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# LIVELIHOODS IN THE PHILIPPINES

Impact evaluation of the project 'Scaling up  
sustainable livelihoods in Mindanao'

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Effectiveness Review Series

2014/15

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Photo credit: Ana Maria L. Caspe/Oxfam

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# 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 'Scaling Up Sustainable Livelihoods in Mindanao' was one of those selected for an Effectiveness Review in the 2014/15 financial year.

The overall objective of the 'Scaling Up Sustainable Livelihoods in Mindanao' project was to widen livelihood options in small-scale agriculture for rural women and men in order to achieve food security and sustainable incomes. The project aimed to achieve three objectives: firstly, to increase income as well as assets for the project participants; secondly to influence the local and national governance environment towards pro-poor economic development; and finally to increase women's leadership among the project participants, changing the economic relationship between men and women, and increasing the political participation of women.

The project was implemented from 2011 to 2013 in three provinces of Mindanao: Surigao del Sur, Sultan Kudarat and Agusan del Sur, by four different partner organisations: Paglilingkod Batas Pangkapatiran Foundation (PBPF), Kasanyangan Rural Development Foundation Inc. (KRDFI), Rural Development Institute of Sultan Kudarat (RDISK), and Integrated Conservation Solutions – Asia (ICS-Asia). The project evolved from a previous project, which was implemented from 2007 to 2011 in the same provinces by a greater number of partner organisations. This evaluation will focus on the activities implemented by the four partner organisations involved in 'Scaling Up Sustainable Livelihoods in Mindanao', but it will use as baseline a period prior to 2007 as it represents a point in time prior to Oxfam's intervention.

## EVALUATION DESIGN

The Effectiveness Review took place in January and February 2015, and intended to evaluate the impact of the project 'Scaling Up Sustainable Livelihoods in Mindanao'.

The global outcome indicator for the livelihoods thematic area is defined as the percentage change in average household income (as measured by household consumption and expenditure per adult equivalent person, per day). The evaluation also included measures of the project's impact on intermediate outcomes according with the theory of change.

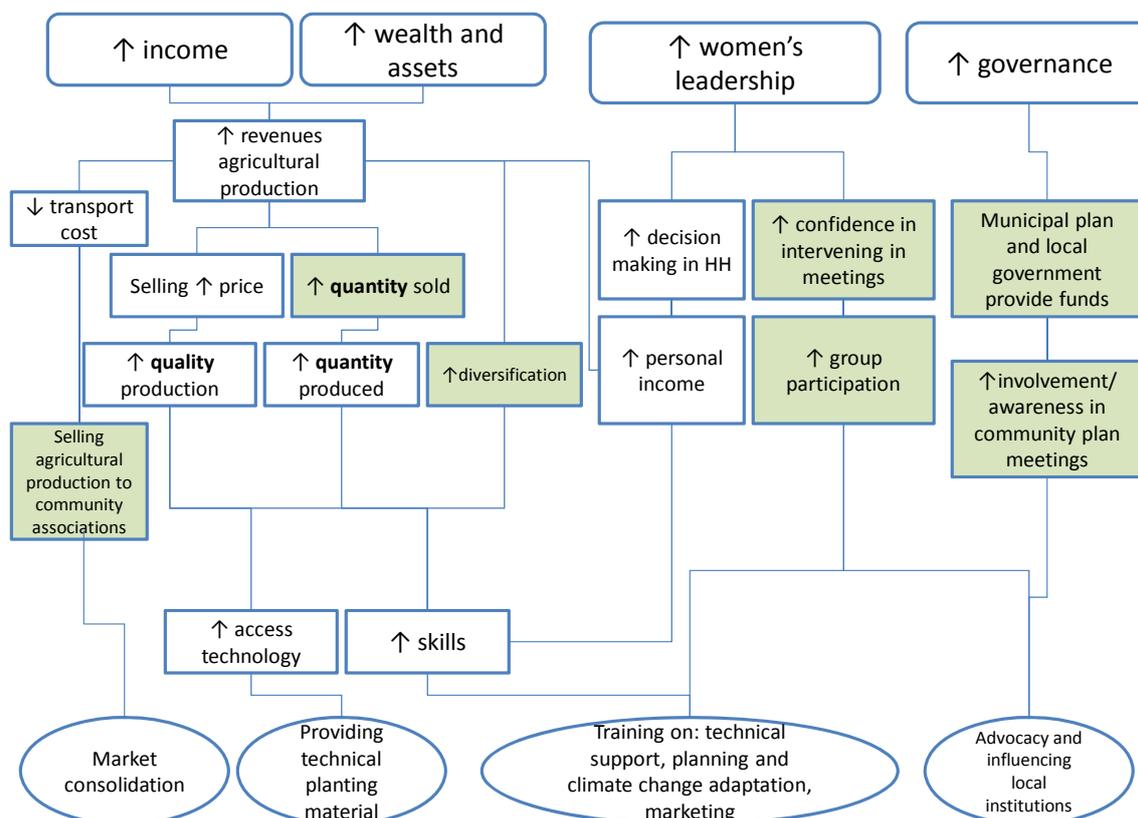
The review adopted a quasi-experimental impact evaluation design, which involved comparing households that had been supported by the project with households in neighbouring municipalities that had similar characteristics in 2007. A household survey was carried out with 300 project participants and 500 comparison households who had never been involved in any Oxfam project. At the analysis stage, the statistical tools of propensity-score matching and multivariate regression were used to control for demographic and baseline differences between the households surveyed in project and comparison areas, to provide additional confidence when making estimates of the project's impact.

# RESULTS

The evaluation found no evidence of higher income or material wealth among the project participants that can be attributed to project activities.

Figure E.1 provides a summary of the results found on the different steps in the theory of change.

**Figure E.1: Theory of change of the project and impact**



The project aimed at improving income through higher revenues from agricultural production. The evaluation identified that the project increased the probability of farmers selling agricultural products in the markets, as well as improving the quantity and increasing the variety of crops sold. These changes, however, did not translate into higher revenues, income or wealth.

This evaluation suggests that the project was successful in increasing the likelihood for a household to gain revenues from selling agricultural crops. On average more than 91 per cent of the households in the intervention group had revenues from selling crops in the previous 12 months, compared with less than 84 per cent in the matched comparison group. However, it appears there are no differences when comparing the average total amount of revenues from the two groups. This might be due to the fact that project participants do not seem to be selling their crop production at higher prices or higher quality compared with comparison households. This explanation is consistent with the fact that project participants did not report using different technological tools or set of skills compared with households in the comparison group.

It should be noted, that different partner organizations took different approaches in order to contribute to the project's goal to increase household income; however there was insufficient sample sizes to reach conclusions around the relative effectiveness of these different approaches.

The second objective of the project was to improve women's economic leadership. A number of indicators linked to the project's theory of change were identified and tested. The evaluation found improved group participation and increased confidence in intervening in meetings, but no evidence of improved personal income or household decision-making. Again, different partner organisations engaged women in the project using different strategies and approaches. Disaggregating figures by implementing partner organisations would have allowed a better investigation of the project's impact on women's leadership, however there was insufficient sample sizes to explore this.

Finally, the project also aimed at improving governance of municipal plans. The evaluation findings suggest that the project improved awareness of community plans. On average, households in the intervention group also reported more frequently that the local government allocated a proportion of budget to their communities compared with households in comparison communities. This does not necessarily mean that the project was effective in influencing local and national governance, as it might simply reflect a greater awareness of government spending among communities where the project has been implemented.

#### Key results of this Effectiveness Review

Outcome	Evidence of positive impact	Comments
Income and wealth	No	The evaluation found higher levels on average of income and material wealth for project participants. However, the difference compared with the comparison group is not statistically significant.
Revenues and production from agricultural products	Mixed	Intervention households are on average more likely to be selling their agricultural products than comparison group. They also sell higher quantities and a greater variety. However this evaluation did not find evidence of higher revenues from agricultural sales between intervention and comparison households.
Women's empowerment	Mixed	The evaluation finds some evidence of improved confidence in women intervening in meetings and higher group participation. However, there are some questions around the quality of the group engagement. Moreover there is no evidence of a higher share of personal income or higher household decision-making power that can be attributed to the project.
Governance (awareness)	Yes	The evaluation finds evidence of higher awareness of and participation to community plans in project communities.

# PROGRAMME LEARNING CONSIDERATIONS

Some important lessons that can be applied to other projects of this type in the Philippines, and elsewhere, have emerged from this evaluation. The programme team in particular is encouraged to consider the following:

- **Improving targeting of project participants**

From the evaluation it emerged that the project engaged households with higher levels of material wealth, including higher levels of education, higher quantities of cultivated land, and a lower probability of being employed as casual labourer compared with a random selection of people living in neighbouring villages. This suggests that the project was not able to engage with the poorest and most vulnerable households in the area. While more attention should be given to this when targeting project households, the country team is also encouraged to consider what type of interventions are more effective in reaching and benefiting the poorest and most vulnerable households in the project area.

- **Explore reasons why income did not increase compared with the comparison group**

The evaluation identified that the project increased the probability of farmers selling agricultural products in the markets, as well as improving the quantity and increasing the variety of crops sold. These changes, however, did not translate into higher revenues, income or wealth. The country team is encouraged to explore the reasons behind this, and to consider possible alternative strategies.

- **Consider scaling up the women's empowerment components of the project defining how women should be involved in group activities**

The evaluation found that on average women involved in project activities reported belonging to a greater number of groups. There is also evidence that the project was successful in improving women's confidence in intervening in meetings, but it appears that the proportion of women who reported participating to a medium to large extent in group activities is lower in the intervention group than the comparison group. There also appears to be no evidence of a greater increase in the proportion of women's contribution to household income, as well as no evidence of change in women's decision-making power within the household.

The programme team is encouraged to consider scaling up the women's empowerment components of this project, defining how change is expected to take place and identifying how women should be involved in group activities. Attending a greater number of groups is not necessarily a positive outcome if it is not accompanied by a greater decision-making power within these groups. Moreover issues on time-poverty and unpaid care should be considered, as well as defining what empowerment means in the context of the project and what power dynamics it is desirable to change as a result.

- **Consider building a strong monitoring system and shaping evaluation questions during programme design**

The programme team is encouraged to consider a monitoring system that collects real time data, which can be used for targeting, project implementation, reflection and , and shaping or adapting intervention strategies and activities.

The project team is also encouraged to define evaluation questions during the project design and develop a robust evaluation framework which will support mid-term course corrections and final evaluations of impact and effectiveness.

