odi
Agricultural Research & Extension Network

AgREN

Network Paper No.138

July 2004

CINDERELLA'S SLIPPER: *SONDEO* SURVEYS AND TECHNOLOGY FAIRS FOR GAUGING DEMAND

Jeffery Bentley, Graham Thiele, Rolando Oros and Claudio Velasco

Abstract

Bolivia now has a large set of almost-ready technologies, which were developed under projects funded by the UK Department for International Development (DFID). Completing the technologies involves systematically gauging demand for them from farmers and other potential users, in an honest way that does not simply rubber-stamp the existing research programme. This is the main task of the INNOVA project (Strengthening technology innovation systems in potato-based agriculture in Bolivia) whose staff coined the notion of 'implicit demand' for the unspoken demand for research topics from smallholder communities. Project personnel adapted the sondeo *(informal survey) method to learn about pilot communities in three regions and their explicit demands. They also created a new method, the 'technology fair', to present almost-ready technology to smallholders and get feedback from them. The technology fairs confirmed that INNOVA's technology did meet many demands for research, and together with the* sondeos *improved understanding of demand. However, it was found that smallholder farmers did not necessarily respond to the technology that most closely addressed their explicit demands as identified in the sondeos but rather to the one that was most convincingly presented.*

Research Findings

- *Smallholder farmers may make explicit demands for research, i.e. well articulated requests posed and validated in town or village meetings.*
- *It is difficult for many people, including poor farmers, to define all the new technology they need before they have seen it, either because they do not perfectly understand the agricultural problem (nematodes being the now shop-worn example) or because they cannot imagine all the possible solutions. The demand for such technology is 'implicit'.*
- *The* sondeo *can be given new life as a way of eliciting the explicit demands of family farmers. We may yet be able to use it to gauge implicit demands.*
- *The technology fair (described in this paper) is a promising method for seeing how poor farm families respond to new crops and varieties, cultivation techniques and machines.*
- *Adequately capturing demand requires combining a range of methods like sondeos and fairs and moving from the notion of capturing demand as an event to an on-going interactive process.*

Policy Implications

- *Research and Development funding for family farms should support at least some research for new technology that smallholder farmers have not explicitly requested, where evidence of implicit demand exists. But technology of this sort should rapidly be exposed to farmers to ensure that the implicit demand really exists.*
- *Competitively-funded systems such as the Bolivian Agricultural Technology System (SIBTA) need to incorporate more nuanced concepts of demand and move from a concept of capturing demand as an event to a process.*
- *Many technologies developed under a more 'supply-driven' agenda turned out to respond to farmers' demands. Throwing away these technologies and starting over from scratch, as some demand-led critics suggested, would have wasted a lot of potentially good technology.*

Contact details

Jeffery Bentley is an agricultural anthropologist and international consultant. He can be contacted at: Casilla 2695, Cochabamba, BOLIVIA. *Email*: Bentley@albatros.cnb.net
Graham Thiele is a social anthropologist at CIP, with the Papa Andina project. He can be contacted at: Apartado 17 21 1977, Quito, ECUADOR. *Email*: g.thiele@cgiar.org
Rolando Oros is an agronomist at the PROINPA Foundation, and editor of the *Revista de Agricultura*. His address is Casilla 4285, Cochabamba, BOLIVIA. *Email*: roros@proinpa.org
Claudio Velasco is an agronomist and the coordinator of the INNOVA project. He can be contacted at: Casilla 4285, Cochabamba, BOLIVIA. *Email*:cvelasco@proinpa.org

The Agricultural Research and Extension Network is sponsored by the UK Department for International Development (DFID)
The opinions expressed in this paper do not necessarily reflect those of DFID.

Network Coordinator: Robert Tripp   Administrative Editor: Alana Coyle

ISBN 0 85003 722 0

Acknowledgements

It would be difficult to thank everyone who contributed to this paper, including the co-authors of the *sondeo* reports, and the dozens of people who worked on the technology fairs. However, the article would not have been possible without Rubén Botello, Raúl Esprella, Ernesto Montellano, Félix Rodríguez, Salomón Pérez, Juan Villarroel and Steve Eguino for their consistent and valuable efforts to make the *sondeo*s and the fairs a success. We gratefully acknowledge the support of the communities of Pomposillo, Qolqe Qhoya and Verdecillos, and the municipal authorities of Umala, Tiraque and Comarapa. We are grateful for the support of the leaders and advisers of the INNOVA project, including André Devaux, Morag Webb, Karen Wilken and Simon Anderson. INNOVA is managed by the International Potato Center (CIP) and is financed by the UK Department for International Development (DFID), through the Crop Protection, Post-Harvest and Livestock Production programme's project number R 8182. Many thanks to Rob Tripp, Doug Horton and Kerry Albright for their comments on a previous version. The opinions expressed here are not necessarily those of DFID.

CONTENTS

Tables and figures

Acronyms

ATICA	Smallholder Water and Land Programme
CIAL	Local Agricultural Research Committee
CIAT	Centre for Tropical Agricultural Research, Santa Cruz, Bolivia (not to be confused with the CGIAR centre based in Colombia)
CIMMYT	International Maize and Wheat Improvement Center, Mexico
CIP	International Potato Center, Peru
DFID	Department for International Development, UK
INNOVA	Strengthening Technology Innovation Systems in Potato-based Agriculture in Bolivia
PRA	Participatory Rural Appraisal
PROINPA	Foundation for Promotion and Research of Andean Products
PROMETA	Animal Traction Improvement Project
PROMMASEL	Sustainable Management of Weeds on Hillsides Project
SDC	Swiss Agency for Development and Cooperation
SEFO	Forage Seed Company
SIBTA	Bolivian Agricultural Technology System/*Sistema Boliviano de Tecnología Agropecuaria*
UMSS	Greater University of San Simón, Cochabamba

CINDERELLA'S SLIPPER: *SONDEO* SURVEYS AND TECHNOLOGY FAIRS FOR GAUGING DEMAND

1 INTRODUCTION

Demand[1] for new technology

Scientists are no longer encouraged to study new technology just because they find it promising. New technology must be 'demand-led' (Almekinders, 2000; Bellon, 2001; Biggs and Smith, 2002; Thiele et al., 2001; Tripp, 2001).

In 2001, Bolivian agricultural scientists had many technologies almost ready to extend. These were the fruits of several earlier projects funded by DFID in areas where farming was centred on potato growing. However, the establishment in the previous year of the Bolivian Agricultural Technology System (SIBTA), to replace the Bolivian Institute of Agricultural Technology (IBTA) which had been disbanded in 1998, presented the scientists with some problems.

SIBTA is an ambitious competitive funding organisation, following similar models established elsewhere in Latin America and a newly emerging paradigm for agricultural research (Byerlee, 1998). It attempts to fund public-sector agricultural research by competitive bidding, seeks to improve the accountability and relevance of agricultural research, and insists that all calls for research and funding come from farmers, in written petitions, preferably from organised groups (cooperatives, farm unions, indigenous organisations, etc.).[2] In this competitive demand-led context it was suggested that technologies researchers had already developed should be abandoned and a fresh start made, by collecting demand from smallholder farmers.

