## International Potato Center

# Impact evaluation of participatory development of integrated insect and disease management (IPM) for the potato crop in San Miguel, Peru

## Report to the Participatory Research and Gender Analysis Program

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## Abstract

The PRGA small grant has co-financed activities oriented to evaluate the impact of participatory research through farmers' field schools (FFS-PR) in San Miguel, Peru. IFAD, OPEC, World Bank, Swiss Cooperation and CIP have also supported this effort. This document reports activities conducted between 1999 and 2001 and presents results of a work in progress. Qualitative and quantitative methods have been used to collect information from different stakeholders according to impact areas and indicators.

Different types of participatory research have been used according to project stages and activities. In general, consultative types of participation have been the most commonly used. Collaborative types was also used albeit to a lesser extent. This study shows how woman participation can be enhanced in projects that have limited scope for shifting their priorities. In general terms, women participated less than men because they considered that pest control on the potato crop was man responsibility and therefore fall within man knowledge domains. Women expressed that they could participate more in projects oriented to livestock, pea or faba bean management, which are more related to their responsibilities. Participatory selection of clones was identified as an activity in which women had an essential contribution to make. Woman participation was also limited by rules established by the groups and communication problems. Efforts were made to change this situation. As a result, formal participation of women in project activities increased from 12% to 25%, but in some specific activities such as clone evaluation their participation was about 50%. Implications of these changes are discussed in the paper.

Evidence indicates that the project has generated impacts related to processes and technologies. There have been changes in priority setting of researchers, facilitators and farmers. Institutions have also enhanced their capacity to use participatory research and training approaches. The cost-benefit relationship of the intervention has also been evaluated and evidence indicates that the investment can generate attractive rates of return. The issue of using participatory approaches for facilitating farmers' access to new clones is discussed in terms of saving time for initiating adoption of promising clones and generating benefits for farmers at an earlier stage. Farmers have learned research-related principles, although there is not evidence yet that new knowledge is being used beyond project scope. Enhancement of farmers' knowledge about biophysical principles of pest control was an important outcome, because it is one of the most important factors that influence IPM adoption. Hence, human capital was enhanced by the project. Changes in social capital (group formation and decision-making) were also assessed and evidence shows that FFS-PR reinforced group formation and the establishment of social links, which facilitate information exchange and innovation. Farmers are also beginning to use their new knowledge for making better decisions related to pest control, which is being reflected in improved productivity and income, although, this is an area that requires more evaluation.

## 1. Introduction

### *The problem statement*

> *To what extent an adapted version of the FFS approach can be an efficient participatory research and training mechanism for developing and disseminating integrated pest management (emphasizing late blight control) on the potato crop at the pilot area of San Miguel, Peru?*

The PRGA small grant supported the impact evaluation activities in the San Miguel area and helped to look at specific issues related to gender, such as a) identifying the factors that constraint and/or facilitate woman and man participation in the research process; and c) understanding the relative importance of gender roles in the process of technology innovation related to pest control.

### *The setting*

The study was conducted in the Province of San Miguel, Cajamarca department, located in the northern highlands of Peru at an altitude of 2500 to 3800 m. Communities involved in the study belonged to the "maize" (corn) agro-ecological zone (2750-3200) and the "tuber and cereal" agro-ecological zone (3200-3600; Deza et al., 1988). The rainy season begins between October and November and ends in April or May with an average rainfall of between 700 to 800 mm. Is in this season when late blight disease is more prevalent. The dry season occurs between May and September; during these months there is a high risk of frost.

The study area is located in the watershed of San Miguel river (Appendix 1). Farms are located in highly heterogeneous land, mainly in stepped hillsides, and only less than 20% of land is located in flat areas. Farmers own their land in most cases. The most important income generation activities are crop and livestock production (Figure 1). Due to the difficult climactic conditions, potato farming is the dominant agricultural activity. Potatoes comprise the bulk of the household's food consumption and are the most lucrative market crop (the mean potato production is 8.8 t/ha). Dairy farming is the primary cash-generating activity. Farmers also plant other crops such as cereals (wheat, barley, maize and rye), peas, faba beans, Andean tubers and grass.

Farmers in this region hold their wealth in the forms of land and cattle. The average household owns 10.3 hectares of land in total and 8.7 hectares of arable land. Median land ownership is much lower (4.3 hectares of total land and 3.8 hectares of arable land). None of the participating communities have electricity, and the standard dwelling is an adobe hut with dirt floors and thatch or tin roofs. Currently seventy-five percent of the communities have potable water and eighty percent of the families within communities have latrines.

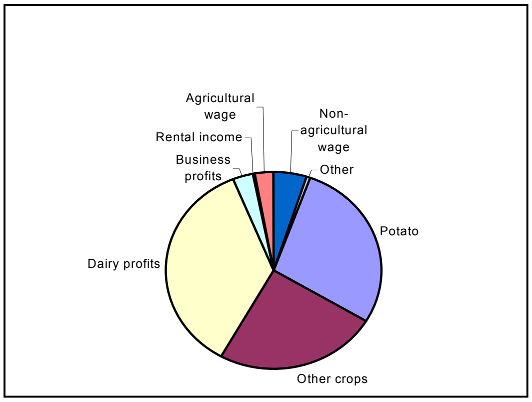


**Figure 1: Income sources of farmers in San Miguel (Godtland, 2001).**

Communities of San Miguel have an average of 60 families. A typical San Miguel farmer is a mestizo who has a combination of both Spanish and indigenous ancestry. All of the farmers speak Spanish, and no other indigenous language is prevalent. Most of the farmers are Catholic, and only a few belong to other Christian sects. Many of the farmers in the sample have little or no education, (with an average of 2.4 years). The legacy of hacienda era, and the subsequent land reform, created a culture of strong individualism and a reluctance to partake in cooperative activities.

The median annual per capita consumption is 796 nuevos soles ($236), and the average is 1105 nuevos soles ($327). By comparison, the consumption level for extreme poverty in the Rural Sierra zone of Peru in 1998 was 959 nuevos soles per year, and 1307 for absolute poverty (INEI, 1998). Hence, sixty-two percent of the households in the sample are below the extreme poverty line and seventy-six percent are below the poverty line. All participants in FFS were below the poverty line.

There are few farmers' organizations in the communities. One of them is called "rondas" which are vigilant groups formed to protect their property, particularly their livestock, from robbery. A women's organization named the "club de vaso de leche" (club for a glass of milk) is also prevalent and was formed as a strategy for food security aiming at obtaining support from the government to feed community schoolchildren. Other two woman organizations are the "club de madres" (mothers' club), and the "comedor popular" group (popular cooking group), which were organized with the purpose of obtaining donations (usually food) from the government and ensuring food security. Municipalities at district level are the most representative local institutions. In terms of access to agricultural information, only CARE and PRONAMACHCS (special project from the Ministry of Agriculture) work on agricultural-related aspects.

Gender roles are defined by cultural reasons. In general terms, women are dedicated to household activities, but they also participate in specific farming activities such as potato planting and harvesting, taking care of livestock and milking. Men are in charge of most farming activities (Vasquez-Caicedo et al 2000).

## 2. Participation within the project

***Types of participatory research:*** The FFS-PR project activities in San Miguel were diverse and involved research and training. The type of participation was not defined in advance, but resulted from a learning process of the people involved. Therefore, there have been different types of participation along the stages and activities of the project (Table 1). According to the typology proposed by Lilja and Ashby (1999), participation at the design stage began with a consultative diagnosis and moved to a collaborative identification of technological alternatives. At the stage of testing, participation has been consultative in cases when farmers were asked to evaluate new potato clones, collaborative when they conducted trials designed by researchers and collegial when they indicated their interest to work not only with potatoes but also with peas and faba beans and planted their own experiments. At the stage of dissemination, the FFS approach moved from consultative to collegial. Consultative when farmers were asked to evaluate training activities, collaborative when farmers participated in specific tasks within training sessions, and collegial when farmers (trained as facilitators) conducted training sessions with the support of CARE facilitators.

**Table 1: Description of the main project activities and types of participation.**

| **Activities/stages** | **Type of participation** |
|---|---|
| Base line study | Consultative |
| Identifying priorities | Consultative |
| Designing learning activities for FFS | Consultative |
| Implementing and evaluating training activities | Consultative, collaborative and collegial |
| Identifying technical alternatives | Consultative |
| Designing potato-related trials | Consultative and collaborative |
| Conducting and evaluating potato-related trials | Consultative and collaborative |
| Designing, conducting and evaluating trials with other crops | Consultative, collaborative and collegial |
| Monitoring and evaluating FFS- related activities | Consultative and collaborative |

***Selection of participants, pilot area and roles by gender:*** A self-selection process was undertaken to define who should participate in the project activities. Farmers were invited to participate openly with no other restriction but their interest and motivation to work in a project that did not provide subsidies (as other projects in the area). The self-selection process turned to be a process of group formation around pre-existing social groups. For example, the PRONAMACHC groups were the basis for FFS-PR formation. In other cases, existing social networks dominated the selection process. Once the groups were formed, they tended to define rules for participation, which impeded other farmers to join if they did not comply the rules. For example, working days invested in the experiments or payment of fees when missing some training session. In summary, participants in FFS-PR belonged to several groups, which had different objectives within the community (see Section 5). Although, a self-selection process could lead to a selection bias, Godtland (2001) indicates that this was not the case of FFS –PR participants in San Miguel, who were not different than the non-participants in terms of their main socioeconomic and agro-ecological characteristics.

The pilot area of San Miguel was selected because there were three important conditions there. First, potatoes were an important crop. Second, late blight was endemic and regarded as the main problem for potato production. Third, CARE had a development project already running in that area, which facilitated logistic support for the FFS-PR activities.

In terms of participation by gender, specific studies indicated that men participated more than women in the project activities. Women participated mainly as informants and collaborators in the project; collegial role was less frequent (Table 2).

**Table 2: Farmer roles, according to gender, in participatory activities of the project.**

| **Activity** | **Farmer role** | |
|---|---|---|
| | **Men** | **Women*** |
| Base line study | Informant | none |
| Identifying priorities | Informant | Informant |
| Designing learning activities for FFS | none | none |
| Implementing and evaluating training activities | Collaborator | Informant |
| Identifying technical alternatives | Informant | Informant |
| Designing potato-related trials | Collaborator | none |
| Conducting and evaluating potato-related trials | Collaborator-colleague | Informant |
| Designing, conducting and evaluating trials with other crops | Collaborator-colleague | Collaborator |
| Monitoring and evaluating FFS- related activities | Informant | Informant |

* Women have less participation than men in most project activities.

***Significant events related to participatory research and their outcomes:*** A number of events related to participatory research have occurred along the project, some of them have been turning points. Table 3 presents the most significant events that influenced participatory research and training activities of the project.