# 1 INTRODUCTION

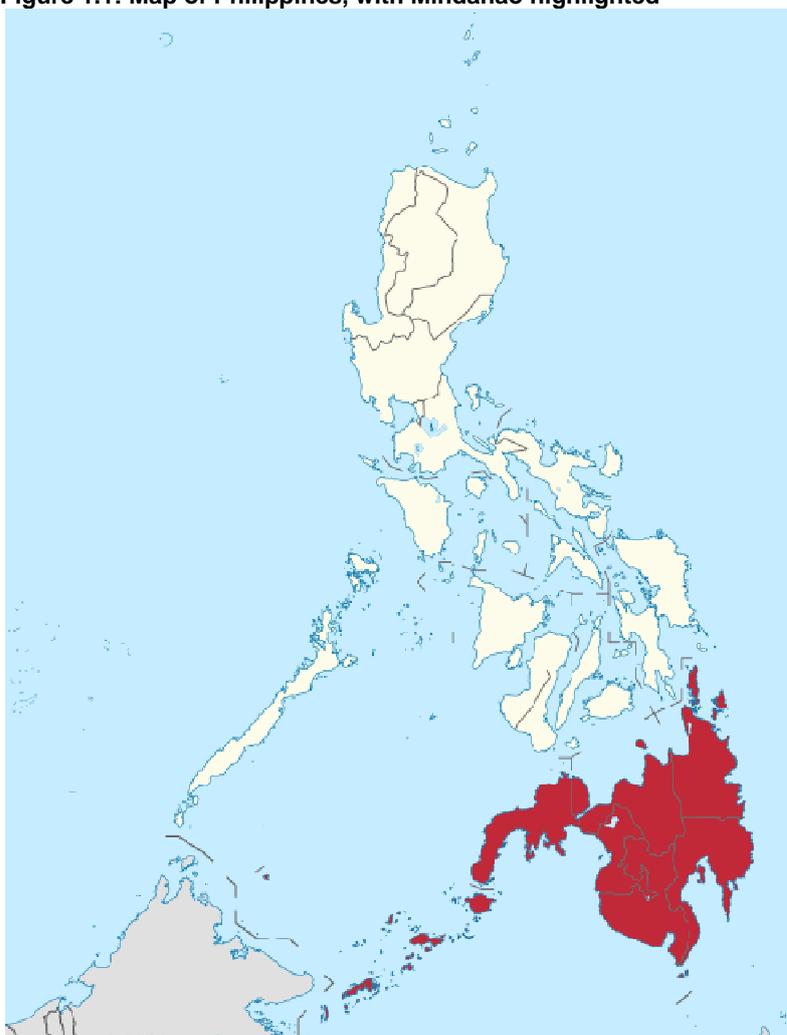
Oxfam GB's Global Performance Framework is part of the organisation's effort to better understand and communicate its effectiveness, as well as enhance learning across the organisation. Under this framework, a small number of completed or mature projects are selected at random each year for an evaluation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

The global outcome indicator for the livelihoods thematic area is defined as the percentage change in average household income (as measured by household consumption and expenditure per adult equivalent person, per day).

This Effectiveness Review took place in three provinces and seventeen municipalities in Mindanao (Philippines) in February 2015 and was intended to evaluate the success of the project 'Scaling Up Sustainable Livelihoods in Mindanao' in supporting rural women and men in widening their livelihood options in order to achieve food security and sustainable income. This project was implemented from 2011 to 2013 by four partner organisations, (PBPF, RDISK, ICSAsia, and KRDFI) in eight municipalities for a total of 1,231 direct households involved into the project. The project under analysis evolved from a previous project called 'Sustainable Livelihoods in Mindanao' which was implemented from 2007 to 2011 in the same provinces by a greater number of partner organisations. This evaluation will focus on the activities implemented by the four partner organisations involved in 'Scaling Up Sustainable Livelihoods in Mindanao', but it will use as baseline a period prior to 2007.

This report is organised as follows. Section 2 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.

**Figure 1.1: Map of Philippines, with Mindanao highlighted**



Source: Wikipedia – Author: TUBS

## 2 PROJECT DESCRIPTION

The overall objective of the ‘Scaling Up Sustainable Livelihoods in Mindanao’ project was to widen livelihood options in small-scale agriculture for rural women and men in order to achieve food security and sustainable incomes. In particular the project aimed to increase income by 20 per cent and project participants were expected to increase acquired assets as results of increased income. The second objective of the project was to influence local and national governance environment towards pro-poor economic development. Finally the project worked towards increasing women’s leadership among the project participants, changing the economic relationship between men and women, and increasing women’s political participation.

The project activities were implemented in the three provinces of Surigao del Sur, Sultan Kudarat and Agusan del Sur, by four different partner organisations: Paglilingkod Batas Pangkapatiran Foundation (PBPF), Kasanyangan Rural Development Foundation Inc. (KRDFI), Rural Development Institute of Sultan Kudarat (RDISK), and Integrated Conservation Solutions – Asia (ICS-Asia). Each partner organisation had a different approach to reaching the objectives. For example, while ICS-Asia focused on business development in order to optimise market potentials of

the Abaca trade, PBPS, RDISK and KRDFI focused on production and partnership with local government.

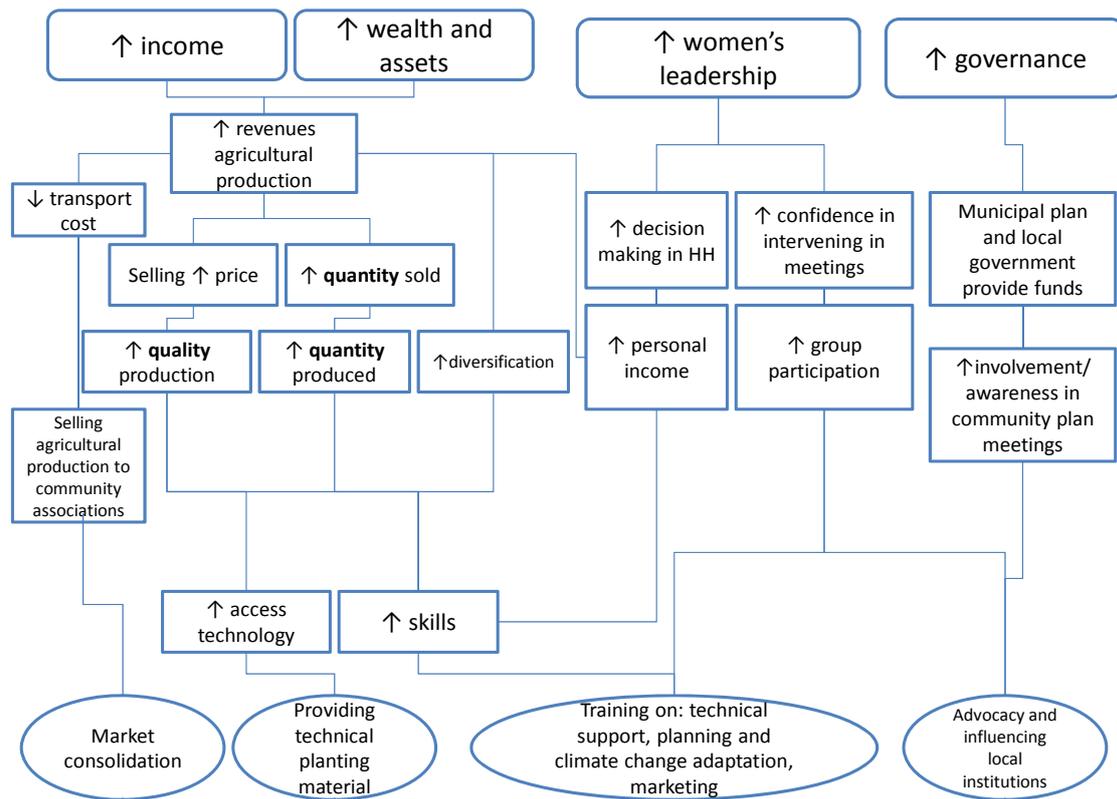
Figure 2.1 provides a graphical representation of the project activities and the indicators that were expected to change as result of the project intervention. The indicators are represented under the three main objectives: income, women's empowerment and governance.

According to the project's logic, income and wealth were expected to increase as a consequence of higher revenues collected from agricultural production. Revenue from agricultural production was expected to rise through three main channels: increased quantity of agricultural production; increased price for products sold to the market; and, reduced transportation costs. Training on planning, climate change adaptation and marketing combined with technical support and planting materials, were expected to increase access to technology and skills, which in turn should increase agricultural diversification and the quantity of crops produced. Increase these to the quality of the agricultural production would increase the price of the products sold to the market. And reduced transport costs and increased community associations would allow producers to sell their crops closer to the markets.

Governance was expected to increase thanks to a greater involvement and awareness of farmers in community plan meetings, with the assumption that greater involvement will increase the probability that local government will provide funds and allocate budget to the communities involved.

Finally, women's empowerment and leadership was expected to increase women's decision-making within the household thanks to increased personal income achieved by higher revenues from agricultural production and greater skills. The project actively engaged women in women's groups which was expected to increase confidence in participating in meetings.

**Figure 2.1: Theory of change of the project**



The project's impact on each of these outcome areas was independently tested for each of these indicators in Section 5.3.

## 3 EVALUATION DESIGN

The central problem in evaluating the impact of any social programme is how to compare the outcomes that result from that programme with *what would have happened* without that programme having been carried out. In the case of this Effectiveness Review, the situation of households in the villages where the project was implemented is examined through a questionnaire – but clearly it is not possible to observe what situation would have been if 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 where the programme will be implemented at random. Random selection minimises the probability of there being systematic differences between programme and non-programme units, and so maximises the confidence that any differences in outcome are due to the effects of the programme.

In the case of project examined in this Effectiveness Review, the unit at which the programme was implemented was the village (or barangay): within each of the project areas, specific villages were selected for establishing project activities, while other villages were not selected. However, the selection of project villages was not made at random; in fact each partner organisation followed its own targeting criteria. However, discussions with local staff and experts revealed that there were, in fact, more villages that displayed the characteristics that made them suitable for project implementation, and could have been covered by the project. This allowed a 'quasi-experimental' evaluation design to be adopted, in which the situation of households in those non-implementation villages was assumed to provide a reasonable counterfactual for the situation of households in the implementation villages.

To improve the confidence in making this comparison, households in the project villages were 'matched' with households with similar characteristics in the non-project (or 'comparison') villages. Matching was performed on the basis of a variety of characteristics – including household size, ethnicity, educational level, productive activities, amount of land owned and cultivated, and indicators of material wellbeing, such as housing conditions and ownership of assets. Since some of these characteristics may have been affected by the project itself (particularly those relating to productive activities and wealth indicators), matching procedure was performed on the basis of these indicators *before* the implementation of the project. As baseline data were not available, survey respondents were asked to recall some basic information about their household's situation from 2007, before the project was implemented. Although this recall data is unlikely to be completely accurate, it should not lead to significant biases in the estimates as long as measurement errors due to the recall data are not significantly different for respondents in the intervention and comparison groups.

