
LIVELIHOODS IN COLOMBIA

Evaluation of market access and food security in
the central region

Effectiveness Review Series

2013/14



Photo: Rob Fuller/Oxfam

ROB FULLER

OXFAM GB



CONTENTS

Contents	2
Acknowledgements	3
Executive summary	4
1 Introduction	7
2 Project description	8
3 Evaluation design	10
4 Data collection	12
4.1 Sampling approach	12
4.2 Analysis	14
5 Results	16
5.1 Introduction	17
5.2 Involvement in project activities	17
5.3 Sales of agricultural products	19
5.4 Overall household income	25
5.5 Involvement in advocacy activities	28
5.6 Attitudes to gender roles	30
6 Conclusions	31
6.1 Conclusions	31
6.2 Programme learning considerations	32
Appendix 1: Baseline statistics before matching	33
Appendix 2: Methodology used for propensity-score matching	35
Notes	41

ACKNOWLEDGEMENTS

We would like to thank the staff of the Comité de Interlocución Campesino y Comunal (CICC), the Alianza Campesina y Comunal (AL CAMPO), the Instituto Latinoamericano para una Sociedad y un Derecho Alternativos (ILSA) and to the Oxfam team in Colombia for their support of this Effectiveness Review. Particular thanks are due to Adriana Rodríguez and Paola Castilla, and to Andrés Mendoza and Carol Niño for their excellent coordination of the whole process.

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 'Market Access and Food Security in the Central Region of Colombia' was once of those selected for an Effectiveness Review in the 2013/14 financial year.

The project under review is part of an initiative supported by Oxfam since 2003 to increase market access and income among smallholder producers in the Central Region of Colombia. Oxfam has worked with the Comité de Interlocución Campesino y Comunal (CICC), the Alianza Campesina y Comunal (AL CAMPO), the Instituto Latinoamericano para una Sociedad y un Derecho Alternativos (ILSA) and the National University of Colombia to establish, support and document learning about alternative marketing channels – especially farmers' markets (*mercados campesinos*) in the capital city of Bogotá, and in other towns in the region. The aim is to provide rural producers with a forum to sell directly to consumers, so as to support producers' livelihoods by increasing their power in markets while also building understanding and awareness among urban consumers about the issues facing rural producers. This Effectiveness Review attempted to evaluate the initiative's impact only in terms of changes in the market access and livelihoods of producers themselves.

Evaluation approach

This Effectiveness Review used a quasi-experimental evaluation design to assess the impact of the farmers' markets initiative on the lives and livelihoods of rural producers. The Effectiveness Review was carried out on a random sample of the municipalities where the project activities had been implemented since at least 2009 and where at least 20 producer households were participating. Within those municipalities, the households that had participated in the farmers' markets during 2013 were selected at random to be interviewed. For comparison purposes, interviews were also carried out with producer households that had not participated in the farmers' markets, but who were eligible and had expressed an interest in doing so. In total, 157 project participants and 330 non-participants were interviewed. To increase confidence when making estimates of the project's effects the statistical tools of propensity-score matching and multivariate regression were used at the analysis stage to control for apparent baseline differences between the participant and non-participant households.

Results

The survey results provide good evidence that the farmers' markets initiative has made a positive contribution to the livelihoods of rural producers.

Firstly, those interviewed as project participants confirmed that they were participating in the local producers' groups established as part of this initiative, and most of them agreed with positive statements about accountability and their ability to influence decision-making in those groups. The project participants had taken up the various new production and marketing practices encouraged under the project – selling directly to consumers, setting specific prices for products, classifying products by quality, producing organic products, and engaging in barter with other producers – at much greater rates than the non-participants. On the other hand, there was no evidence of a difference between project participants and non-participants in the proportions who were specialising in production and sales of the usual types of products.

Key results of this Effectiveness Review

Outcome area	Evidence of positive impact	Comments
Group participation	Yes	Most project participants confirmed that they are members of a local producers' group, and expressed positive views about accountability and decision-making in those groups.
Adoption of new production and marketing practices	Yes	The majority of project participants have adopted most of the production and marketing practices encouraged under the project.
Access to new marketing channels	Yes	Project participants are selling through a wider range of channels than non-participants, with a much smaller proportion depending on intermediaries.
Increase in prices obtained for sales of products	Yes	Suggestive evidence that project participants are receiving higher prices is obtained directly from the agricultural sales data. This is reinforced by the apparent increase in household income brought about by the project.
Increase in overall household income	Yes	Household income among project participants (as measured by consumption) is estimated to be 15 to 20 per cent higher than it would have been without the project.
Involvement in advocacy activities	Yes	More project participants have an understanding of political issues and have participated in advocacy activities than the non-participants.
Perception and recognition of women's roles	Yes	Project participants were more likely than non-participants to express positive opinions on gender roles.

Results apply to all producer households who participated in farmers' markets organised under this project at least once during 2013, and who are based in municipalities that have been involved in the initiative since at least 2009 and where there are more than 20 active participants. The project's impact on producers in the city of Bogotá was not evaluated. The project's impacts on food security among consumers and on attitudes towards rural producers among consumers in the city were also not assessed in this Effectiveness Review.

Survey respondents were asked for details of all the products they had sold, through all marketing channels, during December 2013. Eighty-two per cent of the project participants had sold some products via the farmers' markets during that month. The proportion of producers selling to intermediaries was much lower among the project participants (45 per cent, against 80 per cent of the non-participants). Even so, it is notable that the majority of the products sold by the project participants (58 per cent by value) were sold to intermediaries. A very clear difference between the project participants and non-participants was in the *variety* of products sold during December 2013: participants sold an average of different 5.4 products, whereas comparison respondents sold an average of 2.2 products.

A key question is the extent to which project participants have been able to realise higher prices for sales of their products – whether selling through the farmers' markets or through other channels. Among the 22 most common product types sold, the average price received by the project participants was significantly higher than that received by the non-participants for six products. (There is only one example of a product for which the non-participants received a significantly higher price.) Even among those products for which the price differences are not statistically significant, there appears to be a trend of higher prices being realised by the project participants. This conclusion is given extra weight by calculating the average price per kilogram of the products sold by each household, for all products that could be compared in weight terms (68 per cent of the total number of items recorded in the dataset). Different agricultural products obviously have very different prices per kilogram, so this is only an approximate measure – but it does show a large and statistically significant difference between the project participants and non-participants. The higher prices being gained by the project participants may be a direct result of the increased prices available in the farmers' markets, or they may be due to the project participants having improved negotiation skills when selling through other channels, or they may be due to the project participants having increased the quality of the products they are selling – or a combination of all three factors.

On the other hand, the total volume (measured by weight) of products sold by the participants in December 2013 appears to have been lower than that sold by the non-participants. This finding is compatible with the project participants having switched to the production of higher-value agro-ecological crops, which are produced in smaller quantities. However, there was no difference between the project participants and non-participants in the total revenue generated from sales of agricultural products during December 2013.

In a separate section of the survey, respondents were asked for details about their household's recent consumption, of both food and non-food items. An overall figure for per-day, per-person consumption was calculated, to serve as a proxy measure for net household income. Consumption was estimated to be approximately 15 to 20 per cent higher among project participants than non-participants, suggesting that the project has had a corresponding effect on overall household income. This conclusion is reinforced by examining changes in indicators of households' material wealth (ownership of assets and housing conditions) between 2007 and the date of the survey.

The evidence that the project participants have significantly increased their household income adds weight to the conclusion that the farmers' markets are providing a valuable marketing channel to producers, and that project participants have generally been receiving higher prices than they otherwise would have. The question remains of why the project participants did not generate any more revenue from agricultural sales during December 2013 than the non-participants, but overall it seems clear that the opportunities presented by the project have had a significant, positive effect on producers' livelihoods.

The Effectiveness Review also examined evidence for the project's impact on producers' political awareness and participation. More of the project participants had an understanding of the consequences of free-trade agreements and awareness of the work of the city of Bogotá in support of rural producers, and were much more likely than non-participants to have taken part in advocacy activities. In addition, more of the project participants expressed positive opinions on gender roles than the non-participants.

Programme learning considerations

The results of this Effectiveness Review add to the proof that farmers' markets have a positive impact in terms of increasing income. Concrete quantitative proof is also being gathered for the first time about their impact on marketing capacities, organisational aspects, and advocacy and civil activism.

This Effectiveness Review provides clear evidence that the new marketing channels, which cut out intermediaries, and the related support provided to producers under this project have led to a significant improvement in household income. This evidence can be used to strengthen the case both for scaling up the farmers' markets in Bogotá and the Central Region and for encouraging adoption in other cities. To the extent that political support for farmers' markets depends on an analysis of how public funds can most effectively be used to support rural producers, this evaluation provides a basis against which the effectiveness of alternative interventions can be assessed.

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 Oxfam GB global outcome indicators.

This Effectiveness Review, which took place in the Central Region of Colombia in January and February 2014 aimed at evaluating the success of the 'Market Access and Food Security' project in strengthening producers' livelihoods. The project is a continuation of an initiative supported by Oxfam since 2003 to increase market access and income among smallholder producers in the Central Region of Colombia. Since 2006, Oxfam has worked with the Comité de Interlocución Campesino y Comunal (CICC), the Alianza Campesina y Comunal (AL CAMPO), the Instituto Latinoamericano para una Sociedad y un Derecho Alternativos (ILSA) and the National University of Colombia to establish, support and document learning about alternative marketing channels – especially farmers' markets (*mercados campesinos*) in the capital city of Bogotá, and in other towns in the region. The aim is to provide rural producers with a forum to sell directly to consumers, so as to support producers' livelihoods by increasing their power in markets while also building understanding and awareness among urban consumers of the issues facing rural producers. This Effectiveness Review attempts to evaluate the initiative's impact only in terms of changes in the market access and livelihoods of producers themselves.

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 used, and Section 4 describes how this design was implemented. Section 5 presents the results of the data analysis, based on the comparison of outcome measures between the intervention and comparison groups. Section 6 concludes with a summary of the findings and some considerations for future learning.

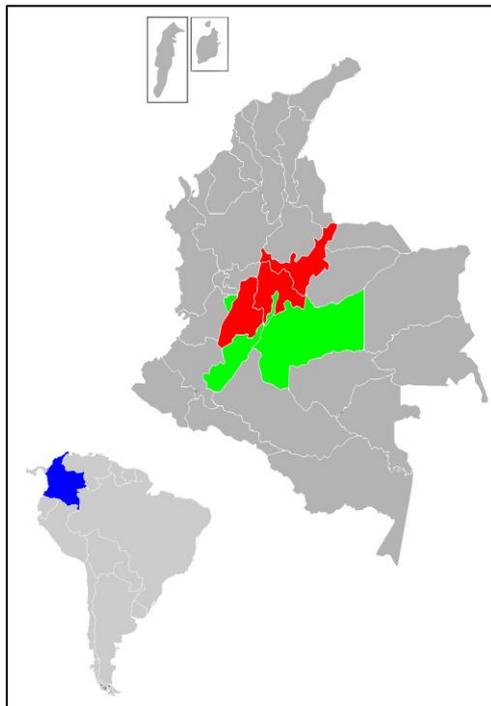


Figure 1.1: Map of Colombia

The three areas included in this Effectiveness Review are shown in red. The project also operates in the Capital District of Bogotá and has some participants in an additional three departments, shown in green.

2 PROJECT DESCRIPTION

The project under review is the continuation of a long-term initiative to increase market access and income among smallholder producers in the Central Region of Colombia. The partners' work in this area began in 2003 with a conference of organisations representing rural producers, which identified poor access to markets as the most serious problem facing their members. Smallholders in Colombia typically sell most of their produce to intermediaries – traders who are seen to hold most of the market power within their local areas, and who are therefore able to drive down the prices they pay to producers.