**Table 3: Summary of significant events related to participatory research and changes generated by them.**

| Cropping seasons | Activity or significant event | Outcome/change |
|---|---|---|
| 1998 | Baseline study combining qualitative and quantitative methods | Selection of the area and definition of main constraints identified by farmers |
| | Initiation of 4 FFS-PR, which combined research and training activities. Trials aimed at testing available varieties with resistance to late blight combined with fungicide treatments. | - Training exercises, field guide and experiments should be coordinated to feedback each other.<br>- Initial assessment showed limited participation of women. |
| 1999 | Evaluation and planning workshop at the beginning and at the end of the cropping season, with the participation of farmers, facilitators and researchers. | - Adjustment of the FFS field guide and training activities.<br>- Farmers expressed their interest to work on insects in addition to late blight.<br>- First stakeholders' committee formed |
| | Focus groups and case studies conducted to assess constraints to participation by gender | - Women participation is limited by their specialization in other farming and domestic activities. |
| | Large survey was conducted, involving 480 households | - Results indicated effects of FFS-PR on learning |
| | Participatory trials repeated with slight adjustment | - Farmers suggested the need to simplify experiments (e.g. only varieties or clones, or only fungicide regimes, but not factorials). |
| 2000 | Evaluation and planning workshop at the beginning and at the end of the cropping season, with the participation of farmers, facilitators and researchers | - Stakeholders recommended that the field guide should be less structured (by sessions) and more flexible (by topics). |
| | Case study conducted to assess possibilities of enhancing woman participation | - Women suggested to work on pea, faba bean and livestock management as a way to enhance their participation. |
| | Single trials with two repetitions to evaluate new clones were conducted | - Farmers were kin in evaluating new clones at harvest time and for culinary quality. Women participation was identified as essential for evaluating culinary quality.<br>- Number of clones was reduced from 54 to 25. |
| | Qualitative and quantitative evaluation of FFS effects | - Results indicated that FFS had an effect on learning, farmers suggested topics to reinforce, effects on adoption were not yet evident |
| 2001 | Evaluation and planning workshop at the beginning and at the end of the cropping season, with the participation of farmers, facilitators and researchers | - Farmers from each FFS were selected and trained as potential facilitators. |
| | First training workshop for farmer-facilitators was held | - Farmer-facilitators showed interest and skills to conduct research and training activities |
| | New trials with the selected clones from the previous season were conducted and evaluated | - Farmers initiated to test selected clones in their own fields. |
| | Farmer-facilitators began to take responsibilities of some of the research and training sessions | - Facilitators from CARE started to divert responsibilities to farmer-facilitators. |

## 3. Expected outcomes of the impact evaluation

The monitoring and evaluation activities of the FFS-PR project in San Miguel were initiated by defining impact areas and indicators (Table 4). These areas and indicators were adjusted accordingly during the second and third year of the project. The PRGA small grant supported a larger evaluation effort, which aimed at assessing the impact of FFS-PR. Evaluation processes are being co-financed by the PRGA small grant, CIP and partial funds from special projects financed by IFAD, OPEC, the World Bank and Swiss Cooperation.

This report presents the results of a work in progress. Therefore, in some cases the evidence presented is not conclusive. Monitoring and evaluation activities will continue during 2002.

**Table 4. Expected outcomes per impact area and stakeholders who have participated in evaluations.**

| Impact areas | Farmers | Facilitators | Researchers | Institutions |
|---|---|---|---|---|
| ***Process impact***: Enhanced: | | | | |
| - Priority setting | √ | √ | √ | √ |
| - Capacity to use PRGA approaches | - | √ | √ | √ |
| - Cost-benefit relationship of the intervention | - | - | - | √ |
| - Capacity to carry out research and self-innovate | √ | - | - | - |
| - Knowledge about biophysical principles of pest control | √ | - | - | - |
| - Enhanced group decision making | √ | √ | √ | √ |
| ***Technology impact***: Enhanced | | | | |
| - Farmers' capacity to tackle pest problems | √ | - | - | - |
| - Food security and income | √ | | | |

## 4. Impact assessment methodology

Impact assessment began with the definition of tentative impact areas and indicators that were adjusted during the process. The evaluation of each impact area required the use of specific methods for data collection and analysis. Table 5 shows the methods that were used.

**Table 5. Main methods for data collection and analysis according to impact areas and indicators.**

| **Impact areas and indicators** | **Type of comparison** | **Method for data collection and analysis** |
|---|---|---|
| ***Process impact***: Enhanced: | | |
| - Priority setting | Before and after | Focus groups* (F, Fc, R) |
| - Capacity to use PRGA approaches | Before and after | Focus groups, workshops (F,Fc,R) |
| - Cost-benefit relationship of the intervention | Before and after<br>With and without | Focus groups, semi-structured interviews surveys, plot monitoring, review of secondary information (F) |
| - Capacity to carry out research and self-innovate | Before and after<br>With and without | Focus groups, questionnaires, observation, case studies, contest of research projects (F) |
| - Knowledge about biophysical principles of pest control | Before and after<br>With and without | Focus groups, questionnaires, box test (F) |
| - Group decision-making | Before and after<br>With and without | Focus groups, case studies (F) |
| ***Technology impact***: Enhanced | | |
| - Farmers' capacity to tackle pest problems | Before and after<br>With and without | Focus groups, questionnaires, plot monitoring, case studies, the card method (F) |
| - Food security and income | Before and after<br>With and without | Focus groups, semi-structured surveys, plot monitoring (F) |

Key: F: farmers; Fc: facilitators (extension workers); R: researchers.
* Focus groups are group discussions in which farmers can use different participatory tools such as matrixes, ranking, scoring, etc.

***Types of comparisons***: For evaluating the impact indicators, two types of comparisons were undertaken. In some cases, the comparison was *before and after*, meaning that the indicator was measured with the same group at the beginning and during the third year of the project. This type of comparison was undertaken when informants were facilitators and researchers, because the reduced number of participants. In other cases, the comparison was *with and without,* meaning that the indicator was measured with the group of farmers who participate in the project and with groups of farmers who did not participate respectively. In some impact areas, with-without and before-after comparison were carried out.

***Description of methods used:*** Qualitative and quantitative methods were used to gather and analyze information related to impact areas and indicators. The use of different methods permitted triangulation of findings and enhanced the validity of the evaluation process (Fielding and Fielding, 1986).

**Qualitative methods**

***Focus groups*****:** Consisted of groups of about 10 people (farmers, facilitators or researchers) and a moderator, who discussed specific questions according to the impact areas and indicator. Participants in the groups used cards, matrixes, ranking and scoring techniques according to the topic to be discussed. The moderator registered conclusions of the discussion. At farmer level, focus groups were organized with participants and non-participants from the same communities (in a separated way) and also non-participants from control communities. The same groups were organized during the second and third year to analyze changes over time. A total of 14 focus groups with participants, and 10 with non-participants were organized during the evaluation process.
***Participatory workshops:*** Meetings that were held at the beginning and at the end of the cropping season (at least twice a year), involving farmer representatives from each FFS, facilitators and researchers. The purpose of these workshops was to discuss the progress of project activities, and make suggestions and adjustments for the following season. In addition, researchers and facilitators had quarterly workshops with the same purpose.
***Participant and non-participant observation***: Facilitators and researchers involved in the process were in charge of observing research and training activities, particularly farmer reactions, which were registered in specific forms.
***Contests of research projects:*** A contest of research project designed, conducted and evaluated by farmers was organized. This method was useful to assess to what extent farmers were using research principles that were taught in the FFS-PR.
***Case studies***: Individuals or groups of participants and non-participants who were monitored in more detail along the evaluation process.
***The box test:*** Specific test designed to evaluate changes in knowledge and attitudes. It consisted on 20 questions with three possible answers each, which were located in the field using samples (plants, leafs, insects, etc.). Participants were asked to answer each question choosing one alternative. The test lasted about 30 minutes and results were feed backed immediately to the group. It was useful to assess knowledge before and after the intervention, and also to compare knowledge between participants and non-participants.
***The card method:*** Specific method used to evaluate technological options, particularly new potato clones. Consisted on three types of cards representing happy, normal or sad faces, which were used to score new potato clones according if farmers liked or disliked each clone. This allowed to collect information about farmer's preferences.
***Semi-structured interviews***: Surveys with open-ended questions were used to register management practices of participants and non-participants, in order to assess possible differences (changes in practices). Farmers participated registering their practices in notebooks and providing the information to interviewers.

### Quantitative methods

***Questionnaires***: Questions about topics that were part of the FFS-PR sessions were asked to farmers and answers registered. In some cases, hypothetical problematic situations were presented, so that farmers had to discern and make a decision. Questionnaires were used with participants and non-participants.
***Plot monitoring***: Designed to register specific variables, which could not be provided by farmers, such as severity of a disease or insect and yield. Plot monitoring was part of the semi-structured survey with the difference that the interviewer observed or sampled directly the potato plot.
***Surveys***: Extensive surveys about socioeconomic characteristics of participants and non-participants were applied once during the evaluation period with the support of the World Bank.

## 5. Results of impact evaluation: a work in progress

### Stakeholder and gender-related outcomes

The PRGA grant supported specific studies oriented to understand participation by stakeholder, giving particular emphasis to gender aspects.

***Stakeholder analysis:***

Vasquez-Caicedo (1999) conducted stakeholder analysis to determine the groups that could influence, or being influenced by, the project activities. Appendix 2 presents a graph that summarizes the findings. The stakeholder analysis indicated that, although, participants were similar in socioeconomic, ethnicity and religious terms, there were differences in terms of their participation in other groups that had specific objectives. For example, groups that influenced directly FFS-PR functioning (most members belonged to the three groups) were the soil conservation group, the “Andino” group organized by CARE to provide credit and the faba bean group that was organized to produce this legume on a contract basis with a processing company. There were groups that influenced FFS-PR indirectly (some FFS-PR members belonged to those groups), such as the vigilant group, the milk producing group and women groups. Farmers had to respond to demands from each group and sometimes there were conflicts in terms of resource allocation, especially time. Therefore, they had to trade-off costs and benefits and make decisions to participate. FFS-PR were not favored for this condition, because in most cases the other groups were providing farmers with tangible benefits (food donations, loans, agricultural inputs), which they did not what to loose. Project activities where, therefore, planned taking into consideration group demands so that conflicts could be minimized, otherwise the cost of participating in FFS-PR could be too high to afford for farmers.

***Participation by gender***:

Initially, about 12% of participants formally registered in FFS-PR were women. Evidence of the gender analysis exercise, indicated that the main limitations to woman participation were: 1) perception of roles and responsibilities, 2) knowledge domains, 3) rules established by the group, and 4) factors related to communication.

Perception of roles and responsibilities and knowledge domains: Women who did not participate indicated that they were not interested in FFS-PR because potato production was perceived as a man responsibility. The analysis of dairy routines of both men and women confirmed that men carried out most of the potato-related activities, particularly those related to pest control, although women participated in specific activities (see below). Case studies indicated that there was a tendency to specialization within households. Men were in charge of potato production, and activities that demanded more strength such as soil preparation, whereas women were in charge of taking care of livestock (grassing, milking, etc.) and were specialized in some minor crops such as pea and faba beans, apart from domestic activities.

