Participatory research and training: Ten lessons from the Farmer Field Schools (FFS) in the Andes

by G. Thiele, R. Nelson, O. Ortiz, and S. Sherwood

Experiences from implementation of the Farmer Field Schools (FFS) in the Andes suggest the following 10 lessons:

1. The FFS help farmers to learn principles of integrated management of late blight, deploy cultivars and improve fungicide use.

2. The economic return to training in managing late blight is very high.

3. Various methodological aspects of the FFS need to be adapted to the potato crop.

4. The content of the FFS should be adapted to the needs and interests of the community.

5. It is not recommendable to carry out an FFS without properly trained facilitators.

6. Special care is needed to avoid turning the learning field into a competition between farmers and facilitators or into a demonstration of the superiority of a new technology.

7. The FFS may play an important role in participatory research but other mechanisms and platforms also exist.

8. NGOs are valuable partners.

9. Farmers are enthusiastic evaluators of new genotypes, and they do it well.

10. Ideally, farmers should take part in trial design; where this is not possible it is essential that the design facilitates their active participation in trial establishment and data collection.

A virtuous circle

This article looks at experiences with potato production in the Andes where late blight is an especially difficult problem. Genetic resistance is one of the best options for managing this disease. Farmers' knowledge is one of the most important components in the use of genetic resistance; it is the base for integrated management of the disease. If resistant cultivars are used without being properly managed, they will not reach their productive potential, and their resistance might be lost more quickly (Fernández-Northcote & Navia, 1995).

Due to the variability of agro-ecological conditions and the different resources and interests of farmers, a participatory process to select resistant cultivars and adapted management options is necessary. Where appropriate, other actors in the agro-food chain should also be involved.

Within this context, participatory research (PR) - aimed at adapting management options - and participatory training - aimed at developing knowledge - reinforce each other, creating a virtuous circle. While participatory training in the principles of integrated management establishes the conditions for more informed research by farmers, participatory research feeds participatory training with new options and information. Both complement each other, and they can orient more basic investigation to generate new cultivars and management options.

During the last four years, the International Potato Center (CIP) and its institutional partners in Bolivia, Peru and Ecuador, have tried the Farmer Field Schools (FFS) as a new approach for training, and to a less extent, participatory research. The main lessons we have learnt are discussed below, but we start with the origin of the FFS.

The Farmer Field Schools (FFS)

The Farmer Field Schools started in Asia in the 1980's as a model for training rice-producing farmers in Integrated Pest Management (IPM), mainly in the area of insect pests, and in reducing insecticide dependency. The FFS use discovery based learning methods to improve the farmers' agro-ecological knowledge, and their capacity to make decisions (Van de Fliert, 1993). Usually, a group of 20-25 farmers form an FFS, participating in weekly meetings during a whole cropping cycle. They learn important ecological principles by managing learning experiments themselves. For example, they discover the biological cycle of damaging insects, by rearing them in containers. Each group establishes a learning field where they compare an area managed under the IPM principles, with another part under local management.

In rice cultivation, insect pests are usually the most important problem and the FFS farmers try to manage the conditions in the IPM-field in order to reduce the population of damaging insects. In order to orient the decision-making in the field under IPM, they apply agro-ecological analysis (AEA) at each meeting. In the AEA, the farmers carefully observe the conditions in the learning field to see whether they favor the pests, counting the number of both damaging and beneficial insects in a sample of plants. The farmers then present the information, and the group discuss if any control measure is needed.

In many cases, the experience of the FFS has led to a reduction in the use of insecticides (Untung, K. 1996), restoring the natural control of beneficial insects. After the first experiences with rice, the FFS have been established with a broad range of crops in many countries with favorable impacts (Ter Weel and van der Wulp, 1999). Recently, a project financed by the Embassy of Holland and coordinated by FAO, began in Peru to promote the FFS with different crops.

The first FFS included experimentation as a learning activity to discover agro-ecological principles. Later on in a number of cases, experimentation to develop or adjust new technologies was included, either during the FFS (van der Fliert et al., 1998), or later with those who had finished the training in more permanent groups called Action Research Facilities (Ooi, 1998).

