


Innovation for Development:
The Papa Andina Experience



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Innovation for Development: The Papa Andina Experience

Editors:

André Devaux, Miguel Ordinola and Douglas Horton

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Contents

Testimonials _____	iv
Foreword _____	vi
Acknowledgements _____	x

HIGHLIGHTS OF THE PAPA ANDINA EXPERIENCE

Highlights of the Papa Andina Experience <i>Douglas Horton, André Devaux and Miguel Ordinola</i> _____	1
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PART 1. DEVELOPMENT OF THE PAPA ANDINA MODEL

Adding value to local knowledge and biodiversity of Andean potato farmers: The Papa Andina Project <i>Graham Thiele and André Devaux</i> _____	37
Underground assets: Potato biodiversity to improve the livelihoods of the poor <i>Ruth S. Meinzen-Dick, André Devaux and Ivonne Antezana</i> _____	40
Collective action for market chain innovation in the Andes <i>André Devaux, Douglas Horton, Claudio Velasco, Graham Thiele, Gastón López, Thomas Bernet, Iván Reinoso and Miguel Ordinola</i> _____	59
Brokering Innovation for Sustainable Development: The Papa Andina Case <i>André Devaux, Jorge Andrade-Piedra, Douglas Horton, Miguel Ordinola, Graham Thiele, Alice Thomann and Claudio Velasco</i> _____	76
Knowledge Management for Pro-Poor Innovation: The Papa Andina Case <i>Douglas Horton, Graham Thiele, Rolando Oros, Jorge Andrade-Piedra, Claudio Velasco and André Devaux</i> _____	111

PART 2. PAPA ANDINA'S APPROACHES AND THEIR APPLICATION

The Participatory Market Chain Approach

Participatory Market Chain Approach <i>Thomas Bernet, André Devaux, Oscar Ortiz and Graham Thiele</i> _____	133
The Participatory Market Chain Approach: Stimulating pro-poor market-chain innovation <i>Thomas Bernet, André Devaux, Graham Thiele, Gastón López, Claudio Velasco, Kurt Manrique and Miguel Ordinola</i> _____	142

Strengthening competitiveness of the potato market chain: An experience in Peru <i>Miguel Ordinola, André Devaux, Kurt Manrique, Cristina Fonseca and Alice Thomann</i>	151
T'ikapapa: A marketing scheme that uses potato biodiversity to improve livelihoods of Andean farmers in Peru <i>Kurt Manrique, Alice Thomann, Miguel Ordinola, Thomas Bernet and André Devaux</i>	161
Multi-stakeholder Platforms	
Multi-stakeholder platforms for innovation and coordination in market chains: Evidence from the Andes <i>Graham Thiele, André Devaux, Iván Reinoso, Hernán Pico, Fabián Montesdeoca, Manuel Pumisacho, Claudio Velasco, Paola Flores, Raúl Esprella, Alice Thomann and Kurt Manrique</i>	180
Linking smallholder potato farmers to the market: Impact study of multi-stakeholder platforms in Ecuador <i>Romina Cavatassi, Mario González-Flores, Paul Winters, Jorge Andrade-Piedra, Patricio Espinosa and Graham Thiele</i>	193
Fostering pro-poor innovation: The case of the Bolivian Andean Platform <i>Claudio Velasco, Raúl Esprella, Paola Flores and Heditt Foronda</i>	208
Learning and Program Improvement Through “Horizontal Evaluation”	
Horizontal evaluation: Stimulating social learning among peers <i>Graham Thiele, André Devaux, Claudio Velasco and Kurt Manrique</i>	221
Horizontal evaluation: Fostering knowledge sharing and program improvement within a network <i>Graham Thiele, André Devaux, Claudio Velasco and Douglas Horton</i>	231
Public Awareness and Advocacy	
Developing a strategic vision for the potato sector in the Andean region <i>André Devaux, Miguel Ordinola, Rubén Flores, Albéric Hibon, Jorge Andrade-Piedra, Jorge Blajos and Iván Reinoso</i>	251
Corporate Social Responsibility	
Native potato market chain and poverty reduction: Innovation around corporate social responsibility <i>Alice Thomann, André Devaux, Miguel Ordinola, Martha Cuentas, Pedro Urday, Mario Sevilla, Jorge Andrade- Piedra</i>	263
Technological Innovation for Sustainable Development	
Cinderella’s slipper: Sondeo surveys and technology fairs for gauging demand <i>Jeffrey Bentley, Graham Thiele, Rolando Oros and Claudio Velasco</i>	276

Unspoken demands for farm technology <i>Jeffery Bentley, Claudio Velasco, Félix Rodríguez, Rolando Oros, Rubén Botello, Morag Webb, André Devaux and Graham Thiele</i> _____	302
Seed systems for native potatoes in Bolivia, Ecuador and Peru: Results of a diagnostic study <i>Oscar A. Hidalgo, Kurt Manrique, Claudio Velasco, André Devaux and Jorge Andrade-Piedra</i> _____	325
Promoting innovations in the Peruvian Altiplano: The case of tunta <i>Cristina Fonseca and Miguel Ordinola</i> _____	335
Empowerment and Gender	
Gender relationships in production and commercialization of potato seed with small-scale farmers in the Central Andes of Ecuador <i>María Conlago, Fabián Montesdeoca, Magdalena Mayorga, Fausto Yumisaca, Ivonne Antezana and Jorge Andrade-Piedra</i> _____	346
Preserving biodiversity of Andean roots and tubers: working with women <i>Ximena Cadima, Franz Terrazas, Magaly Salazar, Rayne Calderón, Ivonne Antezana, Víctor Iriarte, Efraín Ajnota, Rhimer Gonzales and Nathalia Ferrufino</i> _____	354
PART 3. SOUTH-SOUTH KNOWLEDGE SHARING	
Promoting pro-poor market chain innovation with the Participatory Market Chain Approach: Lessons from four Andean cases <i>Douglas Horton, Emma Rotondo, Rodrigo Paz, Gastón López, Rolando Oros, Claudio Velasco, Felix Rodríguez, Estela Escobar, Guy Hareau and Graham Thiele</i> _____	363
Developing capacity for agricultural market chain innovation: Experience with the 'PMCA' in Uganda <i>Douglas Horton, Beatrice Akello, Lucy Aliguma, Thomas Bernet, André Devaux, Berga Lemaga, Damalie Magala, Sarah Mayanja, Immaculate Sekitto, Graham Thiele and Claudio Velasco</i> _____	375
Humans: The neglected corner of the disease tetrahedron - developing a training guide for resource-poor farmers to control potato late blight <i>Jorge Andrade-Piedra, Paola A. Cáceres, Manuel Pumisacho and Gregory A. Forbes</i> _____	401
Abbreviations _____	413
List of authors _____	416

Testimonials

In July 2011, four individuals from Bolivia, Ecuador, and Peru, who have been involved with Papa Andina for several years, were asked to respond to the question, “*What does Papa Andina mean to you?*”? Their replies are presented here, translated from the original Spanish-language replies.

“I believe that the work of Papa Andina is more revolutionary than the Green Revolution and the recent advances in biotechnology. It is our responsibility now to help public officials, the public, and especially farmer organizations understand the significance of the Papa Andina approach. The innovations achieved at different points in the market chain show how science can benefit all market chain actors, and not only those who supply inputs or market agricultural products.”

Luis Paz, Alianza de Aprendizaje Peru

“In Ecuador, the main contribution of Papa Andina has been to consolidate an intervention strategy for the potato sector, which can easily be adapted and applied with other sectors and under different circumstances. The “Papa Andina Brand” and philosophy include a number of key components, including: application of participatory methods to develop market chains; innovation that goes beyond technical and productive concerns and includes empowerment and social inclusion; emphasis on adding value to primary agricultural products; working through multi-stakeholder platforms and public-private partnerships; and engagement of policy makers as a strategy to influence public policies. Now that Papa Andina is winding down, its philosophy will continue and its strategies should be applied and the benefits multiplied through other projects, programs, and public policies.”

Ruben Flores, Oficinas para Estudio del Agro, Ecuador

“Over the years, Papa Andina has contributed to Bolivia’s innovation system in various ways. Strategic contributions include new approaches that facilitate interactions among different groups in innovation processes, via multi-stakeholder platforms and alliances, and that orient research to needs and opportunities present in market chains. Application of these approaches has produced a number of short-term results (such as new products and ways of working) that are now leading to broader impacts. Thanks to Papa Andina’s methodological support, and the continuing work of PROINPA and other partners, more and more projects, programs, and organizations are applying these new approaches and multiplying the results obtained.”

*Antonio Gandarillas, Fundacion PROINPA
Gino Catacora, Consejo Departamental de Competitividad, Bolivia*

“Papa Andina has contributed to strengthening Ecuador’s potato sector in four ways: (1) it has fostered knowledge sharing with other researchers, development professionals, and market chain actors in the Andean region, through horizontal evaluation workshops, study tours, and other regional activities; (2) it has promoted

the establishment of multi-stakeholder platforms, that respond to demands of organized small farmers; (3) it has helped strengthen the capacities of participating researchers, other service providers, and farmers; (4) it has promoted technical, commercial, and institutional innovation processes that have benefited small farmers. Papa Andina has been a crucial source of support for Ecuador's National Program for Roots and Tubers, in its work to strengthen the Consortium of Small-scale Potato Producers (CONPAPA), develop a strategic vision for the potato sector, and raise the profile of the potato sector in the country. Establishment of Ecuador's National Potato Day and the annual National Potato Congresses held during the last few years reflect the potato's higher profile in the country."

Iván Reinoso, Instituto Nacional Autónomo de Investigaciones Agropecuarias, Ecuador

Foreword

We are very pleased to introduce this book on Papa Andina's experiences with innovation for development. We believe that readers looking for examples of successful programs, agricultural innovations, and useful approaches to address rural poverty and food security will find much of interest in this book.

The Papa Andina Partnership Program has been an especially innovative and productive regional initiative. It has brought together researchers, small farmers, diverse market actors, and dozens of organizations in Bolivia, Ecuador, and Peru to spur innovation in public policies, potato products, and value market chains. The program has spearheaded creative participatory approaches to link small potato producers to high-value markets. It has developed and employed complementary approaches for market chain development, multi-stakeholder platforms, corporate social responsibility, social learning, knowledge sharing, policy advocacy, and incorporating empowerment and gender concerns into innovation processes.

Results have included new products and market niches as well as technological innovations in potato production. They have improved public perceptions of potato as a healthy food, resource for development, and source of cultural pride. Smallholder farmers – including women – and many others who have a stake in potato production, processing, marketing, and consumption have directly benefited from these activities and approaches.

In Peru, where Papa Andina's work with local partners has been most intense, the demand for potatoes has increased, especially for native potatoes. This has motivated small farmers to expand the area dedicated to native potatoes, diversify the varieties they grow, increase the volumes of native potatoes produced and marketed, and enter into dynamic new markets. The results are translating into higher incomes; for example, a study in the Andahuaylas region indicated that farmers reaped higher sales and prices, nearly tripling their average annual income from just over US \$300 to nearly \$900.

Benefits also reach beyond economic impacts. In the Lake Titicaca area of Peru, for example, Papa Andina's participatory approaches have been used to improve farmers' production and marketing of a traditional freeze-dried potato product – tunta. This woman's testimonial describes the impacts on her personal capital and family this way: *"With my earnings [from tunta], I have been able to buy a small amount of land, fix up my house, and buy supplies for my children's school. I feel good because I have learned a lot and I will pass these things on to my children."* Similarly, an impact study in Ecuador indicated that Papa Andina's multi-stakeholder platforms were an effective way to link farmers to the market, and that the profits obtained by participants were approximately 6-times those of non-participants. The study highlighted an improvement in social capital among participants, as measured by greater trust among market chain actors. This has facilitated the entry of small-scale producers into more demanding markets.

Another important legacy of Papa Andina is a vast array of tools, publications, and other materials sharing its methodologies, applications, and lessons learned. Indeed, Papa Andina is a model for knowledge management, making intensive use of participatory planning and evaluation, systematic documentation of activities and results, synthesis of findings, in-service training and mentoring, and publication in national, regional, and international outlets. In addition, the program has produced a considerable quantity of guides, manuals, articles, market sector analyses, campaigns, and other products in Spanish and English, also using social media, including its website (<http://www.papandina.org/>) to stimulate knowledge sharing.

The work of Papa Andina has been ground breaking in many ways. When the program began, little was known about how to translate innovation systems thinking into practical application and tangible results for the rural poor. Papa Andina's approaches and projects have served as a critical laboratory for experimenting with new modes of partnering for innovation. At a time when there was great reluctance on the part of many international and national research organizations to partner with the private sector, Papa Andina reached out to engage private entrepreneurs (and large companies) in research and development (R&D) efforts both extensively and effectively. The results have included improved linkage of research with action, leading to pro-poor innovation in market chains for potato-based products.

The Papa Andina Partnership Program has employed a strategy that builds on the assets of small Andean farmers, notably local knowledge and biodiversity. This strategy differs sharply from the one that had been employed traditionally, which focused on the transfer of external solutions to identified constraints or problems. With its national partners, Papa Andina has helped Andean farmers build new livelihood strategies using the genetic diversity of potatoes, local knowledge, and social capital – assets that are often undervalued.

Rather than engaging in potato R&D directly, Papa Andina has focused on developing new R&D approaches, managing knowledge, and supporting local and national groups to facilitate innovation processes. Working with partners, Papa Andina has engaged in the promotion of needed policies and institutions. They have created structures to include lines of accountability to multiple stakeholders and different types of interaction, fostering greater, mutual communication and understanding. As such, Papa Andina has functioned as an innovation broker for the Andean potato sector of Peru, Ecuador, and Bolivia.

Papa Andina's participatory and applied approaches have generated greater understanding of real-world constraints and how to respond more effectively to challenges and opportunities regarding the use of potato to reduce poverty in the Andes. Results and activities have helped inform the research agenda of the International Potato Center (CIP) to strengthen its contributions to sustainable poverty reduction in the Andes. Likewise, it has helped counter a previously held notion that modern science had little to offer Andean farmers, due to their sophisticated local knowledge of the potato crop.

There are a number of lessons learned from Papa Andina's work with new modes of partnering for innovation. These could be of value to agricultural researchers, development professionals, and policy makers at both national and international levels. They include:

1. **Partnering is essential.** The papers presented in this book make it eminently clear that the results obtained - including commercial, technological, and institutional innovations - could not have resulted from a single, isolated actor. Developing new products, the practices needed to produce them, and the new arrangements needed to market them in the required quantities and qualities were possible only through the collaboration of many different actors in the private, public, and NGO sectors.
2. **Long-term commitment and persistence pay off.** Without the continued support of the Swiss Agency for Development and Cooperation (SDC), CIP, and national organizations in the region, Papa Andina would have been far less productive.
3. **Modern science can help preserve biodiversity while contributing to long-term food security.** Agricultural research is often criticized for introducing high-yielding modern crop varieties that can lead to the disappearance of native or heirloom varieties. In the Papa Andina case, modern science has been used to aid in the utilization of native potatoes and to greater appreciation of their nutritional, economic, and cultural value. In this sense, modern science has contributed to an understanding of the local context and potentially valuable assets of producers and given new life to what was previously a forgotten crop.
4. **Research is not enough.** While research is often necessary, it is seldom sufficient to ensure successful innovation. Hence, the importance of initiatives, like Papa Andina, which focus on improving innovation processes per se.
5. **Gender matters.** Unless specific measures are taken, the main beneficiaries of innovation are likely to be the more powerful and connected groups, to the disadvantage of women and other relatively disenfranchised groups. Papa Andina has demonstrated the feasibility of approaches for improving the benefits of innovation processes for women and others who are frequently left out.
6. **Approaches developed for use in the Andes are robust and can be used elsewhere.** It is promising that some of Papa Andina's approaches, which were developed for use with potatoes in the Andes, have proven useful and effective elsewhere. The most striking case is that of the participatory market chain approach, or PMCA, which has now been applied with such diverse market chains as those for coffee, dairy products, yams, sweet potatoes, and vegetables not only in the Andes but also in Uganda, Indonesia, and the Philippines.
7. **International R&D can make a difference, locally as well as globally.** International agricultural research centers are often seen as producing global

public goods that are freely available for use by all interested parties, but of little immediate import in promoting national development and poverty reduction in their host countries. Papa Andina has offered a mechanism to connect CIP effectively with local organizations to identify and develop opportunities for using the potato to promote development and poverty reduction in the Andes. Likewise, the research results and new R&D approaches results of this local work have been shared and used for global applications.

CIP and SDC have been proudly associated with Papa Andina since its inception in 1998; with CIP as the host organization and SDC as the principal donor. Both organizations have been dedicated to supporting potato development in the Andes since the 1970s. Papa Andina has been an important keystone in this effort. Its legacies include increased innovation capacity in the Bolivian, Ecuadoran, and Peruvian potato sectors that will last far beyond the life of the project. In addition, Papa Andina leaves an important body of knowledge and new methods. This book captures key examples of those. We hope you find it useful.

Pamela K. Anderson
Director General
International Potato Center

Philippe Zahner
Resident Director, Swiss Agency for
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Office in Lima - Swiss Embassy

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Roger Cortbaoui	1998–2008
Hugo Fano	1998–2011
Antonio Gandarillas	1998–2011
Ivan Reinoso	1998–2011
Richard Kohli	2001–2003
Oscar Ortiz	2002–2003 and 2008–2011
Miguel Ordinola	2003–2011
Cesarina Quintana	2004–2011
Rubén Flores	2005–2011
Gino Catacora	2006–2011

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André Devaux, Miguel Ordinola and Douglas Horton

Highlights of the
Papa Andina
experience



Highlights of the Papa Andina Experience

Douglas Horton, André Devaux and Miguel Ordinola

INTRODUCTION

This book brings together 25 papers on different aspects of Papa Andina – a partnership program hosted by the International Potato Center (Centro Internacional de la Papa, CIP¹), which is an international agricultural research center affiliated to the Consultative Group on International Agricultural Research (CGIAR).² Established in 1998 and operating until the middle of 2011, Papa Andina worked to reduce rural poverty in the Andean highlands of South America by fostering innovation and market development with potatoes, one of the most important crops of Andean small farmers.

Until recently, agricultural research was often viewed as *the* main driver of technological change and agricultural development. However, it is now generally understood that research, while often essential, is only one among many sources of technological change (Biggs, 1990; Hall, 2009). For agricultural research to benefit the rural poor, it needs to be linked to practical improvements in value chains that are of importance to small farmers. In this context, Papa Andina focused on ‘agricultural research for development’. This contrasts with more basic or strategic research that aims to produce usable results over longer periods of time, and also with development activities that aim to produce practical results in the very short term.

Papa Andina prided itself on being a *learning organization*. With encouragement and support from the Swiss Agency for Development and Cooperation (SDC), it invested considerable time and effort in documenting and drawing lessons from its experience, and using these lessons to improve its future work. Most of the documentation on this partnership program was prepared by researchers and development professionals in the Andes, in the Spanish language. Nevertheless, more than 30 English-language publications have also been prepared on various aspects of Papa Andina’s work. The 25 papers included in this book have been previously published in professional journals, newsletters, or other publication series, or were presented at international conferences.³ They document the development of Papa Andina from its inception in 1998 until the completion of its third and final phase in 2011. During this period, Papa Andina evolved from an applied regional research project into a regional partnership program working to stimulate pro-poor innovation in market chains for Andean potato products.

1 www.cipotato.org

2 www.cgiar.org

3 Eleven of the papers were presented at the 15th International Symposium of the International Society for Tropical Root Crops (ISTRIC) in 2009.

The challenge: linking research with action

Throughout its development, Papa Andina grappled with a central challenge facing international agricultural research organizations: *How to operate a scientific research program that produces high-quality international public goods (IPGs) and also contributes to sustainable local development and poverty alleviation.* As Ashley et al. (2009:1,7) put it:

“There has been a major tension between good science and applied agricultural research, in NARIs [national agricultural research institutes] and also within the CG system.... Years of failing to respond to development needs have led to a situation where those engaged in planning agricultural and rural development often perceive research programmes of the NARIs, through to the CGIAR centres, to have limited relevance to the development agenda.”

Over the years, international agricultural research organizations have used a number of approaches to link research more effectively with development and the needs of the poor. These approaches have included extension and outreach programs, cropping and farming systems research, participatory plant breeding, integrated natural resource management, networking, and partnership, among others (Scoones and Thompson, 2009). Recently, research centers have experimented with innovation systems approaches that shift attention from increasing the supply of new technology to facilitating innovation processes in which new solutions to technical and institutional problems are co-produced by diverse stakeholders in interactive learning processes.

The World Bank (2006: vi–vii) defines an innovation system as:

“a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into social and economic use, together with the institutions and policies that affect their behaviour and performance.”

Various factors can trigger innovation, including changes in policies, markets, and technology. Attitudes, habits, norms, and institutional structures determine how individuals and organizations respond to such triggers.

Applying innovation system concepts in practice to link research more effectively with action, has proven challenging (Hall, 2009), and there are few well-documented cases of successful application of innovation system approaches. The papers presented in this book show how Papa Andina grappled with fundamental issues of linking research with action, how it interpreted and applied concepts and thinking from innovation systems and such related areas as knowledge management and sustainability science, and the results that were obtained.

Partnering for innovation and development

The papers in this book elucidate various aspects of an important strategy that CGIAR centers and their national partners are currently using to link the worlds of research

and action, and to promote pro-poor innovation: partnership programs that work to broker innovation processes and strengthen the capacity of innovation systems.

The Papa Andina Partnership Program was hosted by CIP and supported by SDC throughout its life. Support for specific areas of work was provided by the New Zealand Aid Programme (NZAid), the United Kingdom Department for International Development (DFID), and the McKnight Foundation.

Papa Andina worked with Strategic and Operational Partners in Bolivia, Ecuador, and Peru to promote innovation processes in market chains that benefit small-scale potato producers in highland areas. Papa Andina's Strategic Partners were:

- The PROINPA Foundation in Bolivia
- The National Potato Program of INIAP in Ecuador
- The INCOPA Project in Peru.⁴

Through its Strategic Partners, Papa Andina worked with a range of local Operational Partners in each country.

Papa Andina's Strategic Partners functioned as *innovation brokers* (Devaux et al., 2010a) in each country, facilitating innovation processes in potato market chains that involve small farmers. These innovation processes included not only researchers, but other agricultural service providers, policy-makers, small-scale farmers, and market agents.

Papa Andina's Coordination Team functioned as a *second-level innovation broker*, supporting and backstopping the national teams, facilitating learning and knowledge sharing among them, and encouraging the co-development of approaches and methods for improving innovation brokering processes at national and local levels.

Results of Papa Andina

As illustrated in the papers in this book, Papa Andina and its partners were highly productive, and stimulated changes at the level of individuals, organizations, and innovation systems. Both technical and institutional innovation occurred. Through Papa Andina, a number of assets were produced that remain available for future use. These assets include:

- The Papa Andina brand

4 The partners' full names are: Fundación PROINPA (Foundation for Promotion and Research on Andean Products, Bolivia) (www.proinpa.org/); INIAP (National Agriculture Research Institute, Ecuador) (www.iniap.gob.ec/index.php?option=com_content&view=article&id=422&Itemid=479); and Proyecto INCOPA (Project for Innovation and Competitiveness of the Potato, Peru), a coalition of private and public organizations that aims to improve small-scale potato farmers' access to markets (www.papandina.org/hacemos/proyectos/en-curso/fase-de-capitalizacion-de-papa-andina-incopa).

- The Papa Andina innovation model
- New research and development (R&D) approaches
- New potato-based products that were developed and marketed
- Continuing innovation processes
- Strengthened capacity for innovation
- New perspectives on the role of the potato as a resource for development
- Changes in the research agenda, at CIP, in national research organizations, and elsewhere
- Information on Papa Andina's experiences and results, available in publications and on the Internet.

These assets are described in the final section of these **Highlights**.

Structure of this book

This book has three main parts. **Part 1** deals with the evolution of thinking and practice in Papa Andina and the development of what could be termed '*the Papa Andina innovation model*'. Although Papa Andina was originally set up as an applied regional research project, over time its focus shifted from research to brokering and supporting innovation processes. The papers in Part 1 explain why and how Papa Andina shifted its focus, and how this shift helped to link research carried out at CIP and other research centers with local action, innovation, and development in the public and private spheres.

Part 2 is concerned with the new R&D approaches that Papa Andina developed and applied in order to perform effectively as a '*second-level innovation broker*'. Achieving the shift from research to brokering innovation went hand in hand with the development and application of new approaches, such as:

- Identifying and exploiting opportunities in market chains
- Establishing multi-stakeholder platforms
- Promoting learning and continuous program improvement;
- Influencing agricultural policies through advocacy
- Promoting corporate social responsibility
- Developing sustainable technologies for Andean small farmers
- Specifically addressing empowerment and gender.

The papers in Part 2 describe the approaches that were developed in each of these areas, and illustrate how they have been used.

Part 3 deals with knowledge sharing and the dissemination of Papa Andina's innovation model and approaches. It is sometimes, erroneously, assumed that the dissemination of research results through research publications will stimulate the intended uses of these results by the intended users. However, dissemination of information through publications is not enough to ensure the use of new R&D approaches that are needed to improve innovation systems and their results for the poor. Improving knowledge systems requires fundamental changes not only in the knowledge and skills of individuals but in their attitudes and habits. Bringing about such changes requires more than sharing explicit knowledge via publications or similar media. It also requires sharing of tacit knowledge through sustained personal interaction, which in turn requires the development of trusting interpersonal relationships. Part 3 examines the ways in which Papa Andina worked to disseminate its approaches through the sharing of both tacit and explicit knowledge.

THE EVOLUTION OF PAPA ANDINA

The potato, grown mainly by poor smallholders, is the most important food crop in the Andean highlands of South America. For many years, SDC supported national potato research and development programs as a strategy for reducing rural poverty in Bolivia, Ecuador, and Peru through bilateral projects and collaboration with CIP. In 1998, CIP and SDC established Papa Andina as a regional project in order to improve coordination and the cost-effectiveness of these national efforts.

In line with the CGIAR strategy at the time, Papa Andina aimed to provide a regional approach to research planning, priority setting, and implementation involving the traditional partners of CIP and SDC – the national potato research programs. The goal was to develop a decentralized regional research program with country partners implementing specific research projects and sharing the results with researchers in the other countries.

Through CIP and Papa Andina, SDC provided long-term support to the region for potato R&D. Papa Andina was planned and implemented in three phases:

Phase 1	1998 – 2002
Phase 2	2002 – 2006
Phase 3	2006 – 2010

After Phase 3 formally ended in mid-2010, SDC provided support for an additional year to allow Papa Andina to consolidate and capitalize on the work to date, and to document and disseminate the results. The book you are now reading is one of the main products of this capitalization phase.

Papa Andina was externally evaluated at the end of each phase, and results of these evaluations, as well as those of 'horizontal evaluations'⁵ carried out by Papa Andina's stakeholders, were used to inform the planning and management of each subsequent phase. Consequently, the focus, strategies, and activities of Papa Andina evolved over time, as the operating environment changed, as participants gained knowledge and skills, as productive interpersonal relations were established, and as the program matured.

From doing research to brokering innovation processes

Soon after Papa Andina was established, it became clear that national policy-makers and researchers were less interested in developing a regional potato research program than in learning to cope with the external forces that were buffeting their organizations. These forces included declining funding for agricultural research, accelerating change in the agricultural sector, and greater demands for short-term impact. Both local stakeholders and international donors were complaining that research was not addressing the most pressing problems, and new value chain approaches were being promoted as part of a new 'research-for-development' agenda. In this context, researchers and policy-makers wished to improve their understanding of, and ability to respond to, changing demands for research.

To address these issues, Papa Andina linked up with the New Paradigm Project of the International Service for National Agricultural Research (ISNAR), which was also supported by SDC (Souza Silva, 2001). The New Paradigm Project offered a theoretical framework for understanding and managing organizational change processes. The framework emphasized the growing role of urban and global markets in driving agricultural change and the need for research organizations to understand the changing global context and to respond appropriately to changing demands for agricultural research and related services.

These ideas fell on fertile ground. CIP had a long tradition of participatory technology development (Thiele et al., 2001). Papa Andina's coordinators had complementary training and skills in biological and social sciences, and were experienced in on-farm research. For many years, SDC had supported the use of participatory research methods, and had organized participatory planning workshops for many of the projects it supported. Several of Papa Andina's members had learned participatory project planning methods in these workshops. SDC also believed that agricultural research organizations needed to become more open and responsive, and worked with development partners, including non-governmental organizations (NGOs) and private enterprises to innovate in market chains in ways that would benefit small farmers.

5 The horizontal evaluation approach is discussed below in Highlights of Part 2 in the section on Learning and program improvement through 'horizontal evaluation'.

Encouraged by these ideas, Papa Andina's coordinators and national partners conducted strategic planning exercises and explored different approaches for understanding and developing potato market chains. In Bolivia, this led to experimentation with an approach for market chain analysis developed by the Brazilian Agricultural Research Corporation (EMBRAPA). In Ecuador, strategic planning and market chain analysis led to establishment of multi-stakeholder platforms that involved potato researchers, service providers and small farmers. This led to further work on farmer organization and empowerment. In Peru, experimentation began with a participatory market chain approach that engaged not only small farmers and agricultural service providers, but entrepreneurs involved with potato processing, marketing, cooking schools, supermarkets, and gourmet restaurants. The market chain work in Bolivia and Peru led to the development of an approach known as the 'Participatory Market Chain Approach' (PMCA).

In order to promote knowledge sharing among the different national groups, to strengthen the work of local teams, and to learn lessons of a more general nature, Papa Andina's coordinators took the lead in developing a participatory evaluation approach that fostered learning, knowledge sharing, and improvement in the context of a network. This became known as 'Horizontal Evaluation'.

As the market chain work with farmers, service providers, and market chain actors advanced, national groups realized the importance of engaging with policy-makers and influencing policy dialogue and decisions. This led to national initiatives, each of which reflected the particular policy context of the country. In each country, a strategic vision was drawn up or priorities were defined for the sector. In Peru, when a multi-national corporation showed interest in processing and marketing native potato products, the Peruvian team began work on issues of corporate social responsibility.

Through these efforts, *the focus of Papa Andina shifted from developing a regional research agenda – a set of technically oriented projects, results of which would be shared across national boundaries – to developing a regional innovation agenda* focused on strengthening the capacity of national agricultural research organizations and other local actors to contribute to pro-poor innovation.

Making the shift was not a well-planned process that followed an elaborate strategy or a detailed script, but one that evolved in unexpected ways and that frequently involved disagreements, tensions, and conflict. When work on market chains and multi-stakeholder platforms was undertaken, each local team developed its own perspectives and approaches linked to underlying core beliefs about the nature of the development process, and there was a degree of rivalry among the teams. The diversity of initiatives, experiences and rivalry between the teams promoted methodological innovation. Horizontal evaluation then served as a useful tool for understanding and learning from the diversity of local interests, perspectives and experiences, allowing shared new concepts and knowledge to emerge. In this sense, horizontal evaluation promoted collective learning and continuous improvement within Papa Andina.