Because women at the pilot area did not share the priorities of the project, and there was not flexibility to attend their demands, efforts were made to identify in which activities of the research process could woman participation had an added value. According to the results of focus groups and also questionnaires, women tended to participate more in some activities related to potato production such as planting, harvesting, seed selection and storage management (see Appendix 4). Qualitative and quantitative evaluations also indicated that women had an important contribution when making decisions about what variety to plant (Figure 2). Evidence indicates that when evaluating clones at harvest time (yield, tuber shape and color), women and men tend to have similar opinions. However, when evaluating culinary quality, women and men tend to have different opinions, showing that in this specific PR activity, women participation was essential to enrich the selection process. Appendix 5 shows the results of comparing preference rankings between women and men. Therefore, more women were invited to participate at the moment of evaluating clones.

The rules established by the group: Each FFS-PR group defined their rules for participation. Some of these rules prevented woman from having a more active participation. For example, a rule indicated that each working day in the experimental plot was valued as one arroba (11.5kg) of potatoes at harvest time. Men were in disagreement that women could receive the same payment because women could not perform at the same speed or cover the same areas (for example, when hilling-up). These rules were discussed with farmer groups to find ways to compensate for this difference; for example woman participated in most of the activities but preparing food for men, which was not taken into account as participation. There were also rules established by the group members such as the obligation to attend to all sessions, and pay a fee when missing one of them. Efforts were made to increase the flexibility of these rules were so that women could attend only to those sessions in which they were interested.

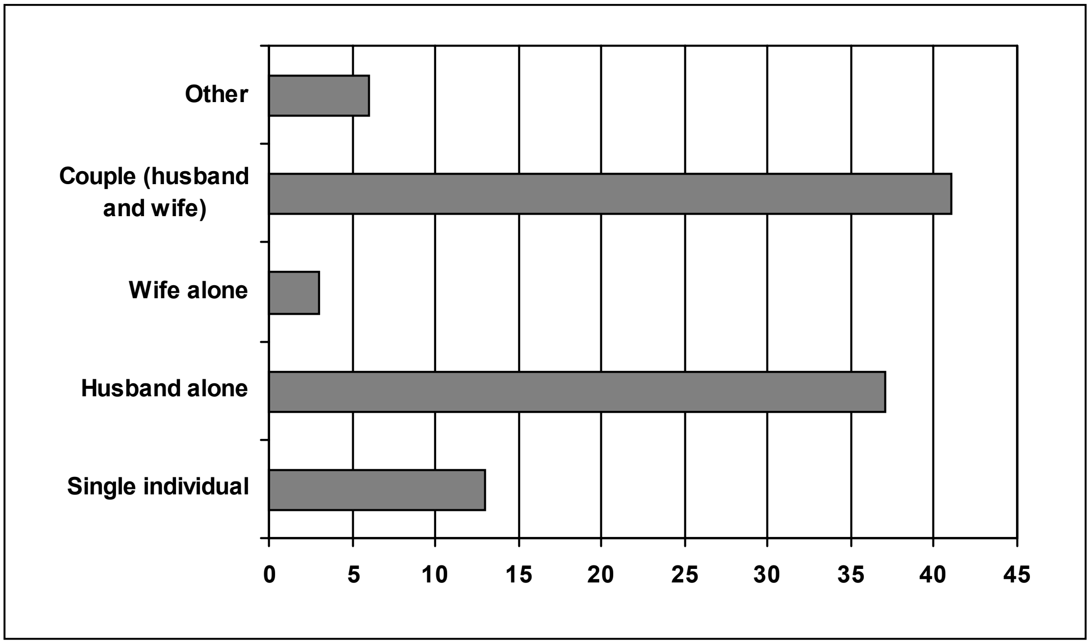


**Figure 2. Participation of men and women (expressed in %) in decision-making related to plant potato varieties (N=1583 plots). San Miguel, Peru (source, survey carried out with the support of the World Bank).**

Factors related to communication: Initially, women had the misconception that the FFS-PR group was only for men, because CARE facilitators tended to communicate with men. Efforts were made to convey the idea that participation in FFS-PR was open to all community members. Meetings and workshops were organized specifically with woman to motivate them to participate and reflect about the importance of their role as women within the communities.

Changes in woman participation and gender balance: In conclusion, women participation in official terms (meaning attendance to all sessions and activities) was improved from 12% to 25% because of changes introduced, but their participation in informal ways and in specific activities was improved substantially. For example, when evaluating clones, at least 50% of participants were women. However, the question is if the increase in women participation changed power relationships within households and woman position within the communities. Women were able to show that they could learn complex concepts and contribute to evaluate technological options, which enhanced their self-esteem and also changed the opinion of men towards them. But, there was not an observable influence of woman participation on power balance or access to resources. Woman indicated that FFS-PR for livestock or pea and faba bean management, and also textile production would have had a more direct impact in power balance and access to income because they were in charge of those activities. At the moment of evaluation, the participation of women in FFS-PR activities meant additional work load for them, which they were willing to undertake because of the benefits that they perceive.

One untapped resource was the existence of pre-existing woman groups, which could have been used as vehicles for disseminating information and technologies developed through FFS-PR. This possibility will be explored in 2002.

**Process impacts**

***Enhanced priority setting***

The question was to what extent priorities of farmers, facilitators and researchers have changed as a result of the project. The indicators were the ranking priorities expressed by each group before and after the project. It was measured through focus groups with farmers, facilitators and researchers separately.

Farmer priorities in terms of the problems that needed attention did not change along the project. Women and men agreed that late blight and the Andean potato weevil were the most important constraints to potato production. However, the priorities in terms of the motives why they decided to participate in the FFS-PR project did change. Initially, they perceived the project as a source of subsidies or donation of inputs as they were used to work in the past. Through their participation they changed their priorities and understood that more attention should be put to research and knowledge generation, so they decided to continue with the project. In general terms, about 70% of initial participants remained during the three years of the project.

Results of the focus groups indicated that there were changes on the part of researchers to establish their priorities and work plans. CIP plant pathologists and social scientists initiated the project giving strong emphasis to late blight control. However, farmers' opinions suggested that the scope of the project should be broadened to include other pests, which were important for farmers such as the Andean potato weevil and *Epitrix sp*. Figure 3 shows the index of farmers' opinions about pests at the pilot area. Hence, the first change that occurred because of farmers' participation was the inclusion of entomologists in the CIP team in order to respond to the demands expressed by farmers. Another influence of farmer participation is related to the interest that researchers began to pay attention to the concept of integrated crop management (ICM). The project was initiated focusing on late blight, then included insects, but farmers also demanded information about seed management, fertilization, cultural practices and post-harvest management. So researchers had to take that demand into consideration. The time period of the project has not allowed responding to that demand, but the idea has been included in new research proposals submitted to donors.

CIP and CARE had to shift priorities, albeit to a lesser extent, when farmers expressed their interest to include participatory research and training activities related to other crops such as pea, faba bean and grass for dairy cattle. Institutional mandates, particularly on the part of CIP, limited the attention that the project could provide to those demands. However, through CARE, some resources were allocated for this purpose. During the second and third year of the project, participatory experiments were conducted to evaluate peas and faba bean varieties with farmers.

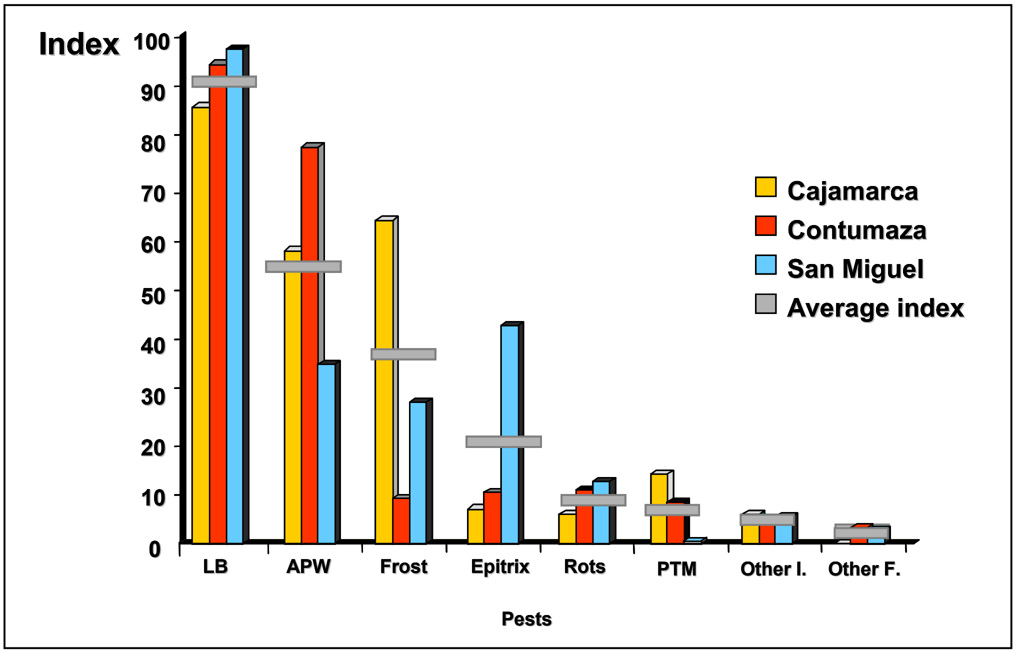


**Figure3: Main pests perceived by farmers in Cajamarca (Ortiz et al 1999). San Miguel was the pilot area for the project.**

The results of participatory evaluation of potato varieties indicated that farmers ranked the variety "Amarilis" as the best in terms of resistance to late blight, yield and culinary quality. These results influenced CARE strategy related to credit provision for potato production in the area, so loans were provided to plant this variety and as a result, its adoption has grown rapidly in the pilot area.

In summary, the participatory experience influenced priorities of the actors and institutions involved.

***Enhanced institutional capacities to use participatory research and training activities***

The research question for this impact area was if there would there be a structured, validated and available FFS approach with emphasis on PR to be used and institutionalized by the involved institutions? The main indicator here was the existence and use of such a methodology by CIP and CARE and other institutions. For this purpose, the evolution of the FFS approach for potato-related problems in San Miguel was recorded and documented. Focus groups and workshops with farmers, facilitators and researchers were organized to evaluate and adjust the approach along three years of the project.

At the beginning of the project in 1998, the FFS approach originated in Asia for rice-related problems began to be adapted to the agro-ecologic and socioeconomic conditions of potato production in San Miguel. A pilot field guide was designed based on previous experiences with potato IPM. This field guide included training and research activities to be conducted by facilitators with farmer groups. Facilitators and farmers monitored these activities constantly so that new versions of the field guide resulted subsequently in 1999 and 2000. Farmer contribution was valuable to realize that initial versions lacked flexibility because the format was pre-defined by sessions. A more flexible version organized around thematic areas resulted in year 2000. Thematic areas included FFS-PR organization, learning activities by constraint (pest biology and control), design of participatory experiments, monitoring and evaluation, and examples of group dynamics. In this way, facilitators could design their research and training programs according to the needs and characteristics of each farmer groups.

