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Measuring Outcome and Impact of Small Development Projects: Lessons from the Evaluation of a Training Project on Low External Input Agriculture in Guatemala[1]

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Contents

Abstract

Impact studies at the level of the beneficiary are not very common in the case of small-scale development projects. In this paper we will present the case of an evaluation study on a training project in Low External Input Agriculture in Guatemala. The evaluation design is based on a simple quasi-experimental design and complemented by qualitative methods of data collection. We want to illustrate that the type of mixed method evaluation used in the case can constitute a useful alternative to study the outcome and impact of small-scale development interventions given their specific constraints of money, expertise and time.

Keywords: evaluation, LEIA, Guatemala

Résumé

Mesurer le résultat et l'impact des petits projets de développement: leçons de l'évaluation d'un projet de formation pour une agriculture à importation limitée au Guatemala

Les études sur l'impact au niveau du bénéficiaire ne sont pas fréquentes dans le cas des projets de développement à petite échelle. Dans cet article, nous présentons le cas d'une étude d'évaluation d'un projet de formation pour une agriculture à importation limitée (low external input) au Guatemala. L'étude d'évaluation se base sur un simple cadre quasi expérimental et complété par des méthodes qualitatives de collecte des données. Nous voulons illustrer que le type d'évaluation mixte utilisé dans ce cas peut constituer une alternative utile pour étudier le résultat direct et l'impact des projets de développement à petite échelle, étant donné leurs contraintes spécifiques d'un point de vue financier, d'expertise et de temps.

1. Introduction

Nowadays, in the context of decreasing aid flows and increasing demand for institutional accountability, impact assessment is becoming an important component of development intervention. In project appraisal, a growing number of techniques are widely used to clarify the potential financial, social, environmental consequences of interventions and, in many occasions, to assure the participatory nature of the planning process (Chambers, 1997). Recently, the growing myriad of specialized appraisals has led to a demand for more integrated appraisal designs (Lee and Kirkpatrick, 2000). A positive development has been the wide use of the logical framework or related techniques to specify causal relationships between project inputs, outputs and ultimately impact (e.g. NORAD, 1995). Although causal links between development interventions and potential effects in the field are increasingly made explicit even in the case of small projects, the actual identification or measurement of project impact is still ignored in many cases. This trend has changed for large projects that are increasingly equipped with adequate budgets and expertise for formal impact evaluations, in contrast to numerous small development projects which lack both. In the latter case, the lack of expertise and financial means is further compounded by a need for "finding out fast" (see Thomas et al., 1998), since the timeliness of evaluation results strongly determines their relevancy for management decisions.

In this paper we want to illustrate that specific mixed method evaluations (Greene and Caracelli, 1997) can constitute useful alternatives to study the outcome and impact of small-scale development interventions given their specific constraints of money, expertise and time. One part of such a mixed method evaluation can be 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). We will use the case of a study carried out in Guatemala to illustrate a specific mixed method evaluation based on a simple quasi-experimental design and complemented by qualitative methods of data collection.

The case concerns an evaluation study of a training project in low external input agriculture (LEIA) in the department of Totonicapán, Guatemala. This project was carried out within the framework of an integrated rural development program (IRDP) implemented by the European Union in cooperation with the Guatemalan government. The objective of the study was to analyze 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 the IRDP would decide on whether or not to extend financial support to ORGANIC,[1] the implementing organization of the project. As ORGANIC also worked in other EU financed rural development projects the evaluation had a wider relevancy than the Totonicapán project.

[1] ORGANIC is a fictitious name..

The structure of the paper is the following. We will start 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 briefly with the issue of adoption of LEIA practices, which constitutes the main intermediate objective of the training project. Looked at from an economics perspective, we will treat the main factors that influence the decision-making process of small farmers with respect to the adoption of LEIA practices. This section is followed by a comprehensive treatment of the methodology employed in the evaluation study. To assess the usefulness of the methodology in being able to measure outcome and impact we will illustrate a number of results. Finally, some conclusions are presented.