It took time for the shift from doing research to facilitating mutual learning and brokering innovation processes to be incorporated into the way Papa Andina and its partners worked, and the process is still incomplete. Changing the central focus of a partnership program and the ways in which it works is a complex process that involves controversy, interpersonal and inter-organizational conflict, and periodic setbacks.

From CIP project to partnership program

Papa Andina began as a CIP project with a single donor – SDC. Over time it evolved into a partnership program with several different donors, including SDC, DFID, NZAid, and the McKnight Foundation, and spanning the institutional boundaries of CIP and its R&D partners in Bolivia, Ecuador, and Peru. Over the years, Papa Andina managed a portfolio of complementary donor-funded projects that aim to stimulate pro-poor innovation and develop national innovation capacities in the potato sector. All its work was funded through donor projects, rather than CIP's core budget.⁶

Papa Andina's Coordination Team was made up of CIP staff members and consultants based in Peru, Bolivia, and Ecuador. The management style was markedly 'horizontal' (Bebbington and Rotondo, 2010: 36). Major decisions were made at Papa Andina's annual meetings or at meetings of the Management Committee.

The Coordination Team worked closely with focal points and collaborators in one R&D organization in each country: the Strategic Partners. Most of Papa Andina's work was led by the Strategic Partners and was implemented directly by them or via local Operational Partner organizations (Devaux et al., 2010: Figure 1).

Papa Andina was also part of CIP's organizational structure, which is made up of Research Divisions and Partnership Programs (CIP, 2004:59). Partnership Programs are characterized by the direct involvement of partners in program planning, implementation, and governance. Papa Andina had its own Management Committee, which included representatives of the Strategic Partners, the Coordination Team, CIP, SDC, and the agricultural sector in each country. This arrangement created multiple lines of accountability between Papa Andina and its main stakeholders.

Papa Andina operated as a second-level innovation broker. Its Coordination Team was not directly involved in brokering in-country innovation processes, but worked to support the Strategic Partners in three ways:

1. Creating an appropriate environment or 'innovation ecology'
2. Facilitating the implementation of innovation processes in each country

⁶ A CGIAR center's 'core budget' is unrestricted in the sense that center management has discretion over the use of the funds to implement the center's program. In contrast, 'project funds' must be used according to agreements between the center and the donor that specify budgets, output and impact targets, and timelines.

3. Acting as a 'broker of innovation in R&D approaches and processes.'⁷

The Coordinating Team mainly provide support for methodology development and innovation brokering, knowledge sharing through regional activities, and grants for operations in each country.

A key Papa Andina strategy was to strengthen the innovation capacity of national partners by delegating responsibilities and authority to them. An external evaluation of Papa Andina found that country-level activities were so closely associated with the Strategic Partners that many Operational Partners, producers, and other stakeholders knew little about Papa Andina, and assumed that they were participating in or benefiting from the activities of PROINPA, INIAP, or INCOPA (Bebbington and Rotondo, 2010:38).

Papa Andina's low profile helped to build up the public image of the Strategic Partners, but may have limited the extent to which Papa Andina was recognized for downstream results of its work – outcomes and impacts. The difficulty of measuring or attributing impacts of innovation brokers, such as Papa Andina, poses problems for fund raising when donors expect their projects to generate tangible impacts in the short term (Klerkx et al., 2009).

HIGHLIGHTS OF PART 1 – DEVELOPMENT OF THE PAPA ANDINA MODEL

The four papers in Part 1 of the book cover the evolution of Papa Andina from a regional research project to a diverse and decentralized knowledge brokerage and innovation facilitating network.

The first paper in Part 1, **Adding value to local knowledge and biodiversity of Andean potato farmers: The Papa Andina Project** (Thiele and Devaux, 2002) was published soon after Papa Andina was established. It outlines the rationale for a resource-based approach to improving the livelihoods of Andean potato farmers by building on two of their most important resources – local knowledge and the biodiversity of their native potatoes.

In the second paper, **Underground assets: Potato biodiversity to improve the livelihoods of the poor**, Meinzen-Dick et al. (2009) show how these ideas were put into practice in the intervening years. Papa Andina and its national partners helped Andean farmers build new livelihood strategies using the genetic diversity of potatoes, local knowledge, and social capital – assets that are often undervalued. This required a range of policies and institutions such as collective action among farmers and interactions with outsiders including market agents and agricultural service providers, to foster market chain innovation, and to access and build market opportunities. The authors conclude that a good understanding of the changing

7 For a discussion of 'innovation in innovation,' or innovation in R&D approaches, see Hall (2003).

context of producers, processors, and consumers is essential to ensure that potatoes play a role in improving the welfare of the poor.

The term ‘collective action’ generally refers to voluntary action taken by a group of *individuals with similar interests* to achieve common goals. The paper, **Collective action for market chain innovation in the Andes** (Devaux et al., 2009a) explains how Papa Andina promoted and used collective action involving *individuals with different, often conflicting agendas*, to foster market chain innovation. Two of the approaches developed and employed by Papa Andina – the participatory market chain approach (PMCA) and multi-stakeholder platforms – engage small potato producers together with market agents and agricultural service providers in group activities to identify common interests, share market knowledge and develop new business opportunities that benefit small farmers as well as other market chain actors. The paper analyzes Papa Andina’s experiences with collective action and discusses the policy implications for research and development organizations.

The inadequate linkage of research with policy-making and economic activity is an important barrier to sustainable development and poverty reduction in many fields, including agricultural research and development. The emerging fields of sustainability science and innovation systems studies highlight the importance of ‘boundary management’ and ‘innovation brokering’ in linking knowledge production, policy-making, and economic activities. **Brokering Innovation for Sustainable Development: The Papa Andina Case** (Devaux et al. 2010a) analyzes how Papa Andina functioned as an innovation broker in the Andean potato sector. As a regional initiative, Papa Andina was a ‘second-level innovation broker,’ backstopping national partners who facilitated local innovation processes in their respective countries. Papa Andina worked to strengthen local innovation capacity and to foster the development of more effective ways of bringing stakeholders together to produce innovations that benefit small-scale farmers. The paper outlines the ways in which Papa Andina fostered innovation brokerage at these two levels, the types of results obtained, and some challenges in innovation brokerage at the international level.

The last paper in Part 1, **Knowledge management for pro-poor innovation: The Papa Andina case** (Horton et al. 2011a) analyzes Papa Andina’s perspectives on knowledge management and innovation and how these have influenced its strategies and results. Due to the highly decentralized mode of operation within Papa Andina, local teams developed their own perspectives and approaches to market chain development and multi-stakeholder platforms. These perspectives and approaches reflected local circumstances and underlying beliefs about development processes. Rivalry among the teams led to creative conflict, which stimulated creativity and innovation. Participatory evaluations within the Papa Andina network played a central role in recognizing differences and building shared knowledge across teams, contributing to continuous program improvement.

HIGHLIGHTS OF PART 2 – PAPA ANDINA’S APPROACHES AND THEIR APPLICATION

Over time, Papa Andina developed a number of new R&D approaches to facilitate pro-poor innovation in market chains. The first of these was the *PMCA*, which served as a trigger for innovation. At the same time, work began with *multi-stakeholder platforms*, in some cases to facilitate innovation processes, in others to improve coordination along market chains.

With work on these two approaches underway in each country, a way was needed to share and learn from the diverse experiences. For this purpose, a participatory evaluation approach, known as *horizontal evaluation* was developed.

Through the work at the farm and market chain levels, it became clear that *public awareness and advocacy* were also needed to achieve large-scale impacts, and work began in this area. As large companies began to show interest in processing native potatoes, Papa Andina also began to work in the area of *corporate social responsibility*.

During the work to improve the participation of small farmers in high value market chains, new priorities for technological research emerged, which were addressed through applied research for *sustainable technological innovation*. In order to ensure that all the benefits of Papa Andina’s work were not captured by powerful groups, work also began on *empowerment and gender*.

Papa Andina’s work on each of these approaches is introduced in the following sections and highlights of the relevant papers in Part 2 are presented.

The Participatory Market Chain Approach

The PMCA stimulates innovation and generates business opportunities that benefit small farmers. This participatory process involves different market chain actors, including small farmers and the business sector, as well as R&D institutions, agricultural service providers and representatives from the gastronomy sector.

This approach uses a carefully structured participatory process focused on market demand, guided by a facilitator, and organized around three phases, focused on diagnosis, analysis of opportunities, and development of innovations (Bernet et al., 2008: Figure 1). Together, the different market chain actors analyze new business ideas and innovative ways to implement them. The participatory process focuses on building trust among the different actors and fostering effective public–private partnerships. The PMCA also provides R&D institutions with an opportunity to capture research demands from farmers and other market chain actors.

The PMCA was originally developed and applied to the potato market chain in the Andes by Papa Andina and its partners. It has subsequently been extended to other market chains such as those for coffee, milk and fruit in the Andes, and to sweet potato and vegetable market chains in Africa and Asia.

The first four papers in Part 2 relate to PMCA. The first two of these, both titled **Participatory market chain approach**, (Bernet et al., 2005, 2008) present the case for a simple participatory approach for promoting market chain development and

outline the basic features of the PMCA. They explain how the approach can be used to bring together small farmers, market agents, and service providers in a facilitated process that builds trust and encourages collaboration in the identification, analysis, and exploitation of new market opportunities. To ensure that impacts are sustained, the PMCA is best used as part of a broader program of market chain development.

In the third paper, **Strengthening competitiveness of the potato market chain: An experience in Peru**, Ordinola et al. (2009) describe an application of the PMCA and the resulting innovations, which included pro-poor, demand-oriented innovations of three types:

- *Commercial innovations*: new products or marketing arrangements that benefit small farmers as well as other market chain actors. These included attractively packaged, washed and selected fresh native potatoes, colored potato chips, dehydrated mashed yellow potatoes, and a high-quality traditionally freeze-dried product, *tunta*.⁸
- *Technological innovations*: **new ways to cultivate potatoes, manage pests and diseases, or process potatoes, which were stimulated by changes in marketing practices.**
- *Institutional innovations*: new rules or organizational arrangements that favor competitiveness of the sector and empower small farmers, including public-private alliances, the National Potato Days that are now celebrated in Ecuador and Peru, and Peru's new Potato Wholesale Commerce Law and technical norms for *tunta*.

In the final paper in this section, ***T'ikapapa*: A marketing scheme that uses potato biodiversity to improve livelihoods of Andean farmers in Peru**, Manrique et al. (2011) analyzes the *T'ikapapa* marketing concept, which emerged from a PMCA application in Peru, and resulted in:

- Entry of small-scale Andean farmers into high value urban markets
- Increased farmer incomes
- A business case for corporate social responsibility in the food processing industry
- Increased public awareness of the value of native potatoes
- Increased interest in conserving the biodiversity of Andean native potatoes
- Changes in the research agenda for potatoes in Peru.

⁸ Some native potato varieties are known as bitter potatoes, which have high levels of glycoalkaloids. These potatoes are bitter tasting and cannot be consumed fresh, but they are highly frost resistant and suitable for cultivation at high altitudes where other crops cannot be grown. Indigenous Andean farmers have developed traditional freeze-drying methods that eliminate glycoalkaloids as well as moisture, allowing bitter potatoes to be stored for long periods before they are consumed. Consequently, bitter potatoes, such as *tunta* and *chuño*, play a key role in the food security strategies of many small farmers in isolated high reaches of the Andes.

Multi-stakeholder platforms

Stakeholder platforms offer a space for public–private collaboration. Papa Andina promoted stakeholder platforms, as they demonstrated the potential for empowering market chain actors, especially small farmers, and improving access to markets, services, and research results. Stakeholder platforms bring together diverse actors who share interests linked to specific market chains or innovation processes. By interacting within the platform, they can improve their mutual understanding, create trust, set priorities, define roles, and engage in joint action.

Stakeholder platforms can perform three main functions that are useful for enhancing the competitiveness and empowerment of small-scale farmers. They can stimulate joint innovation and formulate demand for research; they can improve coordination and governance in the market chain (e.g. by matching demand and supply or by developing information services and business standards); and they can advocate for policy changes and public awareness.

There are two main types of platform. *Commercial platforms* bring together market chain actors such as farmer organizations, traders, processors, and supermarkets, as well as chefs, NGOs, and researchers. They focus on the creation of new products, development of niche markets, and advocacy. *Local platforms* involve actors from a delimited geographical production area such as local public authorities, NGOs, and farmer organizations. They focus on market coordination issues, empowerment of farmer organizations and access to agricultural and financial services. Both types of platform interact with public and academic institutions at the national level and R&D organizations can play an important role in facilitating them.

Three papers relate to multi-stakeholder platforms. In the first paper in this section, **Multi-stakeholder platforms for innovation and coordination in market chains: Evidence from the Andes**, Thiele et al. (2009) describe how Papa Andina and its partners have supported different types of multi-stakeholder platforms to promote interaction, social learning, social capital formation, and collective action involving these diverse actors in innovation and market coordination processes. The paper analyzes experiences with platforms of different types, presents a general framework for characterizing platforms and identifies key lessons for facilitation and securing significant outcomes.

The second paper, **Linking smallholder potato farmers to the market: Impact study of multi-stakeholder platforms in Ecuador**, by Cavatassi et al. (2009), analyzes the impact of participation in multi-stakeholder platforms aimed at linking smallholder potato farmers to the market in the mountain region of Ecuador. It describes the platforms and evaluates their success in linking farmers to higher value markets and the effects that such connections brought. The authors conclude that the program was successful in improving the welfare of beneficiaries, while potential negative environmental impacts, particularly in relation to agro-biodiversity and use of agrochemicals seem not to be a concern.

The third paper, **Fostering pro-poor innovation: The case of the Bolivian Andean Platform**, by Velasco et al. (2009), uses an innovation system perspective as a conceptual framework for analyzing the experience of the Bolivian Andean Platform (ANDIBOL) in fostering pro-poor technical innovation in response to market opportunities.

Learning and program improvement through 'horizontal evaluation'

Horizontal evaluation is a flexible evaluation approach that combines self-assessment and external review by peers. It was developed by Papa Andina to improve the work of local project teams, to promote learning, and to share knowledge within the network. Members of the network had felt frustrated with their experiences with traditional external evaluations and also with study visits to different project sites. In developing horizontal evaluation, they tried to incorporate positive features of external evaluations and cross-site visits, and to avoid the disadvantages.

The first of two papers on this approach, **Horizontal evaluation: Stimulating social learning among peers** (Thiele et al., 2006) offers a brief introduction to horizontal evaluation. The involvement of peers neutralizes the lopsided power relations that prevail in traditional external evaluations, creating a more favorable atmosphere for learning and improvement. The central element of a horizontal evaluation is a workshop that brings together a group of 'local participants' who are developing a new R&D methodology and a group of 'visitors' or 'peers' who are also interested in the methodology. The workshop combines presentations about the methodology with field visits, small group work and plenary discussions. Horizontal evaluation elicits and compares the perceptions of the two groups concerning the strengths and weaknesses of the methodology; it provides practical suggestions for improvement, which may often be put to use immediately; it promotes social learning among the different groups involved; and it stimulates further experimentation with, and development of, the methodology in other settings.

The second paper, **Horizontal Evaluation: Fostering knowledge sharing and program improvement within a network** (Thiele et al., 2007), presents a more substantive treatment of the approach, for a professional evaluation audience. The paper explains how, in a horizontal evaluation workshop, a project team and peers from other organizations independently assess the strengths and weaknesses of a R&D approach that is being developed and then compare the assessments. Project team members formulate recommendations for improving the R&D approach, and peers consider ways to apply it back home. The paper reports on a survey of participants in horizontal evaluations. Results indicate that the horizontal evaluations helped improve the work under review, stimulated visitors to experiment with new R&D approaches back home, and strengthened interpersonal relations among network members.

Public awareness and advocacy

There are limits to what can be achieved through work at the level of small farmers and other market chain actors. To improve the image of native potatoes and

influence governmental policies that affect the competitiveness of the potato sector, Papa Andina and its partners in the Andes engaged in three strategies, which reached a pinnacle during the UN-declared *International Year of the Potato* in 2008.⁹

The first strategy was to develop a strategic vision for the potato sector in the Andean region. Papa Andina worked with research partners in Bolivia, Ecuador, and Peru to implement a regional diagnostic of comparative statistics for the potato sector. These data provided the basis for developing a strategic vision for the whole sector. The participatory vision exercise involved a wide range of actors such as Ministries of Agriculture and leading private sector companies. It identified priority areas requiring public and private action for the development of the potato sector, such as organizing the sector, developing lobbying capacities, and developing technologies for improving the efficiency and sustainability of the potato production system.

The second strategy was to change public perceptions of the value of the potato. Over the past decade, Papa Andina and its partners have created and promoted awareness about native potatoes at the regional, national and international levels, highlighting their culinary, cultural, and economic potential for promoting development in rural areas of the Andean region. The main results include:

- Creation and celebration of a National Potato Day in Peru and Ecuador with the participation of the Ministry of Agriculture, municipalities, supermarkets and restaurants, cooking schools, and media coverage
- Production of a potato photography exhibition that toured the Andean countries in 2008
- High visibility of the potato in the media throughout 2008 and later.

The third strategy was to advocate for measures to enhance the competitiveness of the potato sector. Papa Andina and its partners advocated for ministerial decrees and participated in normative processes. This work led to the introduction of native potatoes in the national variety catalog and the formal seed system in Peru, and to the promulgation of official quality and technical norms for *chuño* and *tunta* in Bolivia and Peru.

The tenth paper in Part 2, **Developing a strategic vision for the potato sector in the Andean region** (Devaux et al., 2009b), describes how Papa Andina and its partners took advantage of the International Year of the Potato in 2008 to promote the development of a strategic vision for the potato sector in the Andean region. This was done in cooperation with the PROINPA Foundation (Bolivia), INIAP's National Potato Program (Ecuador) and the INCOPA Project (Peru), and in coordination with public and private actors in each country. The process involved an international diagnosis, national surveys and analyses in Peru, Bolivia, and Ecuador, and workshops involving public and private stakeholders to build up a joint strategic vision. In each

⁹ www.potato2008.org/en/index.html.

country a strategic vision was elaborated or priorities were defined for the sector. Partners have used these results to support development of the sector. The instability of public authorities responsible for making and implementing political decisions was a common challenge identified in the three countries. This paper explains the diverse dynamics at work and analyzes the progress made in developing the vision and implementing concrete actions in each country. A book based on this work, which compares and contrasts the potato sector in the three countries, is now used as a reference document in technical and political circles in the region (Devaux et al., 2010).

Corporate social responsibility

The entry of large companies into the native potato market boosted the demand for native potatoes and the potential to increase incomes for producers. However, there was a risk that small farmers, who have little market knowledge and limited bargaining power, and produce only small volumes for the market, might lose out to larger commercial farmers. To ensure that small farmers benefitted from development of the market for native potatoes, Papa Andina and its partners in NGOs and processing firms experimented with business models that integrate corporate social responsibility (CSR).

In the context of a high value chain, such as that of the native potato, one way for an agri-food company to implement CSR is to establish a long-term and mutually beneficial relationship with small farmers as suppliers. Such a partnership allows the company to take advantage of market opportunities for native potatoes while contributing to poverty reduction. Labeling and public awareness campaigns driven by independent parties can further strengthen this model, as they provide consumers with a guarantee and the company with credibility for its efforts to invest in small-scale farmers in an impact-oriented way. To implement such a business model, innovation and capacity building are required both at the company and farmer levels. Research and development organizations can provide valuable support to meet these needs.

Native potato market chain and poverty reduction: Innovation around corporate social responsibility (Thomann et al., 2009) analyzes an innovation process promoted by Papa Andina and its partners to integrate CSR into the native potato market chain, and harness the private sector in efforts to reduce poverty. Outcomes included:

1. A tripartite partnership between PepsiCo Foods, R&D organizations and farmer organizations, which has generated substantial benefits for farmers
2. A dialogue on the private sector's role in supporting research to improve smallholders' production
3. New institutional arrangements, such as a social marketing initiative and a CSR certification label for the native potato trade.

Technological innovation for sustainable development

To be competitive in high value markets and improve their incomes, farmers generally need to improve the quality and yield of their potatoes. In collaboration with CIP's research divisions and its national research partners, Papa Andina promoted the development and adoption of technological innovations that help small Andean farmers respond better to market demand, without affecting their productive and natural resources, including biodiversity.

The starting point was market demand. For high value markets, quality criteria included tuber size, absence of pest and disease damage, specific processing or cooking characteristics, and reasonable shelf life. The use of production methods with no, or minimal, use of pesticides also increases the perception of quality for a growing number of consumers who are concerned about food safety.

To respond to market demands and also contribute to poverty reduction, Papa Andina and its partners promoted technological innovations that improved the competitiveness of small farmers, made minimal use of pesticides and other practices that could damage the environment, and combined the traditional knowledge of farmers, the practical experience of local partners (NGOs), and formal knowledge of research institutions.

Technological innovation was promoted in three main areas. The first of these was *quality seed production for native potatoes*, where new techniques such as aeroponics were applied, together with more traditional approaches such as positive selection in seed production systems that integrate elements of both formal and informal systems. Research articles are being prepared on a mixed seed potato system in Ecuador and on the aeroponics techniques used in Ecuador and Peru. The second area, *integrated crop management*, involved the adaptation and use of new techniques in local contexts and participatory capacity strengthening approaches, such as Farmer Field Schools and Local Agricultural Research Committees. The papers by Cavatassi et al. (2009) and Andrade-Piedra et al. (2009) included in Parts 2 and 3 of this book provided examples of this work. The third area covered post-harvest management, and aimed to improve the quality and market price of harvested potatoes.

The first two papers on technical innovation are based on experiences with the Innova project, which aimed to strengthen technology innovation systems in potato-based agriculture in Bolivia. At the time, Bolivia had a large set of almost-ready technologies, which were developed under projects funded by DFID. Completing the technologies involved systematically gauging demand for them from farmers and other potential users, in a way that did not simply rubber-stamp the existing research program. **Cinderella's slipper: Sondeo surveys and technology fairs for gauging demand** (Bentley et al., 2004) describes how 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 elicit 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, 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.

Unspoken demands for farm technology (Bentley et al., 2007) notes that before Innova started, critics suggested that the previously developed technologies should be discarded, because they were not based on a thorough demand survey. Instead, Innova kept the existing technologies, but judged the demand for them using several methods, including local agricultural research committees, *sondeos*, technology fairs, and others. It was found that there was demand for some of the existing technologies, and that a survey would probably have missed much of the demand, which is implicit. People are not initially aware of all their problems or all the possible solutions. Over the years, farmers made more specific, sophisticated demands on the technologies, which evolved as a result.

As market innovations have been introduced and the demand for native potatoes has increased, Andean farmers have been challenged to improve their yields and the quality of harvested potatoes. In this context, one of the main limiting factors has been the low availability of high-quality seed for native varieties. In **Seed systems for native potatoes in Bolivia, Ecuador and Peru: Results of a diagnostic study** Hidalgo et al. (2009) present results of a diagnostic study of potato seed systems in Bolivia, Ecuador and Peru, which reveals that most small farmers keep their own seed and neither buy nor sell much seed. Little is known about the factors that influence seed degeneration or the optimal production technologies for seed of native varieties. Many projects and organizations are helping farmers produce seed, but few of these are concerned with native varieties. Systems that combine elements of formal seed certification systems and informal farmer systems are likely to be the best option for improving the quality of native potato varieties.

In the last paper in this section, **Promoting innovations in the Peruvian Altiplano: The case of tunta**, Fonseca and Ordinola (2009) report on work in southern Peru to promote the production and marketing of *tunta*. Since ancient times, traditional processing has allowed Andean farmers to diversify their consumption and preserve potatoes for later consumption or sale. *Tunta* is a highly nutritious, dehydrated food, but studies have identified deficiencies in the quality of the product. The INCOPA project supported the development of a multi-stakeholder platform in Puno to promote *tunta* production and marketing. This platform worked on three main fronts:

1. Technological improvements in *tunta* processing and quality certification
2. Establishment of the 'Aymaras Consortium', which brought together 100 small producers from eight communities
3. Linking the consortium to different markets and marketing *tunta* under the brand name, 'Los Aymaras'.

In 2008, the Consortium's members sold about 220 tons of tunta at prices about one-third higher than the traditional market price. Producers have reported substantial increases in their income, which translated into expansion of their cropland and investment in livestock.

Empowerment and gender

Innovation processes may not benefit men and women equally. Men usually have better access to external information and play a greater role in decision-making during innovation processes. R&D approaches seldom include gender-specific tools to encourage women's participation. To help counteract the typical gender bias in R&D, Papa Andina prepared a set of guidelines for incorporating gender perspectives into the PMCA, stakeholder platforms, and horizontal evaluations (Avilés et al., 2010). Papa Andina also provided support for partners to strengthen their capacities to address gender issues within their institutional strategies.

Two papers illustrate the importance of applying a 'gender lens' in innovation processes. The first paper, **Gender relationships in production and commercialization of potato seed with small-scale farmers in the Central Andes of Ecuador** (Conlago et al., 2009), reports on a gender analysis conducted in the central Andes of Ecuador. The objective was to analyze gender relationships and benefits in potato seed producers of the farmers' organization CONPAPA (Consortio de Pequeños Productores de Papa) and to propose recommendations to improve the relationships among the actors of CONPAPA's seed system. Women were found to play key roles in seed production in CONPAPA. While becoming part of the CONPAPA seed producers' groups was empowering for women, it may also overburden them. Men were found to still manage the most important events and are in charge of taking the most important decisions. To address these issues the following recommendations were made:

1. Use training materials tailored to women's needs and conduct training events in their native language
2. Promote women's access not only to knowledge, but to other resources, mainly credit
3. Practice affirmative action and promote women's leadership
4. Be aware that new activities could overload women's capacity and, therefore, start the intervention with few and simple activities
5. Highlight women's contributions to specific activities.

The second paper related to gender, **Preserving biodiversity of Andean roots and tubers: working with women** (Cadima et al., 2009) reports on a project to preserve biodiversity of Andean roots and tubers by working with women. PROINPA and the Bolivian Ministry of Agriculture, supported by Papa Andina, worked together to promote women's participation in producers' associations, which have tried to increase their members' incomes through the use and promotion of the biodiversity

of Andean roots and tubers. Women's traditional knowledge related to the use of Andean roots and tubers was combined with new information on additional uses of such products. Results were presented at several food fairs and other events, in order to disseminate the knowledge to other communities. The project contributed to increasing family incomes, and particularly women's incomes, since they were the ones who marketed the products. It also contributed to improving women's self esteem and recognition from other community members.

HIGHLIGHTS OF PART 3 – SOUTH–SOUTH KNOWLEDGE SHARING

It is sometimes assumed that new R&D approaches can be efficiently transferred through scientific publications, training materials, or guidelines. However, changing the approaches used in R&D programs often requires significant changes in knowledge, attitudes, and skills on the part of users; and such changes are not likely to be brought about merely by sharing information via publications or training documents. New R&D approaches do not work in the same ways, nor produce the same results everywhere. They require tailoring and adaptation to fit different circumstances.

For these reasons, the Papa Andina model and approaches cannot be simply 'transferred' from one place to another. Local capacities need to be developed to apply the model and the various approaches, and to tailor them to local circumstances. For this, both explicit and tacit knowledge need to be shared through a number of mechanisms. The dissemination of international public goods is necessary, but it is insufficient to only disseminate the use complex approaches such as the PMCA and horizontal evaluation. Strategies to promote individual and organizational learning are needed to bring about changes in knowledge, skills, and especially attitudes, behaviors, and organizational procedures.

Part 3 presents three papers that deal with issues related to the sharing and utilization of new knowledge. The first two papers report on experiences with introducing the PMCA to new settings. The third paper reports on an initiative to more effectively communicate to potential users principles for controlling late blight, one of the most severe diseases of the potato crop.

The first paper, **Promoting pro-poor market chain innovation with the Participatory Market Chain Approach: Lessons from four Andean cases**, presents highlights of a report on a study of four applications of the PMCA in value chains for coffee, dairy products, native potatoes, and yams in Bolivia, Colombia, and Peru (Horton et al., 2011b). Local and national groups affiliated with the Andean Change Alliance used the PMCA to explore and promote the use of participatory methods in agricultural innovation processes, in order to improve the livelihoods of poor farmers. The authors draw a number of conclusions from this:

- The PMCA stimulated varying degrees of learning, interaction, and innovative thinking and practices.

- Success factors for the PMCA include the economic policy environment and the presence of 'PMCA champions' among the PMCA facilitators and within the market chain.
- One common weakness of PMCA implementation is the limited engagement of business people and their commitment to market chain development.
- The PMCA is best seen not as a '*producer of innovations*' but as a '*trigger for innovation processes*'; the main benefits do not come directly from application of the approach but later on, as market chain actors and stakeholders continue to innovate.

In the second paper, **Developing capacity for agricultural market chain innovation: Experience with the 'PMCA' in Uganda**, Horton et al. (2010) address two fundamental questions that are frequently posed with regard to the PMCA:

- Can the PMCA be successfully used to stimulate innovation outside the Andes and in other commodity chains?
- What does it take to successfully introduce and apply the PMCA in a new setting?

The paper describes the strategies used to introduce the PMCA to Uganda and some of the results to date. The Ugandan experience indicates that the PMCA can, in fact, stimulate technological and institutional innovation in locally relevant agricultural commodity chains in Africa. Since the PMCA requires researchers and development professionals to work in new ways with diverse stakeholders, including not only small farmers but also market agents and policy-makers, its successful introduction requires an intensive capacity development process that fosters social networks, changes in attitudes, and the acquisition of social as well as technical knowledge and skills.

In the third paper in Part 3 and final paper in the book, **Humans: the neglected corner of the disease tetrahedron – developing a training guide for resource-poor farmers to control potato late blight**, Andrade-Piedra et al. (2009) describe how competence analysis was used to develop a training guide on late blight control for extension workers in Ecuador. Late blight, caused by *Phytophthora infestans*, continues to be one of the major threats to potato production, especially in developing countries. A group of farmers, extension workers and plant pathologists identified five areas of competence needed to manage late blight efficiently, which relate to:

- Recognition of the symptoms of disease and the organism that causes it
- Knowledge of how this organism lives
- Identification of the characteristics and benefits of using resistant potato cultivars
- Appropriate use of fungicides

- Selection of practices that control late blight efficiently.

Mental abilities, physical skills, attitudes and information specific for each competence were identified and from those, learning objectives were defined. Based on the objectives, the contents for each training session were defined, and learning strategies and evaluation questions were developed. A Spanish version of the training guide was developed, tested, and improved in three farmer field schools in the central highlands of Ecuador. The guide was then published in Spanish, Quechua, and English. Ecuador's INIAP used the same methodology for developing training guides for three other subjects (soil, seed, and potato tuber moth management) and several countries are in the process of adapting the potato late blight guide to their conditions.

