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‘The *wayq'os* (gullies) are eating everything!’ Indigenous knowledge and soil conservation

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· The gullies

Farmers in the communities of Cebada Jichana and Dami Rancho in Cochabamba, Bolivia are threatened by the growth of numerous gullies. As farmers' leader Guillermo Orellana explained “the *wayq’os* (gullies) are eating everything”. If nothing is done farmers will be left with islands of land in a sea of gullies. The problem is common in other areas of Bolivia too.

PROINPA the Bolivian Potato Research Programme, has been working for three years with farmers in the communities to control the biggest gullies with gabions and trees. However, farmer’s involvement has been more as labourers than as active participants. Here we summarise the results of two participatory rural appraisals (PRAs), carried out simultaneously in Cebada Jichana and Dami Rancho, which were designed to help farmers to resolve the problem themselves.

Methods

Some months before PRA fieldwork began, we explained the proposal to community members and they agreed to take part. On our arrival, to begin five days of intensive fieldwork, we explained more carefully what we hoped to do in a community meeting. The village leaders assigned participants to work with us on each day’s activities. The first day we began with ‘ice-breaker’ activities. We asked farmers to scratch maps of their communities with sticks on the ground and construct time lines of major events and land use. These activities were useful as they stimulated lots of discussion.

Figure 1. Photo showing farmers commenting on gullies during transects

Source: PLA Notes (1998), Issue 32, pp.19–23, IIED London

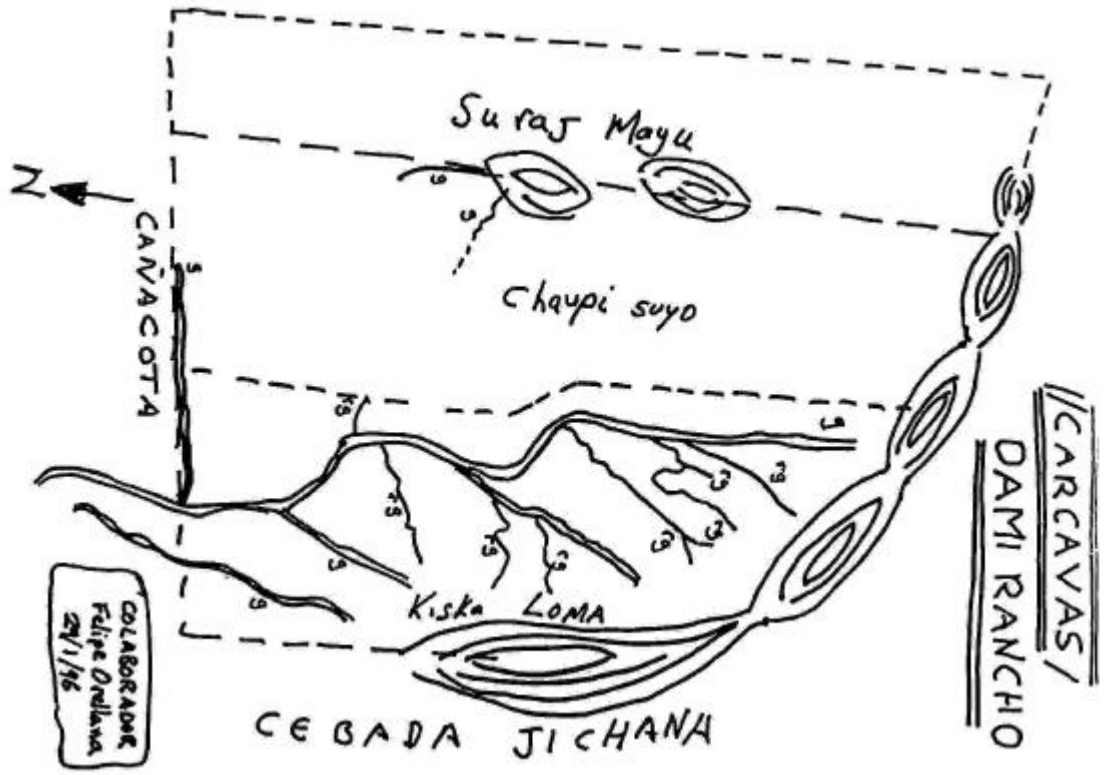
Other PRA techniques included:

- walking transects, where farmers named and described soil types, the crops they grow and the problems they face in soil, crop and livestock management (see Figure 1.);
- farm plans, in terms of soil types and crops;
- mapping gullies, and indicating whether they had formed recently;
- preference matrices of the suitability of different trees and shrubs for erosion control.

