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FINAL TECHNICAL REPORT

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Community-led tools for enhancing production and resource conservation

Project Leader

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Organisation

School of Geography, University of Leeds

NRSP Production System

Hillsides

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R7584: Community-led tools for enhancing production and resource conservation

September 2003

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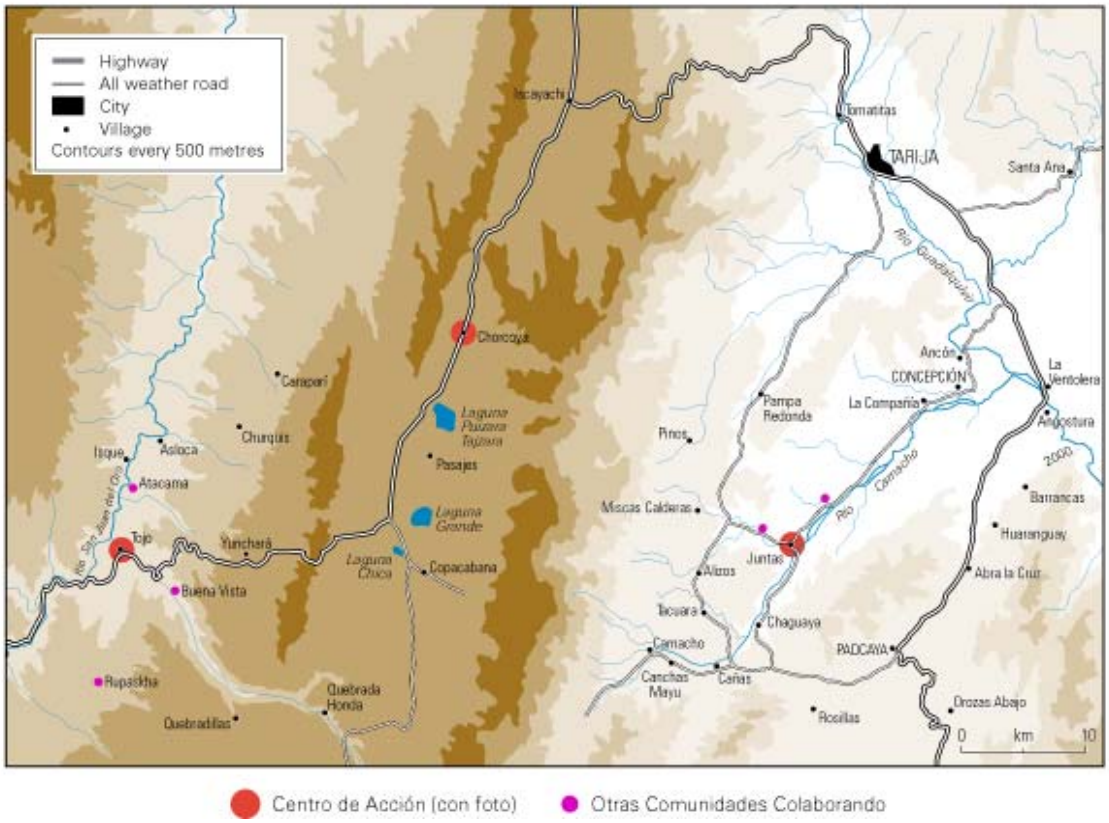
Map 1 Collaborating Communities



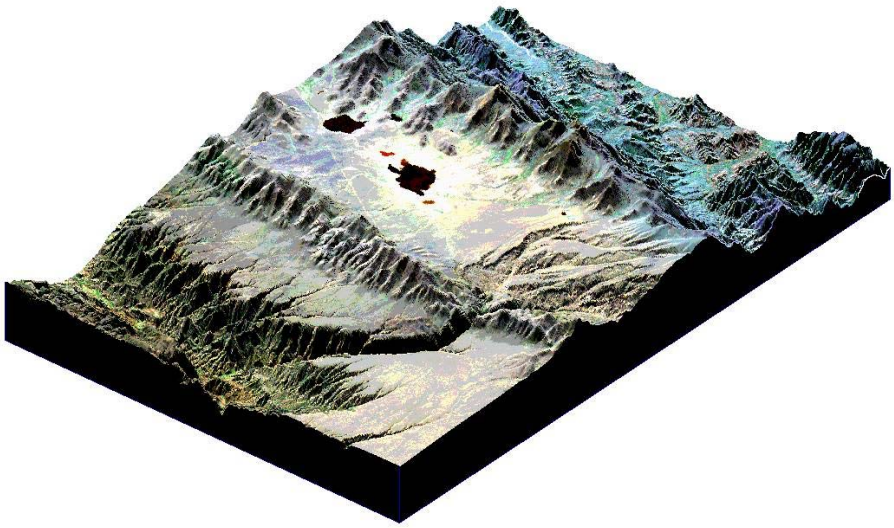


Figure 1 South-west Tarija, viewed from south-west: Río San Juan valley in foreground, Tarija valleys beyond the altiplano

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Abbreviations and Acronyms

ACLO	Acción Cultural Loyola	Jesuit NGO active in southern Bolivia
NGO	Non-government organisation	
GO	Government organiation	
PROMETA	Protección de Medio Ambiente en Tarija	Tarija environmental organisation
LP	Local professional	
NR	Natural resources	

1. Executive Summary

This research aimed to identify ways of helping farmers in poor, isolated mountain areas develop improved hillside farming strategies relevant to their needs. The first purpose was to develop means by which local professionals (LPs) can identify better ways of using natural resources (disease control, pasture improvement, new varieties of existing crops, etc) from which all farmers, but particularly the poor, can benefit to make their livelihood strategies more sustainable. A second purpose was to create among households and communities a greater awareness of the diverse ways in which they can modify their existing farming practices to enhance and stabilise productivity through better access to relevant knowledge.
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High-quality communication between communities and their households and local professionals was developed that facilitated community articulation of their natural resource priorities. This was achieved by their attendance at monthly community meetings, by working with small local groups, and by regular informal contacts. This more profound engagement by LPs with local people resulted in a better understanding by them of the context of local and household NR priorities, for instance, complex household livelihood strategies that incorporate regular migration to Argentina and the eastern lowlands of Bolivia. Evidence of this level of LP engagement is their willing co-operation in new actions during the life of the project in response to articulated community needs.

During the latter part of the project, our principal local NGO partner, PROMETA, came to recognise the value of community-led/initiated approach to NR problems. LPs helped train NGO staff in such methods but there is no evidence of a shift in NGO top-down strategic decision-making. Although, during the life of the project, the mayors of the two municipalities in which work was focussed came to accept and appreciate the success of the improved NR practices adopted in the communities, there has been no acceptance that similar strategies might be used by municipalities in order to promote sustainable NR use innovations in rural communities.

Community-wide engagement with the activities of the project was quickly achieved. Groups were formed in each part of the community and actions took place at that level. 70-90 per cent of households took part voluntarily in some improved methods of resource management. Adoption of other practices, trialled in all communities, is more difficult to assess since most activities were collective, either at a group or community level, and subsequent individual adoption was only beginning at project end when results of trials were apparent.

Members of those households with fewest resources were reached and helped through direct contact from the start. The most important insight gained from this aspect of the research is the multifaceted nature of disadvantage that is experienced by the poorest in each community. Work with such people should not therefore simply be focussed on a single action or even a category of ‘solutions’. Furthermore, for any work by local

professionals to be successful, it must have as a major priority establishing a sympathetic relationship with such people on a personal basis. Two small projects directed at such households were started and one already shows some evidence of success.

This research has shown ways of satisfying the purpose of the NRSP by offering poor people better access to knowledge of the natural resources through quality contact with committed local professionals. The application of such knowledge may be sustainable because it involves mostly low-cost inputs and its local relevance has been tested by farmers over at least two crop years. The degree of sustainability of the production increases can only be assessed over a longer period.

2. Background

The development of alternative ways of improving natural resource use by farmers in mountainous areas needs to be based on an awareness of farmer needs by local professionals and also community awareness of where and how they can obtain advice and support. Projects that are offered to rural communities usually reflect the priorities of the donor agencies, whether they are regional, national or international organizations: they rarely have the flexibility in aims and objectives that allow the staff to listen to what farmers and communities say they want and tailor what they offer to respond to local priorities. Research is therefore needed to identify how local professionals – agronomists, veterinarians, horticulturalists etc. – can best listen acutely to individual and community articulation of their needs to improve natural resource use and work effectively with farmers to help them develop appropriate and sustainable natural resource use strategies. Research is also needed to identify the most effective ways in which communities can communicate their needs and discuss means of satisfying them to a range of possible sources of help from local and regional government, donor agencies and local, national and international NGOs.

Households with fewest resources are often not represented at community meetings or their members attending are silent or else largely ignored. Community priorities discussed at open meetings and even in carefully participative workshops hear little of the needs of the poor since they are absent or waiting outside the meeting to sell soft drinks and snacks when participants emerge. It was therefore necessary to discover ways in which their particular needs could be communicated to local professionals and how they could be in some way satisfied in the context of work which also took account of the needs of those with access to more resources.

Numerous development projects have been implemented, particularly in the Tarija valleys and on the altiplano – few have had a lasting impact. This mirrors the conclusion of a major review of rural development projects in nearby Chuquisaca and Potosí by a Dutch and Bolivian research team which concluded that for the poor farmers ‘development projects are just a minor detail in their environment without having any impact on their livelihood strategies’ (Zoomers, 1998, 494). The only projects in Tarija that focus specifically on poor people have targeted specific groups of the urban poor such as street children. No projects in SW Tarija during the past decade have specifically focussed their work at the poorest groups within communities.

Previous social and natural science research since 1992, some of which is reported in Beck et al 2001, was based of interviews with men and women in over a dozen communities in different ecological areas in SW Tarija, Bolivia. It identified issues of major concern with regard to natural resources that were likely to be expressed in rural areas in many parts of southern highland Bolivia. There was widespread and intense concern at the increased incidence of diseases affecting cattle, sheep, field crops, tree crops and as well as a valued colonising tree species [*Acacia caven*] (Preston 1997, Fairbairn 1999).

At community meetings, particularly in the Altiplano, means of conserving pasture were discussed but few remedial strategies had been identified. There was also concern to identify optimal farming practices in the highest altitude cultivated areas. In the valleys, fruit trees [peaches and quinces] and grape vines are widely cultivated but little attention has been given to maintaining production through re-planting, pruning and disease control. There is anecdotal evidence that the incidence of many plant diseases has increased during recent decades.

Ample broadly-relevant knowledge exists in Bolivia of ways in which rural households can safeguard production against natural hazards including climatic hazards, disease as well as experiment with new farming practices to establish their local value. What is not clearly understood or tested is how local professionals can become aware of farmer priorities or how communities can obtain help and advice that can lead to better and sustainable farming strategies. These are the main research objectives.

3. Purpose

The first purpose of this research was to develop means by which local professionals can more effectively identify, at a local level, a range of better ways of using natural resources (such as disease control, pasture improvement, new varieties of existing crops, etc) from which all farmers but particularly those with fewest resources can benefit in order to make their livelihood strategies more sustainable. If local professionals can identify such strategies, hillside farming will be able to make a more secure contribution to livelihoods in mountain areas.

A second purpose is to create a greater awareness among households and communities of the diverse ways in which they can modify their existing farming practices to enhance and stabilise productivity through better access to relevant knowledge. This involves being able to better withstand climatic hazards (principally hail and frost) as well as reduce losses through disease control. In addition it means building a knowledge system that enables them to call on local professionals when needed and use other farmers with specialist knowledge. This implies that communities should have the means to seek advice from professionals through existing or new institutional links.

4. Outputs

4.1 Community articulation of priorities with respect to natural resource use was developed by means of initial participative workshops, discussion as a part of the monthly community meetings, actions by groups within each community formed by households and regular informal contact by individuals and groups with LPs. Once communities learnt that requests for information and training sessions received a positive response from LPs, regular requests were made by community leaders. This established a dialogue within the community and also offered space for LPs to suggest topics that might be discussed in the context of a workshop or a video presentation. Requests were also made (and satisfied) for workshops on

topics important to the community but not directly related to natural resource use – such as the provisions of the new agrarian reform law and how these might affect them. As a consequence of these actions, there was the gradual development of ease of communication about a wide range of local and personal problems within the context of which it was possible to better situate natural resource use issues. The strategy of encouraging each community to form locality groups that co-operated in specific actions further encouraged debate by smaller groups outside the context of community meetings. Such groups reported back to community meetings. Actions by LPs to talk informally with members of households with fewest resources also allowed them to express their particular concerns more freely.

Evidence of community articulation of natural resource and other farming priorities is contained in the database for each community, recording visits and activities engaged in by LPs in each community. Most visits coincided with a community meeting or a workshop organised by LPs in which debate on NR issues was stimulated. At any community meeting attended by LPs they were asked to comment on work in progress and community members were invited to comment on project activities. More objective evidence, such as notes of matters discussed at meetings in the absence of LPs, is not available. The particular concerns of the LPs employed determined a part of the agenda for debate but the continuity of dialogue did enable community priorities to be well addressed.

Municipalities did not allow space for communication of issues related to natural resources in the Annual Operative Plans. This was because mayors gave highest priorities to infrastructural actions that were quickly completed and highly visible in order to obtain political benefit. One of the two municipalities in whose area the research was carried out employed an extension officer and LPs were asked to accompany her on two visits to rural communities in order to demonstrate our methods and the resulting community relationship. This did not extend to allowing discussion of how communities might contribute to the formulation of annual operational plans. Further issues relating to municipal involvement are discussed later.

The sustainability of community debate and action related to NR issues can only be measured after the completion of the project. Some debate has always taken place and, for example in the January 2003 meeting of the altiplano community, Chorcoya, the head of the peasant union initiated a debate about livestock numbers and overgrazing. Following the workshops and discussions initiated by LPs, people are better informed about a range of issues. It is likely that NR issues will continue to be debated, particularly in relation to those actions that were seen as successful – treatments for disease control among livestock and fruit trees, good yields from new varieties of maize and beans (in the altiplano) – but this can only be judged after a period without visits from project staff. This would enable some objective assessment of the extent to which communities and their members felt better empowered as a result of the knowledge that they had acquired.

This research demonstrated convincingly that communities can and do engage in debate about NR issues and can articulate their priorities if given the necessary space by local professionals. It is less certain that they have gained the confidence to seek advice and to take the initiative to press for NGOs and GOs to respond to their demands.

4.2 LP engagement with local and household NR issues during the course of the research is demonstrated by the incorporation of new activities during the period of collaboration with each of the initial three communities. In Juntas the introduction of a new breed of goats for milk was started following discussions with a group of farmers; in Chorcoya initial trials of beans and alfalfa were not successful and further successful trials of a range of bean varieties enabled the identification of both planting density and variety most suited to the locality. Appropriate varieties of frost-resistant potatoes were similarly identified. Vegetables were introduced into several communities in co-operation with schoolteachers to help vary diet and test which of the varieties were most suitable to the each locality. Flood protection was stressed as important by people in the riverside communities and LPs responded constructively by establishing nurseries for raising trees that could be transplanted to riverside locations to be part of river defences. Evidence of these actions is contained in LP monthly reports verified by observation and consultation during the PI's visits to communities.

