (% HH cultivating own food garden)**
Overall (Groups A+B vs Groups C+D)				
Intervention group mean:	1.86	0.47	0.65	0.96
Comparison group mean:	1.43	0.35	0.57	0.89
Difference:	0.42*** (0.93)	0.12*** (0.05)	0.08* (0.04)	0.07 (0.02)
Observations (total):	748	748	748	748
Organic farmers (Group A vs Group C)				
Intervention group mean:	2.03	0.61	0.78	0.99
Comparison group mean:	1.56	0.37	0.48	0.86
Difference:	0.47** (0.19)	0.24*** (0.09)	0.30** (0.10)	0.13** (0.05)
Observations (total):	309	302	309	309

[a] Among those households that sold any wheat or cotton during the past 12 months, as applicable. Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01.

With the exception of the indicator of own food production in the overall sample, rice-farming households were otherwise found to have benefited significantly from project activities in all four areas – a result that was found to be statistically significant in both samples of project beneficiary groups. The two areas where the difference in project impact was found to be more pronounced were **income diversification and ownership of livestock**. In the first area we found 24 percentage points more respondents among intervention group organic farmers and 12 percentage points more respondents in the overall intervention group that had increased their sources of income over time relative to non-project beneficiaries. Also in terms of livestock ownership, we found a statistically significant difference between matched groups: 30 percentage points more respondents among organic farmers in the intervention group and 8 percentage points more respondents in both intervention groups owned a larger share of livestock relative to the median size of livestock owned by the comparison groups.

DIMENSION 4: INTEGRITY OF THE NATURAL AND BUILT ENVIRONMENT

Characteristics of the natural environment are certainly of high importance to resilience in this project, and in this Effectiveness Review were captured by two different measures of farmers' ability to access different water tools (wells, pipes, pumps, windmills for pumping water, sprinklers and water tanks), as well as their water storage capacity. The first indicator was measured as the proportional change in the number of water tools used by each respondent between 2007 and 2014, i.e. between the beginning and end of the project. The intervention groups for both the overall sample and for organic farmers only have scored significantly higher than the comparison groups, with respectively 4 and 26 percentage points higher growth rates in the number of water tools employed over time.

Table 5.4.4: Integrity of the natural and built environment

	1	2	3	4
	Access to irrigation and water pump **(no. respondents for whom % change in total water facilities since 2007 is positive)**	**Use of improved water manag't. techniques (% respondents for whom total water storage available > median comparison group)**	**Total quantity of water stored in previous 12 months (cubic metres)**	**Ln (Total quantity of water stored in previous 12 months**
Overall				
Intervention group mean:	0.53	0.62	345.77	4.07
Comparison group mean:	0.49	0.49	266.71	3.27
Difference:	0.04*** (0.05)	0.13*** (0.05)	79.06* (43.03)	0.80*** (0.27)
Observations (total):	748	748	748	748
Organic farmers				
Intervention group mean:	0.68	0.63	394.89	4.52
Comparison group mean:	0.42	0.45	234.44	2.67

Difference:	0.26*** (0.09)	0.18* (0.10)	160.46* (87.35)	1.85** (0.78)
Observations (total):	309	309	303	303

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates bootstrapped with 1,000 repetitions.

The second measure of the integrity of natural and built environment was derived by estimating the water storage capacity of the respondents as follows: The capacity of their water tank was added up to get an estimate of the total water volume of all ponds used by the household. Based on this derived measure, column 2 in Table 5.4.4 suggests that both all farmers and organic farmers who benefitted from the project scored respectively **13 and 18 percentage points higher** in their ability to store more water than their corresponding counterparts in the comparison groups. These differences were both found to be statistically significant, therefore pointing to another area of the project having a positive impact. In order to further probe this result, we estimate the total volume of water stored in column 3 (in levels) and 4 (logarithmic transformation). **Estimates of water volumes confirmed a very significant impact among project beneficiaries with regard to their ability to store water.** It is worth stressing the importance of this result given that in the project area it is not a tradition for rice farmers to invest in water storage (other than for rice), as this is considered to be a wasteful use of land, thus suggesting a significant success in terms of the project's intended outcomes.

DIMENSION 5: SOCIAL AND INSTITUTIONAL CAPABILITY

A further characteristic of resilience was examined under the dimension of social and institutional capability. Social support was measured by counting **the number of areas** where the survey respondents stated receiving social support from the community either in time of difficulties, during prolonged droughts, or by regularly participating in important community meetings.

Table 5.4.5 shows that both intervention and comparison groups in different samples benefited from nearly all these social support services in a similar way, with no clear benefit emerging exclusively as a result of the project impact.

Table 5.4.5: Social and Institutional capability

	1
	Social support (number of areas out of three where respondents received social support)
Overall	
Intervention group mean:	2.63
Comparison group mean:	2.70
Difference:	-0.07 (0.06)
Observations (total):	740
Organic Farmers	
Intervention group mean:	2.64
Comparison group mean:	2.65

Difference:	-0.009 (0.13)
Observations (total):	309

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01; PSM estimates bootstrapped with 1,000 repetitions.

