

EVALUATING TRAINING PROJECTS ON LOW EXTERNAL INPUT AGRICULTURE: LESSONS FROM GUATEMALA

Jos Vaessen and Jan de Groot

Abstract

Despite the popularity of the promotional activities of low external input agriculture (LEIA), systematic evaluations of the impact of these activities are scarce. This paper discusses an impact evaluation study of a training project on LEIA in Guatemala. The evaluation design is based on a simple quasi-experimental design and complemented by qualitative methods of data collection. The paper illustrates the utility of this kind of mixed-method evaluation for studying the outcome and impact of small-scale development interventions given their specific constraints of money, expertise and time. In addition, a number of specific lessons regarding the role of the evaluation study, the training project and the adoption of LEIA practices are highlighted.

Research findings

- *The study shows how a basic quasi-experimental design, complemented by qualitative research methods, and without relying on sophisticated statistical techniques, can be very useful to determine the outcome and impact of a training project at the farm level, controlling for the influence of external variables. This type of mixed evaluation method would be quite adequate for the evaluation of similar relatively small-scale interventions.*
- *Farmers' adoption behaviour after the termination of the project can be characterised as selective and partial. Given the particular circumstances of small farmers (e.g. risk aversion, high opportunity costs of labour) it is not realistic to assume that a training project as described in the paper will bring about a complete transformation from a conventional farming system to a LEIA farming system.*
- *In line with the literature, the most popular practices (in this case for example organic fertilisers, medicinal plants) are those that offer a clear short-term return while not requiring significant investments in terms of labour or capital.*

Policy implications

- *The lessons produced by the baseline study could not be used to make mid-course corrections in the design and implementation of the project, with negative consequences for its eventual outcome and impact. It is suggested that a formal appraisal study be carried out to identify potential constraints before selecting the implementing organisation and defining the terms of reference of the project.*
- *Project outreach was concentrated in a limited number of communities and social networks connected to project extensionists who were themselves farmers in the region. When working with farmer-to-farmer extension and education models, close attention should be paid to possible biases in beneficiary selection and indirect effects on local power dynamics. If necessary, corrective action to ensure a broader and more equitable outreach should be taken.*
- *An ideological faith in the absolute supremacy of LEIA practices is not in the best interests of the farmer. Projects promoting LEIA should focus on the complementary effects of LEIA practices and conventional farming techniques, encouraging each farmer to choose the best balance for his/her needs.*

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Acronyms

IRDP	Integrated Rural Development Programme
LEIA	Low External Input Agriculture
NGO	Non-Governmental Organisation

EVALUATING TRAINING PROJECTS ON LOW EXTERNAL INPUT AGRICULTURE: LESSONS FROM GUATEMALA

1 INTRODUCTION

Development interventions promoting low external input agriculture (LEIA) have become increasingly popular in order to tackle resource degradation and poverty in agricultural communities all over the developing world. However, as stated recently, '[t]he effectiveness and impacts of these approaches have been subject of debate' (De Jager et al., 2004: 206). Systematic evaluations of the impact of the promotional activities of LEIA practices are scarce. In practice, many of the small- and medium-scale initiatives run by non-governmental organisations (NGOs), community-based organisations, and local and regional governments face a number of constraints in terms of a lack of expertise and the financial means to carry out studies to evaluate the socio-economic and ecological effects of LEIA.

In this paper we discuss an evaluation study of a training project in LEIA in the Department of Totonicapán, Guatemala. This project was carried out within the framework of an integrated rural development programme (IRDP) implemented by the European Union (EU) in cooperation with the Guatemalan government. The main objective of the study was to assess the outcome and impact of the project by showing the presence or absence of plausible effects of the project on participants and an indication of the magnitude of these effects. Based on the results of this study IRDP would decide whether or not to extend financial support to ORGANIC¹, the implementing organisation of the project. As ORGANIC has also worked on other EU-financed rural development projects the evaluation had a wider relevance than the Totonicapán project.

The primary focus of this paper is to describe and explain the advantages and disadvantages of the particular evaluation methodology applied in this study. The methodology comprises elements of both quantitative and qualitative research. We want to illustrate that this type of mixed method evaluation (Greene and Caracelli, 1997) is very useful for studying the outcome and impact of small-scale development interventions given their specific constraints of money, expertise and time. The basis of the evaluation methodology is a simple quasi-experiment. Quasi-experiments are research designs that involve comparisons between groups affected by a certain intervention and control groups. Participation in either category is not random. Specific statistical adjustments can be made in order to make the two types of groups equivalent in terms of outcome- and impact-related variables (Cook and Campbell, 1979). The quasi-experimental data are complemented by qualitative

methods of research (e.g. field visits, semi-structured stakeholder interviews) to allow for triangulation and a richer interpretation of the quantitative data.

As part of the evaluation methodology, a baseline (ex ante) study was carried out to map the situation of the participants at the beginning of the project and to identify potential constraints of the training project. The paper will show how the timing of the study and the deficient relationship between IRDP and ORGANIC reduced the policy impact of the ex ante study in terms of improving the design and implementation of the project. In fact, some of the disappointing outcomes and low impact of the project had already been anticipated in the ex ante study, but had been largely ignored by ORGANIC at that time. This evidently raises the question of how to ameliorate the connection between evaluation and improving practice, requiring a reflection on the role of evaluation in this type of project.

The paper starts with a brief description of the characteristics of the region in which the project was implemented, followed by an outline of the training project itself. The subsequent section deals with the issue of adopting LEIA practices and briefly discusses the main factors influencing the decision-making process of small farmers to do so. This section is followed by a comprehensive treatment of the methodology employed in the evaluation study. To assess the utility of the evaluation methodology in terms of analysing outcome and impact we illustrate a number of results. The paper concludes with a discussion of lessons learned regarding the applied evaluation methodology and the role of the evaluation study.