CONCLUSIONS AND IMPLICATIONS

This final section of the *Highlights* describes the principal assets generated by the Papa Andina Partnership Program, discusses two main challenges that Papa Andina and other, similar initiatives face, and outlines how CIP and its partners are capitalizing on the assets produced by Papa Andina in order to foster pro-poor innovation in the future.

Assets produced by Papa Andina

The assets produced by Papa Andina are shown in Exhibit 1 and described in the following paragraphs.

Exhibit 1. Assets generated by Papa Andina

Assets generated by Papa Andina include:

- the Papa Andina brand;
- the Papa Andina innovation model;
- new research and development (R&D) approaches;
- new potato-based products that were developed and marketed;
- continuing innovation processes;
- strengthened capacity for innovation;
- new perspectives on the role of the potato as a resource for development;
- changes in the research agenda, at CIP, in national research organizations, and elsewhere
- information on Papa Andina's experiences and results, available in publications and on the Internet.

The Papa Andina brand

Papa Andina's work is well known among different communities concerned with pro-poor innovation. In the agricultural research for development communities in Bolivia, Ecuador, and Peru, Papa Andina was known for its innovative approaches and successful work to promote market chain development and link small potato producers to new high value markets. In the CGIAR, Papa Andina was known for its success in linking international research with national and local research for

development. In the community of professionals and practitioners engaged in agricultural innovation, Papa Andina was known for its approaches for knowledge management, organizational boundary spanning, and innovation brokerage. Papa Andina was widely known for using innovative approaches to articulate potential demands for new technology with possible supplies. Because it was recognized as a competent and trustworthy partner, Papa Andina was able to attract resources and bring stakeholders together to pursue common strategies for reducing rural poverty. Papa Andina and its partners have received a number of awards for this work (Exhibit 2).

Exhibit 2. Awards for work associated with Papa Andina

Papa Andina and its partners received both national and international recognition and awards for their innovative work. In 2005, CIP, INCOPA, and a private firm, A&L Exportaciones y Servicios SAC, won the Peruvian Award for Entrepreneurial Creativity, awarded by the Peruvian University for Applied Sciences for developing T'ikapapa – the first high quality bagged and labeled native potatoes ever sold in Peruvian supermarkets. As the award stated, T'ikapapa “values the enormous diversity of Andean potatoes, brings them to urban consumers, and generates sustainable businesses for small farmers.”

In 2007, INCOPA and Papa Andina won the international SEED Award for Entrepreneurship in Sustainable Development, an annual competition designed to support local, innovative partnerships in developing countries working to achieve poverty eradication and environmental sustainability. Also in 2007, INCOPA, A&L Exportaciones y Servicios SAC, Cadenas Productivas Agrícolas de Calidad (CAPAC) Perú, Wong Supermarket, producer organizations, and Papa Andina won the World Challenge Award. This is a competition sponsored by BBC World News, Newsweek, and Shell Foundation, which rewards projects and small businesses that have shown particular enterprise and innovation at a grassroots level.

In 2008, INCOPA and Papa Andina won the Peruvian Award for Entrepreneurial Creativity again, this time “for exploiting the diversity of native potatoes in expanding the competitiveness of products from the Andean region.” The same year, INCOPA and Papa Andina won Peru’s Ardilla de Oro, which is awarded annually by Peru’s Catholic University for a marketing campaign that contributes to Peru’s social development.

In Ecuador, in 2011 the private firm INALPROCES and the farmers’ organization CONPAPA (Papa Andina’s local partners) received a social responsibility award from the Cámara de Industrias y Comercio Ecuatoriana-Alemana for Kiwa, the first high-quality native colored potato chips sold in Ecuadorian supermarkets. The award recognized the partnership’s use of CSR in the development and marketing of Kiwa. Papa Andina partnered with INALPROCES and CONPAPA to link small producers with the development and benefits of the new product. The award consisted of monetary support for the production of clean seed and the development of new products based on native potatoes.

Papa Andina’s innovation model

Over time, an innovation model has emerged from the collaborative efforts of CIP, SDC, and partners in Bolivia, Ecuador, and Peru. This model was developed to pursue specific objectives in the context of a regional initiative in the Andes, and it reflects these particularities. The model is dynamic and has evolved over time as new needs and opportunities emerged, specific objectives evolved, and the partners learned

new and more effective ways to accomplish them. Key features of the model can be summarized in the following points:

- The over-arching goal is to promote innovation in market chains, as a strategy for improving the livelihoods of small producers, along with other market chain actors.
- The *modus operandi* involves working in partnership with diverse stakeholders in public, private, and non-governmental organizations.
- Two key functions of the partnership coordination unit are:
 - innovation brokerage, which facilitates innovation processes
 - organizational boundary spanning, which links research organizations more effectively with the other actors engaged in innovation processes.
- The three main entry points for innovation are:
 - understanding the key assets of the poor (farmers and other market actors) that could be leveraged to improve their livelihoods. Such assets include local knowledge and biodiversity.
 - understanding the potential market opportunities related to these assets (such as colored potato chips)
 - identifying other sources of information and support (including research) that could contribute to pro-poor market chain innovation.
- Efforts are pursued simultaneously on multiple fronts, to foster technical and institutional innovation and encourage changes in policies and public opinion.
- Initiatives target multiple system levels, including, for example, specific social and economic actors, the market chain, local and national government, public opinion, and the national, regional, and international scientific and development communities.
- Research is mobilized where it is most beneficial, for feeding new ideas into innovation processes; marshalling information to solve identified problems or develop opportunities; and synthesizing results, drawing general conclusions, and packaging them in the form of public goods.

New R&D approaches

New R&D approaches are central to the Papa Andina model. As work and priorities evolved over time, new approaches were developed in the following areas:

- Identifying needs and opportunities and fostering innovation in market chains (the PMCA)

- Promoting collective action among diverse stakeholders to foster innovation and coordination in market chains (multi-stakeholder platforms)
- Collective learning and program improvement in the context of a network (horizontal evaluation)
- Advocacy and public awareness
- Corporate social responsibility
- Developing sustainable technology
- Empowerment and gender.

These approaches were co-developed with partners in Bolivia, Ecuador, and Peru so as to be suitable for local circumstances. They evolved over time while maintaining their core principles. In future, new approaches will surely be needed to address emerging problems and opportunities. These approaches are at different stages of consolidation and documentation, with the PMCA and horizontal evaluation being the most advanced. Papa Andina's Coordination Team played a lead role in systematizing the approaches and disseminating them through publications and training manuals as well as through CIP's global programs and collaboration with other organizations. For example, CIP, the Regional Potato and Sweet Potato Improvement Network in Eastern and Central Africa (PRAPACE), and several national organizations introduced the PMCA into Uganda, with support from DFID. Also with DFID support, the Andean Change Alliance and numerous local organizations applied the PMCA in market chains for coffee, fruits, dairy products, native potatoes, and yams in Bolivia, Colombia, Ecuador, and Peru. With support from the Australian Center for International Agricultural Research (ACIAR), CIP and local organizations introduced the PMCA to Indonesia.

Experience to date indicates that the most significant and lasting results derive from a combination of these approaches over time. The PMCA has been useful for triggering innovation processes. Work to strengthen farmers' organizations and multi-stakeholder platforms has helped to consolidate these innovation processes and improve market coordination. Work on public-awareness has raised the profile of native potato-based products in the marketplace and in the national development agenda. Work on corporate social responsibility, empowerment, and gender has helped ensure that traditionally disempowered groups share in the benefits of market development. As work advanced in these areas on the demand side of the market equation, efforts were also made to improve the supply of information and

technologies needed to enable sustainable development. Such supply-side work has included new research on the following aspects of native potatoes:

- Varietal characterization
- Rapid production and distribution of quality planting material

- Pest management
- Post-harvest handling.

Previously, research in these areas focused on improved varieties and the results were of little use with native varieties.

New potato-based products

As a result of applications of the PMCA and associated approaches, a number of new products based mainly on native potatoes entered markets in Bolivia, Ecuador, and Peru. In Bolivia, an early result of an application of the PMCA was the development of the first colored native potato chips marketed in the country. This product was developed by the Lucana company in Cochabamba in partnership with native potato producers organized around the APROTAC association and with the PROINPA Foundation. It was launched in 2004 and is still in the market. Another PMCA application, with traditional, frost-resistant bitter potatoes grown in high areas near La Paz, resulted in improvements in traditionally freeze-dried potatoes (*chuño*) and in the first-ever official quality norms for this product, which is important in the local food system. A new product, consisting of clean, selected and bagged *chuño* branded *Chuñosa*, was launched in 2005.

In Ecuador, through the stakeholder platforms (and later, CONPAPA), three products were developed and are being marketed:

- Forty-five kilogram bags of selected tubers of the cultivar INIAP-Fripapa and other cultivars suitable for French fries were sold to fast-food restaurants, and 400-gram bags of selected, washed baby potatoes were sold in urban supermarkets. Both the selected table potatoes and seed tubers are sold under the brand name “*Raíz de Vida*” (Root of life, in English).
- Forty-five kilogram bags of quality potato seed of the same cultivars, certified by CONPAPA with an internal control system developed by INIAP.
- Since early 2011, a private company (INALPROCES) has produced 50 gram bags of mixed colored chips (brand *Kiwa*), made from two native potato cultivars grown by farmers affiliated with CONPAPA. This product, sold in Ecuador’s main supermarket chain, won an award for its CSR approach (Exhibit 3).

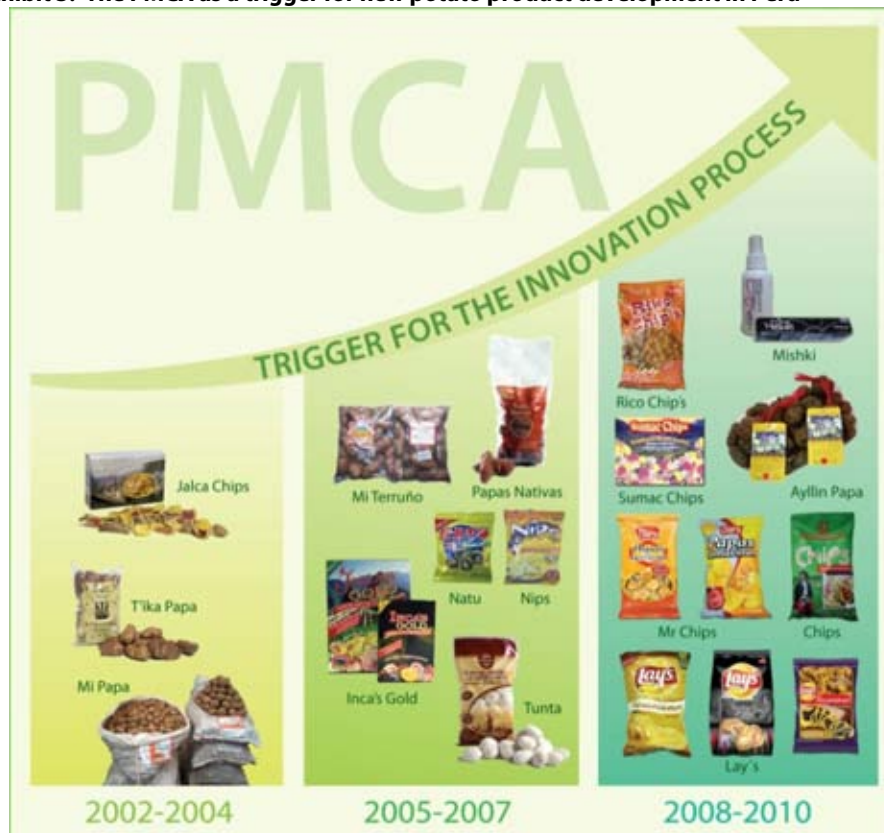
A book of recipes using native potatoes has been published (Monteros et al., 2006). From 2005 to 2010, in the province of Tungurahua, CONPAPA produced 528 tons of seed and sold 4,004 tons of table potatoes to restaurants, generating sales of USD 1,340,480 (F. Montesdeoca, INIAP, personal communication). In Ambato, at least 5 persons (including three former CONPAPA employees) have also begun to sell selected tubers of Fripapa and other suitable cultivars to fast food restaurants that market French fries.

An impact study (Cavatassi et al., 2009) indicates that multi-stakeholder platforms were an effective way to link farmers to the market, and that participants’ profits were

approximately six times those obtained by non-participants. The study highlights an improvement in social capital among multi-stakeholder platform participants, which is expressed in greater trust between market chain actors. This has facilitated the entry of small-scale producers into more demanding markets.

In Peru, there has been more new product development than in the other two countries, as potatoes have played a central role in the country's recent 'culinary boom.' As shown in Exhibit 3, more than a dozen new products have come onto the market since the initial PMCA exercise was conducted. A few of these products, including *Jalca Chips*, *T'ikapapa* and *Mi Papa*, were direct results of the PMCA. When these products came into the market, they stimulated considerable interest and motivated other entrepreneurs to develop other new products, many of which have been of far higher quality and are more successful than the original ones. The innovation process with native potatoes in Peru illustrates how change occurs over time in unpredictable ways, and how the initial results of an innovation process may soon be superseded by other 'copy-cat' innovations.

Exhibit 3. The PMCA as a trigger for new potato product development in Peru



The appearance of these new potato products, promotion of Andean potatoes as an important aspect of the country's cultural heritage, 'the blossoming of Peruvian cuisine as a global gastronomic phenomenon' (Scott, 2010: page 148), and recent economic and political trends in Peru have driven a rapid expansion of Peruvian potato production and consumption. As Scott (2010: page 148) notes, in a study of growth rates for potatoes in Latin America, 'The renaissance in potato output and area planted in Peru over the last 15 years has been perhaps the most remarkable development in the region over the last half century.'

A recent study of Peru's potato sector concludes that initiatives associated with Papa Andina and INCOPA have contributed to shifting the demand curve for potatoes – especially native potatoes – to the right, so that increased production and consumption have been accompanied by increased prices (Proexpansión, 2011: 13). These initiatives have included not only new-product development, but effective work in the spheres of public awareness and political advocacy, which led to establishment of Peru's National Potato Day (since 2006), celebration of the International Year of the Potato (2008), and the central role played by native potatoes in the *Mistura* International Gastronomy Fairs (since 2008).

New product development and general promotion of the potato sector have helped small farmers improve their participation in dynamic markets. Small farmers have expanded the area dedicated to native potatoes, diversified the varieties they grow, increased the amount of native potatoes produced and marketed, and entered into dynamic new markets. A study in the Andahuaylas region (Proexpansión, 2011) indicates that farmers who benefitted from higher sales and prices increased their incomes from their potato crop from an average of just over US\$ 300 to nearly US\$ 900 per year. In the Puno area, where farmers improved the production and marketing of *tunta*, one woman summarized the benefits in this way: "With my earnings [from *tunta*], I have been able to buy a small amount of land, fix up my house, and buy supplies for my children's school. I feel good because I've learned a lot and I will pass these things on to my children." Despite these significant gains, it is important to note that the overall incomes or welfare of rural families have improved relatively little, because livelihoods depend on multiple activities, not only in agriculture but increasingly off farm.

Continuing innovation processes

More important than the initial new products resulting directly from the PMCA are the innovation processes triggered by applications of the PMCA and other approaches, and which will continue long after the work of Papa Andina and its Strategic Partners has ended, as entrepreneurs in the private, public, and non-governmental sectors take over the innovation processes. In Peru, for example, spurred by the early work with native potatoes spearheaded by the INCOPA project, private enterprises in many parts of the country have continued to develop new fresh and processed potato products, and native potatoes have become a central ingredient in the rapidly growing slow-food and gourmet food industries.

Strengthened capacity for innovation

Researchers and development professionals who worked with Papa Andina now tend to approach their work with a new set of eyes. Rather than framing their work narrowly, they tend to think in terms of how it contributes to the development of market chains that benefit the poor. The work of Papa Andina also helped legitimize value chain work in the broader scientific community. For the first time, recent conferences of the Latin American Potato Association and the International Society for Tropical Root Crops have featured sessions on market chain development (which highlighted the work of Papa Andina).

One of the most striking changes stimulated by Papa Andina was the increase in interaction and collaboration among individuals and organizations achieved through capacity strengthening at individual and institutional levels. Previously, both individuals and organizations tended to work alone or with professional peers. It was very rare to find researchers collaborating with extension agents, business people, or NGOs. In contrast, now, individuals who worked with Papa Andina frequently partner with others who represent different institutional or economic interests. It is common now for business people, chefs, and nutritionists to participate in sector-wide events to discuss innovation possibilities for the potato, something that was virtually unheard of a few years ago.

In each of the countries formal, or more often informal, networks have been established that bring people together to pursue common interests. Gradually, people from different backgrounds and with different interests develop a common language and common perspectives on development, and begin to pursue joint activities. Examples include Peru's Learning Alliance (*Alianza de Aprendizaje*) that serves as a forum for discussing and improving the use of market chain approaches; and the stakeholder platforms in Ecuador (CONPAPA), Bolivia (ANDIBOL), and Peru (Production Chains for Quality Agricultural Products, Peru, CAPAC) that serve as fora for discussing and resolving problems related to the potato sector in each country.

New perspectives on the role of the potato as a resource for development

Papa Andina's work also helped to change the perspectives of policy-makers in Bolivia, Ecuador, and Peru on the role of the potato in development efforts and on market-led strategies for improving the livelihoods of the rural poor. Through its advocacy work, Papa Andina has helped raise public awareness of the nutritional value of native potatoes and the importance of maintaining biodiversity in Andean crops.

Previously, in all three of the countries, native potatoes had a very poor image, as a 'poor man's food'. This image has now changed dramatically, particularly in Peru, where multi-colored native potatoes are now viewed as highly desirable and nutritious ingredients in Peruvian cuisine. In Ecuador, a processing company (INALPROCES) has recently incorporated multi-colored native potato chips into its list of products. In Bolivia it is now common to find mixtures of fresh native potatoes

available in supermarkets as well as in traditional markets, something that did not occur a few years ago.

Changes in the research agenda

Papa Andina has shown that modern science can help preserve biodiversity while contributing to long-term food security. Agricultural research is often criticized for introducing high-yielding modern crop varieties that can lead to the disappearance of native or heirloom varieties. In the Papa Andina case, modern science has been used to aid the utilization of native potatoes and to foster greater appreciation of their nutritional, economic, and cultural values. In this sense, modern science has contributed to a better understanding of the local context and local producers' valuable assets. It has given new life to a previously a forgotten crop.

As market demand for native potatoes has increased, technical production constraints have been identified and communicated to researchers. Researchers have responded to these new production and post-harvest challenges, and the research agenda for potatoes has gradually changed, both in national and international organizations. In Bolivia, Ecuador, and Peru, researchers are now working to characterize native potato varieties and to develop seed systems for native varieties. CIP has also expanded its genetic and seed-related research for native potatoes.

Information on Papa Andina's experiences and results, available in publications and on the Internet

With support and encouragement from SDC and CIP, Papa Andina gave a high priority to documentation, learning from experience, synthesis of lessons, and publication. Results of this work remain available on the Papa Andina web site.¹⁰ Individuals associated with Papa Andina have participated in many national and international conferences and have published a large number of research reports and papers in professional journals and books. These publications generally deal with the Papa Andina model, Papa Andina's R&D approaches, or experiences with South-South knowledge sharing – the three main sections of this book.

Most of the publications associated with Papa Andina report on local or national work. They have been prepared in the Spanish language by collaborators in Bolivia, Ecuador, and Peru and have been issued in these countries. In contrast, most of the English-language publications have been presented at international conferences or published in international scientific journals. A small but important sub-set of Papa Andina's publications includes manuals, guidelines, and training materials for two new R&D approaches: the PMCA and horizontal evaluation. It is expected that these publications arising from Papa Andina's work will be useful for others who wish to foster pro-poor agricultural and market chain innovation.

¹⁰ www.papandina.org.

Challenges to the sustainability and effectiveness of innovation brokers

The experiences of Papa Andina, and of other similar initiatives, highlight two main challenges to the sustainability of partnership programs that function as innovation brokers and manage the institutional boundaries separating research organizations from others involved in innovation processes (Klerkx et al., 2009).

Independence and legitimacy

A unit within a research organization responsible for managing relations with other organizations (boundary spanning) may be expected to favor the interests of its host organization. However, an effective innovation broker needs to be seen as independent, trustworthy, and unbiased in its advice and management practices. Being hosted by an international agricultural research center had a number of advantages for Papa Andina, providing easy access to scientific and related resources and ensuring credibility as a source of technical expertise. However, playing the dual roles of boundary manager and innovation broker has at times led to real or perceived conflicts of interest.

Ideally, an innovation broker is independent of the major actors in an innovation system. However, in practice, independence has proven difficult to attain. Most documented experiences concern brokers that are hosted by entities with stakes in the innovation processes being brokered – usually research organizations, and it seems likely that in the near future, most innovation brokers will continue to be hosted by such organizations. This being the case, Papa Andina's experience shows the importance of having long-term external funding, such as that provided by SDC, and an independent Management Committee with members representing key actors in the innovation system.

Evaluation and funding

As innovation brokers are not directly involved in innovation processes, it has proven difficult to document their 'tangible outputs,' 'value added,' and 'long-term impacts' on development objectives (Klerkx et al., 2009: 415, 422-423). This difficulty was highlighted in the final evaluation of Papa Andina (Bebbington and Rotondo, 2010). In the present era of 'results-based management' and 'evidence-based decision-making,' the impossibility of measuring tangible impacts and attributing them to specific interventions makes it difficult to present a convincing business case for innovation brokerage to increasingly impatient private funders, government officials, and international donor agencies who expect to see results of their funding within a few years or even months. Fortunately, SDC provided Papa Andina with funding over a 13-year period, and this after earlier bilateral funding to national potato programs for potato R&D in the Andes beginning in the 1970s. This type of long-term funding support was necessary for the development and maturation of Papa Andina, for the consolidation of its R&D approaches, and for the documentation and dissemination of its results and lessons.

Capitalizing on the Papa Andina legacy

The year 2011 marks the end of Papa Andina as a Swiss-funded initiative operating in Bolivia, Ecuador, and Peru. Therefore, it is timely to ask: *What will be the legacy of Papa Andina?*

As noted earlier, Papa Andina and its partners stimulated the creation of several new potato-based products that have been sold in Andean market outlets. The appearance of these products stimulated 'copy cat innovation' that produced several additional products that are marketed locally, and some of them have been exported to other countries in the region or Europe. Only time will tell how long these new products, generated directly or indirectly as a result of Papa Andina's work, will remain on the market. But it seems likely that the innovation processes triggered by Papa Andina's activities will expand in the future, contributing to new product development, growth in demand for potatoes – especially native potatoes – and benefits for small farmers.

In addition to the new products and innovation processes, there have been many changes at the level of individuals and institutions. Individuals who worked with Papa Andina now tend to approach their work differently. They are less concerned with conducting specific research or development projects and more concerned with developing new products, new policies, or new institutional arrangements with the concrete objective of benefitting poor people. Individuals and organizations that have worked with Papa Andina tend to be more open to collaboration with diverse stakeholders in innovation processes.

Papa Andina's experience shows that partnership programs that broker innovation processes and facilitate communication across institutional boundaries can improve the linkage between international agricultural research and local innovation processes and the alignment of international research agendas with local needs and opportunities. One important way to improve this alignment is to strengthen in-country and regional innovation capacity, so that local groups can work more effectively with national R&D organizations in fostering pro-poor innovation, and in articulating their needs for new technologies to international programs. If CGIAR centers supported innovation brokers in various parts of the world, this could lead to strengthened innovation capacity and improved articulation of technology needs and demands, which could exert significant influence on the research agendas of national agricultural research institutes, CGIAR centers, and other research institutions.

Papa Andina led the development of a community of professionals concerned with pro-poor market chain innovation who now speak a common language and have a common mode of operation. These professionals possess the knowledge, attitudes, and skills needed to facilitate innovation processes and to work effectively across organizational and institutional boundaries. They represent a valuable pool of talent that could be mobilized to facilitate innovation processes on a larger scale. Based on Papa Andina's experience, we believe that support for the development of a network

of innovation brokers dedicated to facilitating pro-poor agricultural innovation would be a high payoff area for international donor organizations, as well as for national and local governments and NGOs.

Papa Andina has become a widely recognized brand in the Andean agricultural community. Over the next five years, this brand will continue to be developed and promoted in the context of a broader program focusing on agricultural innovation and food security in the Andes. This program will be implemented by CIP and supported by the European Union. It will extend work from Bolivia, Ecuador, and Peru to include Colombia and Venezuela. This new program, called ‘Strengthening pro-poor agricultural innovation for food security in the Andean region’, will be implemented in collaboration with national organizations concerned with agricultural innovation and food security. The objective is to promote innovation in potato-based food systems, so as to improve food security and reduce the vulnerability of rural people in the Andean region. The program will work to adapt innovation processes to the needs of vulnerable groups, to strengthen the capacity of participating organizations, and to harmonize policies related to innovation and food security.

This initiative will be integrated in a new CIP geographic program focusing on highland potatoes in the Andes. It will take advantage of partners’ networks and the approaches developed by Papa Andina, which will be complemented with new approaches for addressing new issues. Papa Andina’s brand, innovation model, and approaches will continue to be developed and enriched in the future in a broader context within the framework of CIP’s research program.

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PART I

Development of the Papa Andina model



the 1990s, the number of people in the world who are illiterate has increased from 1.2 billion to 1.5 billion.

There are a number of reasons for this. One is that the population of the world is growing. Another is that the number of people who are illiterate in the developed world is increasing. This is because of the aging population and the fact that many people in the developed world are not attending school. In the developing world, the number of people who are illiterate is increasing because of the high birth rate and the fact that many children are not attending school.

There are a number of ways to reduce the number of illiterate people in the world. One way is to increase the number of people who are attending school. Another way is to improve the quality of education. This can be done by providing more teachers and better training for teachers.

There are a number of organizations that are working to reduce the number of illiterate people in the world. One of the most well-known is the United Nations Educational, Scientific and Cultural Organization (UNESCO). UNESCO has a program called the Global Education Digest that provides information on education around the world.

There are a number of things that we can do to help reduce the number of illiterate people in the world. We can support organizations that are working to improve education. We can also make sure that our own children are attending school and getting a good education.

It is important to remember that education is the key to a better future. If we can reduce the number of illiterate people in the world, we can help to create a world that is more just and more prosperous.

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Adding value to local knowledge and biodiversity of Andean potato farmers: The Papa Andina Project¹

Graham Thiele and André Devaux

ABSTRACT

Andean potato farmers' most important resources are local knowledge and biodiversity. Using these resources to improve livelihoods requires developing participatory technology and improving linkages to agrifood chains. Sharing knowledge and biodiversity between countries implies coming to terms with intellectual property rights (IPR). Papa Andina, a joint Swiss Agency for Development and Cooperation (SDC) and International Potato Center (CIP) regional project that began in 1998, is bringing research institutions and other actors together to put these ideas into practice in Bolivia, Peru and Ecuador.

THE APPROACH

Participatory technology development

Andean potato farmers grow a wide range of potato varieties and rely on rich local knowledge of potato growing, storing, marketing and processing for traditional uses. Increased cross-border trade in potatoes and demands for chips and french fries by urban consumers benefit larger farms and threaten small-scale farmers' livelihoods. Biodiversity and local knowledge are a source of competitive advantage to smallholders. But local knowledge does not suffice when farmers are forced to respond to new market opportunities. For example, improved potato quality might require controlling pest insects and diseases and introducing improved post-harvest practices. Papa Andina has helped promote participatory development of integrated pest management (IPM) through farmer field schools (FFS) and farmer experimenters' committees to complement farmers' knowledge and resources.

Better linkages to agrifood chains

Papa Andina is helping to establish local institutional platforms where specific products in agrifood chains are analysed, in order to improve market access and terms for smallholders. Development of products for markets is a complex venture that simultaneously requires investigation of crop problems, training farmers in new methods, identifying new market niches, getting farmers organized, developing marketing channels and securing access to credit. The local institutional platforms bring research institutions, farmers' groups, potato food chain actors and

1 Originally published in Info agrar News No. 12, 2002, pages 2-3.

development organizations (e.g. NGOs) together to carry out these tasks in partnership.

Poverty filters

Not all potato products have the same potential to benefit the poor. Taking advantage of new markets for products that will ultimately be taken over by large farms does not help to alleviate poverty. Some products that have stringent quality and uniformity requirements, particularly regarding non-visible characteristics such as dry matter or sugar content – which farmers cannot easily check – favour larger-scale farmers. Papa Andina is developing poverty filters to identify products which give small-scale farmers a longer term competitive advantage. In the case of such products, smallholders have the benefit of better location, local knowledge, access to a wide range of local land-races or crop management practices. For example, some market niches require small tubers, which in turn require high planting density and manual harvesting. Such constraints favour small non-mechanized farms.

Sharing knowledge

Papa Andina works with its partners to promote exchange of technology and information within the Andean region. Sharing technology based on genetic resources presents special problems in the Andes. Indeed, while the potato originates from the region, each country increasingly regards control of genetic resources as important to maintaining domestic competitiveness. Papa Andina also helps partners in the different countries to share lessons learned about the agrifood chain approach.

FIRST EXPERIENCES

One of the best opportunities to apply the approach described above is in the case of native potatoes from local landraces. These come in a range of beautiful colours and shapes. Many are especially tasty and form part of local dishes for special occasions. Farmers keep small fields with these crops for home use and call them «gift potatoes», as they are reserved as presents for best friends and relatives. Some native potatoes are especially suitable for freeze drying in the cold highland nights and processing into chuño, a local food that goes back to the times of the Incas. Market studies supported by Papa Andina showed an unmet demand in major towns for native potatoes as a gourmet food and for chuño. But meeting the demand means improving product presentation and quality, as well as ensuring a regular supply to consumers. These changes would also contribute to improving smallholders' incomes.

To access these new markets, farmers have to adapt their existing technology. Often yields of native potatoes are low and farmers need help to increase production while using ecologically sound technology. Typically the seed of these potatoes has become infected with disease. One of the first steps is thus to help farmers have access to disease-free seed that will improve crop yield and quality. Farmer field schools, a training approach developed for integrated pest management as an alternative to chemically based control, are being extended to help farmers learn

about product requirements and negotiation skills in these new markets. Farmers are collaborating to conduct research on so-called rustic stores to extend the period during which potatoes can be stored on farm and facilitate deliveries to market at a better price.

THE CHALLENGES

Papa Andina has three major challenges for the future. The first is to turn ideas into concrete tools, such as the poverty filters and local platforms mentioned above. The second is to create a culture of cooperation between actors with diverging interests and philosophies. Such a culture is essential to the proper functioning of the platforms. Finally, perhaps the hardest part of Papa Andina's mandate is to promote sharing of technology and genetic resources between countries. A critical step in this direction is to develop and agree on easily understood and transparent procedures for dealing with intellectual property rights. If these three challenges are met successfully, the concept of access to biodiversity as a means of improving smallholders' livelihoods will become a reality.