The FFS, late blight and the Andes

In 1997, the International Potato Center (CIP) and its institutional partners in Bolivia and Peru, started to experiment with more participatory approaches to training (Torrez et al., 1999), incorporating some elements of the FFS approach, but not the AEA, which many consider to be its distinguishing feature. CIP has promoted the FFS approach through a project financed by IFAD (International Fund for Agricultural Development) in six different countries, including Bolivia and Peru. In each country a national research institute and a NGO, or other extension organization, has been included. In 1999, in order to support this project, the Global IPM Facility organized a course of three months to train FFS facilitators in Ecuador, Bolivia and Peru. These facilitators then returned to their work places and implemented the FFS incorporating other important elements of the Asian model, such as the AEA. Although many of the fundamental principles are the same, each country has had its own strategy of implementation depending on the demands of the farmers, and the capacity and interest of the institutions involved (Table 1).

In Bolivia, the PROINPA Foundation and the NGO ASAR have, with CIP's support, worked together in the design of the training curriculum. Both institutions, in close coordination, have taken the leadership in promoting the FFS in different communities. PROINPA takes the responsibility for the research activities and provision of genetic material, and ASAR for the multiplication of seeds of resistant cultivars and the replication of the experience in other places. The main emphasis of these FFS has been on participatory training. In the learning fields, previously validated strategies of chemical control for late blight with resistant cultivars have been tried out (Navia et al., 1995; Navia & Fernández-Northcote, 1996; and Fernández-Northcote et al., 1999). Training has concentrated on the use of the strategy and related components. Participatory research activities have been limited to evaluation of new cultivars and advanced clones. PROINPA also supports other related research activities with cultivars resistant to late blight with groups of farmer evaluators, and Local Agricultural Research Committees (CIALs) composed of farmers (Braun et al., 2000).

In Peru, the NGO CARE has been responsible for the implementation of the FFS. CIP has taken the leadership in the development of the training curriculum, in delivering clones and cultivars, and in monitoring the data generated by the participatory research. In these FFS, participatory research has almost the same weight as training (Nelson et al 2001). The concept of PR-FFS (Partici-

Table 1. *Comparison of the FFS in Bolivia, Peru and Ecuador*

	Bolivia	**Peru**	**Ecuador**
Number of FFS formed in late blight areas up to year 2001	15	25	10
Provinces or departments	Cochabamba and Chuquisaca	Cajamarca, Cerro de Pasco, Piura.	Carchi, Bolivar, Chimborazo and Cañar
Institutions involved	PROINPA, ASAR, CIP	CARE, CIP	INIAP, MAG, ONG, CIP
Strategy	Training and some research	Research and training	Training followed by farmer to farmer extension and then research
Research themes	Selection of cultivars	Fungicide use with different levels of resistance and selection of cultivars	Reduced tillage (wacha rosada)
Emphasis	Late blight	Late blight	Management of fertility, weevil and late blight
Duration	One cycle, two under exceptional conditions	Two to three cycles	One cycle

patory Research - Farmer Field Schools) has also been used to give the idea of a hybrid of the FFS with participatory research. The farmers have carried out research into the use of cultivars or advanced clones with different degrees of resistance and high, middle and low intensity of fungicide use, assessing the clones and cultivars by late blight resistance and other qualities.

In Peru, the FFS have also been useful in promoting IPM, in evaluating and disseminating cultivars with resistance, and in generating new information about the efficiency of resistance under different agro-ecological conditions. Here, each FFS lasts for two or three years, with emphasis on research during the first cycle and with a successive transference of responsibility to the farmer group subsequently.

In Ecuador, CIP and INIAP, the national agricultural research institute, have promoted the FFS in the most important potato producing provinces through a network of local institutions. As a result of the recent decentralization of the state, much of the agenda of agricultural development has been placed in the hands of local governments, the NGOs and the communities themselves. CIP, INIAP and the Ministry of Agriculture are trying to develop and institutionalise an extension approach based on the farmers and on participatory research methodologies, establishing an effective mechanism of communication between the local institutional actors and the scientists. Here the strategy has been to first increase the local agricultural knowledge through the FFS and subsequently support the local process of technological development with participatory research groups such as CIALs, including FFS graduates, research institutions and universities.

Lessons

From the four years of experience in promoting participatory IPM we have identified the ten most important lessons. In each case we explain how the lesson was learned, and the implications for implementation of IPM programs.

1. The FFS help the farmers learn the principles of the late blight-IPM, to disseminate cultivars and to improve the management of fungicides

Evidence: Evaluations of learning in the FFS show that farmers have improved their knowledge in the integrated management of late blight (Figure 1). The evidence suggests that with the new approach, the farmers learn more than with former methods (Figure 2). The FFS have promoted the adoption of resistant cultivars in Bolivia, Peru and Ecuador. They have led to changes in the use of fungicides; for example, with the use of a new type of spray nozzle in Ecuador that produces micro drops, and the use of the late blight chemical control strategy in Bolivia.

