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NATURAL RESOURCES SYSTEMS PROGRAMME

FINAL TECHNICAL REPORT

DFID Project Number

R 6638

Project title

Participatory improvement of soil and water conservation practices in hillside production systems in the Andean Valleys of Bolivia

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NRSP Production System

Hillsides

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Contents

Executive Summary

The project purpose was to achieve 'economically viable land, soil and water management practices packaged and promoted' in the Valles Crucerios, an Andean foothill region of Santa Cruz Department, Bolivia. The approach taken was one of participatory research, attempting to go beyond the conventional use of participatory rural appraisal (PRA) to ensure that local people were involved in planning the research, designing trials, evaluating them, and contributing to a dissemination plan in the region. Each of these fields of participatory work formed a cluster of activities, which contributed to the outputs:

1. Farming systems, constraints to sustainability and relevant local knowledge documented.
2. Improved soil conservation practices identified.
3. Participatory research process documented and analysed.
4. Relevant process and technologies promoted.

This approach contributes to the sustainability of rural livelihoods, as demonstrated by farmers' own assessment, in three ways: by supporting the conservation of natural resources; by developing with local people and organisations a model for research based on the exchange of local and scientific knowledge; and by supporting flexibility within the farming system and adaptation to market changes. The last of these takes highest priority with farmers, who, at the time of project initiation, would not have identified soil conservation per se as their principal need for sustainable systems. Poverty alleviation was not an explicit objective of DFID when this project was approved and funded, but nevertheless the project worked in a way which enabled the poorer people in these rural communities to benefit, because it supported research which fitted in with their own needs.

It is important to note that R6638 was written and planned in collaboration with R6621, Strategies for improved soil and water conservation practices in hillside production systems in the Andean valleys of Bolivia, managed by Brian Sims of Silsoe Research Institute. While the latter project was based in both Cochabamba and Santa Cruz, this project (R6638) focused only on Santa Cruz. R6621 included PRA methods for understanding local knowledge and practice in Cochabamba (not in Santa Cruz, where R6638 was responsible for participatory appraisal), but the main difference between the two projects is that while R6621 was introducing scientifically tested technologies from outside Bolivia, R6638 was proactively facilitating knowledge creation and change, by bringing together the external practices being tested on-farm by R6621, with farmers' own knowledge, and supporting a dynamic process of adapting new ideas to suit individual situations. The close links between the two projects were therefore particularly useful in contributing to better methodological understanding.

Together with other concurrent research in the four years since project inception, improvements in understanding have been mainly in the methodological and institutional arenas, rather than the technical. This project therefore serves to support and strengthen the findings of others, and it is important to recognise that such projects are at times tools for exploring the problem, which lead to better understanding of the key problem. Hence the leader of the present project concludes that while the research led to useful methodological insights and institutional progress in the region, its most important output is an unplanned one, i.e. new questions about the linkages between experimentation at the individual level, and the social demands of resource management at catchment level.

Background

Researchable constraints:

The temperate valleys of Santa Cruz are a diverse region of valleys ranging from semi-arid to sub-humid, with the highest rural population densities in the department. Net emigration reflects declining soil productivity and the lack of opportunities for off-farm income generation. The high population density and long history of settlement have brought about severe soil erosion through intensified use of sloping land in a semi-arid climate. Only 14% of the area is classified as suitable for arable crops but very much more is cultivated (Davies, 1994). The area has received less donor attention than the lowland rainforest zones because environmental change is less dramatic, but the acute soil erosion problems there are now widely recognised as the result of gradual deforestation in the search for new land, and overgrazing. In Santa Cruz, soil conservation research has concentrated on the lowlands and the more humid valleys, and scientific technologies had not been tested in the semi-arid conditions of the temperate valleys, nor had indigenous technologies and / or appropriate technologies from other similar agroecological zones been tested. The main collaborator in this project, the departmental agricultural research institute CIAT, has links with a range of NGOs and producer organisations which can facilitate this process.

The following assumptions were made by previous development agencies in the area:

- Soil erosion is the principal natural resource-related problem in the area;
- Farmers are not taking any action to address this;
- The main cause of widespread soil erosion is overgrazing.

This project treated some of these assumptions as researchable constraints in themselves, by exploring whether they were correct, or whether, in fact, farmers had their own knowledge and were adapting to changing circumstances. The central researchable constraint grew from this approach: in recognising that farmers were not visibly controlling soil erosion, the project explored the hypothesis that the key constraints were in fact, access to knowledge, information flow between scientists and farmers, and opportunities for knowledge creation.

The project approach consisted of two stages: the first, to identify relevant knowledge and practices in the temperate valleys (among farmers and institutions), and the second to facilitate the use of this knowledge by a range of farmers, in experiments of their own design on their farms. The project built on the recognition that, while CIAT itself does not have experience with SWC in the zone, relevant scientific knowledge does exist and is being transferred / tested in the zone; it also recognised that NGOs and one FAO-funded programme had knowledge of farming systems, farmers' knowledge, and SWC practices in the zone. The project was designed to identify and bring together these pools of knowledge, and to facilitate the exchange of relevant information between actors. With support from CIAT staff, interested farmers were encouraged to act on the basis of this information, by designing, modifying and trying out SWC practices which are attractive to them. The role of CIAT in this was primarily facilitative, by bringing together actors, convening regular meetings for exchange of experience, and encouraging experimentation with any technical advice required.

Farmer Participatory Research builds on experience showing that SWC is best researched / developed on farm; hillside systems are so complex that farmers need to control the technology development for it to be useful, and systems are often so diverse that research needs to be distributed widely between farmers. Four characteristics of hillsides environments highlight the importance of a participatory approach to soil and water conservation:

- Marginality - remoteness and often low productivity making them unattractive for conventional agricultural research.
- Heterogeneity - diversity between households and communities
- Complexity - diversity within each household's livelihood system and particularly to the common spatial separation of components of the farming system.
- Connectedness - gravity causes the connectedness of farm to farm, and of community to community, in watersheds.

Both heterogeneity and complexity suggest that blanket recommendations are not likely to be widely useful, that production maximisation of a single commodity is unlikely to be the household's livelihood goal, and that the household or community is better placed to conduct research in realistic conditions, than the scientific research.

Summary of any significant research previously carried out.

The participatory approach to developing soil and water conservation practices on hillsides is now widely accepted as the most useful, given the heterogeneity of hillside environments and farming systems, and the range of activities which the farming family is trying to combine in their livelihood strategy. At the time of writing the proposal, the following work was the most significant; in summary, the focus had been on technical approaches to soil conservation, and little had been done in South America.

[edited from the literature review contained in the RD1]
Technology for soil and water conservation (SWC) has long been a high priority in tropical agricultural research. Historically, large-scale barriers to erosion have been the choice of government schemes. Now the emphasis is changing (compare Hudson 1971 with Hudson 1995), with the growing realisation that soil erosion begins with soil degradation and nutrient loss, and that prevention is better than cure. Maintaining vegetative cover and soil organic matter levels is the first stage in the prevention of soil erosion. These practices are also more amenable to small-scale management by farmers rather than unwanted implementation of large-scale schemes for mechanical control.

Various international centres are concentrating research efforts on appropriate vegetative soil and water conservation technologies, particularly leguminous cover crops, contour barriers of grasses, and hedgerow intercropping with leguminous shrubs and trees. Research on-farm has had some spectacular results. The use of simple hedgerows of velvet bean (*Mucuna* species) in Guinope is a particularly celebrated case which has led to increased productivity, reduced cropping area, increased forest cover and reverse migration back to the rural areas (Bunch and López, 1995). Evaluations by farmers and farming-systems researchers in upland areas of Leyte, Philippines indicate successful control of erosion and increased yields of maize, on slopes where contour hedgerows of *Leucaena leucocephala*, and *Gliricidia sepium* have been established (Lawrence, 1995b). In summary, simple and cheap technologies are available, including live barriers (grasses and / or leguminous trees), low tillage and cover crops. However the focus of research has been in humid and sub-humid environments and the technologies have not been tested under the more arid conditions found in the inter-Andean valleys.