The survey data provided a large number of household characteristics on which matching could be carried out. Matching was based on a 'propensity score', which represented the conditional probability of the household being in an intervention village, given particular background variables or observable characteristics. Households in the project and comparison villages were matched based on having their 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. Details about the validity of the propensity score matching procedure are reported in Appendix 2.

As an additional check on the validity of the results derived from the propensity-score matching procedure, results were also estimated using alternative estimation models. Appendix 4 provides estimates for these robustness checks.

It should be noted that both propensity-score matching and multivariate regression rely on the assumption that the 'observed' characteristics (those that are collected in the survey and used 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. Unobservable 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.

# 4 DATA

## 4.1 SAMPLING PROCESS – SELECTING INTERVENTION AND COMPARISON GROUPS

The first stage in identifying an appropriate comparison group for quasi-experimental evaluation is to understand the process through which project participants were selected. The project activities were implemented by four partner organisations in three provinces of Mindanao: Surigao del Sur, Sultan Kudarat, and Agusan del Sur. Within these three provinces the project worked in eight different municipalities with a total of 1,231 households in 38 barangays (which is the administrative unit equivalent to a village).

**Table 4.1: Sampling summary by municipality**

Partner	Municipality, province	Project participants		Sample project participants		Sample comparison	
		Number barangays	Number HHs	Number barangays	Number HHs	Number barangays	Number HHs
<i>PBPF</i>	<i>Carmen, SDS</i>	1	7	1	5	6	145
<i>PBPF</i>	<i>Lanuza, SDS</i>	2	80	2	46		
<i>PBPF</i>	<i>Tago, SDS</i>	1	36	1	20		
<i>PBPF</i>	<i>Tandag, SDS</i>	1	27	1	16		
<i>RDISK</i>	<i>Columbio, SK</i>	14	294	9	84	10	140
<i>ICSAsia</i>	<i>Bayugan City, ADS</i>	2	93	2	17	7	90
<i>ICSAsia</i>	<i>Sibagat, ADS</i>	4	112	4	37		
<i>KRDFI</i>	<i>Bayugan City, ADS</i>	12	465	6	57	9	125
<i>KRDFI</i>	<i>Esperanza, ADS</i>	3	117	2	18		
<b>TOTAL</b>	<b>8 muns, 3 provs</b>	<b>38</b>	<b>1231</b>	<b>26</b>	<b>300</b>	<b>32</b>	<b>500</b>

Among the 1,231 households involved in the project, this evaluation randomly selected 300 for interviewing using a stratified random sampling process proportional to the partner's budget allocation. This process was chosen in order to obtain a fair representation among the four partner organisations, with the total sample divided proportionally by the budget investment over three years of project implementation. Table 4.1 summarises the proportion of respondents allocated to each partner organisation.

In order to identify suitable comparison areas, a detailed consultation was conducted with the country team and the team of local consultants. Eight municipalities and 32 barangays that shared similar socio-economic characteristics to the project barangays were thus selected. Then 500 households were randomly chosen from a comprehensive list of all the households living in the selected barangays. In order to ensure consistency with the sample size identified for each partner organisation, the

sample process for the comparison group also allowed a stratified random sampling proportional to the partner’s budget allocation.

It should be noted that given the diversity of approaches put in place by each of the partner organisations in targeting the project participants, it was not possible to mimic a process that was trying to control for unobservable variables of project participants.<sup>1</sup> In this case therefore the evaluation purely relies on the quality of the matching based on observable characteristics.

## 4.2 ANALYSIS OF BASELINE CHARACTERISTICS

In order to ensure comparability, households in project and comparison villages were looked at in terms of their demographic characteristics and economic activities in 2007. These data are based on information recalled by the respondents during the questionnaire implementation or reconstructed from the household composition at the time of the survey.

**Table 4.2: Intervention and comparison means of recalled baseline characteristics**

	Comparison mean	Intervention mean	Difference
1[Head of HH is female]	0.532	0.563	-0.031
Age head of HH	44.980	45.420	-0.440
1[Head of HH has primary education]	0.478	0.620	-0.142***
1[Head of HH has secondary education]	0.159	0.253	-0.094***
1[Head of HH has university education]	0.052	0.093	-0.042**
Household size today	5.819	5.600	0.219
1[Religion – Other Christian]	0.139	0.183	-0.044*
1[Religion – Islam]	0.271	0.133	0.138***
Number crops farmed – 2007	1.500	2.967	-1.467***
1[Main activity in 2007 – Farming]	0.532	0.873	-0.341***
1[Main activity in 2007 – Casual labourer (daily hire)]	0.321	0.033	0.287***
Total area of land owned in 2007	1.215	9.661	-8.447*
Total land used for agricultural production in 2007	1.015	2.452	-1.436***
1[Wealth index 2 <sup>nd</sup> quintile in 2007]	0.231	0.147	0.084***
1[Wealth index 3 <sup>rd</sup> quintile in 2007]	0.225	0.160	0.065**
1[Wealth index 4 <sup>th</sup> quintile in 2007]	0.177	0.237	-0.059**
1[Wealth index 5 <sup>th</sup> quintile in 2007]	0.145	0.290	-0.145***
<b>Number of observations</b>			<b>750</b>

Table 4.2 provides the full comparison of means between the intervention and comparison groups. Some important differences were found between the households in project and comparison villages. For example:

- Project households reported higher levels of education for the head of the household than households in the comparison group.

- Project households were more likely to report farming as the main household activity in 2007, as well as owning and cultivating higher areas of land than comparison households. By contrast, comparison households were more likely to report employment as a casual labourer as being the main household activity.
- Project households reported higher levels of wealth at baseline (2007) than comparison households.

In conclusion, the preliminary description of the data suggests that the project attracted more wealthy and educated households who owned larger amount of land and were involved in farming rather than casual labour. These differences, which existed before the project, have the potential to bias any comparison of the project's outcomes between the project and comparison villages. It is therefore important to control for these baseline differences when making such comparisons. As described in Section 2, the main approach used in this Effectiveness Review to do this is propensity-score matching (PSM). The full details of the matching procedure applied are described in Appendix 1. After matching, households in the project and comparison villages are reasonably well-balanced in terms of the recalled baseline data, with few significant differences between them. However, not all of the households interviewed in the project villages could be matched and thus six of the 300 households surveyed in the intervention group were dropped from the analysis. The reason and consequence of this are decisions are described more in detail in Appendix 1.

The results described in Section 5 were tested for robustness by estimating them with alternative statistical models, including alternative PSM models and linear or probit regression models. The robustness checks employed are reported and discussed in Appendix 2.

## 5 RESULTS

This report is intended to be free from excessive technical jargon, with more detailed technical information being restricted to the appendices 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.

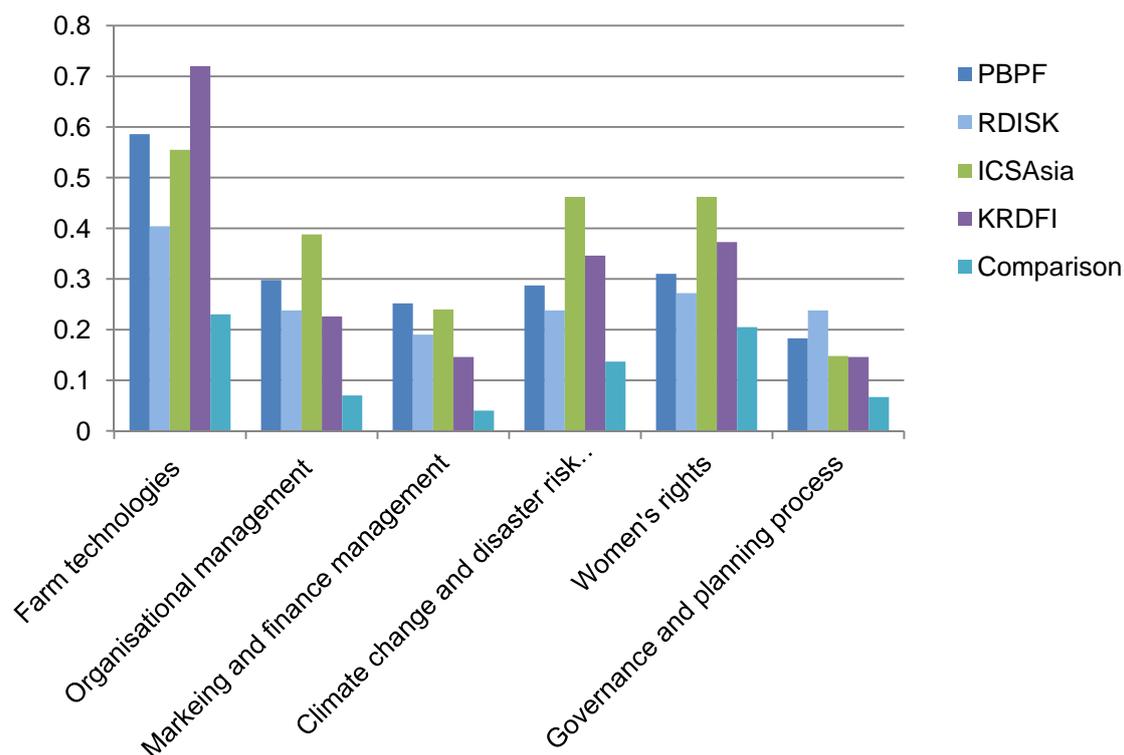
The results are shown after correcting for observable baseline differences between the households interviewed in the project villages (the 'intervention group') and in the households in comparison villages using a propensity-score matching (PSM) procedure. The details of this procedure are discussed in Appendix 1. All outcomes have also been tested for robustness to alternative statistical models in Appendix 2. 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.

## 5.1 INVOLVEMENT IN PROJECT ACTIVITIES

Before considering the project's effect on outcomes, it is important to examine whether the respondents report having participated in the activities implemented under this project. This is important for testing if the households who were supposed to receive the project actually did receive it, as well as for testing if other actors in the area conducted similar activities that might invalidate the comparison group.

As outlined in Section 2 the project provided training to farmers on a range of activities. Figure 5.1 compares farmers that reported receiving training on different topics. Respondents were asked if in the last eight years they – or any other household member – attended training on: farm technologies, organisational management, marketing and finance management, climate change and risk reduction, women's rights, governance or planning processes. Figure 5.1 suggests that more than 70 per cent of the respondents in the intervention group selected under KRDFI participated in training on farming technologies, compared with 58 per cent for PBPF, 55 per cent ICS-Asia, and only 40 per cent among the project participants with RDISK. Only 22 per cent of the comparison group reported having received training on farm technologies. This figure gives confidence that the sampling process has been able to identify comparison households with limited exposure to farming training.