2. Context

2.1. 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 in the region 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 Maria Chiquimula[2]) where agriculture constitutes an important subsistence and income activity. Agricultural activities are complemented with forestry and non-agricultural activities as weaving, tailoring, pottery and commerce. In the Southern municipalities the situation is the opposite: non-agricultural activities predominate, whereas agriculture is of secondary importance as an income generating activity.

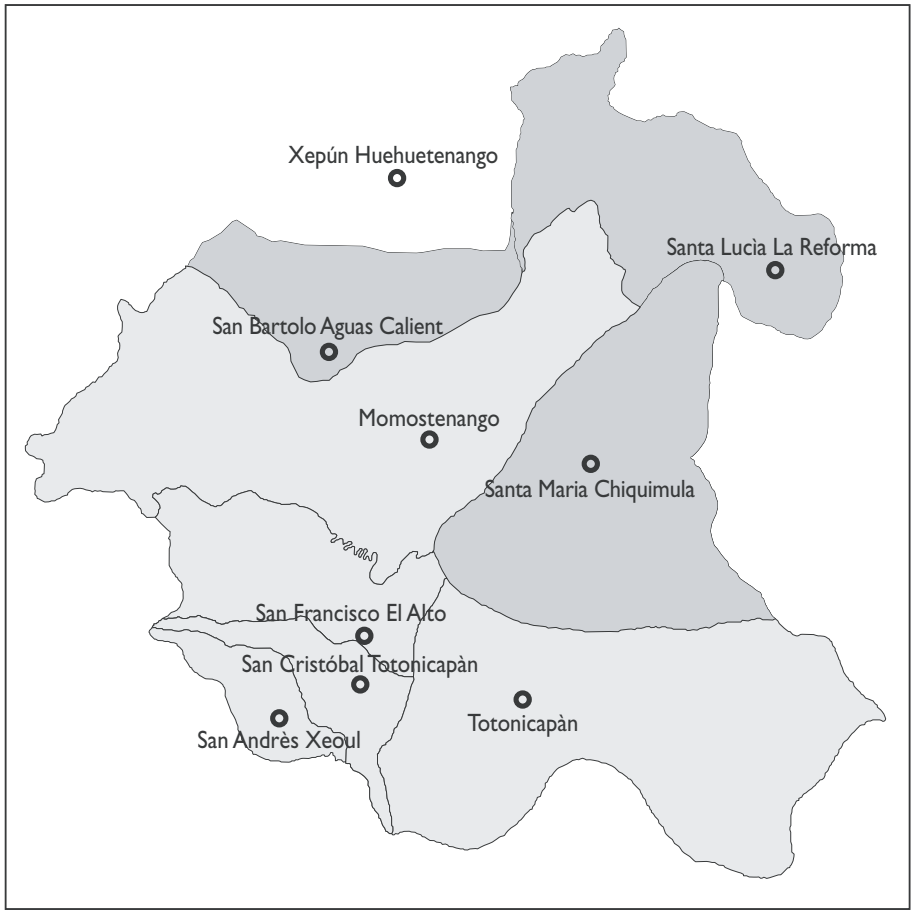
[2] Marked in grey in figure 1. In addition, farmers from the communities Xepón Grande and Xepón Pequeño from the neighboring province of Huehuetenango participated in the project.