The SIBTA proposal to base research on farmer demand has many merits, but it raises two major and related concerns:

- first, capturing farmer demand may not be as simple as SIBTA's architects suppose;
- second, what should be done with research that is already underway and in which a considerable amount has already been invested?

While it is good to start research by determining farmer demand, this requires a more profound interaction with farmers than a petition or canvassing a community in a group meeting.[3] Besides, the scientists who had worked on projects before SIBTA insisted that their nearly completed technologies *had* been designed in response to smallholder demand. Finally, after much heated discussion, the researchers and various colleagues (including the authors) developed the INNOVA project to gauge and respond to farmer demand, even for technology that *already existed*. INNOVA works with three partner organisations which were involved in projects from before SIBTA[4]: the PROINPA Foundation (a private agricultural research institution, which evolved out of a project funded by the Swiss Agency for Development and Cooperation (SDC) with the Bolivian Ministry of Agriculture); UMSS (the Greater University of San Simón, Cochabamba, which includes an agricultural college); and CIAT (the Centre for Tropical Agricultural Research, Santa Cruz, a public agricultural R&D institution affiliated with the prefecture of Santa Cruz Department). Interaction with farmers to test ideas and responses to existing technologies was planned in pilot areas in the departments of La Paz, Cochabamba and Santa Cruz.

How we assess farmers' demands and then provide useful interaction that allows these demands to be elaborated and meshed with research knowledge is a continual problem. *Sondeo*s (which will be explained in Section 2), public meetings with farm communities, formal petitions for research and other methods can help to define the farmers' explicit demands. On the researchers' side, we need some way of making sure that their ideas respond to the reality of farmers' priorities and knowledge as quickly as possible. One innovation for doing that is the technology fair, which we describe later in this paper.

Explicit and implicit demand

At first glance, finding the demand for an existing technology is a bit like looking for Cinderella when one has only the glass slipper. One seems to have things backwards. We introduced the notion of 'implicit demand' to suggest that there might be demand for a technology, even though farmers had not expressed it.

Problems are defined as constraints to agricultural or livestock production, storage, processing or marketing. A demand (for research) is the need for a solution to a problem.

Explicit demand by a farmer for research is defined as a real need for practical, novel, technical solutions to constraints to agricultural production. One way to gather demand is to hold community meetings and ask people what they want from agricultural development institutions. Explicit demands are those which farmers articulate. Smallholders tend to say they want things like:

- higher yields;
- better prices for their products;
- control of specific pests, preferably with pesticides, e.g. a spray for Andean potato weevils;
- subsidies for purchases such as fertilisers;
- irrigation systems.

These are kinds of explicit demands, and they deserve to be taken into account.

Implicit demand is demand for research which smallholder farmers do not articulate when asked, either because they are unaware of the problem, or they confuse the causal agent with something else. This is especially common with pests that are difficult to observe. For example, Bolivian farmers know that their native potato varieties are often low-yielding but they do not generally know that this is because viruses have gradually built up in their crops. In this case, the farmers' explicit demand is for a higher-yielding potato crop with larger tubers, while the implicit demand is for a technique to clean the potatoes of viruses. Bolivian agronomists have a technique for removing viruses from native varieties in laboratories, by rearing the potatoes *in vitro* (Iriarte et al., 2000).

People often ask for chemical control of pests, sometimes because they cannot imagine alternative controls. They do not ask for the control of pests with parasitic wasps if they do not know they exist. Smallholders realise they have problems with frosts, but may not know that frost-resistant crop varieties are available. Perhaps all social groups are like that, not just smallholder farmers: many computer users could not imagine digital photographs but when they saw them, they adopted them. In the same vein, many smallholders do not ask for new machinery until they see a prototype. This demand is implicit. We define implicit demand as:

> *A research need that people do not ask for, but which they recognise if it is explained or shown to them in an appropriate way. Implicit demand is not simply the researcher's favourite topic; rather it must be identified by researchers, on the basis of local problems. Implicit demand must be reconfirmed by the community, in collaboration with researchers. When implicit demands are correctly identified, they become explicit.*

Explicit demand is often vaguely expressed, e.g. farmers may say their soil is 'tired'. However, they are sometimes quite specific, as in the case of pests, where the method and level of control are often specified, e.g. 'What can we spray to get rid of potato tuber moth?'

The problem with using agricultural researchers to identify implicit demands is that the researchers like to find demand for solutions they just happen to have, especially if the thing took years to develop. In this they resemble the prince who already has Cinderella's slipper in his pocket, and will do anything to get a foot into it. However, in order to spot an implicit demand, one must be an expert, or at least have a certain amount of expertise in a specific topic (e.g. nematodes). One way of resolving the problem is to use a team of people of different disciplines, to check from various angles to see if the implicit demand has a foundation, or if it is just one of the researchers' favourite topics. We decided to use the *sondeo* (or informal survey).

Farmers may reject a technology because, although it aims to resolve a problem, it fails to meet a demand,[5] e.g. because the farmers cannot afford it, or it is too tedious, or requires too much labour. For example, in Central America and elsewhere, cover crops seemed to respond to demands for weed control and increased soil fertility. Researchers slowly began to realise that in many cases these legume crops were not, for example, fixing as much nitrogen as agronomists originally expected (Anderson et al., 2001). Many of the farmers in Central America who tried cover crops have since abandoned them, because of the extra labour they require (Jeff Bentley, personal observation, Nicaragua 2003, Felipe Pilarte, personal communication).

2 METHODS

Sondeo

The *sondeo* has a long history, and was designed to understand smallholders' farming systems and find research opportunities. An inter-disciplinary team combining agricultural and social scientists spends some six days in the field, visiting various communities within a region, and working in pairs: walking the land, observing crops and talking to people. The *sondeo* team coins and tests hypotheses about the area. On the sixth day they write a report that is something like an agro-social inventory of a geographical area with recommendations for planning future research (Hildebrand and Ruano, 1982, Davies et al., 1994).

INNOVA's three pilot communities (one on the high plains of La Paz, one in the high valleys of Cochabamba and another in the low valleys of Santa Cruz), where the participatory trials would be planted, were places where the scientists had already worked for several years, with other projects. There are advantages in working in areas one already knows, e.g. the agronomists and some of the local people already know and trust each other (Bentley and Baker, 2002).

We modified the *sondeo* a little to meet our objective of writing a brief description of the agriculture of a community and to identify farmers' demands for research. We did each *sondeo* in two to three days, not in a week, and included some local people on the team. We presented the results to the local people in a public meeting, where they confirmed some conclusions and changed others.[6] We included our own observations, e.g. taking note of large erosion gullies, soil quality and the (lack of) forage and sometimes the presence of pests, but we based our work mostly on semi-structured interviews covering the following topics:

- crops, main and secondary;
- calendar, outlining main tasks and tools, and when labour shortages occur;
- pests, specifying main insect pests, diseases and weeds of major crops;
- animals, with emphasis on the most important;
- paid work, describing other sources of income, including labour migration;
- markets, saying what is bought and sold, where and when, and problems encountered;
- land, describing its quality and quantity, how it is used, and problems with soil and water.