We used flip charts to record key points from group interviews on important themes, such as water management, which didn't lend themselves to geographical representation. We set one day aside to work with women, as men tend to dominate community meetings. We worked almost exclusively in the Quechua language, because farmers feel more at home with this than Spanish. We planned to end the PRA fieldwork by explaining what we had done and by leaving a report, which would include community prioritisation of agricultural problems and possible solutions.

In Cebada Jichana, things went according to plan. In Dami Rancho, despite considerable contact with PROINPA in the past, farmers were reluctant to join in and most participants turned out to be either youngsters or newcomers to the community. Women failed to turn up as agreed. Our 'ice-breaker' activity of mapping community boundaries helped to spread a rumour that we were registering land for taxation. One pair of fieldworkers were chased away by an enraged farmer who threatened them with stones. Once we realised what had happened, we worked hard to regain farmers' confidence and by the end, had a group of active participants including the community leaders. Nevertheless, we didn't achieve as much as we had hoped and, because we didn't have everybody's support, we decided not to prioritise problems in Dami Rancho.

Figure 2. Farmers mapped gullies (marked with 'g' for gullies and 'rg' for recent gullies



Source: PLA Notes (1998), Issue 32, pp.19–23, IIED London

Indigenous technical knowledge

As we walked transects, we found that farmers in the two communities shared a wide knowledge of soil and water management. They described their soils (*jallp'a*) by colour, *puka* (red) or *yana* (black), by texture *chajwa* (sandy) o *llink'i* (clay) and as *ukhu* (deep) or *pata* (superficial). They explained that soils which are deep and black are more fertile and more suitable for potato (*papa jallp'as*) and that red and sandy soils are more susceptible to erosion. They called soils at risk from rill and inter-rill erosion *suchuj jallp'a* (soil which slides). They knew that many of their soils disaggregate very easily in contact with water; as one community member said "these soils are no good for irrigation".

Farmers explained soil conservation technology as we walked through their fields. The orientation of ridges used for growing potatoes depends on the soil type, slope and expected rainfall. In sandy soils, on steep slopes, ridges roughly follow contours, to avoid soil being washed away and to retain moisture for the crop. In black soils, which hold moisture better, ridges run down the slope to avoid water logging. When farmers believe it will be a rainy year, they make ridges steeper to help drainage. They have methods for predicting rainfall, but these are used less because migration and increasing market orientation have eroded traditional knowledge of this sort.

The farmers make shallow ditches (*bangos*) for water management using traditional ox-drawn ploughs. Above fields which are prone to erosion, they use these ditches to divert run-off from higher ground away from the cultivated area. In fallow land, after planting cereals, they construct ditches at varying distances (roughly every 5m on 5% slopes) to avoid soil loss and to serve as channels for irrigating and softening soil before ploughing.

Changes

In the area of Dami Rancho (approximately 3 km^2) farmers drew maps showing 14 large gullies (3-20m wide) formed since 1953 and others in formation (see Figure 2). In spite of their wide knowledge, farmers have not been able to solve the problem of erosion, which has become more severe over the last four decades. Indigenous technical knowledge, which was appropriate for lower population densities with long fallow periods and rain fed production systems, has not been able to adapt to the fast change which has occurred over this period.

Using cards to describe important events, farmers developed time lines for the community and land use (see Figure 3). Perhaps the most important event was the Agrarian Reform of 1953, when feudal estates in highland Bolivia were dissolved and the land was divided amongst ex-labourers.

Prior to the Agrarian Reform in this area, some 19 peasant families lived as tied labourers (*pongos*) on the land of four large estates. Potato was produced using farm manure, soils rested 5 to 6 years - until the native grass (*Stipa ichu*) grew back - the location of fields shifted and yields were good. After the Agrarian Reform, the land was shared amongst the peasant families. Fields became fixed and, to mark the boundaries, farmers made shallow ditches, which also served for drainage.