Limited farm sizes, mountainous areas, mediocre soils, relative isolation and limited access to markets are important factors that make agricultural production in the Northern municipalities less attractive. Altitudes in the province differ between 3500 and 1700 meters. Roughly, altitude decreases when moving from the South to the North. The differences in altitude in the province implicate significant differences in climatic circumstances. In the North micro climates are more suited for subtropical crops and fruit trees. The most important crops in the Northern region are maize and beans. Crop diversification is limited. One of the main reasons for this is the fact that forced labor systems for coffee cultivation in the 19th and part of the 20th century extracted so much labor from the indigenous highland communities that traditional diversified Mayan crop and livestock systems degenerated into a system of mono-cropping of maize and beans (McCreery, 1994; Carmack, 1995). As far as the other crops are concerned, some horticultural crops (tomato, peppers) are cultivated. Among the fruit trees to be found, the most important ones are avocado, peach and citrus fruit trees. In comparison with crops, commercialization grades of fruits are often higher. Livestock produc-

tion in the region is mainly limited to small livestock such as pigs, sheep and chickens. Animals are mainly held for subsistence purposes with the exception of sheep, which are kept mainly to produce wool for the fabrication of clothes.

Guatemala from the beginning of the 1960s until the middle of the 1990s suffered an internal conflict that made numerous victims in particular among the rural indigenous population. In the project area especially the municipality of Santa Lucía La Reforma was affected by war events which, among other things, destroyed the local organizations that existed at the time. One of the consequences of the conflict was a further deepening of distrust of the indigenous population vis-à-vis external organizations. Until 1998, these organizations 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 a reflection of the total rural population than before as the NGOs normally only work with existing local organizations and groups.

Figure 1. The province of Totonicapàn



2.2. The training project

In 1996, an integrated rural development program (IRDP) financed by the European Union and co-implemented by the Guatemalan government was established in the province of Totonicapán in Western Guatemala. The program 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, the IRDP decided to finance a training project in low external input agriculture (LEIA).

We will briefly describe the main features of the project as contemplated in the contract between IRDP and ORGANIC in 1998. The project was envisioned for a period of three years (1998-2000). A total of 18 courses would be imparted to participating farmers in the region. Each course would consist of 2 to 3 days of practical training taking place in an experimental farm of ORGANIC. After each course, participants would be given "home work" and ORGANIC extensionists would provide follow-up at the farm level. The teachers of the courses who also acted as extensionists in the field, like the participants, were Mayan farmers and graduates of former courses by ORGANIC. Only one teacher, the coordinator of the project, held a formal technical degree in agronomy. The methodology implemented by ORGANIC (teaching and follow-up) could be characterized as a form of peasant-to-peasant extension.[3]

[3] This methodology, though criticized for its lack of formal technical expertise, has gained much in popularity in Latin America (e.g. Hocdé et al., 2000).

The training project by ORGANIC 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 centered around the following themes: soil conservation measures (e.g. barriers, ridges), cultivation practices (e.g. refraining from burning crop residues, contour plowing, zero tillage), organic fertilizers (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 organization (e.g. group building, diffusion of knowledge to neighboring 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 Maya 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, the participants gradually would have to abandon conventional farming practices towards a reliance on LEIA practices by the end of 2000. The principal aim of the training project was to reach a number of 120 "transformed" LEIA farms by the end of the project. In addition, participants would be trained to become teachers in their communities. It was contemplated that each graduate would at least teach one or more practices to 10 neighboring farmers. Moreover, graduates were expected to organize themselves in local groups which would form the basis for learning processes among graduates and neighboring farmers. The transformation from conventional farming to LEIA was assumed to lead to the following beneficial effects in the year 2000 after completion of the project: higher commercialization grades of crops and fruits, higher yields (especially in maize, beans and potato), better soils (higher percentage of organic matter), improved managerial and organizational capabilities among participants and hence empowerment of the participants and their families, higher farm income, and finally, improved nutrition and health status of the participant and his/her family.

The potential outcome and impact of the training program presented by ORGANIC was rather overambitious, which apart from a certain marketing zeal for their services, can be explained by an inadequate reflection on 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. Jones, 2002; Neill and Lee, 2001). 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" (1995: 11). In our evaluation study this interpretation became the foundation of our efforts to systematize 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 LEIA refers to an integral use of a wide range of technologies and practices that can be characterized 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 behavior (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 behavior 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 labor for external inputs (Pretty, 1995). While in the case of ORGANIC the knowledge constraint is addressed by the training project, the labor 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 labor in relationship to the marginal returns to farm labor input is a crucial variable for farm household members in their decision making process of adopting a certain practice (Feder et al., 1985; Stocking and Abel, 1992).