In Bolivia, soil conservation research especially with agroforestry had concentrated on the lowlands and the more humid valleys. Agroforestry technologies had been developed in the lowlands of eastern Bolivia, and disseminated amongst the colonising farmers, principally to maintain or improve soil fertility on recently deforested land, to protect fields with windbreaks and to raise income by producing timber species (Lawrence and Carter, 1994). CIAT has also conducted research in the Valles area, mainly in annual crop and cattle production, but the

technologies are not directly linked to erosion control. There is thus a lack of scientific technologies appropriate to the semi-arid conditions of the mesothermic valleys, and a need to develop the indigenous technologies and / or adapt appropriate technologies from other similar agroecological zones. The problems with increasing population pressure (Davies, 1994) indicate that the mesothermic valleys should be a priority for urgent conservation work with the local communities, whereas until now all such work has been on the north side of the national park (Davies and Johnson, 1995).

Indigenous technical knowledge and its application:
White and Jickling (1995) note that 'recently, development experts have gained an appreciation for indigenous farmer knowledge and local innovations [for soil conservation]'. Rural communities in hilly tropical areas have developed a wide range of soil conservation technologies appropriate to the agro-ecological zone. These include contour ploughing and leaving strips of unploughed vegetation along the contours in the Philippine uplands (Baliña et al, 1992); terrace formation in the Yemen (Vogel, 1988) and distribution of compost along contour ditches in Honduras (Bunch, 1989). In Bolivia, Zimmerer (1994) found a range of local conservation methods which were specific to particular soils, and Rist and San Martín (1991) have also documented peasants' knowledge of soils and their management. Zimmerer (1993a and 1993b) emphasises the persistence of this knowledge despite changing socio-economic circumstances and land use, and the view among farmers that their knowledge is more relevant than that of the development institutions. Development workers elsewhere in the Andes have found indigenous knowledge to be a useful basis for agricultural development (e.g. Salas and Tillmann, 1990; Ocaña Vidal, 1990).

Farming systems research in the mesothermic valleys:
The project will be able to start from a firm basis of socio-economic surveys, and rapid diagnostic surveys, carried out by CIAT in the area (e.g. Soruco and Thiele, 1993; Davies, 1994). The farming systems research in the mesothermic valleys has concentrated on annual cropping systems, and an exploration of farmers problems with these crops and potential solutions (Davies and Llanos, 1992; Soruco and Llanos, 1994).

Constraints to adoption of soil and water conservation technologies:
By using a participatory approach, the project will aim to address the constraints which farmers experience in the development or adoption of soil and water conservation technologies. Some of these have already been identified in cases elsewhere in the world and would provide useful starting points for the diagnostic research phase of the project. For example, Fujisaka (1994) listed the following reasons for non-adoption of SWC technologies, in a review of experience from south-east Asia:

- the innovation addresses the wrong problem (or one which is not experienced by farmers); this is supported by the work of Andrew Blackler[1] (personal communication, 1996) who found that farmers in the south of Mexico tackled water supply problems successfully, where outsiders had identified soil loss problems which were not tackled successfully;
- farmer practice is equal to or better than the innovation;
- the innovation does not work (e.g. the species are not suited to the soil type - *Leucaena leucocephala* on acid soils is a common example); or it creates other problems such as attracting pests; or it interferes with other farm practices;
- extension fails by not correctly demonstrating an innovation or by targeting the wrong farmers
- the innovation is too costly, or benefits too distant or overestimated;
- social factors including insecure land tenure; short-term perspective causing mining of resources; war.

[1] Andrew Blackler, Dept of Geography, University of Reading, UK

On the other hand, reasons for adoption were identified as:

- low labour requirements
- hedgerows eliminate weeds (further reducing labour needs)
- hedgerow species give direct cash returns
- the adopting farmers are more dependent on sloping land - others invest more in lower lands
- use of naturally occurring vegetation.

Other researchers have highlighted the problems associated with emigration of rural labour which has led to reduced or ineffective maintenance of traditional SWC technologies (Zimmerer, 1993a; Vogel, 1988). Changing socio-economic contexts mean that traditional knowledge is not always sufficient to meet the needs of present-day farming communities, and there is a role for scientific interaction with farmers to develop new low-labour technologies.

Potential for social co-operation in resource access and management could also be explored. One of the major issues in the mesothermic valleys is the lack of grazing control, cited by farmers and GTZ staff in Vallegrande, and also reported from the Bolivian highlands by LeBaron et al. (1979). Some important contributions to soil conservation could be made by controlling it earlier in the degradation process, with the introduction of community monitored regulations for livestock access to ranges.

Use of participatory research methods and the need for further development:
The farming communities in the Andean valleys of both Cochabamba and the Valles have been settled there for centuries, allowing them to build up a unique store of agricultural and environmental knowledge. Elsewhere in Latin America farmer knowledge has helped researchers to select new species for development in agroforestry systems (e.g. Lawrence, 1995a), but this project aims to involve farmers in all stages of the research process. Recent reviews of farmer participatory research has highlighted the success of participation in the diagnostic phase, but drawn attention to the need for stronger participation in the experimentation and evaluation stages (Farrington, forthcoming). This project represents an opportunity to judge the 'improvement' of hillside / slope cultivation techniques by farmers' criteria as well as those of scientists.

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How the demand for the project was identified.

Research into technologies for soil and water conservation has been an important focus of tropical agricultural research but most of this has been in the more humid tropics, and there is a general lack of technologies appropriate to semi-arid zones. Farmers themselves have developed indigenous technologies but these are not always sufficient to cope with the demands of changing environmental and socio-economic contexts. Hence there is a need throughout the semi-arid tropics to find new ways of developing appropriate soil and water conservation technologies, combining both scientific and indigenous experience.

The project leader had been working and collaborating in the area for six years before project inception, and had participated in many discussions with farmers and extension workers. Farmers directly requested assistance, both in discussions with the project applicant and with the collaborators from SRI. The increasing activities of NGOs in the areas and their focus on

conservation aspects also demonstrates the demand. DFID personnel familiar with the area indicated a lack of appropriate technologies and the need for project intervention in buffer zones, giving priority to participatory planning and technology development (James Johnson, personal communication; Davies and Johnson, 1995). Finally the area has been identified as a priority for such work, by collaborators and programme managers from Silsoe Research Institute, during a planning consultation visit to Bolivia.

Project Purpose

The project purpose was given by DFID. As worded: 'economically viable land, soil and water management practices packaged and promoted' it is an unsubtle statement of conventional technology-led approaches to problem-solving. The project did indeed contribute to the development of economically viable management practices, but it did not package them, a term which is contradictory to the process approach used in participatory research, and not even appropriate to less radical approaches based on the idea of a 'basket of technologies'. Instead a more participatory approach to dissemination was taken, to ensure that the results of the research reached potential users.

Research Activities

Information gathering activities

These activities were stated in the logframe as:
1.1 Identification of NGOs and government organisations as suitable 'intermediary users' (IU's) and exchange of information on projects.
1.2 PRA identification of systems problems (biophysical and socio-economic).
1.3 Review of documents relevant to research questions (indigenous technology in the Andean region, project experience)
1.4 PRA of local knowledge and experimentation relevant to soil and water conservation problems identified by farmers.

These activities proceeded smoothly, and took place before CIAT's institutional difficulties hence with a full multi-disciplinary team of agronomist, forester, socioeconomist and social communicator. This led to vigorous discussion of methods and results, both of which have been documented in detail, and are attached in AERDD Working Papers 97/9 and 97/10.

The involvement of all relevant NGOs and government agencies working in the area, through the research activities, made an important contribution to facilitating dissemination (see below).

Participatory research activities

These activities were stated in the logframe as:

2.1 Farmer and IU visits to CIAT research sites, with feedback discussions.
2.2 Scientific and IU collaborator visits to fields of experimenting farmers.
2.3 Annual participatory research planning workshop, with farmers, IU's and project research staff, to exchange information, plan on-farm experiments, monitor trials and evaluate technologies.
2.4 Definition of evaluation criteria by farmers.
2.5 Implementation of adaptive farmer participatory research, in parallel with expansion of SRI research sites.

2.6 Monitoring of biophysical and socio-economic effects of both formal and farmer trials, according to

- scientific criteria (recommended by collaborators from SRI)
- farmers' own indicators.

2.7 Visits to participating farms by scientists and IU's to facilitate process of evaluation of trial results by farmers and scientists.

Three cycles of workshops were held, to cover the activities described in 2.1 to 2.4, and 2.7:

a) In August 1997, to exchange knowledge and plan participatory trials.
b) In August 1998, to evaluate initial trials with farmers (both owners of trials, and others), and to stimulate a second cycle of experimentation.
c) In April / May 1999 to evaluate all trials with farmers.