CIP and CARE have now a field guide that combines research and training principles with specific learning activities that have been validated. In addition, the importance of these types of methods has been promoted within each institution. As a result, FFS-PR is regarded now as a platform for participatory research and training within both institutions, which are making efforts to include it as part of their intervention methodologies. CARE has inserted it in some development projects that deal not only with potatoes but also with other crops and economic-oriented activities. CIP is using it as a method in other countries such as Bolivia, Uganda, Ethiopia, Bangladesh and China and is being promoted through its participatory research-working group. Hence, the FFS-PR experience has influenced institutional perceptions about the importance of using this type of methods.

The method has also been shared with other institutions such as FAO, which is implementing a four-year project aiming at implementing 450 FFS in Peru. The implementation of this project would have had serious difficulties without the initial CIP-CARE experience. As a matter of fact, staff that initially worked with CIP-CARE are now working with FAO.

There was also a learning process regarding the use of research designs within FFS-PR. The question was what type of designs could be more appropriate so that farmers can understand them but at the same time testing IPM practices could be efficient. Initially, factorial types of experiments were undertaken to test the relationship between resistant varieties and fungicide treatments, but farmers indicated that those experiments were too complex to see differences among treatments. Therefore, experiments were split in two or three more simple designs. Clone or varietal evaluation was one experiment with only one fungicide treatment that was closer to that of farmers. Testing fungicide strategies was another experiments in which three strategies were tested with three potato varieties (susceptible, regular and resistant to late blight). And there was another experiment to test farmers' own ideas, such as quality seed or types of fertilizers.

The methods for evaluating the experiments also changed. Initially, there was a form in which farmers wrote what treatments they liked more and why. This method had the limitation of excluding farmers with low writing skills (particularly women). A modification was introduced using grains of maize or beans to score treatments (five grains if they liked the treatment, and cero if they disliked it). The method worked, but still had problems with counting grains. A final modification was introduced using three types of cards representing a happy, normal and sad face respectively. If a farmer liked the treatment, they picked the happy face and put in a paper bag in front of the treatment. The same process if they thought that the treatment was regular or bad but using the other cards respectively. Counting the number of cards per type allowed to have a ranking and scoring, which was immediately presented to farmers for discussion. Researchers and facilitators who participated in the process have learned how to design, conduct and evaluate experiments with farmers, which as also contributed to enhance the institutional capacities to use participatory methods.

Hence, evidence shows that institutional capacities to use participatory research and training methods have been enhanced as a result of the project.

***Enhanced cost-benefit relationship of the intervention***

This impact area aimed at assessing to what extent the cost of conducting FFS-PR was justified by the benefits generated at farmer level, and also how this type of interventions could be more cost effective for research institutions in terms of accelerating adoption of new technologies. The main indicators were costs per participant farmer, the marginal net benefit per hectare and adoption of IPM components. In addition, the period of time in which new potato clones are selected and put into farmer hands is another impact indicator.

Focus groups were conducted after the second year of the intervention for eliciting farmer perception of benefits. Semi-structured surveys and plot monitoring have been conducted to register practices and yields of participants and non-participants (see section about enhanced food security and income). An extensive quantitative survey was also carried out with the support of the World Bank, and secondary information has also been reviewed for assessing this impact area.

<u>Costs and benefits at farmer level:</u> There are not yet concluding results regarding the cost-benefit analysis. However, some ex-ante, preliminary analysis indicate

potential attractive returns to investment. First, at farmer level, the average cost per farmer who participate in FFS-PR can be approximately US$ 60 per year, and the research and training period could last three years, so there is a total cost of US$ 180 per farmer, which includes only the costs of running the FFS activities at field level (salary of facilitator, per diems, transport and inputs).

With this costs, the minimum benefit per hectare to make the investment profitable would be of about US$ 100, so that the internal rate of return would be about 28%. From previous studies, controlling the Andean potato weevil could generate a net benefit of about US$ 100/ha (Ortiz et al 1996), and controlling late blight could be even more profitable. Torres et al (1999) reports that an enhanced late blight control based on better use of fungicides can generate net benefits per ha from US$762 to US$2415. Fonseca et al (1996) indicates that enhanced late blight control based on the adoption of resistant varieties could generate a minimum net benefit of about US$280. Benefits derived from late blight control are expected to be higher than benefits derived from insect control, because this disease has a strong, negative influence on yield.

Data from plot monitoring indicates that participant farmers spray at least one time less than non-participants, which represents a benefit of US$ 20/ha. Another piece of evidence for a cost-benefit analysis is provided by Godtland et al (2001), who studied changes generated by participation in FFS-PR at the pilot area of San Miguel. They found a significant association between participation in the schools and knowledge enhancement, and also estimate that changes in knowledge can be associated with a 2.16 increase in the potato seed output/input ration, which means an increase of about 2 t/ha because of a better use of knowledge to make decisions. This increase in yield represents about US$ 200/ha, which covers the investment made in implementing the FFS. It also covers additional 50% in the cost of a FFS-PR for administration and supervision, and still generates an attractive internal rate of return.

At the moment a third year of monitoring potato plots of participants and non-participants is being carried out. It is expected to have a more accurate estimation of benefits in 2002.

<u>Costs and benefits at institutional level</u>: A hypothetical analysis was undertaken from the point of view of national programs that invest in potato breeding and variety evaluation. The question is how to shorten the period of evaluating new clones and start disseminating them to farmers. However, preliminary evaluations indicate that a participatory clone selection as part of FFS-PR could shortlist 50 promising clones to the best 10 in about 4 years, at the same time, the best clones enter into informal seed systems and start to be adopted and diffused. If the same 50 clones would be given to a national program, experience suggests that not earlier than 8 years, the best clones would be available for farmers. This means that the adoption curve in the second case would start four years later. Figure 4 presents a simulation of adoption curves to show the differences in

adoption area, which would be reflected in additional benefits for a larger number of farmers in a given year. This working hypothesis in being tested at the moment.

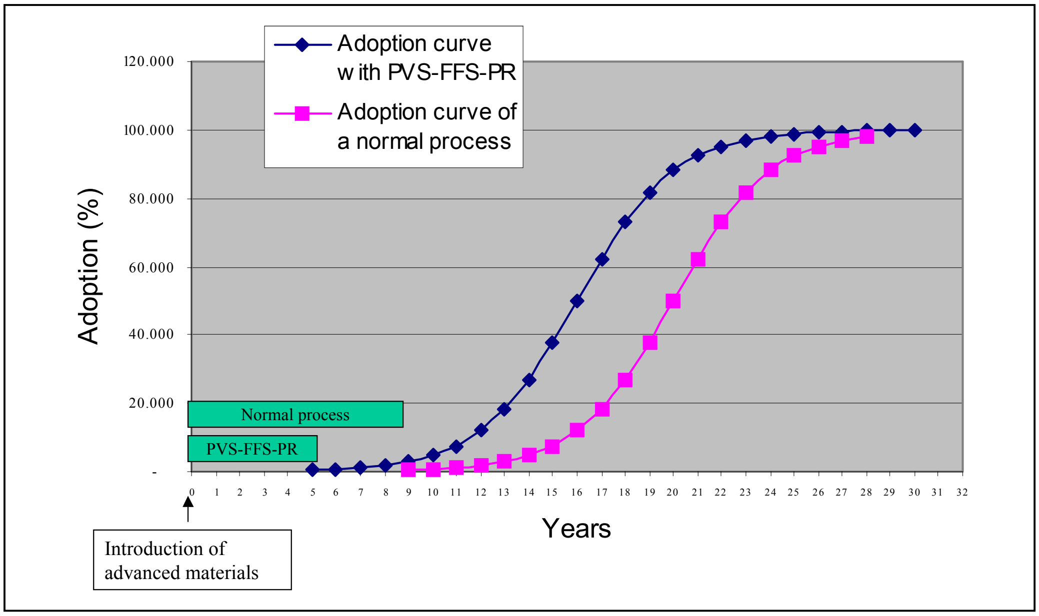


**Figure 4: Hypothetical comparison of adoption curves of clones selected through participatory clone selection (PVS) through FFS-PR, and through a conventional selection process.**

Research costs estimated for these two scenarios indicate that FFS-PR could cost per year twice the cost of a normal clone selection in a national program. But a participatory method such as FFS-PR generates additional outputs than only selecting varieties (see other impact areas of this report). If the objective would be only selecting potato clones, FFS-PR would be too expensive. But if a number of outputs can be generated with the same investment, it would be more efficient. The results of analyzing the rates of return for both scenarios in Figure 4 indicate that having an earlier adoption because of a participatory method could mean an increase of about 20% the internal rate of return. Therefore, the critical point for success is having the right clone as early as possible, and for this purpose, woman participation is essential (see section on gender impacts).

The risk of changes in pathogen populations that cause late blight is increasing. So this is another reason why accelerating the dissemination of new potato clones through participatory means could pay off because potential new varieties could have a longer "useful life" until their resistance is broken. Data from Peru suggests that a resistant variety could lose its resistance about 8 years after its formal release, so the longer the period that the variety is evaluated without release, the shorter the period that its resistance would last at field level.

There is, however, a drawback of participatory clone selection is that it cannot be repeated in several places so that stability of the clones is ensured. Therefore, it would be unknown if the clones selected by farmers in one place could be rapidly adopted in other places. There is the risk that this may not happen because of the variability of agro-ecological conditions in the Andes.

***Enhanced capacity to carry out research and self-innovate***

Farmers do experiment using their own criteria in the Andes. They are constantly testing new ideas for curiosity, for solving problems or for adapting technologies (Rhoades and Bebbington, 1995). However, for the purpose of impact evaluation, the research question was to what extent FFS-PR influences farmers' skills to conduct their own research based on the principles that were taught in the schools. These principles included knowledge about research principles (concepts of hypothesis, repetition, randomization, systematic evaluation, analysis and conclusions), and skills to design and conduct simple experiments. These indicators were evaluated with participant and non-participant farmers using focus groups, questionnaires, contest, observations and case studies. The evaluation was conducted during the second and third year of the project.

Results related to this impact area indicate that farmers have learned concepts related to research principles. A questionnaire applied in 2001 indicated that 79% of participant farmers answered correctly questions related to research principles compared to 7% of non-participant farmers. Evidence generated by a contest of research projects that was held in 2000 indicates that the 25 research projects that were registered belonged only to participant farmers. Among the 25 projects, thirteen were interested in evaluating true potato seed with different management strategies, five were interested in trying botanical or natural pesticides, five were interested in levels of fertilization, and two were interested in defoliating potato plants to see its influence on yield. Unfortunately, weather conditions that were extremely difficult in February and March –2000 prevented farmers from finishing their experiments. However, the experience showed that participants were assimilating research principles.

The FFS-PR has shown to be an appropriate vehicle for teaching research principles. However, the time frame and the evaluation methodology did not allow to elicit if changes have occurred within farmers' own experimentation. It is expected to look at this aspect in 2002.