6 CONCLUSIONS

Since 2004, Oxfam has worked with Earth Net Foundation (ENF), a local organisation in Thailand, to promote organic rice farming and fair trade marketing in Yasothorn province.

During the rainy season in 2007, farmers in the province experienced the longest drought ever recorded that meant their rice yields dropped significantly. In response to this, in 2008 Oxfam and ENF piloted a climate change adaptation project in which 59 farmers participated to test out an adaptation model. The project provided climate change knowledge to induce farmers to re-plan their rice farming, and established a small grant from Oxfam Thailand to encourage farmers to invest in setting up a water management system. Following the successful collaborative effort between Oxfam and ENF, the project 'Development and Scaling Up of a Climate Change Community-Based Adaptation (CC CBA) Model for Food Security in Thailand Project' was developed in 2011 and lasted until August 2013.

This review evaluated the impact of this project in two of the three overall objectives:

1. To increase the resilience and adaptation capacity of small-scale farmers to weather variability and climate change through the development of a self-sustainable climate change adaptation model.

2. To scale up the model implementation to reach new communities and to support the national development of an agenda on climate change adaptation and food security.

Using a quasi-experimental evaluation design to assess the impact of the project activities, the Effectiveness Review looked at the impact of the project among pilot organic rice farmers (direct effect of the project) and among other members of other rice farming associations (spillover effect). The sample used in the review comprised four groups in the Yasothorn province. Two groups were randomly assigned as intervention groups (Group A and Group B, with Group A consisting of organic rice farmers, and Group B including all other rice farmers in the area) and two groups (Group C organic farmers and Group D members of other CBOs) were assigned as comparison groups.

The results of this Effectiveness Review looked at impact on the entire group of rice farmers (both what we will call 'pilot' and 'spillover' farmers, and also present the results for the pilot farmers separately (Group A and Group C) who were not direct project participants.

The main finding of the review is that the project has been largely successful for its direct beneficiaries: the organic rice-farming households. The review found strong and compelling evidence of project impact in the overall resilience index, a measure of resilience derived by combining 16 different characteristics in which each rice-farming household scored positively. This index was found to be significantly higher on average in the intervention group (for both all rice producers and organic ones only) than among comparison farmers.

There were **nine** specific indicators of resilience where the project was particularly impactful. Rice farmers were able to diversify their crop portfolio, and raise fruit production. Also, compared to the farmers in the non-project sample, intervention farmers had access to a larger number of credit sources, and become more aware of climate change.

The project was found to be successful in all areas of contingency resources and support access: rice farming households in the intervention groups were better off relative to those in the comparison group in **accessing savings, diversifying income sources, owning a larger share of livestock, and in cultivating own food garden for self-consumption.** The latter set of findings represent a particularly important result, as these indicators are **all positively correlated with the resilience potential of rice farmers in case of a negative climate change shock.**

The analysis also suggested that all project beneficiaries had better access to water facilities as a result of the project, and that their ability to store water was significantly higher than that of the comparison group thanks to the project impact.

There are three areas where there has been **no evidence** (or mixed evidence) of impact. Firstly, no evidence of project impact was found in terms of use of weather forecasting services, and intervention farmers' ability to use the service to improve their rice production.

Secondly, the project **had limited success** in increasing total agricultural production. The only clear positive effect in this area was found among overall and organic beneficiaries of the project (the direct beneficiaries of the project) whose fruit production was found to be significantly higher than the comparison group. Thirdly, the project had limited impact in the knowledge area: here the only underlying indicator of success was found to be improved water management practices for project beneficiaries.

APPENDIX 1: THRESHOLDS FOR CHARACTERISTICS OF RESILIENCE

Dimension	Characteristic	Threshold: A rice farming household scores positively if...	Coherent with continuous indicator (ALL)	Coherent with continuous indicator (Direct beneficiaries only)
Livelihood viability	Crop diversification	the percentage change in # crops grown is positive	Yes	Yes
	Use of seeds from own production	it used more that 50% of seeds from own production	Yes	Yes
	Improved agricultural production	the share of respondents with production of a specific crop group (rice/fruit/veg.) is greater than the median quantity in the comparison group	Yes	Yes
	Access to land	the percentage change in land cultivated is positive	No	Yes
Innovation potential	Access to credit	it can access at least one borrowing channel out of five	Yes	No
	Attitudes towards changing practices	it is aware of least one area of change out of two	No	No
	Attitudes change practice of water management	it is aware of at least one area of water management out of two	Yes	
Access to contingency resources and support	Savings	it can access savings from at least one possible outlet out of 5	No	No
	Ownership of livestock	# livestock assets owned today is greater than median comparison group	Yes	Yes
	Access to off-farming earnings	% change in # of income generating activities is >0	Yes	Yes
Integrity of the natural and built environment	Access to irrigation and water pump	if water volume available is greater than median water availability in comparison group	Yes	Yes
	Use of improved water management techniques	# days able to maintain *any* rice > # days the 75th percentile in comparison group is able to maintain *any* rice	Yes	Yes
Social and institutional capability	Social cohesion in the community	it received social support in at least one out of three areas	Yes	Yes