Implications: The additional knowledge reinforces the farmer's capacity to make decisions, generating future benefits that go beyond the adoption of the management options promoted by the FFS.

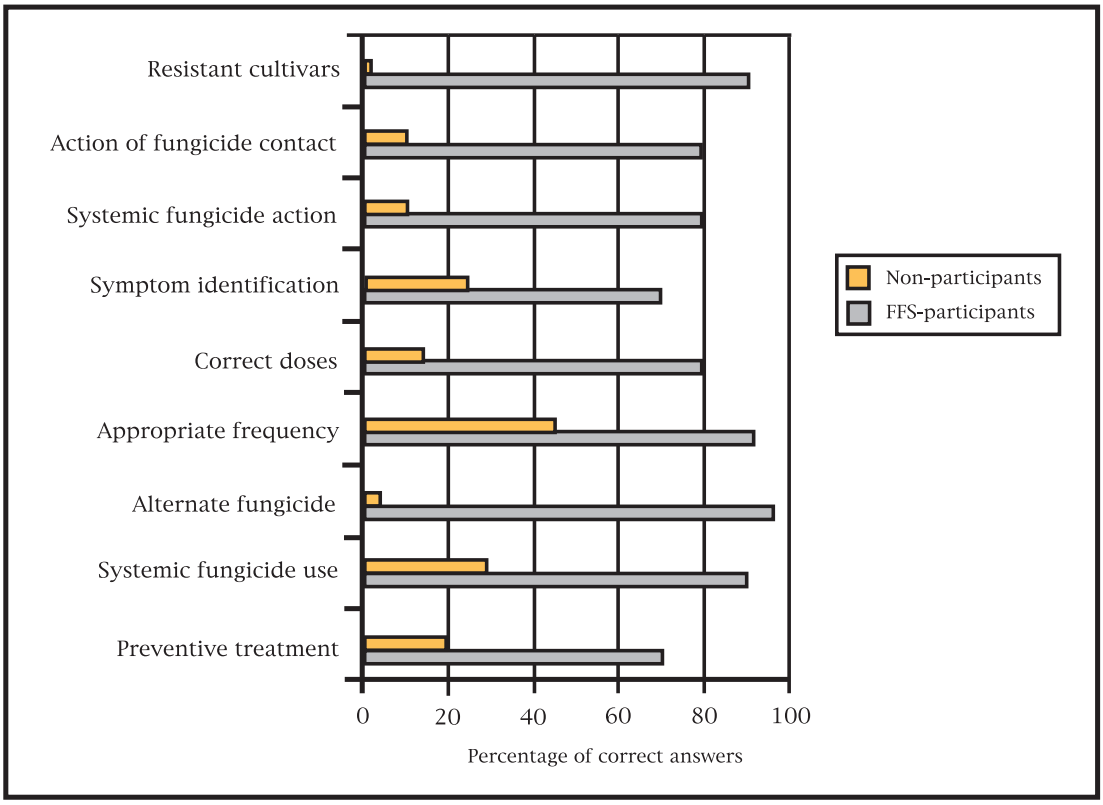
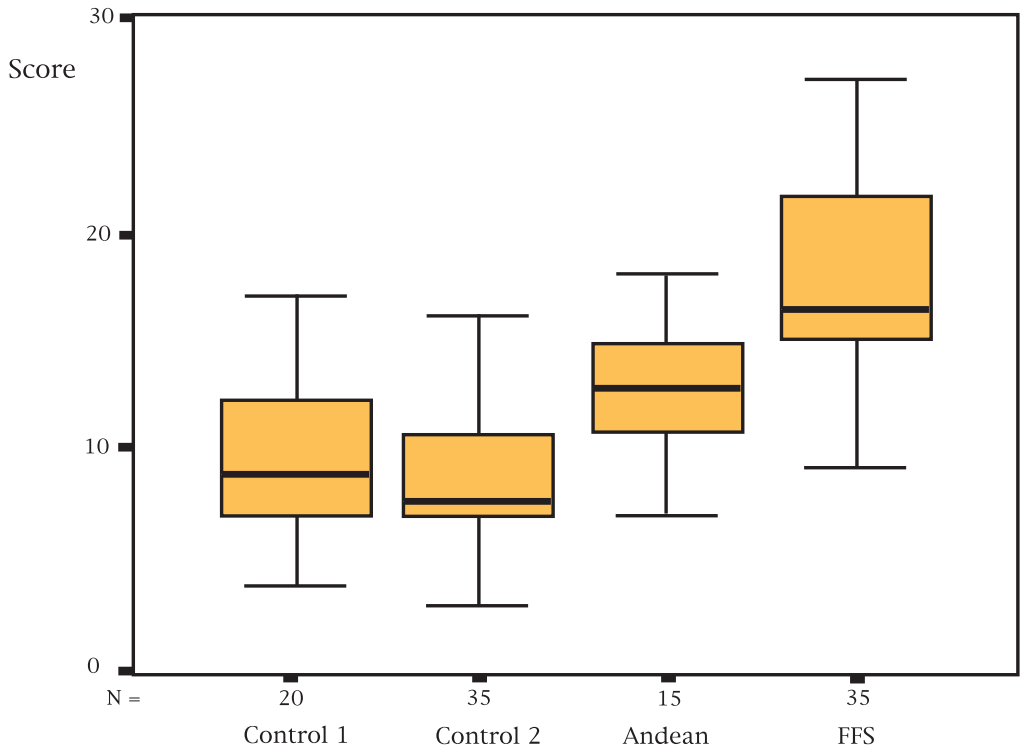