In the first year, activities 2.1 to 2.4 took place within a single workshop, at which farmers and technical staff from CIAT and NGOs exchanged experience, visited field sites and worked together to plan farmer-managed trials. The only variation on the plan presented in the logframe, was that CIAT sites investigating contour hedgerows (i.e. those instigated by Silsoe Research Institute) were deemed to be too immature to be visited by non-experimenting farmers, and the field visits were therefore made to an FAO site in a slightly more humid area, a factor which did not discourage farmers from testing out the ideas demonstrated there.

The last workshops were low-key, as farmers felt that they had contributed as much time as they wanted to; results are reported in CIAT / SRI / University of Reading / University of San Simón (1999). In part these final evaluation workshops were developed into the dissemination workshops held in August 1999, which involved IUs more than farmers.

In numerical terms, most of the targets identified in the OVIs were achieved. The research focused on only three communities, however, as CIAT collaborators felt that these would stretch their resources without adding a fourth. Furthermore, although 20 trials were planned at the first round of workshops, only 8 were implemented because El Niño delayed the sowing time (through drought); when it finally arrived, three months late, farmers were naturally most concerned to establish their food crops. Those who did establish trials were largely unsuccessful but were sufficiently interested to re-establish them in the next season.

By 1998, 45 trials were planned (by participants in the three workshops), who for the first time included 8 women. These included 18 households in Chacopata, 18 in Los Pinos and 9 in Pozuelos. Not all were implemented however, the growing season again being interrupted by unseasonal weather, in this case unusually heavy rain.

Interestingly, although community participants in the workshop described a range of farmers' own practices, they have generally designed trials to incorporate external ideas such as contour hedgerows and cover crops into their systems. Working with farmers' own perceptions, extension workers and researchers have increased their understanding of priorities for conservation of soil humidity and organic matter, rather than preventing erosion itself.

The process led to a strong response from interested farmers in the first year, supporting the assumption that one of the greatest constraints to improving soil and water management in the zone is simply information flow. Facilitating farmer-to-farmer demonstration of suitable practices was the single most important activity of the project until the dissemination workshops at project end.

The planning and experimentation approach is documented in (attached):

- Lawrence A. (1998) Linking with local knowledge for soil and water conservation in Bolivia. AERDD Working Paper 98/4, University of Reading.
- Montenegro O., Soruco O. and Lawrence A. (1998) Memoria: seminario taller de análisis y planificación de evaluación participativa. 14 May 1998. Proyecto Laderas, CIAT, Santa Cruz, Bolivia.

Activities contributing to outputs 1 and 2 in particular benefited from the participation in the team of experienced Bolivian workshop facilitators. Rosario Velasco, and more frequently Roxana Loaiza, were key contributors. Both were CIAT staff at project initiation, but Roxana Loaiza was made redundant during the political upheavals of 1997; thereafter we contracted her as a local consultant. There is no doubt that her contribution was essential; equally, that the need to contract her was a loss to the institutionalisation of the process within CIAT.

Methodological advances

These activities were stated in the logframe as:

3.1 Literature review of participatory research projects.
3.2 Post-project review of methodology and analysis in context of experience and progress world-wide.

These activities in fact began much earlier in the project than anticipated, and as is appropriate to a process approach where the method is continually being assessed and adjusted, several opportunities were taken to share on-going lessons and seek feedback from Bolivian and international audiences.

The first opportunity to review the methodology was taken within the project team, in a self-assessment of the achievements during the first phase of the project. This led to a strengthening of institutional commitment, changes in understanding of participatory approaches and in particular an appreciation of the role of participatory methods in experimentation and evaluation (i.e. beyond appraisal). This is documented in AERDD Working Paper 97/9 (attached).

International opportunities to share methodological lessons included the International Workshop on Participatory Monitoring and Evaluation, IIRR, Philippines, 23-29 November 1997, and the Workshop on Participatory Natural Resource Management, Mansfield College, Oxford, April 6th-7th, 1997. These opportunities were supported with additional funding from AERDD, University of Reading, and projects funded from other sources, particularly the Darwin Initiative which enabled travel to the Philippines.

A further opportunity to share lessons within Bolivia was created at the specific request of CIAT, and was supported by this project although not strictly one of its activities, in order to enhance the institutionalisation of the approach.

Participation in other workshops revealed that other researchers were reaching similar conclusions based on work in different parts of the world; for example, the DFID Integrated soil fertility management workshop, Reading University, 17-18 September 1997 Working Group on Hillsides Production System recommended the following principles to guide research (among others):
- ‘Explore / build on local knowledge wherever possible
- Embrace participatory processes.
- Ensure flexibility in project design for course adjustment

- Closer integration of socio-economic and biophysical research with … implications for scaling up of projects, with better identification and an increased use of farmer recommendation domains. ‘

The project suffered at times from confusion surrounding the identity and interactions of the two projects, which led to some under-estimation of the goals of R6638. R6638 was approved in Bolivia during a visit by staff from Silsoe Research Institute, acting on behalf of Reading University; it was not clear to CIAT staff that the project had a separate logframe and budget, and consequently different approaches to ‘participation’ were overlooked in the initial stages. CIAT’s own problems led to poor communication within the institution, and hence perhaps doubts among staff who were not involved, but R6638 addressed this through organising an institutional-level workshop in May 1997. The workshop was a very positive event, with strong feedback from all the stakeholders, and many comments to the effect that they were pleased to now understand the objectives of the Proyecto Laderas. However this workshop and follow up were not part of the budgeted activities of R6638 and without further support from the Hillside programme it was felt that further action to maintain the links with NGOs and within CIAT, should be the responsibility of CIAT. 15 months later R6638 organised a series of dissemination workshops and encouraged CIAT staff from other programmes to participate; for most it was the first time they had seen the trials, researcher-managed or farmer-managed. This poor level of communication within the institution is a reflection of both the political upheavals of the last two years, but also a tradition of separate research programmes. The project has contributed much to overcoming these barriers, but is not sufficient to maintain the interest of researchers who do not have funds or institutional support to learn about each other’s work at first hand.

Dissemination activities

These activities were stated in the logframe as:
4.1 Dissemination of results through local publications, international journals, extension materials.
4.2 IU-centred workshop (including interested farmers) to review participatory research process and identify improved methodology (this will then feed in to activity 1.2).
4.3 Dissemination of methodological experiences through local publications and international journals, FPR guidelines.

An innovative aspect of the project, and one which was developed beyond the commitment of the lograme, is that participatory approaches to dissemination planning were incorporated into the project process. Novel techniques were used in the final dissemination workshops to identify potential local uptake pathways and to consult the various stakeholders on their preferred dissemination materials. More detail of this can be seen in the outputs section and in the attached document:

It is important to highlight the fact that,the focus has not been on refereed journal articles but rather on communicating with practitioners through workshops and conferences. Journal articles will follow now that analysis of project experience is complete.

General remarks
Planned inputs were all achieved, and savings made in subsistence were used to support dissemination activities. It is important to draw attention to the additional cost of these activities, over and above that planned in the budget, which have undoubtedly enhanced the impact of the project but which were given low priority at the time of project commissioning. The mid-project workshop, publication of diagnostic study, and dissemination consultation workshops were all additional activities with a significant additional cost.

Further added value for the project was gained through extra visits funded through other research projects also being conducted by the project leader in collaboration with CIAT. The greatest constraint to achieving project activities was the frequent changes of staff: as CIAT came under local political control the project lost Eduardo Sandoval (agroforester), Osvaldo Montenegro (socioeconomist, moved to another programme within CIAT), and Roxana Loaiza (social communicator).

Outputs

All the anticipated outputs were achieved. The following gives a brief summary of the results for each output, indicating in which attached report more detail can be found.

Output 1. Farming systems, constraints to sustainability and relevant local knowledge documented.