Hildebrand's *sondeo* tries to identify the various social strata in the communities studied, and the different problems each stratum has. We would have liked to do something similar, to see who makes research demands and especially if the poorest people have different demands from their neighbours. Instead, we lumped all of local people's responses together, without trying to tease apart the differences between the poor and the very poor. (Follow up work by PROINPA later suggested that most people in the communities had similar research demands. Most of them were quite poor, and people with, say seven sheep faced the same problems as people with 30 sheep).

Each day the team divided into groups of two or three to conduct 20- to 30-minute interviews. We chatted with people in their fields or on their patios, either alone or in small family groups (e.g. husband and wife, niece and uncle, mother and son). Each team asked questions in their own words, devising supplementary questions as they went along. They ensured, however, that each interview touched on all the topics given above. In the evenings, we wrote down the answers on laptop computers, before arguing among ourselves over the conclusions (Bentley et al., 2002, 2003, Oros et al., 2002). The second day of each *sondeo* we modified the interviews a bit, to include better questions.

In interviews with large numbers of people, a group of influential people can dominate the others (Brown et al., 2002). The advantage of individual interviews is that, if 20 of them are carried out, 20 people talk, and the team can start to quantify the results, at least in a rudimentary way. For example, if we look at the results of discussions about potato pests on the *Altiplano* (the high plains) we clearly see that the problem most often identified by the respondents is weevil, with aphids worrying them much less (Table 1).

Our methods for hypothesising implicit demands improved with experience. By the third *sondeo* in Pomposillo, after presenting the results to the community and learning their explicit demands, the team members were able to sit down the following day in the PROINPA office in La Paz to discuss the implicit demands. We each proposed possible demands, then criticised each other's ideas, refining some and rejecting others. The method may still need improvement, but we hoped that the technology fair would be another, possibly better way of identifying implicit demand, especially for the technologies we already had. The idea was that, while the *sondeo* helps to see an area, talk to people about their problems and gather their demands, another method should be used to see and measure the farmers' reactions to new technologies. For this, we used the *encuentro tecnológico* (technology fair).

Table 1 Pests and other health problems in potato: *sondeo* Pomposillo, La Paz

Local names*	Technical names	No. of times mentioned
Ch'uqi laq'u, gusano blanco	Andean potato weevil	13
Qasawi, Llaja	*Thrips*, *Epitrix* (basically any small insect, especially if it is black and found on potato)	6
	Hail	5
	Drought	4
	Frost	4
Thutha, polilla	Moth (Gelechiidae)	2
K'uti k'uti, pulgón	Aphid	2
K'anasillu	Adult beetle, possibly Tenebrionidae	1

* The first name listed is Aymara and the second is Spanish, except for 'llaja' which is Quechua. Many thanks to Raúl Esprella for help with the Aymara terms.

Source: Bentley et al. (2003)

Technology Fair

To see smallholders' reactions to INNOVA technologies, we used a format a little like a field day, where several technologies are presented at once. We call it a technology fair (we coined the term *encuentro tecnológico* in Spanish). Preparations began several months beforehand.

- The scientists chose the communities, usually in places where they had worked for several years.
- They set up four or five trials in each community. Each trial was managed by one or two local people, who committed themselves to explaining the results to their neighbours. In this sense it was a bit like the CIAL, which are local committees, set up to identify agricultural problems, test solutions and report the results back to community members. The committees often work with a modest research fund, to buy materials. CIALS frequently test new crop varieties, but some of them try other technologies (Ashby et al., 2000). Unlike the CIAL, however, INNOVA had no local committee, and no local research fund. Also, the evaluation of the trial results was quantitative and statistical, usually with a random block design, so the scientists had to gather and analyse the data.
- The personnel of the institution working in the area (including thesis students and assistants), met with the community to plan the event, down to the order in which visitors would rotate through the trials and other demonstrations, the lunch, the welcoming and closing ceremonies, and even parking. This took two days or more.
- Up to 250 guests, from various communities, arrived on the morning of the technology fair, in transportation paid for by INNOVA.
- Technical people from the three partner organisations (CIAT, UMSS, PROINPA) attended, and helped manage each event.
- The participants registered, were issued name tags, and divided into groups.
- Each meeting opened with a welcoming ceremony from an official of the local municipality.
- People took buses or walked round a circuit of farm trials, two to four groups of 20–30 people each rotating through the trials and stands.
- Each technology was presented by someone who knew it well and could explain it with enthusiasm.

- The participants voted for the technologies they liked most.
- The technical staff administered a short questionnaire, to see which technologies the participating farmers wanted to try.
- Everyone ate a good lunch.
- A formal ceremony closed each meeting.

There were so many new technologies that trials or demonstrations could not be conducted for them all, so some were explained by the technical people at various stands. At each *encuentro* there were three to five trials to see. It doesn't sound like many, but it is, because the number of people involved meant spending a minimum of 30 minutes per trial, which, with five trials, easily accounted for two-and-a-half hours. At each fair we presented six to 16 technologies in stands, which made for quicker viewing: we set them up like booths around a football pitch, and people rotated from stand to stand every 10 minutes or less. But a stand cannot show a technology in the same detail as a demonstration or a field trial.

Each pilot area was coordinated by one institution, but they all tried several technologies in each area, not just those generated by their own institution. Table 2 lists the trials which INNOVA carried out during its first year in all three pilot areas.

3 GEOGRAPHY, FARMING SYSTEMS AND SOCIO-ECONOMIC STRATA

The *Altiplano*

This is one of the most extreme places on the planet. It is in tropical latitudes, but because it is exceptionally high, at about 4,000 metres, it is cold all the time. It is a vast deposit of alluvial sediments (with a lot of rock and gravel) between the Cordilleras of the Andes. The land is flat to rolling, with small outcroppings of rock. It is quite dry, with some 300–400 mm of annual rainfall. It is only thanks to a deep local knowledge that crops can be harvested at all in this austere environment. Much of the land is in range or fallow. Some communities practise a kind of open field system (McCloskey, 1975) or *aynuqa*; they rotate crops in blocks planted together, followed by a seven- to 10-year fallow. Everyone in the community plants the same crop, in the same year, and respects the same fallow, during which all community members can pasture their animals on the *aynuqa*. The forest was almost totally eliminated during colonial times. The main language is Aymara.