Increasing engagement of LPs in community NR issues was effected by emphasising to them the need for evolutionary practice, to expect that activities each year would develop in response to community and LP initiated discussion. This underlines the importance in a component of rural development worker training that emphasises the need for flexibility as well as an ability to encourage and learn from community and small group debate and respect for farmers' opinions and knowledge.

One component of the early stages of the research that was unsuccessful was the collection of information from older people regarding traditional knowledge of climate forecasting. This was expanded by the LPs to include knowledge about useful plants and traditional medicines for people and livestock. Schoolchildren were used to record what their parents and grandparents recalled but it appeared that traditional knowledge was now largely forgotten. People knew that their grandparents, or some old folk in the past, had such knowledge and used it but there was little relevant knowledge and understanding that could be rescued.

LPs were enabled to have a more profound understanding of community NR priorities in the context of complex household livelihood strategies that incorporate regular migration to Argentina and the eastern lowlands of Bolivia. The younger veterinarians, however, showed a strong preference for issues that they had been taught were of universal importance – internal and external parasite control, consanguinity and foot-and-mouth disease prevention. Diseases of local importance, such as *rupa rupa*

(spontaneous abortion possibly caused by eating insect larvae), are not fully scientifically understood and LPs found on-site research into such a disease difficult to get going.

We concluded therefore that developing sensitivity to local needs and priorities through regular visits to communities is not difficult although, inevitably, each professional comes with his or her personal concerns and a strictly bounded corpus of knowledge. A wide range of previous experience may help a professional to be able to respond to local concerns on the basis of past experience. For younger professionals it is necessary that they learn to encourage community experimentation in order for farmers themselves to identify the best solutions.

Reporting community NR priorities to municipalities in order for them to draw up their annual plans with these is mind did not take place because of the lack of receptivity of municipalities to this sort of information.

4.3 LP advice to help communities tackle their NR problems is now better grounded and more sensitive to community needs and preoccupations. This has been achieved by regular meetings with communities over a three year period and the recognition by LPs that the major issues in each community were not pre-determined. This sensitivity was extended and tested at a wider geographical scale through regular meetings and workshops at a community level and in the city of Tarija as well as at a series of meetings organised bringing together people from the three main communities with which work was concentrated. Discussion between members of the communities enabled them to understand their common and distinct problems faced and this reinforced LPs' understanding of local perceptions of NR problems. At meetings in the city of Tarija with representatives from NGOs and some regional government agencies LPs explained and justified the methods being used and reported on the adoption of changed practices in the communities in relation to more top-down methods used by other groups working in Tarija. This established a context in which other agencies could consider the achievements of their own staff.

Evidence of the quality of advice and facilitation of community debate rests largely on individual and community reaction to collaborative work reported orally during visits and, to a limited extent, reported in monthly reports on field work filed by the two lead LPs through the project duration.

While the community-wide actions improving management of fruit trees and disease control left limited scope for community members to chose whether to participate (much effective disease control demands community-wide action), two experimentation strategies did allow community members to chose whether to participate. In the altiplano community, one household (or 2-3 households working collectively) from each of the groups formed within the community, experimented with reclaiming prehistoric terraces or planting short-cycle potatoes and fava beans. By 2003 cultivation practices had been refined and harvests were

sufficiently good that other households wanted to make their own experiments using seed produced locally.

In the valley communities comparable collaborative experiments were in community nurseries where trees for fruit (peaches), fuel (eucalyptus) and as forage (*chacatea*) had been planted. In the altiplano slow-growing native species (Queñua and Kishuara) had been planted that can be used for shelter and for fuel. In each of these nurseries, any community member can transplant trees to their own land for their own exclusive use. At project end saplings were only just reaching an appropriate size for transplanting and no data were available to show the exact scale of uptake.

Local professionals produced a range of leaflets explaining the main features and treatment procedures for the major plant and livestock disease as well as a background leaflet on soil conservation. Single page leaflets were distributed for individual households on fruit tree pruning and the recognition and control of the three main peach tree pests. A complete list of publications follows this report (Section 8). Institutional reports were available in the project office in PROMETA, manuals and extension papers or leaflets were given to communities and either distributed (leaflets) or stored in the school or another central location where they could be consulted. Some institutional reports were distributed to Tarija NGOs and GOs on request.

A distinctive feature of the work was its focus on broadly-defined natural resource problems seen in the context of diversified livelihood strategies and a specific concern with households with few resources. This contrasts with the majority of development actions which focus on a particular area of work – small-scale irrigation or improving production of basic grains – which limits professionals' freedom to respond to other local concerns.

A further distinctive feature of the work of one of the LPs was the emphasis on the use of cheap treatments for plant disease – sometimes making up the treatment mixture from simple ingredients on the spot prior to its application. This makes the continuation of the treatment less dependent of the use of expensive and toxic preparations purchased in the city and thus more likely to be sustained in the longer term.

While advice is better-grounded, it is still worthy of note that some local concerns cannot effectively be responded to without further detailed research. Haematuria is a common and eventually fatal disease affecting cattle in the valleys that have grazed on the better-watered slopes of hills to the east of the central valleys of Tarija. Its cause is uncertain and no treatment appears effective. Rupa rupa (already mentioned) likewise cannot be treated without better knowledge of the nature of the disease.

The implications of these conclusions for training of staff and for the design of development projects in general are evident. Maximum community receptivity to new strategies can be achieved by continuous community

consultation and discussion so that ownership of resultant strategies is shared as much as possible. Furthermore the use, where possible, of simple treatments – even if they may be less effective – may lead to actions being more sustainable in the longer term. Finally, work in parallel with some scientific research might be mutually beneficial by ensuring more effective diagnosis of some problems that are still incompletely understood.

4.4 NGOs and municipalities have recognised the value of community-led changes in natural resource management insofar as they have noted the relative success of our LPs' work as reported to them by community representatives. This project was actually recommended for a municipal award for its success with communities in Yunchará municipality[1]. Our principal local NGO partner - PROMETA - and to a lesser extent our other NGO partner ACLO, came to recognise the value of community-led/initiated approach to NR problems. This was the result of gradual realisation of the high quality of collaboration that had been established with communities. Action on the basis of such recognition is not easy to demonstrate. One result has been that our senior LP was regularly consulted on the development of PROMETA's future strategies and was asked to run training workshops for PROMETA staff. The PROMETA Director publicly recognised the high quality of the work – particularly in relation to low cost - in a final meeting to mark the conclusion of this project. This was spontaneously repeated at a subsequent meeting in August 2003 with the British Ambassador. In particular, the level of adoption and success of new practices in the communities with which we have worked, and the comparatively low budget on which this has been achieved is frequently the subject of comment at formal and informal meetings with staff of other NGO and one national project working in Tarija.

There is no evidence that this has led to the incorporation of community-led initiatives in their own work. This may be the result of methods as well as objectives being pre-determined by donors.

Radio broadcasts were made, using our link with Radio Tarija-ACLO in order to communicate to a broad audience the nature of the work being undertaken. ACLO did not investigate in any formal way audience response to their programmes in general or the programmes prepared by our LPs. A short survey of six of the communities in which work was carried out was commissioned which showed that 68 per cent of those sampled listened to the programmes prepared by LPs (Montaño M 2002). The frequency with which LPs worked with the radio station to produce programmes reporting on work with communities decreased during the period of work. Not enough time was spent in planning ways in which programmes might be developed that would demonstrate to the rural audience the potential of community-led changes in NR management. The programmes led to representatives from a number of communities (six

[1] After enquiry the Mayor found an administrative reason for not agreeing to the nomination.

during 2002) visiting the project office to ask for leaflets, advice or whether LPs could visit them. A much stronger emphasis on the importance of the radio broadcasts and encouragement for other communities to report their initiatives, both successes and failures, and the creation of a system of regional-based consultations with infrequent visits might have created awareness over a wider geographical area of the potential for community-initiated action.

During the life of the project, the mayors of the two municipalities in which work was focussed came to accept and appreciate the success of the improved NR practices adopted in the communities. However, there has been no acceptance that similar strategies might be used by municipalities to stimulate production and security in all their rural communities. This seems to be because mayors are political appointments and believe that they depend for re-election on having visible symbols of their actions – a paved road, a new irrigation channel, new schools or meeting halls – rather than on relatively intangible or invisible increases in production (Hinojosa 2003).

As a consequence of the failure of municipalities to recognise how community-led initiatives might strengthen their Annual Operational Plan other organisations were considered which might recognise the value of using community initiatives. An important rural institution since the period of the 1952 Revolution has been the peasant union (*sindicato*). Peasant unions were initially instrumental in stimulating the land reform process. In many communities they remain the principal organisation which articulate community needs. At a regional level, unions are organised through *sub-centrales* where representatives of 12-25 communities meet every 1-3 months to discuss matters of common concern. Officers of the sub-central report to the department *Central Campesina*. In one of the areas in which we worked, the Sub-Central was asked by LPs to discuss whether it could act as a stimulant of community NR development actions. After agreeing to consult with each of the constituent communities about possible action, no feed-back was received. The principal reason for this inability to respond constructively is that peasant unions are not accustomed to being offered the opportunity to stimulate development actions at a community level. Their organisational structure is predominantly unidirectional and vertical (top→down) with actions customarily being initiated at a national or departmental level. Potential exists for the use of *sindicatos* to promote responses to community needs in this way, although the organisation is more highly politicised at a department level.

4.5 Community-wide engagement with the activities of the project was quickly achieved. This process was promoted through engagement with the whole community by the use of the monthly community general meeting as a forum for identifying priorities and setting up workshops for discussing work plans and training. In the initial three communities, it was decided that, to maximise involvement of households throughout the community, local groups would be formed in the community, covering each part of it and many actions would take place at that level. The importance

of widespread community action, rather than concentrating on a small group of households that could serve as centres from which more widespread diffusion of new practices, was proposed by LPs. This was a result of the need for community-wide action for the effective treatment of easily transmissible diseases such as those spread by intestinal parasites and insect- and fungi-borne fruit disease.

The extent to which actions affected the majority of households is illustrated for the principal veterinary action in Table 1. Most of the de-worming was carried out by farmers, both men and women, following initial training and assistance from the project veterinarian. The results of the de-worming were discussed at community meetings and it was clear that most farmers had participated and were generally satisfied with the results. Reported total annual livestock mortality rates seemed to have fallen to one quarter of what they were before adoption of de-worming (see Section 8.2, Scientific Annexe).

Table 1
Community engagement with new activities:
proportion of livestock de-wormed 2003

Community	*cattle*	*% de-wormed*	*sheep*	*% de-wormed*	*goats*	*% de-wormed*
Juntas	458	79	40	88	559	77
Tojo	6	100	616	94	152	100
Chorcoya	293	100	14991	51		
Atacama	59	93	74	59	202	89
Tacuarita	603	84	570	71	499	72
Rupaska			1962	70	633	56
Ñoquera	135	96				

Data provided from reports to veterinarian at community and group meetings. The low proportion of sheep de-wormed in Chorcoya is partly explained by some with large flocks preferring sheep dip to injected de-wormer.

Some other actions, such as experimentation with new crop varieties took place at community group level while others, such as nurseries for fruit trees, grape vines and trees for shelter and river flood defences, were organised centrally in each community. The extent to which adoption of the new practices was spontaneous is difficult to assess. Decisions on courses of action were taken collectively in community (and sometimes group) meetings. Adoption also depended on the availability of labour to undertake necessary actions that was a function of who in the household was absent working elsewhere (in Argentina, eastern Bolivia or the cities). Enthusiasm to be part of the collective action was regularly shown and LPs were asked for advice by returning migrants eager to catch up on action that had not occurred in their absence. Efficacy of action is as important as the action itself in relation to the likelihood of actions being sustained. Thus, the moment of fruit trees being sprayed (when disease organisms are appearing) is as important as the action of spraying. Data on improvement of yields of fruit, and of decrease in reported mortality of livestock are a more reliable measure of the extent of measures having being adopted efficaciously.

Adoption of other practices trialled by some groups by the rest of the community is more difficult to assess since most activities were collective, either at a group or community level, and subsequent individual adoption was only beginning at project end when results of trials were apparent.

Seasonal fairs are held in different parts of SW Tarija, including in each of the initial communities. These serve as occasions for inter-regional exchange and – to a lesser extent - sale of produce and for social and cultural events. The work of the project was advertised at three such fairs each year, with people from participating communities displaying their produce and talking about the new practices to interested visitors – usually from other communities in the area and thus emphasising their ownership of the new practices.

Incorporation of people from other, usually nearby, communities into existing workshops and meetings proved straightforward. Community leaders from an interested community would come to a community meeting and ask if they could join the workshop and discussion meeting, to learn more of the work in progress. Other requests were received from more distant communities as a result of the broadcasts on Radio Tarija – the station with the largest rural audience in southern Tarija. This resulted in formal requests for the work to be extended to further communities. In Table 2 the communities with which collaboration was established are listed.

Table 2
Collaborating communities

Community	*Collaboration started*	*Year-round access*	*Time on foot to road*	*Driving time From Tarija*
Juntas	3/00	✓		55 mins.
Armaos	7/02	✓		45 mins.
Tacuarita	1/02	usually	1 hr.	75 mins.
Chorcoya	3/00	✓		2 hrs.
Ñoquera	4/02	usually	2 hrs.	3 hrs.
Tojo	3/00	✓		3 hrs.
Atacama	7/00	✓		3½ hrs.
Buenavista	8/00	Dry season	1 hr.	3½ hrs.
Rupaska	11/01	Dry season	3 hrs.	4½ hrs.

Although Juntas, Chorcoya and Tojo are on good, all-weather roads, some of the other communities are more isolated and have rarely worked with local professionals. It may be concluded that both a community-wide focus and a separation of the community into locality groups are effective for ensuring widespread adoption and knowledge of and debate about possible new natural resource use strategies. The use of radio for announcing meetings with communities with which links were well-established also allowed neighbouring communities to know when and where such meetings were taking place. Contact could be made with LP

staff and knowledge acquired of the consequences of actions from initial communities.

4.6 Engagement with households with few resources in each community was made from the outset and good personal relations were established, even facilitating the PI joining discussions with them with ease. This enabled a better understanding of the underlying causes of the frailty of their livelihood strategies. Some attempts to strengthen them were made and important impediments to their better incorporation into their community were identified. People and households with fewest resources were visited during the early phase of work with the three initial communities. They were identified by community leaders and verified by conversation with other community members. They were visited on an individual basis and encouraged to take part in workshops and collective actions. A consultant psychiatrist was commissioned to report, on the basis of eight visits to one community near Tarija, how those with fewest resources saw themselves and the impediments to their progress (Romero 2002). It was concluded that it was not sufficient to label the poor as those with access to fewest resources. Low self-esteem was evident which makes the effort to improve ones situation very difficult. A young man from a poor household described it as 'not daring to dream'. Furthermore the poor comprise a group of people and households looked down upon by the better-off and they were marginalised within the community. In order to try to help households in such situations it was rapidly concluded that simple technical solutions did not exist. A broadly-based method of engagement was planned.