**Figure 5.1: Households receiving training**

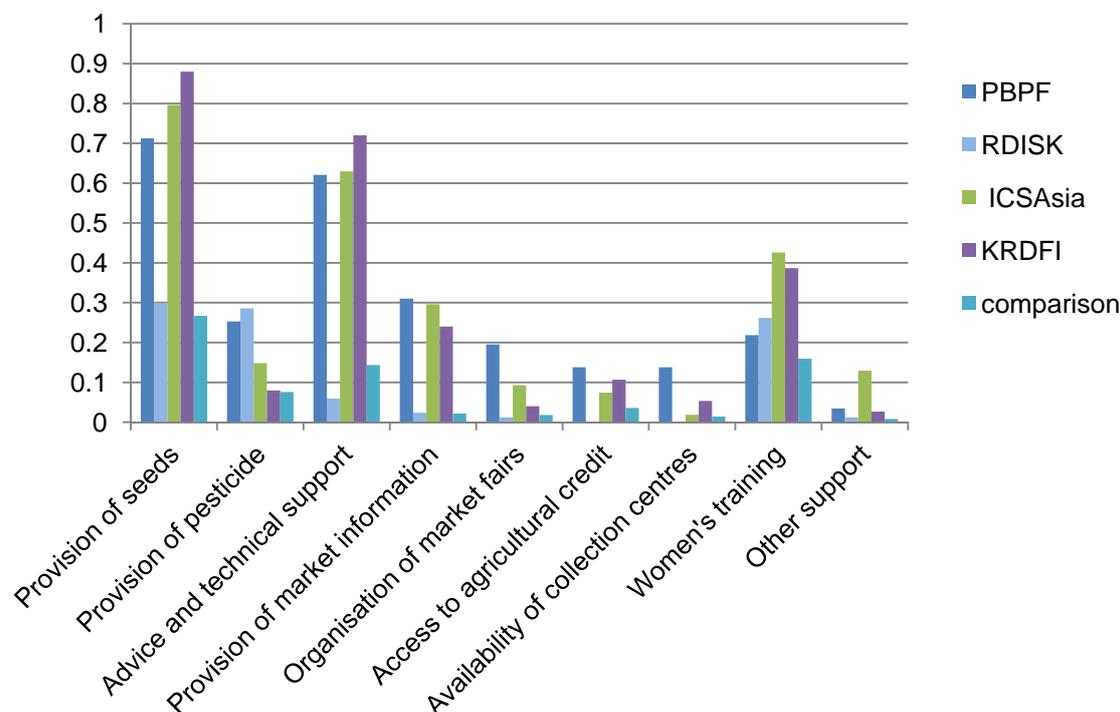


The project also provided support through the distribution of seeds and fertiliser, the provision of advice on technical support, market information, women's training, and other activities related to agriculture. Figure 5.2 shows the proportion of respondents who reported receiving this type of support in the last eight years, divided into the four groups linked with each partner association and then comparing these with the comparison group.

On average 71 per cent of respondents from the PBPF group reported having received support on seeds and seedlings; almost 80 per cent among of project participants for ICS-Asia and 88 per cent among KRDFI farmers. Only 30 per cent of the respondents belonging to RDISK and 27 per cent of the respondents in the comparison group reported receiving support on seeds and seedling.

More than 70 per cent of the beneficiaries from KRDFI reported receiving advice and technical support on farming techniques, more than 60 per cent in PBPF and ICS-Asia, and only 5 per cent and 14 per cent for RDISK and the comparison group, respectively.

**Figure 5.2: Proportion of households who received external support**



This figure also gives confidence in the validity of the comparison group regarding activities such as provision of seeds and advice on technical support. However, there are some concerns regarding the very low rate of respondents in the RDISK group who reported participating into the project activities.

## 5.2 ANALYSIS OF OUTCOMES

This section examines the differences in outcomes indicators between a sample of households involved in the project and matched households in comparison communities. The outcomes measures examined in the survey and discussed as part of the project's theory of change in Section 2 are:

- Household wealth
- Household income
- Revenues from agricultural production
  - Agricultural production (quantity/diversity)
  - Value added and prices
  - Transport costs and selling points
  - Access to technology
  - Improved farming skills

- Women's economic empowerment
- Governance.

## 5.2.1 Household income

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

For this reason, the survey did not attempt to collect data on total household income directly. However, there is a widely-recognised and strong association between household income and consumption.<sup>2</sup> This Effectiveness Review therefore followed common practice in micro-level socio-economic analysis, by considering household consumption and expenditure as an indicator of income.

To that end, respondents were asked to provide detailed information about their recent expenditure on both food and non-food items. Firstly, the respondents were asked from a list of 24 products what types of food, and how much, they had consumed over the previous seven-day period. The quantities of each food item consumed were then converted into a monetary value. This was done by asking the respondent how much was paid for the food item in question or – if the food item was from the household's own production – how much it would be worth if it was purchased from the local market. The respondents were also asked how much they spent on particular regular non-food items and services from a list of 18 items, such as transportation, gas, electricity, water fees, mobile phones, and savings. Finally, they were asked to estimate the value of other occasional types of expenditure that they had incurred over the previous 12 months from a list of 19 items, which included clothes, community events and ceremonies, education, furniture, and building materials for the house. The household expenditure measure was calculated by converting each of the expenditure items into a per-day per capita<sup>3</sup> expenditure figure and adding them together. The expenditure variable has also been expressed on a logarithmic scale to improve the model fit in regression analysis and reduce the influence of outliers.

Table 5.1 shows the comparison of expenditure between supported households and comparison households, both before and after logarithmic transformation. On average, households in the intervention group reported expenses 8.65 per cent higher than the comparison group. However, these results are not statistically significant different from zero. This measure also represents Oxfam GB's 'Global Indicator' for livelihoods Effectiveness Reviews, which is defined as the percentage change in average household income (as measured by household consumption and expenditure per adult equivalent person, per day)<sup>4</sup>.

**Table 5.1: Total consumption**

	Total household expenditure per capita per day PHP	ln(Total household expenditure per capita per day) - Oxfam Global Indicator
<i>Intervention group mean:</i>	129.001	4.658
<i>Comparison group mean:</i>	116.584	4.575
<i>Difference:</i>	12.417	0.083
	(9.439)	(0.057)
<i>Observations intervention:</i>	294	294
<i>Observations:</i>	796	796

Bootstrap Standard Errors in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

Table 5.2 is disaggregates results by food, monthly and yearly expenditure. It appears that yearly expenditure is 49 per cent higher for the intervention group than the matched comparison group, and the difference is statistically significant. In particular it seems that this result is driven by yearly expenditure on entertainment equipment. On the other hand, expenditure on renting land and other farming tools, decreased on average by more than 60 per cent in the intervention group relative to the comparison group.

**Table 5.2: Food consumption, monthly and yearly expenditure**

	Ln (Food consumption per capita per day)	Ln (Monthly expenditure per capita per day)	Ln (Yearly expenditure per capita per day)
<i>Intervention group mean:</i>	4.156	2.582	2.631
<i>Comparison group mean:</i>	4.160	2.593	2.229
<i>Difference:</i>	-0.004	-0.012	0.402***
	(0.051)	(0.089)	(0.126)
<i>Observations</i>	294	291	287
<i>Observations:</i>	796	792	784

Bootstrap Standard Errors in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

## 5.2.2 Household wealth

An alternative way to consider income is to investigate asset ownership. For this reason, respondents were asked about their ownership of various types of household goods and assets, as well as about the condition of their housing. These data were used to create a wealth index using Cronbach's alpha.<sup>5</sup> A total of 30 assets and other wealth indicators were used to construct the household wealth index, with their inter-item correlations. The wealth indices were then created through applying principal component analysis (PCA) to the selected indicators. PCA is a data reduction technique that narrows in on the variation in household 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.

Table 5.3 shows the difference in the normalised wealth index measure between the intervention and comparison groups. Estimates suggest that on average the wealth

index is higher in intervention households, but this difference appears to be not significantly different from zero. These results are in line with results in Table 5.1 that identified a higher level of consumption for the intervention group without the difference being significantly different from zero<sup>6</sup>.

**Table 5.3: Wealth index**

	<b>Wealth Index</b>
<i>Intervention group mean:</i>	17.386
<i>Comparison group mean:</i>	16.138
<i>Difference:</i>	1.249
	(0.974)
<i>Observations intervention:</i>	294
<i>Observations:</i>	796

*Bootstrap Standard Errors* in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

### 5.2.3 Revenues from agricultural production

The project aimed to increase household income from agricultural production. Table 5.4 provides estimates for total revenues on agricultural sales expressed in PHP and its logarithmic transformation, as well as the probability of earning any income from agricultural production.

These estimates were obtained by asking each respondent to estimate the total quantity of crops produced and sold in the previous 12 months from a list of the 18 most common agricultural products grown in the region. For each product it was asked to estimate the amount earned from selling the product in the previous 12 months.

**Table 5.4: Revenues from agricultural production**

	<b>1[Any revenue from agricultural production]</b>	<b>Total value revenues from crop sales PHP</b>	<b>Ln (Total value revenues from crop sales)</b>
<i>Intervention group</i>	0.915	40197.321	9.878
<i>Comparison group</i>	0.838	42354.470	10.114
<i>Difference:</i>	0.077***	-2157.148	-0.237*
	(0.024)	(7536.957)	(0.139)
<i>Observations</i>	294	294	267
<i>Observations:</i>	796	796	538

*Bootstrap Standard Errors* in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

Estimates from the first column in Table 4 are suggesting that on average more than 91 per cent of the households in the intervention group had revenues from selling crops in the previous 12 months; compared with less than 84 per cent in the matched comparison group. This difference of almost 8 percentage points is statistically significantly different from zero. However, it appears there are no differences when comparing the average total amount of revenues from the two groups (second column), and when comparing those households that sold something it appears that revenues for the comparison households are 25 per cent higher than the revenues in the intervention group (third column).<sup>7</sup>

The theory of change of the project aimed at increasing revenues from agricultural products through three different channels. The first channel aimed at increasing agricultural production and diversification and therefore increasing the quantity of products sold. The second channel aimed at increasing value added to agricultural products and therefore increasing revenues with higher prices and value added. The third channel aimed at increasing revenues by having lower transport costs, thus providing additional markets. This evaluation looks at these three channels separately.