The high valleys of Cochabamba

The high valleys of Cochabamba are also tropical, but are a little lower (2,500 to some 3,700 metres above sea level) than the *Altiplano*, and are a little warmer. The soils are variable, since much of the land is steeply pitched, with some small, flat pampas. The soil varies from very thin and rocky to some areas of loamy soil over five metres deep. It is a little more humid than the *Altiplano*, with up to 600mm of yearly rainfall. In places that have irrigation, two or three crops can be harvested per year. Few communities have *aynuqa*. Many communities have individual land tenure, but the households do complicated crop rotations, almost always starting with potato. Land that is too rocky or otherwise unsuited for crops may be individually or communally owned. There are some new, planted forests of pine and eucalyptus and in the highest areas a few remnants of native forests. Quechua is the main language.

Table 2 Origin of technologies tested, 2002–3

Pilot area	Coordinating institution	Trials 2002–03	Institution originally associated with the technology
Pomposillo, on the high plains of La Paz	PROINPA	Improved cultivation (hilling up+) of potatoes	UMSS
		Intercropping of grains with legumes	UMSS
		Quinoa varieties	PROINPA
		Live barriers with Phalaris grass	UMSS
Qolqe Qhoya, in the high valleys of Cochabamba	UMSS	Higher hilling up of potatoes	UMSS
		Intercropping of grains with legumes	UMSS
		New forage species for improved fallow	UMSS
		Live barriers with Phalaris grass	UMSS
Verdecillos, in the low valleys of Santa Cruz	CIAT	High hilling up	UMSS
		New forage species for improved fallow	UMSS
		Live barriers with Phalaris grass	UMSS/CIAT
		Control of virus and Phytoplasma in potatoes	PROINPA & CIAT
		Control of *Rhizoctonia solani* in potato*	PROINPA & CIAT

+ 'Hilling up' (Spanish: *aporcar*) means to pile soil around the stalk of a growing crop, in this case potatoes, usually combined with weeding. It can be done with a hoe. Sometimes people hill up with an animal-drawn plough, often returning with a hoe to finish the task. Hilling higher helps to reduce diseases and increase yields.

* A fungal disease. According to the *Pest Protection Compendium* (CABI 2000), the old scientific name, *Rhizoctonia solani*, has been replaced by *Thanatephorus cucumeris*

The low valleys of Santa Cruz

These are sometimes known as the 'mesothermic valleys'. They are still high, at some 2000 metres or more, but compared with western Bolivia they are warm, low lands, with a sub-tropical climate. The valley floors have loamy soil and where there is water for irrigation; one can grow crops all year round. Land is individually owned. On the hillsides there are still forests, although some of them are secondary, since people occasionally slash and burn it to plant field crops, followed by a long fallow. The main language is Spanish.

Social strata

Most people in the pilot sites are poor. According to the SDC (1999) the percentage of poor households in the following communities is:

- Umala, Aroma Province: 98.03%
- Ayo Ayo, Aroma Province: 98.12%
- Colomi, Chapare Province: 93.15%
- Tiraque, Tiraque Province: 96.55%
- Comarapa, Manuel Maria Caballero Province: 84.55%
- Saipina, Manuel Maria Caballero Province: 55.34%

Although the words 'poor' and 'poverty' can be defined arbitrarily as, for example, an income below a certain level, they are subjective and relative terms. The SDC *Atlas*, cited above, defines the 'incidence of poverty' as the 'percentages of households in a municipality which suffer from a state of want or privation of goods or services judged necessary to maintain life'.[7] It is a vague definition, and one could argue that numbers like 98.12% are too high and smack of false precision. Nevertheless, the numbers may be useful for showing the relative poverty of the municipalities (e.g. Comarapa is not as poor as Tiraque).

We did not rank households by wealth, but all the communities have some people who are poorer than others. All or almost all of them have land, but most (especially in La Paz and Cochabamba) said it was not enough, so they still had to migrate or work for others in their community for part of the year. A minority had sufficient land to support them for the entire year.

Table 3 Explicit demands identified during the *sondeos*

	Place		
Kinds of demands	**Pomposillo (Umala, La Paz)**	**Qolqe Qhoya (Tiraque, Cochabamba)**	**Los Pinos (Comarapa, Santa Cruz)**
Crops	They want to grow more quinoa again	Better potato seed, improved access to seed	
They want solutions for the following crop pests	Potato: Andean potato weevil Barley: hail Quinoa: moth	Potato: llaja, moth and blight. Weeds* Broad beans: *q'epicha* (aphid)	Potato: blight, moth, aphid Maize: rust Wheat: rust and *cominillo* (weed, *Spergula arvensis*) Pea: *ojo de gallo, pasmo amarillo* (diseases) Carrot: *cominillo* Apple: *musuru*, cochineal, aphids. Peach: *musuru*, rust, *salvajina*
They want solutions for the following animal health problems	Cattle: hoof-and-mouth disease, parasites, altitude sickness, *timpanismo* Sheep: parasites, lice, mange, ticks, etc. Chickens: in the winter they get a disease called *moquillo*, which the team could not identify	Cattle: blue flea Sheep: tick	Cattle: hoof-and-mouth disease, parasites, *lengüeta*, hip disease
Lack of forage	They want more pasture	They want pasture, especially for October through December	
Shortage of land	Yes	Yes	There is no great shortage
Soil erosion	Several mentioned the gullies that formed on the hillsides		The steep land is poor, tired, has soil erosion
Irrigation, pasture, livestock	They want more irrigation, especially to grow more pasture for more animals	They want more irrigation, especially for more pasture and more animals	Yes
Market	They have little to sell and they receive low prices	Low prices	

* Especially: *Puka qhora* (*Rumex acetosella*), *comino qhora* (*Spergula arvensis*), *ajara* (*Chenopodium album*), *nabo* (*Brassica campestris*).

Table 4 Implicit demands identified during the *sondeo* in Qolqe Qhoya

Implicit demands	Reason for including them
Information on insect ecology, to avoid making unnecessary applications of insecticides	Local people complained of aphids on broad beans. The team thought it looked like a problem induced by the abuse of insecticides.
Soil conservation	The team observed gullies, etc., although local people did not complain of erosion.
Improve the weight of sheep when they are sold, to increase income	Smallholders said they sold sheep when they needed the money, when there was nothing else to sell, and that often this was when the sheep were skinniest.
Study fertilisation with chicken manure, to rationalise the dosage	One of the agronomists noticed piles of chicken manure that people buy to fertilise potatoes, but without analysing the soil, and without technical recommendations.

Table 5 Implicit demands identified during the *sondeo* in Pomposillo

Implicit demands	Reason for including them
Phalaris grass	It is a robust, perennial forage, and the community members explicitly demanded more forage.
Improve the management of forage in communal lands and in fallowed *aynuqas*	Most pasture lands are fallowed *aynuqas*, but the new forages (e.g. alfalfa) are intensive crops (needing irrigation, etc.) so they only work on individually owned plots.
Restore seed of native varieties, for example, *lluk'i* potatoes for *chuño**	People still plant some 20 or more varieties of potatoes, but they have lost some, which PROINPA has.
Vegetable growing: varieties the people can reproduce themselves, without buying seed every year	Currently the local people buy fruit and vegetables to eat. Another institution (not linked to INNOVA) is promoting home gardens in the community. Local people accept these gardens, even though they are planted with foreign seed, which in the future they will have to buy, or else stop planting the gardens.