Potato market in the Altiplano selling traditional process products: chuño and tunta.



Underground assets: Potato biodiversity to improve the livelihoods of the poor¹

Ruth S. Meinzen-Dick, André Devaux and Ivonne Antezana

ABSTRACT

Vulnerability and limited assets both constrain the options of poor people, especially smallholder farmers. But the poor often also possess a range of potentially valuable natural, physical, financial, human, and social-capital assets. Development interventions requiring high levels of assets that poor people do not have are unlikely to reduce poverty, but those that build on what they do have can build assets and so improve their options. Producing and processing potatoes are important livelihood strategies for millions of the poor. A careful understanding of the context and strategies of the poor can help indicate how potatoes can also be used to reduce poverty. This paper employs the Sustainable Livelihoods Framework to examine these issues, using the Papa Andina case in the Andes as an example of new approaches to use potato diversity to improve livelihoods in a transforming development context. The Papa Andina Regional Initiative, together with its national partners, helps Andean farmers build new livelihood strategies using the genetic diversity of potatoes, local knowledge, and social capital — assets that are often undervalued. But this does not occur in a vacuum; a range of policies and institutions are required, including, for example, collective action among farmers and interaction with outsiders such as market agents and agricultural service providers in order to foster market chain innovation and to access and build markets opportunities. Accurate understanding of the changing context of producers, processors and consumers can help ensure that potatoes play a role in improving the welfare of the poor.

INTRODUCTION

Three quarters of the world's poor live in rural areas where agriculture is the primary source of livelihoods (World Bank, 2007). Although agricultural development has played a major role in reducing poverty in recent decades, many of these advances have bypassed the areas with poor soils, limited infrastructure and other constraints, in which many of the poor live. While they may lack many of these resources, the poor do have other assets, and building on these offers the possibility to respond to multiple constraints and to new threats such as climate change.

This is the case of the South America Andes where the potato remains a key component in the livelihood systems of small-scale farmers, contributing to food security as a direct food source and as a cash crop (Antezana et al., 2005). In the Andes, as in many developing countries, the potato is often produced in poor, remote

¹ Originally published in *International Journal of Agricultural Sustainability* (7, 4) 2009, pages 235-248.

and mountainous areas, on small plots, by families with little land. However, potatoes generate more added value and employment per hectare than any other staple. Once home consumption needs are covered, sales are usually made close to the place of production, and the resultant income is utilized according to the needs of the family: the first bag to pay a hospital bill, another for school fees, a third for savings, etc.

The Andes are the home of the potato, and more than 4,000 native varieties (landraces) are still cultivated in the highlands above 3,000 m.a.s.l. This biodiversity has been undervalued, but could become a stronger asset for the people who maintain the varieties if their nutritional characteristics, multiple colours and the social value associated with traditional knowledge accumulated over time by the Andean farmers were duly recognized. Agrobiodiversity and the social capital linked to it represent unique resources that can partially compensate for the other missing resources that its custodians face and, if well managed, can be transformed into competitive advantages. There is considerable scope for repositioning potato as an added-value cash crop through expanding use for processing and sales of improved and native potatoes (landraces) to satisfy emerging markets in small and large cities. Because agrobiodiversity is often linked to smallholders and marginal areas, the link between biodiversity and livelihoods is not specific to potatoes but has a wider application to high diversity areas.

To be most effective in reducing poverty, development programs need a sound understanding of the often complex and heterogenic conditions which poor people face. The sustainable livelihoods framework provides a useful starting point for this understanding, to help identify appropriate types of interventions or to evaluate how particular interventions have affected poverty (Scoones, 1998; Ellis, 1999; IUCN, 2002). For example, a set of case studies of the impact of agricultural research on poverty (Adato and Meinzen-Dick, 2007) used this framework to synthesize and identify patterns across studies of different technologies, crops, and countries. A key aspect of the livelihoods framework is that it recognizes people themselves, whether poor or not, as actors with assets and capabilities who act in pursuit of their own livelihood goals, not passive “beneficiaries” of programs or victims of circumstances. It gives explicit attention to sources of vulnerability, which will also shape people’s behavior (Chambers and Conway, 1992). Rather than assuming people are full-time farmers or non-farmers, it draws attention to multiple livelihood strategies and the variable role that agriculture plays in people’s lives (ODI, 2003; FAO, 2004). The framework’s emphasis on different types of assets helps us to see the resources that poor people have to work with, and how policies and institutions can help or hinder them from using their assets in pursuit of improved livelihoods and well-being.

In this paper we examine the role that potatoes, especially native potatoes, can play in improving the livelihoods of poor people, as demonstrated by the Papa Andina Regional Initiative, a programme to stimulate innovation in the potato market chain in the Andes. The paper draws on existing studies of this regional initiative using the livelihoods lens to highlight the assets of the poor in these communities that are often overlooked in conventional development approaches. We then consider the

lessons from this approach that can inform other programmes that seek to reduce poverty.

INNOVATION IN THE POTATO MARKET CHAIN AND LIVELIHOOD SYSTEMS IN THE ANDES

The Papa Andina Regional Initiative was established in 1998 to promote pro-poor innovation in Andean potato-based food systems. Financed mainly by the Swiss Agency for Development and Cooperation and other donors such as New Zealand Aid, and hosted by the International Potato Center (CIP), the network includes about 30 partners in Bolivia, Ecuador and Peru. In each country, Papa Andina coordinates its activities with a “strategic partner” that plays a leadership and facilitating role to develop participatory approaches for market chain innovation with the Papa Andina coordination team: the PROINPA Foundation in Bolivia, the INCOPA (Innovation and Competitiveness of the Peruvian Potato) Project in Peru, and the National Potato Program of INIAP (National Agriculture Research Institute) in Ecuador. This network promotes partnership with diverse actors from the public and private sector and reaches directly a growing number of poor rural households, currently estimated to be around 4,000.

Until recently native potatoes, a product domesticated 8,000 years ago and grown since then in the High Andes, was not recognized in urban markets in Peru. A market study led in 2002 showed that they were essentially destined for self-consumption or local markets, and hardly represented a source of income for poor farmers (Lopez et al., 2002). But with their amazing diversity in colours and shapes, high cooking versatility and nutritional profile (superior content of dry matter, C vitamin and antioxidants) and traditional production practices (small-scale farming with low inputs), native potatoes represent a special asset. New urban consumption patterns increasing demand for quality and processed foods, along with health, environmental and social concerns in modern society, create the opportunity to expand the markets for native potatoes. Because native potatoes grow better in higher altitude (above 3,300 m) where small-scale farmers predominate, Papa Andina decided to concentrate its activities around those potatoes to promote market innovation that would give a comparative advantage to small-scale farmers. The native potatoes act as a “poverty filter,” meaning that using them in developing commercial innovation or new commercial products would give a comparative advantage to poor Andean farmers who predominate in the highlands.

The market chain approach is used to bring together research organizations and a wider range of partners to promote pro-poor innovations. The Papa Andina network in these three countries employs novel forms of collective action to foster market innovation in the Andes, with special attention to inclusion of small-scale farmers. The participatory market chain approach (PMCA) (Bernet et al., 2006; Antezana et al., 2008) and stakeholder platforms (Thiele and Bernet, 2005; Reinoso et al., 2007) bring small potato producers together with market agents and agricultural service providers to identify common interests, share market knowledge and carry out joint activities to develop new business opportunities. Papa Andina facilitates knowledge

sharing and promotes collective learning in a regional and broader context (Devaux et al., 2007).

Based on these experiences Papa Andina has developed a framework for analysis of collective action in market chain innovation, which builds on the Institutional Analysis and Development framework (Ostrom, 2005). As illustrated in Figure 1, the Papa Andina framework focuses on important innovation processes, taking account of components of social learning, social capital formation and joint activities (Devaux et al., 2009). The central focus of attention in this framework is the Innovation Arena where social learning, formation of social capital, and joint innovative activities lead to the development of innovations as livelihoods strategies that contribute to livelihoods outcomes. Commercial innovation involves the development of new products or services for specific market niches, to add value to potato production. Technological innovation involves improvements in the way commodities are produced or transformed. Institutional innovation relates to changes in attitudes, habits or relationship among stakeholders, to create more favourable conditions for pro-poor innovation. The Innovation Arena is influenced by four sets of exogenous variables:

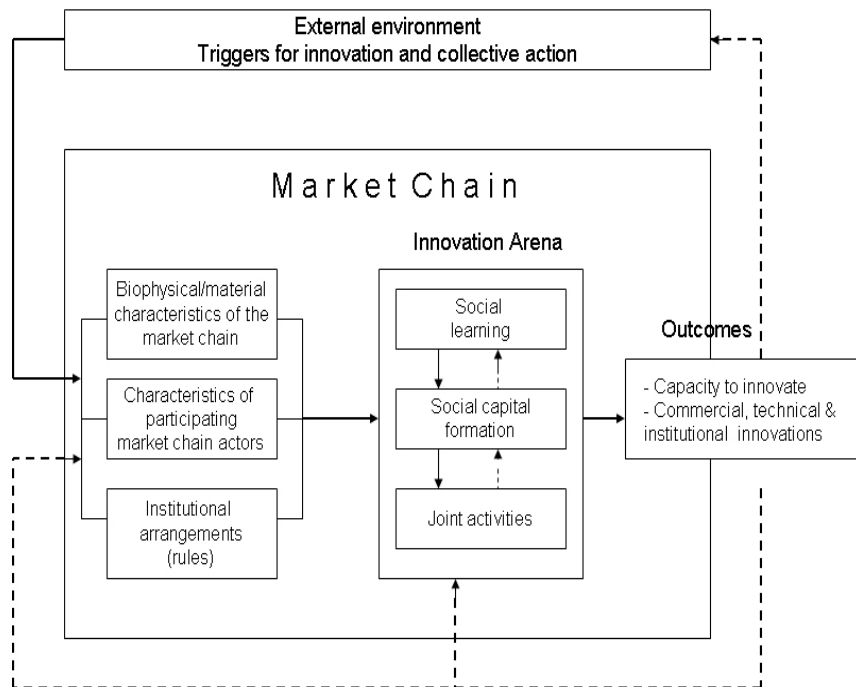
1. The external environment: mainly the formal and informal institutions and organizations that may influence collective action and access to livelihoods strategies playing a facilitating role in bridging between smallholders, other market chains actors and policy makers
2. Biophysical and material characteristics of the market chain, focusing on commercial innovation and development of high-value niches for potato products for generating greater benefits for small farmers
3. Characteristics of market chain actors: relations in market chains are traditionally characterized by lack of trust and cooperation. Hence, getting diverse market chain actors (including small farmers) to work together in innovation processes contributes to increase the social capital among market chain actors and to empower famers (men and women) to participate more actively in high value markets
4. Institutional arrangements: one of the key challenges to stimulate innovation in the market chain has been to provide adequate facilitation for social learning processes, which promote the development of collective cognition, social capital and leadership capacity. In most cases, a research organization took responsibility for this facilitation role.

As indicated by the broken lines in Figure 1, the outcomes may influence the processes that take place within the Innovation Arena. For example, successful innovation may stimulate participants to invest more time and resources in joint activities. Over time, outcomes may also influence the four groups of exogenous variables. For example, successful innovation may predispose policy makers to support future programmes involving collective action.

LIVELIHOODS ANALYSIS OF PAPA ANDINA

The overall conceptual framework for sustainable livelihoods is has been described by Carney (1998) and DfID (2001). The framework is intended to be dynamic, recognizing changes due to both external fluctuations and the results of people's own actions. The starting point is the vulnerability context within which people operate. Attention is next given to the assets that people can draw upon for their livelihoods. Assets interact with policies, institutions and processes to shape the choice of livelihood strategies. These, in turn, shape the livelihood outcomes (which may be positive or negative) - the types of impact we are interested in. However, those outcomes are not necessarily the end point, as they feed back into the future asset base. We examine each of these for the Papa Andina case, drawing on a study on poverty in potato-producing communities in four communities in the central highlands of Peru in 2005 (Antezana et al., 2005) as well as a study on the impact of farmers' participation in multi-stakeholder platforms (Plataformas) aimed at linking smallholder potato farmers to the market in the mountain regions in three provinces of Ecuador (Cavatassi et al., 2009).

Figure 1. Framework for analyzing collective action in market chain innovation



Source: Devaux et al., 2009; adapted from Ostrom, 2005.

Vulnerability context

Vulnerability refers to things that are outside people's control. Perceived and actual vulnerability influence people's decisions, and hence their livelihood strategies. For Andean farmers, the climate is a major source of vulnerability. Regular temperature and rainfall fluctuations affect what they can grow in different landscape niches, and farmers report that sudden frost, hail, and droughts affect their production. The Andean highlands are used to extreme temperatures, fluctuating from 20°C to -25°, and farmers apply different strategies to reduce the impact of frost on their crops such, as planting dates, field location and mixture of varieties. Due to climatic change, frost can have an erratic pattern and may hit any time. In the four communities in Peru, frost, hail and the lack of rainfall were reported as having the most impact on crop production in the past 15 years (Antezana et al., 2005). In 2007, one single unexpected frosty night caused tremendous losses in the native potato harvest in the central highlands of Peru, with some communities losing their whole crop. This extreme situation directly affected the food security, economic income and family health of the most vulnerable communities. Although some preventive measures exist to deal with frost (field burners, community-based early warning, use of less exposed planting areas), setting them up is a costly organizational challenge for the communities. Farmers under these conditions need to diversify their activities and also link to activities outside agriculture to manage risk, cope with shocks, and make the most of their resources.

This is compounded by major rainfall fluctuations associated with El Niño, which are, in turn, associated with global climate change. Additional major constraints in the potato production in the Andes are Late Blight (*Phytophthora infestans*) and Andean Potato Weevil (*Premnotrypes spp.*). Both can cause severe yield losses and reduce the quality of the potatoes. Soil fertility declines are prevalent, attributed to soil erosion, overgrazing, shorter fallow periods and inappropriate use of chemical fertilizers. Support from external agents (such as research organizations, non-governmental organizations (NGOs) or governmental bodies) is required to stimulate innovation and provide technical and institutional backstopping in order to facilitate access to training and technologies to respond these technical constraints.

In addition to considering these common agronomic factors, a livelihoods perspective pushes us to look at other sources of vulnerability. In the areas in which Papa Andina and partners work, low potato and livestock output prices and high input prices have had important effects on livelihoods. Low potato prices, in turn, are attributable to several factors: on the one hand is the declining demand for certain types of potatoes that are commonly grown and the competition from large-scale potato producers with new varieties. On the other hand, small-scale farmers' poor marketing arrangements, which include high transaction costs, poor connection to markets, limited access to information and low negotiation capacity, limit their access to dynamic markets that can be more profitable (Escobal and Caverro, 2007). Illness, especially that related to poor water and sanitation, lack of dietary diversity, and exposure to wood smoke in unventilated houses affects many households. Illness can

cause households to fall into poverty due to loss of labour and additional expenditures, and Antezana et al. (2005) found that health problems made up one of the main reasons why people remained poor. Changes in government policy over the years, including structural adjustment in the 1990s and the decline of agricultural or social assistance projects, have also been sources of vulnerability to these rural communities, particularly with the privatization of agricultural research and extension making it hard for poor farmers to obtain information, increasing their dependence on NGOs. Changes in land tenure cause further uncertainty, with government programmes favouring privatization of land, which undermines the collective ownership of land that has provided a bond among *campesino* communities. Even past crises cast long shadows of vulnerability. The hyperinflation and economic crises of the 1980s and the civil war and consequent militarization of the region caused mistrust, especially of strangers, emigration, and a high number of female-headed households.

Gender interacts with vulnerability. Although the image of gender in the Andean culture calls upon a complementary and harmonic role between males and females without discrimination, in practice rural women are less endowed to face adversities and thus more vulnerable than men. Evidence suggests that female-headed households in the Andes are more likely to fall into poverty and to remain poor than male-headed households (Antezana et al., 2005). This is often a result of gender inequities in access to education and training as well as to lack of own sources of income.

Identifying the sources of vulnerability not only helps outside programmes to understand people's behavior and attitudes to new and potentially risky enterprises, but also to identify opportunities for programmes to help reduce sources of vulnerability. In the Papa Andina case, for example, addressing the small-scale farmers' poor marketing arrangements and limited access to dynamic markets as well as their needs for information were important entry points.

Assets

People use a wide range of assets to make a living. The livelihoods framework goes beyond tangible assets to look at natural, physical, financial, human, and social capital. In this section we consider the role of each of these for potato farmers in the Andes, and the basis they provide for the Papa Andina Initiative.

Natural capital generally refers to land, water, forests, marine resources, air quality, erosion protection and biodiversity. In many Andean communities farm sizes are relatively small (less than 5 ha), and productivity is limited by slopes, soil erosion, and the rocky terrain. Land not suitable for cultivation is set aside for pasture. Many communities hold the land in common and allocate plots to individuals to cultivate. In the central highlands of Peru, lack of access to land appears to increase poverty, but on the other hand, access to land without other assets, such as capital investment or labor force, does not protect from poverty (Antezana et al., 2005). Farmers who own some livestock, including large animals (mainly cattle) to work in the fields,

medium animals (sheep, alpaca, lamas, pigs) for wool and meat, and small animals for meat and eggs, are better endowed to face adversity. An average of 62 per cent of interviewed farmers in the central highlands of Peru mentioned livestock as the second most important source of income after potato production. More than 80 per cent of farmers who remained poor or became poor described the soil of their fields as medium to low fertility. Small-scale irrigation systems can increase agricultural productivity, but much of the land is unirrigated (only 13 out of 120 farmers mentioned having access to irrigation), and some communities even face difficulty in getting enough drinking water. In this context where other natural capital is limited, the agrobiodiversity in potato landraces and Andean tubers represent a valuable asset, because of its adaptation to local environments. Collectively, it is estimated that over 4000 varieties of native potatoes are still cultivated in the Andean region of South America (Spooner et al., 2005, cited in Devaux et al., 2007).

Physical capital encompasses transportation, roads, buildings, shelter, water supply and sanitation, energy, technology, or communications. Because of their mountainous location, Andean communities often lack public transportation, telephone and even drinking water. Nevertheless, most have electricity, primary schools, and some kind of road. Location and infrastructure constraints limit access to markets and information. There are some tractors used collectively, and some have collective facilities for storing potatoes.

Financial capital includes savings (cash as well as liquid assets), credit (formal and informal), as well as inflows (state transfers and remittances). Papa Andina and partners work in communities that have limited access to credit from formal institutions such as banks and from informal providers such as money lenders and friends. In a recent study in Huanuco, Peru (Bucheli et al., 2008, p. 100) only 13 out of 83 farmers had access to credit in the last 5 years. From those 13 small farmers, three were financed by a bank, two through their participation in a savings fund and eight received credit from moneylenders. Less than a quarter of households receive remittances, and lack of cash is a serious constraint that restricts adoption of certain agricultural practices, such as purchase of disease-free planting materials.

Human capital can be analyzed in terms of education, skills, knowledge, health, nutrition and labour power. In the case of Andean farming communities, education levels are variable both within and between communities, with considerable primary and some secondary education. The percentage of female illiteracy is around 35 per cent (INEI, Census, 2005) and many women, although they understand Spanish, speak only Quechua. This limits their participation, for example, training activities conducted in Spanish and in dealing with public affairs outside the communities. There is considerable knowledge of highland cultivation. Health problems are greatest in the cold and rainy months, but there is considerable morbidity that erodes labour productivity. The nutritional status of women and children, in particular, is poor, which is related to starchy and inadequate diets and poor sanitation. Approximately 20-25 per cent of households are female-headed, but all male-headed households have an adult woman. Old age is another factor affecting labour power.

Families headed by elderly or composed by a single elderly person are more likely to become poor.

Social capital refers to social norms and networks that increase trust, ability to work together, access to opportunities, reciprocity, informal safety nets and membership in organizations. Whereas other asset categories are relatively weak, social capital is strong in these Andean communities. There are active indigenous institutions including communal landholding and decision making on production, communal work obligations, and work feasts that create bonds among the community members. In the central highlands of Peru, mutual help and community organizations were frequently mentioned as contributing to people's well-being by protecting them against becoming poor. In some communities, in which the community associations are strong, community members even indicated that those families who do not belong to the associations are more likely to remain poor (Antezana et al., 2005). There are also a number of "modern" organizations that have been introduced by government or NGO programmes, such as producer associations. While there is therefore strong bonding social capital within the communities, many Andean peasants face social exclusion from society at large. This is particularly the case for those of indigenous ethnic origin, especially those who do not speak Spanish. The communities therefore need bridging social capital to link to other similar communities and linking social capital with outsiders to bring in additional resources and represent their interests. Initiatives are implemented by public authorities, in coordination with NGO and other civil society organizations at regional and local levels, to promote livelihoods of rural families. But these efforts are still limited and need to be developed to enhance rural development.

Examining the general pattern of assets held by smallholders in the high Andes illustrates how examining the whole set of assets can assist programmes to help the poor. Interventions, especially agricultural innovations that require a high level of assets to adopt, are more likely to exclude the poor, but those that build upon the assets that the poor have are more likely to be adopted by and help the poor (Adato and Meinzen-Dick, 2007). A conventional approach might only see the small holdings, poor soil, lack of infrastructure and financial resources and conclude that little could be done or (as is often the case), that the only viable strategy was to focus on the "progressive farmers" with more education, better land, etc., and hope that the benefits would trickle down to others. But Papa Andina has picked up on what people do have - the strong social capital and the often overlooked assets of diverse potato varieties, especially native potato and the knowledge of how to grow them, plus the cultural heritage of the communities who have been growing potatoes for generations. These have become crucial ingredients for the programme, as discussed below.

Policies, institutions, and processes

Assets by themselves produce little. The value they have for people's livelihoods is shaped, to a large extent, by the formal and informal institutions and organizations that shape livelihoods by influencing access to assets, livelihood strategies,

vulnerability, and terms of exchange. They may occur at multiple levels, from the household to community, national, and even global levels. The public and private sectors, civil society, and community institutions may all be relevant considerations; laws as well as culture can also be included. Gender norms and relations are relevant, as are class, ethnicity, and other factors that affect one's position in society.

Efforts devoted to reduce rural poverty have traditionally focused on small-scale farmers trying to increase their competitiveness within the market chain by strengthening organizations and improving production through new technologies. Some challenges could nevertheless not be overcome. First, the market chain encompasses a diversity of actors, ranging from small-scale Andean farmers to modern supermarket chains or restaurants, including wholesalers and processors. These actors live in distinct geographical areas and cultural settings, have sometimes never met, or have informal relationships characterized by a lack of trust and wild competition. They lack the capacity to identify common interests and joint opportunities and to innovate to overcome hurdles at different levels of the market chain. For innovation to start taking place requires new patterns of interaction and institutional arrangements among the diversity of actors involved in the value chain (Manrique et al., 2008).

Much of the institutional innovation in Papa Andina has focused on adapting scientific expertise to the local context, paying special attention to the socio-economic, environmental and market-driven dimensions through coordinated efforts and promoting collective action for helping smallholders to have better access to market and research and development institutions. The program partners have developed approaches such as the PMCA and stakeholder platforms to promote commercial, technological and institutional innovations. The PMCA has helped to link small farmers to markets within the context of market chains and by facilitating collective action among different chain actors, including producers, processors and traders. This requires a participative, guided process in which representatives of research and development organizations interact with the chain actors to identify and pursue business opportunities. Small farmers have through this interaction improved access to markets, technical assistance, information and business partners. According to farmers' perceptions in Huanuco, Peru, this improved access to information and markets contributes to reduce their vulnerability and to increase their food security (Bucheli et al., 2008).

Stakeholder platforms facilitate the interaction of research and development organizations, producers and other chain actors in order for them to share knowledge and identify joint actions (Devaux et al., 2006). Unlike conventional agricultural extension programmes that "disseminate" technologies developed by researchers to selected individual farmers, the stakeholder platforms tap into existing community institutions not only to disseminate technologies, but also to articulate their need for research and technologies. The platform in the potato sector in Ecuador promoted by the National Potato Program of INIAP, one of the strategic partners of Papa Andina, is an example of how those actors with different interests can work together (Reinoso et

al., 2007). The platform has been used to bring together potato farmers and a range of suppliers of research and development services to help link farmers to higher-value markets for their produce including, supermarkets and local fast food restaurants. This effort has led to improvements in small farmer productivity and the quality of potatoes supplied to market, facilitating direct linkages of farmer organizations to these purchasers. It provided smallholders with greater opportunities to obtain benefits from their potato production. In Bolivia, the “Bolivian Andean Platform” has contributed to establish links with market agents to develop better quality chuño-based products (traditionally processed and dried potatoes) with a higher price and to explore the export potential of chuño and tunta. The platform today represents 13 core members including four farmers’ associations with around 200 members, processing firms, development projects, an NGO and a research organization, PROINPA. It has helped to build trust and social networks among its members and has improved links between small farmers and market agents on one hand, and regional research and development (R&D) organizations and other service providers on the other (Devaux et al., 2007).

The decision by the government to reduce its support to public extension service in the 1990s has affected the access of small-scale farmers to services in agriculture, although there was support specifically oriented to help small-scale farmers, from NGOs and public programs funded on a competitive basis by international cooperation. But those programmes had a limited impact. Recently Peru has launched programs to help highland farmers link to markets by identifying market opportunities that can benefit rural families and involve them more actively in these new businesses. But the impact of this programme on small-scale farmers’ livelihoods is very limited because the programme is oriented to export crops for which most of small-scale farmers are not competitive enough, because they do not have the assets required. The current decentralization process transferring responsibilities and resources to regional and municipal governments should support local livelihoods strategies, but the lack of capacities of regional and municipal governments in implementing development programs limits their support and response to the needs of small-scale farmers.

In the Andes as elsewhere, agricultural development is taking place in the context of rapid urbanization and increasing market integration. Packaged food sales and supermarket retail outlets are now found in most developing countries. Recent concerns for food quality and safety have stimulated demand for locally grown and organically produced foods including native potatoes from the high Andes. Consequently, the production practices and livelihoods of small Andean potato farmers are influenced by the demands of urban consumers and food industries. These trends have created new market opportunities for indigenous food products such as native potatoes that Papa Andina has been able to exploit through its novel participatory approaches. The PMCA and the multi-stakeholder platforms developed by Papa Andina benefited also from policy support for market chain development in Peru and Bolivia. In contrast, in Ecuador, policies favoured farmer organization through stakeholder platforms over market chain development per se. Recent

governmental changes in Bolivia have reduced support to market chain development vis-à-vis peasant organization. In the context of CIP the new vision launched in 2004 based on the Millennium Development Goals (MDG) has contributed to the strengthening of partnership programmes such as Papa Andina that help link research to development for poverty reduction.

Livelihood strategies

Vulnerability, assets, and institutions all influence people's livelihood strategies, i.e. the choices they employ in pursuit of income, security, well-being and other productive and reproductive goals. A realistic picture of the range of livelihood strategies will generally lead to better programmes, whereas those that assume people are either full-time farmers or non-farmers may limit their choices. In many parts of the world, the number of full-time farmers has been declining as people move into non-farm occupations, or diversify their activities to supplement farm income and to cope in time of stress or shocks. The Andean communities still have a very high dependence on agriculture, not just for subsistence but also for income. But the levels of income they obtain are often insufficient to meet household needs. Thus, a programme that would enable them to earn more income while still doing farming would have a better fit than those that insist on particular types of other jobs.

The Papa Andina initiative has sought to increase profitability of potato cultivation through commercial innovation to improve farmers' access to more dynamic markets that can provide better incomes. There are several ways this can be accomplished: through increasing total demand, adding value to the product, or by improving contractual arrangements and access to commercial information. The Papa Andina initiative works on all of these. First, the programme seeks to differentiate the market and expand demand, especially for native Andean potato varieties that are often bypassed in moves toward homogenization of products, particularly in supermarkets. The PMCA has identified opportunities and developed commercial innovations oriented to high-value niches by working with supermarkets, culinary schools and the media to raise the profile and uses of native potatoes and chuño blanco (traditional dried potatoes). This process draws upon both Andean and urban "gourmet" culture to raise the profile and profitability of native potatoes. Improved storage, labelling and processing of the potatoes added value as well as expanded the market for these colourful and extraordinary potatoes, e.g. through gourmet coloured chips, instant yellow mashed potatoes and other products made from native potatoes. For example, in one community in Huanuco, there was an increase in yearly average income resulting from potato sales from USD 720 to USD 2000. Interviewed community members explain that increase was due to better prices of the improved quality of the product and better market access (Bucheli et al., 2008, p.42). Institutional innovation through the stakeholder platforms also enabled farmers to interact with other market chain actors and get organized and empowered for negotiating for a higher share of the value. But beyond early successes, turning potato biodiversity into a drive for sustainable rural development implies two challenges: strengthening smallholders' participation and competitiveness in these

high-value market chains despite their high transaction costs; and guaranteeing their access to a fair share of benefits despite their low negotiation capacity. During the last year, Papa Andina has been working with its national partners on approaches to stimulate public-private partnership to achieve business with social responsibility within the native potato market chain. In this context, socially responsible companies' efforts to achieve business for development makes them consider small farmers as business partners; innovating around this client-provider relationship becomes a way to access new market segments and generate a win-win situation. The identification and development of sustainable commercial and pro-poor production practices, certification and social marketing schemes represent new research fields for promoting innovation; and R&D institutions appear as knowledgeable allies and warrant of credibility (Thoman et al., 2008).

The Papa Andina initiative has sought to increase incomes by building on existing livelihood strategies in the high Andes, particularly potato production. Technological innovation responding to market should increase or stabilize output and reduce costs of production. As priority was given to identify niche market for native potatoes grown by the Andean smallholders, the programme, together with its national partners, seeks ways to reduce input costs, such as through integrated pest management to reduce expenses for chemical pesticides, and improved seed selection and storage systems to reduce losses from virus or insect infestations. Reducing chemical pesticide use and providing information about safe practices also reduces health risks for household members. Investment in potato production plays an important role in helping Andean farmers move out of poverty (Antezana et al., 2005, p. 165). But even with increased profitability, potato farming alone is unlikely to give small farmers in the Andes enough income and stability to rise or remain above poverty levels. Farmers growing only potatoes remain vulnerable to shocks such as frost, drought, disease, and price fluctuations. Farmers employ additional livelihood strategies, such as diversification of both on-farm and off-farm income sources, to face adverse situations. Expansion of other Andean tubers, other crops, and livestock help to stabilize and increase farm income. Expansion of processing and marketing in the rural areas, will increase options for local non-farm employment, while improved education, transportation and communications can facilitate migration and remittances to supplement rural incomes.