The congress led in 2004 to the creation of the Comité de Interlocución Campesina y Comunal (CICC) to provide a forum for discussion and collective action for organisations representing rural producers. A process of advocacy was launched to encourage the office of the Mayor of Bogotá to implement policies in favour of small producers. In 2006, the partners organised a farmers' market in central Bogotá, which was intended as a demonstration of the concept. This led to the launch of the current project in 2007, under which farmers' markets were organised regularly in several squares in Bogotá. By early 2014, these markets were being held every two weeks in 14 different locations around the city. The operation of the farmers' markets was originally subsidised by project funds, but this subsidy has been reduced over time: the costs are now covered by the Mayor of Bogotá and by the producers themselves.

Rural producers from municipalities all around the Central Region of Bogotá are eligible to participate in the farmers' markets. At a municipal level, the project partners have formed local organisations (*comités de comercialización de mercados campesinos*) to promote the farmers' markets among producers in their area. Nearly 1600 producers from 39 municipalities participated directly in the farmers' markets during 2013. Around half of the participants are women. As well as marketing produce from their own farms, some of the participants also market products on behalf of other producers from their area. A smaller number also participate in the *mayorista* marketing channel established under the project, where produce is sold in wholesale markets and directly to retailers in Bogotá.

One key aim of the project activities is to enable producers to realise higher prices when selling their products. This is done partly through ensuring that products brought to the farmers' markets are of good quality. The organisers establish a 'fair price' for various products – based on their survey of retail prices as well as an understanding of the costs of production and a judgement on whether the product is considered to be a dietary staple – which is displayed in the markets to provide guidance to producers and customers when negotiating. The partners have also provided training for producers in marketing and negotiation skills. It is intended that this capacity-building and the experience provided by participating in the farmers' markets should enable producers to negotiate better prices, even when selling to intermediaries and through other channels, than they have typically been able to in the past.

Another objective of the project has been to encourage awareness among rural producers of political issues affecting their lives, and to provide a means for participation in advocacy and collective action. In addition, the farmers' markets were intended to increase linkages between the rural and urban population, so that consumers in the city are more aware of producers' situations and more receptive towards policies that reduce inequalities and favour rural producers.

Since 2010, a priority of the project partners has been to ensure the sustainability of the farmers' markets by advocating for recognition and support from the office of the

Mayor of Bogotá. The project has also encouraged municipal authorities to establish local markets, and to provide a marketing channel to a larger number of producers than can participate in the farmers' markets in Bogotá. Finally, Oxfam has supported the replication of the farmers' markets in other cities in Colombia, partly through encouraging officials from Bogotá to share their experience with other cities.

This Effectiveness Review considers the project's effect on the market access and livelihoods of rural producers, as well as on their political participation and attitudes towards women's roles. The project's success in advocating for more favourable policies within the city of Bogotá and in changing attitudes among urban consumers is not evaluated.

Initiatives carried on a small scale during the current project include training in women's economic leadership for 15 women, and testing of approaches to respond to climate change in one municipality. Again, the effectiveness of these pilot initiatives is not evaluated in this Review.

3 EVALUATION DESIGN

The central problem in evaluating the impact of any project is how to compare the outcomes that result from that project with *what would have been the case* without that project having been carried out. In the case of this Effectiveness Review, information about the lives and livelihoods of project participants was collected 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 those 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 project, observing the situation of those where the project was not implemented can provide a good estimate of the counterfactual.

An ideal approach to an evaluation such as this is to select at random the areas in which the project will be implemented. Random selection minimises the probability of there being systematic differences between the project participants and non-participants, and so maximises the confidence that any differences in outcomes are due to the effects of the project.

In the case of the project examined in this Effectiveness Review, the implementation areas were not selected at random. Instead, implementing partners promoted the participation in farmers’ markets within particular municipalities, based on partner organisations’ existing links and on their potential for establishing a local organising committee. Within each municipality, the partner organisations worked with local promoters to encourage producers to participate in the marketing committees and in the farmers markets. The numbers of households that directly participated in the farmers’ markets during 2013 ranged from only one or two in some municipalities, to 61 households in the most active municipalities. However, even in the municipalities with dozens of participating producer households, there was thought to be a small proportion of the total numbers who would be eligible and had the potential to benefit from participation, but who did not participate. It was believed that there were many producers living in the same municipalities who could potentially participate in the farmers’ markets, but who had not so far learned about this opportunity, or who had not been able to participate because of limited capacity in the farmers’ markets. This implied that it was possible to identify non-participants living in the same areas as the project participants who are not systematically different from those project participants, who could function as a comparison group. This allowed a ‘quasi-experimental’ evaluation approach to be adopted, in which the situation of non-participant producers was assumed to provide a reasonable counterfactual for the situation of producers who have participated in the project activities.

Under this Effectiveness Review, therefore, households were identified for comparison purposes as those living in the same municipalities as the project participants, who have not participated, directly or indirectly, in any of the project activities, but who had expressed an interest in doing so. As described in Section 4.1, a series of screening questions were asked to potential comparison respondents before carrying out the questionnaire, to confirm that they had not benefited indirectly from the project activities and that they would consider participating.

At the data analysis stage, project participant households were ‘matched’ with non-participant households with similar characteristics. Matching was performed on the basis of a variety of characteristics – including household size, education level, productive activities, land area owned and area 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 should normally be performed on the basis of these indicators *before* the implementation of the project. Although these baseline data were not available in this case, survey respondents were asked to recall some basic information about their household’s situation from 2007, before project implementation began. Although this recall data is unlikely to be completely accurate, it is thought to enhance the reliability of the comparison used to make conclusions in this report.

The survey data provided a large number of baseline household characteristics on which matching could be carried out. (The characteristics that were finally used are listed in Appendix 1.) One practical problem is that it would be very difficult to find non-participant households that correspond exactly in all these characteristics with the participant household. Instead, these characteristics were used to calculate a ‘propensity score’, the conditional probability of the household participating in the project, given these recalled baseline variables. Participant and non-participant households 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 baseline characteristic were similar between the two groups. Technical details on this approach are described in Appendix 2.

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

It should be noted that both propensity-score matching and multivariate regression rely on the assumption that the ‘observed’ characteristics (those that are collected in the survey and controlled for in the analysis) capture all of the relevant differences between the project participants and non-participants. If there are ‘unobserved’ differences between the groups, then estimates of outcomes derived from them may be misleading. While supreme efforts were made to minimise potential unobserved differences, this remains a cause for caution when interpreting the statistical results, as will be discussed in Sections 5 and 6.

4 DATA COLLECTION

4.1 SAMPLING APPROACH

The survey carried out for this Effectiveness Review was conducted concurrently with the project's standard midline survey of the participating households. In preparation for these activities, the survey managers and implementation partners compiled a list of all households that had participated directly in the farmers' markets in Bogotá, or had sent products for sale through the *mayorista* channel, at least once during 2013. After cleaning by the survey managers (and in particular after removing households that were double-counted because they were registered separately by each of the two partner organisations), this resulted in a list of 1664 households across 112 municipalities. The median number of participants per municipality was 6.5, while the mean was 11.9; that is, there were a large number of municipalities where only a small number of participants were registered.

The list compiled by the partner organisations did not include those households that may have benefited indirectly from the project, either by having given products to other producers to sell at the farmers' markets in Bogotá, or by having participated in local farmers' markets (the establishment of which may have been precipitated in part by the activities of this project). These indirect beneficiaries could not, therefore, be included in the survey, so the results of this Effectiveness Review apply only to those who directly participated in the farmers' markets or in the *mayorista* marketing channel during 2013.

In constructing a sampling frame for the Effectiveness Review, it was decided to exclude the 332 project participants in the Capital District of Bogotá. The majority of these producers were thought to be marketing handicrafts rather than agricultural products, which made them quite distinct from the remainder of the project participants. In addition, their being located in a city would have made the selection of a suitable comparison group particularly difficult. The Effectiveness Review survey was therefore restricted to the project participants residing in the rural municipalities.

For budgetary and logistical reasons, the survey had to be restricted to a small number of municipalities, so it was necessary to survey a reasonably large number of households in each municipality. Municipalities with fewer than 20 project participants registered during 2013 were therefore excluded from the Effectiveness Review.¹ It should be noted that, for this reason, all the municipalities in Huila, Meta and Quindío departments were excluded from the Effectiveness Review, as well as all but one of the municipalities in Tolima department.

It was also decided to restrict the Effectiveness Review to those municipalities that had been included in the project activities since at least 2009. Those municipalities where involvement in the farmers' markets began in 2010 or later were excluded, in order for the participants to have had an opportunity to benefit from the project activities for at least four years. A further four municipalities were excluded from the Effectiveness Review on this basis, leaving a sample frame of 23 municipalities. Resources allowed the Effectiveness Review survey to be conducted in 13 municipalities. The 13 municipalities were randomly selected from the list of 23 using probability proportionate to size. The sample plan required that an equal number of project participant households would be interviewed in each of these municipalities; the benefit of this is that the probability of any particular participant household being interviewed across the 23 municipalities is equal, so that no sampling weights need be applied in the analysis.²

As discussed in Section 3.3, comparison households were interviewed within the same municipalities as those where the project participants were interviewed. To ensure similarity of topography and productive activities, comparison households were identified wherever possible from the same communities or neighbouring communities to those where the participant households were interviewed. To ensure that a household was appropriate for comparison, the following screening questions were applied:

1. Have you heard about the farmers' markets? If the respondent answered no, then an explanation was given and the interviewer proceeded to question number 3.
2. Has any member of your household ever participated in the farmers' markets? If answered in the affirmative, whether through direct participation in the farmers' markets in Bogotá or through the *mayorista* channel, through sending products for sale in farmers' markets with another producer, or through participation in local farmers' markets, the interview was aborted.
3. If you had the opportunity to participate in the farmers' markets, would you do so? If the respondent answered no, the interview was aborted. If answered in the affirmative, the respondent's motivation for participation was sought, and the interviewer proceeded with the following question.
4. Why have you not participated in the farmers' markets up until now? The following were considered valid options for the respondent to be appropriate for comparison purposes:
 - a. Not familiar with the programme, or does not know how to participate.
 - b. Currently waiting to participate at the next opportunity.
 - c. Unsure whether the project will continue.
 - d. Does not have a good personal relationship with the local promoter.If the respondent gave any other reason, he/she was not considered appropriate for comparison purposes, and the interview was aborted.
5. How much land does your household own? If the household owns more than 13 hectares or 20 *fanegadas*, they were considered too large to be appropriate for comparison purposes, and the interview was aborted.
6. What is the household's main productive activity? If the main economic activity was agriculture or rearing livestock, they were considered suitable for comparison, and the interviewer proceeded with the questionnaire as normal. Otherwise, the interview was aborted.

The full list of municipalities included in the Effectiveness Review, and the numbers of households interviewed in each, are shown in Table 4.1.