2 CONTEXT

The region

The Department of Totonicapán is situated in the western highlands of Guatemala. It is one of the smallest provinces in the country, consisting of eight municipalities. The population is predominantly indigenous (Maya-Quiché). The training project was aimed at small farmers in the four northern municipalities of the province (Santa Lucía La Reforma, San Bartolo de Aguas Calientes, Momostenango and Santa María Chiquimula²) where agriculture constitutes an important subsistence and income activity. Agricultural activities are complemented by forestry and non-agricultural activities such as weaving, tailoring, pottery and commerce. In the southern municipalities the situation is the opposite: non-

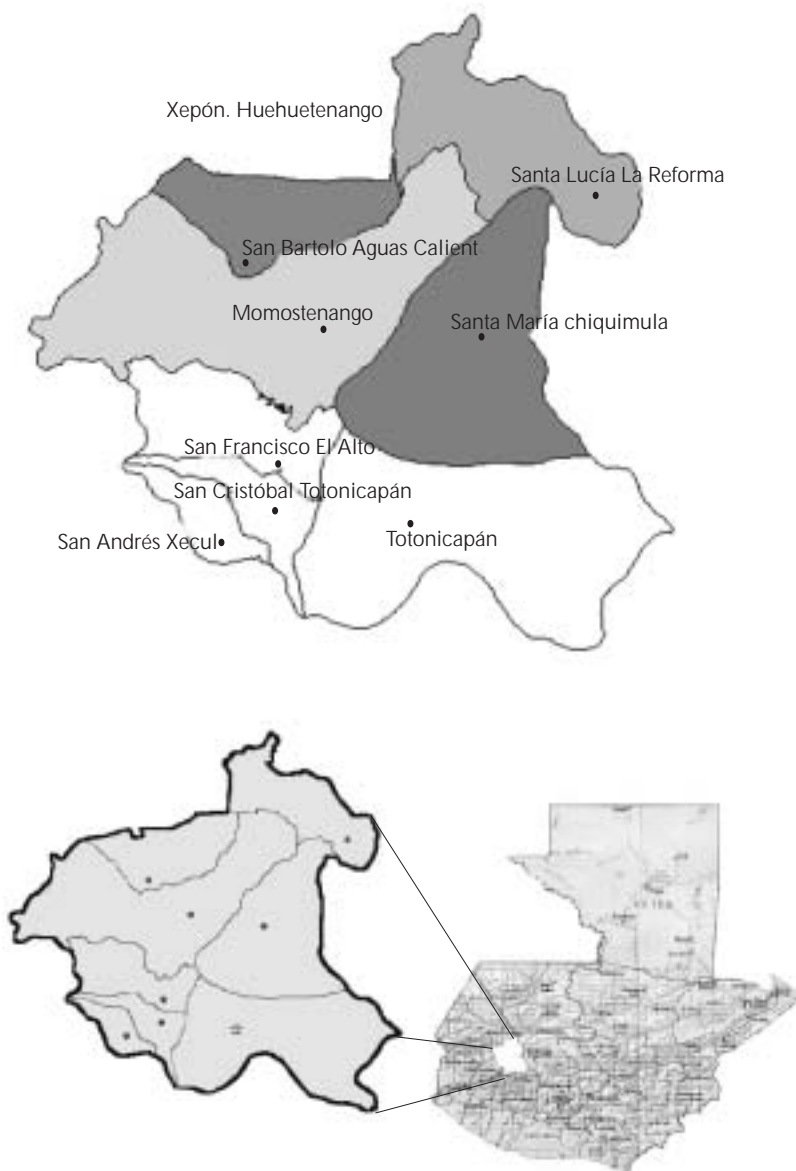
agricultural activities predominate, with agriculture of secondary importance as an income-generating activity.

Limited farm sizes, mountainous areas, mediocre soils, relative isolation and limited access to markets are important factors making agricultural production in the northern municipalities less attractive. Altitudes in the province vary between 3500 and 1700 metres, decreasing roughly from south to north. These differences in altitude imply significant differences in climatic circumstances. In the north, micro climates are more suited to subtropical crops and fruit trees, the most important crops being maize and beans. Crop diversification is limited. One of the main reasons for this is the fact that forced labour systems for coffee cultivation in the 19th and part of the 20th century

extracted so much labour from the indigenous highland communities that traditional diversified Mayan crop and livestock systems degenerated into a system of monocropping of maize and beans (McCreery, 1994; Carmack, 1995). Some horticultural crops (tomato, peppers) are also cultivated. Among the most important fruit trees to be found are avocado, peach and citrus, a substantial part of the fruit harvest being sold in local markets. Livestock production in the region is mainly limited to pigs, sheep and chickens. These are kept chiefly for subsistence purposes with the exception of sheep, which are kept mainly to produce wool for clothes.

From the beginning of the 1960s until the mid-1990s Guatemala suffered from internal conflict, leading to

Figure 1 The province of Totonicapán



numerous victims, in particular among the rural indigenous population. This applied especially to the municipality of Santa Lucía La Reforma in the project area where, among other things, it destroyed existing local organisations. One of the consequences of the conflict was a further deepening of distrust by the indigenous population of external organisations which, until 1998, were mostly governmental. In 1998, the agricultural and livestock services of the government were dismantled. As was often the case in other countries as well, the basic consideration was that these services should be financed but not directly implemented by the state. Sadly, after abolishing the official extension services, government funds for outreach activities implemented by NGOs never became available. Nowadays, NGOs partly fill the gap with their resources but cannot maintain the same level of outreach in quantitative and qualitative terms as their governmental predecessors. Moreover, outreach is less comprehensive than before as the NGOs normally only work with existing local organisations and groups.

The training project

In 1996, an integrated rural development programme (IRDP) financed by the EU and co-implemented by the Guatemalan government was established in the province of Totonicapán in western Guatemala. The programme comprised several components, including support for agriculture, basic infrastructure and small enterprise development. In 1998, in order to support small-scale agriculture in the relatively isolated northern municipalities of Totonicapán, IRDP decided to finance a training project in LEIA.