Livelihood outcomes

Potential outcomes include conventional indicators such as income, food security, a strengthened asset base, reduced vulnerability, empowerment and improvements in other aspects of well-being such as health, self-esteem, sense of control, and thus have a feedback effect on the vulnerability status and asset base. The cases of the T'ikapapa in Peru and the APROTAC (Asociación de Productores de Tubérculos Andinos) Farmer's Group in Bolivia illustrate some of the livelihood outcomes.

T'ikapapa is a commercial innovation obtained through application of the PMCA in Peru, facilitated by INCOPA, a strategic partner of Papa Andina. T'ikapapa is the first brand of high-quality native potatoes sold in Peru's leading supermarket. T'ikapapa

was launched through a partnership between farmers' organizations, NGOs and the private sector facilitated by INCOPA, taking advantage of a stakeholder platform "CAPAC" that was promoted in Peru. T'ikapapa has been implemented as a pilot case since 2004 to market native potatoes in a specific market niche. The idea was improve the visibility of native potatoes in competitive markets, test the viability of marketing native potatoes in those markets and to take advantage of this experience to promote other native potato-based products. INCOPA estimates that in total around 500 families from 21 farmer organizations have participated and benefited directly from the marketing concept behind T'ikapapa. Main outcomes from T'ikapapa can be summarized as increased farmers' revenues, new access to stable markets for native potato producers, higher prices for native potato, improved image of native potato and increased farmer's self esteem (Manrique et al., 2008). The marketing concept has already been imitated by other stakeholders, increasing the number of indirect beneficiaries.

APROTAC is an association of young farmers from the Primera Candelaria community in the Municipality of Colomi in Cochabamba, Bolivia. The PROINPA Foundation, one of the main strategic partners of Papa Andina, has applied the PMCA giving impetus to the work already in place and taking advantage of new market opportunities (Bernet, et al., 2006, p. 129). PROINPA has worked with the Primera Candelaria community promoting technological innovation to guarantee food safety and the conservation and sustainable use of genetic resources to benefit small farmers. PROINPA has promoted Andean tubers such as native potato, oca (*Oxalis tuberosa*), and papalisa (*Ullucus tuberosus*) and has supported the social capital from farmers by strengthening farmer organizations such as APROTAC. A recent study (Oros, et al., 2007) found positive impacts of the intervention in three main aspects: technological (use of quality seed, organic fertilizers and pest control); economic (higher income, increased crop areas, contracts with supermarkets and industry); and social (greater negotiating capacity, enhanced market knowledge, revaluation or agrobiodiversity consolidation in terms of native potato varieties). APROTAC members are now responsible for managing their own business – taking orders, delivering produce, doing the accounts and looking for new markets. They have introduced new native potato products into the market, which not only increases profitability but also helps to accomplish the important goal of agrobiodiversity conservation. New opportunities have opened up for selling potatoes, particularly for farmers affiliated with APROTAC. While non-members continue with their long-term customers and traditional marketing systems ("rankeras" or middlemen/women, retailers, local outdoor markets), 81 per cent of the APROTAC member farmers have accessed new markets (agroindustry, supermarkets), in addition to their traditional buyers. Now about 13 per cent are specializing in sales to supermarkets and agroindustry and potato crops grown solely for home consumption have dropped from 50 to 6 per cent, because the farmers are producing more native potato (Oros, et al., 2007). The new demand for native potato in supermarkets and agroindustries has meant that native potato production in the region has increased in recent years, both among APROTAC members and non-members. While member farmers have

increased their average crops from 38 to 597 kg, non-members have moved from growing 82 kg to 263 kg on average (Oros et al., 2007, p. 8). Increased native potato production and commercial innovation have had positive economic and institutional impacts. These products have fetched higher prices, increasing income for farming families. Members, who previously sold their potatoes at 0.55 bolivianos/kg, obtained 2.38 bolivianos/kg in 2006 (Oros, et al., 2007, p. 10). New business relations have also been introduced, such as contracts, which the farmers say give them greater security that buyers will actually comply with agreements.

In Ecuador, through the stakeholder platforms, small-scale potato producers have access to high-value market purchasers such as local fast-food restaurants, supermarket chains and the multinational food processor Frito-Lay. Platforms provided smallholders with greater opportunities to obtain benefits from the changes in agricultural marketing systems through shortening and improving the efficiency of the potato value chain as well as through the application of better agricultural techniques, thus decreasing transaction costs with the former, and improving yields with the latter (Cavatassi et al., 2009). The platform had a major advantage compared to other providers through the improved Fripapa potato variety which was not previously grown in the area and is much more suitable for processing than traditional varieties grown previously. This variety was originally developed by the INIAP potato research programme, in collaboration with CIP, for its resistance to diseases and processing characteristics. Fripapa gave farmers an advantage analogous to the native potatoes in Peru and Bolivia. From 2003 to date approximately 17,000 tons have been marketed via the platforms. The price received by members was approximately 30 per cent above that received by non-members during the same period. This commercial success resulted from successful collaboration between NGOs, universities and the INIAP potato research programmes to organize different capacity building activities to improve small farmer productivity and the quality of potatoes supplied to the market. Thirty-two R&D institutions, municipal councils and 61 farmers' organizations have participated in the activities of the platforms. The existence of social capital has proved to be fundamental in implementing the platforms, which have in turn contributed to strengthening the social fabric and have built or improved the capacity of farmers to link successfully to the market. As a result of this process, a national organization, the Consortium of Small Potato Producers (CONPAPA), was established to support joint marketing activities (Devaux et al., 2007).

DISCUSSION

In reviewing the impact of agricultural research on poverty, Adato and Meinzen-Dick (2007, p. 332) note:

“Three main sets of factors are likely to affect adoption: (1) whether the technologies are anticipated by potential adopters to increase or decrease their production, profits, and vulnerability; (2) whether the farmers have the requisite assets to make technology adoption worthwhile; and (3) the nature of mediating

institutions, including the extent to which they represent the interests of poor people and people's attitudes toward the institutions"

Increasing productivity is important, but it is not sufficient to reduce poverty, and may not even be sufficient to induce farmers to adopt new practices, unless they are also likely to be profitable. Attending to profitability by expanding markets and value added has been an important factor in Papa Andina's success. But profitability is also not the only measure of success. Because vulnerability is an important aspect of poverty, interventions that seek to reduce poverty need to take into account the sources of vulnerability. Even profitable new enterprises may not be adopted by the poor if they are also perceived as too risky, whereas innovations that reduce vulnerability are valued.

The asset thresholds required for adoption of any innovation play a critical role in whether the poor will be able to adopt and benefit directly. If a particular approach would require an asset that poor or marginalized groups (e.g. female-headed households) do not have, then either that asset needs to be built up or the asset threshold lowered. In the Andes, where many farmers lack financial capital, the technological interventions can help reduce cash requirements, e.g. varieties resistant to diseases will reduce the use of chemical pesticides. Where bridging and linking social capital are weak, the Papa Andina initiative, together with its partners, has worked to build trust between farmers in different areas, and with other actors in the market chains by bringing them together to pursue common objectives. Working with socially responsible companies as new partners in the context of "business for development" is a new approach that involves small farmers as business partners that can contribute to achieve business with social responsibility.

The livelihoods framework requires researchers and practitioners to think holistically, not just about certain types of assets such as land and credit, but also about the potential interaction of different kinds of assets, and the complementarities between assets and their sequencing. For example, membership in a social group (social capital) may be necessary for access to land (natural capital), which is necessary for access to credit (financial capital) and which, in turn, is needed to purchase inputs to take advantage of a new technology. Poor people lack many assets, which often lock them into "poverty traps." But rather than focusing only on what they lack, it is more constructive to identify what they do have, and develop new livelihood options that use and strengthen those assets, and then focus on building up other assets that may be important. Papa Andina identified the genetic diversity of potatoes, local knowledge and social capital - assets that are often undervalued - and built upon those in the program to make them have higher payoffs.

The process of working with people to identify what those assets are and enabling them to build upon those assets is an empowering process in itself, from which all parties can learn. Rather than a patronizing perspective of "lifting people out of poverty", a partnership that recognizes the agency of the poor will have a greater impact. But partnerships that include poor women and men are difficult to achieve,

because social exclusion is also a key aspect of poverty. Programmes need to consider the nature of the relevant institutions such as extension and marketing and how they are viewed by the rich and poor, men and women, etc. In some cases government institutions may be trusted more than private ones; in others government may be seen to favour the rich. In places with high community solidarity, group-based extension or other types of intervention are likely to be effective in reaching all, but where communities are highly fragmented, working through local groups may lead to capture of the benefits by local elites (Adato and Meinzen-Dick, 2007). Papa Andina has invested heavily in new institutional arrangements to bridge between poor farmers and market intermediaries, and has recognized that this requires going beyond creating paper organizations, to actually build trust through regular interaction. Although this type of institutional investment is time-consuming and the results often intangible it can make the difference between inclusive and exclusive development.

The livelihoods framework also provides a structure for thinking about conflicts between livelihood objectives, e.g. whether increased income may be at the expense of increased degradation of the natural resources or of social cohesion, which helps people to weather the storms of life. The Andes, in particular, are a fragile ecosystem, and intensification of productivity can have serious consequences in terms of soil erosion or pesticide pollution. Thus, rather than just increasing quantity of production, Papa Andina is working to increase the market value of production, taking advantage of the cultural, environmental and social values of potato biodiversity to promote it in national and international niche markets. This contributes to maintenance of agrobiodiversity and the sustainability of potato farming in the region. This is a direction that other agricultural development programmes may also consider. However, this requires going beyond technological innovation to also include commercial innovation (to tap into new market opportunities) and institutional innovations such as strengthening collective action within communities and involving communities and outside actors. In joint efforts involving biophysical scientists, social scientists, small farmers and other market chain actors, potatoes can be a valuable asset for poverty reduction.

The implications of this case for other development projects are that a sound understanding of the constraints and opportunities of smallholder farmers is an important starting point. Participation of the poor needs to be more than a slogan—it is crucial for correctly identifying the critical factors that shape their lives, and for finding innovative ways to move forward. But outsiders can also play an important facilitating role in bridging between what smallholders have and what is needed.

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Collective action for market chain innovation in the Andes¹

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ABSTRACT

The Papa Andina network employs collective action in two novel approaches for fostering market chain innovation. The Participatory Market Chain Approach (PMCA) and Stakeholder Platforms engage small potato producers together with market agents and agricultural service providers in group activities to identify common interests, share market knowledge and develop new business opportunities. These forms of collective action have generated commercial, technological and institutional innovations, and created new market niches for Andean native potatoes grown by poor farmers in remote highland areas. These innovations have benefited small farmers as well as other market chain actors. This paper describes Papa Andina's experiences with collective action for market chain innovation. It then discusses the implications of these experiences for the understanding of collective action and the policy implications for research and development organizations.

INTRODUCTION

The Andean region of South America is characterized by extreme social and economic inequalities. It is estimated that more than 60% of Ecuador's rural population and nearly 80% of Bolivia's and Peru's are poor (CEPAL, 2004). Poverty is especially prevalent in highland areas, where the potato is the main staple food and an important source of cash income. In areas over 3,500 meters above sea level, subject to frequent frost and drought, potatoes are among the few crops that can be grown. Over centuries, Andean farmers have developed more than 4,000 native varieties of potato. In Peru and Bolivia, most native potatoes are cultivated by semi-commercial farmers for home consumption, barter and sale in local markets. At lower altitudes, more commercially oriented farmers grow modern varieties employing pesticides, herbicides, and chemical fertilizers. In Ecuador, where growing conditions are generally milder, native varieties have almost entirely been replaced by new varieties introduced by national breeding and seed programs.

Agricultural development is taking place in the context of rapid urbanization and increasing market integration. Farmers are confronted with many new market challenges as well as opportunities. Urbanization and increasing participation of women in the labour force are leading to a dietary transition towards convenience foods, animal protein, fresh dairy products, and higher consumption of fresh fruits

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and vegetables. Packaged food sales and supermarket retail outlets are now found in most developing countries. Demand is also increasing for higher quality foods that meet ever-increasing standards of safety. Supermarkets are becoming major players in vertically integrated food marketing systems. Consequently, the production practices and livelihoods of small Andean farmers are increasingly influenced by the demands of urban consumers, market intermediaries and food industries (Reardon and Berdegue, 2002; Wilkinson and Rocha, 2006).

In contemporary agricultural markets, small farmers are often at a disadvantage in relation to larger commercial farmers who can supply larger volumes of quality-assured products, possess superior bargaining power, and have better access to information, services, technology and capital. Small farmers' limited access to physical and financial resources restricts their ability to expand and invest in technologies that increase efficiency and add value to primary production. Small farmers also frequently have limited technical skills and poor access to information and training for improving their production practices. The limited market surplus of individual small farmers inflates marketing costs, increasing transaction costs and the per-unit costs of assembly, handling and transportation. Small farmers also lack basic knowledge of the marketing system, current information on prices and market conditions, and bargaining power (Kruijssen et al.; Berdegue, 2001).

Various approaches have been proposed to improve the prospects of small farmers in agricultural markets, including collective action via farmer organizations and cooperatives (Shepherd, 2007). In the present paper, we discuss two novel uses of collective action that involve not only small farmers but also market agents and agricultural service providers. The PMCA and Stakeholder Platforms foster market chain innovation in ways that benefit small farmers as well as other market chain actors. The main intended outcomes of these types of collective action are commercial, technological and institutional innovations. This differs from most cases of collective action described in the literature, which report on farmer organization for achieving economies of scale, enhancing small farmers' bargaining power or improving the management of common pool resources. The new forms of collective action reported on here, involving diverse market chain actors, researchers and other agricultural service providers, have been developed by the regional research and development (R&D) network, Papa Andina, which operates in Bolivia, Ecuador and Peru.

PERSPECTIVES ON COLLECTIVE ACTION AND INNOVATION

This paper is concerned with the use of collective action to foster pro-poor innovation in market chains. Much has been written on farmer organizations for managing common pool resources, and for marketing and service provision. There is also a rapidly growing literature on innovation processes. However, the role of collective action in innovation processes has received little attention to date. In this section we review relevant literature on collective action and on innovation, and identify key factors that will later be combined in a framework for analyzing collective action in market chain innovation processes.

Perspectives on collective action

Collective action refers to voluntary action taken by a group to pursue common interests or achieve common objectives. In collective action, members may act on their own, but more commonly they act through a group or an organization; they may act independently or with the encouragement or support of external agents from governmental bodies, non-governmental organizations (NGOs) or development projects (Meinzen-Dick and Di Gregorio, 2004).

There is an extensive body of literature on the role of collective action in managing common pool resources such as forests, fisheries, grazing lands, and irrigation water. Agrawal (2001) presents an exhaustive literature review that identifies 33 “critical enabling conditions” that contribute to the sustainability of common property institutions. These fall into four main categories:

1. Resource system characteristics (e.g., small size, well-defined boundaries, predictability, low levels of mobility, and feasibility of storing benefits from the resource)
2. Group characteristics (e.g., small size, shared norms, past successful experience with collective action (social capital), homogeneity of identities and interests, capable leadership, interdependence among group members, and low levels of poverty)
3. Institutional arrangements (e.g., rules are simple and easy to understand, locally devised access and management rules, ease in enforcement of rules, and graduated sanctions for breaking rules)
4. External environment (e.g., external support for organization, low levels of articulation with external markets, governmental bodies that do not undermine local authority and supportive external sanctioning institutions).

Ostrom (1999) identifies other factors that are important for institutional development, such as the feasibility of improving the resource and a low discount rate. Many authors emphasize the importance of social capital for the emergence and development of local organizations for collective action.

Based on a study of “associative peasant business firms” in Chile, Berdegú (2001) identified several factors that facilitate the emergence and development of collective action for marketing and value-addition. These factors include: high transaction costs; policy incentives; presence of community groups and organizations, providing an important initial forum where alternatives can be discussed; support from external agents, such as NGOs or private extension firms; linkage to actors outside the rural community, providing access to external sources of information, expertise and financial resources; embeddedness in the rural community, facilitating more effective and less costly internal rules, decision-making processes and procedures for monitoring and evaluation; establishment of rules that are consistent with market signals; and potential to differentiate members’ products through value addition.

Kruijssen, Keizer and Giuliani (this issue) discuss the importance of social learning for collective action in the context of smallholder market participation. Social learning is defined as the process through which groups of people learn, by jointly defining problems, searching for and implementing solutions, and assessing the value of solutions for specific problems (Koelen and Das, 2002). Social learning brings about a shift from “multiple cognition” to “collective cognition”. Individuals involved in social learning processes begin with quite different perceptions of their current situation and the potential for change; as they interact, they develop common, shared perspectives, insights and values. Dialogue and social learning foster collective cognition and social capital formation, both of which are necessary for effective joint action. Social learning and social capital formation are also key features of innovation processes.

Perspectives on innovation

Whereas research focuses on generating new knowledge, and technology development aims to create a supply of new production methods, innovation is concerned with the practical use of new knowledge. As Barnett (2004: 1) states, innovation involves “the use of new ideas, new technologies or new ways of doing things in a place or by people where they have not been used before”.

The relationship between research and economic activity is not simple and linear but complex and interactive (Hall et al., 2001; Engel and Salomon, 2003; World Bank, 2007). Interactive social learning processes involving researchers and economic actors are crucial for ensuring that applied research generates useful new knowledge that is put into practical use. Since research organizations have traditionally worked in isolation from the end users of their technologies, institutional innovations that strengthen patterns of interaction between researchers and economic actors are crucially important for strengthening innovation systems.

An innovation system can be defined as “a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into social and economic use, together with the institutions and policies that affect their behaviour and performance” (World Bank, 2007: xiv). Four key sets of factors influence the performance of innovation systems: the external environment, the diversity of actors involved, the values and attitudes of the key actors, and the institutional arrangements and patterns of interaction.

Different factors can trigger innovation, including changes in policies, markets and technology. Attitudes and institutions determine how individuals and organizations respond to such triggers. Behaviours that make organizations and policies responsive to stakeholders’ needs and interests can encourage innovation. Innovation is also stimulated by the interaction of individuals and groups with different backgrounds, interests and perspectives. Hence, groups that are more diverse generally have a greater potential for innovation. Even though participants with different economic interests may initially be sceptical about the benefits of interacting, the values, attitudes and patterns of interaction can change over time as a result of social

learning, development of personal relationships, trust and other forms of social capital. The ability to interact constructively and work in new ways is crucial for the innovation performance of groups.

Recent studies of agricultural innovation highlight the utility of the value chain concept – a set of interconnected, value-creating activities undertaken by individuals and enterprises to develop, produce and deliver a product or service to consumers – as unit of analysis and focus of interventions aimed at stimulating innovations and developing innovation capacity (World Bank, 2007: 24). Thus, attention should not be directed at individual supply chain participants such as producers but at the overall supply chain capacity and the degree to which the chain in its entirety is able to compete.

FRAMEWORK FOR ANALYZING COLLECTIVE ACTION IN MARKET CHAIN INNOVATION

Ostrom and colleagues at the Workshop in Political Theory and Policy Analysis at Indiana University have developed a general framework for understanding institutions known as the Institutional Analysis and Development (IAD) Framework. It has three main components:

- The “Action Arena” in which participants interact
- Three groups of “Exogenous Variables” that influence the “Action Arena”(biophysical/material conditions, attributes of the community and rules)
- The “Outcomes” produced (Ostrom, 2005, Figure 1.2, p. 15).

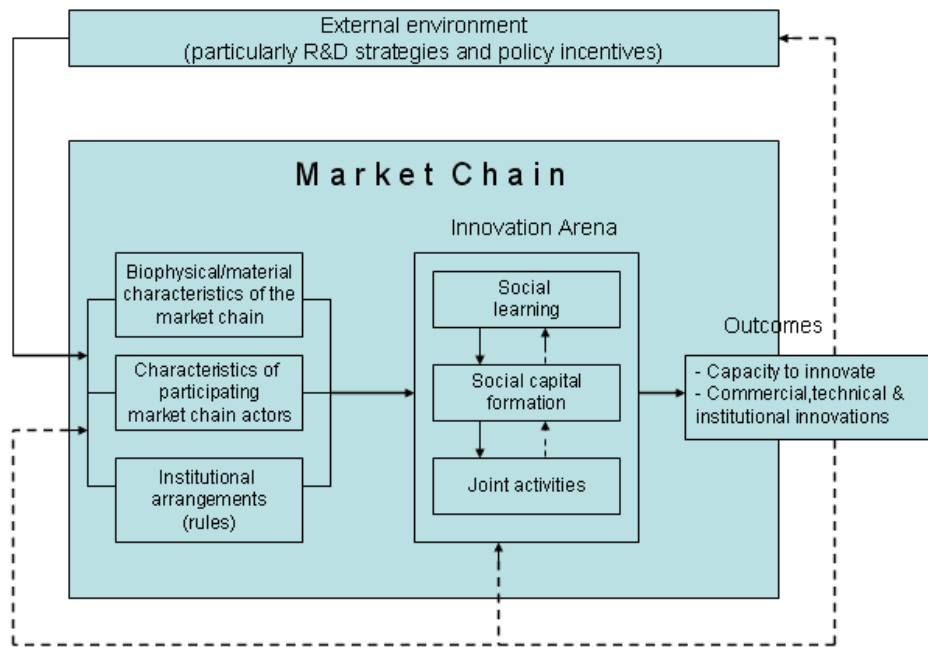
In developing a framework for analysis of collective action in market chain innovation, we have built on the IAD framework and added the external environment component from Agrawal (2001) and the World Bank (2007). To focus attention on important innovation processes, we have also added the components of social learning, social capital formation and joint activities from Kruijssen, Keizer and Giuliani (this issue). The resulting Framework for Analyzing Collective Action in Market Chain Innovation is illustrated in Figure 1.

The central focus of attention in this framework is the Innovation Arena where social learning, formation of social capital, and joint innovative activities lead to the development of innovations. The Innovation Arena is influenced by four sets of exogenous variables: the external environment, biophysical and material characteristics of the market chain, characteristics of market chain actors, and institutional arrangements. Based on the literature review reported in the previous section, particularly the works of Agrawal and Berdegué, we have identified a number of factors in each of these four areas that are likely to influence collective action processes and outcomes in the context of market chain innovation (Table 1).

In the resulting framework, the two major outcomes of collective action are strengthened capacity for innovation and commercial, technological and institutional innovations. As indicated by the broken lines in Figure 1, these outcomes may

influence the processes that take place within the Innovation Arena. For example, successful innovation may stimulate participants to invest more time and resources in joint activities. Over time, outcomes may also influence the four groups of exogenous variables. For example, successful innovation may predispose policy makers to support future programs involving collective action.

Figure 1. Framework for analyzing collective Action in market chain innovation



Source: Based on Ostrom (2005) Figure 1.2, Agrawal (2001), Kruijssen, Keizer and Guiliani (2007) and World Bank (2007) .

PAPA ANDINA’S USE OF COLLECTIVE ACTION TO FOSTER PRO-POOR MARKET CHAIN INNOVATION

Papa Andina was established in 1998 to promote pro-poor innovation in the Andean potato-based food systems. Financed mainly by the Swiss Agency for Development and Cooperation and other donors, and hosted by the International Potato Center, the network includes about 30 partners in Bolivia, Ecuador and Peru. In each country, Papa Andina coordinates its activities with a “strategic partner” that plays a leadership and coordinating role in market chain innovation: the PROINPA Foundation in Bolivia, the INCOPA Project in Peru and the National Potato Program of INIAP in Ecuador. This network of partners reaches a growing number of poor rural households, currently estimated to be around 4,000. The PMCA is used to bring researchers together with

other agricultural service providers and market chain actors, including small farmers, to promote pro-poor innovations.

Interaction among the market chain actors is crucial for market chain innovation. In 2000, we began experimenting with a participatory approach to stimulate agricultural innovation known as 'Rapid Appraisal of Agricultural Knowledge Systems' (RAAKS). This approach, developed by Engel and Salomon (2003), brings diverse stakeholders together in a flexible, participatory process. Papa Andina began using RAAKS to foster pro-poor market chain innovation for native potatoes. Based on RAAKS, through action research we developed two complementary approaches to enhance innovation: the PMCA and Stakeholder Platforms.

Table 1. Exogenous variables that influence the emergence and outcomes of collective action in market chain innovation

External environment
<ol style="list-style-type: none"> 1. "Trigger" for initiation of collective action 2. Support from external agents (such as research organizations, NGOs or governmental bodies) to stimulate innovation and facilitate group activities and provide technical and institutional backstopping 3. Policy incentives for pro-poor market chain innovation 4. Presence of community groups or organizations 5. Collective action institutions at complementary levels (higher or lower)
Biophysical/material characteristics of the market chain
<ol style="list-style-type: none"> 1. Characteristics of the commodity (e.g., perishability and production zones) 2. Current uses and consumer perceptions of intrinsic value 3. Potential to reduce transactions costs through market chain innovation 4. Potential for product differentiation and value addition
Characteristics of participating market chain actors
<ol style="list-style-type: none"> 1. Participation of diverse market chain actors and service providers 2. High levels of dependence on the market chain 3. Presence of social capital (norms, values, attitudes, and beliefs that predispose people towards collective action, as well as rules, procedures, precedents, and social networks) 4. Capable leadership within the market chain and in the farming community
Institutional arrangements (rules)
<ol style="list-style-type: none"> 1. Effective social learning processes, leading to development of collective cognition, social capital, and leadership capacity 2. Locally devised rules that are simple, easy to understand, easy to enforce, and consistent with market signals 3. Fair allocation of costs and benefits of collective action 4. Graduated sanctions for non-compliance with rules 5. Accountability / responsiveness of external agents to group members

Note: Based on Agrawal (2001, Table 2) and Berdegue (2001).

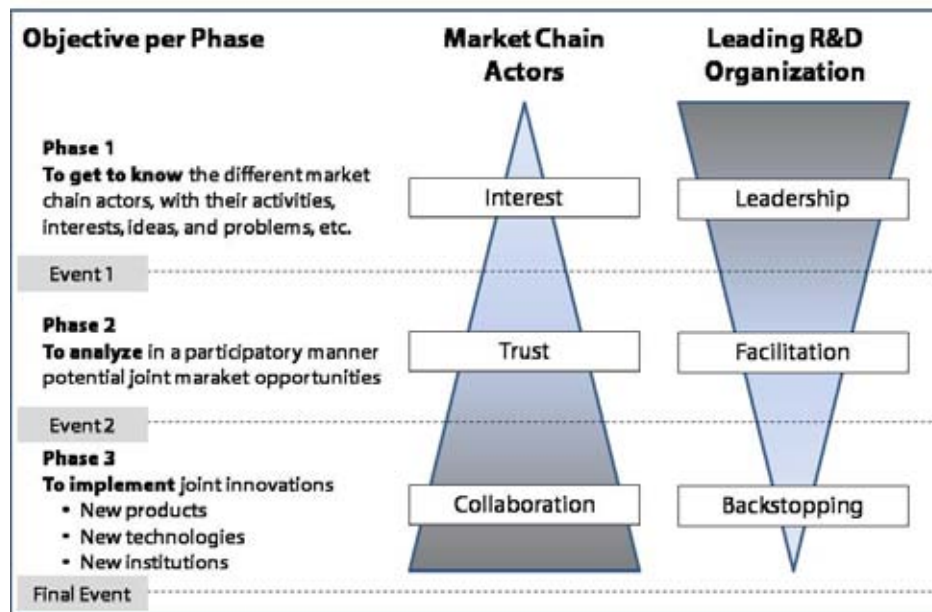
The participatory market chain approach

In 2000, the INCOPA project began working with RAAKS to stimulate social learning, build trust and foster joint actions among potato market chain actors. They added tools for product and market development and re-christened the approach as the 'PMCA' (Bernet et al., 2006). The PMCA has three phases, usually implemented over several months. A R&D organization initially leads planning, coordination and

facilitation. As the process advances, market chain actors take on more responsibility, and the R&D organization shifts to a supporting role (Figure 2).

Phase 1 of the PMCA begins with a rapid market survey and ends with a workshop where market chain actors meet supporting R&D organizations to discuss possible innovations. Phase 2 involves a series of group meetings and applied research to analyse market opportunities. A key goal of this phase is to build trust among participants. Phase 3 involves joint activities that seek to develop concrete innovations, which might be technical (e.g., new products, production practices or packaging) or institutional (e.g., farmer associations, stakeholder platforms or business arrangements such as contract farming agreements). The PMCA formally ends with a large public event where market chain actors and service providers present their innovations and meet national policy makers, donor representatives, the media and other 'VIPs'. After the formal closure, the R&D organization may be called on by specific actors or asked to backstop new institutions.

Figure 2. Three phases of the participatory market chain approach



Source: Bernet et al. (2006).

Stakeholder platforms

In the Andes, interactions among market chain actors and service providers are frequently characterized by lack of trust, and successful private-public partnerships and alliances are rare (Hartwich and Tola, 2007). Agricultural research organizations usually keep their distance from NGOs, farmer groups and traders. The quest for market-led innovation made it necessary to look beyond the research community and build relationships with a broader range of public and private actors. Papa Andina

employs stakeholder platforms to promote interaction, social learning, social capital formation, and collective activities involving diverse actors in innovation processes.

Stakeholder platforms have been established at different levels. Local platforms facilitate interactions between potato producers, local authorities and service providers to empower small farmers, reduce marketing costs, and increase efficiency in service delivery. Market chain platforms bring farmers' associations together with traders, processors, supermarkets, researchers, extension agents, chefs and others to foster pro-poor innovation. In some cases, platforms also serve as representative bodies for interaction with policy makers.

Illustrative examples

The following examples present cases from Peru and Bolivia, where the PMCA has been developed and refined, and from Ecuador, where attention has focused on stakeholder platforms for strengthening farmer organizations.

Peruvian examples

In 2002, INCOPA initiated the PMCA in Peru with a market chain survey. Results were discussed in a meeting of nearly 100 stakeholders, including potato producers, wholesalers, processors, supermarket managers, researchers, and professionals from NGOs and international agencies. Based on this survey, two cycles of PMCA were implemented, one for potatoes in general and one specifically for native potatoes.

Innovations resulting from the first cycle included: 'Mi Papa' (a new brand of high-quality, fresh potatoes for the wholesale market), 'Papy Bum' (a new native potato chip product), and a series of online bulletins with daily information on wholesale prices and supplies for more than 20 types of potatoes. A national organization, CAPAC-Peru, was established to promote marketing of high-quality potato products, reduce transaction costs, and add value through innovation. Founding members included farmer organizations, NGOs, traders and processors. Today CAPAC represents 22 core members including five farmer organizations with 600 members.

In the second PMCA application, several new actors joined the process to develop new native potato products. CAPAC-Peru played a key role (Ordinola et al., 2007), and results included two new products: T'ikapapa and Tunta Los Aymaras.

T'ikapapa is the first brand of high-quality, fresh, native potatoes sold in Peru's leading supermarkets. First marketed in 2004, sales grew from 14 tons to over 70 tons in 2006. This has allowed more than 300 families in 10 highland communities to obtain 10-30% above the going market price for native potatoes. An agro-processing company, a member of CAPAC, owns the brand and contracts farmers to supply potatoes to the supermarket. CAPAC helps to organize small farmer groups to supply potatoes that meet market requirements. In 2007, INCOPA and its partners received a United Nations award for 'Supporting Entrepreneurs for Environment and Development'.