APPENDIX 2: BASELINE STATISTICS BEFORE MATCHING

Full sample (Organic – Groups A and C and CBOs members – Groups B and D)

	Intervention		Comparison		Difference	Standard Error
Variable	**Obs**	**Mean**	**Obs**	**Mean**		
Respondent is HH head	249	**0.67**	508	**0.57**	0.10***	0.04
Age of respondent	248	**54.42**	505	**52.39**	2.03***	0.83
Respondent is male	249	**0.50**	508	**0.40**	0.10***	0.04
Respondent is married/cohabiting	249	**0.90**	508	**0.87**	0.03	0.03
Ln(time it took in 2007 from house to reach local market)	248	**3.10**	504	**3.32**	-0.23***	0.06
% of HH members involved in farming	249	**0.76**	508	**0.72**	0.04***	0.02
% children in HH farming	249	**0.08**	508	**0.05**	0.03***	0.01
Farming main activity in 2007	249	**0.87**	508	**0.86**	0.01	0.03
Natural river was main water management system in 2007	249	**0.40**	508	**0.17**	0.23***	0.03
Relying on rain as main water management system in 2007	249	**0.43**	508	**0.79**	-0.36***	0.03
% HH in bottom quintile	249	**0.15**	508	**0.22**	-0.07***	0.03
% HH in 2nd bottom quintile	249	**0.15**	508	**0.22**	-0.07***	0.03
% HH in 3rd quintile	249	**0.21**	508	**0.20**	0.01	0.03
% HH in 4th quintile	249	**0.21**	508	**0.19**	0.01	0.03
% HH in top 5th quintile	249	**0.28**	508	**0.16**	0.12***	0.03
HH median school qualification level	249	**3.33**	508	**3.07**	0.25***	0.09
Cultivated jasmine rice in 2007	249	**0.97**	508	**0.96**	0.01	0.01
Cultivated sticky rice in 2007	249	**0.96**	508	**0.94**	0.01	0.02

Organic farmers only (Group A and C)

Variable	Intervention		Comparison		Difference	Standard Error
	Obs	Mean	Obs	Mean		
HH median school qualification level	100	**3.42**	211	**3.09**	0.32***	0.15
In 2007, HH using chemical fertiliser	100	**0.17**	211	**0.75**	-0.58***	0.05
In 2007, HH using chemical pesticide	100	**0.09**	211	**0.36**	-0.26***	0.05
In 2007 HH had IFOAM/ACT certificate for organic farming	100	**0.62**	211	**0.11**	0.51***	0.05
Cultivated jasmine rice in 2007	100	**0.97**	211	**1.00**	-0.03*	0.01
Cultivated sticky rice in 2007	100	**0.95**	211	**0.93**	0.02	0.03
Cultivated traditional rice in 2007	100	**0.24**	211	**0.06**	0.18***	0.04
ln(land use in 2007 for agricultural production)	98	**3.04**	211	**2.95**	0.09	0.08

APPENDIX 3: METHODOLOGY USED FOR PROPENSITY SCORE MATCHING

Results presented in Section 5 of this report were estimated using propensity-score matching (PSM). PSM is a statistical technique that allows us to estimate the effect of an intervention by accounting for the covariates that predict receiving the intervention, or 'treatment'. The idea behind PSM is to match similar individuals in the treatment or intervention group to those in the comparison or control group, based on observed characteristics they share at baseline. After each participant is matched with a non-participant, the average treatment effect on the treated (those who benefited from the intervention) is equal to the difference in average outcomes of the treated and the control groups after project completion.

This appendix describes and tests the specific matching procedure employed in this Effectiveness Review. A practical guide on the different approaches to matching may be found in Caliendo and Kopeinig (2008).

Estimating propensity scores

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

Table A3.1: Estimating the propensity score for outcomes relevant to all household-level respondents (organic and CBO members)

Prob intervention = 1 (***Probit with marginal effects***)	**Std. Err.**	**z**	**P>z**	**x-bar**
Respondent is HH head	0.047	0.9	0.37	0.61
Age of respondent	0.014	0.17	0.87	53.03
Respondent is male	0.000	0.18	0.86	2928.30
Respondent is married/cohabiting	0.046	-0.33	0.74	0.44
Ln(time it took in 2007 from house to reach local mkt)	0.055	1.13	0.26	0.88
% of HH members involved in farming	0.023	-3.1	0.00	3.25
% children in HH farming	0.083	0.71	0.48	0.73
Farming main activity in 2007	0.111	2.33	0.02	0.06
Natural river was main water managt system in 2007	0.057	0.69	0.49	0.86
Relying on rain as main water managt system in 2007	0.061	-1.94	0.05	0.25
% HH in bottom quintile	0.062	-6.87	0.00	0.67
% HH in 2nd bottom quintile	0.051	-2.24	0.03	0.20
% HH in 3rd quintile	0.052	-1.85	0.06	0.20
% HH in 4th quintile	0.052	-1.26	0.21	0.20
Respondent is HH head	0.051	-1.6	0.11	0.20
HH median school qualification level	0.017	2.31	0.02	3.16
Cultivated jasmine rice in 2007	0.085	0.54	0.59	0.96
Cultivated sticky rice in 2007	0.084	0.4	0.69	0.95
obs. P .3302139				
pred. P .3076356	(at x-bar)			