The main features of the project that was to be implemented by ORGANIC were:

- The project was to cover a period of three years (1998–2000).
- A total of 18 courses, each consisting of two to three days of practical training, would be imparted to participating farmers in the region. These would take place at an experimental farm run by ORGANIC.
- After each course, the participants would be given 'homework' and ORGANIC extensionists would provide follow-up at the farm level.
- The teachers of the courses, who were also to act as extensionists in the field, would be, like the participants, Mayan farmers and graduates of former courses by ORGANIC. There would be only one teacher, the proposed coordinator of the project, with a formal technical degree in agronomy.
- The methodology implemented by ORGANIC (teaching and follow-up) could be characterised as a form of farmer-to-farmer extension.³

ORGANIC's training project offered a wide range of practices and technologies adapted to the history and culture of the Mayan population in the region. Broadly, the courses and follow-up by ORGANIC were centred around the following themes:

- soil conservation measures (e.g. barriers, ridges);
- cultivation practices (e.g. refraining from burning crop residues, contour ploughing, zero tillage);

- organic fertilisers (e.g. manure, leaves, crop residues);
- organic pesticides (e.g. onion, human urine);
- crop diversification (e.g. mixed cropping, nitrogen fixation with legumes, herbs, fruits);
- farm infrastructure (e.g. traditional ovens, special latrines for processing human manure, corrals);
- family nutrition (e.g. food preparation, composing healthy diets);
- rural organisation (e.g. group building, diffusion of knowledge to neighbouring farmers).

The courses and practices were based on the premise of a more efficient and integrated use of existing resources on the farm. Many of the proposed practices, as indicated, have been in existence in Mayan production systems for centuries but have withered over the course of time in many areas. In this sense, the project performed the role of catalyst, collecting bits of local knowledge and practices in one region and imparting them elsewhere. The peasant-to-peasant extension model is especially useful in this regard because of the tight links with local farming systems.

Over the period of three years, it was anticipated that the participants would gradually abandon conventional farming practices and have moved towards a reliance on LEIA practices by the end of 2000. The principal aim of the training project was to have achieved by its end 120 'transformed' LEIA farms. In addition, participants would be trained to become teachers in their communities. It was contemplated that each graduate would teach at least one or more practices to 10 neighbouring farmers. Moreover, graduates were expected to organise themselves into local groups which would form the basis for learning processes among graduates and neighbouring farmers.

It was assumed that the transformation from conventional farming to LEIA would lead to the following beneficial effects by the year 2000:

- a higher percentage of the harvest being sold in the market;
- higher yields (especially in maize, beans and potato);
- better soils (higher percentage of organic matter);
- improved managerial and organisational capabilities among participants, hence empowerment of the participants and their families;
- higher farm income;
- improved nutrition and health status of the participant and his/her family.

The potential outcome and impact of the training project presented by ORGANIC was rather over-ambitious, which apart from a certain marketing zeal for their services, can be explained by an inadequate attention paid to adoption processes.

3 ADOPTION OF LEIA PRACTICES

The adoption of 'sustainable' farming practices continues to be a popular topic for research and debate among practitioners and researchers (e.g. Neill and Lee, 2001; Moser and Barrett, 2003; De Jager et al., 2004). Sustainable agriculture still remains a somewhat confusing and fuzzy concept. However, as argued by Pretty, what is important is not the exact definition, but clarifying 'what is being sustained, for how long,

for whose benefit and at whose cost, over what area and measured by what criteria' (Pretty, 1995: 11). In our evaluation study this interpretation became an important guideline in our efforts to systematise the effects of the project in terms of outcome and impact. LEIA can be regarded as a form of sustainable agriculture. At the farm level it refers to an integral use of a wide range of technologies and practices that can be characterised by a low use of external resources, local regeneration and reproduction, and an intensive use of local knowledge. Sustainable agriculture, and more specifically LEIA, includes aspects such as integral pest and disease management, local nutrient management and soil and water conservation (*ibid.*).

While different household and farm characteristics have been identified in relation to explaining adoption behaviour (e.g. Feder et al., 1985; Pomp, 1994), the evidence is mixed. Factors such as motivation (e.g. Pannell, 1998) and perceived profitability (e.g. Cary and Wilkinson, 1997) of the practices are important determinants of adoption behaviour which are often not highly correlated with household and farm characteristics. Indeed, as argued recently by Jones (2002), many studies that approach the topic with a checklist of deterministic factors to explain adoption processes fall short of explaining the nature of the process of adoption.

In this paper it is not our aim to arrive at a thorough explanation of the adoption process. We will briefly focus on a few important factors that are expected to influence adoption of LEIA practices in Totonicapán. In general, one can state that the adoption of LEIA practices implies a substitution of knowledge and labour for external inputs (Pretty, 1995). While in the case of ORGANIC the knowledge constraint is addressed by the training project, the labour constraint must be met by the participating farm household. Time availability of the different household members is the essential resource of the farm household in developing countries (Low, 1986). Therefore, the opportunity costs of labour in relationship to the marginal returns to farm labour input is a crucial variable for farm household members in deciding whether to adopt a certain practice (Feder et al., 1985; Stocking and Abel, 1992).

In Totonicapán, opportunity costs of labour are relatively high, given the prevalence of several non-agricultural activities such as weaving and tailoring. In addition, returns to land in the case of the traditional staple crops (maize, beans) are quite low, making agriculture foremost a subsistence activity. While this situation might hamper any investment in agriculture, farmers are willing to invest in new practices that are perceived to offer a return in the short term. Some of the practices imparted by ORGANIC entail a clear return in the short term (e.g. organic fertilisers), whereas others such as (physical) soil conservation practices (e.g. ridges, barriers) require significant labour inputs in the short term while benefits occur in the long term. The perceived unattractive pay-off of the latter, compounded by the short time horizon of small farmers, substantially reduces their willingness to adopt these practices (Lutz et al., 1994).

Besides knowledge and labour as critical inputs for LEIA agriculture, lack of capital may in some cases restrict adoption of certain practices (Pomp, 1994; Ruben and Vaessen, 2000). At first, this might sound somewhat paradoxical since the reduced reliance on external inputs liberates capital that was formerly used for purchases in the market. However, the reduced reliance on purchased inputs does not rule out the possibility of not being able to finance the high initial costs associated with some practices such as the construction of stables or latrines. Offering the opportunity to apply for credit, under the right conditions and selection procedures, might take away the barrier that is keeping willing and motivated farmers from adopting certain practices.