### 5.2.3.1 Quantity of agricultural products produced and sold

The survey investigated the quantity of agricultural products sold in the previous 12 months by asking the respondents to estimate, from a list of 17 agricultural products, the quantity *produced* in the last 12 months, and then to estimate the quantity *sold* in the previous 12 months.<sup>8</sup>

Table 5.5 provides estimates of the total quantity of crops sold in the previous 12 months, expressed in kilograms and its logarithmic transformation. It also provides estimates on the total amount of crops produced in the previous 12 months, and the number of products sold in the previous 12 months. Estimates in the first column suggest that on average households in the intervention group are selling 1,200 kg per year more the matched comparison group.<sup>9</sup>

**Table 5.5: Quantity of agricultural production and sales**

	Total crop sold in the last 12 months <i>Kg</i>	Ln(Total crop sold in the last 12 months)	Total crop produced in the last 12 months <i>Kg</i>	Number of products sold <i>Number</i>
<i>Intervention group mean:</i>	3233.425	7.276	7509.823	3.884
<i>Comparison group mean:</i>	2033.169	7.074	9346.609	3.240
<i>Difference:</i>	1200.256***	0.202	-1836.786	0.645***
	(456.510)	(0.134)	(4629.579)	(0.196)
<i>Observations intervention:</i>	294	267	294	294
<i>Observations:</i>	796	542	796	796

*Bootstrap Standard Errors* in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

This increase seems to have been driven by an increase in diversity rather than by an increase in production. The third column in Table 5.5 suggests that there was no statistically significant difference in the overall crop production in the previous 12 months. Disaggregating at product level, estimates show that households in the intervention group are producing higher quantities of taro and banana, while households in the comparison group are producing more rice, abaca and durian. The fourth column in Table 5.5 suggest that on average households in the intervention group are producing for sale a greater number of crops (3.8 products) than households in the matched comparison group (3.2 products).

### 5.2.3.2 Value added and price

The second channel through which the project aimed to increase income and revenues was by increasing the value added and therefore asking higher prices for certain products. The survey investigated value added by asking if each agricultural product sold in the last 12 months had been processed before sale. Table 5.6 provides estimates of the probability of a household in both the intervention and comparison groups to have processed at least one agricultural product in the previous 12 months. On average 51 per cent of intervention group households reported having processed at least one agricultural product produced in the last year, compared with 61 per cent in the matched comparison group.<sup>10</sup> In order to fully understand these estimates we need to acknowledge that only one partner organisation invested in improving processed products. There were higher proportions of processed products within the PBPF and RDISK groups.

**Table 6: Processing agricultural products**

	<b>1[Processed at least one product]</b>
<i>Intervention group mean:</i>	0.514
<i>Comparison group mean:</i>	0.613
<i>Difference:</i>	-0.099**
	(0.046)
<i>Observations intervention:</i>	294
<i>Observations:</i>	796

Bootstrap Standard Errors in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

The project invested in adding value particularly to rubber and abaca plantations. We would therefore expect the intervention to be successful in raising selling prices as a consequence of these products being processed. Table 5.7 investigates the selling prices for rubber, comparing the average price in the intervention and comparison groups. However, it appears that there are no differences in the selling price of rubber between the two groups. The evaluation also investigated the price for acaba, but found too few observations from which to draw any meaningful conclusions.

**Table 5.7: Price for rubber**

	<b>Price rubber PHP</b>
<i>Intervention group mean:</i>	43.316
<i>Comparison group mean:</i>	39.402
<i>Difference:</i>	3.914
	(4.074)
<i>Observations intervention:</i>	99
<i>Observations:</i>	172

Bootstrap Standard Errors in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

### 5.2.3.3 Access to markets

The third channel through which the project aimed at increasing income and revenues was reducing costs for selling agricultural production. This was done by promoting the

purchase of agricultural products by community associations, thus reducing the cost for farmers of bringing their agricultural productions to market. Table 5.8 provides self-reported estimates of the transportation costs to the main market and estimates of the probability that a farmer sold at least one agricultural product to cooperatives or community associations. Estimates in the first column of Table 5.8 suggest that there are no statistically significant differences in the transport costs between the intervention and comparison groups. Conversely, estimates in the second column suggest that intervention households are almost five percentage points more likely to sell their products to community group associations. However, it has to be noted that the proportion of households selling to community associations is only 5 per cent.

**Table 5.8: Transport costs and selling to community associations**

	Transport costs <i>PHP</i>	1[Selling to community associations]
Intervention group mean:	1,761.999	0.051
Comparison group mean:	2,387.081	0.003
Difference:	-625.082	0.048***
	(1097.368)	(0.013)
Observations intervention:	294	294
Observations:	796	796

*Bootstrap Standard Errors* in parentheses; \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . PSM estimates bootstrapped 1,000 repetitions.

#### 5.2.3.4 Access to technology

The project aimed to improve access to technological tools, such as a solar dryer, warehouse and storage facilities, stripping machines, tractors, etc. The questionnaire asked each respondent if they had used any technological tools during the production, processing and selling of agricultural products. Table 5.9 reports estimates of the number of facilities and the probability that farmers could have accessed at least one technological tool. Estimates in the first two columns in Table 5.9 suggest that households in the intervention group are less likely to use these facilities than matched households in the comparison group.

**Table 5.9: Access to technology and practices**

	Number of facilities	1[At least one facility]	Number of practices	1[At least one practice]
<i>Intervention group</i>	0.884	0.473	2.449	0.867
<i>Comparison group</i>	1.072	0.611	2.403	0.882
<i>Difference:</i>	-0.188*	-0.138***	0.046	-0.015
	(0.111)	(0.045)	(0.143)	(0.026)
<i>Observations</i>	294	294	294	294
<i>Observations:</i>	796	796	796	796

*Bootstrap Standard Errors* in parentheses; \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . PSM estimates bootstrapped 1,000 repetitions.

The project also aimed to improve agricultural practices, such as: seed banking, seed nurseries, organic farming, and use of improved seeds, etc. Estimates in the third and fourth columns of Table 5.9 suggest that there are no statistically significant differences between the intervention and comparison groups in the probability of engaging in these types of agricultural practices.

## 5.2.4 Women’s economic leadership

The project also aimed to improve women’s economic empowerment. In order to investigate this objective the questionnaire included a section with questions for a woman living in the household. These questions investigated: personal income, household decision-making, group participation and confidence in intervening at meetings.

### Personal income

The first indicator for measuring women’s economic empowerment considers the extent to which a woman **contributes to household income**. To assess this, respondents were asked to estimate the proportion of household needs, such as food and money, which they personally contribute to the household, and the proportion they used to contribute in 2007.

**Table 5.10: Personal income**

	1[Respondents’ contribution to income increased since 2007]
<i>Intervention group mean:</i>	0.183
<i>Comparison group mean:</i>	0.136
<i>Difference:</i>	0.047
	(0.047)
<i>Observations intervention:</i>	180
<i>Observations:</i>	455

*Bootstrap Standard Errors in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.*

Table 5.10 provides estimates for the probability that a woman increased the proportion of household income she contributes since the project started. This indicator takes positive values when personal contribution to household income increase, zero otherwise. On average, 18.3 per cent of the women interviewed in the intervention group reported an increase in their contribution to household income since the project started compared with only 13.6 per cent of the matched comparison women. However, this difference appears to not be statistically significantly different from zero.

### Household decision-making

The second indicator for women’s empowerment refers to women’s **decision-making power in the household**. The questionnaire asked each respondent in the household who normally takes the decisions about a list of nine activities including:

- Keeping and managing household income
- Buying and selling of productive assets (e.g. land and machines)
- Buying and selling livestock
- How much money to invest in business activities
- What food to buy and consume
- How children should be educated
- Housework and care of persons
- Whether you personally can travel to visit relatives outside the community
- Whether you personally can participate in community group activities or meetings

Table 5.11 provides estimates of the proportion of decisions in which women from intervention and comparison group were involved in the decision taken. A woman is considered to be involved in household decision-making if she reports taking the decision herself or jointly with her husband or another household member. It appears that on average there is no difference in the household decision-making power between intervention and matched comparison women.<sup>11</sup>

**Table 5.11: Decision making**

	<b>Proportion household decision making</b>
<i>Intervention group mean:</i>	0.912
<i>Comparison group mean:</i>	0.910
<i>Difference:</i>	-0.002
	(0.019)
<i>Observations intervention:</i>	180
<i>Observations:</i>	455

*Bootstrap Standard Errors* in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01; PSM estimates bootstrapped 1000 repetitions

### Group participation

The third indicator linked to project activities and women's empowerment is **group participation**. Table 5.12 provides estimates on the number of groups the respondents reported to regularly attend, and whether they reported participating to a medium or large extent in the groups' activities.

**Table 12: Group participation**

	<b>Number of groups attends</b>	<b>1[Involved in group activities]</b>
<i>Intervention group mean:</i>	3.956	0.367
<i>Comparison group mean:</i>	2.628	0.551
<i>Difference:</i>	1.327***	-0.184***
	(0.352)	(0.058)
<i>Observations intervention:</i>	180	180
<i>Observations:</i>	455	455

*Bootstrap Standard Errors* in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

Estimates in Table 5.12 suggest that on average women in the intervention group are regularly attending meetings of almost 4 groups, compared with 2.6 in the comparison group. However only 36.7 per cent of women in the intervention group reported being involved in group activities to a medium to large extent, compared with 55 per cent of the women in the comparison group.

These estimates seems to suggest that the project increased women's group attendance without increasing participation in group activities.

### Confidence in intervening in meetings

The final indicator investigating women's empowerment is women's **confidence in intervening in meetings**. The questionnaire asked each respondent whether they agreed or disagreed to the following statements:

- Public forums held in your village can be intimidating – it is difficult for a woman like you to stand up and voice any concerns.
- If a decision was made in a public forum that might negatively affect your life and those of your children, you would not hesitate to stand up and protest despite the possible negative consequences.

Estimates in Table 5.13 are suggesting that more than 32 per cent of the interviewed women in the intervention group would not hesitate to stand up and protest if a decision made in a public forum that would negatively affect her life or those of her children, with a difference of almost 25 percentage points between intervention and matched comparison women.

**Table 5.13: Confidence intervening in meetings**

	1[disagree with the first statement]	1[agree with the second statement]
<i>Intervention group mean:</i>	0.322	0.322
<i>Comparison group mean:</i>	0.308	0.075
<i>Difference:</i>	0.014	0.246***
	(0.059)	(0.043)
<i>Observations intervention:</i>	180	180
<i>Observations:</i>	455	455

*Bootstrap Standard Errors in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.*

These estimates are suggesting that the project has been successful in improving women's confidence in intervening in meetings if a decision affecting her life and those of her children was made in public.

## 5.2.5 Governance

The final objective of the project was to influence local and national governance towards pro-poor economic development. In particular, the project aimed to improve governance in municipal plans. While exploring the impact of the project on this objective goes beyond the scope for this evaluation, the questionnaire explored outcomes of awareness and leader participation in community plans.

Estimates in Table 5.14 suggest that more than 68 per cent of the intervention respondents were aware of community plans taking place in the community during the previous five years, compared with 46 per cent of the respondents in the matched comparison group. This suggests that project activities increased awareness of community plans.