Figure 1. *Difference in knowledge between the FFS group (n=10) and non-participants (n=10) in 1999-2000, Cia. Pampa, Morochata, Bolivia. The differences were significant with the Mann-Whitney U test to 0.05.*



Explanation:
Control 1: non-participant farmers in communities with FFS
Control 2: non-participant farmers in control communities without FFS.
Andean: farmers who received conventional training (technical assistance).
FFS: farmers that participated in the FFS.
Note: The score is based on a questionnaire with 26 questions extracted from the FFS field manual. The thick black line in the Table shows the mean, the box includes the other 50% of the observations and the lines the range in each category. Mann-Whitney U's non-parametric test shows significant differences between the average scores of the groups.

Figure 2. *Changes in the knowledge of the farmers as a result of their participation in the FFS in 1999-2000, San Miguel, Peru.*

2. The economic return of the late blight-IPM capacity is very high
Evidence: In 1997-98, farmers who had benefited from participatory training, based on the late blight chemical control strategy organized by PROINPA, obtained more than US$ 2000 per hectare (Table 2), a figure comparable with the return reached in trials in previous years (Thiele et al., 1998).
Implications: The cost of educating the farmers with FFS is higher than with other less intensive approaches, but the economic return for the farmers participating in an FFS - at least where late blight is the most important problem - is higher than the figures usually reported for rice or other cultivars (Ter Weel & van der Wulp, 1999). Recovering part of the benefits that the farmers receive for participating in an FFS, through a charge to participants, would make it possible to cover the relatively high cost of organizing the FFS; one of the bottlenecks

Table 2. *Economic benefits of (PROINPA)'s strategy for the control of late blight in susceptible cultivars in 1997-98*

	Gross benefits US$/ha	Costs that vary US$/ha	Net benefits US$/ha	Marginal costs US$/ha	Net marginal benefits US$/ha	Marginal rate of return %
Without training	2627	99	2533			
				85	2415	2841
With training	5124	184	4948			

Source: Torrez et al., 1999.

to implementation of the approach on a large scale.

3. Various methodological aspects of the FFS need to be adapted to the potato crop in the Andes

Evidence: The FFS were originally designed for rice cultivation where the principal problems are the insects. Within potato cultivation in the Andes, late blight and other diseases are frequently more important than insects.

With insects, the farmer can understand the effects of his decisions in the IPM-farm applying different options in a sequential form. This is not possible with late blight due to the aggressive nature of the pathogen, which can quickly destroy the crop, and to the fact that one of the principal options, resistance, cannot be varied during its growth cycle.

The FFS, as they were conceived in Asia, do not work properly in the new context because they are based on the counting of insects, paying little attention to diseases. In many of the FFS in the Andes farmers have spent much time making detailed sketches of the insects even though they are not necessarily an important problem and often neither the presence, nor the incidence of late blight or other diseases, which are much more important, are systematically registered.

With potato, seed multiplication is very slow as compared with rice and other cereals. It is therefore important to pay special attention to the farmer's provision of seeds in order to ensure that they have access to the cultivars, or resistant clones, that performed well in the learning field.