In Totonicapán, opportunity costs of labor 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 fertilizers), whereas other practices such as (physical) soil conservation practices (e.g. ridges, barriers) require significant labor 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 the willingness to adopt these practices (Lutz et al., 1994).

Besides knowledge and labor as critical inputs for LEIA agriculture, lack of capital in some cases might form a restriction to adopt 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 on 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, if done 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 study

The evaluation study in reality consisted of two independent complementary studies. The first study employed a comprehensive focus on project outcome and impact mostly in the field of agriculture while the second focused exclusively and with more detail on the effects of the project on the

nutrition and health status of participant families. In this paper we will essentially only discuss the first study, which we will refer to as the evaluation study. It was carried out by an external evaluator and a small fieldwork team in close collaboration with IRDP staff.

The methodological design of the study started from the premise that any evaluation study should be perceived as a case study, given the specific nature of the project and the surrounding context (Stake, 2001). Therefore, one should be careful in the use of standardized techniques, where a tailored approach given the aforementioned elements plus the time, money and objective constraints should be the determinants of the specific methodology.

The evaluation study was designed in 1998 in collaboration with IRDP and ORGANIC staff. A simple quasi-experimental design was defined as a basis for measuring the outcome and impact of the project (Cook and Campbell, 1979). However, given the size of the project (and the corresponding budget constraint for evaluation), the implementation of a formal quasi-experimental study with specific matching techniques and sufficient statistical power would be too costly. In addition, given the small population size, 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 purely based 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 characterized 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 of Mayan farmers versus formal institutions (like the IRDP),[4] 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. Anyway, 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 collec-

[4] Which traditionally have always been dominated by white and ladino population groups.

tion and observation. Moreover, the study"s objective was not to prove output and impact with a certain level of statistical accuracy but "merely" showing 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 as crucial.[5]

In 1998, 56 farmers were selected at random and interviewed, representing almost 50 % of the approximately 120 farmers who volunteered (and were admitted after selection) to participate in the project. In 2001, 48 of the initial group could be covered by the ex post survey.[6]

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 farmer for the control group was asked if he/she had heard of the ORGANIC project. In addition, farmers were asked if they had made any changes in their production system as a result of advice from neighboring farmers possibly related to the ORGANIC project.[7]

Table 1 General comparison between 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 (manzanas)	5.1 (9.4)	4.4 (10.3)
cultivated area (manzanas)	0.9 (0.9)	0.7 (0.5)
organizational 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 %

Table 1 compares participants and control group farm households on 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 on a number of diagnostic variables that were used to check for similarity. The close similarity has been the result of consistent geographical sampling and application of the selection rule. No ex post matching was applied. An important difference between participants and control group was the use of technical assistance. In 1998, almost half of the participants had

[5] 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).

[6] 8 cases of the original 56 could not be located mainly because of temporal and permanent migration to other regions. Only one of the 8 participants that could not be located had graduated from the project. This dropout rate was much larger than for the sample as a whole. Hence, 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.

[7] The geographical sampling method was defined in such a way that there was a minimum geographical distance or a minimum of 4 farms between the participant farm and the control group farm. In practice, in most cases this rule could be applied.

[a] Excluding participation in the ORGANIC project.

Note 1: the variables in the case of 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 the situation in 1998 with the exception of the variable technical assistance (which for that reason is shown in the table).

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

Note 3: x (y) represents mean (std. 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.

been receiving technical 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 other institutions 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 "overestimation" of project outcome and impact.[8]

[8] Since 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).

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 are similar between the two groups and therefore do not affect further analysis.

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 organizations 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 defined the following framework as depicted in table 2.