Farming systems

Using a range of research methods including PRA, informal interviews with development workers, and collection of reports and other secondary material, the project explored and documented the farming systems in three communities: Chacopata (in Vallegrande Province); Los Pinos (in Caballeros Province) and Pozuelos (in Florida Province):

On the rainfed slopes of these communities, a basic cycle of slash and burn followed by potato production (or chilli in Pozuelos), maize, peas and / or beans, and wheat is used, varying according to the agroecological conditions. Chacopata is the oldest community (nearly 500 years) and farming has the traditional Vallegrande system of maize production on the lower slopes with extensive cattle production on more distant land, although recent innovations have included potato and fruit production. Los Pinos is a migrant community but now at least 60 years old, near the border with Cochabamba and settled by colla families who left their homes in Cochabamba due to pressures on the land; cattle production there is less important, while potatoes are being replaced by strawberries. Pozuelos is a community first established at the beginning of this century by out-migrants from Vallegrande; being on the main road to Santa Cruz it is also attractive to more recent migrants especially since the hillside forest has been opened up by roads built in the last five years. Both old and new settlers have adopted a system of rapid clearance, production of locoto (chilli peppers) and beans. Soil erosion is most drastic and visible in Pozuelos, but farmers in the other communities note loss of fertility, gradual loss of topsoil and low production. Agrochemicals are used principally for potatoes in Chacopata and Los Pinos, but not at all in Pozuelos where soil fertility is higher, and pests not yet a problem. Burning is a common practice to clear forest and grass fallow the cultivation cycle is much longer in Chacopata and Los Pinos than in Pozuelos where there is still new forest to open up, soil is washed away more quickly, and probably weed growth is faster.

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The key ethnic and agroecological differences between the communities, formed the basis for their selection for the study. The important differences in age of community, migration patterns, tenure, gender roles, organisation, and farming systems, revealed by the diagnostic research have all affected farmers' predisposition to innovate and practise SWC technologies. These differences are summarised in table 1.

Table 1: summary of factors relating to soil and water management in the three communities

Factor	Chacopata	Los Pinos	Pozuelos
altitude (m a.s.l.)[2]	2200	2400	1400 - 1800
mean annual precipitation (mm) [range over last 20 yrs]	680 [448 - 814]	about 700 [350 - 860 in nearest town]	550 in lowland 800 on slopes
access	remote but has daily public transport	5 km from highway; no public transport	on highway
principle cash crops	potato > peas > wheat	strawberries > potato > peas	chili > beans > vegetables
food crops	maize, potato	maize, wheat, potato	maize, potato
cattle	declining cattle; formerly many sheep, now none	cattle and sheep	fewer cattle than other communities; no sheep
years of hillside farming	> 200 years	70 years	5 years
forest remaining	no	a little, far from the community	yes, lots
tenure system	owner tilled; group ownership of pasture	individually owned and farmed	individual ownership; short-term renting
land limited	yes, highly	yes, less	no
migration patterns	some emigration	high emigration	immigration of quechua people; emigration of young vallegrandino people
community organisation and gender relations	community works together when necessary; only men in the OTB	strong sindicato; women excluded from the OTB and most public meetings	weak OTB; women have more voice than in the other communities
experience with agricultural technical support	good	negative	none
fertility decline perceived	yes	yes	no
erosion perceived	little	little	yes
declining water sources perceived	yes	yes	yes
overgrazing perceived	yes	no	no
community's RNR priority problem	water conservation; soil fertility	water conservation	water conservation
innovation to reduce soil erosion	yes	little	no
community action to protect water sources	yes	no	yes
community action to prevent burning	yes	yes	no
interest in SWC	high	medium	low

[2] because of the mountainous terrain, only an altitude for the centre of the community is given; farming is practised at several hundred metres above and below this, except in Pozuelos, where all farming is at or above the altitude of the community.

Constraints to sustainability and soil conservation

Farmers themselves do not consider their farming systems to be unsustainable, at least not biologically, partly because they are continually adapting to new markets and information. The only anxiety farmers show about continuity of their farming systems is the recognition of out-migration as a problem; many of the younger generation have left to find education and work in Santa Cruz, or as far afield as Argentina. In Pozuelos there was a particularly strong feeling that in 20 or 30 years' time there would be no one left to farm in the community.

Other (externally perceived) constraints to sustainability are social and institutional. Tenure systems in the area inhibit planning; in Chacopata the *indiviso* lands, large areas which belong to several people without internal delimitations, are unlikely to be improved or protected by an individual who will not benefit when his neighbours graze their cattle there; in Pozuelos the recently developed system of short term rentals (3 years) gives the tenants no incentive to put anything back into the land which they will soon leave. Access to technology and capital is poor in all three communities, none of whom benefit from regular extension contact. Finally community organisation is not traditionally strong in the area, although the highland communities (e.g. Los Pinos) show much strong communal action than the others.

In both Chacopata and Los Pinos, farmers do not have any more land to farm. Degraded pasture is available for opening in Los Pinos but the soil quality is poor. This is an important factor contributing to the greater interest in these communities than in Pozuelos, which is experiencing a new expansion into fertile forest lands and has been awarded still more land recently. The expectation that the younger generations will leave the farming livelihood also undermines an interest in SWC in Pozuelos; Chacopata is a more traditional community which, although experiencing some emigration, is committed to the future of farming there.

There is a clear correlation between interest in SWC, and the length of time that slopes have been farmed in the community. Chacopata has centuries of experience and reports long-term decline in fertility, whereas the 70 years of farming in Los Pinos have demonstrated water scarcity, but aroused less concern over soil fertility. Five years of hillside farming in Pozuelos provides little basis for observing the long-term effects, and residents there are still enjoying the short term economic bonus of renting their land or producing higher yields than on their lowlands.

The traditional importance of livestock in the farming system impede adoption of certain SWC technologies, particularly contour hedgerows. In Chacopata and Los Pinos, sheep and cattle are grazed on the maize and barley stubble, and it is difficult to protect hedgerow species from severe browsing. In Pozuelos, where farmers have fenced off their hillside crops, this would not be a problem, but the factors describe above prevent farmers from trying out contour hedgerows.

A less obvious factor affecting adoption, is the flow of information within the communities. This appears to be strongest in Chacopata, where families are highly aware of their neighbours' activities. There is also a strong sense of community in Los Pinos, but women rarely participate in public meetings and are therefore often excluded when information from outside the community is disseminated. Some of the strongest interest there has been shown by women, when SWC was discussed with them individually, suggesting that gender relations are a constraint to innovation. Pozuelos shows relatively poor coherence as a community; farmers are often unaware of what their neighbours are practising and there is little social contact between ethnic groups, clearly impeding discussion and adoption of SWC.

Local knowledge

While many farmers and development workers express the view that 'farmers have done nothing to prevent soil erosion', the diagnostic stage revealed detailed knowledge of soil types, uses, fertility problems and management. Local knowledge in fact addresses a different problem from that perceived by outside actors. There is less traditional knowledge specifically addressing soil erosion, because the problem has not been perceived until recently and pressure on natural resources has increased in recent decades as farmers run out of land to farm. Farmers are beginning to innovate as they recognise soil erosion as a problem, although this is still at individual level. Reduced burning, and leaving fallow or crop residues in contour lines, are the most common local practices. Social responses are following more slowly, but a few farmers have decided to delimit individual property which allows them to fence and manage it more sustainably, while two of the communities have acted to ban burning of fallow.

Summary

In summary, interpretation of stakeholders' views shows important differences in perception of the problem, which have to be recognised and worked with constructively. In particular perceptions of constraints to sustainability differ widely. External perceptions are of irresponsible cattle management and expanding slash-and-burn practices, leading to overgrazing and cultivation of inappropriately steep slopes. The experience of farmers is that in fact livestock numbers are greatly reduced from levels 20 years ago, and consequently their attention is focused more on cropped land. By continually adapting to markets and changing natural resources, their farming communities have survived, and they do not believe their practices to be unsustainable. Instead they identify declining water availability at the main constraint to future farming, and in some communities are concerned that many of the younger generation are emigrating, leaving few to farm in the future.

Documentation of this output is attached in the following reports:

- Lawrence A., Eid M. and Sandoval E. (1997) Evolving local knowledge: soil and water management in the temperate valleys of Santa Cruz. AERDD Working Paper 97/9
- Lawrence A. (1997) Contours, crops and cattle: participatory soil conservation in the Andean foothills, Bolivia. Agroforestry Forum 8 (4): 11-13.

Output 2. Improved soil conservation practices identified.

Both the exploratory and the experimental phases of the project worked towards the identification of improved soil conservation practices. Table 2 summarises traditional practices, recent local innovations, and practices introduced either by FAO or R6621.