* Traditional method of freeze-drying potatoes in the high, cold Andes.

Table 6 The supply of technology

Technology	**Pomposillo, La Paz**	**Qolqe Qhoya, Cochabamba**	**Verdecillos, Santa Cruz**
New machinery and associated practices			
New animal traction implements	✓	✓	✓
Higher or improved hilling-up potatoes	✓	✓	✓
New crops or varieties			
New grasses and forages[1]	✓	✓	✓
Forages for improved fallow[2]		✓	
Live barriers of Phalaris grass	✓	✓	✓
New varieties of quinoa	✓		
Forage oats and barley intercropped with legumes (vetch and clover)	✓	✓	
Seed potato, native varieties cleaned of virus in the laboratory		✓	
IPM (integrated pest management)			
Matapol® biological insecticide to control potato tuber moth		✓	
Control of virus and Phytoplasma in potato			✓
Control of *Rhizoctonia solani* in potato			✓
Chicken manure to control soil-borne diseases and nematodes			✓
Chemical control of late blight in potato			✓
Chemical control of leaf spots in potato			✓
Vegetable growing by women's groups			✓
Community lab to identify pests and diseases			✓
Weed control (*Spergula arvensis* and *Cyperus rotundus*)			✓
Botanical insecticides			✓
Others			
Bokashi[3]			✓
Plant-meds (home remedies for animals, made from plants)	✓	✓	

[1] An agronomist at a stand showed bags filled with several dozen different kinds of new species and varieties of forage crops. He discussed their uses and encouraged people to plant them.
[2] A trial and a demonstration of mixed forage crops planted in fallow land, instead of allowing weedy pioneer plants to re-colonise the soil.
[3] *Bokashi* is a cleverly-made, but extremely labour-intensive organic fertiliser. See section 5.

4 RESULTS

Results of the *sondeo*s

We did three *sondeo*s in late 2002 and early 2003, during which the communities and researchers identified the explicit demands listed in Table 3.

The explicit demands in Pomposillo and Qolqe Qhoya are quite similar. Community members explained that they want improved pasture and irrigation, to rear more cattle and sheep for sale at higher prices. They also have some pests and animal health problems. In Los Pinos, near Comarapa, it is a little different, since there is more land and water. However, since the people there grow more diverse crops, they mentioned more pests.

Implicit demands identified in the *sondeo*s

In Section 2 we discussed how we identified implicit demands. Some of these demands, identified through *sondeo*s, are given in Tables 4 and 5.

Researchers were unable to respond to most of these demands right away. They did plant a trial of Phalaris grass with two members of the Pomposillo community, but they had planned this before the *sondeo*. This inability to respond quickly is partly because the researchers already had a full agenda (after all, they were working with technology that was nearly ready), but it is also because research topics are easier to identify than to resolve satisfactorily.

Results of the technology fairs

INNOVA held three technology fairs in March 2003, in the three areas where *sondeo*s had been carried out. The supply of technology was enormous: 10 or 15 technologies or groups of technologies (see Table 6) to be shown in three or four hours, which forced us to limit the time given to each presentation. Depending on the fair and whether the technology was presented as a trial or at a stand, the time allotted to each ranged from seven to 30 minutes.

At the end of the technology fair we asked the respondents which of the technologies they had seen that day they would like to try. The respondents could choose between several technologies, but we encouraged them not to answer 'everything'. Most people chose two or three out of a dozen options.

If we compare farmers' explicit demand for technology (Table 3) with INNOVA's supply of technology (Table 6), we see that some explicit demands have not been satisfied. However, most of INNOVA's technologies did respond to demand. Only two (new animal traction implements and improved hilling-up) did not respond to demands *identified in the sondeo*. However, both were well accepted by the community; they turned out to satisfy implicit demands unidentified during the *sondeo*.

The technologies the researchers supplied to the community in Pomposillo partially fulfilled the demands identified in the *sondeo*, i.e. for more water and forage so that they could have more livestock. At the technology fair, INNOVA did not offer an irrigation technology, but did offer three forage technologies. However, these were not well received. Improved pasture caught the interest of only 48% of the people, and Phalaris just 29%, while quinoa interested 89%.

People preferred quinoa to pasture, not because they needed it more, but because it was *better presented* at the technology fair. Pasture was presented in three different, but not overly convincing ways: 1) Some pasture seed was shown on a table at one of the stands by two agronomists from Cochabamba, so people immediately doubted that this grass species would thrive in La Paz (which is higher, colder and dryer). 2) The Phalaris had been planted in a trial, but it is a perennial crop, only three months old at the time of the fair, and looking so poor that the agronomists decided not to show the trial to the public. Instead, the farmer-researchers talked about Phalaris at a stand, and had a most animated discussion in Aymara. 3) The trial of grains associated with legumes was a student thesis project, and even though it was presented by two farmers in Aymara, the pasture plants were growing poorly and the trials were split into tiny squares like a chessboard, so that people could hardly tell what they were supposed to show.

The trial of grains intercropped with legumes was presented in Aymara by two enthusiastic farmers (Figure 1). There were many replicates, each of which was labelled. Even though two local women explained the trial, it was really a thesis project which is why it was managed as on an experimental station, in little squares. Because the trial grew poorly, people were unimpressed. The technology might have been more attractive if it had been better managed.

In the quinoa trial the agronomists had used chemical fertiliser (which is not a common local practice), as a result of which the crop was growing spectacularly. Also, rather than planting it in small squares, the quinoa was in large, easy-to-see strips. Besides the trial, there was a stand where two young agronomists were distributing pieces of delicious quinoa cakes to each

Figure 1 Trial of grains (barley and oats intercropped with legumes (vetch and clover)

Table 7 Comparison of demand and supply of technology in Pomposillo

Explicit demands (from the *sondeo*) from INNOVA	Supply of technology	Number of farmers at the technology fair wanting to try the technology
More irrigation water	Not yet	NA
More and healthier cattle	Not yet	NA
More forage	New forage species (seeds) Grains intercropped with legumes Phalaris grass	51 (48%) 33 (31%) 31 (29%)
More quinoa production	Quinoa varieties	94 (89%)
Control of pests (especially Andean potato weevil) and hail, frost and drought	Not yet	NA
Higher prices for produce	Not yet	NA
Implicit demands (themes not identified in the sondeo)	New implements Improved hilling-up	45 (43%) 54 (51%)

Figure 2 Two young men looking at potato plants growing in vitro

of the 200 participants. In sum, quinoa was presented in a better (more attractive, convincing) way than pasture, and the audience went for it, even though pasture would have responded better to their own, explicit demands.