Probit regression, reporting marginal effects Number of obs = 748

Wald chi2(18) = 130.88

Prob > chi2 = 0.0000

Figure A3.1: Density plot of propensity scores for modelling outcomes relevant to all

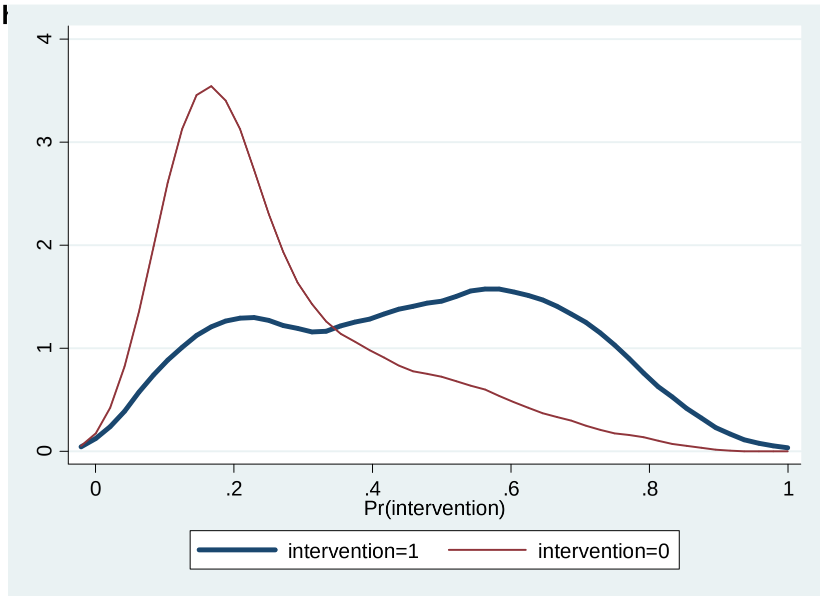


Table A3.2: Estimating the propensity score for outcomes relevant to direct project beneficiaries (Organic farmers only)

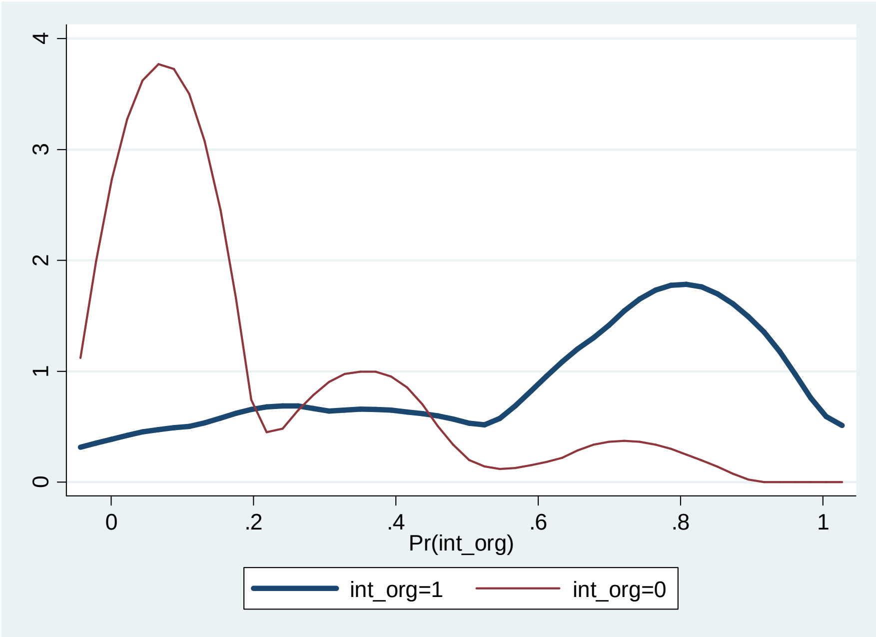
Prob intervention = 1 **(*Probit with marginal effects*)**	**Std. Err.**	**z**	**P>z**	**x-bar**
HH median school qualification level	0.02	1.17	0.24	3.18
In 2007, HH using chemical fertiliser	0.07	-5.06	0.00	0.57
In 2007, HH using chemical pesticide	0.08	-0.08	0.94	0.27
In 2007 HH had IFOAM/ACT certificate for org. farming	0.07	5.34	0.00	0.28
Cultivated jasmine rice in 2007	0.24	-0.42	0.67	0.99
Cultivated sticky rice in 2007	0.08	1.66	0.10	0.94
Cultivated traditional rice in 2007	0.10	2.71	0.01	0.12
ln(land use in 2007 for ag production)	0.05	0.17	0.87	2.98
obs. P .3171521				
pred. P .2624376	(at x-bar)			