The strategy employed by LPs was to develop as close a relationship as possible, through regular informal visits with five households in each of the initial three communities. Their particular needs were elicited through repeated informal conversations. Many had limited access to basic resources, such as land and water as well as employment. However quality of housing and furnishings and absence of symbols of status, such as acceptable clothes, were also of equal importance, especially to younger people in such households.

Local professionals were able to help such individuals and households in various ways, to offer comfort and advice, to encourage some members of the household to attend workshops to learn skills (administering injections to livestock, pruning fruit trees, etc.) which might allow opportunities for earning, participation in small projects using existing and new skills (tending penned poultry for their eggs, or raising a new variety of goat for milk that can be used in various ways) and encouraging the community as a whole to debate the issues surrounding the persistence of poverty and seek ways in which such households might be helped, for instance by releasing unproductive and uncultivated land. We were successful in one community – Tojo – in helping a group of 12 women, some of whom were among the poorest in the community, to improve their level of living by offering them laying hens that have subsequently produced eggs that are consumed by their family, sold or exchanged in the community and, in a

few cases sold at a nearby urban centre. The group plans to include other households into the group and there is some possibility that the activity will be sustained.

Where such households are also handicapped by alcoholism and domestic violence, as in several cases, direct help is more difficult. The presentation of the report on the consultant's work at a community meeting was used as a strategy to encourage community members present (which included all the better-off and those most engaged in leadership) to consider how such households and individuals could be helped. It provoked a lively discussion but the debate was not sustained in subsequent meetings. While specific actions may be directed at particularly needy households, concerted actions to aid the poorest demand long-term work with the community to encourage collective consciousness-raising that might lead to the marginalisation of the poor being reduced. Any work involving collaboration with households to help them make better use of natural resources should recognise the importance of such concerns and the need for LPs to encourage support from the community as a whole.

Work of LPs with households with fewest resources was reported in monthly reports and one person was given responsibility for maintaining and recording talks with such people. The results of work with poor households cannot adequately be quantitatively assessed except in the medium term. Two specific sub-projects that included poor households – the introduction of goats and laying hens – have only recently started, although data for the disposal of eggs for the former project do indicate a substantial number of eggs produced, consumed by the household and sold either locally or in the nearest town. More objective assessment of the results of the work can be made after a further period but, in particular after withdrawal of the LPs.

The most important insight gained from this aspect of the research is the multifaceted nature of disadvantage that is experienced by the poorest in each community[2]. It carries with it the lesson that work with such people should not be simply focussed on a single action or even a category of 'solutions'. Furthermore, for any work by local professionals to be successful, it must have as a major priority establishing a sympathetic relationship with such people on a personal basis. This means being willing to listen to and discuss a range of issues that go far beyond any one person's professional competence. This further suggests that LPs working in rural areas should be able to call on support from other professionals in the city whose work rarely takes them to visit rural communities. Although there is a growing awareness in Bolivia that alcoholism and domestic violence (usually directed at women) should not be accepted as an unfortunate but inevitable part of some people's lives, there are no sources of help and advice in rural areas. Local professionals working in rural areas may achieve much greater respect and be listened

[2] This mirrors a major conclusion of Chambers (1997) reviewed in Preston (2003)

to with more attention if they also show themselves aware of the importance of a wide range of personal problems faced by those with whom they work. Just as medical training now often prepares medical staff to be aware of a wide range of social, cultural and economic problems the knowledge of whose importance creates a meaningful context in which specific 'medical' issues may better be understood, so training for agricultural extension staff should emphasise the importance of understanding all factors that impinge on an individual or household's attitude to farming and natural resource use.

4.7 To take the results of this research forward it is important to monitor the extent to which the changes in NR practices are sustained over at least a five year period. This would enable examination of the variables that might explain why some practices are sustained and others not and only some communities manage to sustain innovations. The sustainability of actions develop during a short (3-year) project cannot otherwise be reliably assessed.

The ways in which meso-level actors can be encouraged to support and develop ways of increasing farm production through better use of natural resources must be further explored. Our experience suggests that the adoption and diffusion of new practices is not difficult. Creating links between LPs and communities at a municipal level is possible but for such links to outlast the change in staff that accompanies each newly-elected mayor involves major changes in the politicisation of local-level government.

5. Research Activities

5.1 Communities hold monthly meetings to discuss a range of matters of common concern. Project staff attended most such meetings in order to report on project work, arrange workshops and to enable those who attended meetings to comment and ask questions on the work. Attendance at such meetings also allowed the recording of community debate on any matters relating to NR issues. Project staff were frequently consulted about a range of matters and, for example, they were also asked to organize workshops to instruct the community on the implications of the new agrarian reform legislation and best practice of peasant union organization.

Reports were prepared of all meetings. These formed a database of matters discussed at community meetings over a three year period. Data related to crop farming and livestock issues are the most complete.

The three initial communities were sufficiently large that locality-based groups were formed in each to organize and monitor project work. The locality-based groups nominated a co-coordinator with whom the project LPs liaised and who reported progress and problems to the general community meeting. At this level of work it was possible to try to ensure that households with few

resources were incorporated into project actions and to understand how land belong to absent migrants was managed.

5.2 Following initial participatory workshops, the main concerns and priorities of community members attending meetings were recorded and action plans for work that LPs could undertake were proposed and discussed in community meetings. Further actions were proposed by LPs or community members at later stages were discussed in community meetings.

Botanists from the Instituto de Ecología of the Universidad Mayor de San Andres in La Paz, with whom we had previously worked in this part of Tarija were contracted to prepare a summary report on grazing potential and problems and possible alternative strategies for human use in the two valley areas of Juntas and Tojo (Paniagua and Yevara 2000). Fairbairn and Morales carried out field work with farmers and graziers in the altiplano community of Chorcoya to map soils, particularly in areas where cultivation is or has been practised, using both technical analysis and farmer perception in order to identify areas where cultivation might best be developed (Fairbairn and Morales, 2001)..

During the initial meetings with communities, it was proposed that representatives from neighbouring communities might attend workshops and other project activities and all communities welcomed this way of informing other nearby communities of actions associated with the project. In the Tarija and Río San Juan valley communities, several people from nearby communities regularly attended meetings and this subsequently resulted in requests from their communities for work with them. This happened on a lesser scale in Chorcoya, the altiplano community. Nearby communities in the highlands did learn of LPs work by word of mouth and via Radio Tarija and further requests for their communities to be included in the work were received but they did not regularly attend meetings in Chorcoya.

5.3 UNITAR, the umbrella organisation of Tarija NGOs, was chaired by our partner ACLO Radio Tarija. On our initiative, three meetings of regional NGOs and some GOs were held. Current work programmes of those attending were discussed and we prepared and circulated a Directory of NGOs to facilitate exchange of information. Horizontal links between NGOs are viewed as being of less importance than vertical links with national and international partners since it is mainly through such links that funding is organised. Although our LP achievements were known in the NGO community, it was only our partner NGO - PROMETA - that acted to seek further advice and collaboration.

During the first year of project work, particular attention was paid to reporting the initial actions in the first communities in weekly short (5-10) minute broadcasts on Radio Tarija. This ensured that listeners in rural communities throughout the Department of Tarija – as well as in NW Argentina – were aware of the work being started. This generated communication from some nearby communities and letters and visits from five other communities during 2002. During the latter part of the project, recordings for broadcasts were

made about every two months and included more input from community members, including accounts of inter-community meetings.

Audience response to broadcasts has only recently been evaluated by Radio Tarija and, in advance of their analysis (still not completed) we organised a sample of ten people in six communities to judge listener response to our broadcasts (Montaño M 2002)

5.4 Meetings and other contacts with staff from the two municipalities in which communities were located – Concepción (also known as Uriondo) and Yunchará – took place during regional and local fairs. Contacts with Mayors were unproductive, largely because they saw little pecuniary profit in being associated with such a low budget project. Meetings of the peasant union sub-central including communities in the valley of the Río San Juan were attended in order to encourage discussion about the union organisation taking responsibility for stimulating more communities to explore more productive NR practices but with little effect.

5.5 Work to ensure the adoption and recognition of the benefits of different NR use strategies for those households with fewest resources started at the beginning of the project work. A team member recorded names of such households from community leaders, verified their data with other community members and systematically visited such households in order to discuss their view of their needs with respect to natural resources. They had fewest livestock and little or no land, invariably without irrigation water. This work was reported in Morales 2001. A psychiatrist was contracted to report on attitudes to poverty and the process of social exclusion in one community (Romero 2002).

In order to monitor livestock numbers and treatments, a livestock database was constructed for each initial community, as well as others as work progressed. In this database all livestock owners were listed, the numbers of different categories of animals held and their report on numbers treated as part of the collaborative de-worming programme. This also permitted monitoring of the relative uptake of new practices by those with fewest livestock. In communities for which data were already held from previous research (Juntas in particular) it was also possible to verify households listed and their livestock numbers. This database was revised annually.

At the beginning of the project links were established with SENAMHI (national meteorological office) and a separate project (SINSAAT) within the Ministry of Agriculture whose aims were to establish an early warning system for climate forecasting. They made slow progress and seemed to prefer to focus on systems that could help commercial fruit farmers in the Tarija valleys. We established simple meteorological stations in the schools in each of the three initial communities and teachers or assistants collected temperature and rainfall data. In addition LPs collected local knowledge about climatic hazards – floods, hail and frosts in particular – from schoolchildren who in turn obtained such information from their parents or grandparents. These data were reported in a paper prepared by Cristina Morales (2001). Data collection

proved difficult, since teachers were regularly absent. Most importantly, an analysis of long-term climate data by Preston suggested that ENSO phenomena in SW Tarija were not good predictors of wet season precipitation (Preston 2001). Folk knowledge of climate prediction appeared minimal. This part of the research was therefore abandoned.

During the activity previously mentioned, schoolchildren were also asked to collect information about the use of native plants for treating disease. In association with this a local homeopathic practitioner visited two of the communities to talk with people about his knowledge of the medicinal uses of local plants. We concluded that local knowledge was scanty and the feeling of community members was that such knowledge was widely used a generation ago but that few people now had or used such knowledge.

During the latter part of the second year of work, following the MTR, community evaluations of ongoing work were recorded. This took place in the context of monthly community meetings, irregular meetings with the working groups established within most communities and in the course of visits by the project director in supplementary informal interviews. Some of these are recorded in monthly reports, others in field notes.

It was agreed in community meetings that a meeting of people from each of the communities was desirable and each community wished to host one such meeting. These meetings, the travel costs of which were borne by the project, involved a total of 40-60 people and included semi-formal exchange of produce, similar to that in the seasonal fairs. Valley people brought fruit, wine, brandy, and maize to exchange with sheep or wool from the altiplano people. The two valley communities exchanged whatever was most available that the other valley community lacked. Tojo brought fruit that was exchanged for maize or other crops. In addition a range of social activities took place. Such meetings proved extremely popular, in large measure because of the opportunity for exchange of produce, complementing attendance at seasonal fairs where such exchange is a very important means of obtaining domestic necessities.

At the final inter-community meeting to mark then end of the project, 3-4 representatives from each of the communities held an informal round-table discussion, structured by LPs, discussing current issues of concern in each community. In a final discussion many of those present commented forcefully that it was the meeting to talk about each other's community problems that was the most valuable element of the day's programme.

6. Environment assessment

The improvement of the levels of production from fruit trees may result in better foliage and therefore ground cover and reduced runoff. In one of the communities, trees to be planted to aid flood defences are approaching a stage of development for transplanting to improve river bank stabilisation. In Chorcoya, native tree species have been planted in the area of reclaimed prehistoric terraces and other community groups are planning similar small-

scale planting of trees in the altiplano. A debate on livestock numbers in Chorcoya has been started in community meetings that may lead some households to experiment with smaller flocks. If this occurs ground cover will improve and run-off will be checked.

The reclamation of prehistoric terraces has begun to demonstrate that crops may be grown on altiplano hillsides. A member of the group working to reclaim the ancient terraces has built similar terraces on a hillside plot of his own, planted potatoes and obtained an acceptable harvest in an unusually dry growing season. This practice may reduce soil loss on hillsides. Constructing walls will reduce or at least allow control of grazing in those areas with attendant improvement of soil quality and better ground cover.

The more widespread dissemination of the practice of nurseries for improved fruit tree varieties, for trees for fuel-wood and river defences, as well as shelter would lead to small-scale positive environmental improvement. Establishing nurseries with trees suitable for fruit production, fuel-wood, river defences and shelter in more communities and guidance in maintaining them on a continuing basis would satisfy a range of domestic and community needs. Further research is needed on strategies for planting trees for flood defences.

Little evidence is yet available to quantify the extent of changes and no runoff monitoring is in place. Any post-project assessment 2-3 years after project conclusion should include the collection of data that could enable measurement of the environmental consequences of changes that have been sustained.

7. Contribution of Outputs to NRSP Goals

7.1 Regular debate by communities concerning their most important NR problems and priorities was facilitated through discussion at the monthly community meetings attended by project LPs. The subsequent debates and comments informed ongoing work by LPs in each community and ensured that actions related to needs of all groups within communities. This has contributed to enhanced production and productivity of some components of renewable natural resource systems – principally fruit and livestock. The extent to which these actions are sustainable can only be assessed after a longer period of time. The new knowledge for communities is tested locally by them and disseminated throughout communities to benefit all households, including the poorest.

7.2 Local professionals have succeeded in establishing a series of NR management practices that reflect community priorities, particularly with respect to control of disease in fruit trees and livestock. Community-wide reporting on the outcomes of project work clearly shows widespread adoption of new practices and positive outcomes for farmers. The improved management practices have been imparted to women and men; heads of household and young people for each group is able to benefit from their adoption. Young people may apply their knowledge by working for others that

are short of labour – common when many are absent working in eastern lowland Bolivia or Argentina. Women carry out many traditionally male tasks when men are absent; they tend small livestock as well as gardens and were as involved as men in all workshops.

7.3 One of the most satisfying achievements of this research was making good quality contact in each of the initial communities with some households with access to fewest resources and experiencing marginalisation by the community. The methods of engagement developed by LPs, focussing on particular households, establishing close personal relations with them and demonstrating commitment to discuss any type of problem with them, enabled a good level of understanding of the impediments to improving their livelihoods. Sub-projects have been specifically targeted at the poorest to ensure benefits for them. The strong uptake and continued demand for the means to experiment with further new practices suggests long-term sustainability of some of these practices. There are few data to demonstrate the impact of new actions on the livelihoods of the households with which we worked. The one sub-project with some demonstrable results has apparently benefited several of the poorest in one community but benefits should have been accruing only 2-3 months before project conclusion and no data on the ways in which benefits were experienced were collected.