Table 4.1: Numbers of project participants and non-participants interviewed in each municipality

Department	Municipality	Project participant households interviewed	Non-participant households interviewed
Boyacá	Soracá	13	26
	Motavita	13	26
Cundinamarca	Cáqueza	8	26
	Chipaque	13	26
	Choachí	13	24
	Chocontá	13	26
	El Colegio	12	26
	Cota	12	26
	Granada	13	26
	Silvania	13	26
	Soacha	9	22
	Zipaquirá	12	25
	Tolima	Icononzo	13
Totals		157	330

4.2 ANALYSIS

Households of project participants and non-participants were compared in terms of their demographic characteristics, livelihoods activities and economic situation 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 1. Some important differences were found between the project participants and comparison respondents. For example, a much larger proportion of the project participants than non-participants interviewed were female (64 per cent, against 37 per cent), and the project participants were correspondingly less likely to be the head of their household. This seems to have occurred as, naturally, in the non-participant households who were approached ‘cold’ by the survey team, the head of household was likely to take responsibility for responding. By contrast in participant households, the survey team arrived with the name of the individually identified project participant, who was not necessarily the head of household. There were also significant differences between the project participants and non-participants in their education levels, the amount of land they were farming in 2007, in their other livelihoods activities in 2007, and in their overall economic level at that time (as measured by an index of asset ownership and housing conditions).³

These differences that existed before the project, have the potential to bias any comparison between the project and comparison cells. It was therefore important to control for these baseline differences when making such comparisons. As described in Section 3, the main approach used in this Effectiveness Review was propensity-score matching (PSM). The full details of the matching procedure applied are described in Appendix 2. After matching, households in the project and comparison cells were well-balanced in terms of the recalled baseline data, with very few significant differences between them. However, it should be noted that in the matched model, more of the participant households were in the top quintile in terms of wealth indicators in 2007 than were those of comparison respondents. In addition, matches could not be found

for all of the project participants interviewed: four of the 157 project participant households could not be matched and were dropped from the analysis. The consequence of this is that the estimates of the project's impact presented in Section 5 are not fully representative sample of households in the project communities, but exclude a non-random minority.

An additional point to note from the comparison of baseline characteristics shown in Appendix 1 is that project participants were much more likely than non-participants to say that they were participating in some producers' group in 2007 (24 per cent of the participants responded positively to this, compared to only three per cent of the non-participants), and that they were less likely to recall having sold via intermediaries at that time, and more likely to recall having sold direct to consumers. It is possible that these results are affected to some extent by recall error: respondents who have become involved in the farmers' markets since that time may mis-remember and believe that they were participating at that time.⁴ If so, then the information provided by those questions should be excluded when making comparisons between project participants and non-participants. On the other hand, it may be that these variables are capturing real baseline differences between participants and non-participants, at least to some extent – in which case, excluding them when making comparisons would mean that useful information is lost. For this reason, separate versions of the PSM models were created, both with and without recalled baseline participation in a producers' group as a matching variable. The results shown in Section 5 are the estimates derived from the model without baseline participation as a matching variable, but all results have been tested to ensure that similar results are obtained from the alternative model that *does* include baseline group participation as a matching variable.

All the results described in Section 5 of the report were also tested for robustness by estimating them with various alternative PSM models and linear or probit regression models. The alternative models produced results that are all similar (in size and in statistical significance) to those presented in the tables in this section.

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' pre-existing differences between the two groups – such as individuals' attitudes, motivation, skills or confidence – 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

Statistics primer

This report is intended to be free from excessive technical jargon, with more detailed technical information being restricted to the footnotes and appendices. However, there are some statistical concepts that cannot be avoided in discussing the results.

Effect size

The size or magnitude of an effect when evaluating outcomes refers to the size of the difference between groups. In this report, results will usually be stated as the average difference between households that have participated in the project (that is, the 'intervention group') and households that have not (the 'comparison group').

Statistical significance

When we refer to 'impact' in this report, we mean differences between the project participant and non-participant households that are 'statistically significant'. For example, imagine that we observe that the project participant households sold an average of four different types of products in a given period, whereas the non-participant households sold an average of two different types of products. This seems to be a large difference between the participants and the non-participants. However, it is important to remember that this estimated average impact is derived from data on *samples* of participant and non-participant households, rather than data on the whole population. It is possible that, by chance, we happen to have interviewed participant households that sold unusually large numbers of products, but that the sales in the overall group of participants are very similar to those among the non-participants.

For this reason, it is necessary to take into consideration the statistical probability of observing a difference between the participant and non-participant groups in the data, if there were in reality no difference in the overall population. This probability is usually referred to as the *p*-value. *p*-values help to evaluate study hypotheses. The default hypothesis is always that there are no differences between the intervention and comparison groups. When a difference is detected, the *p*-value is used to evaluate whether the default hypothesis (that there is no difference between the intervention and comparison groups) should be rejected – that is, to conclude that the project had an impact. If the *p*-value is small, for instance 1 per cent, this means that the probability that our sample would show project participants selling an average of four types of products and the non-participants selling an average of two types of products if the true difference was zero is only 1 per cent. This is a small probability, and so we would have confidence in rejecting the default hypothesis that the project had no impact on this outcome. We would then say that the result is 'statistically significant'. Note that the smaller the sample size and the greater the variation in the outcome measures among the sampled households, the larger the *p*-value will be, and hence the less likely we are to conclude that a result is statistically significant.

In the tables of results on the following pages, statistical significance will be indicated with asterisks, with three asterisks (***) indicating a *p*-value of less than 1 per cent, two asterisks (**) indicating a *p*-value of less than 5 per cent and one asterisk (*) indicating a *p*-value of less than 10 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 project participants and non-participants in terms of various outcome measures relating to the project under review. In the tables of results, asterisks are used to indicate where the differences are statistically significant at at least the 10 per cent significance level.

The results are shown after correcting for the baseline and demographic differences found in Section 4.2 using a propensity-score matching procedure. The details of this procedure are described in Appendix 1. All outcomes discussed here have also been tested for robustness to alternative statistical models. In particular, as discussed in Section 4.2, alternative propensity-score matching models were created to take account of whether respondents recalled having been participating in a producers' group in 2007. The alternative models produced results that are similar (in size and in statistical significance) to those presented in the tables in this section.

It is important to stress that the results presented in this section are average results across all those who participated at least once in farmers' markets organised under this project during 2013, in the 23 municipalities among which the sampling was carried out. Clearly it would be of interest to investigate the effects of the project at a more local level and for specific subgroups – but the small sample sizes available limit the potential for detecting any differences between these various subgroups. Nevertheless, all outcome variables were examined for differential impacts according to whether the survey respondent was male or female, and (for project participants) according to the number of years they reported having been participating in the project activities, but little evidence of any such differences was found.⁵

One further point that was discussed in Section 3 should be remembered when considering the results presented in this section. The statistical estimation procedures used to derive estimates of outcomes are based only on 'observable' baseline characteristics. If there are any 'non-observable' differences between the households surveyed in project and comparison communities – such as individuals' attitudes or motivation, differences in local leadership, or weather or other contextual conditions – then these may affect the estimates of outcomes. 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

The first step in understanding what impact this project has had is to examine the extent to which respondents participated in the activities implemented under the project. Table 5.1 shows a comparison between those identified as participants (the 'intervention group') and those identified as non-participants (the 'comparison group') in terms of their participation in producers' organisations. It should be noted that these figures make a comparison between outcomes after correcting (as far as possible) for the baseline and demographic differences between the intervention and comparison respondents, using the propensity-score matching process described in Appendix 2. Asterisks are used to indicate where the differences are statistically significant at at least the 10 per cent significance level.

As is immediately apparent from the table, nearly all of those who were identified as being project participants confirmed during the survey that they are members of some producers' group, while only two per cent of the non-participants did so.⁶ Eighty-one per cent of the participants specified that they participate in the local farmers' market committee (*comité de comercialización de mercados campesinos*). However, all of those (with one exception) who did not claim to be members of the committee had participated in the farmers' markets or used other marketing channels organised under the project during 2013 project activities. For this reason, all of the 157 producers interviewed as project participants for the purposes of this Effectiveness Review will be treated as the 'intervention group' for this analysis.

Table 5.1: Involvement in project activities

	1	2
	Respondent participates in some producers' group %	Respondent participates in the farmers' markets committee %
Intervention group mean:	96.1	81.0
Comparison group mean:	2.4	0.2
Difference:	93.7*** (1.8)	80.8*** (3.1)
Observations (intervention group):	153	153
Observations (total):	445	445

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

Of the project participants, 93 per cent reported that they had participated in farmers' markets in Bogotá during 2013, either in person or by sending products with other producers. The median project participant took part in farmers' markets 14 times during 2013. Of these, approximately a fifth (21 per cent) reported that they had brought others' products to Bogotá for sale, as well as their own. Smaller numbers of the project participants had sold products through the other channels associated with the project: 41 per cent in local or municipal markets, and seven per cent through the *mayorista* channel.

Around a quarter of the project participants reported that they had been participating in the farmers' markets since the project's launch in 2007 (or, in several cases, even further ago than that – there is presumably some error in recalling these dates). More participants joined during subsequent years, while just over a third said that they had been participating only since 2013. It is important to note when looking for evidence of the project's impact that many participants have been involved in the project only for a short time. Each of the outcome measures presented in the following sections was tested for sensitivity to the number of years the participant had been involved in the project, but in no cases was there evidence of a significant difference. (It should be noted, though, that sample sizes are very small to hope to detect differences in outcomes according to the number of years participating.)

One of the indicators identified to investigate in this Effectiveness Review was the project's impact on group organisation. To that end, three questions on respondents' perceptions of their group organisation were included in the survey. Since very few of the comparison group were members of any producers' group, it is not possible to compare these indicators between the intervention and comparison groups. It is anyway of interest to note the responses to these questions: these are shown in Table

5.2, disaggregated by the respondents' gender. As can be seen, the majority responded positively to the questions about the opportunities for involvement in the committees, and were aware of the annual meetings being held by the committees. With these small sample sizes it is not possible to detect any significant difference between the responses given by women and men.

Table 5.2: Respondents' perceptions of the farmers' market organising committees

Statement	Proportion of respondents agreeing with statement		
	Overall %	Female respondents %	Male respondents %
If you wanted, there are real opportunities for you to obtain a leadership position in the committee.	74.1	70.5	80.4
There are too many barriers for you to influence decisions in the committee.	22.6	23.1	21.7
The committee holds annual meetings to present its results.	90.3	91.0	89.1
Observations	124	78	46

5.3 SALES OF AGRICULTURAL PRODUCTS

We now turn to investigating the effects of the project on outcomes relating to marketing and sales of agricultural products.

The first outcome area to consider is to what extent the project has been successful in encouraging producers to adopt new marketing practices. Table 5.3 shows the difference between the project participants and non-participants in terms of the adoption of six marketing practices encouraged by the implementing partners. It can be clearly seen that the majority of project participants are selling directly to consumers, setting specific prices for their products, and engaging in exchange or barter, whereas only a minority of the non-participants are doing so. Many of those answering positively recalled that they were also engaged in those practices in 2007, though it is clear that there has also been a significant increase in the number of project participants engaged in those practices since that time.⁷

More of the project participants than non-participants reported that they farm organic products – though the difference between the two groups in this respect is smaller, and the evidence that there has been a change over the project's lifetime is less clear.⁸

Column 3 of Table 5.3 shows that majorities of the project participants and non-participants reported classifying their products by quality, and that the difference between them is not statistically significant. In fact there *is* a significant difference in the proportions who reported having started doing this since 2007: 27 per cent of project participants said that they had started since 2007, against 14 per cent of non-participants.⁹ It is possible that there is a difference in understanding between the participants and the non-participants of what 'classifying by quality' means, and that the participants are using a more specific definition; this would account for the lack of a significant difference in column 3 but the apparent increase since 2007.