Table 2 Main variables to be included in the evaluation framework

output	outcome	impact
course implementation course participation content of courses field assistance	adoption of practices diffusion of practices	commercialization grade soil quality yields farm income nutritional and health status[a] organizational 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. Given the timing, i.e. the ex post evaluation study was implemented just months after the end of the project, the study as a whole was best suited to measure the outcome of the project, since one can assume a 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 and long term nature. It was acknowledged that the full impact of the project was still to emerge at the time of the ex post evaluation study.[9] Nevertheless, impact effects were measured to get an indication of potential impact, especially if clear adoption effects had been taking place in the farms of the participants.

The evaluation study was implemented in a total period of three months. Two months for the baseline study (including preparation) and one month for the ex post evaluation study. Given this tight schedule, both studies (especially the ex post study) depended heavily on logistical preparations carried out beforehand by IRDP staff. In order to make the evaluation study more manageable given time restrictions, 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 that their situation had improved over the last 5 years. In addition, organizational and managerial capacities were left out of the evaluation exercise. The former was monitored by the 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.

[9] However, it was important that the ex post evaluation study was to be carried out soon after the termination of the project for at least two reasons. First, the budgetary planning and limited time horizon of the IRDP as a whole (the IRDP program ended in 2002) made any delay in the timing of the study difficult. Second, the decision for further financial support to ORGANIC and follow-up by IRDP staff towards 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.

5. Results

5.1 Looking at the project output

Measuring output was not among the formal objectives of the evaluation study. However, some aspects of output, complementary to the IRDP monitoring activities, were taken into account in the evaluation process. We will briefly touch upon the aspects of course participation and the organization of the project. The baseline study was executed after the first two courses were already implemented. The reason for this timing was the high initial fluctuation in attendance of 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 on the composition of the participant population was necessary. After two sessions some 120 farmers were enlisted as participants. Given the potential restrictions that may refrain farmers from adopting LEIA practices, a substantial number of dropouts was expected. Therefore, in the initial talks between the 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.

[11] There is always some degree of adverse selection, i.e. farmers who enroll for different reasons or with different expectations and will come to the conclusion that the project does not serve their purposes (anymore).

On the basis of the survey data and course attendance data, the dropout level over the three years was estimated to be in the neighborhood of 45 %. The most important reason for desertion was a lack of time, which points at the relatively high opportunity costs of labor in the region. The established dropout level was in plain contradiction with the number of 210 graduates reported by ORGANIC at the end of the project. A more detailed study of the "graduates" carried out in the ex post evaluation study revealed that the number of fully trained farmers was substantially less than 120 as feared at the beginning of the project. The 210 reported graduates included dropouts and farmers who entered the project as late as the last year.

A second important element to be noted was the change in organization of the project during the three years. In the first year, all courses were held on an experimental farm administered by ORGANIC. This system was changed during the second year for two reasons. First, some farmers living in distant areas were dropping out because of the distance to the experimental farm. Second, some courses on nutrition and related topics depended on the participation of wives and daughters from participant farmers. For this group it was very difficult to travel long distances or stay two or three days away from home. Consequently, ORGANIC started organizing local courses in different communities. The number of communities where courses were held was small, thereby not offering a real solution for the two aforementioned problems. In essence, much of the change was driven by the need for ORGANIC to meet the course participation targets. The shift to local courses in the communities led to a higher influx (and fluctuation) of new participants to compensate for the relatively high dropout level from the original group.

5.2 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.[12] Significant differences between participants in 1998 and 2001 and between the participants in 2001 and the control group provide strong evidence of an adoption effect caused by the project.

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, leafs,...) (%)	25 % **	63 %	18 % **
"chemical" fertilizers (%)	96 % *	79 %	97 % *
"organic" fertilizers (%)	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 % **
pig sties (%)	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 first important observation from the table is that at the beginning of the project most practices were already known and applied by 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 behavior of different practices. Adoption rates in the participant group in 1998 are slightly better because of the higher rates of previous technical assistance from NGO's and government organizations and the fact that already two courses had taken place in the project, resulting immediately in experimental application of the practices in the farms.