Probit regression, reporting marginal effects Number of obs = 309

Wald chi2(8) = 117.82

Prob > chi2 = 0.0000

Figure A3.2: Density plot of propensity scores for modelling outcomes relevant to organic farming households



Matching intervention households to comparison households

Following Rosenbaum and Rubin (1983), households were matched on the basis of their propensity score. The literature has developed a variety of matching procedures. After a series of checks, we decided to employ the kernel-matching algorithm for the results presented in this Effectiveness Review.[5] Kernel matching assigns more weight to the closest control observations that are found within a selected 'bandwidth'. Thus 'good' matches are given greater weight than 'poor' matches. We used the *psmatch2* module in Stata using the default bandwidth of 0.06, and restricted the analysis on the area of common support. When using PSM, standard errors of the estimates were bootstrapped using 1,000 repetitions, to account for the additional variation caused by the estimation of the propensity scores and the determination of the common support.

Table A.3.3: Balancing test on matching variables for household-level outcomes all household-level respondent (organic and CBO members)

	Mean			% reduction		t-test		
Variable	**Matched/ Unmatched**	**Treated**	**Control**	**%bias**	**bias**	**t**	**p>t**	**V_e(C)**
Respondent is HH head	U	0.67	0.57	20.20		2.59	0.01	0.91
	M	0.66	0.66	0.70	96.50	0.08	0.94	0.99
Age of respondent	U	54.42	52.39	19.00		2.44	0.02	1.01
	M	54.24	54.04	1.90	90.20	0.20	0.84	0.99
Age of respondent squared	U	3076.00	2859.90	18.40		2.38	0.02	1.08
	M	3054.30	3034.90	1.60	91.00	0.18	0.86	0.97
Respondent is male	U	0.50	0.40	20.70		2.68	0.01	1.09
	M	0.50	0.51	-2.50	87.70	-0.28	0.78	0.99
Respondent is married/cohabiting	U	0.90	0.87	9.20		1.17	0.24	0.79*
	M	0.90	0.91	-1.50	84.00	-0.18	0.86	1.04
Ln(time it took in 2007 from house to reach local mkt)	U	3.10	3.32	-29.40		-3.76	0.00	0.92
	M	3.11	3.16	-7.00	76.20	-0.76	0.45	0.86
% of HH members involved in farming	U	0.76	0.72	15.80		2.06	0.04	1.06
	M	0.75	0.74	4.80	69.80	0.52	0.61	0.90
% children in HH farming	U	0.08	0.05	16.50		2.24	0.03	1.77*
	M	0.07	0.06	8.20	50.20	0.87	0.39	1.10
Farming main activity in 2007	U	0.87	0.86	3.20		0.42	0.68	0.93
	M	0.87	0.85	7.20	-121.50	0.78	0.43	0.94
Natural river was main water mgt. System in 2007	U	0.40	0.17	52.30		7.08	0.00	2.20**
	M	0.41	0.42	-1.40	97.30	-0.14	0.89	1.01
Relying on rain as main water mgt	U	0.43	0.79	-79.20		-10.59	0.00	1.27*

system in 2007								
	M	0.43	0.42	2.50	96.80	0.25	0.80	1.08
% HH in bottom quintile	U	0.15	0.22	-18.40		-2.32	0.02	0.74*
	M	0.16	0.17	-2.20	87.90	-0.26	0.80	0.92
% HH in 2nd bottom quintile	U	0.15	0.22	-17.90		-2.26	0.02	0.74*
	M	0.16	0.17	-2.90	83.90	-0.34	0.74	0.97
% HH in 3rd quintile	U	0.21	0.20	3.00		0.39	0.70	1.06
	M	0.21	0.21	1.70	43.30	0.18	0.86	1.04
% HH in 4th quintile	U	0.21	0.19	3.50		0.45	0.65	1.03
	M	0.20	0.19	3.50	-0.50	0.39	0.70	1.03
HH median school qualification level	U	3.33	3.07	21.10		2.81	0.01	1.48*
	M	3.28	3.40	-9.60	54.50	-0.96	0.34	0.87
Cultivated jasmine rice in 2007	U	0.97	0.96	7.20		0.91	0.37	0.71*
	M	0.97	0.98	-6.10	15.60	-0.81	0.42	1.58*
Cultivated sticky rice in 2007	U	0.96	0.94	5.90		0.75	0.46	0.82
	M	0.96	0.97	-3.50	39.70	-0.45	0.65	1.23

Sample	**Ps R2**	**LR chi2**	**p>chi2**	**MeanBias**	**MedBias**	**B**	**R**	**%concern**	**%bad**
Unmatched	0.152	144/31	0	20.0	18.2	98.7*	1.43	39	6
Matched	0.007	4.61	0.999	3.8	2.7	19.5	1.06	6	0

* if B>25%, R outside [0.5; 2]

Table A.3.4: Balancing test on matching variables for organic farming households only