Implications: A key element in the integral management of late blight is the interaction between the resistance of the cultivars and the use of fungicides. Resistant varieties require less fungicide, but just how much will depend on the local ecology and climate so that a simple recipe approach to spraying will not work well. In Peru and Bolivia, different alternatives have been used to help the farmers to better understand and utilize this interaction. In Peru, three different intensities of application of fungicides, with 12 to 14 cultivars or clones with different levels of resistance, have been compared on the learning field (Figure 3). In FFS in Bolivia, two elements have been combined: first, in the large IPM learning field, a strategy for fungicide use has been compared with local practice with a single variety (either resistant or susceptible according to farmers' demands), second, a special study in a small plot of cultivars or advanced clones with different levels of resistance (including the same cultivars as in the IPM learning field) using the fungicide strategy developed for resistant materials (Figure 4). With both alternatives, the farmers have enriched their knowledge of the interaction between the use of fungicides and resistance. In Peru, the learning field has generated data that feeds the generation of new clones by scientists, and in Bolivia it has helped the farmer to learn how to apply the strategy of chemical control in the context of late blight-IPM.

It is not advisable to compare the integrated management using new resistant cultivars with the local management of a susceptible variety. In this case, the varietal effect is so dominant that the farmers will not learn much about the contribution of other components. The field simply becomes a demonstration of the superiority of the resistant cultivars.

It is necessary to adjust the formats and procedures to perform the AEA, systematically including the degree of late blight damage and the factors that influence its incidence (temperature and humidity). This implies some initial training in estimating degrees of damage, and the measurement of relevant factors. The aim of adjusting the AEA in this way is to help the farmer to better understand how the disease develops and the effects of different management options.

One option to improve access to seed of resistant cultivars, is using the informal system, linking the FFS at higher altitude seed-producing areas with others requiring these seeds in lower areas. The NGOs can also make an important contribution (see lesson 8).

4. The content of the FFS should be adapted to the needs and interests of the community

Evidence: The first facilitators' guides in Peru and Bolivia were rigid, containing step-by-step plans, and with an approach that was too restricted to late blight. The guides have been made more flexible to embrace other problems prioritised by the community, constituting a resource that the facilitator can use according to the situation and the needs of the group.

In Peru, the format of weekly activities was replaced by a format with different sections such as: concepts, planning (by cycle and session), dynamics, experiments, training activities, following-up, assessments, and technical information.

Implications: The FFS should seek to improve the profitability of potato cultivation in an integral form, and not ad-

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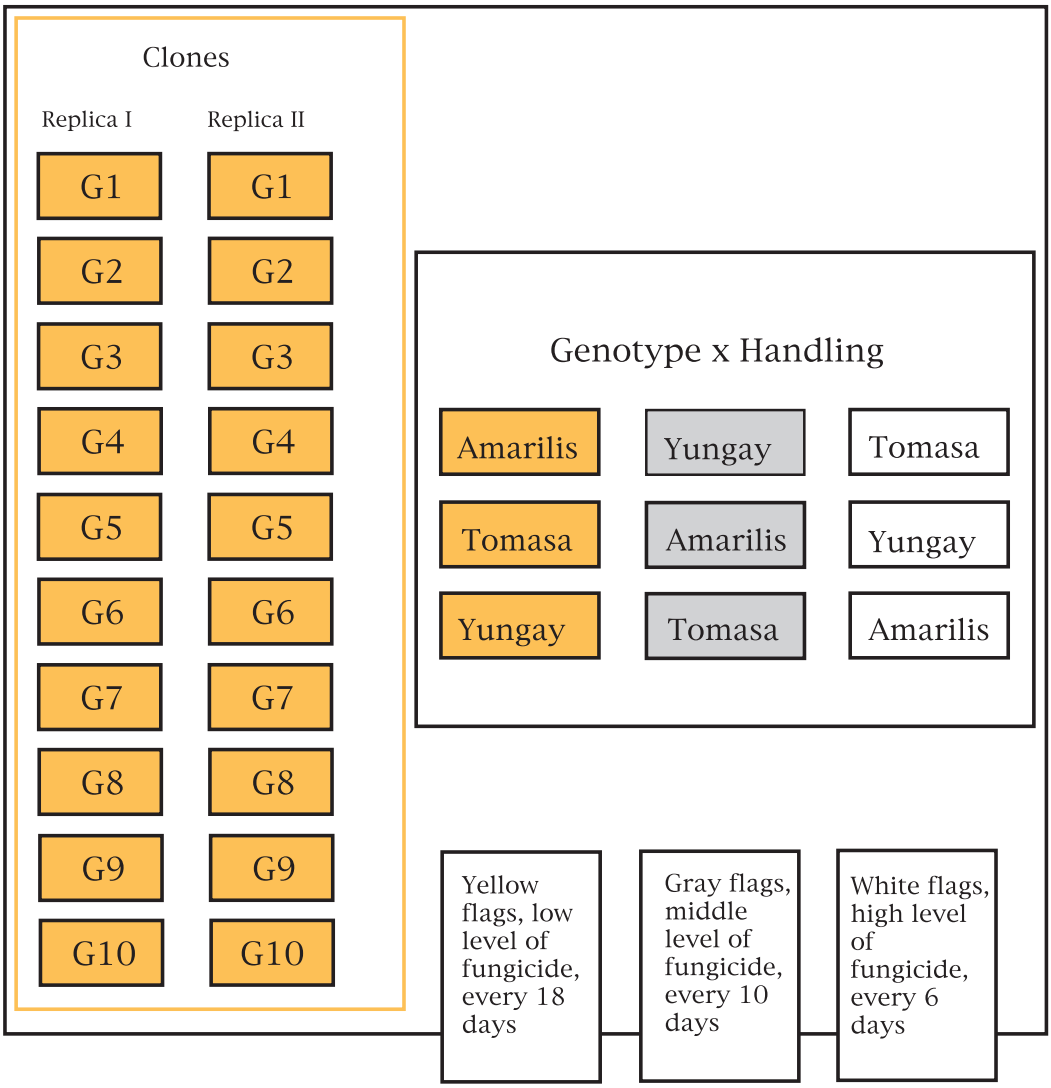