Tunta Los Aymaras is a brand of high-quality, freeze-dried, native potatoes developed through a coalition of farmers' groups, local government agencies, NGOs and a private service provider. Tunta is produced traditionally from native 'bitter potatoes' by small farmers in the high Andes and has generally been restricted to traditional Andean markets. Through collective action, farmers' marketing and processing capacities were strengthened; quality norms developed, and market studies undertaken. A farmers' association, 'Consortium Los Aymaras', was created to market this new product, and it also owns the brand.

Bolivian examples

The PMCA was applied in two regions of Bolivia. In Cochabamba, the PMCA was introduced from Peru in 2003, validated and adapted. PROINPA led the exercise with a local farmers' association, a food processing firm and a supermarket in Santa Cruz. Based on the common interest identified by the participants, two new products were developed for sale in supermarkets: coloured chips made from native potatoes and high-quality, pre-packaged, fresh native potatoes. PROINPA gained a new approach for linking small farmers to markets; it helped the farmers' association to get better organized, build links with market agents, and upgrade the quality of its members' native potatoes. It also helped them to improve working relations and negotiation capacity with market chain actors.

From 2003, the PMCA was applied twice in the Department of La Paz in market chains for tunta and chuño, traditional freeze-dried products. These applications involved farmers, traders, food processing firms, exporters, cooking schools and R&D organizations. In the first cycle, participants prepared a set of 'Bolivian quality's standards for chuño and tunta' in coordination with national authorities. In 2004, the PMCA was used to identify new uses for chuño and tunta, and ways to improve the products' image. This exercise involved some participants from the first cycle plus chefs and a food-processing firm manager. It resulted in a new product: clean, selected and bagged chuño, marketed under the brand 'Chuñosa'.

In 2005, participants established the 'Bolivian chuño and tunta platform', formalized as the 'Bolivian Andean Platform', to sustain and consolidate their collective action. Among other activities, the platform has established links with market agents to develop better quality chuño-based products with a higher price and to explore the export potential of chuño and tunta. The platform today represents 13 core members including four farmers' associations with around 200 members, processing firms, development projects, an NGO and a research organization, PROINPA. It has helped to build trust and social networks among its members and has improved links between small farmers and market agents on one hand, and R&D organizations and other service providers on the other.

Ecuadorian examples

INIAP's potato program initially attempted to create a national-level consortium of market chain actors and development organizations to address macro-level problems. When this effort failed, attention shifted to local stakeholder platforms to

develop better collaboration among local institutional actors and farmers' organizations. With financial support from the SDC, it has provided small grants for 'collaborative projects' that link small potato farmers with specific markets.

Platforms and collaborative projects were set up in the provinces of Tungurahua, Chimborazo in 2003, and in Cotopaxi and Bolivar in 2006. With initial leadership from INIAP, these involved 24 farmers' groups that were created through previous Farmer Field School experiences (they include around 200 members), universities, local governments, and NGOs representing 32 core members in total including the farmer groups' representatives. Platforms were organized around existing farmers' groups. Their activities have included marketing selected fresh potatoes to 29 restaurants, fast food outlets and processors in Ambato and Riobamba. Platform members grow the new Fripapa potato variety, which is in high demand for processing and fast food outlets. Through the platforms, researchers have interacted with small farmers as well as local authorities, development projects and NGOs. This has facilitated knowledge sharing, social learning and capacity building, leading to improvements in small farmer productivity and the quality of potatoes supplied to market. As a result of this process, a national organization, the Consortium of Small Potato Producers (CONPAPA), was established to support joint marketing activities.

DISCUSSION

In this section, we summarize patterns that emerge from our examples of collective action in relation to the main components of the Framework for Analysis of Collective Action in Market Chain Innovation (Figure 1).

Role of external factors

In each of the cases described, the collective action was triggered by a research organization associated with Papa Andina, external to the market chain. Once local groups had been established with external facilitators, they took on lives of their own and often evolved in unexpected ways. All the groups were supported by such external agents as NGOs, local or national governments, and R&D organizations. The Bolivian and Peruvian groups benefited from policy support for market chain development. In contrast, in Ecuador policies emphasized farmer organization and empowerment rather than market chain development per se. In several cases, collective action for market chain innovation built on earlier groups, such as Farmer Field Schools, NGOs and farmers' associations, confirming the importance of prior experience with collective action. In some cases, when collective action got underway, complementary groups were established at other levels (for example, CONPAPA, CAPAC-Peru and the Bolivian Andean Platform).

Importance of market chain characteristics

As shown in the cases, joint marketing can reduce transaction costs. However, commercial innovation and development of high-value niches for potato products have generated more significant benefits for small farmers as well as other market chain actors. In Peru and Bolivia, use of the PMCA led to the development of new

products based on native potatoes. In contrast, in Ecuador, where attention focused on organizing farmers' groups to respond to existing market opportunities for modern varieties, fewer commercial innovations, and benefits, have resulted.

Importance of participants' diversity

In the Bolivian and Peruvian cases, small farmers, market agents, researchers and service providers have participated in groups working with the PMCA. In contrast, in Ecuador market agents have not been involved in the platforms. An important factor for innovation has been the trigger effect of researchers who brought new information and ideas. For example, in Peru and Bolivia, researchers suggested that it might be possible to market a colourful native potato product, and they assisted with laboratory testing of processing techniques. With these inputs, other participants took the lead in product development, testing and refinement. The Ecuadorian approach focusing on farmer organization has strengthened farmer organizations but has led to less market chain innovation.

Women were involved in all cases, more actively in marketing and processing than in production. In most of the cases, men assumed leadership at the community level, while women assumed leadership in R&D organizations in Bolivia and Peru. Small farmers are generally more dependent on the potato market chain than large retailers; this may be one reason why it is easier to engage small farmers in the PMCA than to engage market agents. Small Andean farmers have traditions of collective action at the community level, but not along market chains. Relations in market chains are traditionally characterized by lack of trust and cooperation. Hence, getting diverse market chain actors (including small farmers) to work together in innovation processes is itself a significant institutional innovation.

Institutional arrangements

One of the key challenges has been to provide adequate facilitation for social learning processes, which promote the development of collective cognition, social capital and leadership capacity. In most cases, a research organization took responsibility for facilitation. There has been a tendency for facilitators to introduce rules to speed up the process, rather than facilitate the local development of rules. Where multi-stakeholder platforms have emerged from PMCA exercises, they have developed their own rules, often with little support from Papa Andina.

The Innovation Arena

The three phases of the PMCA correspond to the three social processes that take place in the Innovation Arena. Therefore, where the PMCA has been implemented, in Peru and Bolivia, the groups involved have advanced through the phases of social learning and social capital formation, and have engaged in joint activities focused on the development of specific commercial, technical and institutional innovations. In all the cases, participants report that the group meetings and social interactions with other market chain actors and service providers were useful to them, even before they began the process of developing specific innovations. Participants learned new

things about the market chain or about technical and market potentials that they could put into practical use in their businesses. They also established personal relationships with other market chain actors or service providers that have proved useful to them in their businesses. This is one reason why stakeholder platforms have been established in some cases: to allow the diverse stakeholders to continue to interact and work together over time.

Outcomes

An important result of the collective action processes promoted by the PMCA and stakeholder platforms has been the build-up of participants' capacity for teamwork and innovation. Leadership capacity has also been developed at the level of farm communities to enable communication and interaction with market chain actors and service providers as well as institutional leadership for facilitating collective action and distributing roles among the market chain participants.

The groups identified new market opportunities and developed new production processes, new ways of working together and, finally, new commercial products to exploit these opportunities. This is illustrated by the case of T'ikapapa in Peru, where this commercial innovation stimulated other innovation in the areas of technology development to respond to the quality criteria required by the market and institutional innovation required in the CAPAC association to provide the necessary services to these market chain actors. The results of these outcomes can be summarized as higher prices for native potatoes, increased farmers' revenues, more stable markets for native potato producers, improved image of native potatoes and increased farmer's self-esteem.

An example of indirect outcomes is the creative imitation process by which other market chain actors develop similar products based on the original creative idea that stimulated further innovation and involved new participants in the process and eventually new members to the CAPAC association. The promotion of successful innovation has also attracted the attention of policy makers and donors to the process, increasing their support for future collective action for market chain innovation.

Implications of Papa Andina's experience

Implications for general understanding of collective action

Papa Andina's work illustrates how collective action involving small farmers, market agents, researchers and other agricultural service providers can generate pro-poor market-chain innovations. The collective action literature emphasizes its role among individuals with common interests, in managing common pool resources, reducing transaction costs, gaining scale economies, and improving the bargaining power of small farmers. The innovation literature, in contrast, highlights the importance of interactive, social learning among individuals with different perspectives and interests. Neither discusses the use of collective action in fostering innovation. Papa Andina provides some concrete examples of how these two fields can be bridged –

how collective action involving diverse stakeholders can contribute to innovation processes that benefit small farmers. In the examples presented, participants strengthened business contacts and social networks, shared knowledge, and built up trust. As the capacity for teamwork developed, participants identified market opportunities and developed new products and marketing methods creating innovation processes that improved the market participation of smallholders on more favourable terms.

Papa Andina's work shows that diversity of participants' roles and interests is not always bad for collective action. In fact, diversity is valuable for innovation. The collective action literature commonly observes that diversity within a group impairs collective action. Papa Andina's experience confirms that diverse groups may be more difficult to establish and maintain over time, and that good facilitation is essential. But, in line with the innovation literature, diverse groups are potentially more productive in terms of social learning and innovative behaviour. Papa Andina's experience shows that a well-facilitated group, with diverse backgrounds, values and economic interests, can coalesce into a high-performance team that actively, creatively and successfully pursues the common objective of market chain innovation.

Papa Andina's work illustrates the synergies of different forms of collective action at different levels: stakeholder platforms and the PMCA have proven to be highly complementary. At the market-chain level, groups have found that exploitation of new market opportunities often requires collective action at the local level, and vice versa.

In many cases, collective action has been short lived, linked to accomplishment of the initial goal. In others, it has evolved into more formal and stable multi-stakeholder associations. Much of the collective action literature seeks to identify factors that contribute to sustainable institutions. While clearly important for natural resources management, institutional sustainability is perhaps less relevant for innovation processes. Our experience highlights the dynamics of collective action – the different ways in which it has emerged and the different courses it has taken over time as social capital and leadership capacities have been built up and institutions have emerged.

Papa Andina's work highlights the initial importance of competent external facilitation and support. The collective action literature notes that many local organizations are established as a result of external interventions. However, the roles of external agents and the capacities they need are seldom carefully assessed. In collective action for market chain innovation, facilitators need to motivate business development, and at the same time foster development of social capital and leadership within the group. This often involves a delicate balance between achievement of short-term results (e.g. new products) and the development of sustainable institutions that can foster innovation processes.

Policy implications

Three broad policy implications come out of Papa Andina's experiences with collective action. First, institutional innovations in R&D (such as use of the PMCA and Stakeholder Platforms) can lead to technical and institutional innovations that enhance small farmer market participation. For example, as a result of the PMCA, new native potato products were launched. This stimulated the formation and strengthening of farmer organizations, which facilitated marketing and improvements in production and post-harvest practices. At the market chain level, formal associations were established, such as the Bolivian Andean Platform in La Paz and CAPAC-Peru.

Secondly, market chain innovation for indigenous agricultural products can aid in-situ conservation of biodiversity. In Bolivia and Peru, commercial innovation with native potatoes has been a key element in linking small farmers to markets. Until recently, urban consumers did not appreciate the cultural value and nutritional characteristics of native potatoes. However, recent concerns for food quality and safety have stimulated demand for locally grown, organically produced foods, reflected in the number of gourmet restaurants serving dishes based on indigenous products. These trends have created new market opportunities for indigenous foods, including native potatoes. The resulting products also have export potential, because they are seen as exotic and nutritious. As Smale (2006) and others have shown, increasing farmer returns to crops with a high public value, such as native potatoes, will enhance the incentive for farmers to maintain agro-biodiversity. Applications of collective action approaches such as the PMCA may also prove useful for the conservation of other indigenous agricultural products in other settings.

Lastly, for R&D organizations to contribute to market chain innovation, they must develop their capacity to facilitate and participate constructively in collective action. Pro-poor innovation goes far beyond the traditional R&D. Implementing the PMCA requires R&D organizations to have the capacity to diagnose innovation systems and facilitate group processes involving people with diverse stakes in a commodity's production, marketing and use. Women's opportunities for participation in collective action processes like the PMCA and the potential benefits need to be addressed more systematically. To effectively facilitate such processes, R&D organizations need new skills and resources. Retooling themselves to play these new roles is likely to pose major challenges for many R&D organizations.

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Brokering Innovation for Sustainable Development: The Papa Andina Case¹

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ABSTRACT

The inadequate linkage of knowledge generation in agricultural research organizations with policy-making and economic activity is an important barrier to sustainable development and poverty reduction. The emerging fields of sustainability science and innovation systems studies highlight the importance of “boundary management” and “innovation brokering” in linking knowledge production, policy-making, and economic activities. This paper analyzes how the Papa Andina Partnership Program, based at the International Potato Center, functions as an innovation broker in the Andean potato sector. As a regional initiative, Papa Andina operates as a “second-level innovation broker,” backstopping national partners who facilitate local innovation processes in their respective countries. Papa Andina works to strengthen local innovation capacity and to foster “innovations in innovation” – the development of more effective ways of bringing stakeholders together to produce innovations that benefit small-scale farmers. There are virtuous feedback loops between first- and second-level innovation brokering functions. The paper outlines the approaches Papa Andina has developed and promoted for fostering innovation brokerage at these two levels and the types of results obtained. It then identifies some important challenges that Papa Andina faces in innovation brokerage at the international level. The paper concludes with a discussion of broader policy issues related to the roles and functions of innovation brokers and boundary organizations in promoting sustainable development.

INTRODUCTION

This Working Paper deals with a central challenge facing international agricultural research organizations, including those affiliated to the Consultative Group on International Agricultural Research (CGIAR): How to contribute significantly to sustainable development and poverty reduction while maintaining a focus on scientific research that produces international public goods (IPGs). A recent discussion paper produced by the Global Donor Platform for Rural Development and the European Initiative for Agricultural Research for Development (EIARD) (Ashley et al., 2009:1, 7) characterized the problem as follows:

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- There has been a major tension between good science and applied agricultural research, in NARIs [national agricultural research institutes] and also within the CG system.
- Years of failing to respond to development needs have led to a situation where those engaged in planning agricultural and rural development often perceive research programmes of the NARIs, through to the CGIAR centres, to have limited relevance to the development agenda.

The Working Paper focuses on an approach that international agricultural research centers and their national partners are experimenting with to link the worlds of research and action and promote pro-poor innovation: Partnership Programs that work to broker innovation processes, develop more effective ways of fostering innovation, and strengthen national innovation capacities.

When the CGIAR system was established in the early 1970s, its mission was “to use the best science in advanced countries to develop technologies for the benefit of food deficit countries and populations” (Lele, 2004). Over time, as donor priorities shifted and the limitations of a narrow “pipeline” approach to productivity enhancement became apparent, the CGIAR mandate expanded to include poverty reduction and environmental protection. New research programs were added to address issues of food policy, institutional arrangement, and the management of water, forest, and fishery resources.

The CGIAR’s current mission is to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment (www.cgiar.org). The research priorities include genetic improvement, sustaining agriculture biodiversity, the sustainable management and conservation of water, land and forests, improving policies and facilitating institutional innovation. Although these priorities cover a wide range of subjects, it is important to note that they are priorities for *research*, which aims to produce IPGs, taken to mean “research outputs of knowledge and technology generated through strategic and applied research that are applicable internationally to address generic issues and challenges consistent with CGIAR goals” (Harwood et al., 2006). The CGIAR Science Council encourages centers to focus on research that addresses problems of broad international importance and discourages them from engaging in applied research and development activities that address local problems (CGIAR Science Council, 2006).

CGIAR centers have produced new knowledge and technologies that have helped to increase food production and reduce rural and urban poverty (Evenson and Gollin, 2003; Hazell, 2008; Kelly et al., 2008). Nevertheless, problems of poverty, hunger, and environmental degradation remain daunting in many developing regions (IAASTD, 2009). As Ashley et al. (2009) noted, despite substantial donor investment in agricultural research over many years, “many of the outputs of research have not impacted on poverty.”

Increasingly, those who provide funds for research expect their investments to benefit poor people (Adato and Meinzen-Dick, 2007). Consequently, there has been growing emphasis on “research for development” and a search for research and development (R&D) methods that ensure the relevance and use of research results. The increasing emphasis on research impact has challenged the status quo for research organizations and has stimulated a major reform process in the CGIAR system, which is presently underway (Ashley et al., 2009:3).

Over the years, international agricultural research organizations have used a number of approaches to link research more effectively with development initiatives and farmers, including outreach programs, farming systems research, participatory technology development, networking, and partnership (Horton et al., 2009; Scoones and Thompson, 2009). Recently, there has been experimentation with innovation systems approaches that shift attention from increasing the supply of new technology to facilitating innovation processes in which new solutions to technical and institutional problems are co-produced by diverse stakeholders in interactive learning processes. An innovation system can be defined as “a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into social and economic use, together with the institutions and policies that affect their behaviour and performance” (World Bank, 2007). Various factors can trigger innovation, including changes in policies, markets and technology. Attitudes and institutional structures determine how individuals and organizations respond to such triggers.

Papa Andina is a Partnership Program hosted by the International Potato Center (CIP).² Since its establishment in 1998, Papa Andina has worked with national partners in Bolivia, Ecuador, and Peru³ to promote innovation processes in market chains that benefit small-scale potato producers in highland areas (Devaux et al., 2009; Meinzen-Dick et al., 2009). In each country the national partners function as “*innovation brokers*” who facilitate innovation processes in potato market chains. These processes involve not only researchers, but also other agricultural service providers, policy-makers, small-scale farmers, and market agents. Papa Andina’s Coordination Team functions as a “*second-level innovation broker*” in that it supports and backstops the national teams, facilitates learning and knowledge sharing among them, and

2 CIP is an international agricultural research center affiliated to the CGIAR (www.cipotato.org).

3 Through its Strategic Partners, Papa Andina works with a range of local partners in each country. Its Strategic Partners are: Bolivia – the PROINPA Foundation; Ecuador – the National Potato Program, INIAP; and Peru – the INCOPA Project (Peru). The partners’ names in Spanish are: Fundación PROINPA (Promoción e Investigación de Productos Andinos) (www.proinpa.org/); Programa Nacional de Raíces y Tubérculos rubro Papa (PNRT-Papa), INIAP (www.iniap-ecuador.gov.ec/); and Proyecto INCOPA, a coalition of private and public organizations that aims to improve small-scale potato farmers’ access to markets (www.cipotato.org/papandina/incopa/incopa.htm).

encourages the co-development of approaches and methods for improving innovation brokering processes at national level.

Papa Andina and its partners have received national and international recognition and awards for their innovative work.⁴ Based on successful experiences in the Andes, some of Papa Andina's approaches have been applied by other groups to broker innovation processes in other value chains in the Andes and in other regions. Despite these achievements, however, a number of challenges remain. For example, a recent external evaluation noted that Papa Andina lacks a clear "theory of change" for its work. The evaluators also commented on the ambiguity of some of the roles and responsibilities of Papa Andina's Coordination Team and those of its national partners, particularly with regard to responsibilities for achieving impact. There is also uncertainty about the future sustainability of Papa Andina and the functions it performs (Bebbington and Rotondo, 2010). As we will see in the next section, evaluations of many other innovation brokers have reached similar conclusions.

In this paper, after a brief review of the literature on "innovation brokerage" and the related topic of "boundary management," we describe the development of Papa Andina as an innovation broker. We then describe the approaches it has used to broker innovation processes, the types of results obtained, and the challenges it faces as an innovation broker. Based on the Papa Andina case, as well as prior research, we close with a discussion of policy issues related to the role of innovation brokers in linking research with action to support sustainable development and in catalyzing pro-poor innovation processes in other settings.

4 In 2005, CIP, INCOPA, and a private firm, A&L Exportaciones y Servicios SAC, won the Peruvian Award for Entrepreneurial Creativity (<http://creatividadempresarial.upc.edu.pe>), given by the Peruvian University for Applied Sciences for developing T'ikapapa (bagged native potatoes) through an initiative that "values the enormous diversity of Andean potatoes, brings them to urban consumers, and generates sustainable businesses for small farmers". In 2008, INCOPA and Papa Andina won the award again, this time "for exploiting the diversity of native potatoes in expanding the competitiveness of products from the Andean region." In 2007, INCOPA and Papa Andina won the international SEED Award for Entrepreneurship in Sustainable Development, an annual competition designed to support local, innovative partnerships in developing countries working to achieve poverty eradication and environmental sustainability (www.seedinit.org/about-the-seed-awards/index.html). In 2007 INCOPA, A&L Exportaciones y Servicios SAC, Cadenas Productivas Agrícolas de Calidad (CAPAC) Perú, Supermarket Wong, producer organizations, and Papa Andina won the World Challenge Award, a competition sponsored by BBC World News and Newsweek, in association with Shell, that rewards projects or small businesses that have shown enterprise and innovation at a grassroots level (www.theworldchallenge.co.uk/previous-winners.php). In 2008 INCOPA and Potato Andean won Peru's Ardilla de Oro, awarded annually by Peru's Catholic University for a marketing campaign that contributes to social development in Peru (www.infoandina.org/node/26072).

BOUNDARY MANAGEMENT AND INNOVATION BROKERAGE

This section presents highlights of recent applied research on “boundary management” and “innovation brokerage.” Much of the literature on boundary management is associated with the work of the Sustainability Sciences Program at Harvard University’s Center for International Development.⁵ The literature on innovation brokerage, in the field of innovation systems studies, has been summarized by Klerkx et al. (2009).

Boundary management

In their report on a major study of knowledge systems for sustainable development, Cash et al. (2003:8086) emphasized the importance of boundary management:

This study suggests that efforts to mobilize S&T [science and technology] for sustainability are more likely to be effective when they manage boundaries between knowledge and action in ways that simultaneously enhance the salience, credibility, and legitimacy of the information they produce. Effective systems apply a variety of institutional mechanisms that facilitate communication, translation and mediation across boundaries.

The study found that scientific information is effective in influencing decision-making so long as it is seen as credible, salient, and legitimate. In this context, *credibility* refers to the perceived scientific adequacy of the technical evidence and arguments; *salience* relates to the relevance of the information to the needs of decision-makers; and *legitimacy* reflects the perception of stakeholders that the information was produced in a way that was “respectful of stakeholders’ divergent values and beliefs, unbiased in its conduct, and fair in its treatment of opposing views and interests” (Cash et al., 2003).

The credibility, salience, and legitimacy of information are tightly linked in the sense that an increase in one of them generally comes at the expense of a reduction in the others. For example, if efforts are made to maximize the relevance of information for decision-makers, methodological shortcuts might be made that reduce the credibility of the findings. Similarly, use of state-of-the-art research methods that maximize the credibility of research results might alienate decision-makers who do not understand the methods used (therefore reducing legitimacy) or delay the delivery of results until they are no longer relevant or useful to the decision-makers.

Cash et al. (2003) identify three key functions that contribute to effective boundary management:

- *Communication*. Active, iterative, and inclusive communication between researchers and decision-makers is crucial in efforts to mobilize knowledge in the service of practical action.

⁵ www.hks.harvard.edu/centers/cid/programs/sustsci.

- *Translation.* Understanding between experts and decision-makers is often hindered by jargon and differing assumptions about what constitutes a persuasive argument. For this reason, translation is often needed to ensure that participants from different institutional settings understand each other.
- *Mediation.* Although communication and translation are essential for effective information flows between researchers and decision-makers, they are seldom enough to ensure that research influences decision-making. Because stakeholders often have conflicting interests, mediation is usually needed for mobilizing science for practical action.

Boundary management functions can be carried out effectively through various organizational arrangements and procedures, but are frequently performed by “boundary organizations” responsible for managing one or more specific boundaries. Although they have lines of responsibility and accountability to groups on both sides of the boundary, these organizations can provide a forum or “safe space” in which members from participating organizations can come together to discuss and negotiate problems and solutions.

Empirical studies of boundary management show that “not all organizations that bring together divergent perspectives necessarily result in anything new or better” (Schneider, 2007:60). Successful boundary organizations tend to exhibit an inclusive leadership and management style (Schneider, 2007:76) that facilitates the co-production of plans, strategies, models, methods, or reports that are viewed as salient, credible, and legitimate by those involved and by their organizations. Studies also highlight the important contribution made by particular individuals, known as boundary agents, who play key roles in “creating and sustaining relationships, building trust, communicating information needs and concerns, and bridging gaps between various stakeholder groups (McNie et al., 2008:2; see also Kristjanson et al., 2009 and Reid et al., 2009).

Innovation brokerage⁶

Insights from the literature on industrial and agricultural innovation have recently been brought together within the concept of agricultural innovation systems (Klerkx et al., 2009). The World Bank (2007:6-7) defines an innovation system thus:

An innovation system may be defined as comprising the organizations, enterprises and individuals that together demand and supply knowledge and technology, and the rules and mechanisms by which these different agents interact. The innovation systems concept focuses not merely on the science suppliers but on the totality and interaction of actors involved in innovation. It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of new and existing knowledge in novel and useful ways. Thus, innovation is viewed in a social and economic sense and not purely as discovery and invention

6 This section is based on Klerkx et al. (2009).

Klerkx et al. (2010:390) note that “in the AIS [agricultural innovation systems] approach, innovation is considered the result of a process of networking and interactive learning among a heterogeneous set of actors, such as farmers, input industries, processors, traders, researchers, extensionists, government officials, and civil society organizations.”

One implication of innovation-systems thinking is that the innovation capacity of a country’s agricultural sector depends on: the extent of shared visions; effective linkages and information flows among public and private actors; incentives for cooperation; adequate marketing, legislative, and policy environments; and well-developed human and organizational capital (Hall, 2006; Gijsbers, 2009; Klerkx et al., 2009).

Past efforts to strengthen agricultural innovation systems focused mainly on training and organizational capacity development (Horton et al., 2003). Attention is now shifting towards improving incentives for cooperation and strengthening linkages among relevant actors. The importance of having intermediary organizations that link the various actors involved in innovation is becoming recognized (Szogs, 2008; Klerkx et al., 2009; Kristjanson et al., 2009). These intermediaries have been referred to as “innovation intermediaries” or “innovation brokers”.

Howells (2006:720) defines an innovation intermediary as “an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties”. The provision of brokerage and mediation services might or might not be the primary role of an innovation intermediary. For example, a research or extension organization might, as a sideline, broker innovation in some of its projects. Winch and Courtney (2007:751) define an innovation broker more narrowly as “an organization acting as a member of a network ... that is focused neither on the organization nor the implementation of innovations, but on enabling other organizations to innovate”.

Klerkx et al. (2009:413) identify three main functions of an innovation broker:

- *Demand articulation*: Articulating innovation needs and visions and the corresponding demands in terms of technology, knowledge, funding and policy
- *Network composition*: Facilitating linkages among relevant actors
- *Innovation process management*: Enhancing alignment in heterogeneous networks of actors with different objectives, institutional norms, values, incentives, and reward systems. This is a continuous activity that involves boundary management, translation, and mediation to build trust, establish working procedures, foster learning, and manage conflict and intellectual property.

A number of risks and challenges to effective innovation brokerage have been identified in the literature, which Klerkx et al. (2009:414-415) summarize in three points:

Tensions over legitimacy. The legitimacy of an innovation broker depends on the extent to which stakeholders consider the broker to be a relatively neutral “honest broker”. Neutrality is never absolute “because brokers always exercise a certain degree of steering”, but the degree of steering needs to be acceptable to those involved in the innovation process. To minimize tensions over legitimacy, brokers should avoid taking over management and ownership of the innovation process from innovation network partners, and should attend to the goals and interests of each partner. Tensions are inevitable in innovation networks because innovation tends to challenge current practices and the participants often have conflicting interests.

Ambiguity of functions. Innovation brokers and intermediaries are often linked to research organizations, non-governmental organizations (NGOs) or donors, which can lead to confusion or ambiguity about their role in the innovation process. Due to this association with parent organizations engaged in research or other activities, other participants in innovation networks sometimes view innovation intermediaries as competitors for resources rather than neutral facilitators.

Intangible effects / unwillingness to pay. Assessing the impact of innovation brokers is difficult because of the indirect and intangible results of their work. They do not produce technologies or innovations, but work to improve the performance of innovation systems composed of other actors. The difficulty in assessing the impact of innovation brokers applies both ex-ante (making it difficult to justify allocating funds to brokerage activities) and ex-post (making it difficult to demonstrate “proof of concept” through the documented impact of successful brokerage). The current emphasis on logframe-based planning and evaluation, “hard” and “SMART”⁷ indicators, and short-term results all exacerbate this problem, as funders aim to support the production of tangible outputs in short-term projects (rarely more than 3-5 years). Innovation brokers need more time to establish themselves and produce significant results in terms of strengthened capacity and improved performance of local agricultural innovation systems. Similar difficulties in acquiring funding for boundary-spanning activities that support innovation processes have been reported in the CGIAR (Kristjanson et al., 2009:5052).

Implications for CGIAR-based innovation brokers

The literature on boundary management and innovation brokerage is overlapping and complementary in many respects. In this section we bring together some major themes from the two sets of literature that are relevant for analyzing Papa Andina and other boundary organizations that are attached to CGIAR centers and that function as innovation brokers.

An innovation broker can be viewed as a type of boundary organization that specializes in brokering or facilitating innovation processes involving several other

7 SMART is shorthand for Specific, Measurable, Achievable, Realistic, and Time-bound.

parties, but does not itself engage in the innovation process. The main functions of an innovation broker are to facilitate the following processes:

- Articulation of demands for innovation and technology
- Creation of effective innovation networks
- Management of innovation processes.

In performing these functions, innovation brokers need to pay particular attention to ensuring that all network members consider the information generated and exchanged to be salient, credible, and legitimate. Given the inherent tradeoffs between these information characteristics, innovation brokers need to skillfully balance the diverse information needs and standards of different groups. They should also be skillful in communicating technical and non-technical information, translating it effectively (so that it is understood by parties from different institutional and cultural backgrounds), and mediating between participants with different, and often conflicting, interests and agendas.

International agricultural research and innovation tend to be characterized by a range of challenging traits: “immature” and highly fractured national innovation systems in developing countries; weak capacity at the level of individual organizations performing various R&D functions; weak or unproductive inter-organizational relationships often characterized by mistrust; significant language and cultural differences between the diverse groups in the private, public, and non-governmental sectors and those operating at local, national, and international levels; significant imbalances in power and access to resources, especially between “northern” and “southern” partners (with CGIAR centers typically falling into the “northern” category); and considerable variation in all these traits from region to region, country to country, and sector to sector.