The project process (see output 3) exposed farmers and researchers to all of these practices, and supported farmers in testing any combination of these ideas on their farms. As a result of the participatory trials and the M&E process stimulated by the project, farmers changed their attitude to the new technologies throughout the course of the project, and began to incorporate contour hedgerows into their systems primarily as a source of fodder. At the same time they began to appreciate that such approaches could have a beneficial effect on soil management.

The external technologies appeared to have much greater impact on participating farmers, than the traditional practices or local innovations, not surprisingly as they were already largely aware of the latter. Nevertheless the way in which the project linked all the different sources of ideas, showed respect for local knowledge, and stimulated discussion of the reasons for local

practices, clearly contributed to the change in perception and innovation levels within the participating communities, as the monitoring and evaluation demonstrated (see output 3).

Table 2. Old and new technologies for soil management

Traditional (practised by parents of the current generation)	**Innovations (newly developed by individuals)**	**Outside practices (under formal trial in the area)**
• fertility and water management • drainage trenches • digging in weeds • leaving weeds under fruit trees • grazing livestock on stubble • expanding uphill edge of fields	*These could be interpreted as relating to erosion control, but farmers explain them as intended to maintain levels of soil organic matter* • not burning fallow or crop residues • leaving trunks/ roots in the soil • leaving contour strips • contour-planting fruit	• contour hedgerows • cover crops

The second output of the project was achieved, but with reservations regarding the extent to which technological aspects were really developed. Project R6638 was strongly linked to R6621 which had greater financial resources, and a technology-led focus, so that we found farmers were being strongly encouraged to adopt contour hedgerows, rather than adapt outside ideas into their systems. While R6638 found that farmers were adopting contour hedgerows for their own (non-soil related) reasons, and adapting them to suit their individual farming systems, there were opportunities which were not followed up, particularly in the ways in which women and farmers from more far-flung areas wanted to adopt the technology. Consequently the approach used by R6638 has indeed identified improved conservation practices but has had little opportunity to test the more novel ones out with farmers, because of the limits of time and money. These ideas included, in particular:

- interest in growing the tree species introduced through the R6621 trials, in the form of windbreaks rather than contour hedgerows.
- Interest in growing the tree species as small woodlots (particularly noted by women in Los Pinos).
- Interest in growing the grasses in small areas of permanent pasture to facilitate grazing management.

Documentation of this output is included in the following attached reports:

- Lawrence A. (in press) *Creating new knowledge for soil and water conservation in Bolivia. In* Jeffery R. (ed) Co-operation and conflict in natural resource management: lessons from case studies. Macmillan, London and St Martin's Press, New York.
- Lawrence A., Haylor G., Barahona C. and Meusch E. (in press) *Adapting participatory methods to meet different stakeholder needs: farmers' experiments in Bolivia and Laos.* Chapter in Estrella M., Blauert J. and Gaventa J. (eds) Learning from Change: Issues and Challenges in Participatory Monitoring and Evaluation. Intermediate Technology Publications, London.

Further documentation of the introduced technologies should be available through the final report of R6621. During the final meeting held between R6638 and CIAT, there was a strong

consensus from CIAT that the outputs of 'Proyecto Laderas' (i.e. R6621 and R6638) fell into two categories, the methodologies and the technologies. CIAT felt that while the methodologies had been amply demonstrated, and should be disseminated to other CIAT programmes, NGOs and municipal extension workers, the technologies which had been introduced through R6621 would need to be tested through further seasons. Discussions with Jim Ellis-Jones (Silsoe Research Institute) led to agreement that dissemination of the methodology would be the main responsibility of R6638, while that of the technologies would be managed by R6621. Consequently no further detail is added here, in relation to the introduced technology – the concern of R6638 has been the adaptation of ideas both local and scientific, by farmers.

Output 3. Participatory research process documented and analysed.

It is in this output that R6638 probably has the most global relevance. The most valuable lessons have been the following:

- The project developed tools for a complete process of participatory research from problem identification through trial planning, implementation, monitoring and evaluation. This process was appreciated by CIAT as being the output most widely applicable in their work. (see Mason and Lawrence, 1999).
- The project stimulated CIAT to consider different models of participatory research, in part through the workshop reported in Montenegro *et al.* (1998) and in part through contributing research results to a project initiated within CIAT to 'systematise' its experience. DFID's own attitude to 'participation' has probably changed in the four years since this project was planned. Initially there were misunderstandings owing to the expectation that a participatory project would somehow supply the PRA to justify the scientific components of R6621, but great efforts have been made to take that further, and this is recognised and welcomed by CIAT, as demonstrated by their response to the dissemination consultation in August 1999.
- The project has contributed to the growing global discussion about appropriate ways to conduct participatory research, and in particular the appropriateness of the results for statistical analysis . We have especially benefited by comparing our experience with that of other participatory projects in which the project leader was collaborating, in Asia (see Lawrence, Haylor, Barahona and Meusch, *in press*; and Lawrence, Barr and Haylor, 1999).
- Particular tools have been developed for participatory rural appraisal of soil-related knowledge (see Lawrence, Eid and Sandoval, 1998).
- Analysis has led to consideration of ways in which external actors can most effectively stimulate and link in to 'knowledge creation'. Reflection towards the end of the project led to an analysis of knowledge as a dynamic process, explained in Lawrence, *in press*. An alternative model of knowledge creation, presented in Sinclair and Walker (1999)[3], requires further research to explore the impact of these different approaches to combining scientific and local knowledge. In fact both authors (Anna Lawrence and Fergus Sinclair) are now collaborating on a new NRSP project (R7412) in Nepal (led by Morag McDonald) which combines Sinclair's approach to knowledge acquisition and documentation, with the model developed in Bolivia through R6638, and which specifically incorporates from the beginning tools for monitoring knowledge change and adoption of ideas / technologies generated through the project. This would have been ideal in the Bolivian project but proved unfeasible given the lack of social researchers in CIAT and the institutional upheavals which led to such frequent change of staff on the project.

[3] Sinclair F.L. and Walker D.H. (1999) A utilitarian approach to the incorporation of local knowledge in agroforestry research and extension. In: L.E. Buck, J.P. Lassoie and E.C.M. Fernandes (eds) *Agroforestry in sustainable agricultural systems.* CRC Press LLC, USA. Pp. 245-275.

- Use of Participatory Monitoring and Evaluation (PM&E) as a tool to facilitate institutionalisation and dissemination. The project focused on issues such as the nature of data: diagrams, maps, matrix scoring and data forms (reported in Lawrence, Haylor et al, in press); and the need for reconsideration of who needs the data. In particular the project took forward ideas about monitoring simple technologies, to consider the challenges of monitoring complex changes in farming systems. Furthermore it led to a direct consideration of the role of women in participatory research, and a change in approach of the CIAT staff involved. Analysis of these issued benefited from the synergy of comparing and contrasting lessons in this project and Laos (see Lawrence, Haylor *et al.,* in press).
- Developed participatory methods for dissemination planning (see Lawrence and Mason, 1999).

While the key documents associated with these research findings are attached to this report, the conclusions from the two most significant are repeated below, for ease of understanding.

The value of participatory M&E as a learning process

From: Lawrence A., Haylor G., Barahona C. and Meusch E. (in press) *Adapting participatory methods to meet different stakeholder needs: farmers' experiments in Bolivia and Laos.* Chapter in Estrella M., Blauert J. and Gaventa J. (eds) Learning from Change: Issues and Challenges in Participatory Monitoring and Evaluation. Intermediate Technology Publications, London.

This paper identified some of the challenges presented by donor-funded participatory research projects:
- Taking into account different stakeholder needs,
- Generalising about project results and findings,
- Developing appropriate participatory methods and institutionalising participatory approaches within government research institutions,
- Identifying indicators for measuring systems level changes affected by participatory technology development.

This section elaborates on these challenges to PM&E research.

Usefulness of the PM&E process to different stakeholders

Researchers sometimes assume that asking farmers to evaluate new technologies is intrinsically useful to those farmers. While our experience does not negate that assumption, it does indicate that participatory methods involving farmers in documenting change (even in using a shared, visual method such as matrices) may be of more value in facilitating communication between farmers *and* researchers, than in enabling farmers themselves to arrive at dramatic new insights. The more formal approach and forms used in Laos, in particular, limit the method in terms of providing in-depth, meaningful data. It becomes all too easy for government officials who are accustomed to collecting census data to fall into the mode of merely recording views without generating local analysis and reflection. The method has also been invaluable to researchers in terms of drawing out the different perceptions between women and men. Through external facilitation, local staff were encouraged to compare the evaluation matrices of men and women. In both projects in Laos and Bolivia, government staff are now much more aware of the value of women's perspectives on the impact of new technology. Particularly in Bolivia, despite their initial reluctance, staff eventually appreciated different views of men and women farmers and that each were equally valid. As a result, the value of women's knowledge of livestock forage preferences is now much more acknowledged by CIAT staff.