**Table 5.14: Municipal plans**

	<b>1[Are you aware of community plans that have been taking place in your community in the last 5 years]</b>	<b>1[Did the leaders of your community/association participate in these meetings]</b>
<i>Intervention group mean:</i>	0.684	0.704
<i>Comparison group mean:</i>	0.463	0.655
<i>Difference:</i>	0.221***	0.049
	(0.048)	(0.043)
<i>Observations intervention:</i>	294	294
<i>Observations:</i>	796	796

*Bootstrap Standard Errors* in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

The questionnaire also investigated whether community plans have ever been included in the local government plan and if the local government plan allocated budget for the community plan. Table 5.15 suggests that that project activities are associated with a higher probability that local government budget is invested into community plans.

**Table 5.15: Government plans and budget**

	<b>1[In the last 5 years has the community plan ever been included in the local government]</b>	<b>1[Did the local government allocate budget for this community plan in the last 5 years]</b>	<b>1[In the last 5 years, did the local government provide funding relative to the proposed activities]</b>
<i>Intervention group mean:</i>	0.432	0.425	0.395
<i>Comparison group mean:</i>	0.333	0.307	0.283
<i>Difference:</i>	0.099**	0.119**	0.111**
	(0.048)	(0.045)	(0.045)
<i>Observations intervention:</i>	294	294	294
<i>Observations:</i>	796	796	796

*Bootstrap Standard Errors* in parentheses; \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. PSM estimates bootstrapped 1,000 repetitions.

Given the nature of the intervention, more qualitative work should be put in place in order to establish a causal relationship between the project activities and change in governance attributable to the project. These estimates are likely to be reflecting greater awareness rather than changes in policies.

# 6 CONCLUSIONS

## 6.1 CONCLUSIONS

Overall, this Effectiveness Review has found no evidence that after eight years of its implementation the project 'Scaling Up Sustainable Livelihoods in Mindanao' can be linked with higher living standards of the households involved in the project. Households that participated in project activities reported expenses 8.65 per cent higher than the comparison group, however these results are not statistically significantly different from zero. When disaggregating results by food, monthly, and yearly expenditure it appears that yearly expenditure is 49 per cent higher for the intervention group than the matched comparison group, and the difference is statistically significant. In particular it seems that this result is driven by yearly expenditure on entertainment equipment.

The evaluation suggests that the project was successful in improving the probability of households having revenues from agricultural production. However, estimates suggest that on average total values revenues from selling agricultural products are not different between the two groups. When comparing only those households that are selling agricultural products it appears that on average revenues could be higher for the comparison group than for intervention households.

The project aimed at improving revenues through three different channels: firstly increasing agricultural production and diversification, therefore increasing quantity of products sold; secondly increasing value added to agricultural products; and finally increasing access to markets. This evaluation suggests that the project was successful in increasing the quantity of agricultural production sold to the markets (particularly due to an increase in agricultural diversification). On the other hand, there is no evidence of increased overall agricultural production. This might be suggesting improved access to markets among project participants. Finally, there is no evidence of higher selling prices, which would have been attributed to higher quality production.

The second project objective is improving women's leadership. The evaluation found improved group participation and increased confidence in intervening in meetings. However there is no evidence of improved personal income or increased household decision-making, or involvement in group activities.

The final objective of the project was improving governance and participation in the communities. The evaluation suggests that the project was successful in increasing awareness of community plans which are taking place into the communities. Measuring if this project had an impact on policy change at local and national level goes beyond the scope to the tools used in this evaluation.

## 6.2 PROGRAMME LEARNING CONSIDERATIONS

Some important lessons that can be applied to other projects of this type in Philippines and elsewhere have emerged from this evaluation. The programme team in particular is encouraged to consider the following:

- **Improving targeting of project participants**

From the evaluation it emerged that the project engaged households with higher levels of material wealth, including higher levels of education, higher quantities of cultivated land, and a lower probability of being employed as casual labourer compared with a random selection of people living in neighbouring villages. This suggests that the project was not able to engage with the poorest and most vulnerable households in the area. While more attention should be given to this when targeting project households, the country team is also encouraged to consider what type of interventions are more effective in reaching and benefiting the poorest and most vulnerable households in the project area.

- **Explore reasons why income did not increase compared with the comparison group**

The evaluation identified that the project increased the probability of farmers selling agricultural products in the markets, as well as improving the quantity and increasing the variety of crops sold. These changes, however, did not translate into higher revenues, income or wealth. The country team is encouraged to explore the reasons behind this, and to consider possible alternative strategies.

- **Consider scaling up the women's empowerment components of the project defining how women should be involved in group activities**

The evaluation found that on average women involved in project activities reported belonging to a greater number of groups. There is also evidence that the project was successful in improving women's confidence in intervening in meetings, but it appears that the proportion of women who reported participating to a medium to large extent in group activities is lower in the intervention group than the comparison group. There also appears to be no evidence of a greater increase in the proportion of women's contribution to household income, as well as no evidence of change in women's decision-making power within the household.

The programme team is encouraged to consider scaling up the women's empowerment components of this project, defining how change is expected to take place and identifying how women should be involved in group activities. Attending a greater number of groups is not necessarily a positive outcome if it is not accompanied by a greater decision-making power within these groups. Moreover issues on time-poverty and unpaid care should be considered, as well as defining what empowerment means in the context of the project and what power dynamics it is desirable to change as a result.

- **Consider building a strong monitoring system and shaping evaluation questions during programme design**

The programme team is encouraged to consider a monitoring system that collects real time data, which can be used for targeting, project implementation, reflection and , and shaping or adapting intervention strategies and activities.

The project team is also encouraged to define evaluation questions during the project design and develop a robust evaluation framework which will support mid term course corrections and final evaluations of impact and effectiveness.

## APPENDIX 1: METHODOLOGY USED FOR PROPENSITY-SCORE MATCHING

The analysis of outcome variables, presented in Section 5 of this report, involved group mean comparisons using propensity-score matching (PSM). The basic principle of PSM is to match each participant with a non-participant that was observationally similar at baseline and to obtain the treatment effect by averaging the differences in outcomes across the two groups after project completion. Unsurprisingly, there are different approaches to matching, i.e. to determining whether or not a household is observationally 'similar' to another household. For an overview, we refer to Caliendo and Kopeinig (2008).<sup>12</sup> This appendix describes and tests the specific matching procedure followed in this Effectiveness Review.

### Estimating propensity scores

Given that it is extremely hard to find two individuals with exactly the same characteristics, Rosenbaum and Rubin (1983) demonstrate that it is possible to match individuals using a prior probability for an individual to be in the intervention group, naming it *propensity score*. More specifically, propensity scores are obtained by pooling the units from both the intervention and comparison groups and using a statistical probability model (e.g. a probit regression) to estimate the probability of participating in the project, conditional on a set of observed characteristics.

Table A1.1 presents the probit regression results used to estimate the propensity scores in our context. To guarantee that none of the matching variables were affected by the intervention, we only considered variables related to baseline, and only those variables that were unlikely to have been influenced by anticipation of project participation (Caliendo and Kopeinig, 2008).

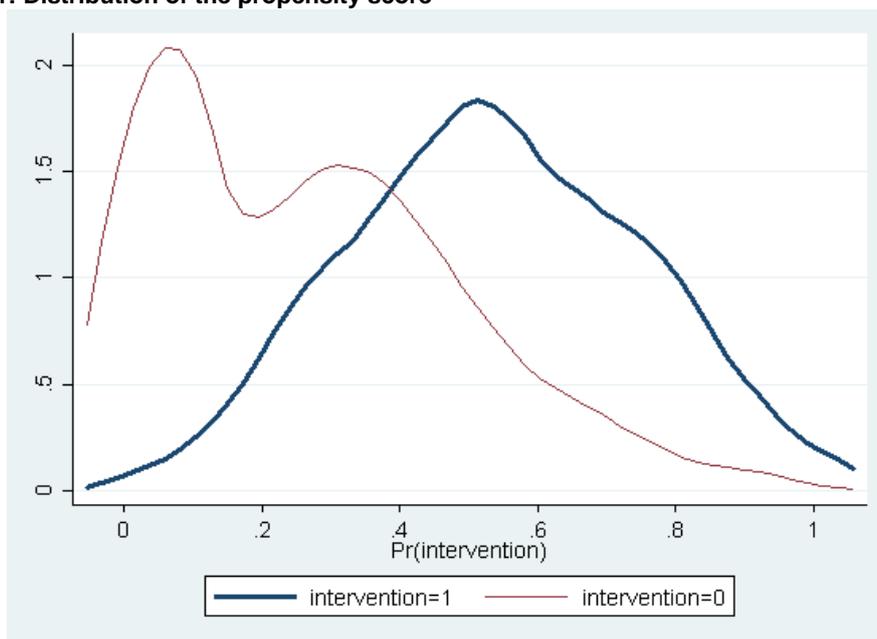
**Table A1.1: Estimating the propensity score**

	<b>1[Intervention]</b>
1[Head of HH is female]	0.308***
	(0.106)
Age head of HH	-0.010**
	(0.004)
1[Head of HH has primary education]	0.232*
	(0.121)
1[Head of HH has secondary education]	-0.152
	(0.163)
1[Head of HH has university education]	0.255
	(0.232)
Household size today	-0.065***
	(0.024)
1[Religion – Other Christian]	0.164
	(0.143)
1[Religion – Islam]	-0.285*
	(0.148)
Number crop farmed – 2007	0.114***
	(0.034)
1[Main activity in 2007 – Farming]	0.351**
	(0.174)
1[Main activity in 2007 – Casual labourer (daily hire)]	-0.791***
	(0.227)
Total area of land owned in 2007	0.116***
	(0.028)
Total land used for agricultural production in 2007	-0.021
	(0.044)
1[Wealth index 2 <sup>nd</sup> quintile in 2007]	-0.313*

	<b>1[Intervention]</b>
	(0.173)
1[Wealth index 3 <sup>rd</sup> quintile in 2007]	-0.092
	(0.168)
1[Wealth index 4 <sup>th</sup> quintile in 2007]	-0.087
	(0.169)
1[Wealth index 5 <sup>th</sup> quintile in 2007]	0.287
	(0.175)
Constant	-0.343
	(0.328)
Observations	802

Figure A1.1 shows the distribution of the propensity score for the intervention and comparison group.