The important conclusion that the poorest households are handicapped in many ways – poverty is multi-facetted – conveys the important consequence that many actions are necessary to help such people, in particular the attitudes of community leaders and the better-off majority that perpetuate exclusion. The success of encouraging close personal contact with poor households and listening to their account of the ways in which they need support implies that the training of extension staff needs to be broadly focussed and pro-poor policies [at every level] need to recognise the need for multiple, broad-based action involving human resources and health professionals as well as those trained in natural resources management. Progress on such a broad front is unlikely to be rapid and development programmes need to take this in mind and consider funding programmes that taper off involvement, allowing for more attention to the development of sustainability during withdrawal. This very clear focus on very poor households, their social exclusion and fragile livelihoods relates to the central part of both NRSP and HS goals.

7.4 Community awareness of the range of available NR management practices is enhanced by literature prepared by the project retained by households. This knowledge relates to the NRSP goal and as a means to strengthen livelihoods, to the HS goal too. Some households have the self-confidence to continue using such practices; others need regular information to help form appropriate routines. Continued contact with LPs is necessary to strengthen and widen to knowledge base and to help ensure livelihood benefits for poor households. The peasant union organisation at a sub-central level is similarly aware of the successful adoption of such practices in the communities. They wish to facilitate more widespread adoption – as recorded in records of sub-central meetings and letters requesting future

collaboration. They are unclear about how best they can organise such actions on their own initiative. More attention might be given to the potential of the peasant union organisation as a motor for improving NR management but politicisation at higher levels may make this difficult.

Community motivation to test the relevance of new NR practices to their environment is shown by continued demand for the extension of local trial as well as by the requests from other communities for collaboration.

7.5 The main weakness of this research was the failure to convince municipalities and our partner NGO of the value of community-led initiatives. One impact of our work on the principal research partner – PROMETA – is demonstrated by their use of project LPs to train their own staff. Other GOs and NGOs in the region have recognised the success of work of our LPs, as well as the work's low cost in relation to widespread adoption of different NR practices, but they are uncertain of any lessons it may hold for them. NGO policies are driven by donor priorities and GOs by politicians' preference for short-term visible results.

7.6 The impact of the outputs on rural people in the areas in which the LPs worked is considerable but only demonstrable through the commentary of local people themselves in formal and informal meetings. It was clearly shown that productive communication between LPs and rural people can be achieved. Local professionals need to be sensitive and receptive to individual and community concerns and to develop a capacity to respond in the most appropriate way. LPs however, usually visit rural areas in the context of a project or initiative with narrowly-defined objectives. What is needed is to find ways in which local communities can be pro-active to seek action from government and non-government agencies for advice and help without waiting for an unsolicited visit.

We have suggested that municipalities, as at present constituted, seem a level of government organisation only capable of responding some community concerns. Further research is needed to test the capability of the peasant unions to respond to community needs and to explore other alternatives.

7.7 A most effective promotion pathway is to demonstrate the impact of new NR strategies on household production. Diffusion of information by a local radio station, widely listened to by rural people, proved an effective method of communication, particularly when combining didactic content with farmer input. This creates a farmer demand for the product. Middle-level beneficiary organisations – principally municipalities and peasant unions – can best be reached by national-level or international donors offering incentives for them to experiment with employing local professionals to direct low-cost community managed actions.

8. Publications and other communication materials

8.1 Books and book chapters

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8.2 Journal articles

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8.3 Institutional Report Series

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8.4 Symposium, conference, workshop papers and posters

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8.5 Newsletter articles

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8.9 Media presentations

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8.10.3 Project workshop papers and proceedings

Reunión de organizaciones del desarrollo rural en Tarija: respondiendo a las necesidades de los marginados rurales, Marzo 2001, Informe de seminario-taller

8.10.4 Literature reviews

None

8.10.5 Scoping studies

None

8.10.6 Datasets etc.

None

8.10.7 Project web site

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10. Project Logframe

Narrative Summary	Measurable indicators	Means of verification	Important assumptions
Goal Improved hillside farming strategies relevant to the needs of marginal farmers developed and promoted	By 2002 new methods of cost effective soil and water conservation and tillage systems which explicitly benefit the poor validated in two targeted areas By 2002 new approaches to maintenance and improvement of soil fertility validated in two targeted areas By 2003 this new knowledge incorporated into strategies to increase the local availability of food and/or fodder supplies and adopted by target communities	Reviews by programme manager Reports of research team and collaborating/target institutions Dissemination products Local national and international statistical data Data collected and collated by programme manager	Target beneficiaries adopt and promote systems and approaches Enabling environment exists Budgets and programmes of target institutions are sufficient and well managed
Purpose 1. Means by which local professionals identify 'best bet' and 'win-win' technologies strengthened	By end of project: local professionals actively engaged with, and flexibly responding to the needs of the poor in communities	Monitoring against baseline municipal and community data Local organisations records, including annual reports and funding requests	Enabling environment (policies, economy) encourages wider adoption
Community awareness of, and access to natural resource management technologies enhanced	community-related organisations taking positive steps to sustain project outputs some measures taken by communities for improvement of natural resource management	Minutes of community meetings NRSP MTR report	Positive community response
Outputs 1. Ways established for regular community articulation of NR priorities and problems to local professionals and municipalities	At least 8 out of 12 community meetings per year, NR management issues debated, problems and priorities specified, communicated to LPs and taken forward by the community to municipios	Community records Project meeting records Municipio follow up as reported in project quarterly reports	Regular community meetings
2. Local professionals better engaged with NR problems and priorities	All local professionals involved in the project can advise and assist	Project reports of meetings	Commitment of local professionals to knowledge transfer

of local communities	local communities to inform municipios of community-specified NR issues by end of year one and in all following years	with municipios Project staff interviews with local community	Municipio remains committed throughout the project's life
3. Local professionals better enabled to offer advice and facilitation with regard to solutions to local NR management problems	By end of year 1 in at least 2 communities: - LPs stimulate debate in order to facilitate the community to make informed decisions on solutions to NR problems. - LPs provide educational materials suitable for local communities to understand the scientific basis of NR priority problems and their possible solution.	Community meeting records supplemented by project records	Commitment of local professionals
4. NGOs and municipal government recognise value of community led changes in NR management strategies	By mid-project at least 2 NGOs have formulated plans for incorporating community-led initiatives in NR management By end of project, two municipios will have incorporated community-led NR management priorities into the annual municipal plan	NGO and municipio annual plans and/or funding requests	Commitment of municipios
5. Communities (especially their poorer households) are motivated to adopt sustainable NR management practices	By end of month 6 "wish list" of poorer contact households documented in all communities By mid-project at least 50% of target households in all three communities change at least one NR management practice By end of project evidence recorded of spontaneous adoption by other households in target and other communities	Project reports	Co-operation of poor households

Activity	Milestones	Summary Budget	Risks
1.1 LPs attend community and municipio-level meetings	Database designed for recording meeting records by month 2 Community and municipal meeting records added to database	Staff costs £43.1K Staff costs OS £30.1 Overheads £21.6K Equipment £1.2K Overseas travel £37.7K Miscellaneous £11.1K **TOTAL £144.8K**	Irregularity of community and municipal meetings
1.2 LPs comments on meetings attended recorded and discussed 1.3 Community groups collaborate regularly with LPs to discuss NR issues and priorities and a range of relevant local activities	Summary reported quarterly Meetings and interviews recorded and added to database and reported to community meetings by representatives		Limited LP commitment
2.1 LPs assist action priorities of NR problems with communities and households 2.2 LPs collaborate with communities in preparation of reports on areas appropriate for changed NR management 2.3 Neighbouring communities attend workshops on NR issues and organise with help of target communities their own workshops	LPs meetings with households and communities recorded in database. Summary reported quarterly Reports incorporating maps of soils and vegetation identifying areas with potential for different management completed month 6 Community workshop attendance by people from other communities recorded Communications with other communities during LP visits recorded		LPs attempt to dominate meetings Communities not motivated to organise workshops Neighbouring communities unwilling to organise their own workshops. LPs short of time to visit such communities to facilitate organisation
3.1 Tarija NGOs assisted to organise meetings of LPs to exchange information, discuss their needs and plan actions on new insights on NR management issues 3.2 Radio Tarija initiates regular programmes on NR work in target communities including	Meetings recorded in database. Meetings initiated by month 12 and others planned and executed Broadcast schedules and scripts. By month 6 Evaluation with ACLO and audience months 9, 21 & 33		Inter-NGO jealousies result in low attendance Forecasts inadequate or non-existent

climate reports and forecasts			
4.1 NGOs and GOs meet to discuss innovative community NR management strategies emerging from workshops and relate to their work. 4.2 Municipio staff consult with LPs to formulate annual plans and respond to community NR priorities	Meeting of NGOs and GOs, by month 10 Proceedings recorded Consultation meetings with municipio staff by month 18 and thereafter		Poor relations between different organisations limits quality of communication Political orientation of municipio leadership hostile to community or external influence.
5.1 Priorities of poor households established	Ranked list of household priorities recorded in database by month 6		
5.2 Impediments to poor households' adoption of beneficial NR practices identified and remedies adopted	Conversations with poor and their [and other] opinions recorded.		Poor unresponsive to LP concern. Exclusion of poor by community.
5.3 Communities construct database of crop and livestock diseases and local remediation	Community databases constructed by month 4, revised month 16 & 28		
5.4 LPs' advice sought on community-led remediation	LPs' suggested modifications incorporated into community databases by month 6, revised months 18 & 30		
5.5 Communities evaluate alternative NR management strategies (including those appropriate for poor households)	Community evaluations initiated by month 6, reviewed by community groups and staff months 18 & 30		Heads of most households migrate
5.6 NR management practices of households and communities recorded	NR management practices of households before evaluations recorded by month 5 NR management practices of households after evaluations recorded month 8, 20 & 32		Household migrate or become disinterested

5.7 Communities record past climatic events and exchange weather records via school activities	Installation of thermometers and rainfall gauges for children to monitor local climate by month 4 Children record old people's drought and flood memories and chart community weather differences		Equipment stolen or damaged
5.8 Inter-community communication of project activities, results and experiences	Representatives of each community to have visited each other project community by by end of project		

11. Keywords

Andes, households, poorest, Bolivia, hillsides, crop diseases, livestock diseases

12. Anexes

SCIENTIFIC ANNEXE

1. Methods of work

1.1 Project management

Dr Jamie Fairbairn was appointed on a part-time basis as Research Officer for the project in February 2000. He maintained contact with the team of LPs by email, telephone and through four visits of 1-2 months duration until August 2001 at the time of the Mid-Term Review. Dr David Preston as Project Director, maintained continuous contact with Dr Fairbairn and visited Bolivia twice yearly to provide a greater frequency of visits, accompanying the team into the field and holding meetings in Tarija with team members and associated organisations related with the project. Following Dr Fairbairn's departure – as planned – in August 2001, he visited Tarija about every 4 months to take part in field visits, carry out some supplementary research and to monitor team progress. Although Raimundo Montaño remained as farming specialist, with a primary focus on crop disease, during the entire period of work, Patricia Ruíz, appointed from the start as veterinarian, left after 14 months and was replaced by Rosario Condori. Cristina Morales was appointed as agronomist and social co-ordinator for the first 14 months of the project. Both left shortly before the birth of their first children. Secretarial help was provided by Maria Eugenia Armata for a period after month 14, then by Maria Isabel Cano who, in the final months of the project, accompanied the LPs into the field and reported on meetings with households with fewest resources. Staff selection was managed by Dr Fairbairn and later Dr Preston.

1.2 Methods of working with communities and households

Communities with which the research started were those which had been associated with previous research directed by the Project Director. Community leaders and many of the households were known to staff and a range of data existed to facilitate the development of effective ways of collaborating with communities. During initial meetings to explain the objectives and methods of working, two communities – Juntas and Tojo – supported the proposed work and diagnostic workshops were immediately arranged. The third, altiplano, community was hesitant, demanded a statement of financial investment in the community and was unconvinced by the community-focus of the proposed work. This may have been related with a change in community leadership. At a subsequent meeting of the regional grouping of peasant unions – the Sub-Central – project staff were invited to outline the proposed work and communities interested in collaborating were encouraged to make contact. Leaders of Chorcoya Avilés immediately requested staff to discuss collaboration at a community meeting. During that meeting the community asked the project to work with them.

During the course of the project life, two further communities in the Río San Juan valley with which previous research had been carried out (Buenavista and Atacama) invited the project to work with them and this was agreed, although direct contact with Buenavista was hampered by lack of access during the wet season. One particularly dynamic member of a very isolated community – Rupaska – three hours walk from Tojo and inaccessible by vehicle during the wet season, regularly attended workshops held in Tojo and after 18 months his community formally requested a visit and subsequently collaboration started and was maintained with breaks during the wet season. On the altiplano, project staff responded to a tentative contact from a small isolated community, Ñoquera, and the community subsequently collaborated with meetings and workshops. In the Tarija valleys, members of three communities close to Juntas regularly attended meetings and workshops and formed a small, semi-independent group. Two of their communities – Tacuarita and Armaos – subsequently requested that the project work with the whole community and this was done.

Community priorities for actions with LPs were identified during initial workshops, held in all communities. During these workshops participants were asked to discuss and identify the main characteristics of farming and livelihood strategies and important differences between households. Groups then identified the principal problems facing the community and these

were compared and further discussed in a final community meeting. These methods were successful in uncovering issues that community members brought forward and in structuring priorities. However good the participatory methods used, they could not fully incorporate the views of other not present – because of absence in Argentina or eastern Bolivia, lack of time to attend and lack of confidence that they could (or be allowed) to express their views. This inevitable and common problem was overcome by meetings held with some of the poorest households (Section 9 below) and by regularly consulting smaller groups about their views of what were important issues. That the LPs employed were known to include a technically competent plant disease specialist and a veterinarian inevitably skewed community priorities towards highlighting needs that these staff could most obviously fulfil. However, once close personal links had been formed between community households and staff, a wider range of personal and group issues were discussed.

Work at a community level was carried out during visits approximately monthly. Visits to communities in the Tarija valleys (Juntas, Tacuarita and Armaos) were made in day trips while visits to Chorcoya (and sometimes Ñoquera) were combined with visits to Tojo (and sometimes Atacama, Buenavista and Rupaska). Many of the visits coincided with monthly community meetings, and workshops were often held following community meetings to optimise convenience for attendance at workshops. Visits were also made to each of the groups into which some communities were divided. Time was always available for discussions at an individual level while waiting for people to arrive for group meetings. In Tojo, since the team always stayed the night there (it is 3-3.5 hours drive from Tarija) early morning and evening were always times when individuals came to visit to chat or consult about a particular issue. It was also a convenient time to visit households that might not have time to attend meetings – particularly those with fewest resources.