This raises the question of who is benefiting from the PM&E process. Our experience suggests that farmers may not immediately value nor derive direct benefits from indicators, forms and matrices used as evaluation tools, because many already have informal ways of assessing their own experiments. The tools are more useful in that they help extension agents and researchers better understand farmers' needs and perceptions, and the costs and benefits of farming experiments. Nevertheless, using participatory evaluation tools can place local staff and farmers in better positions to make decisions about new technologies on local farms. Overall, however, our experience shows that the process of learning from farmers' indicators and their evaluation of those indicators has been most valuable in helping outside researchers, e.g. in thinking about replicability, institutional appropriateness, and institutionalisation.

Adapting methods for different institutions or culturesCIAT and LFS[4] have quite different institutional cultures, which in turn have implications for the way PM&E methods are used and adapted. CIAT staff in Bolivia tend to adopt a more informal, flexible approach to decision making and working. Because most of their time is spent in the field, staff have a very good understanding of farmers' perspectives and ideas about technology development and are quick to support them. However, CIAT staff are less interested in formal documentation and reporting. Matrices and forms have been introduced into workshops but are not widely used. On the other hand, LFS staff in Lao respond to a more centralised model of decision-making and accountability and have adopted a more structured approach to documenting results. District staff wanted to record quantitative data and use 'forms' for recording information, pointing out that farmers were able to quantify changes and values more often than PRA methods allowed them to. These observations led them to develop more structured methods, such as matrices, for monitoring and registering feedback.

While matrix scoring was promoted in both institutions, differences in institutional working styles necessitated that the tool be adapted and supplemented. Staff in Laos used matrices for recording information but found resource flow diagrams helpful in facilitating communication between farmers and researchers. Because of language barriers and staff's limited experience with open-ended group discussions, resource flow diagrams made it easier to identify farmers' evaluation criteria which were eventually converted into indicators on the matrices. On the other hand, in Bolivia semi-structured interviews between farmers and researchers sufficed.

Potential for comparisons and applying the results elsewhere

The way research was conducted in Laos and in Bolivia, in turn, affected the potential for comparing and generalising results. As mentioned previously, in Laos, local staff paid more attention to detail and documentation. By contrast, in Bolivia while staff were enthusiastically committed to helping farmers, they did not see much value in filling in evaluation forms but invested in developing more personal interactions and informal discussions with farmers.

The Lao approach led to a data-gathering method which was more amenable to statistical analysis and generalisation than in Bolivia. Once sufficient data is collected in Laos, it will be possible to link the results to factors such as gender, the agroecological system and individual wealth, and to draw conclusions on how these factors affect farming strategies. However, the validity of the data collected through the Lao 'form-filling' approach has yet to be verified. Furthermore, while the more formal Lao approach led to meticulous quantitative documentation of farmers' evaluations, there was limited explanation of *why* different farmers rated change in different ways. By contrast, the more haphazard, informal approach in Bolivia- while perhaps more frustrating to donors and others seeking more

[4] Livestock and Fisheries Section, the colloborating institution for work in Laos which this paper also drew on.

systematic procedures- provided a better understanding of why farmers were developing technologies in a particular direction. Limited documentation in Bolivia, nevertheless, prevented the further sharing of experiences amongst other staff and farmers. These institutional differences are cultural, an aspect of PM&E which has been little explored but has significant implications for the way information is obtained and used.

Evaluating farming systems change

In both countries the research process made new attempts to explore the range of factors affected by farming systems development. Through resource flow diagrams and semi-structured interviews, farmers were able to identify indicators which pointed out systems impacts that researchers had been unaware of. For example, in Laos management of cultured fish can affect wild fish populations. In Bolivia, growing contour hedgerows for soil conservation could affect cattle nutrition, or be affected by browsing cattle.

Farmers' indicators were themselves a valuable product of the research. In both projects indicators revealed farmers' understanding of ecological and economic processes and interactions. In particular, indicators of success identified by Bolivian farmers (described above) show that they understand the role of organic matter in conserving nutrients, humidity and soil.

The use of indicators in a matrix improved comparability before and after trials and across farming households. However, we found it more useful to complement the more rigid matrix method with more open methods which helped reveal unexpected outcomes or benefits, even though results may be less comparable and generalisable. For instance, the more open-ended use of methods in Bolivia showed that indicators can change over time, as farmers' experiments produced results which farmers and researchers did not expect.

Towards institutionalisation: building on participatory evaluation of technologies

In both projects, an iterative approach to the research process incorporated stages of self-evaluation and learning, which led to local staff defining their own needs for PM&E. In Bolivia, workshops to share the experience with other CIAT staff and a range of NGOs, have helped to draw out stronger conclusions about the usefulness of the research, including those reported in this paper. In Laos, a key feature of PM&E was that it incorporated methods that staff had learnt and used in conducting other PRA work, hence building their confidence and understanding in applying the tools more flexibly. In both countries, staff have strengthened their understanding and capacities to plan, monitor and evaluate new technologies together with farmers and apply what they learn in other aspects of their work.

Farmer participatory research and watersheds

It is important to remember that while this project was taking place, the global context of participatory methodologies was also moving ahead, and this project interacted with those changes through various global fora. Consequently the strongest indication at project conclusion, is that while the project clearly had an important impact locally, it also raises questions in the global context, linked to the rise in interest in 'watershed' management approaches. The concept of 'participatory watershed development' (PWD) is now a widespread one, but it has been mainly applied in India, about which hundreds of papers and reports have been written. Participatory research might be expected to be an important part of such development, but (at least as experienced in Bolivia) it is conducted at the level of individuals and households, not groups and communities. Is this the best way to proceed, and how can the results of such trials be usefully related to the broader sustainable approach of PWD?

To build on participatory research and the potential for watershed development, we have to ask questions such as 'How do people differ within the watershed? Who are we working with? Who aren't we working with? How would the results of our 'participatory' trials relate to these others?' This paper already provides pointers to some of the answers, in the Bolivian context: the focus has been on the cultivable parts of the watershed, through gender, technology and accessibility biases. Part of the reason for this is also that the *research* is narrowly construed; donors have their own reasons for separating research and development, but these distinctions may be arbitrary to participating farmers, and hinder the application of results to the whole watershed. 'Experimental' approaches are insufficient to find out how to include the whole community, production system or watershed, and social forums need to be built up too – which is why it is important to involve NGOs.

Reflection on the experience of R6638 suggests that the best way to approach this may vary considerably between cultures. Greater analysis of this is given in 'Going with the flow', attached to this report. Most of these differences suggest that there is considerable potential for applying the results of individual households' experiments, throughout the watershed – but more research is needed into this. And in the final analysis, technology, even developed by farmers themselves, is not a substitute for management of the decision-making processes required for participatory watershed management. This is a significant conclusion of the work conducted for R6638, and one which led to the proposal for scaling up processes currently being considered by NRSP. It is very important that such work be based on an understanding of the variation of livelihoods across the watershed, which will not be so marked as it is in India for example, but which has not been explored in the context of interactions to contribute to sustainability.

Documentation of this output is included in the following attached reports:

- Lawrence A. (in press) *Creating new knowledge for soil and water conservation in Bolivia. In* Jeffery R. (ed) Co-operation and conflict in natural resource management: lessons from case studies. Macmillan, London and St Martin's Press, New York.
- Lawrence A., Haylor G., Barahona C. and Meusch E. (in press) *Adapting participatory methods to meet different stakeholder needs: farmers' experiments in Bolivia and Laos.* Chapter in Estrella M., Blauert J. and Gaventa J. (eds) Learning from Change: Issues and Challenges in Participatory Monitoring and Evaluation. Intermediate Technology Publications, London.
- Lawrence A. (1999) Going with the flow or an uphill struggle? Directions for participatory research in hillside environments. *Mountain Research and Development* 19 (3): 203-212.
- Mason T. and Lawrence A. (1999) Methodological guidelines for the planning, implementation and evaluation of participatory research projects. [unpublished report]

Output 4. Relevant process and technologies promoted.