**Figure A1.1: Distribution of the propensity score**



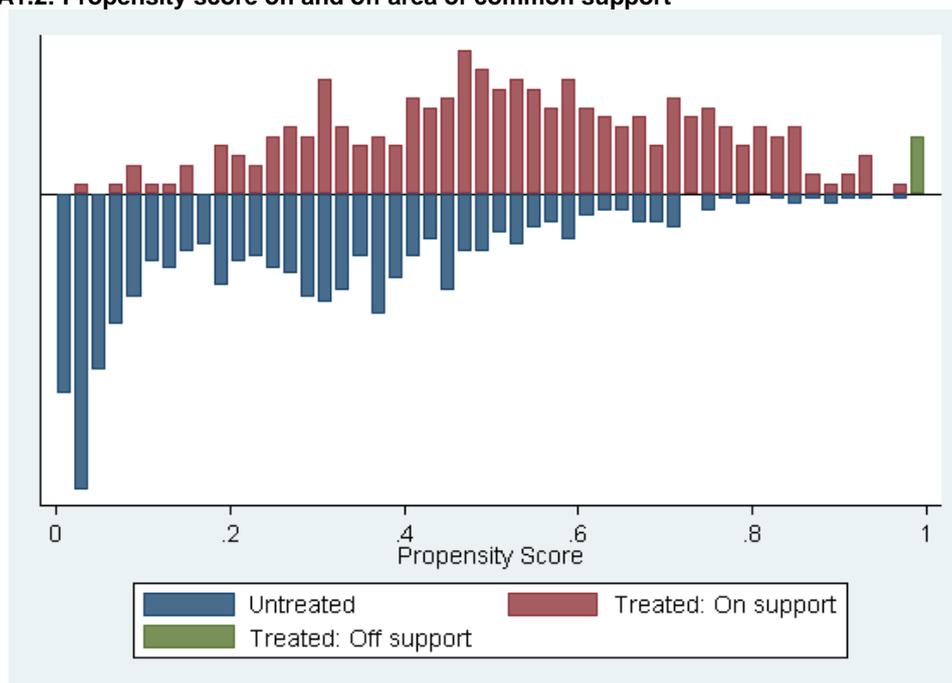
## Defining the region of common support

After estimating the propensity scores, the presence of a good *common support area* needs to be checked. The area of common support is the region where the propensity score distributions of the treatment and comparison groups overlap. The common support assumption ensures that ‘treatment observation have a comparison observation “nearby” in the propensity score distribution’ (Heckman, LaLonde and Smith, 1999). Since some significant differences were found between the intervention and comparison groups in terms of their baseline characteristics (as detailed in Section 4.2), some of the women in the intervention group are too different from the comparison group to allow for meaningful comparison. We used a minima and maxima

comparison, deleting all observations whose propensity score is smaller than the minimum and larger than the maximum in the opposite group (Caliendo and Kopeinig, 2008). Six of the 300 households interviewed in the project communities were dropped because they lay outside the area of common support. The consequence of dropping project participant households is that the estimates of differences in outcome characteristics between the various treatment groups only apply to those intervention households that were not dropped; that is, they do not represent the surveyed population as a whole.

Figure A1.1 illustrates the propensity scores and shows the proportion of women lying on and off the areas of common support, by treatment group.

**Figure A1.2: Propensity score on and off area of common support**



## Matching intervention and comparison households

Following Rosenbaum and Rubin (1983), after estimating the propensity scores and defining the area of common support, individuals are matched on the basis of their propensity score. The literature has developed a variety of matching procedures. For the main results presented in this Effectiveness Review we chose to employ the method of kernel matching. Kernel-matching weights the contribution of each comparison group member, attaching greater weight to those comparison observations that provide a better match with the treatment observations. One common approach is to use the normal distribution with mean zero as a kernel, and weights given by the distribution of the differences in propensity score. Thus ‘good’ matches are given greater weight than ‘poor’ matches.

The *psmatch2* module in Stata was used with a bandwidth of 0.06 and with the analysis restricted to the area of common support.

When using PSM, standard errors of the estimates were bootstrapped using 1,000 repetitions, to account for the additional variation caused by the estimation of the propensity scores and the determination of the common support.<sup>13</sup>

## Check balancing

For PSM to be valid, the intervention group and the matched comparison group need to be balanced, in that they need to be similar in terms of their observed baseline characteristics. This should be checked. The most straightforward method to do this is to test whether there are any statistically significant differences in baseline covariates between the intervention and comparison group in the matched sample. As we can see from Table A1.4 none of the variables implemented for the matching are statistically significant in the matched sample.

**Table A1.4: Balancing test**

Variables	Unmatched Matched	Mean		t-test	
		Treated	Control	t	p> t
1[Head of HH is female]	U	0.56333	0.53187	0.86	0.387
	M	0.56122	0.57279	-0.28	0.778
Age head of HH	U	45.42	44.98	0.48	0.629
	M	45.401	44.671	0.72	0.475
1[Head of HH has primary education]	U	0.62	0.47809	3.93	0.000
	M	0.61905	0.65668	-0.95	0.343
1[Head of HH has secondary education]	U	0.25333	0.15936	3.27	0.001
	M	0.2517	0.26801	-0.45	0.653
1[Head of HH has university education]	U	0.09333	0.05179	2.28	0.023
	M	0.09184	0.11492	-0.92	0.359
Household size today	U	5.6	5.8187	-1.34	0.181
	M	5.619	5.6697	-0.28	0.777
1[Religion – Other Christian]	U	0.18333	0.13944	1.66	0.098
	M	0.18027	0.17686	0.11	0.914
1[Religion – Islam]	U	0.13333	0.27092	-4.61	0.000
	M	0.13605	0.14848	-0.43	0.667
Number crops farmed – 2007	U	2.9667	1.5	10.93	0.000
	M	2.9014	2.8802	0.13	0.897
1[Main activity in 2007 – Farming]	U	0.87333	0.53187	10.52	0.000
	M	0.87075	0.89943	-1.09	0.276
1[Main activity in 2007 – Casual labourer (daily hire)]	U	0.03333	0.32072	-	0.000
	M	0.03401	0.02255	10.21	0.403

Total area of land owned in 2007	U	9.6613	1.2146	1.82	0.069
	M	3.1564	2.8874	1.03	0.303
Total land used for agricultural production in 2007	U	2.4516	1.0153	6.22	0.000
	M	2.0921	2.0289	0.39	0.697
1[Wealth index 2 <sup>nd</sup> quintile in 2007]	U	0.13	0.24104	-3.84	0.000
	M	0.13265	0.13861	-0.21	0.833
1[Wealth index 3 <sup>rd</sup> quintile in 2007]	U	0.18667	0.20916	-0.77	0.442
	M	0.19048	0.22413	-1.01	0.315
1[Wealth index 4 <sup>th</sup> quintile in 2007]	U	0.18667	0.20717	-0.7	0.483
	M	0.18707	0.21003	-0.7	0.486
1[Wealth index 5 <sup>th</sup> quintile in 2007]	U	0.30333	0.13745	5.8	0.000
	M	0.29932	0.28363	0.42	0.676
		0.56333	0.53187	0.86	0.387

\* if 'of concern', i.e. variance ratio in [0.5, 0.8) or (1.25, 2]

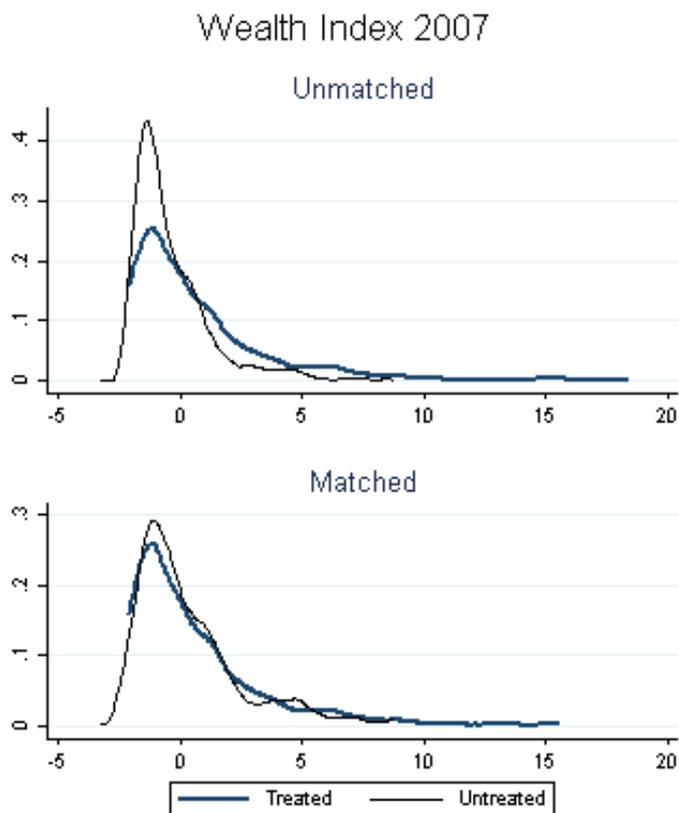
\*\* if 'bad', i.e. variance ratio <0.5 or >2

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	% concern	% bad
<i>Unmatched</i>	0.232	245.65	0	29.8	23.3	19.2	213.07*	35	24
<i>Matched</i>	0.009	7.62	0.974	4.0	3.2	22.8	1.11	12	0

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

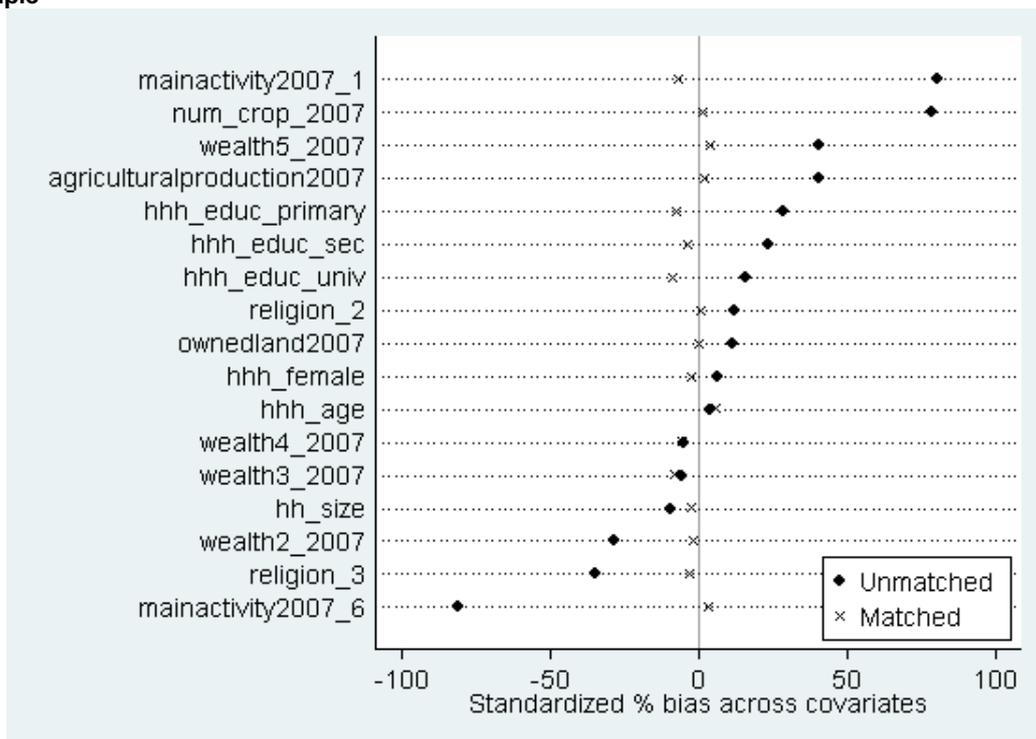
Figure A1.3 provides the distribution of the wealth index in 2007 for treated and untreated households before and after matching. It can be appreciated how the distribution for treated and untreated is more similar after matching has taken place.