1.3 Recording of work by project staff, creating community databases

Monthly reports were written by each of the two LPs and transmitted to UK by email. These reports served as a record of field work and community and group meetings. They also recorded other events, such as fairs and NGO & GO workshops in Tarija and also allowed UK staff to monitor field activities. They provided the basis of the community databases which can be consulted to create sequential records of actions, debates and summary reports of activities. It was initially intended to create a relational database to facilitate rapid consultation of records and IdeaList was used at the outset. Access to computers in our office in PROMETA was not always reliable – all PCs were shared by several projects and various staff and office management was weak. Finally all reports were stored as Word files on floppy discs, duplicating the copies on HDs that were occasionally erroneously deleted. Duplicates were kept in Leeds.

As the veterinary work developed, it was necessary to record all households and their livestock in each community. These data were checked and revised each time health campaigns were conducted and provide an exceptionally accurate database of livestock. To these data was added information from laboratory analysis of faecal samples as well as numbers of livestock de-wormed.

In tandem with this database, Montaño created a similar database of peach trees and vines in relevant communities that provided a basis for recording fruit yields although the data were collected largely on a group rather than individual basis.

During the project life, quarterly reports were prepared by LPs that were designed to provide more detailed technical reports on particular issues and many were the basis of documents that were then produced and circulated in Tarija and elsewhere. Quarterly reports were of variable quality. Reports were made available through the project website located at www.geog,leeds.ac.uk/groups/andes/fragenv.htm as pdf files. They will be accessible from that site for at least a year following conclusion of the project.

Both the veterinarian and the agricultural specialist wrote documents for circulation among LPs in Tarija and for farmer use. Simplest information was circulated in twice-folded A4 sheets, with black & white sketches, printed on both sides; other information was circulated colour-printed with diagrams on a single plastic-laminated sheet. Longer documents with

basic information on chicken disease control, animal parasites etc, as well as on local soil classification were colour printed but cheaply photocopied (black & white).

Visits made to the project office in Tarija by farmers, NGO & GO staff were logged as was the participation of LPs in other meetings held in Tarija and elsewhere. Montaño attended a workshop in Cochabamba on fruit tree diseases organised by CABI Bioscience in February 2001 and the workshop organised by NRSP Hillsides in Kathmandu in February 2003.

1.4 Contacts with NGOs, municipal and departmental government organisations.

The project was linked principally with PROMETA [Protección del Medio Ambiente en Tarija – *Protection of Tarija's Environment*] – during the three years of the project's life. PROMETA provided us with office space (a desk, filing cabinet and access to telephone and computers but not Internet), maintained our financial accounts and provided a vehicle with driver for field visits. Because we shared a large office with a number of staff working on a wide range of activities related to Bolivian Protected Areas, we had regular contact with field staff working on a range of projects, some of which were potentially relevant to the skills of our LPs. Their projects were usually of limited duration (less than 12 months) and employed junior people, contracting experienced LPs when necessary for specific tasks. Having experienced professionals on site and with a range of relevant experience, it was natural that there should be regular person-to-person contacts between our staff and those of PROMETA. Our altiplano community lay within the Sama Protected Area and they also had links with Chorcoya. PROMETA was seen as a threat to normal farming activities in the Sama area because they were concerned with managing (that is limiting) some natural resource uses and the relationship between the peasant unions and PROMETA were uneasy. In time rural people realised that our working methods were different and that we sought to listen to the needs of communities but were not likely to be able or willing to buy tractors, seeds or medicaments on a grand scale. The LPs were therefore seen as having a good working relationship at a personal and community level and thus able to 'interpret' some actions that PROMETA were keen to undertake in such a way that communities could obtain a second opinion on possible changes.

At a technical level, our veterinarian was able to advise on illnesses suffered by the captive vicuñas held by PROMETA – usually orphan young reared by hand – and also the llamas recently re-introduced by PROMETA. Our agriculturalist was likewise able to advise on possible reasons for failures of plants sown in association with PROMETA and in particular help with controlling disease.

By mid-project it was clear to PROMETA that our LPs had established excellent links with communities and that our work with them was generally seen by farmers as successful. This resulted in requests for our staff to make presentations and run workshops to train new PROMETA staff. Alfonso Blanco, Director of PROMETA, was unfailingly helpful to the project and their rigorous financial accounting system was of considerable benefit.

By project end Blanco suggested that he and Montaño prepare a project to establish a series of low-input ('biological') experimental centres in a series of communities in Tarija that would use Montaño's expertise and capitalise on the known commitment of PROMETA to environmentally-friendly action. The extension of the existing actions to promote changes in NR use strategies was not seen as falling easily in the remit of PROMETA and more related to work previously carried out by government agencies.

ACLO

Acción Cultural Loyola is a local community development organisation directed by Jesuits. It is active in the Departments of Potosí, Chuquisaca and Tarija in southern Bolivia. It is particularly known for the local radio stations which broadcast in indigenous languages as well as Spanish and are – in Tarija – the radio stations with the largest rural audience. Our links with ACLO were largely in order to use Radio Tarija as a means of communicating with rural communities and to introduce a coherent broadcast content that rural communities could relate to and through which they could obtain useful information.

Broadcasts were made every two weeks (with repeats in intervening weeks) until mid-project. Thereafter, as a function of the growing work load on LPs, they were made monthly. The content covered actions appropriate to the season in altiplano and/or valley communities. Groups of people from communities occasionally came to record stories and songs about their community to add specific community content to broadcasts.

A series of interviews concerning radio listening habits in all the communities in which we worked, reported in Montaño 2002, showed that over 2/3 of listeners in the communities in which we worked (Table 1).

Table 1
Listening to Project Broadcasts on Radio Tarija

Community	*Total interviewed*	*Number listening to project broadcasts*
Juntas	10	8
Rupaska	10	3
Tacuarita	10	8
Chorcoya	10	7
Tojo	10	8
Armaos	10	7
TOTAL	60	41
%		68.33

Meetings of UNITAR, the co-ordinating organisation for Tarija NGOs, were held about annually and were an opportunity for exchange of ideas and reports on practices. Contacts, both formal and informal were made with staff of other NGO. GO and international agency projects based in Tarija, invitations to sessions and closing meeting. People met in communities at regular community meetings.

Meetings with mayors and other municipio staff took place either in Tarija, in municipal headquarters and often during fairs and other events at which the mayor customarily played a prominent role.

2. Appraisal of natural resource elements

Both soils and vegetation had been studied in various parts of SW Tarija during earlier research but it was necessary to supplement this by research designed to identify the extent to which there might be under-utilised potential, particularly in the altiplano, where small areas with particular environmental problems or potential might exist. In addition, the actual nature of climatic events and longer-term fluctuations were unknown despite a range of data that had been collected by the national weather service.

2.1 Local soil classification in Chorcoya

Research evaluated soil conditions in the communities of Juntas, Tojo and Chorcoya Avilés in southwest Tarija from the point of view of local people. It identified local knowledge about the different categories of soil or 'land', their preferred uses and the way that the different soils are managed by the inhabitants. People classify soils by way of colour, texture, consistency, topography, soil water conditions and best use. Farmer-conceived soil classifications were established in each community. Soils knowledge varies from household to household, and those who know most have been identified as potential communicators of soils knowledge within the communities. Local people recognise that water can and does carry away earth from their plots, but do not consider soil erosion as a significant constraint affecting production. Whilst there are areas where people have noticed that soil fertility has reduced or 'the earth has become tired' as a result of intensive production, there are also areas where people have perceived improvements in soil quality resulting from application of manure and river sedimentation during floods, particularly in Juntas and Tojo. Areas where soils are

under-utilised were identified by local people and technical staff, and adjustments in use suggested – in Chorcoya there is an area of fertile soils formed on recent fluvio-lacustrine deposits with potential for more cultivation, in Tojo and Juntas there are fluvial soils with the potential for growing trees and producing crops. Soil analyses highlighted low levels of organic matter in most of the cultivated soils. Techniques to raise soil organic matter were identified for discussion in community meetings: better gathering and application of manure, composting and green manuring with local and introduced species.

2.2 Vegetation inventory and analysis

In previous research, reported in Preston et al 2003, evidence of vegetation change as a result of grazing practices on the altiplano was examined and it was concluded that there was evidence of vegetation degradation possibly caused by excessive grazing in only a few localised areas, in particular close to settlements,

Two members of the same research team were contracted to report specifically on evidence of vegetation change in the two valley communities in which work was concentrated – Tojo in the valley of the Río San Juan, and Juntas in the Camacho valley, near Tarija. They reviewed field evidence of the location of areas of impoverished vegetation and attempted to link the vegetation characteristics with slope, aspect, geology and soil quality as well as evidence of intensive use by grazing livestock (Paniagua and Yevara 2000).

They concluded that, although there was insufficient evidence to indicate whether vegetation degradation was of recent origin, there was evidence that some areas were experiencing systematic high grazing pressure that prevented to growth of more palatable plants for livestock. In addition, some households practised conservation measures from which vegetation and livestock benefited – notably walled fields in which grasses could grow and grazing be controlled – and some areas of springs had channels created to ensure that larger areas had moisture to facilitate plant growth. Such practices could be more widely adopted for the benefit of livestock and, ultimately, their owners.

2.3 ENSO and climatic variations in Tarija

The climate of the Central Andes is characterised by considerable inter-annual variability of rainfall. The relationship between this variability and regional global variations of ocean temperatures manifested by El Niño Southern Oscillation [ENSO] events have been widely discussed and are reviewed in Preston 2000. In general El Niño events are associated with lower than average precipitation in the altiplano but the extent to which this is true of the eastern margins of the altiplano (in SW Tarija, for example) is uncertain.

A division of the Bolivian Ministry of Agriculture – SINSAAT – was established in 2000 with the objective of providing the capability of offering predictions of harvests at a national level in order to enable national level planning of food supply and demand. They were to establish meteorological stations in all departments of the country to provide data on rainfall from month to month. They showed interest in exchanging information with our team. They were very slow in setting up the data collection network and the National Meteorological department was not offering climate forecasts at a department level by project completion.

It was believed that, if a good correlation between ENSO events and rainfall could be established in this part of Tarija, it might be possible to offer seasonal climate forecasts for farmers. It was also necessary to know what local knowledge and practices existed that enabled farmers themselves to predict seasonal climate. Orlove and collaborators have shown that farmers in Andean Peru forecast summer (wet season) rainfall on the basis of observation of changes in the apparent brightness of the Pleiades at the southern winter solstice (Orlove et al 2000). Data about climatic hazards, associated problems and local knowledge regarding climate forecasting were collected in Tojo, Chorcoya and Juntas from schoolchildren by Morales (Morales 2001). It was concluded that almost no knowledge now existed that allowed climate forecasting but that earlier generations had such knowledge.

The relationship between past SO events and rainfall during the wet season (October-March) was reviewed during the period for which rainfall has been recorded. We used meteorological

data from seven localities in SW Tarija, Bolivia. Little rain falls during the other half of the year, which can therefore be ignored in this simple analysis. An attempt was made to assess the extent of differences in rainfall variations in years with strong SO signals in different parts of SW Tarija. Our intention was to judge the reliability and possible value of climate forecasts, based on the strength of present and forecast future SO conditions, to help farmers plan for the forthcoming wet season. Precipitation data are available for nine SO episodes in SW Tarija, five of which were warm El Niño episodes and four were cold La Niña episodes. The most recent cold phase (1999-2000) was included although only data for Tarija airport were available.

For El Niño (warm) episodes, there is a considerable likelihood of drier than usual months during the wet season but considerable variation both from month to month and year to year occurs. It seems unlikely that the strength of the SO signal can be used as a very reliable element in medium-term climate forecasts although it does have a role as part of a multi-component forecast. Farmers need more detailed information than can be provided by seasonal climate forecasts - particularly forecasting the likelihood of rain during the planting period - but even low probability forecasts may be worth communicating. During La Niña (cold) episodes, the variation of rainfall from the mean follows no clear pattern and drier as well as wetter than average months may be expected. Such episodes seem unlikely to help create reliable forecasts for farmers.

The weak correlation of rainfall and ENSO signals makes climate forecasting difficult in the eastern margin of the Tarija altiplano. Although simple rainfall and temperature recording stations were established in each community, in conjunction with community schools, this aspect of the project was discontinued.

3. Improving production of tree fruit

In the two valley communities most households have a range of fruit trees on their land: quinces, peaches, a few citrus trees in Tojo particularly, vines trained up trees [principally molle (*Schinus molle*)] but also up quince trees and sometimes an odd apple or pear tree. Only a few households use fruit trees as a major source of cash income: most frequently the fruit is dried (especially quinces and peaches) and used for cordials and fruit is traded with products from other ecological zones. Grape vines likewise provide only a small surplus to sell in urban markets and grapes are used to make wine or singani (grape brandy) on a domestic scale. Earlier field work and the diagnostic workshops at the start of research work had shown that the incidence of a range of disease had increased during the past 25 years. This is possibly related to plants and cuttings brought from elsewhere, possibly Argentina, carrying disease. Since peaches and grape vines were rated as the most important fruit providers (and quinces seem to suffer less from disease) the team focused on ways of controlling the principal disease, introducing new stock and helping farmers experiment with ways of improving plants to provide better quality fruit.

An issue of considerable importance was the demonstration of ways of disease control avoiding the use of powerful and possibly harmful chemicals and easily managed by relatively poor farmers. Montaño attended a course organised by CABI for DFID Crop Protection Programme in Cochabamba to discuss with experts from other parts of Bolivia correct identification of pests and diseases and optimal methods of control. Workshops organised in each of the fruit-producing communities explained the importance of recognition and correct identification of pests and diseases and the basic principles behind the use of environmentally-friendly treatments.

3.1 Disease identification and control measures

The principal disease affecting peaches and vines in both communities included fruit flies *Ceratitis* sp. and *Anastrepha* sp., the borer – taladro - *Crysobothis* sp., Spider mite – ácaro - (*Bryobia*), cochineal (*Aspidrotus perniciosa)*, aphids *Aphis* sp., crown gall (*Agrobacterium tumifaciens*), viruela (*Clasterosporium carophilum*), oidium (*Sphaerotheca panosa*), anthracnose (Elsinoe ampleina) and mildew (*Plasmopara viticola*).

The life cycle of the principal pests was explained in workshops, reinforced by leaflets prepared for farmers and remedial measures were applied with groups of farmers for them to apply with the groups formed in each community.

3.2 Systems for maintaining fruit trees

The declining yields from fruit trees and vines had discouraged farmers from being active in replacing dead plants, introducing new species or varieties and in considering any programme for systematic plant reproduction. We organised a series of workshops to introduce farmers to best practice with regard to pruning to maximise yield and minimise danger from hail, mulching to encourage health growth and inter-cropping to facilitate environmentally complementary plants growing together. Even though grape vines trained up *molle* trees are well tended, with molle branches pruned to allow good light to reach grapes and the leaf growth on the branches is used for mulch, a larger range of practices plus disease control allowed substantial increases in yield.