Outputs were disseminated through a range of local, regional and international fora:

a) Locally - village workshops where farmers and NGOs presented their experience with SWC
b) Regionally - a mid-project updating workshop with 50 participants from CIAT and NGOs based in Santa Cruz
c) Internationally – at the 'Workshop on Participatory Natural Resource Management, Mansfield College, Oxford, April 6th-7th, 1997.', the 'International Workshop on Participatory Monitoring and Evaluation, IIRR, Philippines, 23-29 November 1997' and

the 'Conference on Poverty, Rural Livelihoods and Land Husbandry in Hillside Environments' Silsoe College, Bedfordshire, 6th –8 th January 1999, and through AERDD working papers.

It is important to highlight the fact that since the whole range of stakeholders were involved from the start, the process and technologies were promoted during the course of the project, as a product of the way that the research was conducted. In other words the process involved dissemination at all stages.

At the end of the project, three participatory workshops were held from 2 to 4 August in three municipalities of the Santa Cruz department. The aim of the workshops was to ensure the useful dissemination of the research results from *Proyecto Laderas*, by making all the relevant local institutions aware of the project outputs and able to participate in the selection and design of appropriate dissemination materials. The intermediary users involved included staff from local NGOs and the recently created municipal extension agencies, as well as interested farmers. The workshops also provided an opportunity to involve staff from the various departments of CIAT Bolivia (Centro de Investigación de Agricultura Tropical), the collaborating research institute, thereby supporting inter-departmental dissemination.

We were guided by a recently completed study commissioned by DFID[5] which concluded that failure to prepare plans for dissemination, or to consult with potential users of the dissemination material and the project outputs hinders the uptake of ideas and technologies developed by those projects. In order to avoid this problem, the project developed innovative techniques based on PRA methods such as matrix scoring and communication mapping, and tested them in the workshops (see dissemination workshops report). This novel approach doubled as a dissemination medium (both for the process and technologies) and a consultation forum about the most appropriate future forms of dissemination. The dissemination outputs of the project are specifically based on the results of these meetings.

Consultations with the municipal offices in Mairana, Comarapa and Vallegrande indicated that a practical methods guide was needed, and that it was the methodology which would most reward dissemination – because it was applicable in other contexts. They also requested a simple leaflet with specific recommendations.

Farmers in the dissemination workshops thought that a field day with visits to sites where other farmers were experimenting with technologies would be most effective, followed by a workshop which included a video. The latter appears to cost more than is available within project resources ($5000). Cheaper approaches to making the video are being sought. The experience of this project concurs with that of the recently completed RNRKS study, that a significant component of the budget needs to be set aside for dissemination activities in order to ensure that they meet the needs of stakeholders. This has project planning implications.

[5] Norrish et al (1999) Improving communication strategies for the promotion, and dissemination of NR research outputs to intermediate and end users,
Draft Final Technical Report, Volume 1, to DFID

Documentation of this output is included in the following attached reports:

- Lawrence A. (in press) *Creating new knowledge for soil and water conservation in Bolivia. In* Jeffery R. (ed) Co-operation and conflict in natural resource management: lessons from case studies. Macmillan, London and St Martin's Press, New York.
- Montenegro O., Soruco O. and Lawrence A. (1998) Memoria: seminario taller de análisis y planificación de evaluación participativa. 14 May 1998. Proyecto Laderas, CIAT, Santa Cruz, Bolivia.
- Lawrence and Mason (1999) Participatory methodologies and live barriers: disseminating the outputs of Proyecto Laderas. Report from three dissemination workshops 2 – 4 August 1999. [unpublished report]
- Mason T. and Lawrence A. (1999) Methodological guidelines for the planning, implementation and evaluation of participatory research projects. [unpublished report]

Contribution of Outputs

Although this research was initiated before the publication of the 1997 White Paper, which established poverty alleviation as the main development goal of DFID, the outputs contribute to this goal principally through enhancing the sustainability of rural livelihoods and therefore reducing resource degradation and emigration. The process developed ensures that farmers are involved from the start in the design and development of new technologies and practices. Because of this they are able to experiment with and develop practices which are most appropriate to their individual needs. This should ensure the enhancement of rural livelihoods and more sustainable management of natural resources. The process developed is not only suitable for soil and water management projects but can also be adapted to fit a whole range of natural resource management issues (see examples in Mason and Lawrence, 1999), and it is this aspect which has been most appealing to CIAT, and will have most contribution to institutional strengthening and the improved impact of research centres on problems of poor farmers. Successful dissemination will ensure that it can benefit many other projects attempting to develop appropriate NR management technologies and practices with farmers.

The identified promotion pathways to target institutions and beneficiaries.

Promotion pathways have been identified by working closely with a wide range of intermediate users throughout the project, and by building on CIAT's own 'technology transfer' model which relies on communicating with users through NGOs, other research organisations and municipal extension agents.

<u>Donor organisations</u>

DFID, GTZ, FAO: projects funded by these organisations have participated in our workshops in Bolivia.

<u>International research organisations</u>

Specific contacts have been maintained with the CGIAR centre CIAT, Colombia, through Jacqueline Ashby.

<u>National research centres</u>

By collaborating directly with CIAT this is where most impact has been made.

Government extension organisations

Bolivia has no national extension service, but since the planning of this project important changes have taken place in the policy and institutional framework for agricultural extension. Following the *Ley de Participación Popular* (1997) devolution of funds to municipalities is accompanied by the requirement for local government to provide extension support to the communities in the municipality. Each of the three municipalities now have extension officers, although the financial resources and commitment of each varies enormously between municipalities (HAMs). Our dissemination planning workshops showed a particularly high level of interest in the HAM Comarapa, where the municipality provided facilities for the workshop and about 10 employees participated along with the seven NGOs working in their area.

NGOs
National and international NGOs: FAN, CARE
Local NGOs: AGROPLAN, ICO, ATS
These NGOs were involved in the information exchange, planning and evaluation workshops which formed the backbone of the participatory research process.

Farmers and households / Farmer groups.
The process enhanced dissemination throughout the project, by facilitating research within the communities and by bringing villagers together to discuss and evaluate trials within their communities. Our emphasis on working alongside NGOs and municipal extension workers in the area means that more farmers will be reached in future.

What follow up action/research is necessary to promote the findings of the work to achieve their development benefit? This should include a list of publications, plans for further dissemination, as appropriate. For projects aimed at developing a device, material or process specify:

This work has highlighted some issues associated with participatory research and natural resource management, principally that the scientific focus can draw attention away from the social processes which contribute to, or solve, resource management problems. The collaboration with scientists certainly helped to introduce valuable new ideas into the communities, which were in used in several ways not foreseen by the scientists. However the focus on technologies for enhancing soil conservation on cropped land, missed the point that most outsiders attribute soil erosion in this area to overgrazing on the extensive ranges.

One of the greatest limitations to promoting the project findings is not lack of interest but lack of finance and time on the part of the relevant NGOs. For example, most NGOs already have specific agendas, often defined from outside, so even where they would like to adopt the methodology or technology for their communities, they find that they are unable to. Those NGOs who attended the dissemination workshops were all interested but expressed the same problems. This requires a more realistic understanding of the role that in-country institutions can be expected to play, i.e. how can we overcome the problem of breakdown in uptake pathways where interested institutions are unable to get involved. It must not be assumed that this is due to lack of interest and there appears to be a need to focus on the research development interface to ensure that good research outputs do not get wasted.

Furthermore, it is important to try to understand *which* farmers are participating and why; the difficulties in enthusing scientific researchers with evaluating uptake by non-experimenting farmers, has led to a clearer focus on this as an important M&E tool from the start, in a new project within NRSP Hillsides System, R7412. This was a principal focus of the internal project evaluation (CIAT / SRI / University of Reading / University of San Simón, 1999) but one which proves difficult to ascertain in a rapid way in the Bolivian context.
Comparisons with work in India, and the MSc thesis of Guillaume de Sauvert (supported by R6638 in the design of his methodology), suggest that most of the farmers participating in

the trials were wealthy according to a selection of wealth indicators such as number of cattle owned, extent of land holdings, and number of fruit trees. Therefore, to ensure that the development benefit is achieved by the poorer farmers we need to gain a better understanding of the livelihood variation across the watershed and to explore ways that successful research at plot level can be scaled up to a landscape level. This impression is reinforced by the conclusion of a discussion in the DFID Integrated soil fertility management workshop, Reading University, 17-18 September 1997: 'in recognising the spatial links of [hillsides production systems], there is a need to move the focus of hillside research form plot or farm scale towards a hillside or small catchment scale.'