Table 5.3: Proportions of producer households adopting new marketing practices

	1	2	3	4	5	6
	Selling directly to consumers %	Setting fixed prices for products %	Classifying products by quality %	Organic production %	Selling less common types of products %	Exchange with other producers %
Intervention group mean:	93.5	67.3	76.5	43.1	10.5	71.2
Comparison group mean:	24.7	25.5	70.3	26.6	8.25	10.6
Difference:	68.8*** (4.9)	41.8*** (5.8)	6.1 (6.0)	16.6*** (6.0)	2.2 (3.9)	60.6*** (5.1)
Observations (intervention group):	153	153	153	153	153	153
Observations (total):	445	445	445	445	445	445

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

Finally, column 5 of Table 5.3 shows that only around 10 per cent of the respondents reported choosing to sell products that are less common in their local area, and that this proportion was not significantly different between the project participants and non-participants.

In the course of the survey, respondents were asked for details of all the products that they (and other members of their households) had sold during December 2013. The month of December was chosen both because it was in the recent past (the survey having been conducted in February 2014) and because it is the time of year that typically sees the highest level of sales. The detailed sales data will be used to derive the remainder of the results in this section.

Firstly, Table 5.4 shows how the use of different channels for marketing differed between the project participants and non-participants. It can be seen from column 1 that four out of five project participants made sales at a farmers' market during December 2013, and a small proportion used the *mayorista* channel. Less than half of project participants made any sales to intermediaries, a much smaller proportion than among the non-participants. On the other hand, the proportion selling at local markets and through other channels was approximately the same between the participants and non-participants.

Column 5 summarises the information in the first four columns of the table, showing that the number of different channels used by project participants during December 2013 was significantly higher than the number used by non-participants.

It should be noted that a different pattern emerges when examining the *volume* of products sold through each channel. In value terms, only 25 per cent of the products sold by project participants during December were sold through the farmers' markets or through the *mayorista* channel. Even though less than half of project participants were selling to intermediaries, these sales accounted for 58 per cent of the sales (by value) of all participants interviewed. Among the non-participants, sales to intermediaries accounted for 77 per cent of sales.

Table 5.4: Use of marketing channels in December 2013

	1	2	3	4	5
	Households making any sales through farmers' markets %	Households making any sales through <i>mayorista</i> channel %	Households making any sales to inter-mediaries %	Households making any sales in local markets or through other channels %	Number of channels through which households made sales
Intervention group mean:	81.7	2.0	45.1	35.3	1.64
Comparison group mean:	0.5	0.0	79.8	39.3	1.20
Difference:	81.2*** (3.1)	2.0 (1.0)	-34.7*** (5.5)	-4.0 (6.55)	0.44*** (0.09)
Observations (intervention group):	153	153	153	153	153
Observations (total):	445	445	445	445	445

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

Table 5.5: Products sold and prices realised in December 2013

	1	2	3	4
	Number of distinct products sold by household	Average price for which products were sold ^a (pesos per kg)	Average price for which products were sold ^a (logarithm of pesos per kg)	Total volume of products sold ^a (kg)
Intervention group mean:	5.42	2 711	7.24	2 422
Comparison group mean:	2.21	2 008	6.70	4 369
Difference:	3.22*** (0.36)	912* (543)	0.59*** (0.17)	-1 947** (801)
Observations (intervention group):	153	115	115	153
Observations (total):	445	374	374	445

^a Including only products that can be converted to kilograms.

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

Table 5.5 shows the differences between project participants and non-participants in terms of the products they sold and the prices they realised for those sales during December 2013. The first point to note is that, as shown in column 1, the variety of products sold by project participants was much greater than non-participants. The project participants on average sold 5.4 different products during that month, compared to only 2.2 products sold by the average non-participant household. Interestingly, this difference in the range of products being sold was particularly large in the department of Boyaca, where the project participants on average reported having sold more than eight different products during that month.¹⁰

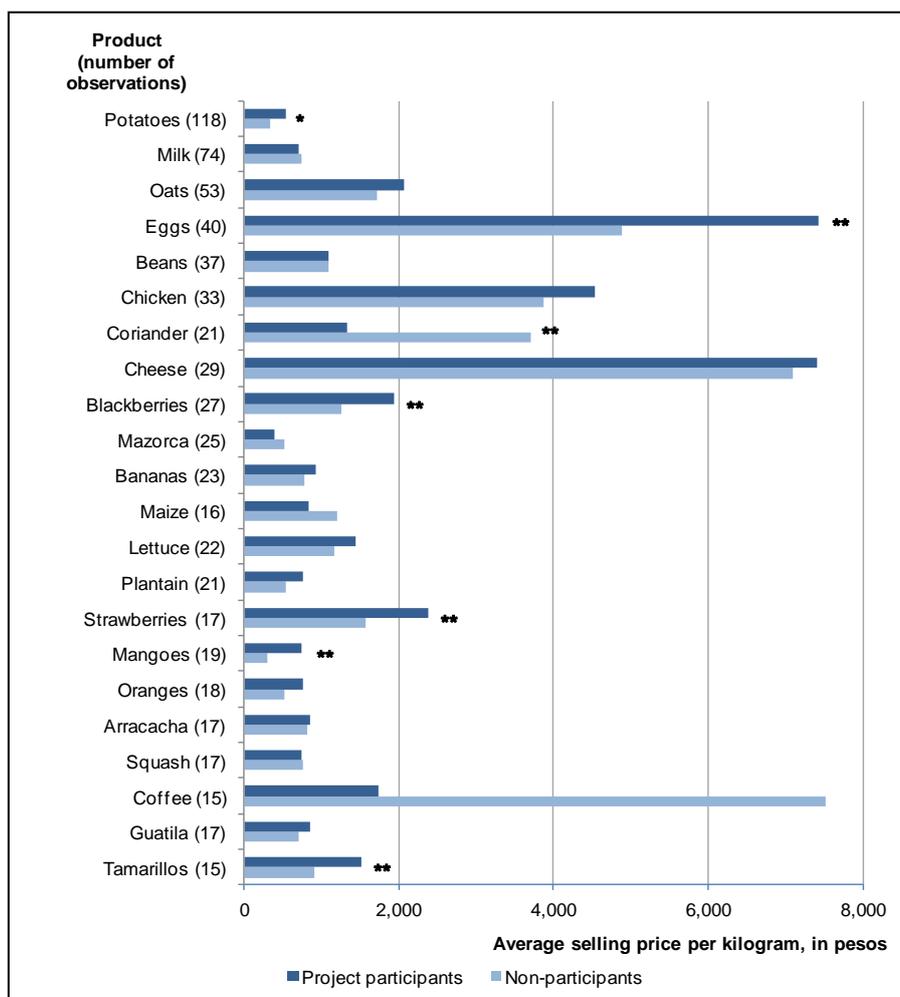
A key outcome area for the project is the extent to which participants have been able to obtain higher prices when selling their products. The question is not simply whether products sold through the farmers' markets are sold at higher prices than those sold through other channels. Rather, as discussed in Section 2, the aim of the project was to build the market power of producers through exposing them to farmers' markets and building their skills and confidence in negotiation, and so enable them to generate more favourable prices when selling through all marketing channels.

The effect of the project on prices is challenging to evaluate, because the range of products grown in the Central Region of Colombia is very large. Sales of 253 product types were recorded in the survey data, of which nearly half were recorded as having been sold by only one producer. Figure 5.1 shows a comparison of the average prices realised by project participants and non-participants for sales of all the products for which at least 15 observations were available for analysis.¹¹ The number of observations available for many of the comparisons shown in Figure 5.1 is very small, so the potential for finding statistically significant differences is limited. Nevertheless, of the 22 products listed, statistically significant differences in selling price between the participants and non-participants were found for seven of them. Of those, the average price was higher among project participants in six cases (potatoes, eggs, raspberries, strawberries, mangoes and tomato de árbol), and higher among non-participants in only one case (coriander).¹² Despite the lack of significant differences for the other products listed, it is notable that the average price received was higher among participants than non-participants among the majority (16 out of 22) of the products on the list.

It would be desirable to test for the presence of price differentials between the participants and non-participants more systematically than is possible from a simple comparison of prices for specific products. To that end, for each household, the average per-kilogram price was calculated for *all* the products sold by that household during December 2013 that were reported in standard weights and could be converted into kilograms. (This includes approximately 68 per cent of all the products for which sales were reported in the survey: the remainder were reported in non-standard units and conversion to kilograms could not be made.)¹³ Clearly the per-kilogram value of different products varies widely (as is clear from the selection of products shown in Figure 5.1). However, if the balance of higher value-per-kilogram and lower value-per-kilogram products is similar between the project participants and non-participants, then this measure should provide some indication of any overall difference in prices.

In column 2 of Table 5.5 we find that there is a large positive difference between the average price of products sold by the participants and non-participants, though this difference is statistically significant only at the 10 per cent level.¹⁴ Since the range of average prices was very large (perhaps as a result of some households selling a particularly unusual range of products, or because of errors in respondents' recollections of the details), logarithmic transformation was carried out to reduce the influence on the overall result of observations with particularly large average prices. After logarithmic transformation, as shown in column 3, the difference between average selling price on the part of participants and non-participants is clearly statistically significant. The estimated difference of 0.54 is consistent with prices being around 70 per cent higher on average per kilogram of products sold by project participants than those sold by non-participants.

Figure 5.1: Comparison of prices realised for specific products



What cannot be determined from this measure is the extent to which the per-kilogram price difference depends on each of these factors:

1. Project participants selling types of products with a higher value for their weight than non-participants (for example, they may be selling more soft fruit and fewer root vegetables).
2. Participants selling similar types of products, but with higher quality than non-participants and so receiving higher prices.
3. Participants realising higher prices for the same type and quality of products, as a result of the better opportunities available to them through the farmers' markets, and through improvements in their negotiation skills.

Some evidence suggesting that the first of these three factors is important is presented in column 4 of Table 5.5. There it can be seen that the total weight of all products sold by project participants during December 2013 was considerably lower on average than that for non-participants. This may imply that the differences in per-kilogram prices shown in columns 2 and 3 of the table are caused by the project participants changing to products that simply have lower weight.

It should be reiterated that the results presented in columns 2 to 4 of Table 5.5 are based only on information obtained during the survey about transactions that were reported in standard units of measurement (approximately 68 per cent of the total number of products sold). This creates a significant element of uncertainty, so caution should be exercised in interpreting directly from those results.

Table 5.6 examines the total value of all products reported to be sold by respondents' households during December 2013. Unlike the figures in Table 5.5, these figures are derived simply by adding the value of sales of every product recorded in the survey – so the figures are not subject to the same degree of uncertainty as those in Table 5.5.¹⁵

Table 5.6: Revenue from sales in December 2013

	1	2	3	4
	Total gross revenue (pesos)	Total gross revenue (logarithm of pesos)	Total revenue after deducting transport costs (pesos)	Total revenue after deducting transport costs (logarithm of pesos)
Intervention group mean:	2 982 617	13.2	2 811 037	13.1
Comparison group mean:	2 677 115	13.1	2 489 748	13.2
Difference:	305 502 (612 521)	0.0 (0.4)	321 290 (611 721)	-0.1 (0.4)
Observations (intervention)	153	153	153	152
Observations (total):	445	445	445	443

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

Total sales figures are shown in their original form and after logarithmic transformation; again, the logarithmic transformation was carried out so as to reduce the dependence of estimates on households with particularly large sales figures.

It can be seen from column 1 of the table that survey respondents reported having sold an average of 2.8 million pesos' worth of products (approximately US\$ 1500) during December 2013. Although this figure is estimated to be slightly higher among the project participants and non-participants, the difference is not statistically significant.