Nurseries were established in each of the valley communities to serve a range of functions, including raising new tree saplings for grafting and gradual planting by community members to renew fruit trees. Local varieties were used as roots stock onto which different varieties were grafted to optimise the probability of better yields and larger fruit. We were conscious of the need to sustain growth of some grape varieties that have given good yields both trellis trained and tree-trained. The introduction of new grape varieties should not lead to the abandonment of well-tried varieties capable of producing good quality fruit.

Nurseries were all well cared for after more than two years of attention but considerable differences existed between levels of care and any extension to this project should ensure community management of the nurseries can be sustained.

3.3 Results of disease management and improved care

The harvest of 2003 allowed collection of data to demonstrate the results of at least two years of production following the application of new resource management practices. The data gathered during community group reporting are presented below (Table 2). Generalised productivity data were arrived at at a community level according to the species and system of cultivation. Even allowing for over-estimation of yields reported orally in an open meeting, random verification from selected producers during meetings in April 2003 confirmed that the order of magnitude of increased fruit production is broadly correct.

Table 2

Changes in fruit harvested

Kgs. of fruit harvested per tree/vine

Community	*Fruit*	*Before 2000*	*2003*	*Percent increase*
Juntas	Peaches	2.35	30	1277
Tojo	Peaches	4.62	30	649
	Grapes (on tree)	10	150	1500
	Grapes (on trellis)	1.0	5	500

Farmers were very satisfied with the improved yields and the fruit provided larger amounts for domestic consumption and for sale or exchange either fresh or dried (in the case of peaches). No data were collected on sales of fruit before and after the adoption of new practices. The principal problems associated with the application of new methods were ensuring that disease control was applied to trees or vines of absent migrants. Only one producer who had the care of vines for several migrants was recorded as obtaining no increase in yield. The cost of treatments were low and LPs recommended products that were either cheap or could be made up by farmers. This is likely to improve the likelihood of the action being sustained after project completion.

4. Vegetables and other crops for local consumption

4.1 Growing vegetables

In various communities within easy reach of the city of Tarija farmers have begun to produce a wider variety of vegetables and fruit for urban markets. Urban tastes have changed likewise and a demand for asparagus and broccoli has been noted. Vegetables are only grown by a few rural households even though there is increasing awareness that garden vegetables can be a valued addition to diets. Experiments were started in all communities to enable community members to see how well different crops might grow in their environment. In Chorcoya previous projects had demonstrated that vegetables could be grown under cover but LPs sought to demonstrate that some could also be grown in the open sheltered areas with adequate water for irrigation between October and April.

Table 3

Community Gardens

Community	*Winter*	*Summer*	*Participants*
Chorcoya	Broad beans, potatoes, oats		Each community group
Atacama	Lettuce, cabbage, broccoli, onions, radishes, broad beans	Tomatoes, melon, small squash, cucumber	Parents, teacher, school children
Buenavista		Tomatoes, melon, small squash, maize, cabbage	Parents, teacher, school children
Rupaska	Lettuce, cabbage, onions, radishes, broad beans		Parents, teacher, school children
Tacuarita	Lettuce, cabbage, onions, radishes, broad beans	Maize, tomatoes	Community

Although some households that are associated with the management of the gardens, including teachers when schools are involved, express satisfaction at the relative success of the experiments, more time is needed to document how many households have copied the practice and started gardens with similar crops on their own account.

4.2 Experimental crops on the altiplano

Experiments were carried out in one property (of a group leader) in Chorcoya to test varieties of fava beans (Table 5 below). Beans sown at a greater distance apart (for example 40 x 60 cms.) received more light and showed greater yields than beans sown at 30 x 60cms. Preliminary indications in 2003 suggest that good yields have been repeated. We suggested the incorporation of beans into a rotation: beans-potatoes-barley with beans and barley cut and fed to livestock (after removal of bean seeds) to avoid trampling of the cultivated fields.

Table 4
Fava bean crops in Chorcoya 2001-2002

Area m^2	*Date of planting*	*Variety*	*Germination*	*Distance Between Rows*	*Distance Between Lines*	*Disease*	*Harvest*	*Growth period*	*Yield Kgs.*
100	9 Sept.02	Habilla	30 Sept.02	30 cms	60	Pulgón	17 Mar 02	182	8
100	"	Habilla	30 Sept 02	40 cms.	60	Pulgón	17 Mar 02	182	12
100	"	Banana	30 Sept 02	30	60	Pulgón	30 Mar 02	204	9
100	"	Banana	30 Sept 02	40	60	Pulgón	30 Mar 02	204	12

The principal hazards for potato crops on the altiplano are frost and drought. By sowing more rapidly growing varieties it was hoped to find a variety less sensitive to frost. Varieties of certified seed were obtained from were obtained from experimental stations in Tarija and in Potosí department – Désirée, Collareja, Revolucionaria and Sani Imilla were tested in plots in three areas in Chorcoya. Results are shown in Table 5.

Table 6
Potato varieties tested in Chorcoya

Farmer	Zone	Variety	Area. m2	Date of planting	Density	Germina-tion	Mounding	Date of Harvest	Yield. kgs.	Frost
F. Colque	N	Désirée	300	22/10/01	50 kgs.	25/11/01	10/12/01			0ºC 22/12/01
										-2,5ºC 01/01/02
	N	Sani-imilla	200	22/10/01	33 kgs.	25/11/01	12/12/01	20/04/02	200	-3ºC 09/01/02
	N	Collareja	200	22/10/01	33 kgs.	27/11/01	15/12/01	22/04/02	190	-3ºC 09/01/02
		Revolucionaria	200	22/10/01	33 kgs.	27/11/01	17/12/01			-3ºC 09/01/02
L. Condori	Sud	Désirée	300	22/10/01	50 kgs.	25/11/01	10/12/01			-3ºC 09/01/02
		Sani-imilla	200	22/10/01	33 kgs.	25/12/01	15/12/01	22//04/02	198	-3ºC 09/01/02
T. Condori	E	Désirée	200	22/10/01	33 kgs.	25/11/01	10/12/01			-3ºC 09/01/02
		Sani-imilla	100	22/10/01	16 kgs.	25/11/01	15/12/01	22/04/02	95	-3ºC 09/01/02

The varieties Désirée and Revolucionaria were both destroyed by frost but the yield of both Sani Imilla and Collareja were satisfactory. The harvest for 2003 has not been completed but first indications confirm these results. Farmers in all the groups are eager to sow the better varieties in their fields in the next crop year. Each group is contributing 46 kilos of potatoes to the community to be shared between all households that wish to take part in planting next season. Farmers reported that others are very keen to plant the new varieties.

Experimental sowing of alfalfa and barley for forage have had mixed success. In 2003 the improved alfalfa seed produced good results and barley yields have been about 2000kg/ha. of barley cut green for forage. The growing of these crops for forage is a novelty in altiplano communities and it remains to be seen how many farmers will seek to experiment further with such methods.

Community evaluation of these experiments is muted since it remains to be proven that these yields can be reproduced in a wider range of locations but, in community meetings, there is enthusiasm for the practice and seemingly little difficulty in the strategy for distribution of seed. The results of these trials are also relevant to future sowing of crops in the area of newly-reclaimed or constructed terraces (see 7.1)

5. Tree nurseries and afforestation

Logically associated with the production of saplings for fruit production is the provision of trees that can be used in other ways. Riverside communities (Tojo, Atacama and Juntas) were keen to have a source of trees that could be planted on river banks to stabilise the soil and help protect against erosion at times of floods. Although willows grow widely along river banks, often associated with bamboo, eucalyptus – which is widely grown in many parts of highland Bolivia – was planted to offer a varied tree flora and as a species whose timber has many uses. Planted along river banks, its extensive lateral root development will affect field crops only minimally. Between 900 and 1500 seedlings are established in the three riverside communities. In addition chacatea (*Dodonea viscosa*) has been planted experimentally in Atacama to be tried for growth and ability to provide forage from its leaves.

At project end no results could be recorded since no trees were yet ready for transplanting. Community response to the tree nurseries was muted since it was infrastructural rather than directly productive but it seems likely that, once trees have been transplanted and if growth is satisfactory, there will be a more widespread appreciation of the value of the activity.

When the PI visited tree nurseries they were almost always overgrown and weeding took place when the growth of the saplings was being reviewed. Similar neglect was noted in

some vegetable gardens. The problem seems to be uncertainty about responsibility for the activity. The same was noted for projects started by previous collective projects – breeding rabbits and guinea pigs – neither of which were getting the necessary level of care.

Associated with the reconstruction of prehistoric hillside terraces (see below) two native tree species – Queñua (*Polylepis* sp.) and Kishuara (*Buddleia* sp.) – have been planted to provide both shelter from cold winds and to stabilise the soil around the margins of the terraces. Queñua is slow-growing but Kishuara grows rapidly and will also provide a better environment for the protection of the Queñua seedlings planted nearby. Local farmers are eager to plant more, particularly close to their houses and the possibility of establishing nurseries for these and other native trees is being explored. The effective exclusion of grazing livestock is a major problem.

6. Pasture conservation

There is little botanical evidence to suggest that the degradation of mountain vegetation as a consequence of grazing livestock is any greater now than during the last 500 years. The lack of grazing during the dry season has resulted in seasonal movements of livestock, both vertically and horizontally as we have described elsewhere (Preston et al. 2003, and see also Vacaflores et al 2003). In the valleys of the Río San Juan and the Camacho the use of vegetation for grazing is combined with conserving crop residues as well as local movements of livestock during the year. On the altiplano, pasture conservation is practised by using walled fields for lambing ewes and young but various issues discussed at community meetings are related to a consciousness of the need to conserve pasture for sheep. There is widespread awareness that the number of donkeys in the communities is greater than needed for transport. But, while some owners castrate males to limit reproduction, other households prize their donkeys and are unwilling to limit numbers. In the same way, wide variations in sheep numbers reflect social status as much as domestic need but mechanisms for limiting numbers do not receive universal support.

There seems to be widespread recognition of the need, in some way, to enhance the quality of pastures in the altiplano area. Several previous projects and regional initiatives, some even promoted by the peasant union *sub-centrales*, have attempted to raise consciousness of the problems related to insufficient grazing resources. One of the least controversial approaches would be to control donkey numbers, since their value for transport is less than it was a generation ago. There is strong resistance among some households, who say they just like having a lot of donkeys, and no community has been prepared to take any concerted action.

Action to limited or control use of common pastureland is even more controversial and most strongly opposed by those with most sheep, who are also likely to be the most influential in community government. Limited fencing has not been successful and all farmers comment on the continual danger to walled crop fields of marauding livestock. As in many highland grazing areas, action with relation to common property resources is difficult.

Limited experiments to encourage the propagation of desirable native grasses in walled fields were unsuccessful as have similar experiments by previous development projects. A problem seems to be uncoordinated collection of seed from wild plants. Effective control of access to such fields is difficult. A new practice that may gain wider acceptance is the storage of plant residues and introduction of legume rotations to offer better food value forage for storage.

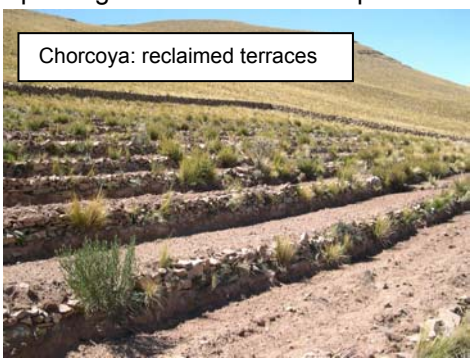
7. Small projects for households with few resources

Many of the poorest households have access to little or no land for cultivation. Most will have a few sheep or goats that graze common property but land on which crops can be grown is scarce. An important issue is the nature of the extra resources that might be encountered and the ability of the deprived households to make use of them. LPs encouraged discussion about this with community leaders, particularly in Tojo where several areas are little used and some land has been effectively abandoned by owners who live in Argentina or Santa Cruz. Giving access to such land to others is seen as risky, in the event that their owners may return. Kinsfolk of migrants may also seek to protect the rights of absent owners. As part of

the actions intended to offer benefits to some of the poorer households LPs discussed with a number of community members ways in which small projects might be generated by community groups that could benefit some of the poorer people. Three projects have been initiated and, in the relatively short time available for their development, two of them are showing some signs of success.

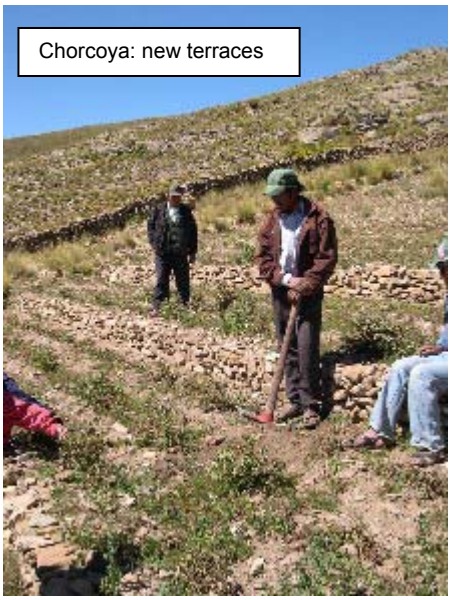
7.1 Rehabilitation of prehistoric terraces

A prolonged visit to an area of prehistoric terracing on the fringes of the hills overlooking the basin of Chorcoya during the Mid-Term Review visit of Michael Stocking led him to suggest that a small group of terraces might be reclaimed for cultivation. The locality group within whose land the terraces lay enthusiastically endorsed the idea and developed a formal proposal to such action. In fact, it is probable that some of the terraces have been cultivated during the last century and the remains of an ancient water channel can be detected adjacent to the terraces. By April 2003 the area had been walled and the terraces cleared for cultivation in late 2003 (see picture).



Chorcoya: reclaimed terraces

The potential of such action in encouraging other farmers to imitate or modify such actions is shown by the independent action of one farmer of the group who decided to create similar terraces in a walled field that he had been using for protected grazing on a hillside opposite the reclaimed terraces. He constructed the terraces in time to plant potatoes in early 2003 and harvested the first plants to demonstrate to LPs the results of his experiment.



Chorcoya: new terraces

The walled area surrounding the reclaimed terraces includes a wide border in which native trees (Queñua and Kishuara) have been planted with the intention of providing shelter for crops and possibly fuelwood and timber in the future.

Produce from the reclaimed terraces will be shared between the locality group and the tools purchased to aid the collection of stones and the building of the wall will similarly be accessible to all group members. The community has asked that we assist them in reclaiming other areas of prehistoric terraces.