***Enhanced knowledge about biophysical principles of pest control***:

Integrated pest management on the potato crop is a knowledge and information intensive technology, which means that its adoption is not based on the use of inputs but on the understanding of biophysical principles of pest control (Ortiz et al 1997, Ortiz 1999 and Ortiz 2001). Although, farmers have sound knowledge about a number or processes that occur within their farms, they lack knowledge about those phenomena that cannot be easily observed (e.g. microorganisms and insects), but they can develop such knowledge when are exposed to suitable information in appropriate ways (Bentley, 1989, 1990, 1991, 1994). Therefore, the first step for assessing IPM implementation was measureing changes in knowledge about such principles. The research question was to what extent FFS-PR contributes with new, useful knowledge for farmers. Focus groups, questionnaires and the box test were used to elicit information from participant and non-participant farmers after one, two and three years of intervention.

Results from focus groups, questionnaires and the box test have indicated that FFS-PR had a significant effect on farmers' knowledge about biophysical principles of pest control, which confirms the findings of Godtland et al (2001) studying the same population. Figure 5 shows the first comparison that was carried out in 2000 using a questionnaire, in which results indicate significant differences in knowledge (using non-parametric tests) between participants and non-participants, including a control group that participated in a more conventional training approach ("Andino") without a PR component.

In 2001, the evaluation was repeated and results confirmed the differences. In this year, results indicated that knowledge gain was associated with the number of years of involvement in FFS-PR. Figure 6 shows the results of knowledge in function of years of participation. Results indicate that farmers gained significant knowledge by participating in one training cycle vs. non- participating. They also gained knowledge if they were involved in a second cycle, but there was no additional knowledge gain after the second year. These results suggest that the FFS-PR should last no more than two years with a group.

Woman participation in knowledge evaluation activities was lower than their participation in learning activities. Therefore, it was not possible to disaggregate data by gender. Women felt less confident on their knowledge than man so they did not want to be evaluated with questionnaires. However, qualitative evaluations indicate that they also perceive changes in their knowledge, although to a lesser extent than men.

An important issue to discuss is related to the dissemination of information from participants to non-participants. Results of qualitative studies indicate that participant farmers share information, first, with their nuclear family, second with their extended family, and third (to a lesser extent) with neighbors. The evidence of quantitative studies does not indicate that information is being disseminated to non-participants. Ortiz (1997) indicates that the complexity of IPM-related knowledge makes it difficult to be shared naturally with other community members.

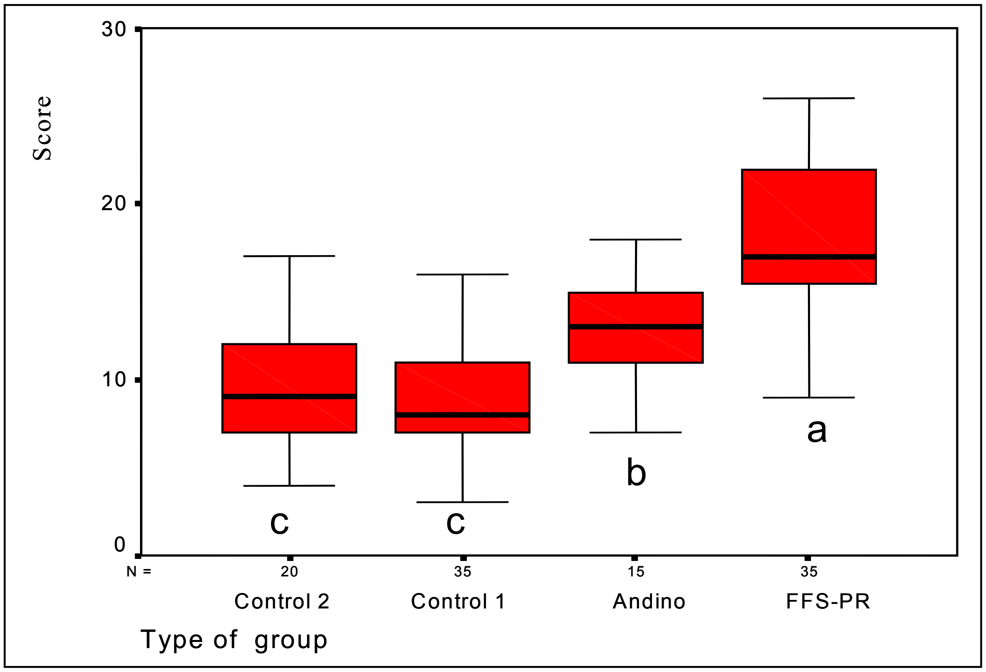


**Figure 5: Comparison of knowledge between participants and non-participants in FFS-PR. Control 1 and 2 were groups of non-participant farmers in communities with FFS-PR and without FFS-PR respectively. Andino was a group that participated in a more conventional training approach. The maximum score (100% correct answers) was 26.**

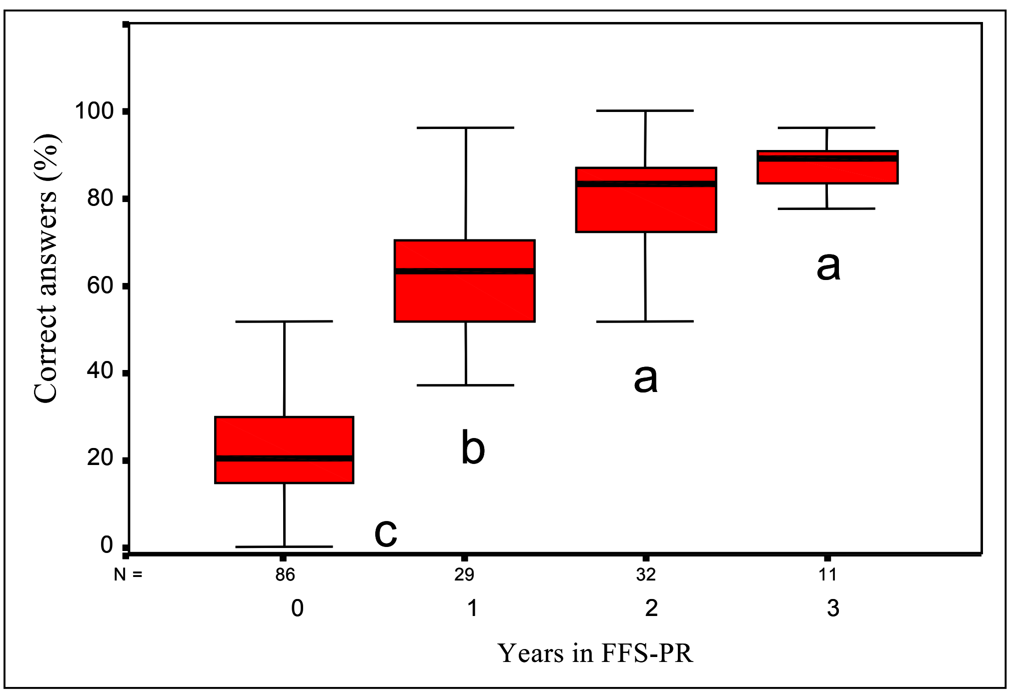


**Figure 6: Comparison of knowledge in function of years of participation (a, b and c show significant differences using t test).**

There are two types of information to be shared: basic information (biophysical principles) and applicable information (control practices). Qualitative evidence indicates that the applicable information is more likely to be shared. For example, information about which clones or varieties are more resistant to late blight or what type of fungicide and dose is appropriate. The rapid dissemination of the variety "Amarilis" in San Miguel area seems to confirm this hypothesis. However, how to facilitate dissemination of basic information still remains as a challenge. Training farmers as facilitators so that they can organize other research-learning groups is an alternative for sharing knowledge within and to other communities.

Qualitative evaluations through focus groups indicate that farmers' degree of satisfaction with their own knowledge was significantly higher (using non-parametric tests) in participants than in non-participants. Figure 7 presents the results comparing one FFS-PR community with a control community using cards with happy, normal or sad faces which indicated high, regular or low satisfaction with their own knowledge about specific topics. This comparison was repeated in nine FFS-PR communities and five control groups with similar results.

Participant farmers have enhanced their knowledge about biophysical principles of pest control, which has enriched their traditional body of knowledge by generating new concepts and reinforcing or adjusting existing knowledge and practices, coinciding with the findings of Ortiz (1999, 2000). Hence, the enhancement of human capital has been one of the major outcomes of the project.

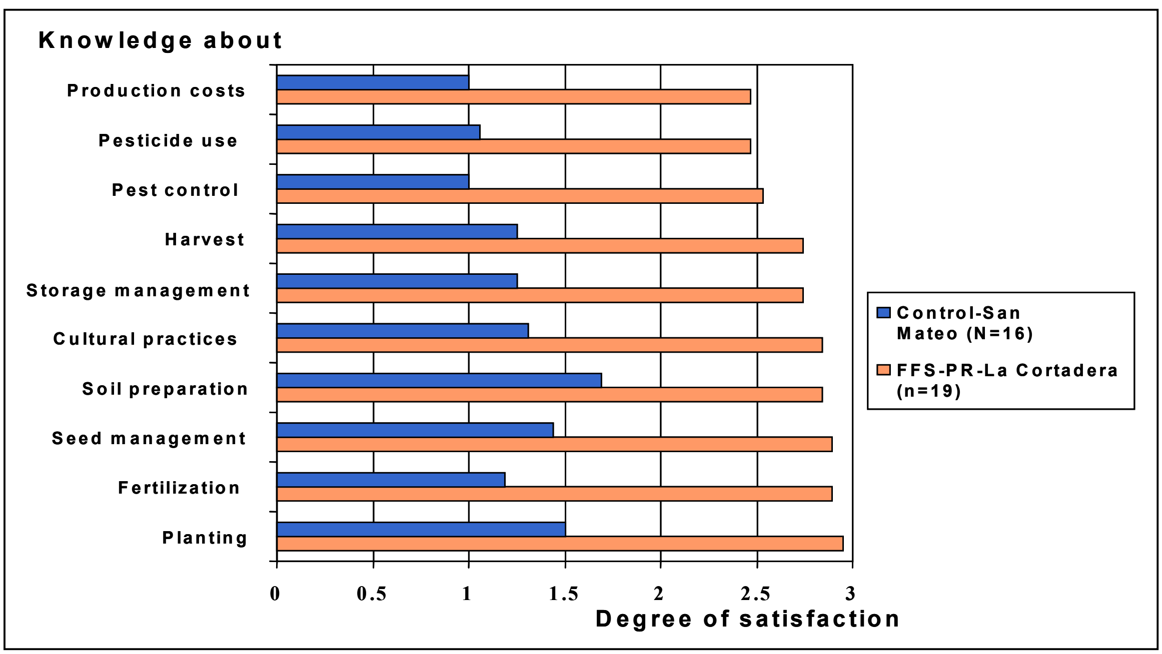


**Figure 7: Comparison of degree of satisfaction regarding their own knowledge between participants and non-participants in two communities. Key: 0 means non-satisfaction, 3 means high satisfaction.**

***Enhanced group decision-making***:

FFS-PR involves group activities, so it was important to know what was the influence of the approach on enhancing group cohesion and decision-making as an indicator of changes in social capital. Indicators such as, type of group activities, information exchange, type of joint decision-making were monitored. Nine focus groups with participants (one, two and three years of participation) and five with non-participants were conducted in early 2001 for this purpose. Case studies of key informants were also conducted along the project period.