Innovation brokers attached to or associated with CGIAR centers can be considered “second-level innovation brokers” in that they do not facilitate national- or local-level innovation processes, but support the work of national and local partners who take the lead in brokering innovation processes in their countries. In this context, a key role for a second-level innovation broker attached to a CGIAR center could be to facilitate the co-production of new approaches and methods for improving innovation processes.

The traits listed highlight the need for CGIAR-based innovation brokers to balance competing demands. On one hand, they need to establish themselves as “honest brokers,” trusted to negotiate fair deals among diverse actors with different objectives and interests. On the other hand, however, they need to steer innovation processes in ways that strengthen national innovation capacities. This often involves pushing for the expansion of an innovation network in ways that traditional partners might find threatening. Second-level innovation brokers therefore need to balance their roles as honest brokers in negotiation and as advocates for capacity strengthening.

CGIAR-based innovation brokers are often expected to provide specialized scientific information for decision-making. Playing such an “expert” role, however, conflicts with serving as an independent process facilitator. It also increases the risk that the CGIAR center begins to dominate local innovation processes, rather than playing a backstopping role.

To effectively help strengthen local innovation capacity, center-based innovation brokers need to work behind the scenes and promote the achievements of local actors (Horton et al., 2003). Playing such an invisible and catalytic role, however, makes it difficult to assess their results and measure “tangible impact” or “value added.” The consequent lack of hard evidence could jeopardize obtaining funding support for innovation brokers.

Klerkx et al. (2009:432) note that “innovation brokers ... always have to perform a balancing act.” For the reasons outlined in this section, CGIAR-based innovation brokers need to be particularly adept at balancing conflicting needs, priorities, and agendas.

THE PAPA ANDINA INITIATIVE

Much of the literature on boundary management and innovation brokering is abstract, and there are few detailed case studies on the structures of boundary organizations or the approaches used by innovation brokers to facilitate innovation processes and strengthen innovation capacities. In this section, we analyze four aspects of Papa Andina’s evolution as a second-level innovation broker:

- Its shift in focus (and paradigm) from regional research to regional learning and innovation brokering
- How it is structured and its relationship with first-level partners
- The approaches it has developed to facilitate innovation processes and strengthen national innovation capacities
- The types of results it has achieved through its work with national partners.

Shift in focus from research to learning and innovation

Papa Andina was designed to strengthen potato research capacity in Bolivia, Ecuador, and Peru through the development of a regional research program. In line with the CGIAR strategy at the time, outlined by de Janvry and Kassam (2004:159), it sought to develop “a regional approach to research planning, priority setting and implementation” involving CIP’s traditional research partners in the Andes – the national potato research programs.

It soon became clear, however, that national policy-makers and potato researchers were less interested in developing a regional potato research program than in coping with external forces that were buffeting their organizations. Production-oriented agricultural research had fallen out of favor with international donors and national governments, research funding was falling precipitously, and market-chain

approaches were being promoted as part of a new development agenda that researchers found alien and threatening.

To address these issues, Papa Andina linked up with the New Paradigm Project of the International Service for National Agricultural Research (ISNAR) (de Souza Silva, 2001; de Souza Silva et al., 2001), which offered a theoretical framework for understanding and managing organizational change. The framework emphasized that research organizations operate in highly dynamic environments and need to anticipate and respond with agility to changing demands and opportunities for their services.

Encouraged by these ideas, Papa Andina gradually shifted its focus from devising a regional research agenda to developing a regional learning agenda and strengthening national capacities for innovation, making use of resources in the region, incorporating new ideas, and adapting them to local circumstances. This shift involved developing and using participatory approaches, facilitating teamwork and group decision-making, and collaborating with new types of partners outside the usual circle of research organizations. The changes took some time to be incorporated into the way Papa Andina and its partners worked. The co-development of several approaches for facilitating innovation (described in Section 3.3) was central to moving from a focus on research to one on learning and innovation.

The shift in focus was radical, and continues to be controversial within the international agricultural research community. For example, a recent review of social sciences in the CGIAR notes that “IS [innovation systems] theory remains underdeveloped and exceedingly difficult to operationalize empirically ... we see only a very limited role for this line of research within CGIAR social science while the concepts and methods remain seriously underdeveloped and the CGIAR lacks appropriately trained staff to enjoy a high likelihood of generating breakthroughs” (CGIAR Science Council, 2009).

Organizational structure and relationships with partners

Papa Andina began as a CIP project funded by the Swiss Agency for Development and Cooperation (SDC). It has evolved into a Partnership Program with different donors, and spans the institutional boundaries of CIP and R&D partners in Bolivia, Ecuador, and Peru. Over the years, Papa Andina has managed a portfolio of complementary donor-funded projects that aim to stimulate pro-poor innovation and develop national innovation capacities in the potato sector. All its work has been funded through donor projects, rather than through CIP’s core budget.⁸

8 A CGIAR center’s “core budget” is unrestricted in the sense that center management has discretion over the use of the funds to implement the center’s program. In contrast, “project funds” must be used according to agreements between the center and the donor that specify budgets, output and impact targets, and timelines.

Papa Andina is part of CIP's research structure, which is made up of Research Divisions and Partnership Programs (CIP, 2004:59). Partnership Programs are characterized by the direct involvement of partners in program governance and implementation. Papa Andina has its own advisory body – the Coordination Committee – that includes representatives of its Strategic Partners, its Coordination Team, CIP, SDC, and the agricultural sector in each country. This creates multiple lines of accountability between Papa Andina and its main stakeholders. It also reports through CIP's management system. Some of its approaches and innovative strategies for linking research with action and some of the results achieved in the Andes have been reported as CIP outputs and outcomes, and are becoming part of CIP's research strategy.

Papa Andina's Coordination Team is made up of CIP staff members and consultants based in Peru (3), Bolivia (2), and Ecuador (1). The Papa Andina Coordinator, who is based in Lima, Peru, makes frequent trips to field sites in all three countries and the management style is markedly "horizontal" (Bebbington and Rotondo, 2010: 36). Major decisions are made at Papa Andina's annual meetings or at meetings of the Coordination Committee.

The Coordination Team works closely with focal points and collaborators in one R&D organization in each country. Known as "Strategic Partners", these organizations are: the PROINPA Foundation in Bolivia; the National Potato Program at INIAP in Ecuador; and the INCOPA Project in Peru.⁹ The team members are based at CIP or with the Strategic Partners. This facilitates communication between the team and the partners, but "in some cases this co-location may have weakened the independence of the coordination team and created uncertainty in the eyes of stakeholders as to institutional identities" (Bebbington and Rotondo, 2010: 37).

Most of Papa Andina's work in Bolivia, Ecuador and Peru is led by the Strategic Partners and is implemented directly by them or via local organizations known as "Operational Partners" (Figure 1). In this sense, therefore, Papa Andina operates as a second-level innovation broker. Its Coordination Team is not directly involved in brokering in-country innovation processes. Instead, it works to support and co-fund the Strategic Partners by creating an appropriate environment or "innovation ecology", facilitating the implementation of innovation processes in each country, and acting as a "broker of innovations for innovation."¹⁰ The main types of support that the Coordinating Team provides are methodology development and support for

9 The organizations' names in Spanish are: Fundación PROINPA (Promoción e Investigación de Productos Andinos), Bolivia (www.proinpa.org); Programa Nacional de Raíces y Tubérculos rubro Papa (PNRT-Papa), INIAP, Ecuador (www.iniap-ecuador.gov.ec/); and Proyecto INCOPA, Perú (www.cipotato.org/papandina/incopa/incopa.htm), a coalition of private and public partners that aims to improve small potato farmers' access to markets.

10 For a discussion of this term, and some examples, see Hall (2003).

innovation brokering, knowledge sharing through regional activities, and grants for operations in each country.

A key Papa Andina strategy is to strengthen the innovation capacity of national partners by delegating responsibilities and authority to them. An external evaluation of Papa Andina found that country-level activities were so closely associated with the Strategic Partners that many Operational Partners, producers, and other stakeholders knew little, if anything, about Papa Andina, and assumed that they were participating in or benefiting from the activities of PROINPA, INIAP, or INCOPA (Bebbington and Rotondo, 2010:38).

Approaches for brokering innovation processes

Papa Andina has developed and promoted several R&D approaches for brokering innovation processes and strengthening national innovation capacities. At this level, it promotes “innovations in innovation”, as described in Section 3.4. Some of these approaches are outlined here and have been taken up by other organizations involved in brokering innovation in other settings.

Going beyond the “High-yielding varieties (HYV) technology regime”

The CGIAR is best known for the “Green Revolution” of the 1970s, which ushered in the use of HYV of staple food crops along with chemical fertilizers and pesticides. Green Revolution technology boosted crop production and yields on irrigated land, contributing to significant reductions in food prices. Early success with the technology helped consolidate an “HYV technological regime” in the CGIAR, which prizes breeding and genetic engineering over other more holistic approaches, such as integrated natural resources management and agro-ecology, which are more closely associated with concepts involved in evolutionary thinking, systems analysis, complexity, and innovation (Vanloqueren and Baret, 2009).

Whereas modern high-yielding potato varieties have been introduced into many parts of the Andes, native varieties (landraces) still predominate on small farms in areas above 3,500 meters in Bolivia, Ecuador and Peru. Until recently, native potatoes received almost no attention in potato research agendas. And yet, with their diversity in color and shape, high cooking versatility, nutritional profile, and traditional, low-input production practices, native potatoes represent a valuable asset for small-scale farmers in the region (Ordinola et al., 2007; Meinzen-Dick et al., 2009). As they grow best at the higher altitudes where small-scale farmers predominate, using them in the development of new commercial products should give these farmers a comparative advantage. Based on a market study that indicated untapped market potential for native potato products in Peru, Papa Andina began exploring ways to exploit the potential of native potatoes through new product development, resulting in several new products being developed and marketed in Bolivia and Peru. In Ecuador, where native potatoes have almost disappeared from the market, efforts have remained focused on improving small-scale farmer access to markets for modern potato varieties.

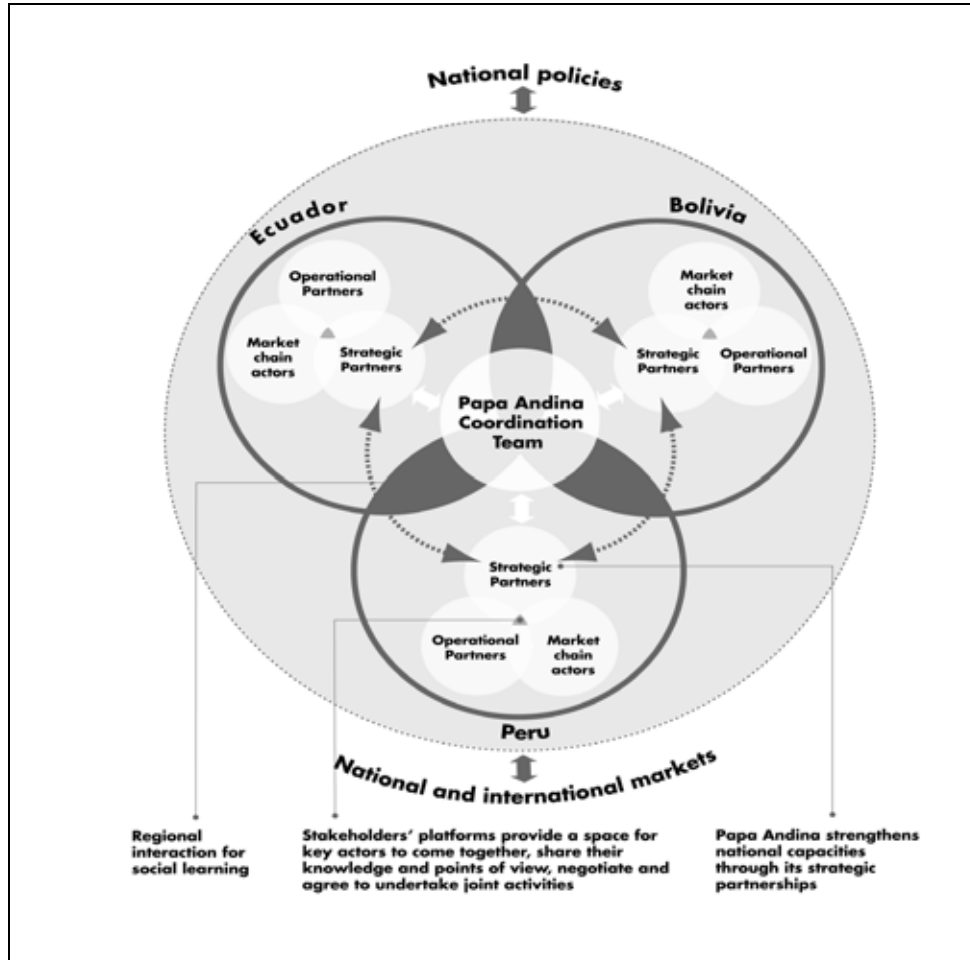
Papa Andina's experience with native potatoes illustrates that innovation brokers need to avoid being constrained by the prevailing research agenda and dominant technological regime. Successful pro-poor innovation needs to begin with an understanding of the assets, perspectives, and needs of key stakeholders in the innovation process – especially those of small-scale farmers and market agents – and then building on this understanding. The main approach that Papa Andina has developed for initiating innovation processes that capitalize on local assets and address local needs is the Participatory Market Chain Approach (PMCA), described here.

The Participatory Market Chain Approach

In 2003, in order to stimulate agricultural innovation, Papa Andina and CIP's Social Science Department began to use a participatory approach known as Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) (Engel and Salomon, 2003). RAAKS brings diverse stakeholders together to stimulate social learning, build trust, and foster innovation. Papa Andina used RAAKS to bring market chain actors together to identify and develop market opportunities that could be of mutual benefit. Rapid market assessments and focus group approaches were added, and gradually a new approach emerged, known as the Participatory Market Chain Approach.¹¹ The PMCA seeks to build trust and connectedness and to facilitate the acquisition of useful knowledge, skills, and attitudes for innovation. One of its goals is to foster relationships that continue after the completion of the specific PMCA application.

11 The PMCA methodology has been documented in Spanish and English in User Guides and Training Guides (Bernet et al., 2006, 2008).

Figure 1. Interaction mechanisms among key actors in the Papa Andina Partnership Program



The PMCA engages those who make their living from a market chain ('market chain actors') and public and private service providers (such as researchers, credit providers and development workers) in facilitated group processes in which market opportunities are identified and assessed and innovations are developed. The objective is to stimulate commercial innovation (such as the development of new products or the identification of market niches). Experience has shown that developing new products or identifying new markets stimulates institutional innovation (such as the creation of new supply channels) and technological innovation (such as improved potato production methods).

An R&D organization initiates the PMCA process by identifying key market chain actors and supporting organizations, and by conducting market research to learn about these actors and their activities, problems, and priorities. Thematic groups are formed that focus on market opportunities, and facilitators lead group meetings to analyze the opportunities and conduct the R&D activities needed to develop specific innovations.

As the process advances, the aim is for the facilitator to hand over responsibilities to the market chain actors. This has often proven difficult, however, and R&D organizations have found it necessary to continue in a facilitating mode.

In promoting and supporting the use of the PMCA, Papa Andina's partners play the role of innovation broker. Key facilitation functions involve:

- Encouraging relevant actors to participate in the PMCA process (network formation)
- Ensuring effective communication and mutual understanding among the diverse groups implementing the PMCA (communication and translation)
- Mediating conflicts, which are often inevitable during market-chain innovation
- Catalyzing problem-solving when groups get stuck, often by linking to external sources of expertise (boundary spanning)
- In order to consolidate the innovation processes initiated through the PMCA and to promote the scaling up of its interventions with partners, Papa Andina has developed complementary approaches focusing on stakeholder platforms, policy dialogue, corporate social responsibility, and horizontal evaluation.
- Establishing multi-stakeholder platforms

In the context of the Papa Andina initiative, a multi-stakeholder platform is defined as “a space for interaction between different stakeholders who share a resource or common interest and interact to improve their mutual understanding, create trust, learn, reach consensus over priorities, define roles and engage in joint action” (Thiele et al., 2009). These platforms have proven useful for consolidating innovation processes during and after a PMCA, helping to maintain dialogue and sustain the innovation dynamics and working relationships among stakeholders. Papa Andina and its partners have promoted two types of platform. The first is structured along the market chain and brings farmers together with traders, processors, retailers, researchers, chefs and others to foster new product development. The second is structured around geographically delimited supply areas. In both cases, key functions are communication, translation, and mediation, which require leadership and competent facilitation. Platforms can be used to address market coordination problems, helping small-scale farmers to meet the volume, quality, and timeliness standards demanded of particular market chains. They can also help in coordinating

the acquisition of inputs, bringing NGOs and others in to provide technical support or access to credit (Thiele et al., 2009). Papa Andina's partners have promoted the establishment of multi-stakeholder platforms and supported capacity development for platform leadership and facilitation. Although the platforms have performed useful innovation, marketing, and advocacy functions, their continued operation has often depended on external facilitation and financial support.

Facilitating policy dialogue

Innovation in the value chain might stall without policy support and corresponding changes in the legal framework. To influence pro-poor policies in the potato sector, Papa Andina's partners have developed two strategies to promote dialogue among researchers, civil society organizations, the private sector and political decision-makers. The first strategy is based on influencing public opinion through media coverage about the importance of potato value chains and the challenges facing them, and bringing these issues to the attention of political decision-makers. The second aims to directly engage policy-makers in developing a vision and strategy for the potato sector (Devaux et al., 2010). Here, Papa Andina's role has been to draw on methodological expertise developed in other value chains and, with its partners, to adapt and validate these approaches for potato value chains. In establishing spaces for policy dialogue, Papa Andina is working on the boundary between politics and science, as referred to by Guston (2000).

Promoting corporate social responsibility

In value-chain innovation processes, there is always a risk that the lion's share of the benefits will go to large commercial interests. Corporate social responsibility (CSR) is an entry point for addressing the issue of small-scale farmers' interests with the largest players in the value chain. CSR refers to an ethical form of management that takes into account the expectations of a company's stakeholders in order to achieve sustainable development (Thomann et al., 2009). In a value chain, two important areas for CSR work are: developing a market segment willing to pay a premium price for a high-quality, environmentally and socially sustainable product; and developing the competitiveness of supplier organizations to reduce asymmetries in bargaining power. Papa Andina works to sensitize its partners to CSR, facilitating dialogue among large companies, NGOs, and farmer organizations on the application of CSR in the market chain. In this way, it facilitates communication and translation among stakeholders with differing perspectives, and through mediation it seeks to address asymmetries in power and areas of conflicting interest among stakeholders in the value chain (for example, small-scale producers and large corporate buyers).

Box 1: Applying the PMCA to unleash the potential of native potatoes in Peru

Papa Andina applied the PMCA in Peru with researchers, farmers, private companies, and nutritional and gastronomic experts to find innovative ways to expand the market for native potatoes through product development.

Early products opened new market niches and brought higher prices for farmers. Among these were T'ikapapa (bagged native potatoes), which received the prestigious BBC World Challenge Award and the UN Seed Award, and Jalca Chips (multicolored native potato chips), which took off in the duty-free shops at Lima airport. As visibility and interest in native potatoes rose, Papa Andina worked with small-scale farmers, NGOs, and large multinationals to develop more products, while boosting the bargaining power and participation of local farmers. As a result, a supply chain has been created that gives more than 200 farmers access to a stable market and a negotiated price that provides them with a 20-40% profit margin. Export channels are opening, too, and in 2009 the overall demand for native potatoes in Peru was estimated to have reached 2,000 metric tons, generating close to \$US1 million in revenues for farmers.

The emergence of a native potato market has fueled the research agenda. CIP scientists, along with NGOs and farmers, are working on ways to increase quality and yield while safeguarding the sustainable and natural production methods valued by consumers.

An important aspect of consolidating the market is to position the native potato on the political agenda. Interested stakeholders have linked up to form lobbying platforms, recording successes such as the creation of National Potato Days in Peru and Ecuador and the compilation of quality norms for potatoes and their processing. A CIP-led "vision exercise" implemented in Bolivia, Ecuador, and Peru, involving public and private sector representatives, identified opportunities for public and private investment to increase the competitiveness of the sector as a whole, with the focus on small-scale farmers.

Conducting horizontal evaluations

The "horizontal evaluation" approach was developed to promote knowledge sharing and collective learning within the Papa Andina network (Thiele et al., 2006, 2007; Bernet et al., 2010). It combines elements of self-assessment and external peer evaluation within the setting of a regional workshop. In these workshops, two groups – a local project team and a group of peers from other organizations – assess the strengths and weaknesses of an experience (usually within a project), and then compare their assessments. Papa Andina's horizontal evaluations have a strong regional knowledge-sharing component because most of the peer evaluators come from abroad. There are usually important differences between the self-assessment conducted by the local project team and the assessment by the external peer group. The ensuing dialogue helps both groups fill information gaps and address points of disagreement. No attempt is made to reach broad agreement on the merits of the project. Instead, the local team formulates recommendations for improving the project, and the peer evaluators look at how they can apply lessons learned during the evaluation in their own work back home.

Participants report that these horizontal evaluation workshops have been extremely useful opportunities for learning about the strengths and weaknesses of new R&D approaches, as well as for building common visions, language, and understanding among diverse stakeholders. As a result of horizontal evaluations,

many local project teams have significantly altered the way they pursue their innovation agenda. After the workshops, when the peer evaluators return home, they often begin to experiment with things they learned during the evaluation. For example, after the horizontal evaluation of a PMCA project in Peru, Bolivian participants began to work with the PMCA themselves, and subsequently made major contributions to the approach. In contrast, Ecuadorian participants did not see the value of the PMCA in their context, preferring to focus their energies on strengthening farmer organizations.

Through the use of horizontal evaluations, the Papa Andina Coordination Team provides a safe space for frank and open discussion, the airing of disagreements among network members, and constructive criticism of work and results. The constructive conflict that takes place between national teams has been an important source of social learning, contributing to the development of Papa Andina's approaches. It has also motivated national teams to perform at high levels. For national partners, representing high-profile R&D institutions in the Andean region, horizontal evaluation exercises have generated ideas for improving current practices, insights into the potential use of new R&D methods, and greater disposition to learn and share knowledge with other R&D teams.

Types of results achieved

New R&D approaches

The most important products of the Papa Andina initiative are the new approaches for fostering innovation and strengthening innovation capacity, described above. They can be considered innovations in innovation, which Hall (2003:v) refers to as "institutional and organizational innovations that emerge as new ways of developing, diffusing, and using new knowledge" or "new ways to generate and promote innovation". Lawrence et al. (2002:281) refer to them as "proto-institutions" – new approaches, practices, and norms that transcend a particular collaborative relationship and could become new institutions if they diffuse sufficiently.

User guides on the PMCA and horizontal evaluation have been produced (Bernet et al., 2006, 2010) and many reports have been published on Papa Andina's approaches, co-produced by CIP and R&D organizations in Bolivia, Ecuador, and Peru. Some of the new approaches have been applied by other groups in other settings and have the potential to develop into new ways of conducting agricultural R&D.

Through partnerships with other organizations and CIP's global network, the PMCA has been used in a range of market chains in the Latin America, Africa, and Asia. The first pilot application of the PMCA outside the Andes was in Uganda, where it was used in the potato, sweet potato and vegetable market chains. The Ugandan experience indicates that the approach can foster pro-poor innovation in local commodity chains in sub-Saharan Africa (Horton, 2008; Horton et al., 2010). Through

alliances with other organizations, including Practical Action¹² and in collaboration with CIP's research divisions and regional projects (most notably Alianza Cambio Andino),¹³ the PMCA has also been applied in market chains for milk, coffee, potatoes and other commodities in the Andes. In a project supported by the Australian Center for International Agricultural Research (ACIAR), the PMCA is being used in Indonesia to develop and promote dynamic potato market chains. The horizontal evaluation approach has been applied by other regional projects in the Andes, such as the InnovAndes and Cambio Andino projects, and some professional evaluators have picked up the approach from specialist publications (Thiele et al., 2006; 2007).

Strengthened innovation capacity

An important goal of innovation brokering is to strengthen innovation capacity. Actually measuring such capacity, however, can be daunting (Horton et al., 2003; Baser and Morgan 2008; Klerkx et al., 2009). As noted in Section 2, key aspects of innovation capacity are the willingness of groups to work with other stakeholders in innovation processes, openness to a range of ideas for diagnosing and solving problems, and the nature of relationships among R&D organizations, public authorities, NGOs, private companies, farmers and other stakeholders. Although the extent to which Papa Andina has contributed to innovation capacity in the region has yet to be measured, illustrative results can be noted:

- Researchers who have worked with Papa Andina generally think now more in terms of facilitating innovation processes, rather than simply conducting research.
- Groups that have worked with Papa Andina (researchers, NGOs, other service providers, farmers, or other market chain actors) are generally more open to working with others.
- New approaches using native potatoes to improve small-scale farmer livelihoods, which were not considered as a priority in the past, are now part of the agenda of R&D organizations in the region.
- Working with such approaches as the PMCA and multi-stakeholder platforms is now common practice among Papa Andina's partners, and some of the R&D agendas are now more market oriented.
- Researchers and NGOs that have worked with Papa Andina are more aware of gender issues and the need to achieve impact at farmer level.

12 <http://practicalaction.org>

13 www.cambioandino.org/index.shtml

Box 2: The Bolivian Andean Platform (ANDIBOL): Result of the PMCA and innovation platform in its own right

ANDIBOL provides an example of a multi-stakeholder platform that emerged from an innovation process triggered by use of the PMCA, and which itself has stimulated further innovation.

Farmers who produce native potatoes above 3,500 meters in altitude in the Bolivian highlands are among the poorest people in Latin America. Native potatoes (landraces) and the local knowledge for their cultivation and transformation are among the main assets possessed by farmers in these areas. Traditional freeze-dried potato products known as chuño and tunta are typically used for home consumption, intra-household exchange, and trade in local markets. The ANDIBOL platform – an alliance of small potato producers, R&D organizations, NGOs, and medium-scale enterprises – was established to promote the development and exploitation of market niches for chuño in demanding urban markets.

In 2003, PROINPA used the PMCA to foster innovation in the market chains for tunta and chuño. This work involved farmers, traders, food-processing firms, exporters, cooking schools and R&D organizations. In the first cycle, participants prepared a set of Bolivian Quality Standards for Chuño and Tunta. In 2004, the PMCA was used again to identify new market opportunities for chuño and tunta, and ways to improve the products' image in different market from the traditional ones. This exercise involved some participants from the first application plus chefs and a food-processing firm manager. It resulted in a new product: clean, selected and bagged chuño, marketed under the brand 'Chuñosa'. In 2005, based on their successful collaboration to date, participants established the Bolivian Chuño and Tunta Platform, which later was christened the Bolivian Andean Platform (ANDIBOL) (Velasco, et al, 2009).

ANDIBOL has established links with market agents to develop quality chuño-based products with a higher price and to explore the export potential of chuño. The platform has developed a strategic plan and has obtained funding to support new projects. Facilitated by PROINPA, the platform has 13 core members including R&D organizations, processing firms, and 4 farmers' associations grouped in APEPA (Asociación de Productores Ecológicos Primero Aroma), which represents 485 families in 20 communities.

One of the platforms' functions is to promote innovation around traditional chuño products. Introduction of chuño into urban markets and access to export markets have stimulated demands for quality improvement in production and processing. These demands, in turn, have led to work with a local manufacturer to develop simple machines for classifying and peeling native potatoes and with R&D organizations to improve potato production technology and management of the Andean tuber weevil, a major pest in the Andean highlands. Recently a new brand Chef Andino was established for marketing products based on chuño as well as Andean grains (flours, instant soups, and flakes). On average, farmers now receive 30-40% more for their chuño when sold to supermarkets as compared to their traditional market.

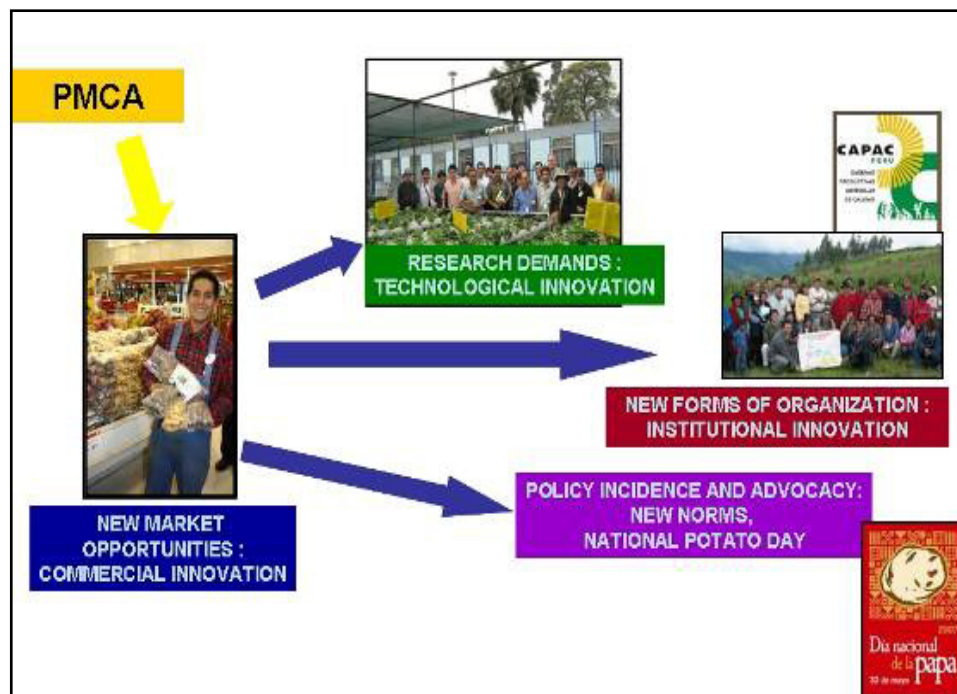
While ANDIBOL has made great strides, it is not without challenges, which include relatively weak farmer participation, limited influence of farmer demands on research agendas, the small number of participating farmers, and limited volumes of produce marketed

Commercial, technological, and institutional innovations

Papa Andina's experience shows that commercial innovation often stimulates institutional and technological innovation. Applications of the PMCA in Bolivia and Peru have led to the development of native potato products, including selected

“gourmet” native potatoes, naturally colored chips, and selected and bagged chuño and tunta, a potato product dehydrated using a traditional highlands method (Ordinola et al., 2009). Stakeholder platforms and CSR have played useful roles in developing pilot products into economically and socially sustainable larger-scale businesses. For example, after the first native potato chips were introduced in Lima on a small scale, a large commercial firm developed a higher-quality product based on supply from small-scale Andean farmers that is now available all year round in supermarkets, is marketed on TV, and is certified as “ethically produced” by an independent body. This boom in the native potato market has increased the demand for these potatoes, which are grown mainly by small-scale farmers (Figures 2 and 3).

