Moth control with local plants

Strengthening farmers' research

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The high incidence of pests and diseases in potato crops has induced many farmers to apply different sanitation practices to reduce damage to tubers. In 1997, when GIAREC integrated PTD as a methodology to reinforce farmers' experimentation and innovation capabilities, the small farmers of Quilcas Peasant Community expressed their interest. This community has a long-standing working relationship with Yanapai, an NGO member of GIAREC. The farmers identified the rate of pests and diseases in potato crops as one of their main concerns. Among these pests was the 'Andes weevil' (*Prennotrypes suturicallus*), the 'potato moth' (*Symmetrischema tangolias Gyen*), and the soil worm known as utushcuro (*Copitarsia turbata*). Of the three, the one that required urgent control was the 'potato moth', particularly during seed storage.

photo: GIAREC

Harvesting LEISA potatoes.

Starting the search for innovations

After identifying and setting priorities for this particular problem, the PTD process enabled the farmers -together with the Yanapai facilitators- to visualise causes and effects, and to recognise why the problem occurred and with what results (Table 1).

After the identification of the causes and effects of moth infestation, the farmers decided which causes to experiment on, what could be learned, and what was beyond their control and could not be changed:

- Things that could be tried (trials): use of plants for moth control in potato storage
- Things to be learned (training): seed selection, biological cycle of moths
- Things that could not be changed: climate

In this way ideas emerged that could be tried in the experimentation phase. Promising solutions arose from farmers' knowledge of agricultural practices. Old ways of controlling moths using local plants such as 'muña' (*Minthostachys spp.*), eucalyptus (*Eucalyptus globulus*), and 'chilca' (*Baccharis sp.*) were recovered. The moment the farmers became aware that traditional solutions using local resources were possible, they became very enthusiastic. Old practices that had almost been forgotten by community members were revived and their usefulness discussed. During these discussions it became apparent that farmers were very disillusioned with the chemical alternatives, mainly because they were too expensive and the concern about their toxicity.

Designing the experiment

The need to develop reliable experimental designs that could be handled and evaluated by the farmers themselves gave rise to the following questions which had to be answered by the farmers involved in the experimental process:

- What has to be solved?
- What is to be experimented with?
- Why is it useful to compare?

This methodology allowed the participants to define the experimental objective: 'To compare three forms of potato seed storage to establish the best way to reduce moth damage'. The treatments were defined with the help of the following questions.

- What is to be tried?
- When will this trial be carried out?
- How is the trial going to be carried out?
- What are the amounts to be tried?

Based on the suggestions of the older, more experienced farmers, the treatments compared were as follows:

- *Eucalyptus*, *'muña'* and *'chilca' ashes* People in the region used aromatic plants such as eucalyptus, muña and chilca to control potato moths in the storage site. Many people used the fresh branches of these plants while others used dried leaves. For this trial the farmers decided to spread a combination of ashes from these plants over the seeds.
- *Petroleum traps* An alternative way of controlling moths was the petroleum trap. The farmers suggested placing these traps in every corner of the storage site. White, one-litre trays containing 0.25 litre of petroleum were used.
- *Control* (farmers' practice of storage) The common way of storing seeds was to place tubers over a straw bed without spreading any product on top.

Experimenting

In order to validate the experiment, it was necessary to set up certain basic rules. Constant factors had to be established, procedures that all the farmers would follow in each of their experiments. It was decided that constant factors were the time of harvest, amount of ▶

treated seed, variety and size of seed, the storage site, material in the storage site, amount of ashes, storage period, and the process of monitoring and evaluation.

The farmers designed the experiment using a participatory process. The way in which the trial was to be implemented (size, materials, place) was described. For statistical purposes each farmer represented a duplication of the trial. This allowed experimentation to be simplified but meant that the conditions of the trial had to be the same for all farmer experimenters.

The design consisted of three small storage sites of the 'pen' type (0.70 m x 0.70 m x 0.25 m) made from eucalyptus, a local resource, with 1.50 m between treatments. The storage sites were placed around the dwellings. Each storage site represented a different treatment. Treatments were allotted randomly.

When the scheme was finished, an activity plan and schedule were prepared. Each activity was detailed and programmed in time. Inputs used were described, those who had suggested them, and the names of those in charge of the experiment. Training and evaluations were also included in this schedule. In this way farmers were able to follow each step of the experiment chronologically and were able to start organising the trials to carry on with planning and implementing the experimentation process.