4 METHODOLOGY OF THE EVALUATION STUDY⁴

The main objective of the study was to determine the outcome and impact of the training project, serving two underlying purposes. The principal purpose was to establish if the ORGANIC training project had proven to be a worthwhile investment. In addition, the study would help determine whether or not to extend further funding to ORGANIC after the project was ended. The utility of the evaluation study went beyond Totonicapán as the results were discussed with other EU-funded IRDPs working with similar training projects in the country, many of which were implemented by ORGANIC.

The evaluation study was designed in 1998 in collaboration with IRDP and ORGANIC staff. It was carried out by an external evaluator and a small fieldwork team in close collaboration with IRDP staff. Given the main objective, a simple quasi-experimental design was defined as a basis for measuring the outcome and impact of the project (Cook and Campbell, 1979). However, because of the size of the project (and the corresponding budget constraint for evaluation) and the size of the population to be studied, the implementation of a formal quasi-experimental study with specific matching techniques and sufficient statistical power would be too costly. In addition, the small population size meant that a good qualitative assessment would offset the need for sophisticated statistical analysis. Nevertheless, the basic framework of the quasi-experimental design was deemed essential, since an alternative approach based purely on for example farm visits, stakeholder interviews and secondary data would not sufficiently uncover the heterogeneity in patterns of adoption, the scale of adoption and the subsequent impact on farm households. The final study design could best be characterised as a kind of mixed method evaluation (Greene and Caracelli, 1997), the basis being formed by a simplified quasi-experimental design which would be thoroughly supplemented with information from field visits and semi-structured stakeholder interviews (IRDP and ORGANIC staff, participant and non-participant farmers).

The quasi-experimental design constituted a baseline survey among participating farm households in 1998,

an ex post survey covering the same sample in 2001, and, in the same year, a control group survey consisting of non-participant farm households. Ideally, a control group should be included in the baseline study as well. This would imply finding a stable control group that would be available in 1998 and in 2001. One of the reasons that this was difficult was the historical basic distrust felt by Mayan farmers for formal institutions (like IRDP),⁵ which has been exacerbated by the experiences of the civil war. Whereas participants, because of their obvious links with the training project, were more prone to cooperate with the survey, non-participants were more reluctant. It was considered too costly and inefficient to cover a control group in 1998 big enough to leave a sufficiently large number of farmers willing and able to assist in the survey of 2001. In any case, the small size of the total population of participant farmers and the subsequent sample size limited the prospects and rationale for sophisticated statistical analysis while enhancing the scope for additional 'qualitative' methods of data collection and observation. Moreover, the study's objective was not to prove output and impact with a certain level of statistical accuracy but 'merely' to show the presence or absence of plausible relationships between intervention and effect with an approximate indication of magnitude. Hence, a control group in the baseline survey was not considered crucial.⁶

In 1998, 56 farmers were selected at random and interviewed, representing almost 50% of the

approximately 120 farmers who volunteered to participate in the project. In 2001, 48 of that initial group could be covered by the ex post survey.⁷ In the same year, a control group of 38 farm households with similar characteristics (see Table 1) was established by means of geographical sampling. The distribution of the control group sample over the territory was proportional to the participant distribution over the territory. To avoid contamination of the control group by spill-over effects from the project, each potential member of the control group was asked if he/she had had contact with the ORGANIC project. In addition, farmers were asked if they had made any changes in their production systems as a result of advice from neighbouring farmers possibly related to the ORGANIC project.

Table 1 compares participants and control group farm households with regard to a number of diagnostic variables in order to check for possible differences. A first look at the table reveals that the participant group and the control group are quite similar regarding a number of diagnostic variables that were used to check for similarity. The close similarity was the result of consistent geographical sampling and application of the selection rule. No ex post matching was applied. An important difference between participants and the control group was the use of technical assistance. In 1998, almost half of the participants had been receiving such assistance. By 2001, participation in the ORGANIC project had largely substituted for the old sources of technical assistance. In contrast, the incidence of technical assistance in the control group was much lower. The high proportion of participant farmers receiving technical assistance prior to ORGANIC underlines the importance of the baseline study in recording pre-project adoption rates of several practices that other institutions in the region had already been teaching before 1998.

The difference between the two groups in terms of technical assistance received from institutions other than ORGANIC is partly due to the reduction in governmental extension services since 1998, but in part suggests a certain selection bias (see Mosley, 1997). To clarify, had we measured use of technical assistance for the control group in the year 1998, we would have come up with a higher percentage than in 2001, but still lower than the use of technical assistance by participant farmers in 1998. As suggested by the data and confirmed in farm visits, participating farmers were on average more motivated towards agricultural innovations and had had more experience with other institutions in the past than the control group. In the design no attempt was made to change the control group in order to correct for this bias. Rather, it was noted that this bias would lead to a slight 'over-estimation' of project outcome and impact.⁸

Because of the applied sampling method and the relatively small differences between participants and control group, we assumed that external factors such as market access, climatic conditions and institutional environment were similar between the two groups and therefore did not affect further analysis.

Table 1 General comparison of participants and control group

Variable	Participants (n = 48)	Control group (n = 38)
Education participant/ household head (years)	2.4 (2.3)	2.6 (2.8)
Family size	6.4 (3.1)	7.1 (3.2)
Off-farm activity participant/ household head (%)	71%	71%
Artisanal activity participant/ household head (%)	31%	21%
Remittances (%)	23%	18%
Land owned (<i>manzanas</i>)	5.1 (9.4)	4.4 (10.3)
Cultivated area (<i>manzanas</i>)	0.9 (0.9)	0.7 (0.5)
Organisational membership (%)	71%	61%
Received loan in last 3 years (%)	27%	18%
Received technical assistance in last 3 years (%)	46% ^a *	13% *
Received technical assistance (2001) (%)	6% ^a	13%

^a Excluding participation in the ORGANIC project.

Note 1: The variables for the participants reflect the year 1998, whereas the control group data are from 2001. The values for the participant group in 2001 are almost identical to those in 1998 with the exception of the variable technical assistance (which is shown in the table for that reason).

Note 2: Variables expressed in percentages are dichotomous variables; the value refers to the percentage responding 'yes'.

Note 3: x (y) represents mean (standard deviation).

Note 4: One *manzana* is approximately 0.7 hectare.