		Mean		% reduction		t-test		
Variable	**Matched /Unmatched**	**Treated**	**Control**	**%bias**	**bias**	**t**	**p>t**	**V_e(C)**
HH median school qualification level	U	3.42	3.09	24.90		2.15	0.03	1.55*
	M	3.10	3.14	-2.40	90.20	-0.17	0.87	0.92
In 2007, HH using chemical fertiliser	U	0.17	0.75	-143.90		-11.57	0.00	1.09
	M	0.24	0.27	-9.20	93.60	-0.51	0.61	0.92
In 2007, HH using chemical pesticide	U	0.09	0.36	-67.10		-5.11	0.00	0.37**
	M	0.11	0.12	-2.60	96.20	-0.19	0.85	0.82
In 2007 HH had IFOAM/ACT certificate for org. farming	U	0.62	0.11	122.90		10.95	0.00	1.21
	M	0.50	0.52	-5.20	95.80	-0.26	0.80	0.96
Cultivated jasmine rice in 2007	U	0.97	1.00	-19.30		-1.85	0.07	2.15**
	M	1.00	1.00	2.00	89.90	0.43	0.67	.
Cultivated sticky rice in 2007	U	0.95	0.93	7.00		0.56	0.58	0.48**
	M	0.96	0.97	-4.30	38.70	-0.32	0.75	1.26*
Cultivated traditional rice in 2007	U	0.24	0.06	53.10		4.88	0.00	2.97**
	M	0.10	0.10	-1.00	98.10	-0.07	0.94	0.93
ln(land use in 2007 for ag. production)	U	3.04	2.95	14.60		1.17	0.24	0.84
	M	2.99	2.97	1.90	86.70	0.12	0.91	1.03

Sample	**Ps R2**	**LR chi2**	**p>chi2**	**MeanBias**	**MedBias**	**B**	**R**	**%concern**	**%bad**
Unmatched	0.355	137.22	0	56.6	39	169.7*8*	1.73	13	50
Matched	0.004	0.89	0.996	3.6	2.5	15.6	0.94	13	0

* if B>25%, R outside [0.5; 2]

APPENDIX 4: ROBUSTNESS CHECKS

In order to address the validity of the results presented in Section 5, a series of robustness checks were carried out to check if the preferred matching algorithm is the one the best performs the matching between intervention and comparison groups. This section presents a number of alternative matching algorithms used to test the robustness of the estimates presented in Section 5.

1 Multivariate regression

The first basic specification for estimating the impact of project participation is an OLS model (when the dependent is continuous) or probit model when the dependent is binary.

$$Y_i = \alpha + \beta_1 Project\ participation_i + \delta' X_i + \varepsilon_i$$

Where Y_i is the dependent variable; X_i is a vector of household covariates used in the model in table A2.1; finally the variable of interest is the dummy variable *Project Participation* that assumes value equal to one when the household is enrolled in the project, zero otherwise. When the dependent variable Y_i is binary variable, a probit model replaces the OLS specification. It is important to note that in the absence of randomised allocation of the project among the population in our sample, OLS and probit models fail to identify the causal effect of the programme, and can only be used as additional qualitative checks for the non-parametric estimates. Only the estimate of β_1 will be reported.

2 Propensity Score Matching – Nearest Neighbour

The nearest neighbour (NN) matching algorithm finds an observation from the comparison group to be matched with an observation from a treated individual that is closest in terms of their propensity score. Several variants of NN matching are possible, e.g. NN matching ‘with replacement’ and ‘without replacement’. In the former case, an untreated individual can be used more than once as a match, whereas in the latter case it is considered only once. Matching with replacement involves a trade-off between bias and variance. If we allow replacement, the average quality of matching will increase and the bias will decrease. This is of particular interest with data where the propensity score distribution is very different between the treatment and the control group (Caliendo and Kopeinig, 2008).

3 Propensity Score Matching – Caliper

NN matching faces the risk of bad matches if the closest neighbour is far away. This can be avoided by imposing a tolerance level on the maximum propensity score distance (caliper). Imposing a caliper works in the same direction as allowing for replacement. Bad matches are avoided and hence the matching quality rises. However, if fewer matches can be performed, the variance of the estimates increases. Applying caliper matching means that an individual from the comparison group is chosen as a matching partner for a treated individual that lies within the caliper (‘propensity range’) and is closest in terms of propensity score. Estimates in this analysis will impose a caliper of 0.05.

4 Propensity Score Weighting

Following the example of Hirano and Imbens (2001)[6] we implemented a regression adjustment with weights based on the propensity score. The average treatment effect can be estimated in a parametric framework as follows:

$$Y_i = \alpha + \beta_1 Project\ participation_i + \delta_2' Z_i + \delta_1' X_i + \varepsilon_i$$

Where $\mathrm{Y_i}$ represents the outcome of interest; $\text{Project participation}_\mathrm{i}$ is a dummy binary variable equal to one if an individual/household is enrolled into the programme and zero otherwise; $\mathrm{X_i}$ is a vector of matching covariates used to estimate the propensity score match; and$\mathrm{Z_i}$ is a vector of control variables that cannot be used for the matching as they are not supposed to influence project participation. The regression is estimated with weights equal to one for the treated units and $\hat{\mathrm{e}}(\mathrm{x})/(1-\hat{\mathrm{e}}(\mathrm{x}))$ for control units.