Focus groups with participants and non-participants were conducted in early 2001 to assess farmers' perceptions about the influence of FFS-PR on their organization. Appendix 3 shows the results of such evaluation, including the perception of researchers and facilitators on the same impact area. Results showed that farmers perceived a strong influence of FFS-PR on group cohesion, decision-making, access to technology, information exchange among members, strengthen of social links, improved research, and enhanced participation of women, compared to non-participants. It is important to highlight that communal action was not common in San Miguel area. In this respect, the situation in the northern highlands of Peru is different than in central or southern highlands.

Another indicator of changes in social capital is related to the formation of the committee of FFS-PR representatives, which participated in evaluation and planning workshops. In addition, each FFS-PR selected at least two representatives to be trained as facilitators. It is aimed at having internal facilitators within the communities to coordinate group action, information dissemination and continue with the work initiated by the FFS-PR. These facilitators have participated in three training and planning workshops and have established priorities with the community members to be addressed during 2002. The idea is to formalize this group as an association of FFS-PR facilitators, which can be linked to the local municipality with the support of government projects. Initial contacts with these institutions have been encouraging.

**Technology impact**

***Enhanced farmers' capacity to tackle pest problems***

This impact indicator aimed at assessing the FFS-PR influence on farmers' capacities to tackle potato pests. Some specific indicators were the number of pest control options in the system, adoption of pest control options, proportion of farmers who had knowledge about biophysical principles of pest control and IPM control components, and proportion of farmers who had skills for correct pest diagnosis. Changes in indicators were monitored in participant and non-participant groups in 1999 and 2001.

The initial perception by researchers, facilitators and farmers that there could be standard components for IPM, particularly to control late blight, probed to be wrong. The experience indicated that the "software" of the technology (basic principles) could be widely used, but the "hardware" (specific inputs, varieties or activities) had to be site specific, even at the level of a plot depending on planting dates and weather conditions.

Focus groups with participant and non-participant farmers at the beginning of the project and during 2001 indicated that farmers were able to identify more pest control options as a result of their participation in FFS-PR. Table 6 indicates the type of pest control options mentioned. These results were also confirmed by questionnaires.

**Table 6. Pest control options mentioned by participant and non-participant farmers in 1999 and 2001.**

| | **Participants** | **Non-participants** |
|---|---|---|
| 1999 | - Pesticide use<br>- Crop rotation<br>- Planting early in the cropping season | - Pesticide use<br>- Crop rotation<br>- Planting early in the cropping season |
| 2001 | - Resistant varieties and clones<br>- Pesticide use according to pests, resistance levels of clones, weather and type of product.<br>- Planting early in the cropping season<br>- Manual collection of Andean weevil.<br>- Crop rotation.<br>- Vegetal barriers.<br>- Use of sheets and chickens.<br>- Use of pheromones<br>- Use of yellow sticky traps<br>- Diffused light stores | - Pesticide use<br>- Resistant varieties<br>- Planting early in the cropping season |

Results from plot monitoring indicated that farmers were adopting resistant varieties and clones introduced through FFS-PR, so there was more diversity of genotypes in participating communities. The case of "Amarilis" variety is worth to highlight. This variety was tested as part of a group of 12 varieties in 1997-1998 cropping season. Because of its outstanding performance, farmers initiated to plant it immediately. This effort was supported by credits provided by CARE, so at the moment this variety is planted in 45% and 38% of area from participants and non-participants respectively, which supports the idea that applicable information and technologies are disseminated more rapidly than basic information.

Results also indicate that farmers were using insecticides and pesticides more thoughtfully, taking into consideration the toxicity of the product (label color), the type of the product (particularly differentiating systemic and contact fungicides). However, adoption of new practices depended on the specific characteristics of each plot (location, date of planting, history of the plot, etc.). Qualitative evidence indicates a reduction of at least two sprays per season, and quantitative data indicate a negative correlation between participation and number of sprays (r=-0.2, significant at 0.05), which means consistent reduction of at least one spray (equivalent to about US$ 20/ha) as a result of participation in FFS-PR. These results should be taken as preliminary, because the analysis did not discriminate number of sprays according to potato variety. Data indicate that farmers tend to spray even less when using resistant varieties.

Focus group results also indicated that farmers were taking sounder decisions using their new knowledge about technological principles. In some cases, this represented no change in an specific practice, but a better understanding of why they should continue doing what they considered right (i.e. crop rotation).

***Enhanced food security and income***

This impact area and indicators were oriented to assess to what extent new knowledge, skills and practices adopted by participant farmers resulted in better income and/or food security. The indicators defined for this purpose were potato yields, severity of pest damage at field level, control costs and income. Qualitative and quantitative methods are being used for this purpose. Focus groups with participants and non-participants were conducted in 2001 to assess farmers' perceptions about changes related to the indicators described above. Semi-structured interviews and plot monitoring were initiated in 2000, repeated in 2001 and will continue in 2002.

Qualitative evaluations conducted through focus groups have indicated that farmers perceive that they are improving potato production, reducing costs and, therefore, improving net benefits. Farmers perceive that new knowledge and information about IPM, and the access to new genetic materials have contributed to improve their production. Linares (2001) indicates that farmers with limited resources, who plant small plots with potato, are who tend to adopt resistant varieties introduced through FFS-PR. For this specific type of farmers who cannot afford controlling late blight with fungicides, having access to new potato varieties and clones generates an impact in their food security.

Evidence collected from communities where weather conditions are more conducive to late blight indicate that participant farmers are planting potatoes during the rainy season, which was not done before. Therefore, they can diversify planting dates, reduce risk and enhance food security of family members (women and men).

Godtland et al (2001) indicates that participant farmers who enhanced their knowledge can increase their productivity. Based on their projections, it is possible to estimate an increase of 2 t/ha as a result of participating in FFS-PR. This increase contributes to enhance food security and income of small potato growers in that area.

The PRGA grant supported collecting more detailed information about potato management at field level. Data was collected in 2000 and 2001 from about 150 potato plots from participants and non-participants. Preliminary data analysis indicates that participants can save at least US$ 20/ha in fungicides, which become an increase of their income. This type of evaluation will continue during 2002, so that the effects of new knowledge on adoption and income can be documented. However, the factors that influence farmers' decision-making related to potato management are diverse and tend to depend on the location of the community on the watershed and the agro-ecological conditions at plot level. This heterogeneity of conditions may difficult establishing a cause-effect relationship between FPR-PR and enhancing income and food security in pure quantitative terms.

## 6. Lessons learned

***Trade-offs between project priorities and participation outcomes.***

The project objectives and priorities at the beginning focused on late blight control on the potato crop. Farmer participation contributed to include aspects such as insect management as a priority. In addition, although the main focus remained as IPM for potatoes, minor shifts were undertaken in terms of including experiments related to pea and faba beans as a response to farmer, particularly woman, demands.

In the study area, sustaining the household was the final family goal, and women and men had specialized contributions to make for this purpose. Because CIP-CARE project had a specific purpose (developing IPM for potatoes), it could not respond to woman interests (livestock production, pea and faba bean management and textile handicraft). But, women involvement in monitoring and evaluation helped to define how their participation could be improved within the limited range of action imposed by the project objectives. Specific activities in which woman participation could have an added value were identified and promoted (i.e. evaluation of potato clones). The added value mentioned here relates not only to research purposes but also to woman interests. It is assumed, that those clones that were selected with woman involvement could have a better chance of a rapid diffusion.

The lesson here is how to interpret participation by gender within a project. Woman participation should not be taken only as the increase in the proportion of women involved, but more on the added value of their participation for the relevancy of the technology that is being developed, and for their own interests. There may be cases in which no participation by gender could be the most efficient in terms of using resources and achieving specific goals. There may be other cases in which partial participation may be more efficient and achievable. And there may be other cases where total involvement of women could be essential. However, existing gender unbalances (access to resources or income) cannot be addressed by highly specialized projects that have a limited mandate and periods of time to operate. When this is the case, efforts should be made to find ways to enhance woman participation towards efficiency within the existing limitations.

***The cost and impact of participatory research and the adoption speed.***

Costs and impacts of participatory research in economic terms are still being evaluated in the case analyzed by this study. However, the analysis also indicates that integrated pest management could not be developed by conventional research methods. In other words, there are no options but undertaking participatory methods when dealing with technologies that are knowledge and information intensive.

Evidence so far indicates that the cost per participant in FFS-PR is likely to generate attractive returns in terms of enhancing productivity and income. When talking about comparing approaches, FFS-PR could be an alternative for facilitating farmer access to new potato clones, particularly if we take into consideration the limitation of the formal research systems at government level. Although, this is still a working hypothesis, the idea is that putting promising clones in farmers' hands as soon as possible through participatory means could save between five to twelve years to initiate the adoption of such clones, resulting in earlier benefits for farmers who adopt the technology. Results of the evaluations indicate that adoption of new materials starts as fast as one cropping season after the materials are put in farmers' hands.

However, releasing new clones with resistance to diseases such as late blight in a participatory way may not differ that much from a conventional way of doing research. What FFS-PR proposed is releasing clones as part of IPM strategies, for which farmers have to make decisions based on information and knowledge (it was confirmed that farmers gained knowledge by participating in FFS-PR). Therefore, it would be a technology composed by "hardware" (potato clone) and sound "software" (Rogers, 1995). This may have implications for the duration of the resistance of new materials. Previous experiences have shown that varieties selected as resistant have lost its resistance after 8 years of its formal release, probably because of inappropriate fungicide management. New materials, if adopted as part of IPM strategies, could have a longer period of resistance, resulting in savings in pesticides. On the other hand, farmers (particularly women) do not select new materials only because of the resistance to the disease, but because of other characteristics such as culinary quality. Ensuring the right combination of characteristics could help the variety to stay longer in farmers' fields because of its acceptance in the market.

This working hypothesis will be tested in the next two years. So far, ex-ante evaluations indicate that the investment in FFS-PR could be profitable if participating farmers could achieve an additional benefit of at least US$100/ha. Studies conducted by Godtland et al (2001) indicate that this is likely to happen.

***Influence on local experimentation.***

Evidence indicated that participating farmers enhanced their knowledge and skills related to research in the terms that were taught in the FFS-PR. However, the application of such knowledge and skills for testing new ideas and innovate has not been evaluated yet.

In 2002 cropping season, specific activities will be carried out to assess if participating farmers are conducting their own research and if they are using the new knowledge for this purpose.

***Influence on capacity building on sustainable changes.***

FFS-PR involved research and training activities that were useful to built local capacities on an individual and group basis. On an individual basis, there is strong evidence that the project has contributed to enhance human capital (knowledge and information management). Changes in social capital have also been observed. Group formation and decision-making has been reinforced. There is a group of farmer-facilitators who are starting to take over the responsibility of conducting FFS-PR within their communities and farmers plan to keep the groups working for communal benefits. The performance of these facilitators will be assessed during 2002.

Sustainability of changes in social capital will depend on the response that farmers can find to their demands. In other words, the project has raised expectations and farmers want to work on other aspects related to farming. However, there may not be institutions that could provide knowledge, information and technologies to satisfy such demands. So, the question that remains unanswered is to what extent farmers will be able to keep their interest in searching for new knowledge when there may not be sources of appropriate knowledge.