Note 5: * p < 0.05, ** p < 0.01; depending on the measurement scale t-tests and chi-square tests were applied

To complement the analysis from the simple quasi-experimental design, other data and information sources were used to assess the impact of the project. The most important elements that contributed to the quality of the surveys as well as constituting additional sources of information for the evaluator were the following: First, IRDP field staff intensively cooperated in the design and implementation of the surveys. This support and the collaboration of ORGANIC staff guaranteed a sound local embeddedness of the study. Moreover, it was easy to conduct interviews and informal talks with staff from both organisations during the study process. Second, the surveys were sufficiently small for the evaluator to be directly involved in all the operational tasks of the survey work (i.e. interviewer training, coordination, quality control, data processing). In this way, the evaluator was able to develop a good understanding of the field while being able to conduct more efficiently a relatively large number of farm visits and farmer interviews parallel to the formal survey.

In order to structure the different causal relationships between the project and the participating farmers we devised the following framework as depicted in Table 2.

Table 2 Main variables to be included in the evaluation framework

Output	Outcome	Impact
Course implementation	Adoption of practices	Soil quality Yields
Course participation	Diffusion of practices	% of harvest sold Farm income
Content of courses field assistance		Nutritional and health status ^a Organisational and managerial capacities

^a Covered by the study on nutrition

The objective of the evaluation study was to focus on outcome and impact. A brief assessment of project output was incorporated in the project, but the principal tool for evaluating output consisted of an ongoing process of monitoring the courses and field assistance by IRDP field staff during the project implementation period. The study as a whole was best suited to measuring the outcome of the project, given the close link between project output and outcome in terms of adoption and diffusion processes. Moreover, these processes are manifest in the short and medium term, hence were identifiable at the time of the ex post evaluation study. On the other hand, the link between project output and impact is typically more indirect and of a medium- to long-term nature. The ex post study was implemented just months after the end of the project, at a time when its full impact had still to emerge.⁹ Nevertheless, impact effects were measured to get an indication of potential impact, especially if it was clear that practices taught in the training project had been adopted on the participants' farms.

In order to make the evaluation study more manageable given time and language restrictions and a limited interview length per respondent,¹⁰ it was decided to submit a selection of practices imparted by

ORGANIC to the evaluation process. The selection covered more than half of all the elements that constituted the courses. In the case of the impact effects it was decided to leave out a formal measurement of farm income and instead incorporate a proxy variable for family well-being, asking the respondents whether they perceived their situation as having improved over the last five years. In addition, organisational and managerial capacities were left out of the evaluation exercise. The former was monitored by IRDP field staff while managerial capacity was considered too difficult to measure in simple terms. Moreover, it was assumed that this variable was highly correlated with other impact variables.

The baseline study was executed after the first two courses had already been implemented. The reason for this timing was the high initial fluctuation in attendance at the courses that normally occurs in the first sessions of a training project.¹¹ In order to select the sample for the baseline and ex post survey, some degree of certainty as to the composition of the participant population was necessary. After two sessions some 120 farmers were enlisted as participants. Given the potential restrictions that may constrain farmers from adopting LEIA practices, a substantial number of dropouts was expected. Therefore, in the initial talks between IRDP and ORGANIC and once again after the baseline study, ORGANIC was strongly recommended to select substantially more farmers, such that the target of 120 'fully trained' farmers by the end of the project could be met.

However, ORGANIC did not heed IRDP's advice, the latter having little effective influence over the former given ORGANIC's strong mandate in project implementation. On the basis of the survey and course attendance data, the dropout level over the three years was estimated to be in the neighbourhood of 45%. The most important reason for desertion was a lack of time, which points to the relatively high opportunity costs of labour in the region.

5 RESULTS

Adoption and diffusion

Table 3 shows the adoption levels of the selected practices for the three groups: participants in 1998, participants in 2001, and control group in 2001. For most practices the percentage of farmers applying a certain practice was used as an indicator for outcome. In some cases it was relatively easy and also more relevant to use quantity per farm household as an indicator of outcome. Significant differences between participants in 1998 and 2001 and between participants in 2001 and the control group provide strong evidence of an adoption effect caused by the project.

A first important observation from the table is that at the beginning of the project most practices were already known and applied by many farmers in the region. A second important observation is the fact that the participant group in 1998 and the control group are quite similar as to their adoption behaviour. Adoption rates in the participant group in 1998 are

slightly better because of the higher rates of previous technical assistance from NGOs and government organisations and the fact that two courses had already taken place in the project, resulting immediately in experimental application of the practices on the farms.

The first group of practices concerns land preparation and fertilisation. Both the burning of crop residues and the application of 'chemical' or purchased fertilisers (e.g. NPK fertilisers) were discouraged by the project. We can see that the project has had a clear effect in reducing both these practices, although the majority of participant farmers continued to apply purchased fertilisers. This ran counter to the ideological message delivered by ORGANIC's field coordinator (which in fact went further than the general philosophy of ORGANIC), who advocated a total substitution of organic fertilisers¹² for purchased fertilisers.

In some cases, the real adoption effect is not adequately reported by the table because, by the time of the study, the application of organic fertilisers and some soil conservation measures had already been dealt with in the first two courses (see Methodology section). However, other information sources suggest that the project had a significant effect on the adoption of these practices. Minimum tillage was a technique unknown in any form in the region. In contrast to their normal practice of preparing and clearing a whole plot before sowing and planting, ORGANIC taught the farmers to restrict land preparation to just the tiny area around the spot where each plant was to be sown or planted. In this way, the soil was better protected against the potential effects of wind and water. The adoption effect (among more than half of the participants) was solely due to the training project.

The data on nurseries and furnaces suggest that participants had already benefited from other organisations. The added value of the training project was less evident in these cases. The special latrines were quite popular among participants, because they are connected to one of the processes of creating organic manure on the farm. In the case of pigsties no significant effect can be noted. The same goes for other investments in livestock production (not in the table). Perhaps the most important adoption effects can be found in the area of crop and fruit tree production. First, as a special category of crops, there was a significant increase in the cultivation of medicinal plants which were highly popular among participants. In addition, crop diversification and especially fruit tree diversification increased significantly.