A weakness of this project was that those constructing the dry stone walls were paid by this project and basic tools were purchased to aid clearing of old terrace fronts and preparing foundations of the field walls. The concept that the beneficiaries should in future recognise that the results of the work will justify the investment in preparation is clouded by the wish for further payments to cover the cost of the work. LPs justified the budget for payments by saying that this was customary with all development projects. Thus previous dubious practice makes it harder for subsequent projects to encourage community investment of time.

Several of the group who reclaimed the first prehistoric terraces are among the poorer in the community and group. It may be claimed that this sub-project will have some potential benefit for the poor.

7.2 Laying hens in pens, weaving baskets and selling eggs

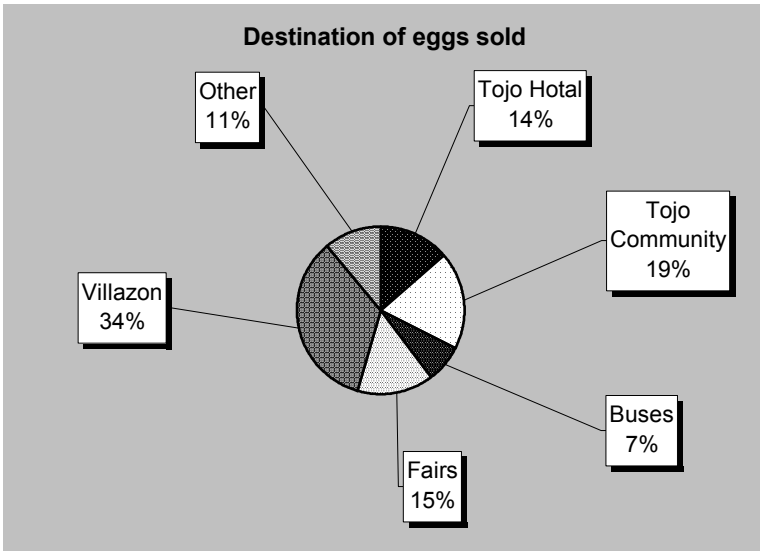
A second project originated from discussion with a women's group that was meeting regularly in Tojo and five of the twelve households represented had no land and few other resources. The project veterinarian suggested that they consider how they might manage laying hens, to

be kept in pens to control feed and egg collection. The community is on a road along which a small number of buses and lorries travel to and from the border with Argentina – 1-2 hours drive away. Vehicles customarily stop in the village for meals and passengers frequently buy local produce. Some women are accustomed to weave baskets from riverside reeds for festivals and fairs and it was proposed that eggs could be presented for sale ready-packed in such baskets. The group presented a formal proposal to LPs indicating their commitment to construct pens, and collect adequately nutritious feed. One hundred chickens (2 months old) were to be given to the group. Chicks from the fertilised eggs would subsequently be given to any other women wishing to join the group.

Chickens were distributed in June 2002 and eight months later 77 hens had survived (about 20 were killed by dogs or foxes) and large brown eggs (70-80 gms weight) were being plentifully produced. The group reported that a third of the eggs were consumed by the owners' household and two-thirds were sold, either locally or taken to Villazón on the frontier.

Table 7
Benefits of chicken project

Chickens		Eggs	
Delivered	*Survive*	*Eaten*	*Sold*
100	77	379	903



This sub-project seems to be successful, those taking part are satisfied with the outcome and there seems no hesitation in incorporating other women into the group. None had actually been incorporated at project end. In order to identify comparative benefits to those with most and least resources it would be desirable to obtain detailed feedback. There is no report of any difficulty in selling the eggs and the improved food intake for those eating more eggs would seem desirable. The success of this project is directly related to the existence of a dynamic women's group that included some of the younger poor women.

7.3 Goats for genetic improvement and for milk production

One part of the community of Juntas, Josepillo, lies across the river from the main community and has no irrigable land. A number of the poorest households in the community live there and relatively few of them actively participate in community activities. During the wet season the river is difficult to cross. There is ample grazing for the cattle, sheep and goats and some people from the central area of the community pay to graze their cattle on the hillsides. One household is experimenting with peach trees to see if they can be grown without irrigation.

After discussion with several households, seven of them proposed the formation of a formal group that would receive two males and five female Anglo-Nubian goats to be used to

improve the quality of the area's goats for milk and meat. The progeny would be shared between the group and pens for the goats would be built and they would be stall-fed for at least the first year. The goats were not provided until the pens had been built and some fodder crops planted to ensure adequate feed. The last of the goats were given to the group early in 2003. It is impossible to judge the likely result of this project until 2004 by which time the goats will have reached maturity.

A strength of this project is that it has engaged a group in preparatory work before receiving goats and that the area is one where adequate pasture exists. It involves a group of households all of whom are among the poorer in the community and in a locality that is usually ignored by development projects. A weakness is that the uses for the milk that may eventually be produced have not been fully discussed. Although, like the egg project the increased consumption of milk will be, in itself a benefit, particularly to poor households, further input of LP time will be needed to experiment with other uses for the milk.

8. Livestock disease control and quality improvement.

During participative workshops at the start of the project the range of diseases of common occurrence in each of the three communities were identified. The veterinarian was confident that many of the livestock would be carrying a considerable load of internal and external parasites. A consultation with senior staff at the University of Edinburgh, Centre for Tropical Veterinary Medicine confirmed this as a reasonable assumption. In most communities status is associated with numbers of livestock. Since almost all households had some livestock, a general improvement in health of all animals would affect all households positively.

8.1 Parasite control, diagnosis and treatment

The most intensive work with livestock throughout the period of the project has focussed on control of internal and external parasites. Following preliminary workshops, simple leaflets were circulated that explained the problems and remedial strategies. De-worming by injection was preferred. In the first campaign, domestic pets were also de-wormed and de-worming of school children was encouraged and carried out with the help of the municipal nurse. No data were collected concerning the extent of the children's programme.

Work was undertaken with small groups of livestock keepers, frequently women since small animals (sheep and goats) are most numerous and cared for by women. Techniques of intravenous and intra-muscular injections were demonstrated and disposable syringes were distributed. Following instruction, most de-worming was carried out by livestock keepers. Data on a household by household basis were collected and reports on de-worming were made at community meetings. Data on actions are therefore approximate. In the highland community, Chorcoya, with large numbers of sheep, some farmers with large numbers of sheep preferred to use sheep dips, which in part accounts for their low de-worming rate.

Faecal samples were collected from a small number of livestock keepers in all communities to track parasite loads and to identify particularly important parasites. Samples were sent for analysis at the main government veterinary laboratory in Santa Cruz. In successive campaigns, the proportion of animals injected by project staff decreased as local confidence in the treatment grew. An attempt was made to encourage the veterinarian to urge a different de-worming product each year, in order to reduce the danger of resistance to Ivermectin (the preferred treatment), but with limited success. Livestock keepers too wanted to continue to use the chemical that had showed good results.

Table 8 below show, for one community, data from our livestock database that indicate a high level of de-worming and records of parasite loads and species identified in laboratory tests. Differences in livestock owned and treated occasionally revealed an initial under-enumeration.

Table 8
Chorcoya: livestock de-worming

Owner	Number of animals		De-wormed		Faecal samples, sheep			Faecal samples, cattle		
	Cattle	Sheep	Cattle	Sheep	N|	Test	Results	N|	Test	Results
Santiago Galean	6	300	12	280	3	H,P	+Anap.+Sb	1	P	+ Pul.
Nicolas Aramayo	0	300	0	280	2	P	+Sb	-	-	-
Felipe Colque	7	200	7	200	-	-		-	-	-
Severiano Farfan	18	230	18	200	1	P	+Sb	1	-	+Sb
Gumercindo Jurado	4	150	4	150	1	P	+Sb	-	-	-
Gabino Colque	6	180	4	150	1	P	+Sb	-	-	-
Apolinar Colque	5	300	5	200	-	-	-	-	-	-
Paulina Colque	1	105	1	100	1	P	+Sb	-	-	-
Maria Aramayo	0	200	0	150	1	P	-	-	-	-
Clemente Aban	8	350	8	300	1	P	+Sb	1	-	+ Pul.
Daniel Aban	0	84	0	84	1	P	+Sb	-	-	-
Juan Aban	0	180	0	100	1	P	+Sb	-	-	-
Alejandro Sanchez	0	300	0	200	-	-	-	-	-	-
Lucia Aramayo	0	290	0	200	1	P	-	-	-	-
Juan Armella	15	950	12	300	1	P	-	1	-	+Sb +Pul.
Pedro Armella	14	200	10	200	1	P	-	-	-	-
Amado Jurado	0	390	0	350	1	P	+Sb	-	-	-
Juana Condori	2	350	2	300	1	P	+Sm	-	-	-
Valentina Sanchez	0	100	0	100	1	P	+Sb	-	-	-
Justino Condori	1	200	1	200	1	P	-	-	-	-
Sinforoso Condori	0	300	0	200	1	P	+Sb	-	-	-
Remberto Galean	0	150	0	150	1	P	+Sm	-	-	-
Angel Sanchez	0	390	0	300	1	P	-	-	-	-
Valentin Galean	5	240	5	240	1	H	+Hist/Neum	-	-	-
Remigio Condori	0	180	0	180	1	P	+Sb	-	-	-
Adrian Galean	1	20	1	20	1	P	-	-	-	-
Juan Condori	0	100	0	80	-	-	-	-	-	-
Ivar Galean	1	80	1	80	1	P	+Sb	-	-	-
Florencia Armella	0	240	0	200	-	-	-	-	-	-
Julio Sanchez	26	350	25	350	-	-	+Sm	1	P	+Sb +Pul.
Tomas Condori	10	300	11	300	1	P	+Sm	1	P	+ Sb +Pul.
Jose Sanchez	0	110	0	100	1	P	-	-	-	-
Sandro Condori	5	150	5	100	1	P	-	-	-	-
Pablo Condori	10	130	10	100	1	P	-	1	P	+ Sb +Pul.
Adolfo Sanchez	0	130	0	120	1	P	-	-	-	-
Vicente Sanchez	1	50	1	50	-	-	-	-	-	-
Savas Condori	10	300	12	300	-	-	-	1	P	+ Sb +Pul.
Pascual Sanchez	8	215	11	215	1	P	+Sb	-	-	-
German Sanchez	0	50	0	50	-	-	-	-	-	-
Vivian Sanchez +	3	180	3	180	-	-	-	-	-	-
Anacleto Sanchez	6	300	6	200	-	-	-	-	-	-
Marcusa Sanchez	2	200	2	200	1	P	-	-	-	-
Rosaura Aramayo	6	280	6	280	1	P	+Sm	-	-	-
Lino Condori	20	700	50	300	1	P	+Sm	1	P	+ Sb +Pul.
Luis Delgado	6	350	7	300	1	P	+Sb	-	-	-
Facundo Aramayo	6	230	7	23	1	H	+ Hist./Neum.	-	-	-
Daniel Aramayo	1	43	1	43	-	-	-	-	-	-
Martin Aramayo	1	60	3	60	-	-	-	-	-	-
Pedro Tolaba	3	500	2	400	1	P	+SB	-	-	-
Remigio Tolaba	0	150	0	150	-	-	-	-	-	-
Nicolaza Galean	3	200	3	200	1	P	+Sm	-	-	-
Ermelindo Jurado	6	500	6	500	1	P	+Sb	-	-	-
Teofilo Armella	6	300	6	300	1	P	+Sb	-	-	-
Teofilo Condori	1	210	1	210	-	-	-	-	-	-
Berna Condori	7	100	7	100	-	-	-	-	-	-
Candido Condori	14	265	14	200	1	H	+ Hist./Neum.	1	P	+Sb +Pul.
Francisco Sanchez	23	1018	23	500	1	H	+ Hist./Neum.	1	P	+Sb +Pul.
Reinaldo Condori	2	230	2	230	1	H	+ Hist./Neum.	-	-	-
Santiago Sanchez	13	331	13	330	-	-	-	-	-	-
T O T A L	293	14991	318	7641	45			11		

Date of sample: Sheep: Nov/01, Cattle: Apr./02
Anap.=Anaplasmosis Sb=Strongylus low infestation Sm=Strongylus moderate inf.
Hisp.=Proceso histopatológico Neum.=Pneumonía

In order to test the extent to which the de-working programme was benefiting households with fewest livestock the reported uptake of de-worming was tabulated by number of livestock owned. The result of this analysis is shown in Table 9 below

Table 9
De-worming rates by size of flock, 2002

Community	*Livestock*	*Percentage de-wormed*
Juntas	Cattle, all	71.0
	Cattle, less than 15	56.9
	Goats, all	78.9
	Goats, less than 50	54.2
Chorcoya	Sheep, all	73.4
	Sheep, less than 200	92.3
	Sheep, less than 100	100
	Sheep, more than 200	54.5
Tacuarita	Sheep, all	70.9
	Sheep, less than 35	96.7
	Cattle, all	88
	Cattle, less than 15	97.1

No clear conclusions can be drawn from these data about the relationship between size of flock and proportion of them de-wormed. In Tacuarita those with less than 15 cattle had de-wormed a larger proportion of their animals than community mean and those with fewest sheep had also de-wormed a larger proportion than the mean. Although data for Chorcoya are distorted by some of those with most sheep preferring to use dips, still treatment rates were highest for those with the smallest flocks. Juntas showed a different pattern than other communities: those with most cattle de-wormed a larger proportion of their animals than those with fewest and with goats the same was true.

8.2 Evaluation of results

All communities reported satisfaction at the results of de-worming. They commented in community meetings that animals had put on more weight and mortality during the dry season was less than previously. Debate in community meetings regarding future campaigns was largely concerning obtaining de-worming fluid than whether de-worming should continue.

Table 8
Estimated mortality decreases after de-worming

Community	Animals	Pre-project mortality %	2003 est. mortality %
Chorcoya	Sheep	70	10
	Cattle	30	5
Juntas	Cattle	60	10
	Sheep	40	20
	Goats	10	5
	Pigs	50	5
Tojo	Sheep	20	5
	Goats	10	5

Source: Estimates based on random interviews

Community collective evaluation of the success of parasite control is uniformly positive. This is true for communities for which livestock are the main element in livelihood strategies – such as Tojo - and for others where they are only one of multiple elements, such as Tojo or Atacama. The sustainability of the work will be tested when communities pay the whole rather than a part of the cost of treatment. Owners of large flocks readily requested and paid for the LPs to bring de-worming fluid from Tarija and the veterinarian told them where it could most economically be purchased. Collective action to purchase fluid in large quantities, which

would lower the cost per animal, is desirable but LPs left this largely to each community although they were successful in initiating community debate on this.