***Influence on institutional priorities.***

The existence of a FFS-PR approach in a tangible way (field guides available) and initial evidence of its efficiency (monitoring and evaluation results) has influenced CARE to make decisions about the potential use of the approach in other projects and for other purposes (livestock and forest management and entrepreneurial activities). Other institutions, such as CORPOICA (Colombian research institution) have asked for training related to this methodology. In addition, FAO is using the lessons learned in San Miguel for scaling-up the experience to other parts of Peru and not only with potatoes but with other crops such as cotton, coffee and vegetables.

CIP experience at the pilot area of San Miguel has been shared with similar projects that are being implemented in Bolivia, Uganda, Ethiopia, Bangladesh and China, particularly in terms of stakeholder analysis and participation by gender. At least ten research and extension institutions (other than CARE and CIP) have been exposed to these ideas. However, most institutions may not be able to conduct a proper stakeholder and gender analysis because of their lack of experience.

***Participatory research and training as part of larger development interventions.***

The experience in San Miguel suggests that any participatory research and training project should be part of a larger development intervention. In this way, farmers could perceive more integral and tangible benefits of their participation in such activities. Participation only for the sake of research and training may not be attractive for farmers who are struggling to survive day after day, so they have to perceive more tangible benefits of their participation. This has implications for the research-development continuum because implies that research has to be part of development-oriented interventions and that the boundaries between both type of activities are not clearly defined.

***Towards institutionalization***:

Institutionalization means that institutions adopt methodologies. Therefore, the theory of adoption of innovations could be used to analyze this process. For example, there may be limited adoption if institutions are asked to conduct "proper and complete" gender an analysis (which is only possible when there are gender specialists). There may be more adoption if they are able to include parts or elements of these methods in their daily routines and find functional ways of using them for doing more efficient research. So the question is if we would like institutions to adopt the "package" of gender analysis or adopt "elements" of it. Adoption studies in other fields tend to suggest that people adopt elements or parts that consider useful instead of packages. Hence, more thought should be given to analyze the adoption process of participatory methods by institutions.

Within CIP, a working group related to participatory research has been formed and is working since 2000. Having the small grant from PRGA has been useful to support the collection of evidence about the benefits of this type of approaches.

Informal exposure of this evidence to other scientists has helped them to consider this type of approach as useful for research and development purposes. However, participatory methods should not be presented as a panacea but as an alternative that could have comparative advantages for some types of technologies and not for others. There is the tendency to consider PR as one single type of approach instead of a diversity of alternatives and types of approaches that could be used according to the type of technology, the stages of its development and the orientation of institutions. Therefore, institutionalizing these approaches should take into consideration that institutions with different mandates and objectives may like to adopt different types of participatory methods. Figure 8 shows the relative importance that research or development-oriented institutions, such as CIP and CARE, could give to different types of participation (the triangle area represents the suggested involvement). The overlapping area between the two triangles represents participatory activities in which both types of institutions could collaborate according to the type of project. Therefore, it would not be advisable that a research institutions like CIP is involved in all types of participation with the same intensity. Each institution should select the type of participatory approach that could contribute more to their goals.

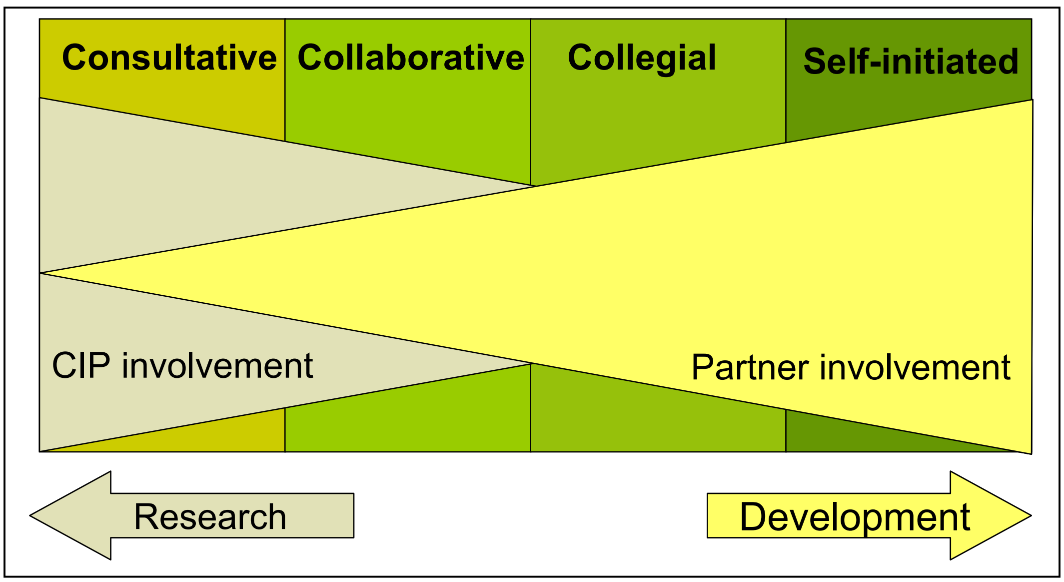


**Figure 8: Types of participatory approaches according to institutional specialization. The case of CIP, a frame for discussion.**

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List of documents that have been generated during the evaluation process.

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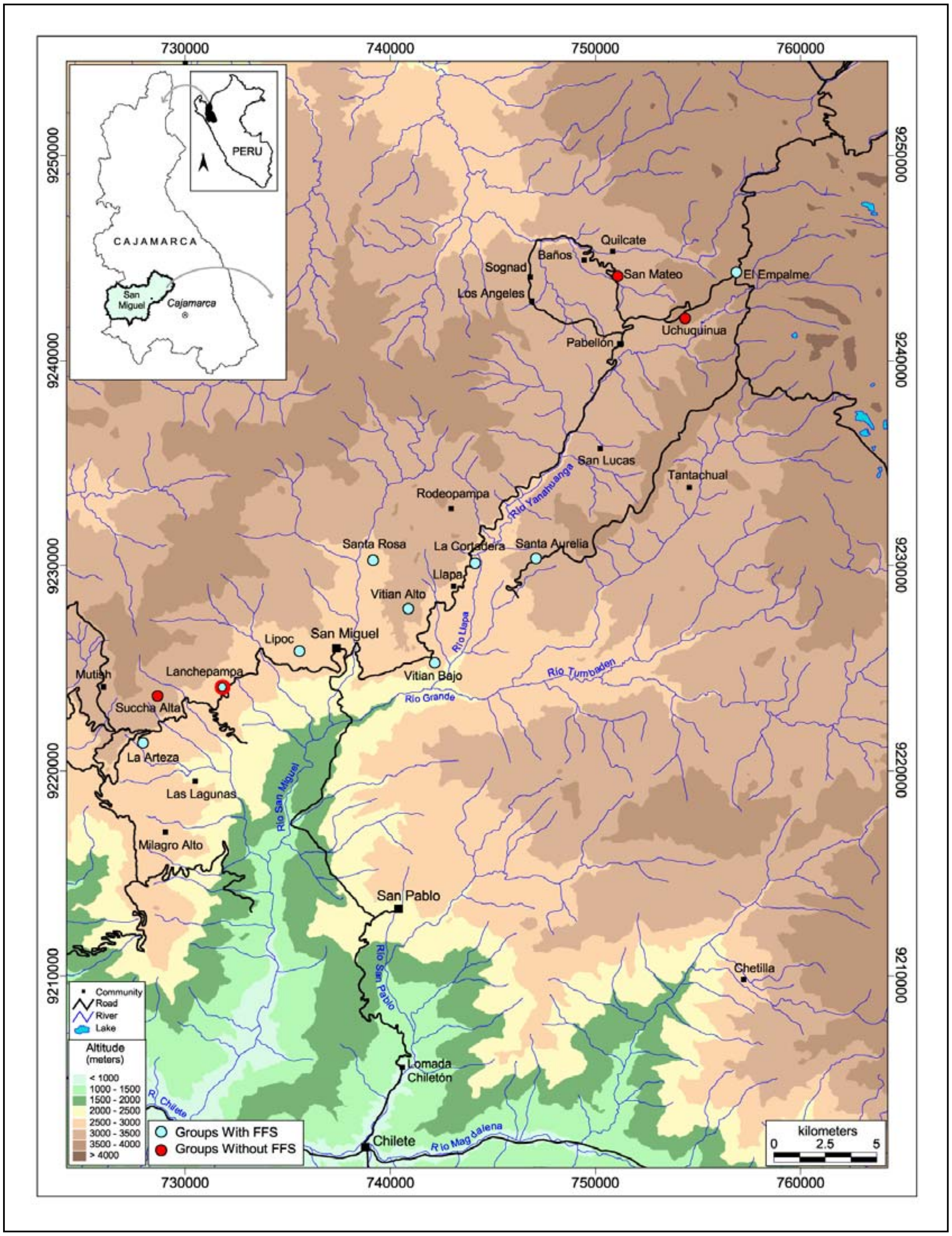
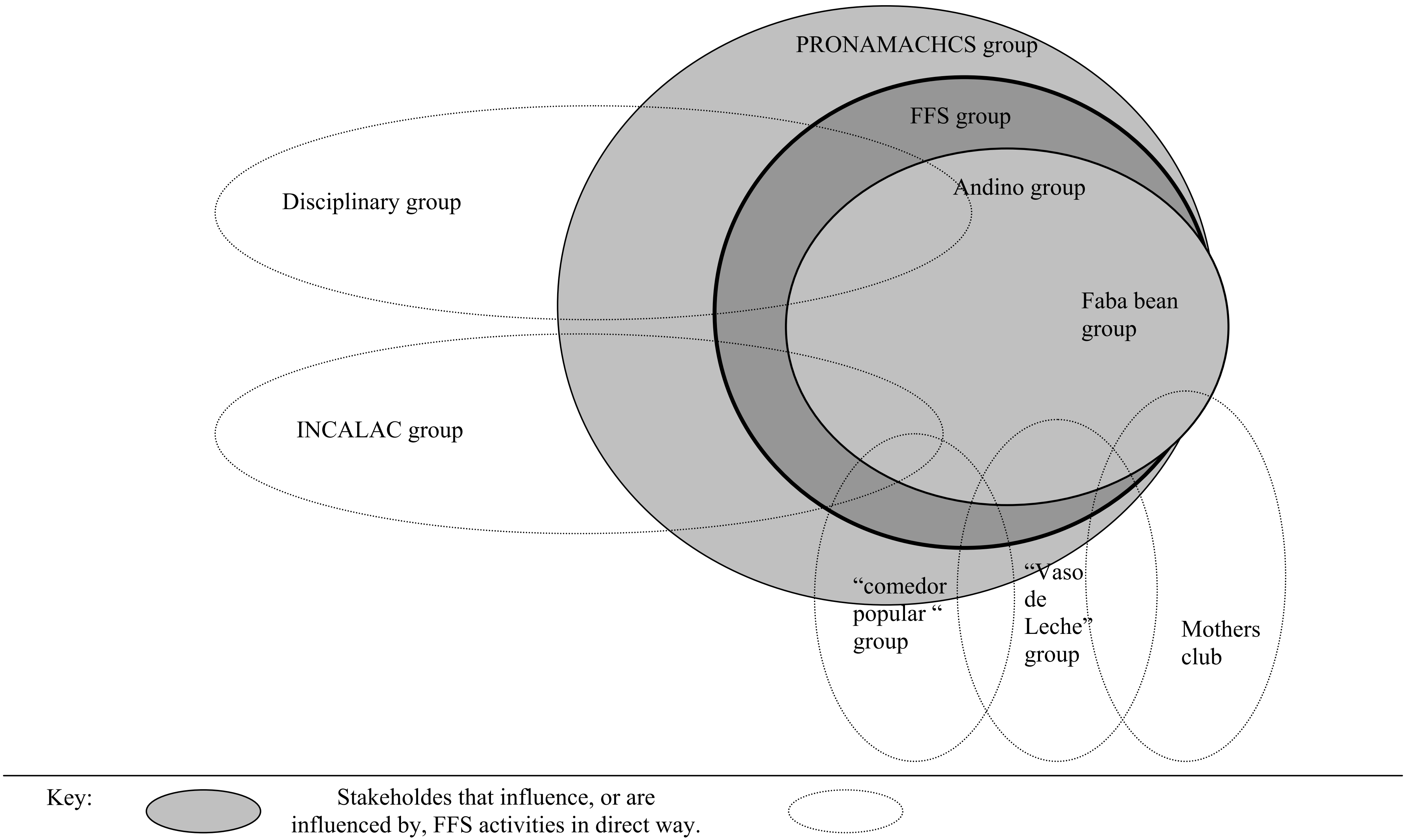
## 9. Appendixes