In Qolqe Qhoya, as in Pomposillo, the researchers supplied several technologies that responded to the shortage of forage. However, just because a technology is aimed at people's explicit demands, does not mean it will be accepted. The Qolqe Qhoya community explicitly asked for more pasture, but, in the event, the most popular of the three forage technologies they saw attracted 72% of farmers, while the least popular interested only 17%. The trial they liked was a simple intercrop of grains and legumes, planted by a local farmer and his father. The trial they least liked was similar, planned by researchers: the plants were thriving, lush and vigorous, but local farmers (and visiting anthropologists) found the little squares (random blocks of various treatments) hard to see, so showed less interest in it. Although it is not a DFID technology, PROINPA showed native varieties of potatoes cleaned of viruses in the lab. Farmers liked the idea, even though they only saw it at a stand, not in the field (Figure 2).

There were fewer surprises in the valleys of Santa Cruz than in the other two places. The technologies responded to several of the local people's explicit demands, especially regarding pest and disease management.

The voting and the questionnaires provided rapid feedback as to how the ideas were being received. One of the UMSS agronomists presented Phalaris grass at all three technology fairs. At the first, in Pomposillo, Phalaris was not well received, for reasons explained above. In the second *encuentro*, the agronomist brought a farmer-collaborator with several years of experience, who described the grass with conviction. His farm was too far away to visit, but he had brought several clumps of the grass with him to show people, and he discussed it in Quechua at a stand. At the end of his presentation, the agronomist observed that the smallholders spontaneously took pieces of the Phalaris sample so they could try it themselves at home (Figure 3). The agronomist profited by this observation, and at the third technology fair in Verdecillos (Santa Cruz), he prepared samples for people to take home and plant, thereby directly stimulating local experimentation with this technology.

5 DISCUSSION

Most themes that the researchers identified and proposed do respond to explicit demands identified in the *sondeo*, even though the technologies existed before the *sondeo* was carried out. Some of the other technologies, especially farm implements, responded to implicit demands, which people did not articulate during the *sondeo*. However, when they saw the implements, they knew they wanted them. In general, the technologies were well received.

In Pomposillo (Table 7) the preferred technologies were quinoa, higher hilling up of potatoes, and animal-drawn tillage implements. Even though the forages were an explicit demand, the people did not view these

Table 8 Comparison of demand and supply of technology in Qolqe Qhoya

Explicit demands (from the *sondeo*)	Supply of technology from INNOVA	Number of farmers at the technology fair wanting to try the technology
More land (there is a land shortage)	Several of the technologies raise yields or increase returns to land	See technologies associated with new forages
More irrigation water Better prices for produce	Not yet	NA
Control of potato tuber moth	Matapol® for the control of moth	15 (33%)
Control of aphids in broad beans	Not yet	NA
Improved seed for potato, rye and oats	Native seed potato, cleaned of virus in lab	21 (46%)
More pasture	New pastures and forages (in trial: for improved fallow; at stand: seeds) Grains intercropped with legumes Phalaris	33 (72%) 22 (48%) 8 (17%)
Implicit demands (themes not identified as demands during the *sondeo*)	Higher hilling up	16 (35%)

particular examples favourably, because the test-plot crops looked straggly. INNOVA does not have a supply of technology to meet the major demands of irrigation and improved livestock (mainly sheep and cattle).

In Qolqe Qhoya (Table 8) grains intercropped with legumes and the new pasture crops were the favourite technologies, which was to be expected, since the people identified forages as a priority during the *sondeo*. The high acceptance of implements was not anticipated from the evidence of the *sondeo* nor was the strong interest in virus-free seed potatoes, although people did say that they wanted quality seed. The presentation of the potato plantlets, growing in vitro, which people could see and hold, was a crowd pleaser. Again, the quality of presentation influenced how well a technology was accepted (at least at that moment).

Figure 3 A man in Qolqe Qhoya with a clump of Phalaris in his pocket

In Verdecillos (Table 9) the people wanted to try control of *Rhizoctonia*, new pasture species, Phalaris, implements, higher hilling up and *bokashi*. In other words, they liked the things they saw in the trials, in real demonstrations, and not what they saw at the stands. The only exception was implements (which they could see and touch at the stand, as well as watch them during the hilling up trial). The acceptance of *bokashi* is an anomaly, since it is an expensive compost, which is tedious to make. It requires some 10 non-local materials, which people have to buy in town, at different stores. One needs to add 10–20 tons of organic matter per hectare to make *bokashi*, and it must be stirred several dozen times. Because of the high labour demand, this technology is probably not profitable. In the future, perhaps we should include simple economic analysis so farmers can make better informed decisions about the technologies on offer.

Most of the technologies won the interest of at least 10% of the people, who said they wanted to try them. That is fairly high, considering that, in its first year, an innovation is rarely tested by 25% of the population (Rogers, 1983). The massive adoption of a technology comes later, after a few people have tried it out and tell their neighbours about it (Henrich, 2001).

The need to know how people use innovations

In industrial design, to see how a new product would fit into users' homes or offices, the designer must observe the behaviour of would-be consumers (how they choose items at a supermarket, or what objects they already have on their desks) to assess user demand. For example, the design of motorcycle safety equipment must take into account the fact that many bikers are trying to project a youthful, manly image (Wasson, 2000).

Table 9 Comparison of demand and supply of technology in Santa Cruz valleys

Explicit demands (from the *sondeo*)	Supply of technology from INNOVA	Number of farmers at the technology fair wanting to try the technology
Irrigation water	Not yet	NA
Control of pests and diseases	Control of virus and Phytoplasma	23 (27.1%)
	Control of *Rhizoctonia solani*	36 (42.4%)
	Chicken manure to control soil-borne diseases and nematodes	13 (15.3%)
	Chemical control of late blight	17 (20.0%)
	Chemical control of leaf spots, potato	12 (14.1%)
	Lab providing community service: identification of pests and diseases	4 (4.7%)
	Control of cebollín (nutgrass, the weed *Cyperus rotundus*)	10 (11.8%)
	Control of cominillo (the weed corn spurry, *Spergula arvensis*)	7 (8.2%)
Forage	Pasture garden	28 (32.9%)
Improved household diet Raise animals Windbreaks	Not yet	NA
Live barriers to avoid erosion	Phalaris grass	20 (23.5%)
Grow and market organic vegetables as a group	Vegetables grown by women's groups	17 (20.0%)
	Botanical insecticides	18 (21.1%)
Problems with soil fertility	*Bokashi*	24 (28.2%)
Implicit demands (themes not identified as demands in the *sondeo*)	Tillage systems	23 (27.1%)
	Animal drawn tillage implements	34 (40.0%)
	Hilling up	22 (25.9%)

For us, the designers of new agricultural technology, it is more important to see how new technologies fit into the lives of smallholders than to do more trials. In the next year of INNOVA (2004) we will see what technologies people try on their own account, and why, how they modify them and how many people adopt them. These will be more reliable indicators of the probability of final adoption.

Distributing materials

If we want people to try the technologies, we must distribute some materials, especially in the case of new crops and varieties: people cannot try them without some planting material. With the exception of the UMSS agronomist in Verdecillos, we left the farmers with nothing after the technology fairs but the wish to try some things. We talked about the virtues of quinoa, and when people asked where they could get these varieties, we told them they were not ready. We showed the use of new forage species, and when the smallholders asked where they could buy a kilo to try, we told them we had not brought any to sell. Technology fairs would be much improved by distributing seed samples and other material for people to try on their own farms.