Finally, to systematise the results, simple easy to handle tools such as a peasant's log were introduced. These logs were used by the experimenters once every 20 days to note activities undertaken. In a parallel process technicians used the trial log to record quantitative data and the scientific evaluation of the trial.

Evaluating the experiment

It was decided that both farmers and technician would formulate evaluation criteria in order to seek complementarity and correspondence between the various opinions and avoid any one criteria being dominated by another. Table 1 shows the criteria defined.

According to the farmer experimenters, the results of the evaluation showed that the difference between the three treatments was not very great. However, farmers felt the ashes treatment was better because the moth damage was only observed in the 'guides'. Not many tubers had been attacked. Although the petroleum traps were effective in attracting adult moths, butterflies and flies, and served as a protection in all trials, they were not functional because animals and children could brush against them causing the contents to spill over the stored potatoes and cause loss through tuber pollution. The 'control' also had a low incidence of moth damage; the tubers were well preserved.

Statistical analysis

According to the field technician from the Yanapai Group who was facilitating in Quilcas, a statistical analysis was too complex because it implied the adaptation of a statistical design to small-size peasants' experimentation. The design used was one of random blocks with each farmer being considered a block. The statistical result shows that there was no significant difference in the weight of tubers damaged by moths in the three treatments, but there was a significant difference between the blocks (farmers), which showed a differentiation between the farmers in the control. Although the high variability between treatments and blocks could have been reduced with a larger number of duplications, this was complicated in the peasants' experimentation because of limitation in time, space and resources.

It should be noted that, for experimenting farmers, results from the storage sites alone were not enough. They also had to try the seeds in the field. In the following agricultural season, the seeds were sown and the statistical results showed that there was no significant difference in the yields from treatments. Nevertheless, a significant difference was found between farmers.

The scientific evaluation of the trials was an opportunity for NGO technicians and scientists from the agricultural research centres to discuss which statistical designs were best for farmers' trials. Ways of reducing variability in statistical analysis, and ensuring that these analyses were intelligible to all experimenting farmers, were also discussed. The need to establish statistical designs specifically suited to the farmers' trials was stressed because this was considered a critical factor for the scientific validation of farmers' experiments.

Strengthening farmers' capacity

It is important to observe that the analysis of cause and effect enabled farmers in the Quilcas Peasant Community to clarify such issues as differentiating the damage inflicted by pests and processes such as the moths' life cycle that had not been discussed earlier. This enabled them to differentiate the type of pest in the storage site from that produced in the fields. It helped them to develop a mental model of the experimentation process and to understand why a sequence must be followed. This knowledge allowed them to describe their experience and to share processes and results with other experimenting groups within GIAREC.

Despite these positive aspects which indicated a strengthened capacity of local peasant research, the follow-up process and the way trials were recorded was weak. The farmers were not used to noting down data, and that made it difficult to systematise quantitative information. Sheets from the trial were not always correctly registered because many women were illiterate. This shows the need to create or design more adequate tools for these types of social reality that might motivate a more permanent follow-up and strengthen the capacity of peasant experimentation and innovation from a gender perspective. ■

Table 1: Problem tree showing causes and effects of potato moth

EFFECTS:	CAUSES
1. Damage to tubers' eyes hampered budding	1. Not all tubers are harvested
2. Sour/acid taste in potatoes for consumption; not even suitable for animals	2. Use of contaminated manure or plant residues
3. Damage in all growing stages of the plant	3. Lack of knowledge on pests' biological cycle
4. Affects storage and field crops	4. Indiscriminate use of agrochemicals
5. Moths become resistant to agrochemicals	5. Lack of cleanliness in storing sites
	6. Bad selection of harvested potatoes

Table 2: Farmers' and technicians' evaluation criteria

Criteria of farmers evaluation	Criteria of technician's evaluation
Tubers with moths	Number of tubers damaged by pest and disease in the store site
Colour and size of 'guides'	Mechanical damage
The emergence of the tubers in the field	Weight loss per storage site
Quantity of tubers damaged by pests	Type of budding, emerging, height of plants
Quantity of input used	Yield (number and weight)
Yield	Tuber loss
	Pests and diseases

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