Figure 3. *Field design for participatory experiment and evaluations of clones and evaluation of interaction of cultivars per fungicides doses, Cajamarca, Peru, 1999-2000.*

dress only one limiting factor. At present in the three countries, the FFS are conceived as vehicles to promote integrated crop management (ICM), and not only of IPM. At the same time, it is possible to adapt the content of the FFS to specific conditions to improve the profitability, for example, forming seed producers or groups of farmers linked to agro-processors. However, we should be careful when widening the FFS' training to other problems, themes and opportunities. Late blight is a relatively complex problem involving various key points and the economic return of the control program is high. It is not possible to cover everything, and it is preferable to concentrate in a few priority themes of high impact.

5. It is not recommendable to carry out a FFS without properly trained facilitators

Evidence: The initial attempts at training using the FFS' approach in Peru and Bolivia were partial successes. Facilitators had not been trained in the approach, and did not understand some of its most important elements. Several of them had used methods that have something in common with the FFS, and because of that they thought it was obvious how to implement the new approach. In general they did not understand how to use and develop discovery based learning exercises. At the start of the two and a half month training course, many of the participants were not convinced of its relevance. At the end it became clear that what they had perceived as an excessively lengthy course was barely enough to teach them the new tools and skills needed.

Implications: Attempts to implement the FFS without trained facilitators, or with a shortened period of training, could easily result in activities that are "FFS" in name only. This could discredit the approach.

6. Special care is needed to avoid turning the learning field into a competition between farmers and facilitators, or into a demonstration of the superiority of new technology

Evidence: In many FFS in Bolivia and Ecuador, the learning field evolved into places of competition between farmers

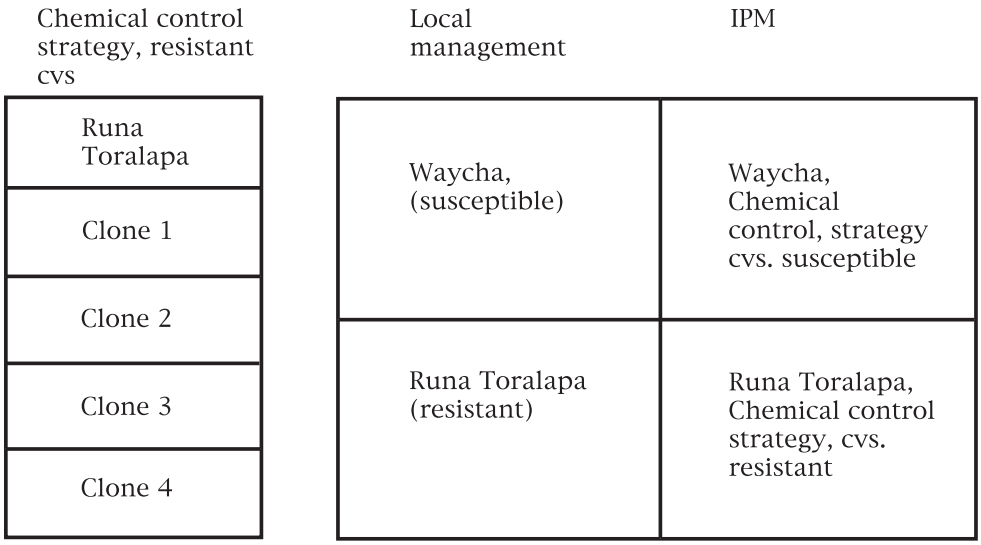

Figure 4. *Design to promote learning about the interaction of tilling and fungicide use, Palta Loma, Morochata, Cochabamba, 1999-2000.*