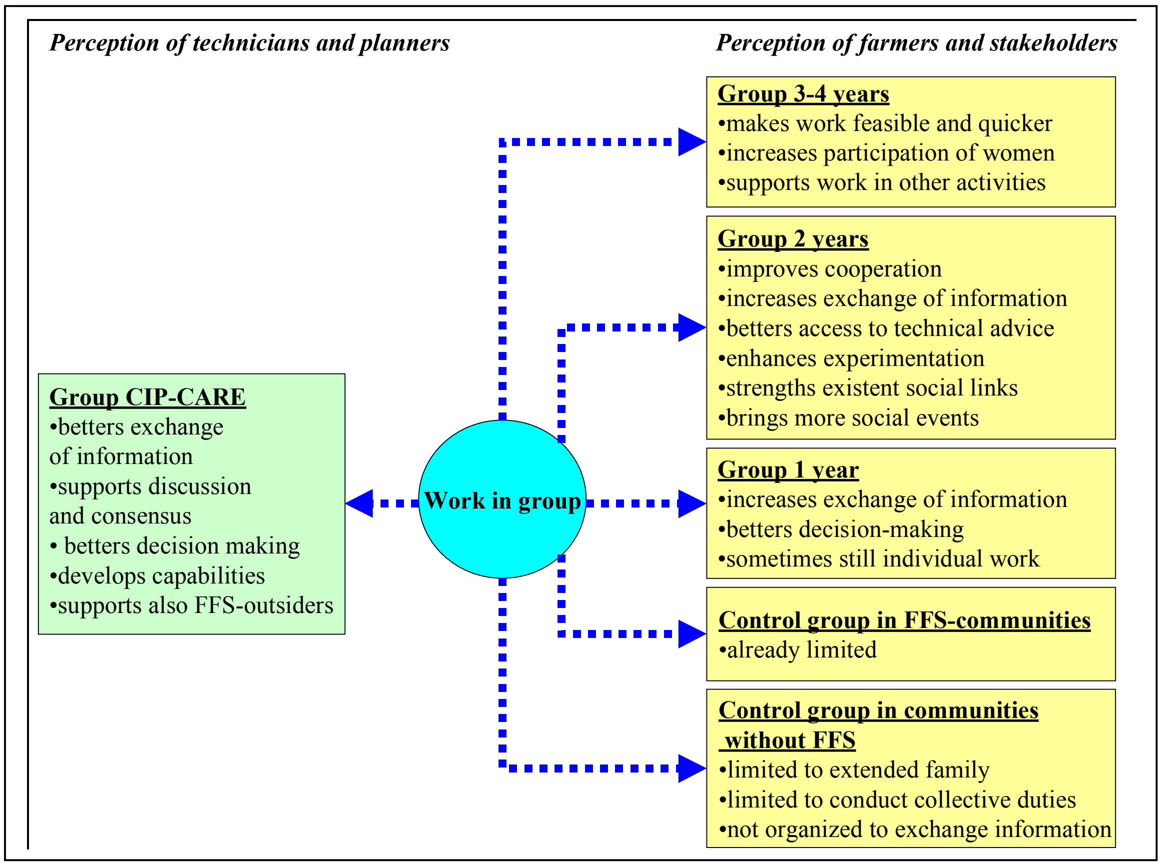
**Appendix 1: Map of the pilot area of San Miguel, indicating the communities that participated in the FFS-PR project.**



**Appendix 2: Stakeholder groups related to FFS in the communities analyzed**

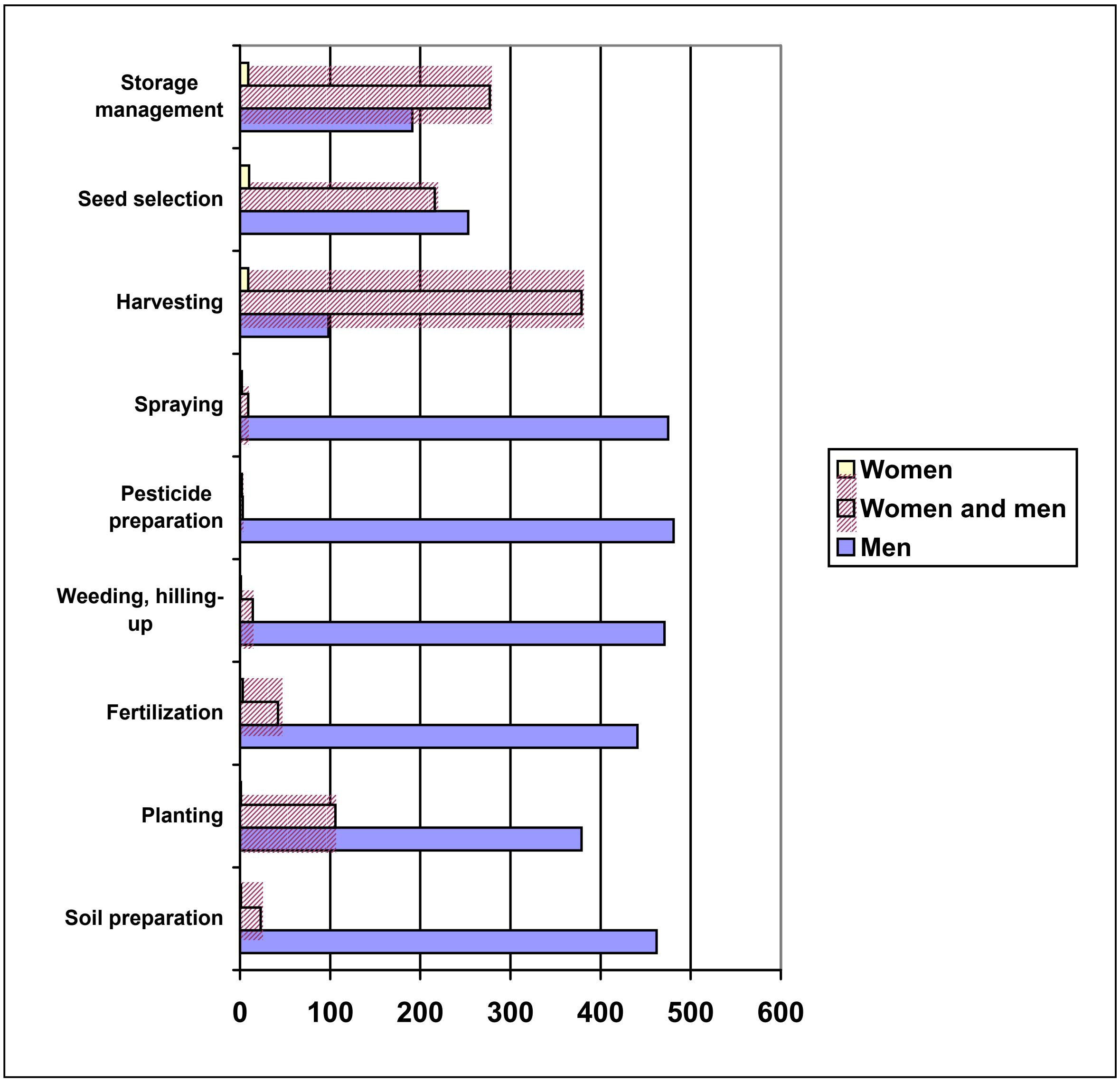


**Appendix 3: Perception of farmers, facilitators and researchers regarding the effects of FFS-PR on organization (group decision-making).**



**Appendix 4: Participation by women and men in potato-related activities. Results of a survey of 480 households, San Miguel, Peru. 1999**

The figure below shows that men in the study area carry out most of the potato-management activities. However, women play important roles in three specific activities: harvesting, seed selection and storage management. These results suggest that women should receive information about, and participate in, research related to these three activities.




**Key:** Numbers below indicate the number of households.

**Women:** Indicates the number of households that indicated that activists are carried out mostly by women.

**Women and men:** Indicates the number of households that indicated that activities are shared between women and men.

**Men:** Indicates the number of households that indicated that activities are carried out mostly by men

**Appendix 5: Spearman's correlation between man and woman ranking preferences of clones in eight communities of San Miguel. 1999-2000 cropping season.**

| Community | Evaluation at harvest time | | Evaluation of culinary characteristics | |
|---|---|---|---|---|
| | Spearman's correlation | Significance | Spearman's correlation | Significance |
| **La Arteza** | 0.5 | 0.1 | -- | -- |
| **Lipoc** | 0.8 | 0.05 | -- | -- |
| **Santa Aurelia** | 0.2 | N. S. | 0.51 | 0.1 |
| **Santa Rosa** | -- | -- | 0.5 | 0.1 |
| **San Lucas** | 0.8 | 0.05 | 0.3 | N.S. |
| **Pabellón** | 0.6 | 0.05 | –0.1 | N.S. |
| **Los Angeles** | 0.2 | N.S. | 0.1 | N.S. |
| **La Cortadera** | 0.6 | 0.05 | –0.1 | N.S. |

Note: Women and men tend to rank clones in a similar way (counting frequencies) when selecting clones at harvest time. This indicates that women and men have similar preferences related to yield, tuber color and shape. In most communities the correlation coefficient was significant. However, when evaluating for culinary characteristics, the correlation coefficient did not show significance in most cases, suggesting that women and men tend to have different criteria to evaluate clones for tuber taste and texture. This shows the importance of involving women in this type of evaluation. Differences in types and number of potato varieties planted in each community may also influence the coincidence or difference between woman and man opinions.