Conscious that the cost of transporting goods from their farms to the capital city to participate in farmers' markets could be significant, respondents were also asked to estimate the costs they had paid for transport of all the products sold during December 2013. As would be expected, most of the project participants reported having paid some transport costs during that month, against just over half of the comparison respondents. However, the reported transport costs were generally small in comparison to the value of sales (180 000 pesos on average), so the results after deducting transport costs – shown in columns 3 and 4 of the table – are little different from the gross sales figures.

A better indicator of the project's contribution to household income would take account of more of the costs of producing and marketing the products for which sales were reported. Such a measure would account for costs of inputs, rent for land on which products are grown (or the value of potential alternative uses for the land), and the value of the producers' time taken both to grow the products and to bring them to market. Such an exercise would be very complicated, and accounting for all costs in this way is rarely attempted in practice. Instead, in Section 5.5 we will examine household consumption as a proxy for overall net household income.

In summary, then, when examining respondents' sales of products during December 2013, we have found that:

- Project participants sold a much wider range of products than non-participants.
- The prices being received by project participants for sales of some of the most common product types were significantly higher than the prices received by non-participants. In addition, the average per-kilogram prices received by project participants is clearly higher.
- The total weight of products sold by project participants appears to be considerably smaller than that sold by non-participants (with the caveat that this comparison could be made among only 68 per cent of the transactions recorded in the survey data).
- Project participants and non-participants generated approximately the same total revenue from sales of agricultural products during the month.

We will return to assessing the significance of these findings in Section 6, after considering the effect of the project on net household income in the next section.

5.4 OVERALL HOUSEHOLD INCOME

The previous section found some evidence that project participants were realising higher prices when selling agricultural products, but were not necessarily generating higher revenue overall. Of course, this information does not provide a complete picture about the effect of the project on household income. It does not account, for example, for costs of production, nor for changes in the time that participants devoted to agricultural production and sales as against other livelihoods activities. In a context where households generally have multiple livelihoods activities, it is possible that a project that has made agricultural activities more productive could have diverted resources from other livelihoods activities. It is important, therefore, to evaluate the effects of the project on household wellbeing as a whole.

Measuring household income directly is problematic: self-reported measures of total income are generally regarded as unreliable, given the wide variety of activities that households engage in to generate income.¹⁶ 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.¹⁷ The Effectiveness Review therefore followed common practice in micro-level economic analysis, by considering the value of household consumption as a proxy measure 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 what types of food they had consumed over the previous seven-day period, as well as the quantity. 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 had spent on non-food items over the past seven days, past month, past three months, or past 12 months, as appropriate to the particular item.

The household expenditure measure was calculated by converting each of the expenditure types into a per-day figure and adding them together. This figure was then divided by a factor representing household size, to generate a per-day, per-person expenditure figure.¹⁸ As with the measures of agricultural sales, the expenditure variable has been expressed on a logarithmic scale, to reduce the influence on the

overall result of any households with extreme values for total consumption. The comparison of expenditure between supported households and comparison households, both before and after logarithmic transformation, is shown in Table 5.7.

It can be seen in column 1 of the table that the value of food consumed within the households of project participants was greater on average than that consumed in non-participants' households – although this difference was statistically significant only at the 10 per cent level.¹⁹ However, the difference is seen to be more significant after logarithmic transformation, as shown in column 2. The difference in the logarithmic values of 0.18 implies a difference in food consumption between the project participants and non-participants of approximately 20 per cent.

Table 5.7: Household consumption

	1	2	3	4	5
	Food consumption per adult equivalent per day (pesos)	Food consumption per adult equivalent per day (logarithm of pesos)	Total household consumption per adult equivalent per day (pesos)	Total household consumption per adult equivalent per day (logarithm of pesos)	Global indicator for livelihoods support %
Interventio	9 474	8.83	27 037	9.79	68.9
Compariso	6 806	8.64	20 745.5	9.65	63.8
Difference:	2 657* (1 575)	0.18** (0.075)	6 227 (4 769.5)	0.14 (0.095)	4.8 (5.9)
Observatio	151	151	151	151	151
Observatio	443	443	443	443	443

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

Columns 3 and 4 show comparisons corresponding to those already discussed in columns 1 and 2, but this time with non-food expenditure included. Consistent with the food consumption measure, total consumption is also higher among the households of project participants – although it is less clear that this difference is statistically significant. After logarithmic transformation, a difference of 0.14 units is found between the households of project participants and the non-participants, implying that consumption is approximately 15 per cent higher among the participants. Although this result is not statistically significant at conventional levels, those obtained from most of the alternative statistical models tested (as discussed in Appendix 2) are significant. The Oxfam GB global indicator for livelihoods support is derived directly from the per-capita household expenditure measure, by measuring the situation of each household against a 'typical' household in the region. The indicator is defined to take the value 1 if a household has expenditure per capita per day greater than the median household in the comparison group in the same region, and zero otherwise. As can be seen in column 5 of Table 5.7, 69 per cent of the project participant households reach that threshold, compared to 64 per cent of the matched non-participant households. That difference is not statistically significant, but again some of the estimates derived from alternative statistical models are significant.

In summary, then, the results of Table 5.5 imply that household consumption was significantly higher on average among the households of project participants than among households of non-participants at the time of the survey. One caveat to consider is that (as mentioned in Section 4.2), the comparison made between the project participants and non-participants of their situation at baseline is not perfect – in particular, more of the project participants than non-participants were in the top quintile according to their asset wealth in 2007. It is conceivable that the difference found in consumption here in 2014 could be a result of existing differences before the project started.

Clearly it would be preferable to look at the *change* in the level of household consumption since 2007. Unfortunately, detailed consumption data from 2007 are not available. However, an alternative indicator of households' level of material wellbeing was derived from questions included in the survey about the households' ownership of land, livestock and other assets, as well as about the physical conditions of their house. In addition to being asked about their asset ownership and housing conditions now, respondents were also asked to recall what assets they owned and the condition of their house in 2007. This information can therefore be used to examine changes in household wealth since that time.

To examine changes in wealth indicators, the data about ownership of particular assets and housing characteristics were aggregated into a single index of material wealth. To do this, they were first checked to see which of the indicators appeared to be good indicators of wealth. If each of the assets and housing characteristics are indicators of household wealth, they should be correlated with each other. That is, a household that scores favourably on one particular wealth indicator should be more likely to do so for other wealth indicators. Items that had low correlations or negative correlations with the others were therefore not included in the index.²⁰ In particular, ownership of most types of livestock was not found to be correlated with ownership of other assets, nor were ownership of a motorbike, ownership of the house (as opposed to renting), or some other minor characteristics. These variables were therefore not used in the construction of the wealth index.

A data reduction technique called principal component analysis (PCA) was used to produce the indices of overall material wealth. PCA produces a measure that maximises the variation in asset types by assigning more weight to those assets that are most highly correlated with the inter-item variation. Hence, each household's weighted index score is determined by both the number of assets it owns, and by the weight assigned to each asset type. The resulting index enables the relative wealth status of the households to be compared.

Two separate wealth indices were created. The wealth index based on the data recalled from 2007 is the measure that is shown in the table of summary statistics in Appendix 1, and that has been used throughout this analysis to control (to the greatest extent possible) for baseline differences in wealth status among the households of the various treatment groups. The second index allows the wealth indicators at the time of the survey to be compared with those from 2007.

A comparison of the households of project participants and non-participants in terms of the change in the wealth index is shown in column 1 of Table 5.8. Positive numbers represent a positive change in wealth indicators. It can be seen in the table that project participants have increased in terms of wealth indicators since 2007, whereas the non-participants have remained approximately at the same level.

Unfortunately there is no natural interpretation of the magnitude of the figures reported in column 1 of Table 5.8. The measure reported in column 2 may be clearer. This was constructed by categorising the households, in 2007 and at the date of the survey, into the quintile of the wealth index in which they lie. That is, the top 20 per cent of households according to wealth indicators were categorised together, as were those in the next 20 per cent, and so on. Column 2 shows the average movement of households of project participants and non-participants between these wealth quintiles. For example, a household that changed from being among the bottom 20 per cent of the sample in 2007 to being in the second (20 to 40 per cent) quintile at the time of the survey would be given a score of +1. A household that moved from the middle quintile to the bottom quintile would have a score of -2. It is clear that project participants on average moved up 0.34 wealth quintiles between 2007 and the date of the survey, relative to the non-participants.

It appears, then, the wealth indicators of project participant households increased between 2007 and the time of the survey at a greater rate than those of non-participant households. This provides support to the finding that the project has resulted in a significant increase in household income and material wellbeing over that time.

Table 5.8: Index of wealth indicators

	1	2
	Difference in wealth index between 2007 and date of survey	Number of quintiles of wealth index in which household increased
Intervention group mean:	0.70	0.18
Comparison group mean:	-0.09	-0.17
Difference:	0.79*** (0.24)	0.34*** (0.13)
Observations (intervention group):	153	153
Observations (total):	445	445

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

5.5 INVOLVEMENT IN ADVOCACY ACTIVITIES

As discussed in Section 2, one of the project's aims was to involve producers in active citizenship and advocacy activities. To evaluate the project's success in this respect, the questionnaire included questions about respondents' understanding of some political issues affecting producers, and about whether they had participated in advocacy activities – both before and since 2007.

Table 5.9 shows a comparison between project participants and non-participants in terms of their awareness of free-trade agreements and their impacts on rural producers, and of the programmes that the office of the mayor of Bogotá has in place to support rural producers.²¹ In all three respects, there is a large difference between the project participants and non-participants in the proportions that responded positively. It is important to note that female respondents were considerably less likely to respond positively to each of these three questions than male respondents, though the difference between participants and non-participants is clear among both female and male respondents.

Table 5.9: Awareness of political issues

	1	2	3
	Respondent is aware of what a free-trade agreement is %	Respondent is aware of impacts of free-trade agreements for rural producers %	Respondent is aware of the Mayor of Bogotá's initiatives to support rural producers %
Intervention group mean:	74.5	56.9	37.9
Comparison group mean:	51.6	33.0	3.3
Difference:	22.9*** (5.9)	23.9*** (6.6)	34.6*** (4.25)
Observations (intervention group):	153	153	153
Observations (total):	445	445	445

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

Table 5.10: Participation in advocacy activities

	1	2	3
	Respondent has participated in activities to create or change laws since 2007 %	Respondent has lobbied the city of Bogotá on the situation of rural producers since 2007 %	Respondent has been to meetings to make proposals in favour of rural producers since 2007 %
Intervention group mean:	25.5	41.8	46.4
Comparison group mean:	10.5	11.4	19.7
Difference:	15.0*** (5.6)	30.5*** (4.9)	26.7*** (6.15)
Observations (intervention group):	153	153	153
Observations (total):	445	445	445

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

There are also large differences between the project participants and non-participants in terms of their participation in advocacy activities, as shown in Table 5.10. For these questions, respondents were asked whether they had participated in each type of activity both before 2007 and since 2007, so providing more confidence in our judgements about whether the differences in these outcome measures are the effect of the project activities. Only small proportions of respondents recalled having ever participated in these three types of activity before 2007.²² While the proportions were greater among the project participants than among the comparison respondents, the differences are not large in magnitude, and certainly smaller than the differences in participation between the two groups since 2007. For this reason, we can have some confidence that the results shown in Table 5.10 do reflect the impact of the project on individuals' involvement in advocacy activities.

5.6 ATTITUDES TO GENDER ROLES

A section of the questionnaire sought to elicit respondents' attitudes towards gender roles by asking whether certain activities are more suited to women, to men, or both. The following are the activities that were included on the list of activities:²³

- Caring for children or ill, elderly or disabled people.
- Participating in producers' organisations.
- Taking part in training courses or events.
- Advocacy with the city government on issues facing producers.