and facilitators. The farmers often referred to the area of the learning field with IPM as "the agronomist's field" and the other part as the "farmer's field". This sometimes affected management because the farmers took better care of the part they considered their "own". Another mistake was that the agronomist sometimes promoted the IPM part simply as a demonstration of the superiority of new technology with little critical analysis.

Implications: It is important, before establishing the field, that the farmers properly understand that it is not a competition, but about an opportunity to compare two types of management, and about learning how to manage the field in an integral way. In Ecuador, to reduce the tendency to compete, the IPM field is deliberately made bigger than the part under local management. Even when the IPM field does not yield as much, or is less favourable in cost benefit terms than the area under local management, this does not mean that IPM is a failure. It is necessary for the group analyse and understand why this occurred in order to improve IPM implementation.

7. The FFS might play an important role in participatory research but other mechanisms and platforms also exist

Evidence: The strategy followed in Peru of incorporating participatory research as a central element in the FFS raised much discussion about its validity. The diversity of strategies in the three countries, and the different kinds of success in each of them, suggest that there is no correct way, but different options. The relation between participatory research and participatory training is a virtuous circle; different points of entry to the circle are valid.

Implications: It is necessary to search for a harmonic way to integrate participatory research and training within the FFS, or between FFS and other farmer researcher groups such as CIALs. In places where the FFS have more elements of participatory research, they could last longer period, and it is important to determine how they should evolve over time.

8. The NGOs are valuable partners

Evidence: Some NGOs, for example, ASAR in Bolivia, provide facilities and access to credit for seed production and distribution, and can help to resolve this important bottleneck. The NGOs have contributed with infrastructure and personnel, allowing an increase in the scale of the FFS. Additionally, the reputation, or good name of the NGO, has been important in promoting the participation of the farmers in the FFS when initially the potential benefits were still uncertain (e.g. CARE-CIP, in Peru).

Implications: For future programs, it is important from the beginning to establish ties with NGOs and other local organizations. Later on, when the benefits become clear, the methodology of the FFS could be assumed by the hundreds of organizations that work with potato cultivation and with communities of farmers in the Andes.

The first eight lessons are common for the three countries. The experience from Peru, where participatory research was an important element, suggests lessons 9 and 10.

9. Farmers are enthusiastic evaluators of new genotypes, and they do it well

Evidence: In the FFS in Peru, the farmers appreciated the opportunity to evaluate potential cultivars. The positive assessments influenced the decision of the National University Hermilio Valdizan (Huanuco) of releasing the variety *Chata Roja*.

Implications: Including these types of activities in the FFS adds value for the farmers and it is also an opportunity for the researcher to discover varietal types preferred by the farmers (Nelson et al., 2001).

10. Ideally, farmers should take part in trial design; where this is not possible it is essential that the design facilitates their active participation in the trials and data collection

Evidence: In Peru, in the first year (1997-98), the FFS' principal trial had 12 to 14

cultivars with different levels of resistance to late blight, and three different intensities of fungicide use (Torrez et al., 1999). Follow-up evaluation showed that the farmers appreciated the FFS trials as a form of obtaining new cultivars, and as a form of acquiring new knowledge. But not all of them understood the trial which had been designed by the scientists, and furthermore the farmers were used to having fields with production objectives. The farmers themselves suggested simplifying the tests (Groeneweg and Schouten, 1998).

Implications: Complex designs, which are difficult for the farmers to understand should be avoided. However, to understand the interaction between the level of resistance and the intensity of fungicide use requires a relatively complex design. If the results of the trials are to be statistically valid, it is necessary to have a certain degree of randomisation. Given these constraints it is necessary to develop procedures for collecting and analysing the data that facilitates comprehension. In Peru, in the 1999-2000 trials, with different intensities of fungicide use, instead of having random blocks, a design was used where the clones of cultivars with the same level of fungicide use were placed together in a strip (Figure 3). In this way, there was a strip for each treatment, with plastic flags with a distinctive colour indicating the name of each clone or cultivars. Cards were used to register and analyse the data with a sketch of the trial with the same coloured strips. These data could be transcribed to flipcharts for better visualization of the differences.