There are now more than 150 families in the communities. Farmers had to shorten the fallow periods. With the intensification of farming, erosion increased. The ditches, which had been made for field boundaries, began to change into gullies. Guillermo Orellana commented that when he was a boy, 25 years ago, he easily jumped a gully which is now four or five metres wide (see Figure 1).

Source: PLA Notes (1998), Issue 32, pp.19–23, IIED London

Figure 3. Photo showing Felipe Orellana checking transects and time lines

With the increase in population, the land which the community used in the upper part of the hillside for livestock was divided into individual fields and cultivated. At the same time, the intensification of cropping in the lower area reduced land for livestock. Consequently livestock (mainly sheep) grazed around the gullies and even in them, removing vegetative cover (*Stipa ichu* could no longer grow back), thus worsening the problem.

In 1991 an irrigation canal was opened. Water flow is high (5 litres/second) for the steep, earthen, secondary canals, creating new gullies or worsening the existing ones. Inadequate management of irrigation is also leading to more rill and inter-rill erosion.

Effects of the gullies

Gullies are threatening the existence of the communities, reducing the arable area, cutting roads and making access difficult. The main irrigation canal crosses several gullies and is at risk of collapsing.

Community members are increasingly aware of the risk of the gullies. Although many are passive in the face of what they see as a natural disaster, others, mostly those who are directly affected, are doing something. Felipe Orellana is planting eucalyptus, kishwara (*Buddleja* sp.), kewiña (*Polylepis* sp.), retama (*Sparteum junseum*) and thola (*Baccharis polycephala*) in the gully near to his house to stop it increasing. Some farmers plant thola along secondary irrigation canals to protect them. Other farmers are benefiting from an FAO project to conserve soils by constructing deep infiltration ditches along contours and planting trees in gullies. Others are participating as labourers in the PROINPA project mentioned above. Truck owners fill gullies with stones so that they can enter their fields to remove their produce, such as potatoes. But this doesn't slow their growth.

During the meeting at the end of the PRA, members of Cebada Jichana used pairwise ranking to rank problems in order of importance. Gullies and soils susceptible to erosion (*suchuj jallp'a)* were ranked as most important, together with the poor condition of access roads (potato pests came sixth). Farmers identified some concrete measures which they could take without outside assistance, such as planting pasture and trees.

· What to do?

The role of PROINPA must be to help bring indigenous knowledge up to date. We can show farmers some options which might be useful, such as the use of a chisel plough to

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improve water infiltration and reduce run off. PROINPA should strengthen research on 'double purpose technologies' which improve productivity and conserve soil simultaneously, because farmers do not adopt conservation measures without an economic return. Finally, we should make use of the community dynamic which the PRA generated to help the farmers of Cebada Jichana and Dami Rancho play a more proactive role in the control of erosion. Large erosion control structures are not sufficient, each farmer should be involved on his or her land. They can use maps and other PRA techniques to plan their own conservation measures.

One initial step we have taken is to encourage farmers in Cebada Jichana to form a locally selected committee (CIAL[1]) of experimenting farmers. The CIAL researches problems which have been prioritised by the local community and reports back to the community on its findings. It uses the IPRA methodology (Investigación Participativa en Agricultura) described by Ashby *et al* (1995).

This work has been co-ordinated with the Hillsides Project (managed by the Silsoe Research Institute) which is testing vegetative methods for controlling erosion and has proposed a number of promising species of exotic grasses and shrubs which could be used to counter erosion. The CIAL has identified additional local species and is carrying out its own trials to identify those which might be suitable as vegetative barriers to stabilise hillsides. After the first year's research, we used preference ranking with the CIAL to identify two potentially useful exotic species (*Phalaris tuberoarundinacea* and *Festuca arundinacea)* and one local species, (*Bromus* sp.*)* which farmers are planting on their own land. However, this is just a beginning. If we don't increase our efforts with farmers here, and elsewhere, the *wayq'os* will eat much more.

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[1] Comité de Investigación Agrícola Local.

Source: PLA Notes (1998), Issue 32, pp.19–23, IIED London