Large majorities of all respondents stated that both genders are suited to each of these activities. As can be seen in Table 5.11, the proportions of respondents answering 'both' were slightly higher among the project participants than among the non-participants. These differences are statistically significant for all but the question about suitability to participate in advocacy activities.²⁴ Of course caution should be exercised in claiming that the project participants expressing these more positive attitudes to gender roles as a result of the project activities, particularly since no baseline data on attitudes is available. In addition, it clearly cannot be known from these results how these positive expressions of gender roles translate tangibly into changes in participants' actual behaviour.

Table 5.11: Attitudes to gender roles

	1	2	3	4
	Respondent agrees that both sexes are suited to care for children and ill, elderly or disabled people %	Respondent agrees that both sexes are suited to participating in producers' organisations %	Respondent agrees that both sexes are suited to participating in training courses or events %	Respondent agrees that both sexes are suited to taking part in advocacy activities %
Intervention	96.7	97.4	99.3	98.0
Comparison	91.2	88.3	96.0	95.3
Difference:	5.6* (3.0)	9.1** (4.1)	3.3* (1.7)	2.8 (2.0)
Observations	153	153	153	153
Observations	445	445	445	445

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

6 CONCLUSIONS

6.1 CONCLUSIONS

This Effectiveness Review has found evidence that the farmers' markets initiative has made a positive contribution to the livelihoods of rural producers. The difference in consumption between the households of project participants and those of the matched non-participants, combined with the apparent increase in wealth indicators (asset ownership and housing conditions) since 2007, suggests that net household income among the participants is significantly higher than it would have been without this project. The estimates derived from the measures of household consumption imply that the magnitude of this increase in income is around 15 to 20 per cent.

Detailed data about sales made by survey respondents during December 2013 show that the project participants were selling a much wider range of products (an average of 5.4 products sold during that month) than the non-participants (2.2 products on average). A key question is the extent to which project participants have been able to realise higher prices for sales of their products. Among the 22 most common product types sold, the average price received by the project participants was significantly higher than that received by the non-participants for six products. (There is only one example of a product for which the non-participants received a significantly higher price.) Even among those products for which the price differences are not statistically significant, there appears to be a trend of higher prices being realised by the project participants. This conclusion is given extra weight by calculating the average price per kilogram of the products sold by each household, for all products that could be compared in weight terms (68 per cent of the total number of items recorded in the dataset). Different agricultural products obviously have very different prices per kilogram, so this is only an approximate measure – but it does show a large and statistically significant difference between the project participants and non-participants. The higher prices being gained by the project participants may be a direct result of the increased prices available in the farmers' markets, or they may be due to the project participants having improved negotiation skills when selling through other channels, or they may be due to the project participants having increased the quality of the products they are selling – or a combination of all three factors.

On the other hand, the total volume (measured by weight) of products sold by the participants in December 2013 appears to have been lower than that sold by the non-participants. This finding is compatible with the project participants having switched to the production of higher-value agro-ecological crops, which are produced in smaller quantities. However, there was no difference between the project participants and non-participants in the total revenue generated from sales of agricultural products during December 2013. This is surprising given that the prices being gained for specific products generally appear to be higher, and that overall household income (as measured by consumption) is also higher.

The Effectiveness Review also examined evidence for the project's impact on producers' political awareness and participation. More of the project participants had an understanding of the consequences of free-trade agreements and awareness of the work of the city of Bogotá in support of rural producers, and were much more likely than non-participants to have taken part in advocacy activities. In addition, more of the project participants expressed positive opinions on gender roles than the non-participants.

6.2 PROGRAMME LEARNING CONSIDERATIONS

The results of this Effectiveness Review add to the proof that farmers' markets have a positive impact in terms of increasing income. Concrete quantitative proof is also being gathered for the first time about their impact on marketing capacities, organisational aspects, and advocacy and civil activism.

This Effectiveness Review provides clear evidence that the new marketing channels, which cut out intermediaries, and the related support provided to producers under this project have led to a significant improvement in household income. This evidence can be used to strengthen the case both for scaling up the farmers' markets in Bogotá and the Central Region and for encouraging adoption in other cities. To the extent that political support for farmers' markets depends on an analysis of how public funds can most effectively be used to support rural producers, this evaluation provides a basis against which the effectiveness of alternative interventions can be assessed.

APPENDIX 1: BASELINE STATISTICS BEFORE MATCHING

	Intervention mean	Comparison mean	Difference	Standard error
Number of household members in 2007	3.70	3.48	0.22	(0.16)
Proportion of household members who were children (less than 16 years old) in 2007	29.1	25.1	4.03*	(2.26)
Proportion of adult household members in 2007 who were fit and able to work	99.0	97.8	1.22	(0.86)
Household had only one adult member in 2007	% 15.3	11.5	3.77	(3.23)
Household had no male adult members in 2007	% 14.0	5.76	8.26***	(2.67)
All adult household members were elderly (at least 60 years old) in 2007	% 8.92	13.3	-4.42	(3.14)
Household head is female	% 26.1	19.7	6.42	(4.00)
Age of household head in 2007	years 44.1	44.7	-0.57	(1.35)
Household head was elderly (at least 60 years old) in 2007	% 26.8	28.5	-1.73	(4.36)
Household head is fit and able to work	% 98.7	98.5	0.24	(1.16)
Household head has any education	% 96.8	94.8	1.97	(2.02)
Household head completed primary school	% 65.6	57.3	8.33*	(4.75)
Household head completed secondary school	% 22.9	9.09	13.8***	(3.27)
Number of years of education of household head	6.20	4.80	1.39***	(0.32)
Respondent is female	% 63.7	37.0	26.7***	(4.68)
Female respondent interviewed by male interviewer	% 33.8	14.5	19.2***	(3.84)
Male respondent interviewed by female interviewer	% 25.5	31.8	-6.34	(4.43)
Respondent is head of household	% 56.1	74.5	-18.5***	(4.43)
Age of respondent in 2007	years 40.5	42.5	-2.06	(1.34)
Respondent was elderly (at least 60 years old) in 2007	% 17.2	24.2	-7.04*	(4.01)
Respondent is fit and able to work	% 97.5	99.1	-1.64	(1.15)
Respondent has any education	% 95.5	95.5	0.087	(2.02)
Respondent completed primary school	% 66.9	59.1	7.79*	(4.71)
Respondent completed secondary school	% 27.4	12.7	14.7***	(3.63)
Number of years of education of respondent	6.67	5.25	1.42***	(0.34)
Proportion of adult household members in 2007 with any education	% 97.1	93.8	3.38**	(1.56)
Proportion of adult household members in 2007 who completed primary school	% 69.8	61.0	8.77**	(3.72)
Proportion of adult household members in 2007 who completed secondary school	% 32.1	16.3	15.9***	(3.05)
Household owned any land in 2007	% 59.2	72.4	-13.2***	(4.49)
Land area owned by household in 2007	hectares 1.31	1.22	0.094	(0.19)
Household cultivated any land in 2007	% 59.9	74.5	-14.7***	(4.41)
Land area cultivated by household in 2007	hectares 1.21	1.23	-0.023	(0.26)
Sources of income for household in 2007:				
Sale of products from own farm	% 58.0	75.8	-17.8***	(4.38)
Sale of livestock products from own farm	% 45.9	42.7	3.13	(4.82)
Sale of crops or livestock products from others' farms	% 18.5	7.88	10.6***	(3.04)
Sale of processed products	% 26.1	7.88	18.2***	(3.24)
Non-agricultural commerce	% 23.6	13.9	9.63***	(3.63)
Casual labour	% 49.0	54.8	-5.80	(4.84)
Non-agricultural self-employment	% 34.4	27.0	7.43*	(4.41)
Regular formal employment	% 20.4	11.8	8.56**	(3.41)
Remittances	% 4.46	5.15	-0.69	(2.10)

		Intervention mean	Comparison mean	Difference	Standard error
Pension	%	1.91	1.52	0.40	(1.23)
Rental income	%	3.82	1.82	2.00	(1.50)
Household sold any agricultural or livestock products in 2007	%	40.8	41.8	-1.05	(4.79)
Agricultural or livestock products in 2007 sold to:					
Intermediaries who visited the farm	%	31.2	44.2	-13.0***	(4.72)
Other intermediaries	%	24.8	36.7	-11.8***	(4.53)
Direct to consumers	%	15.3	8.48	6.80**	(2.98)
Local market	%	13.4	4.55	8.83***	(2.51)
Supermarkets or other retailers	%	5.10	0.91	4.19***	(1.43)
Purchasers in Bogotá	%	19.1	14.8	4.26	(3.58)
Other purchasers	%	9.55	4.24	5.31**	(2.29)
Household was participating in a producers' group in 2007	%	24.2	3.33	20.9***	(2.76)
Household was in the lowest 20% of the sample according to wealth indicators recalled from 2007 ^a	%	17.2	21.5	-4.32	(3.89)
Household was in the second 20% of the sample according to wealth indicators recalled from 2007	%	17.2	21.2	-4.01	(3.88)
Household was in the middle 20% of the sample according to wealth indicators recalled from 2007	%	16.6	21.8	-5.26	(3.89)
Household was in the fourth 20% of the sample according to wealth indicators recalled from 2007	%	17.8	20.9	-3.07	(3.88)
Household was in the upper 20% of the sample according to wealth indicators recalled from 2007	%	31.2	14.5	16.7***	(3.81)
Household had an electricity connection in 2007	%	96.8	97.0	-0.15	(1.68)
Distance from house to nearest town in 2007, by most commonly-used method of transport	minutes	34.2	32.8	1.44	(3.68)
Observations		157	330	487	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Variables dated 2007 are estimates, based on recall data or reconstructed from the composition of the household at the time of the survey. The construction of the wealth index is described in Section 5.4.

^a These variables were not used for matching or as covariates in regression models, since they are highly correlated with other variables on the list.