8.3 Identification and treatment of other diseases

In the initial workshops a series of diseases were identified as most seriously affecting livestock. Some leaflets were prepared to help livestock owners identify some of these diseases and an indication of appropriate medication was given. As a result, some people have bought and successfully applied the recommended medication. In Juntas, some of whose cattle go on the hoof to the eastern hillsides in the sub-tropical forest during the dry season - May until October, haematuria (known locally as blood in the urine) affected a number of cattle on their return to the valleys. No treatment was effective and slaughter was usually necessary. Some research has been carried out, including by Cuban veterinarians, and it is believed to be caused by eating young bracken. Two common diseases, *Oestrosis ovina* (Nose fly) and *Haematobia irritans* (Horn fly), affect livestock and the veterinarian was regularly asked to diagnose these and was able to offer effective treatment. A number of livestock keepers also commented on the presence of muyu-muyu (*coenurosis*).

Two other disease are common but no research has been carried out to diagnose the cause and exact nature of the disease – rupa rupa and mal de boje. Rupa rupa is manifested by spontaneous abortion believed to be caused by eating insect larvae; mal de boje is thought to be a form of pneumonia.

Foot and Mouth Disease is of considerable political importance and Bolivia is under pressure from Argentina to eradicate or at least control Foot and Mouth Disease in order for the important Argentina livestock industry to remain notionally free of that disease. It is not common in the areas in which we work nor is it believed to threaten livelihoods. Bolivian government campaigns are managed informally through NGOs or teams already working in livestock areas. Our LPs were forcefully requested to collaborate but livestock keepers had to pay for the vaccination and no payment was offered the team veterinarian.

From our work in Tarija communities it is clear that more basic research is needed to diagnose and devise effective treatment for a range of diseases that affect all farmers.

8.4 Genetic improvement using local resources

The veterinarian was convinced that an important issue in all communities was the introduction of new genetic resources to reduce potential problems of in-breeding. To this end, she started to encourage farmers to exchange male animals between different communities in order to introduce new blood lines. Considerable difficulties were experienced in convincing farmers that such exchanges were likely to be equitable. There is interest in introducing better quality breeding males to improve wool and carcase weight. Just as it was necessary to initiate discussions concerning regulating livestock numbers to see if pasture quality can be improved, so introducing the idea of acquiring new breeding stock on a regular basis is useful but can only be the start of a longer-term change. A priority for future research would be to estimate the importance of in-breeding in livestock in this area in order to establish the importance of the issue.

9. Helping the poorest

The research team shared a full commitment to ensuring that the beneficiaries of the work would include some of the poorest households in the communities with which we collaborated. This focus is unusual among rural development projects working in Tarija. When this was discussed at meetings of NGOs and GOs there was comment that what we were trying to achieve with poor households was unusual and there was apparent approval for this emphasis. Two major difficulties had to be overcome: one was to identify those who had fewest resources and establish a positive working relationship with them such that they believed that we were committed to help them improve their quality of life; the second was to identify the processes by which the community of which they are part marginalises them from community activities and is blind to their needs. A further problem is that axiomatically,

households with access to fewest resources have few animals and little or no land. Farming may therefore be only one of a wide range of activities that form their livelihood.

Since, of necessity, a research team coming from the city must establish links with community leaders, out of respect for their authority and in order to communicate effectively with the majority of the community, it is they whose voice is heard most loudly and frequently. This was most noticeable in Juntas which is distinctive in having a group of middle class households – including two retired teachers, a former estate manager and a former taxi-driver become politician – all of whom lived close to the village centre. There is also an estate producing grapes and making both wine and grape alcohol actively managed by the resident upper class wife of the owner. The community leaders were successful in persuading the LPs that the community comprised only those households living near the centre, thereby excluding households living across the river in a hilly area devoid of irrigation water. Only because Preston had worked in the community for some years previously and had detailed census enumerations of the whole community was it possible to try to include other households in the work. It is worthy of comment on the inscribed mementos of the project presented to Preston at final meetings: while those from Tojo and Chorcoya were inscribed as being from the community that from Juntas was from the 'Juntas Group'.

9.1 Identifying the poorest

Initially community leaders were invited to identify 3-4 households that were among the poorest in the community in the context that the work undertaken was intended to include all in the community, including those with fewest resources. These data were verified with other members of the community and these households were visited individually during the first six months of the project. During these visits, people were informed about the collaborative work that would be done with the community, their views on what best responded to their own needs were noted and an attempt was made to summarise the main elements in the livelihood strategy of these households. This work was reported in Morales (2001).

9.2 Making contact

Following the initial contacts with some of the poorer households, they were encouraged to attend workshops and find ways in which they might benefit from the new knowledge offered. It was recognised that they often had little time free to attend meetings that lasted for several hours. One mother always attended such meetings, sitting outside in order to sell drinks and snacks to those attending the meeting. Men working sometimes as day labourers could not afford the wage foregone to come to a meeting. Team members visited their homes regularly to chat and obtain their views on the project work. This afforded an opportunity for direct help – checking on a sow that was giving birth, looking at a sheep that appeared sick etc. – and further understanding their livelihood in such a way as to see how they might best be incorporated in community actions. It was evident that there were many aspects of poverty that could not be helped simply by improving productivity in their use of natural resources. Many households included single mothers with children from different fathers, and male alcoholism and sometimes domestic violence was commonplace. During the course of the visits, contact was made with other households with few resources and this enabled continual revision of our view of those whose livelihoods were most precarious in each of the communities.

9.3 Consulting the resource-poor and identifying marginalisation processes

It was felt necessary to formally consult with groups of households that were amongst the poorest in order to try to identify what they felt were the principal components of poverty and marginalisation. This follows some of the work carried out for a recent World Development Report which communicated well some of the views of poor people (Narayan 2000) and a review of views on poverty by scholars from different disciplines (Preston 2003).

A consultant psychiatrist visited one community to spend time with individuals and groups of people with few resources and to discuss with them individually and in groups what being poor meant, in particular with respect to being looked down on by others in the community

(Romero 2002). This work used a skilled professional from outside the LP team to investigate in greater depth the self-perception of such people and the sorts of barriers that might exist to prevent them benefiting from the collaborative work. The report identified categories of people who felt marginalised (for example older widows) and some of the handicaps that such people face. One young man imaginatively described 'not daring to dream' of a better life (Ibid. 19). Changes in attitudes in all social strata in the community are a necessary pre-condition to initiate change.

9.4 Community attitudes and support for the poor

Following the consultation carried out in one community (Juntas), the results of the report were reported to a meeting of the community. The purpose was to initiate a debate on the particular situation of the poor in that community and whether the community could take any action to help such people. It is paradox that there is widespread recognition in any of the communities with which we work that poverty exists and of the circumstances of those households that can be so categorised and yet no examples of positive action to respond to the needs of such people were given. There is also a variety of individual responses to the causes of such poverty – from those who believe that one is born poor, to others who believe that it the result of individual inadequacy. In group discussions it is frequently difficult to get beyond very broad generalisations with regard to remediation.

A summary of this report was presented at a community meeting and led to a lively discussion about how to encourage more widespread recognition of the ways in which the community itself needs to act to reduce social exclusion. However, some of the most personal comments, supportive of the approach, were made to the LPs after the meeting, indicating both the depth of feeling and the difficulty of listening to those with fewest resources other than in a more separate context. Individuals came to talk about their personal situation and the difficulty in finding solutions to problems. An important conclusion, related to the aims of this research is that natural resources issues cannot be considered apart from the range of factors that influence the livelihood of any person or household.

An issue faced by several of the poorest households in Tojo was the absence of land for cultivation. Several small areas of cultivable land, although several of them suffered from salt accumulations were unused. The LPs asked community leaders to consider whether such land could be leased or given to some of those who had no land. The response was negative and the reasons were the danger that a legal owner might appear (or re-appear since they might live elsewhere) and reclaim the land or simply that they had no confidence that such people would make good use of it. For such a remedy to be seriously considered by the community either a compliant landowner willing to lease has to be found, or a long-term process started of finding legally-acceptable ways for unused land to be given to those in need.

Since work with the poorest households was embedded in the programme of collaborative community action, no explicit community view can be reported for these actions. At a personal level there was respect for efforts to listen and work with poorer people. Juntas community meetings were never reported as having included issues relating particularly to the poor. By contrast, Tojo did discuss problems such as alcoholism which is often linked to low self-esteem and poverty. Even so Tojo was unwilling to take action to allow some of those with no land access to unused areas. For communities to confront ways in which they can confront their own internal socio-economic inequalities considerable preparation and consciousness-raising is necessary which is customarily felt to be beyond the remit of natural resource-focussed activity.

The work done with the poorest members of the communities may have some medium-term impact on the households involved. Since many of the issues related to poverty are community-based – principally social exclusion – this work has been but a small step along a long road.

10. NGOs

The methods of working with our NGO partners have been described in section 1 of this report. In this section we report the conclusions of our work with them and the probable longer-term influence of this research.

10.1 PROMETA

The good working relationship with PROMETA has resulted in their commitment to the sort of work with communities that LPs established being continued in some form in the future. However PROMETA is dependent on funding to continue its work and a new source of funding would be necessary. The most promising path would be placing more emphasis on demonstrating the efficacy of environmentally friendly farming methods in order to encourage a more widespread use of such methods. The strengthening and broadening of links between communities and LPs is more logically dependent on creating appropriate means for this to be achieved at a municipal level.

10.2 Radio Tarija-ACLO

The use of Radio Tarija was undoubtedly successful in reaching the communities in which collaboration was being developed as well as other communities throughout the region. This is surely a method by which communities with a position proactive leadership can be identified. It has not been customary for NGOs to use the radio other than for messages announcing or cancelling meetings. It has been possible to demonstrate to the range of organisations that work in rural areas that radio programmes are an effective way of reporting work and involving rural people in stimulating further debate about important issues.

11. Other meso-level organisations

Two organisations are important in linking rural communities and their members to the rest of Bolivia at a regional level, the peasant unions and the municipalities. Both have, in different places and times, shown how they can act as stimulants to social and economic progress. Equally there are many communities in which neither the peasant union nor the municipality plays such a role.

11.1 Peasant unions, communities and progress

Bolivia has one longstanding and political powerful rural institution – the peasant union. It was established as part of the 1952 Revolution and land reform throughout the highlands and valleys. In the communities with which we collaborated, the monthly community meeting also served as the meeting of the peasant union (*sindicato)*. Reports on workshops and plans for future meetings were always discussed, as were other similar activities, at such meetings. The next level of the hierarchy of unions is the *sub-central*, to whose meetings come representatives of 15-20 communities: they hear reports from sub-central leaders on national and regional union activity and discuss matters of common concern. Few NGOs use the sub-central as a means of communicating simultaneously with all the *sindicatos* in one area and only limited use has been made in Tarija of *sub-centrales* as intermediate organisations that can play a positive role in stimulating positive economic and environmental change. A focus on sub-regional groupings – which *sub-centrales* are – is unusual. Discussions about the *sindicatos* actively stimulating actions to meet community needs were held at two successive meetings of the sub-central for the Río San Juan communities but active co-operation was difficult to achieve. Delegates agreed to report back to their communities and return at the next meeting to report on the attitude of their community. It appeared that few of the delegates reported back in any way, and none generated a local debate the conclusions from which were reported. This is principally because communities are not accustomed to being consulted and asked to generate their own wish-list for changes or problems that need to be overcome. They are more used to professionals arriving with their own list of actions than seeking an open discussion about community needs.

11.2 Municipalities of Yunchará and Uriondo (Concepción)

In the past decade, municipalities have been given both more power and a budget that can allow them to assist in realising at least some of the aspirations of their inhabitants. The chief executive officer of a municipality is the Mayor. He/she is elected and candidates are selected by political parties. Some municipalities have an excellent record in helping the development of projects for the benefit of the population, and of obtaining further external funding. There is no cadre of professional public servants (even though such people now exist at national government level) and appointments to most posts in the mayor's office are political. Unless the same party remains in power for several terms, there is limited opportunity for the accumulation of experience by officeholders who change after each election. Contracts for work and for relevant fact-finding are awarded as much on the basis of friendship and political affiliation as the probability that the work will be well done. Even so, the municipality does have a development function and it links with the departmental government and through that can participate in concerted actions. It was for this reason that LPs met mayors and other municipal officials on various occasions, at fairs, and occasionally formal regional meetings and sought to inform them of the project activities at a community level.

Each municipality has to present an Annual Operation Plan (POA) that must reflect the priorities expressed by communities in the municipality. Research to determine what communities want is carried out by social scientists working for regional NGOs and the reports are public documents. Nevertheless they are not necessarily the principal basis on which investment decisions are made (Hinojosa 2003). Infrastructural works far outnumber productive projects since they are both more visible and more rapidly completed. Thus new school buildings (with the mayor's name on a plaque on the wall recording his wise act in proposing it) are more common than school gardens or a project providing better quality breeding stock. Technical staff work for the mayor for short periods, usually linked to specific projects. Support staff are mostly for secretarial, accounting and planning work. But some do appoint technical staff whose role is to establish links with the rural communities and our LPs were invited to accompany a municipal professional in the field in order to discuss our methods of engagement with communities.

Meetings are held by the municipality to which representatives of all communities are invited. Vehicles are even sent to collect some from particularly distant communities but not all communities send representatives. Even so community leaders do request assistance from the municipality to satisfy local needs but there is no clearly recognised way in which such requests are received and processed. Municipal responses do not even necessarily take account of the priorities in the POA (Hinojosa 2003). The absence of a cadre of LPs working for the municipality limits its potential for linking communities with LPs.

We believe that potential does exist for both peasant unions and municipalities to be used as administrative organisations in touch with communities in different ways that can assist in meeting their development needs. Discussions both with municipal staff and with leaders of peasant unions have suggested that this potential is recognised but, in the absence of prior experience of such a role a stimulant, such as a policy initiative from national government, experimenting with such actions is unlikely.

12. Outreach activities

Two categories of outreach activities were undertaken to inform people over a wider area of the project activities with collaborating communities: radio broadcasts, participation in regional and community fairs. The content of broadcasts was indicated in Section 1 and their role in informing people and communities over a wider area has already been outlined.

Fairs are an important part of rural life in Tarija. Some are of very ancient origin and were places for the exchange of produce between people from different ecological zones. Those from the highlands brought meat, skins and wool (and even salt from the salt lakes far to the west) that were exchanged with fruit and maize from the valleys. The fairs always included stands that displayed information about development activities of NGOs and other agencies and where produce and handicrafts were displayed. Stand organisers would be asked to sponsor prizes for dancing, singing and sporting events and expected to talk on loudspeakers

about their work. LPs were expected to take part by our participating communities – alongside community members - and it provided a further way of presenting the work and meeting interested people from communities from more distant areas. The mayor of the municipality would usually be present and this was a further opportunity to exchange views with him and for him to observe the inter-action between rural people and LPs.

Local fairs were held by many communities – Tojo held a fruit fair, Chorcoya a sheep fair and Juntas a cheese fair. These were smaller-scale events than regional fairs but with the same range of activities and, in the same way, served as a showcase for work in progress. Our participation was demanded by the communities and in some ways it was their opportunity to display our work with them from which they and we derived prestige.

Meetings held in Tarija with other NGOs and to mark the start and finish of the project attracted radio and press coverage.