The technology fairs

The fairs were fun, novel and helped create a team spirit among the technical personnel of the partner institutions. They cost money, but if they speed the adoption of something worthwhile or cull an inappropriate line of research, they may justify their cost. However, another option is to find ways of lowering the costs of the fairs.

One of the innovations of the technology fair was that it proved to be a way of giving the public a good deal of information and seeing how it was received, all in one day. Working independently, anthropologists at CIMMYT have developed something similar, which they call the voting method. They present many maize varieties to *campesino*s, who vote for the ones they prefer (Bellon, 2002).

Knowing your audience

We agree with Bellon that voting gives us a rapid (albeit preliminary) idea of the public's perception of several innovations. Voting and questionnaires are forms of rapid feedback, a kind of marketing survey which we hope will help researchers make more efficient use of their scarce resources. Researchers tend to love their inventions the way other people love their children ('it's not a bad technology; it's only misunderstood'). It remains to see whether researchers will learn from the technology fair or any other feedback method, but that is a task for the second half of the INNOVA project.

The importance of good presentations

At the technology fairs, people seemed to respond both to the quality of the presentations and demonstrations and the extent to which they felt the technology responded to their own problems and circumstances. For example, audiences were attracted to technologies presented in a field trial, with a thriving crop, especially if the trial was described by an enthusiastic farmer.

In Pomposillo the people stated quite clearly that they wanted irrigation and improved pasture, as ways of having more and better livestock. The project did not present irrigation or animal management, and the forage trials were not very attractive. But quinoa, which was a secondary demand, was so well presented that it 'beat' the forage technologies. There we learned that presentation (the 'show') has a big influence on the attractiveness of a message.

The notion of implicit demand

Talking with people about their problems is a way of finding out their explicit demands for research. However, there can be things they need, even though they don't say so. Farmers can have an implicit demand for certain technologies, e.g. new implements. The technology fair is a way of further identifying implicit demand, and of making it explicit. As farmers learn about a technology (whether at a fair or elsewhere), and as they come to value it and want to adopt it, the demand becomes explicit.

The need to improve methods for hypothesising implicit demand

Scientific research is creative (Wilson, 1998). Hypothesising implicit demand also requires some imagination and background information. Still, in the future we need to develop more replicable methods for identifying it, otherwise the notion could degenerate to the point that researchers defend pointless inventions by saying that they meet an implicit demand.

The slipper fits

The researchers developed their supply of technology before the *sondeo*s to estimate demand were conducted. Yet the people's response during the technology fairs suggests that the research agenda was not just pulled from a hat. If the researchers were not able to make the glass slipper fit Cinderella, at least they showed a range of shoes for her wardrobe, most of which will probably be suitable for different circumstances.

Conclusion

The *sondeo* can be dusted off and used to learn about farmer demand. As for the technology fair, while we don't want to make unrealistic claims, it seems to be a good way of measuring how farmers react to a new technology, even to a large set of technologies, especially if researchers can create a level playing field (present the innovations equally well). That will be impossible to achieve perfectly: even if all the technologies are presented in the same amount of time, and in trials or talks of similar formats, someone will always give a more charming talk, or have a more eye-catching field trial. Whether the technology fair is useful or not depends not so much on whether farmers adopt the innovations they see there (although that is part of it), rather the main point is whether researchers in the future learn about their clients at the fairs, the way the UMSS agronomist learned that his Phalaris grass would be more attractive to his audience if he gave them samples they could take home and try. We are planning a study to understand the way interaction between farmers and researchers occurs and how we can facilitate the processes involved.

This brings us back to the concerns posed at the beginning of this paper in the context of SIBTA. First, capturing farmer demand may not be as simple as SIBTA's architects suppose and second, what should be done with research that is already underway and in which a considerable investment has already been made?

With regard to the first concern, we have shown that learning about demand requires more than just a petition from farmers. Demand cannot be captured in a single event, it requires a process, including tools like the *sondeo* and fair, which bring farmers together with researchers with expert knowledge and a stock of near-ready technology to pick out the implicit demands that lie beyond what farmers demand explicitly. INNOVA is building mechanisms to incorporate this insight into the procedures for capturing demand within SIBTA.

With regard to the second concern, we found that most, but not all, the technology generated by the previous projects responded to either an explicit demand or to an implicit one. The tools we tested should help improve resource allocation in INNOVA, where some of the technology deserves a higher share of resources to promote its use, and research on a few of the technologies should probably stop. We are working on mechanisms to translate these findings into decisions about research management. It is clear though that throwing away DFID's existing technologies and starting from scratch would have thrown away a lot of potentially good technology, wasting a considerable research investment and potential for assisting poor farmers in Bolivia and elsewhere.

REFERENCES

Almekinders, C. (2000) 'Fortalecimiento del Sistema de Semillas de los Agricultores y el Reto de la Colaboración'. Manuscript. Technology and Agrarian Development, Wageningen University, Wageningen, the Netherlands.

Anderson, S., Gündel, S. and Pound, B. with B. Triomphe (2001) *Cover crops in smallholder agriculture: Lessons from Latin America*. London: ITDG Publishing.

Ashby, J., Braun, A.R., García, T., Guerrero, M.P., Hernández, L.A., Quirós, C.A and Roa, J.I. (2000) *Investing in farmers as researchers: Experience with local agricultural committees in Latin America*. Cali, Colombia: CIAT.

ATICA (2001) 'Demanda calificada'. *Nota Conceptual* No. 1. Cochabamba: ATICA (*Programa Agua Tierra Campesina*).

Bellon, M. R. (2001) *Participatory research methods for technology evaluation: A manual for scientists working with farmers*. Mexico DF: CIMMYT.

Bellon, M. R. (2002) 'Analysis of the demand for crop characteristics by wealth and gender: A case study from Oaxaca, Mexico', pp. 66–81, in M. R. Bellon and J. Reeves (eds). *Quantitative analysis of data from participatory methods in plant breeding*. Mexico, DF: CIMMYT.

Bentley, J.W. and Baker, P.S. (2002) *Manual for collaborative research with smallholder coffee farmers*. Egham, UK: CABI Commodities.

Bentley, J.W. and Boa, E. (2003) 'Stolen Harvest' available on line at: www.jefferybentley.com/STOLEN%20HARVEST.pdf. And 'Robando la Cosecha' at: www.jefferybentley.com/COSECHA%20ROBADA.pdf

Bentley, J.W., Oros, R., Herbas, J., Botello, R., Rodríguez, F., Verduguez, C., Galindo, J.J. and Orellana, J. (2002) *Sondeo en Qolqe Qhoya: ¿Si no sembramos papa, qué vamos a comer nosotros?* INOVA Project Report. Cochabamba, Bolivia. 18 November 2002.