APPENDIX 2: 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 woman is observationally 'similar' to another woman. For an overview, we refer to Caliendo and Kopeinig (2008).²⁵ 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)²⁶ 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 and A1.2 present the probit regression results used to estimate the propensity scores in our context. **Error! Reference source not found.** Table A1.1 shows the probit results for the non-parsimonious model entering the full set of matching variables considered in this study. 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: non-parsimonious model

	Coefficient	Standard error	p-value
Number of household members in 2007 = 1	0.010	(0.067)	0.882
Proportion of household members who were children (less than 16 years old) in 2007	0.037	(0.461)	0.936
Proportion of adult household members in 2007 who were fit and able to work	1.444	(1.214)	0.234
Household had only one adult member in 2007 = 1	0.125	(0.296)	0.674
Household had no male adult members in 2007 = 1	0.678	(0.373)	0.069
All adult household members were elderly (at least 60 years old) in 2007	-0.023	(0.342)	0.947
Household head is female = 1	-0.327	(0.305)	0.284
Age of household head in 2007 years	-0.004	(0.014)	0.805
Household head was elderly (at least 60 years old) in 2007 = 1	0.640	(0.385)	0.097
Household head is fit and able to work = 1	-0.574	(0.821)	0.484
Household head has any education = 1	-0.380	(0.670)	0.570
Household head completed primary school = 1	-0.242	(0.327)	0.459
Household head completed secondary school = 1	0.109	(0.561)	0.846
Number of years of education of household head	0.024	(0.082)	0.768
Respondent is female = 1	0.886	(0.353)	0.012
Female respondent interviewed by male interviewer = 1	0.409	(0.211)	0.052
Male respondent interviewed by female interviewer = 1	0.740	(0.235)	0.002
Respondent is head of household = 1	-0.070	(0.312)	0.822

		Coefficient	Standard error	p-value
Age of respondent in 2007	years	0.004	(0.014)	0.786
Respondent was elderly (at least 60 years old) in 2007 = 1		-0.783	(0.430)	0.068
Respondent is fit and able to work = 1		0.114	(1.078)	0.916
Respondent has any education = 1		-0.512	(0.712)	0.472
Respondent completed primary school = 1		-0.058	(0.328)	0.861
Respondent completed secondary school = 1		-0.425	(0.544)	0.434
Number of years of education of respondent		0.000	(0.080)	0.996
Proportion of adult household members in 2007 with any education		1.247	(0.864)	0.149
Proportion of adult household members in 2007 who completed primary school		0.101	(0.410)	0.806
Proportion of adult household members in 2007 who completed secondary school		0.979	(0.427)	0.022
Household owned any land in 2007 = 1		-0.543	(0.194)	0.005
Land area owned by household in 2007	hectares	0.086	(0.041)	0.039
Household cultivated any land in 2007 = 1		-0.006	(0.222)	0.979
Land area cultivated by household in 2007	hectares	0.021	(0.025)	0.396
Sources of income for household in 2007:				
Sale of products from own farm = 1		-0.215	(0.218)	0.324
Sale of livestock products from own farm = 1		0.167	(0.156)	0.287
Sale of crops or livestock products from others' farms = 1		0.663	(0.216)	0.002
Sale of processed products = 1		0.921	(0.200)	0.000
Non-agricultural commerce = 1		0.183	(0.191)	0.339
Casual labour = 1		0.018	(0.163)	0.911
Non-agricultural self-employment = 1		0.431	(0.167)	0.010
Regular formal employment = 1		-0.071	(0.229)	0.756
Remittances = 1		-0.064	(0.354)	0.856
Pension = 1		0.801	(0.583)	0.169
Rental income = 1		0.206	(0.445)	0.643
Household sold any agricultural or livestock products in 2007 = 1		0.043	(0.158)	0.785
Household was in the second 20% of the sample according to wealth indicators recalled from 2007 = 1		0.160	(0.227)	0.480
Household was in the middle 20% of the sample according to wealth indicators recalled from 2007 = 1		-0.029	(0.234)	0.901
Household was in the fourth 20% of the sample according to wealth indicators recalled from 2007 = 1		0.190	(0.233)	0.415
Household was in the upper 20% of the sample according to wealth indicators recalled from 2007 = 1		0.317	(0.275)	0.249
Household had an electricity connection in 2007 = 1		0.003	(0.002)	0.081
Distance from house to nearest town in 2007, by most commonly used method of transport	minutes	0.216	(0.412)	0.600
Observations		487		

Notes: Probit regression. Variables dated 2007 are estimates, based on recall data or reconstructed from the composition of the household at the time of the survey. Explanatory variables expressed as $x = 1$ represent binary variables taking values of either 0 or 1. The dependent variable is 1 if the household is a participant in the project activities, and 0 otherwise. The coefficients represent the contribution of each explanatory variable/characteristic to the probability that a household participates in the project.

The final set of variables used in the matching process was identified using a backwards stepwise regression to identify those variables correlated with being in an intervention group at p -values of 0.20 or less. Nineteen such variables were identified. Table A1.2 shows the results of the probit model restricted to this final (restricted) set of matching variables.

Table A1.2: Estimating the propensity score: non-parsimonious model

	Coefficient	Standard error	p-value
Household had no male adult members in 2007 = 1	0.776	(0.288)	0.007
Household head is female = 1	-0.382	(0.226)	0.091
Household head was elderly (at least 60 years old) in 2007 = 1	0.653	(0.278)	0.019
Respondent is female = 1	0.845	(0.232)	0.000
Female respondent interviewed by male interviewer = 1	0.399	(0.190)	0.036
Male respondent interviewed by female interviewer = 1	0.672	(0.215)	0.002
Respondent was elderly (at least 60 years old) in 2007 = 1	-0.772	(0.305)	0.011
Respondent has any education = 1	-0.800	(0.428)	0.062
Respondent completed secondary school = 1	-0.383	(0.277)	0.167
Proportion of adult household members in 2007 with any education	1.261	(0.600)	0.036
Proportion of adult household members in 2007 who completed secondary school	1.101	(0.329)	0.001
Household owned any land in 2007 = 1	-0.518	(0.176)	0.003
Land area owned by household in 2007 hectares	0.090	(0.037)	0.016
Sources of income for household in 2007:			
Sale of products from own farm = 1	-0.255	(0.166)	0.125
Sale of crops or livestock products from others' farms = 1	0.691	(0.201)	0.001
Sale of processed products = 1	0.909	(0.190)	0.000
Non-agricultural self-employment = 1	0.414	(0.156)	0.008
Pension = 1	0.724	(0.542)	0.181
Distance from house to nearest town in 2007, by most commonly-used method of transport minutes	0.003	(0.002)	0.105
Observations	487		

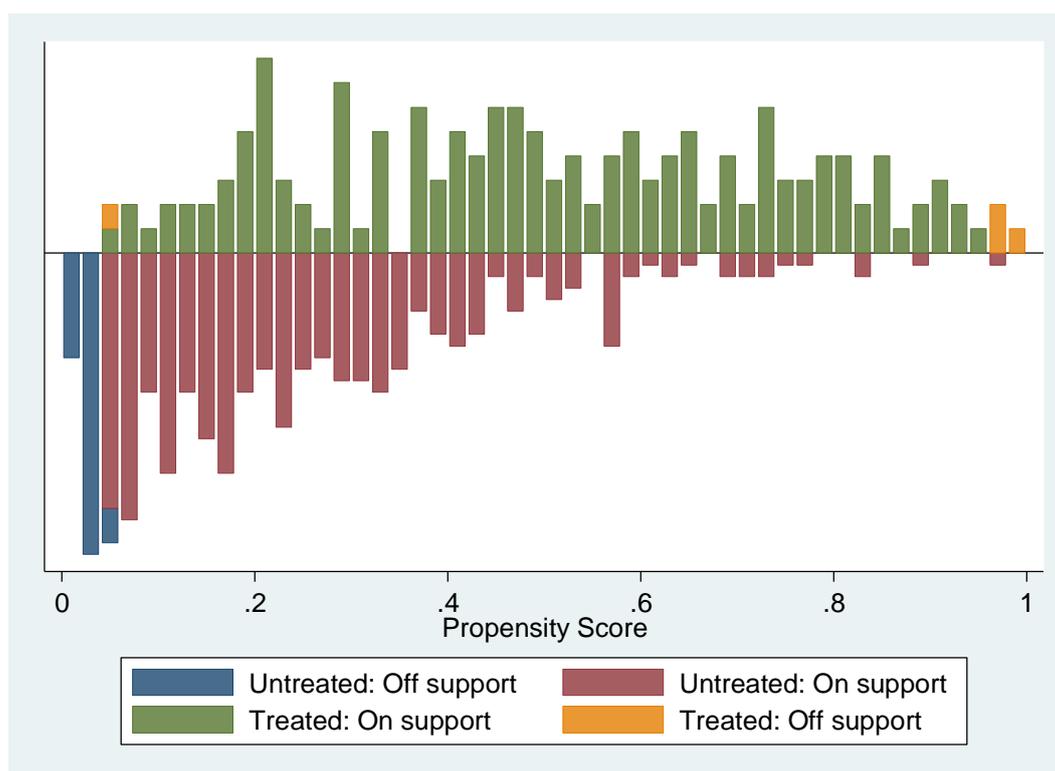
Notes: Probit regression. Variables dated 2007 are estimates, based on recall data or reconstructed from the composition of the household at the time of the survey. Explanatory variables expressed as $x = 1$ represent binary variables taking values of either 0 or 1. The dependent variable is 1 if the household is a participant in the project activities, and 0 otherwise. The coefficients represent the contribution of each explanatory variable/characteristic to the probability that a household participates in the project.

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 observations have a comparison observation "nearby" in the propensity score distribution' (Heckman, LaLonde and Smith, 1999²⁷). Since some significant differences were found between the intervention and comparison groups in terms of their baseline characteristics (as detailed in Appendix 1), some of the households 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). In this case, four of the 157 project participant households and 38 of the 330 non-participant households surveyed were dropped because they lay outside the area of common support. This means 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 area of common support and indicates the proportion of households lying on and off the common support area, by treatment group.

Figure A1.1: 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 (note that we use alternative matching procedures as a means of robustness checks in Appendix 2). 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 mean for kernel matching, and weights given by the distribution of the differences in propensity score. Thus 'good' matches are given greater weight than 'poor' matches.

We use the *psmatch2* module in Stata using the default bandwidth of 0.06, and restrict the analysis on the area of common support. When using PSM, standard errors of the estimates were bootstrapped using 1,000 repetitions (clustered by municipality), to account for the additional variation caused by the estimation of the propensity scores and the determination of the common support.²⁸

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. Efforts were made to ensure that the covariates were balanced across groups at *p*-values greater than 0.20. The balance of each of the matching variables after kernel matching is shown in Table A1.3. None of the variables implemented for the matching is statistically significant in the matched sample.

Table A1.3: Balancing test on the restricted set of matching variables

	Treated	Untreated	p-value
Household had no male adult members in 2007 = 1	0.144	0.131	0.747
Household head is female = 1	0.268	0.240	0.571
Household head was elderly (at least 60 years old) in 2007 = 1	0.261	0.240	0.671
Respondent is female = 1	0.634	0.613	0.704
Female respondent interviewed by male interviewer = 1	0.333	0.386	0.336
Male respondent interviewed by female interviewer = 1	0.261	0.300	0.460
Respondent was elderly (at least 60 years old) in 2007 = 1	0.170	0.155	0.720
Respondent has any education = 1	0.967	0.957	0.636
Respondent completed secondary school = 1	0.268	0.248	0.690
Proportion of adult household members in 2007 with any education	0.977	0.975	0.876
Proportion of adult household members in 2007 who completed secondary school	0.320	0.303	0.689
Household owned any land in 2007 = 1	0.595	0.631	0.512
Land area owned by household in 2007 hectares	1.274	1.366	0.724
Sources of income for household in 2007:			
Sale of products from own farm = 1	0.582	0.634	0.346
Sale of crops or livestock products from others' farms = 1	0.183	0.232	0.293
Sale of processed products = 1	0.248	0.224	0.619
Non-agricultural self-employment = 1	0.327	0.301	0.623
Pension = 1	0.020	0.013	0.645
Distance from house to nearest town in 2007, by most commonly used method of transport minutes	34.542	33.153	0.773
Observations	153	292	

Notes: Variables dated 2007 are estimates, based on recall data or reconstructed from the composition of the household at the time of the survey. Explanatory variables expressed as $x = 1$ represent binary variables taking values of either 0 or 1.

Similarly, as shown in Table A1.4, we also pass the balance tests when using the full (unrestricted) set of matching variables. Only three of the variables in the complete set are unbalanced with p -values of less than 0.2. However, it is important to note that significantly more of the project participants are in the top quintile of the index of baseline wealth indicators than are the non-participants. This is a reason for caution, particularly when analysing outcome variables relating to material wellbeing.