In conclusion, while this project has developed important new processes for technology development in an area where participatory research was a new concept, it has perhaps made a greater contribution in highlighting the contradictions between research at the *individual* level, and the watershed approaches currently favoured for their ability to strengthen rural social capital at the same time as addressing poverty and natural resource degradation.

Publications

- **Lawrence A.** (1997) Contours, crops and cattle: participatory soil conservation in the Andean foothills, Bolivia. *Agroforestry Forum* 8 (4): 11-13.
- **Lawrence A.** (1999) Going with the flow or an uphill struggle? Directions for participatory research in hillside environments. *Mountain Research and Development* 19 (3): 203-212.
- **Lawrence A.** (in press) Creating new knowledge for soil and water conservation in Bolivia. In Jeffery R. (ed) *Co-operation and conflict in natural resource management: lessons from case studies*. Macmillan, London and St Martin's Press, New York.
- **Lawrence A., Haylor G., Barahona C. and Meusch E.** (in press) Adapting participatory methods to meet different stakeholder needs: farmers' experiments in Bolivia and Laos. In Estrella M., Blauert J. and Gaventa J. (eds) *Learning from Change: Issues and Challenges in Participatory Monitoring and Evaluation*. Intermediate Technology Publications, London.
- **Lawrence A., Barr J.J.F. and Haylor G.S.** (1999) Stakeholder approaches to planning participatory research. *ODI Agricultural Research and Extension Network Paper* no. 91.

Published informally:

- **Lawrence A., Haylor G., Barahona C. and Meusch E. (1997)** Participatory indicators for farming systems change: matrices for learning in farmer-managed trials in Bolivia and Laos. Paper presented at the International Workshop on Participatory Monitoring and Evaluation, IIRR, Philippines, 23-29 November 1997. *AERDD Working Paper* 97/8.
- **Lawrence A., Eid M. and Sandoval E. (1997)** Evolving local knowledge: soil and water management in the temperate valleys of Santa Cruz. *AERDD Working Paper* 97/9
- **Lawrence A. with Miguel Eid and Osvaldo Montenegro (1997)** Learning about participation: developing a process for soil and water conservation in Bolivia. *AERDD Working Paper* 97/10.
- **Lawrence A. (1998)** *Linking with local knowledge for soil and water conservation in Bolivia.* Paper presented at the Workshop on Participatory Natural Resource Management, Mansfield College, Oxford, April 6th-7th, 1997. AERDD Working Paper 98/4, University of Reading.

Internal / unpublished reports and working papers

- Montenegro O., Soruco O. and Lawrence A. (1998) *Memoria: seminario taller de análisis y planificación de evaluación participativa. 14 May 1998.* Proyecto Laderas, CIAT, Santa Cruz, Bolivia. [unpublished report].
- CIAT (1997) *Diagnóstico Participativo sobre Conservación de Suelos en Tres Comunidades de los Valles Cruceños* - CIAT / University of Reading [unpublished report]
- CIAT / SRI / University of Reading / University of San Simón (1999) Participatory technology assessment of hillsides soil and water conservation practices. [unpublished report].
- Mason T. and Lawrence A. (1999) Methodological guidelines for the planning, implementation and evaluation of participatory research projects. [unpublished report]
- Lawrence A. with Allkin B., Eid M., Ibisch P., Lima M., Magariños E., Mason T., Queiroz L,. Soliz B. and Vargas I. (1999) *Planning communication and dissemination: some new experiences from Bolivia.* Mimeo, 7 pp. [unpublished report]
- Taller de Evaluación y Planificación de Ensayos: Pozuelos. 28-29 August. Proyecto Laderas. [unpublished report]
- Taller de Evaluación y Planificación de Ensayos: Los Pinos. 31 August – 1 Sept 1998. Proyecto Laderas. [unpublished report]
- Taller de Evaluación y Planificación de Ensayos: Chacopata. 3-4 Oct1998. Proyecto Laderas. [unpublished report]
- Lawrence and Mason (1999) Participatory methodologies and live barriers: disseminating the outputs of Proyecto Laderas. Report from three dissemination workshops 2 – 4 August 1999. [unpublished report]
- Lawrence A, Eid M, Montenegro O and Sandoval E (1997) *Mejoramiento participativo de conservación de suelos y agua en los valles mesotérmicos, Santa Cruz*. Proceedings of the Hillsides Workshop, Universidad Mayor de San Simón, Cochabamba, Bolivia, 25-26 October 1996, pp 43-46. [unpublished report]
- Ellis-Jones J., Lawrence A., Céspedes E. and Eid M. (1997) *Farm household decision-making with regards to productivity, land degradation and land management.* Proceedings of the Hillsides Workshop, Cochabamba, Bolivia, October 1997. [unpublished report]

All these items can be obtained from the project leader, now at:
Centre for Natural Resources and Development
Green College, University of Oxford
Woodstock Road
Oxford OX2 6HG

The last two items can be obtained from Jim Ellis-Jones, Silsoe Research Institute.

Appendices

Project inventory

Item	Make & Model	Serial Number	Date of Purchase	Purchase Price	Location and/or User	Disposal To	Disposal Date	Disposal Authorised
Lap-top PC	RM SL8-75C 520 MB		2.9.96.	1539	AERDD	AERDD	31.12.99.	

Attached:

Please note that in order to spare the reviewer of this FTR, I have avoided attaching documents which essentially duplicate the content of the following. For example, AERDD Working Paper 97/8 was rewritten as Lawrence A., Haylor G., Barahona C. and Meusch E. (*in press*), and 98/4 was rewritten as Lawrence (*in press*). Perhaps of most interest to the reviewer will be items 4, 5, 6, 11, 12 and 13. In particular see items 12 and 13 for photographs illustrating the project process.

1. CIAT (1996) Diagnóstico de la comunidad de Pozuelos. October, 1996.
2. Lawrence A., Eid M. and Sandoval E. (1997) Evolving local knowledge: soil and water management in the temperate valleys of Santa Cruz. AERDD Working Paper 97/9
3. Lawrence A. with Miguel Eid and Osvaldo Montenegro (1997) Learning about participation: developing a process for soil and water conservation in Bolivia. AERDD Working Paper 97/10.
4. Lawrence A. (1997) Contours, crops and cattle: participatory soil conservation in the Andean foothills, Bolivia. *Agroforestry Forum* 8 (4): 11-13.
5. Lawrence A. (in press) Creating new knowledge for soil and water conservation in Bolivia. In Jeffery R. (ed) *Co-operation and conflict in natural resource management: lessons from case studies*. Macmillan, London and St Martin's Press, New York.
6. Lawrence A., Haylor G., Barahona C. and Meusch E. (in press) Adapting participatory methods to meet different stakeholder needs: farmers' experiments in Bolivia and Laos. In Estrella M., Blauert J. and Gaventa J. (eds) *Learning from Change: Issues and Challenges in Participatory Monitoring and Evaluation*. Intermediate Technology Publications, London.
7. CIAT / SRI / University of Reading / University of San Simón (1999) Participatory technology assessment of hillsides soil and water conservation practices.
8. Taller de Evaluación y Planificación de Ensayos: Pozuelos. 28-29 August. Proyecto Laderas. [unpublished report]
9. Taller de Evaluación y Planificación de Ensayos: Los Pinos. 31 August – 1 Sept 1998. Proyecto Laderas. [unpublished report]
10. Taller de Evaluación y Planificación de Ensayos: Chacopata. 3-4 Oct1998. Proyecto Laderas. [unpublished report]
11. Lawrence A. (1999) Going with the flow or an uphill struggle? Directions for participatory research in hillside environments. *Mountain Research and Development* 19 (3): 203-212.
12. Lawrence and Mason (1999) Participatory methodologies and live barriers: disseminating the outputs of Proyecto Laderas. Report from three dissemination workshops 2 – 4 August 1999. [unpublished report]
13. Mason T. and Lawrence A. (1999) Methodological guidelines for the planning, implementation and evaluation of participatory research projects. [unpublished report]