**Figure A1.3: Wealth index distribution for matched and unmatched sample**



Finally Figure A1.4 shows the standardised percentage of bias across matching variables for matched and unmatched samples. As already explained in Section 4, in the unmatched sample intervention and comparison differed for the type of main activity involved in 2007, the number of crops cultivated in 2007, and for wealth indicators. Figure A1.4 provides a visual representation of the reduction in bias across these matching variables in the matched sample.

**Figure A1.4: Standardised per cent of bias across matching variables for matched and unmatched sample**



# APPENDIX 2: 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 was the one that 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 ordinary least squares (OLS) model (when the dependent is continuous) or probit model when the dependent is binary.

$$Y_i = \alpha + \beta_1 \text{Project participation}_i + \delta' X_i + \varepsilon_i$$

Where  $Y_i$  is the dependent variable;  $X_i$  is a vector of household covariates used in the model in Table A1.1. The variable of interest is the dummy variable *Project Participation* that assumes a 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  $\beta_1$  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 in the treatment and control groups (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)<sup>14</sup> 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:

$$Y_i = \alpha + \beta_1 \text{Project participation}_i + \delta_2' Z_i + \delta_1' X_i + \varepsilon_i$$

Where  $Y_i$  represents the outcome of interest; *Project participation*<sub>*i*</sub> is a dummy binary variable equal to one if an individual/household is enrolled into the programme and zero otherwise;  $X_i$  is a vector of matching covariates used to estimate the propensity score match; and  $Z_i$  is a vector of control variables, which 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  $\hat{e}(x)/(1 - \hat{e}(x))$  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  $\beta_1$ .

**Table A2.1: Household consumption and wealth**

	(1) OLS / probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
<i>Total Household expenditure per capita per day</i>	16.708 (7.486)	11.136 (12.014)	11.136 (11.517)	10.779 (10.713)
<i>N</i>	802	796	796	802
<i>Ln(Total Household expenditure per capita per day)</i>	0.109** (0.045)	0.089 (0.072)	0.089 (0.070)	0.068 (0.060)
<i>N</i>	802	796	796	802
<i>Wealth index</i>	1.301** (0.548)	1.442 (1.200)	1.442 (1.223)	2.487*** (0.922)
<i>N</i>	802	796	796	802

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

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

**Table A2.2: Revenues from agricultural production**

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
<i>1[Any revenue from agricultural production]</i>	0.729*** (0.183)	0.078** (0.036)	0.078** (0.037)	0.746*** (0.197)
<i>N</i>	802	796	796	802
<i>Total value revenues from crop sales (PHP)</i>	454.287 (4572.258)	-845.774 (9452.061)	-845.774 (9941.352)	601.842 (7794.917)
<i>N</i>	802	796	796	802
<i>Ln(Total value revenues from crop sales)</i>	-0.191* (0.115)	-0.120 (0.163)	-0.120 (0.170)	-0.164 (0.119)
<i>N</i>	546	538	538	546

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

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

**Table A2.3: Quantity agricultural production**

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
<i>Total crop sold last 12 months (Kg)</i>	1055.504*** (329.387)	1338.585*** (503.400)	1338.585** (538.010)	1454.862*** (453.394)
<i>N</i>	802	796	796	802
<i>Ln(Total crop sold last 12 months)</i>	0.220** (0.110)	0.408** (0.168)	0.408** (0.171)	0.293** (0.121)
<i>N</i>	542	542	542	542
<i>Total crop produced</i>	-1390.023 (3041.081)	600.364 (4363.440)	600.364 (4940.570)	1081.622 (3180.478)
<i>N</i>	802	796	796	802
<i>Number of products sold</i>	0.684*** (0.098)	0.752*** (0.223)	0.752*** (0.225)	0.620*** (0.108)
<i>N</i>	802	796	796	802

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

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

**Table A2.4: Value added and price**

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
<i>1[Processed at least one product]</i>	0.034 (0.115)	-0.085 (0.055)	-0.085 (0.055)	-0.207 (0.140)
<i>N</i>	802	796	796	802
<i>Price rubber (PHP)</i>	14.495 (21.520)	-13.000 (19.082)	-13.000 (17.157)	16.507 (24.081)
<i>N</i>	176	172	172	176

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

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

**Table A2.5: Access to markets and technology**

	(1) OLS/probit	(2) PSM NN	(3) PSM Caliper	(4) Propensity Score Weighting
<i>Transport costs</i>	23.073 (547.034)	-74.162 (1225.516)	-74.162 (1264.417)	-25.067 (791.776)
<i>N</i>	802	796	796	802
<i>1[Selling to community associations]</i>	1.156*** (0.305)	0.051*** (0.013)	0.051*** (0.013)	1.257*** (0.331)
<i>N</i>	631	796	796	631
<i>Number of facilities</i>	-0.152* (0.086)	-0.245* (0.138)	-0.245* (0.133)	-0.132 (0.108)
<i>N</i>	802	796	796	802
<i>Number of practices</i>	0.242** (0.116)	0.119 (0.162)	0.119 (0.173)	0.033 (0.139)
<i>N</i>	802	796	796	802

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

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

**Table A2.6: Women's leadership**

	(1)	(2)	(3)	(4)
	OLS/probit	PSM NN	PSM Caliper	Propensity Score Weighting
<i>1[Respondent's contribution to income increased]</i>	0.151	0.033	0.033	0.148
	(0.165)	(0.052)	(0.052)	(0.196)
<i>N</i>	460	455	455	460
<i>Proportion household decision making</i>	-0.216***	-0.159***	-0.159***	-0.266***
	(0.035)	(0.046)	(0.049)	(0.032)
<i>N</i>	460	455	455	460
<i>Number of groups participating</i>	0.933***	1.283***	1.283***	1.127***
	(0.317)	(0.434)	(0.449)	(0.365)
<i>N</i>	460	455	455	460
<i>1Involved in group activities]</i>	-0.639***	-0.139*	-0.139*	-0.847***
	(0.158)	(0.076)	(0.076)	(0.186)
<i>N</i>	460	455	455	460
<i>1[Disagree 1<sup>st</sup> statement]</i>	0.615***	0.033	0.033	0.743***
	(0.198)	(0.059)	(0.060)	(0.206)
<i>N</i>	460	455	455	460
<i>1[Agree 2<sup>nd</sup> statement]</i>	0.668***	0.217***	0.217***	1.119***
	(0.185)	(0.051)	(0.051)	(0.214)
<i>N</i>	460	455	455	460

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

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

**Table A2.7: Governance**

	(1)	(2)	(3)	(4)
	OLS/probit	PSM NN	PSM Caliper	Propensity Score Weighting
<i>1[Are you aware of community plans that have been taking place in your community in the last 5 years]</i>	0.335***	0.119**	0.119**	0.308**
	(0.112)	(0.054)	(0.053)	(0.131)
<i>N</i>	802	796	796	802
<i>1[Did the leaders of your community/association participate in these meetings]</i>	0.360***	0.109**	0.109**	0.421***
	(0.114)	(0.051)	(0.052)	(0.128)
<i>N</i>	802	796	796	802

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

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

# NOTES

- 1 In other instances this was done by exploiting different phases of the project intervention, or identifying other formal or informal groups from which it was possible to identify the comparison group.
- 2 See Gujarati, Damodar N. (2003) *Basic Econometrics*: Fourth Edition. New York: McGraw Hill.
- 3 Per capita figure refers to adult equivalent units. Daily total consumption was divided by a factor representing household size, to generate a per-day, per-person expenditure figure. To reflect that the existence of economies of scale within households, and the lower consumption needs of children, the formula used for calculating household size is  $(A + \alpha K)^\theta$ , where A is number of adults in the household; K is the number of children;  $\alpha$  is the consumption of a child relative to an adult; and  $\theta$  stands for the extent of economies of scale. This Effectiveness Review follows the common practice of setting  $\alpha$  equal to 0.33 and  $\theta$  equal to 0.9.
- 4 In past years this indicator was measured as the proportion of the samples whose daily consumption exceeded the median value of the unmatched comparison group. In order to provide some continuity with previous Effectiveness Reviews the same estimates were also calculated using this old indicator. Estimates are suggesting that 69 per cent of the households in the intervention sample had expenditure exceeding the critical value while 60.5 per cent of the matched comparison sample did, giving a difference, attributable to the project, of 9 percentage points. This is statistically significant at the 5 per cent level.
- 5 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. See: Bland, M. J. & Altman, D. G. 1997. Statistics notes: Cronbach's alpha. *BMJ*, 314, 572.
- 6 The robustness checks in Appendix 2 show positive and statistically significant results for wealth estimates when using alternative estimation models.
- 7 It should be noted, however, that when alternative estimation techniques are employed, as in Appendix 2, these estimates stop being statistically significant and it reduces the estimated size.
- 8 The questionnaire was designed to allow the respondent to give flexible answers on the unit of measurement for the quantity produced. If estimates were reported in a unit of measurement different from Kg, the questionnaire asked the respondent to estimate the conversion rate, and the median was then used for computing the conversion rate.
- 9 Estimates in the second column suggest that the difference is not statistically significant when employing kernel matching. Estimates in Appendix 2, on the other hand, suggest that this difference is positive and statistically significant.
- 10 This difference is not robust to alternative matching procedures.
- 11 It should be noted, however, that these estimates are not consistent with alternative matching procedures.
- 12 Caliendo, M. and Kopeinig, S. 2008. Some Practical Guidance for the Implementation of Propensity Score Matching, *Journal of Economic Surveys*, Wiley Blackwell, vol. 22(1), pages 31–72.
- 13 Bootstrapping is a statistical procedure where repeated samples (of the same size) are drawn from the original sample with replacement. This results in a statistical distribution of parameter estimates (the sampling distribution). The bootstrapped standard error is the standard deviation of this sampling distribution and it can be shown that as the number of repeated samples becomes large, provided certain technical conditions are met this is a good estimate for the standard error of the estimate.
- 14 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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