The favourite and most widely applied practices were the use of medicinal plants and organic fertilisers. Both practices have in common that they do not require significant investments in terms of capital or labour, and both have a clear short-term payoff which is in line with most small farmers' planning horizons and levels of risk aversion. Medicinal plants were used to cure minor illnesses and improve the quality of the diet (e.g. elderberry, rosemary, camomile and several other mostly local species). Organic fertilisers partly substituted for purchased fertilisers without incurring negative yield effects (see section on impact).

Table 3 does not tell the whole story. Findings from field visits and farmer interviews indicated that knowledge of LEIA practices had significantly increased as a result of the project. In addition, the care with which farmers implemented the practices and the diversity in modes of application had improved

Table 3 Project outcome in terms of adoption

Practice	Participants 1998	Participants 2001	Control group 2001
burning crop residues (%)	27 % **	2 %	29 % **
applying green material (crop residues, leaves, ...) (%)	25 % **	63 %	18 % **
'chemical' fertilisers (%)	96 % *	79 %	97 % *
'organic' fertilisers (%)	79 % ^a	83 %	18 % **
ditches (%)	56 % ^a	73 %	24 % **
barriers (%)	44 % ^a	58 %	21 % **
minimum tillage (%)	nihil ^b	54 %	nihil ^b
latrines (%)	15 % **	56 %	8 % **
furnaces (%)	60 %	69 %	34 % **
pigsties (%)	42 %	60 %	45 %
nurseries (%)	33 %	44 %	3 % **
medicinal plants (no. plants)	3.2 (5.3) **	8.7 (7.0)	3.2 (3.5) **
crop diversity (no. crops)	4.3 (1.7) *	4.9 (2.4)	3.2 (1.4) **
fruit tree diversity (no. trees)	4.8 (2.9) *	6.2 (3.2)	4.6 (2.3) **

^a At the time of the baseline survey, a course on the topic had already taken place.

^b Not known by respondent.

Note 1: Variables expressed in percentages are dichotomous variables; the value refers to the percentage responding 'yes'.

Note 2: x (y) represents mean (standard deviation).

Note 3: * p < 0.05, ** p < 0.01. Comparisons are always between the 1st and the 2nd column and the 3rd and the 2nd column; depending on the measurement scale t-tests and chi-square tests were applied.

noticeably. Also not shown in the table is the degree of adoption regarding land preparation, fertilisation and soil conservation practices, which was mostly between 25% and 55% of the total cultivated land on the farm. In reality, given the small farm sizes, this often meant that application was restricted to one or two experimental plots. We received no indication that many farmers were expanding their practices to other plots.

The literature on adoption (see Section 3) suggests that there are a number of constraints, depending on the type of practice, which can inhibit adoption processes. ORGANIC supplied valuable knowledge to participant farmers in the field of LEIA. However, capital and labour constraints were not addressed by the project. This partly explains why, for example, soil conservation measures that require significant investments in terms of labour (e.g. barriers, ditches) were not applied beyond experimental plots.¹³ It also explains why relatively costly investments in terms of capital, such as the construction of pigsties, were not carried out by all the participants despite the fact that most of them owned some pigs. Other factors explaining the selective and partial adoption of the practices are first of all a lack of trust between farmers and institutions like ORGANIC. In addition, farmers in the region are reluctant to take risks especially if there is no clear (short-term) return on some of the practices. For example, those that introduced LEIA practices on their main subsistence plot (a crucial plot for the household's food security), did so gradually and selectively. Evidently, this picture undermines the somewhat ideological assumption of a complete linear transformation of conventional farming to LEIA farming as posed by ORGANIC.

The importance of these factors had been acknowledged by IRDP by the time the ex ante study had been carried out. However, although IRDP employed ORGANIC, the latter refused to cooperate with them in trying to offer solutions to the labour and capital constraints, a resistance which to a large extent can be explained by ORGANIC's (ideological) faith in its own philosophy. Short of withdrawing its financial support, IRDP did not have much leverage in terms of influencing ORGANIC's operations in the field.

Although a substantial number of participants said they had shared their knowledge with other farmers,

no substantial diffusion effect took place. The ambitious target of 1200 indirect beneficiary families had not been reached, nor would it be reached in the near future. The sometimes strong social divisions within the region may in a sense have obstructed the diffusion processes. The attempts by ORGANIC to organise participant farmers in structured groups to increase knowledge sharing and stimulate diffusion to other farmers were largely unsuccessful. An important lapse in the training project was the fact that ORGANIC failed to point out the complementary benefits of combining LEIA practices with conventional techniques (see Ruben and Lee, 2000; De Jager et al., 2004). Instead, in the field it assumed a relatively extreme ideological stance, condemning conventional techniques, which was not very beneficial in terms of meeting the needs of the local farmers.

Impact at the farm level

In comparison to the causal relationship between participation in the project and the adoption of LEIA practices, the relationship between the adoption of LEIA practices and the impact variables specified in Table 4 is less straightforward. Besides the adoption of LEIA practices, various other external variables significantly influence the specified impact variables. In a formal framework, multiple regression can be used to isolate the effect of adoption rates and control for other potentially influential variables (e.g. Rossi et al., 1999). Our small sample sizes did not allow for such an analysis. Another complicating factor was the timing of the study. At the time of the ex-post analysis, it was still too early to assess the full range and magnitude of the impact effects brought about by the intervention. Therefore, even more than in the case of assessing the adoption effects, our quasi-experimental design needed to be complemented by sufficient qualitative information stemming from interviews and field visits to enable meaningful interpretation.

Table 4 shows the values on different impact variables for the three samples and forms the basis for our interpretation. In the first variable no significant improvement had occurred in the percentage of harvested fruit sold in the market. Given the fact that fruit yields in 2001 had not declined in relationship to the base year, the lack of improvement here cannot be

Table 4 Project impact

Variable	Participants 1998	Participants 2001	Control group 2001
% of fruit harvest sold	0.25 (0.37)	0.24 (0.35)	0.27 (0.35)
Soil quality (% organic matter)	2.69 (1.23) **	3.37 (1.57)	3.36 (1.70)
Yields maize (<i>qq / cuerda</i>)	1.85 (1.05)	2.28 (2.25)	2.30 (1.79)
Do you think your situation has improved over the last 5 years?	46 % **	88 %	55 % **

Note 1: x (y) represents mean (standard deviation).