Bentley, J.W., Oros, R., Thiele, G., Botello, R., Esprella, R., Aguilera, J., Zambrana, L., Huanca, J.C. and Canaviri, M. (2003) *Sondeo en Pomposillo: No hay nada fácil*. INOVA Project Report Cochabamba, Bolivia. 17 January 2003.

Biggs, S. and Smith, S. (2002) A paradox of learning in project cycle management and the role of organisational culture. MS. School of Development Studies, University of East Anglia Norwich, UK.

Brown, D., Howes, M., Hussein, K., Longley, C. and Swindell, K. (2002) 'Participatory methodologies and participatory practices: Assessing PRA use in the Gambia'. *Agricultural Research and Extension Network Paper* No. 124. London: Overseas Development Institute.

Byerlee, D. (1998) 'The search for a new paradigm for the development of national agricultural research systems'. *World Development*, Vol. 26, No. 6, pp. 1049–55.

CABI (2000) *Crop protection compendium*. CD. Wallingford, UK: CAB International.

Davies, P., Hoyos, F., Jones, W.L., Llanos, J.L., Pozo, M., Severiche, J. Soruco, O., Thiele, G. and Vélez, R. (1994) *El sondeo: Una guía de orientación para el equipo de campo. Informe Técnico No 22*. Santa Cruz: CIAT/MBAT. .

Henrich, J. (2001) 'Cultural transmission and the diffusion of innovations: Adoption dynamics indicate that biased cultural transmission is the predominate force in behavioral change'. *American Anthropologist*, Vol. 103, No. 4, pp. 992–1013.

Hildebrand, P. E. (1981) 'Combining disciplines in rapid appraisal: The sondeo approach'. *Agricultural Administration*, Vol. 8, pp. 423–32.

Hildebrand, P. and Ruano, S. (1982) *El sondeo: Una metodología multidisciplinaria de caracterización de sistemas de cultivo desarrollada por el ICTA*. Guatemala: Institute of Agricultural Science and Technology.

Iriarte, V., Terrazas, F., Aguirre, G. and Thiele, G. (2000) 'Local seed systems and PROINPA's genebank: Working to improve seed quality of traditional Andean potatoes in Bolivia and Peru', pp. 154–61 in E. Friis-Hansen and B. Sthapit (eds) *Participatory approaches to the conservation and use of plant genetic resources*. Rome: International Plant Genetic Resources Institute.

McCloskey, D.N. (1975) 'The persistence of English open fields' in W. Parker and E.L. Jones (eds). *European peasants and their markets: Essays in agrarian economic history*. Princeton University Press. Princeton, NJ.

Núñez, W., Pfaumann, P. and Graf, W. (2003) 'The making of a new agricultural research and extension system: The case of Bolivia'. BeraterInnen News 1 (available on-line: http://www.sfiar.infoagrar.ch/publicat.htm).

Oros, R., Eguino, S., Montellano, E., Antezana, O., Crespo, M. and Botello, R. (2002) *Sondeo y taller de levantamiento de demandas. Comunidad Los Pinos, Municipio Comarapa – Valles Mesotérmicos 24 y 25 de noviembre de 2002*. INNOVA Project Report.

Rogers, E.M. (1983) *Diffusion of innovations*. Third edition. New York: The Free Press.

SDC (1999) *Bolivia: Un mundo de potencialidades. Atlas estadístico de municipios*. La Paz: Instituto Nacional de Estadísticas, Viceministerio de Participación Popular y Fortalecimiento Municipal, Agencia Suiza para el Desarrollo y la Cooperación (Cosude—Swiss Agency for Development and Cooperation).

Thiele, G., Nelson, R., Ortiz, O. Sherwood, S. (2001) 'Participatory research and training: Ten lessons from the farmer field schools (FFS) in the Andes'. *Currents*, Vol. 27, pp. 4–11.

Tripp, R. (2001) *Seed provision & agricultural development: The institutions of rural change*. London: Overseas Development Institute.

Wasson, C. (2000) 'Ethnography in the field of design'. *Human Organization*, Vol. 59, No. 4, pp. 377–88.

Wilson, E. O. (1998) *Consilience: The unity of knowledge*. New York: Vintage Books.

ENDNOTES

1 Doug Horton (personal communication) suggests that 'demand' in economics refers to the relationship between price and quantity purchased in a market. The technology that farmers 'demand' of researchers is actually more like the demands made by a labour union ('We demand better control of these potato pests.').

2 http://www.infoagro.gov.bo/sibta/sibta.htm#h. See also Núñez et al. (2003) for a history and description of SIBTA, which is supported by several donors, including DFID.

3 For example, in Bolivia the ATICA project made a detailed study of demand in dozens of communities in six municipalities (ATICA, 2001). In the area around Pocona, Cochabamba, they sent an agronomist to live in a community to find a solution to their demand for improved soil fertility. However, after living in the field for several months, agronomist Velasco realised that the soils were not particularly poor, but that the crops had several pests which people had not recognised, which limited their harvest (Bentley and Boa, 2003).

4 CIAT and PROINPA managed MIP Papa (Integrated management of potato pests),while UMSS managed the Laderas (Hillsides, soil conservation), PROMETA (animal traction and forage), and PROMMASEL (weed management) projects.

5 We are grateful to André Devaux for first pointing this out to us.

6 For example, in Pomposillo, about 20 community members attended the meeting, including some people whom we had interviewed in their homes or fields. We used an overhead projector to show charts, outlining the conclusions, in the order we had asked our questions during the interviews. Our presentation described the local farming system, including problems and explicit demands. We invited corrections and the local people were quick to speak up. They added some specific details about veterinary diseases, for example. Most importantly, they explained to us very carefully that, although all our conclusions were more or less accurate, the community's greatest demand was for more irrigation and improved forage, so they could have healthier, fatter livestock. Although a few community members did most of the talking, we could see by the nods and words of approval from the rest of the audience that improved animal health really was a major explicit demand of the community. Most of the meeting was in Spanish, but at one point we broke into separate workgroups of men and women. One of the PROINPA agronomists who is a native speaker of Aymara facilitated the discussion with the women, in Aymara. The women concluded that they were in general agreement with the demands as expressed, but they encouraged us not to forget the smaller animals (e.g. sheep and chickens) and added that they wanted to grow more quinoa, especially to feed their children.

7 "*el porcentaje de hogares del municipio que padece un estado de carencia o privación de bienes o servicios juzgados necesarios para el mantenimiento de la vida*."

AgREN

Network Papers cost £3.00 sterling each (plus postage & packing).
This paper may be downloaded free of charge from the AgREN website at: www.odi.org.uk/agren
Please contact the Network Administrator at:
The Overseas Development Institute, 111 Westminster Bridge Road, London SE1 7JD, UK
Telephone: +44 (0)20 7922 0300 Fax: +44 (0)20 7922 0399 Email: agren@odi.org.uk

Information about ODI and its publications can be found on our website at:
http://www.odi.org.uk/