This parametric regression analysis framework has the advantage of exploring heterogeneity in the treatment effect. Moreover it allows controlling for variables that cannot be included in the propensity score equation. The robustness check tables will only report β_1

Table A3.1a: Resilience, wealth, food security and investment in education (All rice farmers)

	(1) **OLS/probit**	**(2)** **PSM NN**	**(3)** **PSM Caliper**	**(4)** **Propensity Score Weighting**
Resilience	9.502**	10.752*	10.752	10.524*
	(4.613)	(6.506)	(6.791)	(5.632)
N	741	741	741	741
Wealth index	0.996***	0.985***	0.985***	1.099***
	(0.125)	(0.224)	(0.226)	(0.148)
N	748	748	748	748
Food security (diversity)	0.007	0.000	0.000	0.009
	(0.018)	(0.021)	(0.022)	(0.015)
N	748	748	748	748
Severity of food security	-0.009	0.000	0.000	-0.004
	(0.013)	(0.021)	(0.021)	(0.013)
N	748	748	748	748
Investment in education	0.022	0.037	0.037	0.024
	(0.037)	(0.062)	(0.064)	(0.041)
N	748	748	748	748

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.1b: Resilience, wealth, food security and investment in education (Organic farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Resilience	21.535**	18.663	18.663	7.932
	(10.642)	(11.998)	(12.741)	(13.308)
N	309	309	309	309
Wealth index	1.390***	1.604***	1.604***	1.340***
	(0.316)	(0.436)	(0.422)	(0.277)
N	309	309	309	309
Food security (diversity)	0.059**	0.018	0.018	0.033*
	(0.027)	(0.029)	(0.028)	(0.020)
N	309	303	303	309
Severity of food security	-0.004	0.036	0.036	0.049
	(0.025)	(0.038)	(0.038)	(0.032)
N	309	303	303	309
Investment in education	-0.038	-0.145	-0.145	-0.207**
	(0.096)	(0.128)	(0.123)	(0.102)
N	309	303	303	309

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.2a: Livelihood viability (All rice farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Crop diversification	0.281**	0.225***	0.225***	0.227***
	(0.112)	(0.086)	(0.086)	(0.085)
N	743	743	743	743
Improved agricultural production (fruit only)	0.509***	0.140**	0.140**	0.532***
	(0.116)	(0.057)	(0.058)	(0.123)
N	748	748	748	748
Use of seeds from own production	-0.013	-0.010	-0.010	-0.008
	(0.025)	(0.035)	(0.035)	(0.026)
N	741	741	741	741
Access to land	0.120	0.125	0.125	0.103
	(0.095)	(0.086)	(0.084)	(0.080)
N	737	737	737	737

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.2b: Livelihood viability (Organic farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Crop diversification	0.748**	0.838**	0.838**	0.579**
	(0.325)	(0.394)	(0.407)	(0.248)
N	308	302	302	308
Improved agricultural production (fruit only)	1.499***	0.200	0.200	1.266***
	(0.307)	(0.164)	(0.164)	(0.396)
N	303	303	303	307
Use of seeds from own production	-0.041	0.037	0.037	-0.075
	(0.049)	(0.064)	(0.061)	(0.047)
N	309	303	303	309
Access to land	0.111	0.046	0.046	0.348
	(0.118)	(0.030)	(0.029)	(0.311)
N	309	303	303	309

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.3a: Innovation potential (All rice farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Access to credit	0.111	0.169	0.169	0.117
	(0.074)	(0.104)	(0.108)	(0.080)
N	748	748	748	748
Attitudes towards changing practices	0.091	0.136**	0.136*	0.106*
	(0.056)	(0.067)	(0.072)	(0.057)
N	748	748	748	748
Attitudes change practice wat. management	-0.024	-0.021	-0.021	-0.019
	(0.052)	(0.077)	(0.079)	(0.053)
N	748	748	748	748
Awareness of climate change	0.155***	0.161**	0.161*	0.107*
	(0.057)	(0.081)	(0.083)	(0.057)
N	748	748	748	748
Use of weather forecasting to manage rice production	0.249**	0.095	0.095	0.208*
	(0.111)	(0.063)	(0.064)	(0.121)
	748	748	748	748

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.3b: Innovation potential (Organic farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Access to credit	0.318*	0.255	0.255	0.438***
	(0.165)	(0.248)	(0.251)	(0.149)
N	309	303	303	309
Attitudes towards changing practices	0.349**	0.636***	0.636***	0.473***
	(0.135)	(0.144)	(0.138)	(0.121)
N	309	303	303	309
Attitudes change practice wat. management	0.054	0.164	0.164	0.024
	(0.107)	(0.154)	(0.154)	(0.086)
N	309	303	303	309
Awareness of climate change	0.281**	0.418**	0.418**	0.259**
	(0.112)	(0.181)	(0.177)	(0.108)
N	309	303	303	309
Use of weather forecasting to manage rice production	0.601**	0.473***	0.473***	0.993***
	(0.248)	(0.154)	(0.156)	(0.321)
	307	303	303	307