Table A1.4: Balancing test on the full set of baseline covariates

	Treated	Untreated	p-value
Number of household members in 2007 = 1	3.699	3.486	0.270
Proportion of household members who were children (less than 16 years old) in 2007	0.288	0.279	0.740
Proportion of adult household members in 2007 who were fit and able to work	0.990	0.989	0.887
Household had only one adult member in 2007 = 1	0.144	0.138	0.881
Household had no male adult members in 2007 = 1	0.144	0.131	0.747
All adult household members were elderly (at least 60 years old) in 2007	0.085	0.099	0.669
Household head is female = 1	0.268	0.240	0.571
Age of household head in 2007 years	44.000	43.422	0.707
Household head was elderly (at least 60 years old) in 2007 = 1	0.261	0.240	0.671
Household head is fit and able to work = 1	0.987	0.995	0.451
Household head has any education = 1	0.974	0.982	0.623
Household head completed primary school = 1	0.654	0.698	0.411
Household head completed secondary school = 1	0.229	0.168	0.186

	Treated	Untreated	p-value
Number of years of education of household head	6.163	5.879	0.502
Respondent is female = 1	0.634	0.613	0.704
Female respondent interviewed by male interviewer = 1	0.333	0.386	0.336
Male respondent interviewed by female interviewer = 1	0.261	0.300	0.460
Respondent is head of household = 1	0.569	0.568	0.992
Age of respondent in 2007 years	40.641	39.629	0.518
Respondent was elderly (at least 60 years old) in 2007 = 1	0.170	0.155	0.720
Respondent is fit and able to work = 1	0.980	0.975	0.747
Respondent has any education = 1	0.967	0.957	0.636
Respondent completed primary school = 1	0.673	0.721	0.369
Respondent completed secondary school = 1	0.268	0.248	0.690
Number of years of education of respondent	6.592	6.587	0.992
Proportion of adult household members in 2007 with any education	0.977	0.975	0.876
Proportion of adult household members in 2007 who completed primary school	0.697	0.727	0.464
Proportion of adult household members in 2007 who completed secondary school	0.320	0.303	0.689
Household owned any land in 2007 = 1	0.595	0.631	0.512
Land area owned by household in 2007 hectares	1.274	1.366	0.724
Household cultivated any land in 2007 = 1	0.601	0.651	0.366
Land area cultivated by household in 2007 hectares	1.198	1.114	0.812
Sources of income for household in 2007:			
Sale of products from own farm = 1	0.582	0.634	0.346
Sale of livestock products from own farm = 1	0.458	0.390	0.232
Sale of crops or livestock products from others' farms = 1	0.183	0.232	0.293
Sale of processed products = 1	0.248	0.224	0.619
Non-agricultural commerce = 1	0.229	0.167	0.178
Casual labour = 1	0.490	0.481	0.879
Non-agricultural self-employment = 1	0.327	0.301	0.623
Regular formal employment = 1	0.196	0.214	0.692
Remittances = 1	0.046	0.042	0.863
Pension = 1	0.020	0.013	0.645
Rental income = 1	0.039	0.020	0.332
Household sold any agricultural or livestock products in 2007 = 1	0.405	0.462	0.315
Household was in the second 20% of the sample according to wealth indicators recalled from 2007 = 1	0.176	0.140	0.382
Household was in the middle 20% of the sample according to wealth indicators recalled from 2007 = 1	0.170	0.183	0.763
Household was in the fourth 20% of the sample according to wealth indicators recalled from 2007 = 1	0.183	0.198	0.744
Household was in the upper 20% of the sample according to wealth indicators recalled from 2007 = 1	0.307	0.233	0.146
Household had an electricity connection in 2007 = 1	34.542	33.153	0.773
Distance from house to nearest town in 2007, by most commonly used method of transport minutes	0.967	0.962	0.800
Observations	153	292	

NOTES

- 1 A total of 13 project participants were targeted for interview in each sampled municipality: in principle it would therefore have been possible to restrict the sample to those municipalities with 13 or more participants, rather than those with 20 or more. However, it was not known at the time of sampling what proportion of the households would be available and willing to participate in the survey: a threshold of 20 households was used so as to ensure that there would be an ample number of reserve households on the list, so as to be able to achieve the required number of interviews in each municipality.
- 2 In contrast, for the midline survey, 13 households were targeted for interview in every municipality included in the project that had at least 20 registered participants during 2013 (as well as in two additional municipalities with smaller numbers of participants, but which were considered as particularly interesting for other reasons). In addition, a random sample of participants' households in the Capital District of Bogotá was also interviewed. For these reasons, sampling weights had to be applied in the analysis of the midline data.
- 3 The construction of the wealth index is described in Section 5.4.
- 4 Indeed, when asked directly which year they began participating in the farmers' markets, 15 per cent of the project participants gave dates before 2007, when the markets are known to have first taken place. These account for the majority of the project participants who recalled having participated in a producer's group in 2007.
- 5 This analysis was carried out by adding terms for the interaction between being a project participant and the survey respondent being female, and for the number of years in which project participants reported having been participating in the farmers' markets (truncated at seven years for those who – apparently mistakenly – recalled having been participating since before 2007), to the parametric PSM and linear regression models for each of the outcome measures examined in this report.
- 6 As already noted in Section 4.2, respondents were also asked to recall whether they were participating in a producers' group in 2007. Approximately 24 per cent of the project participants said that they were, against only six per cent of the matched non-participants. It is possible that this figure is affected by recall error to some extent. In any case, there is a very large difference between the project participants and non-participants in the proportion who reported having started participating in a producers' group since 2007: this applied to 72 per cent of the project participants, and only one per cent of the non-participants.
- 7 Binary variables for take-up of each practice since 2007, constructed from the recalled baseline data, all produce estimates that are statistically significant at the 1 per cent level. Respondents who had taken up each practice since 2007 were also asked directly why they had made that decision. The support from the farmers' markets project was mentioned as the cause by more than half the project participants who had adopted each of those three practices.
- 8 The various statistical models all produce estimates of a difference in producers taking up organic agriculture that is positive. The estimate obtained from the standard PSM kernel model for which the results are shown in this section of the report is not statistically significant ($p = 0.11$), though the estimates from most of the alternative PSM and regression models are significant at the 5 or 10 per cent level. Forty-three per cent of the project participants who had adopted organic agriculture since 2007 said that they had been prompted to do so by the farmers' market project.
- 9 Again just over half of the project participants who have started classifying by quality since 2007 said that the farmers' markets project has been the direct cause of that decision.
- 10 This was found by adding a term for the interaction between being a project participant and residing in the department of Boyacá to the parametric PSM and linear regression models for the number of products sold. The coefficient on the interaction term in each case was statistically significant at the five per cent level. The coefficient on the overall term for being a project participant remained statistically significant at the one per cent level under each of the models after adding these interaction terms, confirming that there is an effect from project participation on the number of products sold during December 2013 in the other two departments.
- 11 That is, at least 15 observations were available, in total, for the intervention and comparison group, after matching. In the case of some products, more observations have been recorded, but in non-standard units that prevent any comparison being made. In all the analysis of prices in this section, a litre of a liquid product is assumed to weigh one kilogram. A further approximation has been made to derive the sales figures used in this section. Respondents were asked for the total amount of each product sold during December 2013, and for the per-unit price obtained in the last sale during that month. If sales were made more than once during the month, then the price from the last sale has been used as an approximation for the price realised during the earlier sales.
- 12 Finding a difference in favour of the non-participants in one case out of 22, which is statistically significant at the five per cent level is compatible with that difference being due to sampling error. Finding a difference in favour of the project participants in six cases out of 22 is very unlikely to be a result of sampling error.
- 13 The consideration described in the previous endnote about the price data being from the last transaction during December 2013, rather than the average of all transactions during that month, also apply to this measure.
- 14 This difference is not statistically significant under most of the PSM and regression models tested. However, models run under robust regression produce estimates that are significant with $p < 0.01$,

suggesting that the data may be affected by the presence of outliers, potentially caused by measurement error. This is what motivates the decision to examine the logarithm of average price, in column 3 of Table 5.5.

- 15 However, the approximation has again been made of applying the price data from the last transaction made during December 2013 to all sales of each product made during that month.
- 16 Morris, Saul, Calogero Carletto, John Hoddinott, and Luc J. M. Christiaensen. (1999) *Validity of Rapid Estimates of Household Wealth and Income for Health Surveys in Rural Africa: FCND Discussion Paper No. 72*. Washington: International Food Policy Research Institute.
- 17 See Damodar N. Gujarati, *Basic Econometrics* (fourth edition, New York: McGraw Hill, 2003).
- 18 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 $\frac{A + Kc}{1 + c}$, where A is number of adults in the household; K is the number of children; c is the consumption of a child relative to an adult; and stands for the extent of economies of scale. This effectiveness review follows the common practice of setting c equal to 0.33 and stands equal to 0.9, but the findings are not sensitive to reasonable changes in these parameters.
- 19 The approximately magnitude and statistical significance of this result is maintained under most of the statistical models and alternative formulations of the propensity score that were applied.
- 20 Cronbach's alpha was used to measure this inter-item correlation. The Cronbach's alpha obtained for all the indicators for the recalled 2009 data was 0.72. This alpha was increased to 0.77 by removing those items that had a low correlation with the others. The alpha derived for the index of change in wealth indicators was originally 0.73, and was increased to 0.78 by removing those items that had a low correlation with the others.
- 21 Respondents who said that they were aware of some of the impacts of free-trade agreements and aware of the support from the city of Bogotá were asked to mention some examples, to verify that their positive responses were accurate.
- 22 The case with the greatest reported participation was for lobbying the city of Bogotá, which 12.7 per cent of project participants reported having participated in before 2007.
- 23 Two more activities were included in the questionnaire, but due to an error in data transfer, the data is not usable.
- 24 No significant differences could be observed between the impact on male and female project participants – but with low-sensitive outcome measures and a small sample size, this is to be expected.
- 25 Marco Caliendo and Sabine Kopeinig 'Some Practical Guidance for the Implementation of Propensity Score Matching', *Journal of Economic Surveys*, vol. 22(1) (2008), pages 31–72.
- 26 Paul R. Rosenbaum and Donald B. Rubin, 'The Central Role of the Propensity Score in Observational Studies for Causal Effects', *Biometrika*, vol. 70(1) (1983), pages 41–55.
- 27 James J. Heckman, Robert J. LaLonde and Jeffrey A. Smith, 'The Economics and Econometrics of Active Labor Market Programs', *Handbook of Labor Economics*, vol. 3, part A (1999), pages 1865–2097.
- 28 Bootstrapping is a statistical procedure where repeated samples are drawn from the original sample and parameters, such as standard errors, are re-estimated for each draw. The bootstrapped parameter is calculated as the average estimate over the total number of repeated draws.

Oxfam Effectiveness Reviews

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

© Oxfam GB March 2015

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

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

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

OXFAM

Oxfam is an international confederation of 17 organisations networked together in over 90 countries, as part of a global movement for change, to build a future free from the injustice of poverty:

Oxfam America (www.oxfamamerica.org)

Oxfam Australia (www.oxfam.org.au)

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

Oxfam Canada (www.oxfam.ca)

Oxfam France (www.oxfamfrance.org)

Oxfam Germany (www.oxfam.de)

Oxfam GB (www.oxfam.org.uk)

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

Oxfam India (www.oxfamindia.org)

Intermón Oxfam (www.intermonoxfam.org)

Oxfam Ireland (www.oxfamireland.org)

Oxfam Italy (www.oxfamitalia.org)

Oxfam Japan (www.oxfam.jp)

Oxfam Mexico (www.oxfammexico.org)

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

Oxfam Novib (www.oxfamnovib.nl)

Oxfam Québec (www.oxfam.qc.ca)

Please write to any of the agencies for further information, or visit www.oxfam.org.