Note 2: Variables expressed in percentages are dichotomous variables; the value refers to the percentage responding 'yes'.

Note 3: Notwithstanding some local variation, one hectare comprises approximately 23 *cuerdas*.

Note 4: *qq* refers to *quintales*. One *quintal* is approximately 50 kilograms.

Note 5: * p < 0.05, ** p < 0.01. Comparisons are always between the 1st and the 2nd column and the 3rd and the 2nd column; depending on the measurement scale t-tests and chi-square tests were applied.

attributed to bad harvests. Some diversification in fruit trees had already occurred under the influence of the project (see Table 3), though many of these new trees were not yet bearing. Probably the first harvests from these newly planted trees would have a minor positive effect on fruit sales. At the time of the evaluation study, one of the basic factors behind the lack of improvement in fruit sales was the fact that the project course module on marketing skills for farm households had not been properly implemented.

The variable soil quality requires some attention. Soil samples had been collected in 1998 from the farms of all those participating in the study. The samples were taken from those plots where the farmers would (and had already started to) practise their newly acquired knowledge from the training project. With the help of GPS (Global Positioning System), the coordinates of the plots were stored and, in 2001, soil samples were collected from the same experimental plots. Although the actual method of taking soil samples in the field allows for some variation,¹⁴ the comparison between 'before' and 'after' was considered to be quite reliable. For the control group the rule for plot selection (to assure some level of homogeneity as a basis for comparison) was to choose the main plot for maize, a crop cultivated by all farmers in the region.

Table 4 shows a significant increase in the percentage of organic matter in the soil within the participant group. However, differences with control group farmers are not significant. This lack of difference could be explained by the fact that the main maize plots have a higher level of soil fertility than the plots where participant farmers started applying their practices (which in some cases had not been cultivated regularly). Hence, the comparison with the control group is not very reliable. In addition, caution should be taken in interpreting the increase in organic matter in the participant plots. As explained before, a combination of factors made farmers reluctant to shift fully to LEIA farming on their main subsistence plots. Where the experimental plot (from which the samples were taken) coincided with the main subsistence plot, participant farmers often applied organic fertilisers in combination with purchased fertilisers (see Table 3). Sometimes experimental plots were plots that were formerly not used intensively. The shift from little or no attention to more attention to crop cultivation on a given plot probably contributed to the increase in organic matter. Given these and other influential factors (e.g. soil type), a more controlled experimental setting would have been preferable. However, not only would such an experiment have been very costly, it would have to be determined which effect was to be isolated. Establishing the increase in soil organic matter given different combinations of purchased and organic fertiliser use would have resulted in a different experiment from isolating the effect of organic fertilisers on soil organic matter. All the same, despite the limited level of precision, we can infer from this exercise that the combined use of organic and purchased fertilisers and the extra dedication to the plots had a positive effect on soil organic matter.

In the case of yields, a slight increase over time (though not statistically significant) in maize yields was recorded. Although in this analysis one is faced with the limits of a two-year comparison of yields and the effect of specific yearly climatic conditions, different sources of information permitted some conclusions to be drawn in this regard. First of all, weather conditions, if anything, were worse in 2001 than in 1998. Hence, in a normal situation one would have expected a decline in yields. This might explain why the participants' yields in 2001, despite extra attention and in most cases the application of both organic and purchased fertilisers, were not significantly different from 1998. When asking participant farmers if they thought that their yields had improved, a majority (despite adverse climatic conditions) answered affirmatively. Although their positive assessment could have been discounted as an effort to simply speak positively (or politely) about the project, the other sources of evidence support the occurrence of better yields arising from the adoption of the LEIA practices. However, it should be stressed that in most cases the combined use of both purchased and organic fertilisers, and not a complete transformation of conventional farming to LEIA, was probably the main cause for yield improvements. As in the case of organic matter, the lack of difference between participating farmers and the control group can be explained by the sometimes structural differences in soil quality between the main plots of the control group farmers and the experimental plots of the participant farmers.

The last variable represents the respondents' perceptions of any improvement in their general situation over the last five years. In principle, this is not a pure impact variable, since the perception of general improvement might be influenced not only by the 'real' effects of the project on the livelihood of the participant household, but simply by the respondents' sentiments about participating in it. The fact that the variable was measured at two different moments in time, allows for a general interpretation of the role of 'real' effects in the perception of the participant.¹⁵ Table 4 shows that participants were more positive about improvements in their situation than control group farmers (while starting from similar levels), suggesting that participation in the project and the adoption of LEIA practices have had an overall positive effect on the livelihoods of the participants and their families, a conclusion that was confirmed by impressions from individual interviews.

6 LESSONS LEARNED

Strengths and weaknesses of the evaluation methodology

Given the objective of the evaluation study, the applied methodology proved to be quite useful. Evaluation studies of the type discussed in this paper, based on a quasi-experimental design, are not very common in development projects of a comparable (small) size to our training project. We have shown that the formal method of comparing participants with control groups

can constitute an important framework on which to build the analysis of outcome and impact. Without complex matching procedures and with limited statistical power, the strength of a simple quasi-experiment relies heavily on additional qualitative information. This shift in emphasis should not give the impression of a lack of rigour. Problems such as the influence of selection bias still need to be addressed carefully, even if not done in a formal statistical way.

The research design has proven to be quite reliable for analysing outcome. The clear causal relationship between participation in the project and adoption of LEIA practices facilitates the interpretation of the quasi-experimental data. Controlling for starting levels before joining the project and adoption levels of similar non-participating farmers, a plausible indication of the range of practices adopted and their magnitude that may be attributed to the project was established. The findings, e.g. the logic behind the high popularity of practices such as organic fertilisers and medicinal plants, are supported by findings from other studies.