The first group of practices concerns land preparation and fertilization. Both the burning of crop residues and the application of "chemical" or purchased fertilizers (e.g. NPK fertilizers) were discouraged by the project. We see that in both cases, the project has had a clear effect on the reduction of both. In the case of purchased fertilizers however, the majority of participant farmers continued to apply them. The continued use of purchased fertilizers ran counter to the ideological message that was delivered by the coordinator of ORGANIC in the field, which in fact went further than the general philosophy of ORGANIC in advocating a total substitution of organic fertilizers for purchased fertilizers.

[12] For those practices where the degree of adoption would be relevant information (e.g. amount of organic fertilizer applied), in practice we observed a significant diversity in terms of care, quality and form. This, in combination with the extra effort needed to establish good estimates of quantity per household, made us decide to use "incidence" (percentage of farmers applying a practice) in most cases as the prime indicator of outcome along with a more qualitative assessment of quantity.

[a] At the time of the baseline survey, already a course on the topic had taken place.
[b] Not known by respondent.
Note 1: Variables expressed in percentages are dichotomous variables; the value refers to the percentage "yes".
Note 2: x (y) represents mean (std. deviation).
Note 3: * $p < 0.05$, ** $p < 0.01$. Comparisons are always between 1st and 2nd column and 3rd and 2nd column; depending on the measurement scale t-tests and chi-square tests were applied.

In some cases, the real adoption effect is not adequately reported by the table because of the timing of the study. The application of organic fertilizers and some soil conservation measures had already been treated in the first two courses at the time of the study (see methodology section). For these practices other information sources suggest a significant adoption effect as a result of the project. Minimum tillage is a technique that was not known in any form in the region. 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 organizations. The added value of the training project was less evident in these cases. The special latrines were quite popular among participants, more so because the latrines are connected to one of the processes of creating organic manure in the farm. In the case of "pig sties" no significant effect can be noted. The same counts 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. Firstly, 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 complementary study on nutrition and health effects of the ORGANIC project confirms the greater use of medicinal plants and the higher consumption of vegetables among participant families.

Table 3 does not tell the whole story. Findings from field visits and farmer interviews indicated that the existing knowledge on 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 noticeably. Also not shown in the table, the degree of adoption at the level of the farm for practices in the field of land preparation, fertilization and soil conservation was mostly between 25 % and 55 % of the total quantity of cultivated land in the farm. In reality, given the small farm sizes, this often implied that application was restricted to one or two experimental plots. We received no signals that many farmers were expanding their practices to other plots. The explanation for this was twofold. First, there was a problem of trust. Many farmers were reluctant to trust external institutions like ORGANIC, a situation that for some farmers had not changed by the end of the project. Second, not all farmers were willing to risk their yields on their main subsistence (maize) plots by introducing (too many) new practices. Those that introduced the LEIA practices in their main subsistence plot did so gradually and selectively. Evidently, this undermines the somewhat ideological assumption of a complete linear transformation of conventional farming to LEIA farming as posed by ORGANIC.

Economic literature on the topic (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 labor constraints were not addressed by the project.[13] This explains partly why for example soil conservation measures that require significant investments in terms of labor (e.g. barriers, ditches) were not applied beyond experimental plots.[14] It also explains why relatively costly investments in terms of capital, such as the construction of pig sties were not carried out by all the participants despite the fact that most of the participant farmers owned some pigs.

The most favorite and widely applied practices were the use of medicinal plants and organic fertilizers. Both practices have in common that they do not require significant investments in terms of capital or labor and that both have a clear short term payoff which is in line with most small farmers' planning horizon and level of risk aversion. Medicinal plants were used to cure minor illnesses and improved the quality of the diet, while organic fertilizers partly substituted for purchased fertilizers without incurring negative yield effects (see section on impact).