Conclusion

The FFS' approach, as it has been implemented, is relatively intensive and reaches a limited number of families. Resistant cultivars can diffuse quickly, enabling the seed to reach more families. However, there is no guarantee that the knowledge acquired by the farmers about the use of the new cultivars will spread with the seed. The FFS, as they are designed, reach only a relatively small group of communities even though they involve local organizations such as NGOs. There are several options that need to be explored in order to resolve this problem. First, improve the flow of information and technology of the participants in the FFS to the non-participants. Second, work with new partners, such as groups based in the communities and municipalities, in order to increase the number of FFS. Third, develop FFS for farmer extensionsts who can then train other groups of farmers. Fourth, cover part of the FFS' cost, by taking payment from the participants (see lesson 2). Fifth, complement the FFS, using mass media methods, e.g. on the radio, the importance of alternating fungicides, and other simple information, to reach a greater number of farmers.

In the three countries these different options are being explored more or less intensely. Whichever options are used, as we try and increase the coverage of the FFS, special attention should be paid to maintaining quality and to developing the virtuous circle between participatory research and training.

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In this issue

Rural development in Latin America

Miscellaneous

Apologies to Dr. Bengt Frykman!

With engagement, enthusiasm and a lot of hard work Dr. Bengt Frykman used his long experience and contacts to initiate the last issue of Currents - Influences of Trees, Forests and Forestry? We sincerely regret that due credit was not given to Bengt who deserves full recognition for his efforts.

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Editorial

The experience of rural development in Latin America provides a glimpse of how many of the reforms being introduced in other parts of the world may impact on poor people's livelihoods in the years to come. New methods and institutional structures have been introduced at a fast pace in Latin America, within a turbulent climate of neo-liberal reforms, violence, conflict and natural disaster. The greatly skewed income inequality in most Latin American countries has raised grave concerns that technological change is leading to social exclusion and increasing destitution, particularly in marginal areas that have little chance to take advantage of new market opportunities. The importance of agriculture in poverty alleviation is frequently stressed, but the poor themselves are increasingly turning to wage labour, non-farm enterprises and migration for their survival. The State has limited influence on these trends. The private sector and civil society are providing the majority of extension and other rural services. Whereas in other regions, such as Africa, the shift away from state structures has often been donor-driven, strong and politically engaged farmer organisations and NGOs in Latin America are taking the lead in pressing for a greater role, taking advantage of decentralisation initiatives and weakened central governments.

In this issue Thiele, et al, present how farmer field schools, coordinated by the International Potato Centre and managed by NGOs, are providing an effective Andean platform for working with integrated pest management. Methods that were originally developed in Asia have been adapted to different needs and conditions. Murgueito also presents evidence of how an NGO has used participatory research and extension to introduce new intensified cut and carry and silvopastoral production systems in Colombia. Haugen looks at the resilience of farmers' own seed systems in Honduras in the face of natural disasters, and suggests that a greater understanding of how farmers manage their seed stocks could greatly improve the effectiveness and efficiency of outside assistance to address livelihood shocks without undermining existing coping strategies and genetic resources.

Bojanic reviews how decentralisation and promotion of popular participation in Bolivia could (in theory) create opportunities for more responsive extension and other rural services, but how in practice it has meant that agricultural investments have been given lower priority. When given a chance to choose, the municipalities have invested in infrastructure instead. Christoplos looks at the potential for pro-poor agricultural extension in Nicaragua and finds that a livelihoods approach, seeing the poor as not only producers but also as labourers and consumers is a precondition for identifying where and how the poor may benefit from technological change, given that the poor are increasingly leaving farm enterprises of their own. The studies by Bojanic and Christoplos are part of a global research programme on the relevance of agricultural extension to alleviating poverty and reducing vulnerability, supported by the UK Dept. for International Development and Sida. Longer versions of these studies have been previously published as ODI Working Papers (available at http://www.odi.org.UK/publications/working.html).

Rudqvist surveys an innovative approach to rural development in a conflict-torn area of Colombia. Through projects such as these, the World Bank is developing its understanding of how to promote rural development in areas faced with violence and weak state institutions.

These articles illustrate many of the trends, challenges and opportunities facing rural development in Latin America today. They suggest the need to bring together micro-level analyses of potential improvements in farming systems with an understanding of how agricultural polices are changing in the face of globalisation and societal transformation.

Ian Christoplos
Guest Editor