In the case of impact variables such as yields or soil quality, the causal influence from the project is weaker and more indirect. To isolate the effect of the intervention on impact variables from the influence of other factors would ideally require a more controlled experiment. Since this would raise both the budget as well as the required level of expertise, such experiments do not represent real options for many smaller projects. For these projects, a simple quasi-experimental design can be used to establish some trends in impact variables in relationship to the intervention. If prepared carefully, such a design already controls for a substantial part of the exogenous effects on impact variables. The next step would be to uncover some of the complexity in underlying causal relationships between different exogenous variables and project intervention on the one part and impact variables on the other. In practice, a wide range of techniques such as field visits, semi-structured interviews and other more participatory research techniques are available to incorporate in a structured approach to study this complexity. Our study did not entirely succeed in studying these underlying relationships. Nevertheless, despite the fact that the full impact of the project had yet to materialise at the time of the ex post study, the evaluation study was able to establish some important relationships between the project and changes in impact variables at the level of the farm and the farm household.

The role of the evaluation study: measuring effectiveness versus improving practice

In contrast to the study's successful compliance with the main objective of the evaluation study, i.e. assessing the outcome and impact of the training project, the evaluation study (and especially the ex ante study) was quite ineffective in terms of influencing the design and implementation of the project. This lack of influence is first of all due to the timing of the study which was quite adequate for establishing the baseline picture of the project participants. Nevertheless, the

ex ante study was implemented at a time when the basic structure of the project was already in place and the contract and terms of reference between IRDP and ORGANIC had already been finalised. Short of withdrawing its financial support, IRDP did not have much leverage to influence the project's design and implementation, reducing the utility of the conclusions of the ex ante study in terms of its potential to influence practice. In fact, ORGANIC did not heed IRDP's 'advice' nor did it respond to their offers of assistance in the field.

As a future remedy for this kind of problem, part of the ex ante study could be implemented as a formal appraisal study before the selection of the implementing organisation takes place. Such an appraisal would include the same kind of succinct literature review as carried out in the ex ante study and the same type of general assessment of a number of potential weaknesses. On the basis of the literature on adoption and innovation processes, key constraints could be identified and posed as requisites for selecting an implementing organisation and drawing up the terms of reference of the project.

In this study some of the key constraints identified in the ex ante study but with little impact on improving project design and implementation include the following: first of all, ORGANIC failed to recruit a representative and sufficiently large group of motivated farmers from a wide variety of communities in the territory, as contemplated beforehand. Instead of investing in simple advertising campaigns (e.g. pamphlets, community meetings), communication about the project was spread through social networks. As a result, outreach was concentrated in communities and specific social networks connected to ORGANIC staff, who are themselves farmers and sometimes community leaders in the region. This is a particular danger for projects based on the model of farmer-to-farmer extension. Not only did outreach fail to cut through social divisions in and between communities, the specific outreach mechanisms through these social networks also reinforced the local power positions of community leaders involved in the project.

Second, a number of generally known constraints to adoption processes could have been acknowledged and more effectively dealt with. Problems of labour availability for investment in LEIA practices (given the farmer's opportunity costs of labour and the perceived return on investment in the practices) could have been foreseen. In addition, the training project should have focused on the complementary benefits of using both LEIA practices and conventional techniques. This would have facilitated processes of innovation and enhanced the attractiveness of LEIA agriculture, where each farmer would be motivated to choose the best balance between conventional and LEIA practices tailored to his or her personal circumstances. ORGANIC's ideological bias favouring an exclusive reliance on locally reproduced practices not only reduced the attractiveness of many LEIA practices, it also embodied a solution that was less than optimal for the farmers in the region.

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ENDNOTES

- 1 ORGANIC is a fictitious name.
- 2 Marked in grey in Figure 1. Farmers from Xepón Grande and Xepón Pequeño in the neighbouring province of Huehuetenango also participated in the project.
- 3 This methodology, although criticised for its lack of formal technical expertise, has become popular in Latin America (e.g. Hocdé et al., 2000).
- 4 The evaluation study in fact comprised two independent complementary studies. The first focused comprehensively on project outcome and impact, mostly in agriculture, while the second dealt exclusively and in more detail with the effects of the project on the nutrition and health status of participants and their families. In this paper the focus is exclusively on the first study.
- 5 The Mayans have traditionally been dominated by white and *ladino* population groups.
- 6 Apart from the small sample size and the lack of a baseline control group that distinguishes the applied design from formal 'Best Practices', there are a number of techniques (e.g. matching techniques, use of instrumental variables in two-stage regression analyses) to isolate the effect of a certain intervention on outcome and impact variables in a more rigorous manner (see for example Rossi et al., 1999; Mosley, 1997).
- 7 Eight of the original 56 farmers could not be located mainly because of temporal or permanent migration to other regions. Only one of these eight participants had graduated from the project. This dropout rate was much larger than for the sample as a whole. Using only the 48 cases for comparison between the baseline and the ex post survey would result in a slight 'overestimation' of the project outcome and impact.
- 8 This is because the counterfactual, i.e. what would have happened with the group of relatively

motivated farmers without the project, is not entirely accurately captured by the control group (see Mosley, 1997).

- 9 However, it was important that the ex post evaluation study be carried out soon after the termination of the project for at least two reasons: First, the budgetary planning and limited time horizon of IRDP as a whole (the programme ended in 2002) made any delay in the timing of the study difficult. Second, the decision about further financial support for ORGANIC and follow-up by IRDP staff with the participant farmers depended in part on the results of the evaluation study.
- 10 In practice, a lot of time was needed for careful explanation and formulation of the survey questions. Sometimes this required a mix of Spanish and Quiché, the local Mayan language.
- 11 There is always some degree of adverse selection, i.e. farmers who enrol for dubious reasons or with unrealistic expectations and who come to the conclusion that the project does not serve their purposes.
- 12 The application of green material (crop residues, leaves, etc.) was also encouraged by ORGANIC. The green material was simply gathered and distributed on the plots. It was also incorporated into the process of preparing organic fertiliser. One such process involved composting green material in combination with animal (and sometimes human) manure and lime.
- 13 This was despite the fact that the steep slopes on the majority of the farms required protection from erosion.
- 14 Soil samples were collected according to a standardised procedure in which the person collecting the samples walked in a zigzag through a plot, taking small samples from different parts of the plot, then mixing all the samples together.
- 15 This assumes that the feeling of optimism due to participating in the project did not increase significantly during the course of the project.

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