With respect to the diffusion effect of the imparted knowledge from participants to other neighboring farmers, a number of things were found. First of all, the attempts by ORGANIC to organize participant farmers in structured groups to increase knowledge sharing and to stimulate the diffusion effect to other farmers, were largely unsuccessful. Though part of this failure could be attributed to ORGANIC, the social divisions within and between communities have certainly played a large role. Second, some 67 % of the participants reported to have been teaching one or more practices to neighboring farmers. This percentage, along with the number of neighboring farmers that was reached per participant is probably not very reliable. Participant farmers found it hard to distinguish between the local courses (part of the new methodology of imparting the courses in different communities instead of on the experimental farm) where many of the participants had been teaching new participants, and "spontaneous" inquiries by neighbors. Indeed, ORGANIC also mixed up these numbers, thereby boosting the number of graduates to 210, while in fact many of these graduates were at the same time being reported as indirect beneficiaries through the "diffusion effect".

It was clear that the ambitious number of 1200 indirect beneficiary families had not been reached, nor would it be reached in the near future. Besides the social divisions within the region, some characteristics of ORGANIC as an organization might have undermined the diffusion effect. For example, ORGANIC failed to point out the complementary effects of LEIA and conventional techniques. Instead, in the field it assumed a relatively extreme ideological stance, condemning conventional techniques, which was often not compatible with the real situation and the needs of local farmers.

[13] The importance of the three bottlenecks knowledge, labor, and capital was acknowledged by IRDP by the time the ex ante study had been carried out. Though the IRDP was in fact the employer of ORGANIC, the latter refused any cooperation in the field with IRDP staff when trying to offer solutions for the labor and capital constraints.

[14] Despite the fact that the steep slopes in the majority of the farms required more protection from erosion.

5.3 Impact at the farm level

Causal relationships between adoption rates and the impact variables specified in table 4 are less straightforward than between participation in the project and adoption of LEIA practices. Besides adoption rates, a number of other variables can 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. In addition we were faced with the complicating factor of the timing of the study. At the time of the ex-post analysis, it was still too early to assess the full range of impact effects that might manifest itself after some time of the intervention. Therefore, even more so than in the case of assessing adoption effects, our comparative quasi-experimental design needed to be complemented with sufficient qualitative information stemming from interviews and field visits to allow for careful interpretation.

Table 4 Project impact

variable	participants 1998	participants 2001	control group 2001
commercialization grade (fruits)	0.25 (.37)	0.24 (.35)	0.27 (.35)
soil quality (% organic matter)	2.69 (1.23) **	3.37 (1.57)	3.36 (1.70)
yields maize (qq / cuerda)	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 (std. deviation).
Note 2: The value of the last variable refers to the percentage "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 1st and 2nd column and 3rd and 2nd column; depending on the measurement scale t-tests and chi-square tests were applied.

Table 4 shows the values on different impact variables for the three samples and forms the basis for our interpretation. In the first variable commercialization grade of fruits no significant improvement had occurred. Given the fact that fruit yields in 2001 had not declined in relationship to the base year, the lack of improvement in commercialization grade cannot be 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 bearing fruits yet. Probably the first harvests of these newly planted trees will have a minor positive effect on fruit sales. At the moment of the evaluation study, one of the basic factors behind the lack of improvement in fruit sales was the fact that the course module on marketing skills for farm households had not been properly implemented in the project.

The variable soil quality requires some attention. Soil samples had been collected in 1998 in all of the farms of the participants who participated in the study. The samples were taken in those plots were farmers would (and had already started to) practice with their newly acquired knowledge from the training project. With the help of GPS (Global Positioning System), the coordinates of the plots were stored. In 2001, soil samples were collected in the same experimental plots. Though the actual method of taking soil samples in the field allows for some variation,[15] 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,

[15] The method of collecting the soil samples was as follows. According to a standardized procedure of zigzagged walking through the plot, at different places in one plot a small soil sample would be taken and mixed with the rest of the samples of the same plot.