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.4a: Contingency resources and support (All rice farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Savings	0.475***	0.380***	0.380***	0.425***
	(0.084)	(0.124)	(0.124)	(0.089)
N	748	748	748	748
Ownership of livestock	0.327***	0.066	0.066	0.214*
	(0.113)	(0.057)	(0.058)	(0.122)
N	748	748	748	748
Access to off-farming earnings	0.100**	0.170***	0.170***	0.108**
	(0.050)	(0.060)	(0.060)	(0.046)
N	730	730	730	730
Food own production	0.456***	0.054	0.054	0.483***
	(0.170)	(0.035)	(0.035)	(0.167)
N	748	748	748	748

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.4b: Contingency resources and support (Organic rice farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Savings	0.739***	1.073***	1.073***	0.780***
	(0.183)	(0.263)	(0.252)	(0.167)
N	309	303	303	309
Ownership of livestock	0.571**	0.236	0.236	0.840**
	(0.252)	(0.165)	(0.164)	(0.343)
N	301	303	303	303
Access to off-farming earnings	0.313***	0.206	0.206	0.259**
	(0.114)	(0.171)	(0.175)	(0.102)
N	302	296	296	302
Food own production	2.590***	0.127*	0.127*	2.088***
	(0.560)	(0.074)	(0.070)	(0.405)
N	157	303	303	303

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.5a: Integrity of the natural and built environment (All rice farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Access to irrigation and water pump	0.399***	0.515***	0.515***	0.436***
	(0.078)	(0.089)	(0.087)	(0.070)
N	425	425	425	425
Use of improved water management techniques	0.296***	0.128**	0.128*	0.315***
	(0.110)	(0.063)	(0.065)	(0.120)
N	748	748	748	748
Total quantity of water stored in previous 12 months	75.448**	72.843	72.843	84.755**
	(37.048)	(53.022)	(55.457)	(41.039)
N	748	748	748	748

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.5b: Integrity of the natural and built environment (Organic rice farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Access to irrigation and water pump	0.933***	0.901***	0.901***	0.876***
	(0.262)	(0.248)	(0.250)	(0.235)
N	188	184	184	188
Use of improved water management techniques	0.758***	0.382**	0.382**	1.008***
	(0.256)	(0.163)	(0.162)	(0.319)
N	309	303	303	307
Total quantity of water stored in previous 12 months	134.454*	224.421**	224.421**	73.321
	(76.699)	(107.047)	(104.996)	(75.290)
N	309	303	303	309

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.6a: Support from social network (All rice farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Social Support	-0.070	-0.074	-0.074	-0.054
	(0.057)	(0.076)	(0.075)	(0.056)
N	748	748	748	748

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

Table A3.6b: Support from social network (Organic rice farmers)

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
Social Support	-0.116	0.073	0.073	0.026
	(0.111)	(0.142)	(0.140)	(0.112)
N	309	303	303	309

Robust standard errors in parentheses. PSM estimates bootstrapped 1,000 repetitions.

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

NOTES

1 Bak Rue Farmer Organisation, Lerng Nok Ta & Thai Chareon Organic Agriculture Cooperative and Nature Care Society in Yasothorn, and Mae Ta Sustainable Agriculture Cooperatives in Chiang Mai

2 In this, as in other tables of this report, when using the log transformation of a variable, we interpret the estimated coefficient on the difference between intervention and comparison groups as a percentage change calculated with the formula: (e (estimated diff coeff.)-1)

3 When items are used in a scale or index, they should all measure the same underlying latent construct (e.g. household wealth status). The items, then, must be significantly correlated with one another. Cronbach's alpha is a measure of this inter-item correlation. The more, the variables are correlated, the greater is the sum of the common variation they share. If all items are perfectly correlated, alpha would be 1 and 0 if they all were independent from one another. For comparing groups, an alpha of 0.7 or 0. 8 is considered satisfactory. See: Bland, M. J. & Altman, D. G. 1997. Statistics notes: Cronbach's alpha. *BMJ*, 314, 572.

4 This approach is described in 'A Multidimensional Approach to Measuring Resilience', Oxfam GB working paper, August 2013: http://policy-practice.oxfam.org.uk/publications/a-multidimensional-approach-to-measuring-resilience-302641.

5 Kernel matching outperformed the other matching algorithms tested: nearest-neighbour and caliper matching. Kernel matching was found to have the lowest pseudo-R2 after matching, the maximum reduction in mean and median bias, and no signs of bad variance.

6 Hirano, K. & Imbens, G.W. (2001), Estimation of Causal Effects using Propensity Score Weighting: An Application to Data on Right Heart Catheterization. *Health Services & Outcomes Research Methodology*, vol. 2, pp. 259–278.

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