was to choose the main plot for maize cultivation, 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 were participant farmers started applying their practices (which in some cases were plots that were not cultivated regularly). Hence, the comparison with the control group is less reliable. However, caution should be taken in interpreting the increase in organic matter in the participant plots. In the cases that the experimental plot (where the samples were taken) coincided with the main subsistence plot, participant farmers often applied organic fertilizers in combination with purchased fertilizers (see table 3). As explained before, a combination of distrust and risk avoidance made farmers reluctant to shift fully to LEIA farming on their main subsistence plot. Sometimes experimental plots were plots that were formerly not used intensively. The shift from little or no attention to more attention to crop cultivation in a certain plot probably influenced the increase in organic matter. Given these and other influential factors (e.g. soil type), a more controlled experimental setting might have been more desirable. However, not only would such an experiment have been very costly, it would have to be determined which effect should be isolated. Establishing the increase in soil organic matter given different combinations of purchased and organic fertilizer use would have resulted in a different experiment than isolating the effect of organic fertilizers 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 fertilizers and the extra dedication to the plots have had (and will have) a positive effect on soil organic matter.

In the case of yields, a slight increase over time (though not statistically significant) in maize yields has been 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 to make some conclusions with regard to yield effects. First of all, weather conditions, if anything, had been worse in 2001 than in 1998. Hence, in a normal situation one would have expected a decline in yields. This might explain why yields in 2001 in the case of participants, despite extra attention and the application of both organic fertilizers and purchased fertilizers (in most cases), were not significantly different from 1998. When asking participant farmers if they thought that their yields had improved, a majority of farmers (despite adverse climatic conditions) answered affirmatively. Although this could have been discarded as a Hawthorne effect, the combination of both farmers' perceptions on higher yields and apparent higher (though not statistically significant, but definitely not lower) yield values in 2001, suggests indeed positive yield effects of the adoption of the LEIA practices. However, it should be stressed that in most cases the combined use of both purchased

and organic fertilizers, 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 with control group farmers can be explained by the sometimes structural differences in soil quality of the main plots of the control group farmers versus the experimental plots of the participant farmers.

The last variable represents a perception of respondents on the improvement of their general situation over the last five years. In principle, this variable is not a pure impact variable, since the perception on general improvement of the situation might be influenced not only by the "real" effects of the project on the livelihood of the participant household, but simply by the participant's sentiment of participating in the project. 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.[16] 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 participants and their families, a conclusion that was confirmed by impressions from individual interviews.

[16] Under the assumption that the feeling of optimism due to participating in the project did not increase significantly during the course of the project.

6. Conclusions

In this paper we have illustrated the usefulness of a specific mixed method evaluation through the example of an evaluation study on a training project in LEIA in Totonicapán, Guatemala. 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 as 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 rigor. 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 analyzing outcome effects. This is due to the fact that there is a clear strong causality between participation in the project and adoption effects. Controlling for starting levels before joining the project and adoption levels of similar non-participating farmers, a plausible indication of the magnitude of different adoption effects and its attribution to the project were established. The findings, e.g. the logic behind the high popularity of practices such as organic fertilizers and medicinal plants, are supported by findings from other (economic) 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 smaller 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 one side and impact variables on the other side. Our study did not entirely succeed in studying these underlying relationships. In practice, a wide range of techniques such as field visits, semi-structured interviews and other more participatory techniques of research are available to incorporate in a structured approach to study this complexity. Our experience in using a simple quasi-experimental design as a basis for the evaluation of small projects has been quite positive. We believe that there is scope for a wider implementation of this method, especially by NGO's and local and regional governmental organizations. The challenge would lie in a fruitful integration of a simple quasi-experimental design, stripped of some of its more sophisticated design and analytical features on the one hand, and existing participatory techniques and other qualitative methods of data collection on the other hand. With respect to the latter, expertise is more widely available. Such mixed method evaluations would be in line with budgetary constraints and the objective of establishing plausible relationships between intervention and outcome and impact that many small projects endorse.

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