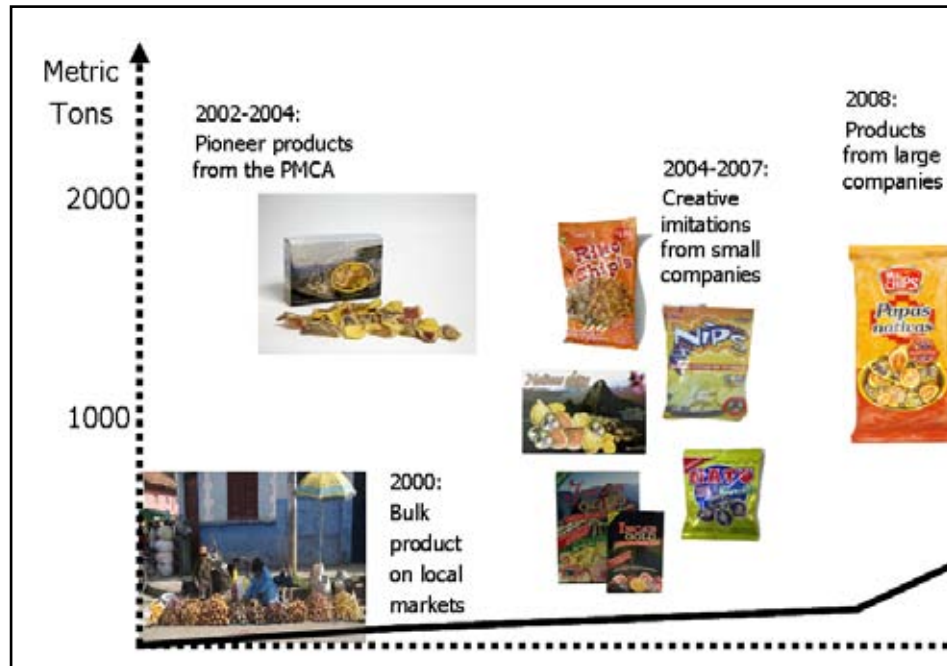
Figure 2. The PMCA as a catalyst for innovation



Commercial development has led to demands for new institutional arrangements, such as quality standards for potato products. Stakeholder platforms – themselves institutional innovations – have served as springboards for further institutional innovation. In several cases, policy dialogue or specific working groups facilitated by Papa Andina and its partners have been necessary to consolidate institutional innovations. This was the case, for example, in getting native potato varieties included in Peru’s official seed certification system and in establishing National Potato

Days in Peru and Ecuador (which, in turn, inspired the FAO to proclaim 2008 as the International Year of the Potato).

Figure 3. Milestones in the development of the market for native potato chips in Peru



Commercial innovation has also stimulated innovation in potato production. For example, it has improved the seed production system for native potatoes in Peru by including 61 native varieties in the national commercial variety list and establishing a seed system aimed at low-resource potato farmers in Ecuador (FAO, 2006). Research is also being conducted in Peru and Bolivia on post-harvest practices to improve the quality and shelf life of selected and processed native potatoes in high-quality markets.

Farm-level impact

Achieving farm-level impact is not a direct result of the work of an innovation broker (Klerkx et al., 2009). An innovation broker needs to interact with partners and stimulate their capacity to improve small-scale farmer competitiveness. This applies even more so to the work of second-level innovation brokers operating regionally or globally. Nevertheless, Papa Andina's experience provides insights into the impact pathways connecting innovation brokers with farm-level changes. The development of market opportunities for potatoes has enabled small-scale Andean farmers to access higher-value markets for the first time, despite the high production and transaction costs associated with scattered smallholder production. In Bolivia, the Andibol stakeholder platform has enabled farmers to sell processed chuño in local

supermarkets and start exporting to Spain (20 to 40% price increase compared to local market). In Ecuador, stakeholder platforms have enabled hundreds of small-scale farmers to sell their potatoes to fast-food restaurants, resulting in an increase in their yields from 6.3 to 8.4 MT/ha and in their gross margins from \$US 63 to 259/ha (Cavatassi et al., 2009). In Peru, the establishment of a business model incorporating CSR has made it possible for farmer organizations in the Central Andes to sell native potatoes on contract to a multinational company. Access to markets has motivated farmers to strengthen their organizations and to introduce changes in their production and post-harvest practices, such as improvements in pest and disease management, seed quality, and the classification of harvested potatoes (Velasco et al., 2009). These new practices have increased yields and improved product quality.

CHALLENGES FACING PAPA ANDINA

In this section, we discuss some of the challenges to Papa Andina's operations and sustainability. As outlined in Section 2.2, Klerkx et al. (2009) identified three broad types of challenges to effective innovation brokerage: the independence and legitimacy of the broker; the ambiguity of the functions performed by the broker; and the issues of funding, evaluation, and willingness to pay for innovation brokerage services. Papa Andina has faced challenges in each of these areas.

Independence and legitimacy

The institutional base

At times, some partners have suspected that Papa Andina's position has reflected the interests of CIP rather than those of the partners or countries involved. For example, some partners in Ecuador have questioned Papa Andina's promotion of the PMCA, of native potatoes, and of the participation of private entrepreneurs in driving innovation processes. They did not think the PMCA reflected local Ecuadorian needs and circumstances. Another issue relates to competition for funding. As both CIP and its national partners have scarce core resources and actively seek project funding from donors, and because Papa Andina depends entirely on donor project funding, national partners have sometimes viewed Papa Andina as a competitor for scarce resources. It is important to note that, in other instances, the close working relationship between national organizations and Papa Andina has helped them obtain donor funding.

Donor interests and influence

As Papa Andina is funded by donor organizations, it sometimes finds it necessary to mediate between the interests and priorities of its donors and national partners. For example, in recent years, donors have sought to involve the private sector to a greater extent in R&D efforts, but researchers in some NARIs view the involvement of the private sector with suspicion. Other themes of high priority to many donors, such as gender, empowerment, and partnering with NGOs, have not always been the top priority of national partners. In some cases, promoting such themes has compromised

Papa Andina's legitimacy as an "honest broker" of innovation processes at the national level.

Governance and intellectual property

Funding for Papa Andina, including the funds received by national partners, goes through CIP. This has led partners to express concern sometimes about the sharing of resources, center expenses, and power imbalances. A recent evaluation questioned the current management model of Papa Andina as a Partnership Program based at CIP, with one Strategic Partner in each country. The recommendation was to establish a broader consortium with a more diverse set of Strategic Partners (including NGOs and representatives of the private sector), with CIP playing the role of one among many partners. But there was no specific analysis of the capacity of these actors to play a second-level innovation-brokering role.

There have also been sensitivities related to intellectual property. Papa Andina's approaches draw on the contributions of many actors with different institutional affiliations, but few of the contributors have the time and ability to participate in writing up results of Papa Andina's work for publication. Additionally, the publication of Papa Andina's work is seldom a priority for the contributors' home institutions. These issues have led to problems related to authorship and to individual and institutional recognition, which have often required dialogue, negotiation, and compromise.

Ambiguity of functions

What is the appropriate research role for Papa Andina?

While Papa Andina's main function is that of innovation broker, as a program based at CIP and within the CGIAR it is expected to conduct research and produce results of global relevance and use. There can be confusion between its brokerage work to support partners in local innovation processes and its research work that might not be of direct use to these partners. A related issue is that the demand-oriented research focus promoted by Papa Andina does not always fit with the traditional biophysical research on which the CGIAR has built its reputation and legitimacy; the emphasis on innovation strategies and processes remains controversial in the CGIAR.

Which boundaries is Papa Andina managing?

As an innovation broker, Papa Andina works to manage boundaries between organizations that can play a role in innovation processes, in order to promote pro-poor innovation with potatoes in the Andes. It appears, however, to be doing much more on managing boundaries between research entities, other service providers, small-scale farmers and market agents at the country level than on managing boundaries between CIP and these groups. Indeed, Papa Andina's Coordination Team has often felt frustrated in its efforts to mobilize CIP expertise in support of national innovation processes and to help improve the impact of CIP research in the Andes. As we note in the Conclusions section, however, this frustration might stem from unreasonable expectations in this area.

What is Papa Andina's role relative to the role of national innovation brokers?

As a program hosted by CIP, Papa Andina is expected to support national and local-level innovation processes, not to lead them. Between support and leadership, however, there is a broad continuum of types and levels of involvement. Some degree of involvement is essential for learning, action research, and effective steering of innovation processes. The challenge of operating as a "hands-off" second-level innovation broker is compounded by the fact that national and local innovation brokers are generally based at R&D organizations whose priorities and core activities could jeopardize the legitimacy of the organization as an "honest broker." For example, an innovation agent based at a national research organization might feel under pressure (overt or covert) to channel research contracts to his / her own organization, even when another organization might be more appropriate. In such situations, Papa Andina sometimes needs to steer processes (particularly with regard to the composition of innovation networks) and mediate agreements among parties with conflicting interests and agendas. As a result, the first- and second-level innovation brokerage roles sometimes become confused.

Evaluation, funding, and willingness to pay***Dependence on short-term donor project funding***

To date, all Papa Andina's work has been funded through donor projects with time horizons of 4 years or less. SDC funding has been renewed twice and extended over a total of 12 years, allowing the Coordination Team to develop good working relationships with national-level teams. Nevertheless, the inherently unpredictable nature of donor project funding is not ideal for developing innovation brokerage capacity, either at national or international level.

Limits of objective-based performance measurement

Recent trends in project management and evaluation that call for the use of logical frameworks, SMART indicators, and "hard evidence" of impact put Papa Andina and other innovation brokers at a disadvantage compared with projects that produce tangible outputs and promise short-term, direct impact on poverty. Papa Andina's direct results are at the level of innovation processes and capacity strengthening, which are inherently difficult to document, measure, and attribute to specific actors (Perrin, 2002; Klerkx et al., 2009:415).

Burden of multiple external evaluations

Since Papa Andina is now well known for its work and has many donors and stakeholders, it has been subjected to numerous external reviews and evaluations. During 2009 and early 2010 alone, Papa Andina and many of its national partners were asked to participate in seven external evaluations conducted for three donor

organizations.¹⁴ These evaluations diverted the scarce human resources of Papa Andina and its partners from brokering innovation processes to meeting donors' accountability needs.

CONCLUSIONS

The Papa Andina case illustrates the useful roles that a Partnership Program attached to a CGIAR center can play as a second-level innovation broker and the types of results that can be achieved. It also highlights important challenges facing innovation brokers. Here, we present some of the main conclusions of our analysis and identify possible ways forward.

1. Second-level innovation brokers can play useful roles in fostering innovations in innovation, strengthening national and local innovation capacities, and promoting pro-poor innovation processes.

Three important roles for second-level innovation brokers are:

- Fostering innovations in innovation through developing and testing new R&D approaches, such as the PMCA, that can be useful for articulating demands for innovation, forming innovation networks, and managing innovation processes
- Strengthening the capacity of national and local innovation brokers who, in turn, can broker local innovation processes and strengthen national innovation capacity
- Creating a dynamic innovation environment that fosters feedback and learning between the innovations-in-innovation level and the innovation brokering level linked to national contexts and particular value chains.

2. Innovating in innovation processes requires substantial capacity development.

Our analysis has shown that becoming an effective innovation broker requires the application of a complex set of new knowledge, attitudes, and skills. For example, based on assessments of experiences with the PMCA in the Andes and Uganda (Devaux et al. 2009; Horton et al., 2010b), we believe that the successful introduction of the PMCA into new settings requires a multi-pronged capacity-development strategy implemented over several months.¹⁵

14 There were evaluations of: (1) SDC projects in the area of biodiversity; (2) the SDC agricultural research program; (3) the Papa Andina project (financed by SDC); (4) the INCOPA project (financed by SDC); (5) the Andean Change Alliance (financed by DFID); (6) the Latin American program of NZAid; and (7) the InnovAndes project (financed by NZAid).

15 The main components of such a capacity development strategy are: (a) participatory planning and decision-making involving local actors; (b) negotiation with senior managers in lead R&D organizations to foster institutional commitment to the PMCA and to support raising funds for its application; (c) South-South learning exchanges via study tours to sites where the PMCA has been successfully used; (d) a comprehensive training strategy that includes action-

Implementing such strategies takes time and resources, but they should be seen as an investment in innovation capacity that will generate returns for many years. Our analysis indicates that the capacities developed, at both individual and innovation-system level, continue to be utilized long after the initial PMCA exercise formally ends. In many cases, the creative imitations that occur years after the initial efforts are the most important ones.

When introducing innovation-brokering approaches such as the PMCA to new settings, it should be kept in mind that each situation presents a unique combination of socio-economic, political, institutional and technological conditions. The approach therefore needs to be customized for use in each country and market chain. Institutional sustainability issues should be dealt with as priorities from the outset of any process involving the introduction of new approaches.

3. There are tradeoffs between boundary management and innovation brokering.

Being an effective innovation broker requires being a trusted and reliable “match-maker” to ensure that the most appropriate actors are involved in innovation processes. Papa Andina’s experience highlights the importance of involving a wide range of national actors with different areas of expertise. If an innovation agent is overly concerned with engaging the services of his / her host institution, this could hamper the development of local innovation capacity.

4. There are no simple recipes for the organizational locus and structure of a second-level innovation broker.

The Papa Andina experience indicates that being hosted by a CGIAR center has both advantages and disadvantages. Affiliation with a center can provide easy access to valuable technical inputs, expertise, and knowledge. It could also give the innovation broker the legitimacy to serve as an “honest broker,” vis-à-vis national actors. A CGIAR center also has recognized prestige within the national and international R&D community, which gives the innovation broker greater credibility. CGIAR centers can provide administrative and other facilities that may be valuable for an innovation broker operating regionally or internationally. On the negative side, being hosted by a CGIAR center that works on a limited set of commodities or resource areas could constrain the work of the innovation broker. An innovation broker based at a center might fall back into a technical, or expert, role, which is incompatible with the effective facilitation and brokerage of innovation processes. He/she might also be motivated to involve the center in activities for which it is not best suited. The center might have high overhead costs. And there could be pressure within a center to give

oriented PMCA training workshops, use of the PMCA User Guide and complementary training materials, practical hands-on work with the PMCA in commodity groups, and backstopping and coaching by experienced PMCA facilitators, involving both face-to-face and virtual communications; (e) knowledge sharing among the PMCA practitioners working in different commodity teams; and (f) periodic learning-oriented reviews and evaluations to improve the process and document results (Horton et al., 2009: 387).

priority to research and the production of IPGs, rather than to what are perceived to be less valuable “service functions” or “development activities.” The innovation broker must find the right balance in responding to both agendas.

Some authors (for example, Bebbington and Rotondo, 2010:27) have suggested that it would be preferable for the innovation broker to be constituted as an independent consortium, but it is not clear how such an entity would function.

5. Traditional objective-based evaluation approaches and the mechanical use of logical frameworks are inappropriate for evaluating innovation processes and the work of innovation brokers, which are inherently complex and emergent.

Traditional tools for project planning, management, and evaluation, which have their origins in the engineering field, have serious limitations when applied to programs such as Papa Andina that seek to promote innovation in varied and dynamic contexts. As Perrin (2002:13) noted, “Most attempts at innovation, by definition, are risky and should ‘fail’ – otherwise, they are using safe, rather than unknown or truly innovative approaches.” To promote innovation, rather than focusing on pre-determined indicators or average results, evaluations should identify situations where actual impact has occurred and the reasons for success.

Similarly, Rogers (2008) noted that logical frameworks pose many challenges when applied to the evaluation of complex interventions that have numerous components, operate under varying and changing conditions, and have complex cause-effect relationships. These characteristics make complex interventions such as Papa Andina difficult to analyse. This has important implications not only for evaluating innovation projects, but also for planning and managing them. Rogers (2008:44) emphasizes the limitations of logical frameworks for performance measurement and the use of management results in complex interventions:

Particular care should be taken to not imagine that a logic model, however detailed, can be used to generate performance measures that can be used formulaically to modify implementation and improve performance when interventions have complex aspects

There are also important methodological issues in the evaluation of capacity development, which is an essentially intangible property (Horton et al., 2003; Baser and Morgan, 2008).

Whereas it will always be inherently difficult for innovation brokers, especially when operating at the regional or international level, to document impact at the level of broad development goals, it is important for them to develop clear and testable “theories of change” or “impact pathways” for their interventions (Douthwaite et al., 2007; Rogers, 2008).

6. Innovation brokers can improve the linkage between international agricultural research and local innovation processes over time.

Papa Andina’s experiences make it clear that one should not expect such mechanisms as innovation brokering and boundary management to serve as a “silver bullet” for

linking CGIAR research with local needs and innovation processes. These mechanisms could, however, contribute to a gradual process of alignment between the research priorities in CGIAR centers and locally articulated needs. A logical pathway for influencing the international agricultural research agenda would be to strengthen in-country and regional innovation capacity, so that local groups could work more effectively with national R&D organizations to strengthen the national innovation system and place demands on international programs.

No single entity such as Papa Andina should be expected to have a significant influence on the research agenda of its host center. CGIAR centers work on problems of global importance, and core resources are assigned according to global priorities. Potato farmers in the Andes are a very small group in the total constituency of potato and sweet potato farmers whose problems CIP is mandated to address. CIP has prioritized key problems of global relevance, and a problem such as improved storage methods for native potatoes would rank very low in any priority-setting exercise driven by total number of beneficiaries or value of net benefits to research.

Nevertheless, if CGIAR centers supported innovation brokers in various parts of the world, this could lead to strengthened innovation capacity and improved articulation of technology needs and demands, which could exert significant influence on the research agendas of national agricultural research institutes and CGIAR centers.

Another promising avenue for influence is via donor-funded projects. As a very large share of centers' operating budgets comes through donor projects, one strategy would be for innovation brokers to seek to influence the priorities of donor-funded projects. This, in turn, could influence centers to focus on food security, environmental sustainability and poverty reduction linked to development outcomes in partnership with public and private research and development partners.

7. Investment in a network of innovation brokers could yield handsome returns.

Papa Andina has contributed to an emerging community of R&D professionals with the knowledge, attitudes, and skills needed to facilitate innovation processes among stakeholders and to foster market chain innovation. These professionals represent a potentially valuable resource that could be mobilized to facilitate innovation processes on a larger scale. Based on our (admittedly limited) experience, we believe that support for the development of a community or network of innovation brokers dedicated to facilitating pro-poor agricultural innovation would be a high-payoff area for international donor organizations, as well as for national and local governments and NGOs that wish to foster pro-poor innovation in developing regions.

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Knowledge Management for Pro-Poor Innovation: The Papa Andina Case¹

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ABSTRACT

Papa Andina began as a regional research program, but later shifted its focus to facilitating pro-poor innovation. To accomplish this shift, a number of approaches were developed to foster innovation, by facilitating mutual learning and collective action among individuals and groups with differing, often conflicting, interests. This paper explains why and how Papa Andina shifted its focus from conducting research to facilitating innovation, and describes two approaches that Papa Andina developed to facilitate mutual learning and innovation: the “participatory market chain approach” and “horizontal evaluation.” Differing local circumstances and beliefs shaped the work of local teams, and rivalry among the teams stimulated creativity and innovation. Participatory evaluations helped individuals recognize and appreciate differences and build shared knowledge across the teams. After describing the case, the paper discusses the implications for knowledge management and innovation theory, and for the potential use of Papa Andina’s approaches in other settings.

INTRODUCTION

There is little systematic understanding of the ways in which agricultural research and development (R&D) organizations manage knowledge in order to foster innovation in developing regions. By innovation we do not mean the production of new knowledge but “the use of new ideas, new technologies, or new ways of doing things in a place or by people where they have not been used before” (Barnett, 2004: 1 (emphasis added)). This paper analyzes how Papa Andina, a partnership program hosted by the International Potato Center (CIP), has managed knowledge in order to foster innovation.

CIP is one of 15 international agricultural research centers affiliated with the Consultative Group on International Agricultural Research (CGIAR). The initial goal of

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2 We would like to acknowledge the valuable contributions of our collaborators in the Andean region. Julie Ferguson, Laurens Klerkx, and two anonymous reviewers provided useful suggestions for improving the paper. Since its inception, Papa Andina’s work has been hosted by the International Potato Center (CIP) and has been generously supported by grants from the Swiss Agency for Development and Cooperation (SDC), and by contributions from the New Zealand Aid Programme and the United Kingdom Government’s Department for International Development (DFID).

the CGIAR, established in the 1970s, was to increase food production in developing countries by carrying out and mobilizing research on major food crops and livestock. The institutional design of the CGIAR reflected a “research-and-technology-transfer” model of innovation that was popular at that time. In this model, the role of CGIAR centers was to carry out strategic and applied agricultural research, the results of which were used by national agricultural research organizations to generate production technologies that were subsequently transferred to farmers. CGIAR centers were expected to produce globally applicable and relevant knowledge that would be freely available for use by all national research programs. Such knowledge has been referred to as an “international public good” (Sagasti and Timmer, 2008).

Over time, knowledge of innovation processes has improved, the goals of agricultural research organizations have broadened, and more actors have become involved in research and innovation processes. There has been considerable experimentation with participatory approaches for democratizing knowledge management (KM) and improving linkages between research programs and innovation processes. However, few of these experiences have been systematically documented or analyzed.

This paper seeks to contribute to our understanding of KM and innovation in developing regions, by analyzing the case of Papa Andina. The paper was prepared by six individuals who have been directly involved with Papa Andina, and were based at CIP or at Papa Andina’s “strategic partners” in Bolivia, Ecuador, and Peru.³ In this sense it presents the reflections of key actors in the Papa Andina case.

In the next section, we introduce theoretical perspectives on KM and innovation. In the third section, we explain why and how Papa Andina shifted its focus from agricultural research to facilitating learning and innovation in value chains, and we outline two approaches developed and used by Papa Andina to promote situated mutual learning (Ferguson, Huysman and Soekijad, 2010) and pro-poor innovation. In the final section, we reflect on the implications of this case for KM and innovation theory and on the potential utility of our approaches in other settings.

CHANGING PERSPECTIVES ON KNOWLEDGE MANAGEMENT AND INNOVATION

In this section, we introduce perspectives on KM and innovation that have informed discussions and decisions on the organization and conduct of R&D efforts, including those associated with the CGIAR.

3 The Strategic Partners are: the PROINPA Foundation in Bolivia; the National Potato Program, INIAP in Ecuador; and the INCOPA Project in Peru. The partners’ names in Spanish are: Fundación PROINPA (Promoción e Investigación de Productos Andinos) (www.proinpa.org/); Programa Nacional de Raíces y Tubérculos rubro Papa (PNRT-Papa), INIAP (www.iniap-ecuador.gov.ec/); and Proyecto INCOPA, a coalition of private and public organizations that aims to improve small-scale potato farmers’ access to markets

(www.cipotato.org/papandina/incopa/incopa.htm).

Changing perspectives on knowledge management

There are two main perspectives on KM – one concerned primarily with codifying, storing, and transferring existing knowledge and the other concerned primarily with producing useful new knowledge. McElroy (2003) refers to these two perspectives as generations of KM. *First-generation KM* focuses on capturing, codifying, and transferring existing knowledge and getting the right information to the right people at the right time. It values what is considered to be universally valid, context-free, objective information. It strives to formulate broadly applicable lessons and best practices. It emphasizes the use of information and communication technology (ICT) for storing, managing, and transmitting knowledge. In contrast, *second-generation KM* goes beyond knowledge warehousing and transfer and also seeks to enhance the capacity of individuals and groups to produce new knowledge that they need to achieve their goals. Second-generation knowledge managers think of KM in a cyclical, holistic way, and are concerned with both knowledge production (learning) and knowledge transfer. As a result, they are concerned with social interactions and social dynamics as well as engineering.

In a recent review of KM practices in international development, Ferguson, Huysman and Soekijad (2010) note that these two perspectives on KM often exist – and are in conflict with one another – within the same organization. International organizations frequently promote networking among development stakeholders to enhance their participation in development debates and expand the use of context-relevant knowledge in decision-making processes. However, the internal KM systems of these same organizations usually focus on codifying, storing, and transferring the organization's knowledge through ICTs. By stressing the use of presumably context-free and universally applicable codified knowledge in their planning and reporting, the internal KM systems of international organizations ignore or downgrade the value of local knowledge, “marginalizing intended beneficiaries rather than incorporating their knowledge more closely into development interventions” (*ibid*: 1798). As a result, the internal KM systems of development organizations frequently impact negatively on the achievement of their broader development goals.

The authors suggest an alternative perspective on KM – a third generation – in which “*situated mutual learning*” helps reconcile the external KM goals and programs of international organizations and their internal KM systems and practices (*ibid*: 1806). In situated mutual learning, different groups and organizations with different interests and social positions interact with one another to generate commonly shared knowledge. Situated mutual learning involves negotiation and mediation of conflicts and reflects the unequal social positions of diverse actors. It does not involve a one-way process of knowledge transfer, but emerges where different parties interact while seeking to advance their own interests. When an international organization and its local partners engage in situated mutual learning, they co-produce new knowledge that is considered valid and useful on both sides of the organizational boundary.

Changing perspectives on innovation

Studies of industrial innovation have identified perspectives on innovation that are similar to those just described for KM. The “research-and-technology-transfer” or “pipeline” model of innovation remains the dominant perspective in many settings. Nevertheless, there is a trend toward what Von Hippel (2005) terms “democratizing innovation.” User-centered innovation processes are seen as offering “great advantage over the manufacturer-centric innovation development systems that have been the mainstay of commerce for hundreds of years” (*ibid*: 1). Chesbrough (2006) observes a “paradigm shift” in how companies produce and commercialize industrial knowledge – a shift from “closed innovation” (an internally focused approach with companies generating their own ideas and then developing and marketing them) to “open innovation” (with firms using external as well as internal ideas and paths to market). These and other authors provide examples of the growing importance of non-traditional, open and democratic innovation processes in many sectors, including agriculture (Cash et. al. 2003; Douthwaite et. al., 2009; Kerkhoff and Lebel, 2006).

When the CGIAR was established in the 1970’s, its strategy was “to use the best science in advanced countries to develop technologies for the benefit of food-deficit countries and populations” (Lele, 2004). It sought to mobilize cutting-edge agricultural sciences, particularly breeding and genetics, to increase the yields of major food crops and livestock in developing countries. The “Green Revolution” of the 1970s ushered in the use of high-yielding varieties of staple food crops along with chemical fertilizers and pesticides. Early successes with these technologies helped consolidate the research-and-technology-transfer model, which subsequently guided researchers’ decisions on what problems to address, what types of solution to pursue, and what organizations to partner with (Vanloqueren and Baret, 2009).

Over time, in agriculture as in industry, the limits of the research-and-technology-transfer model have become apparent, as our understanding of innovation processes has improved, more actors have become involved in research and innovation processes, and stakeholders have come to expect agricultural research to help solve complex problems of rural poverty, food security, nutrition, and natural resource management. As a result, since the 1970s, attention has shifted from improving technology transfer to strengthening national agricultural research systems, to strengthening innovation systems (Hall et al., 2000; Pant and Hambly, 2009).

An innovation system can be defined as “a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behavior and performance” (World Bank, 2006: vi-vii). An innovation system “extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways” (*ibid*, vii). In addition to researchers, extension agents, and farmers, an agricultural innovation system includes policy makers, agricultural service providers (such as financial entities, seed certification agencies and non-governmental organizations (NGOs) that support

agricultural and rural development), and such market chain actors as input suppliers, commodity traders, processors, retailers, and consumers.

There are subtle, but important differences between perspectives on knowledge systems and innovation systems. Knowledge systems are concerned fundamentally with the production, exchange, and use of knowledge. As Klerkx et al. (2009: 411) point out, although these functions are essential for innovation processes, innovation systems need to fulfill several other functions, such as fostering entrepreneurship, developing a vision for change, mobilizing resources, building legitimacy for change, and overcoming resistance to change. Additionally, “the agricultural innovation systems approach recognizes the influential role of institutions (i.e., laws, regulations, attitudes, habits, practices, incentives) in shaping how actors interact” in innovation processes.

One approach that has been proposed for promoting innovation is “innovation brokering,” which can be defined as acting as a “systemic facilitator” within an innovation system, which focuses on enabling other actors to innovate (Klerkx et al., 2009: 413). As we will see in the next section, over time, Papa Andina’s role evolved from one of conducting research to one of brokering innovation processes.

Despite the evolution of thinking on innovation processes and systems, the institutional arrangements and practices of agricultural R&D have lagged behind. As Hall (2009: 30) notes, “the central challenge remains with us: the need to accelerate policy and institutional change in public (and increasingly, private philanthropic) investments in agricultural science, technology and innovation for development.”

There has been considerable experimentation in recent years in both national and international agricultural research organizations with new ways of linking research with innovation processes. This has mainly been on the periphery of research organizations, in externally funded projects designed to achieve practical outcomes in short time periods. The following section presents the case of one such initiative – the Papa Andina Partnership Program. Examples of other similar initiatives that engage in innovation brokering and the related concept of “boundary work” are provided by McNie et al. (2008) and Kristjanson et al. (2009).

THE PAPA ANDINA CASE

Grown mainly by poor smallholders, the potato is the most important food crop in the Andean highlands (Meinzen-Dick, Devaux, and Antezana, 2009). For many years, in order to contribute to reducing rural poverty in the Andes, the Swiss Agency for Development Cooperation (SDC) supported potato R&D in Bolivia, Ecuador, and Peru. In 1989, Papa Andina was established as a regional project supported by SDC and hosted by CIP. In line with the CGIAR strategy at the time, Papa Andina was designed to implement a regional approach to research planning, priority setting, and implementation that would involve the traditional partners of CIP and SDC – the national potato research programs of Bolivia, Ecuador, and Peru. The goal was to establish a decentralized regional research program with country partners

responsible for implementing specific research projects and sharing the results with researchers in the other countries.

Shifting the focus from doing agricultural research to brokering and supporting innovation processes

When the project began, it soon became clear that national policy-makers and researchers were less interested in developing a regional potato research program than in learning to cope with external forces that were buffeting their organizations. These forces included declining funding for agricultural research, accelerating change in the agricultural sector, and expanding demands for short-term impact. Both local stakeholders and international donors were complaining that research was not addressing the most pressing problems, and new value-chain approaches were being promoted as part of a new “research-for-development” agenda. In this context, researchers and policy-makers wished to improve their understanding of, and ability to respond to, changing demands for research.

To address these issues, we linked up with the *New Paradigm Project* of the International Service for National Agricultural Research (ISNAR), which was also supported by SDC (Souza Silva, 2001). The New Paradigm Project offered a theoretical framework for understanding and managing organizational change processes. The framework emphasized the growing role of urban and global markets in driving agricultural change and the need for research organizations to understand the changing global context and to respond appropriately to changing demands for agricultural research and related services.

These ideas fell onto fertile ground. CIP had a long tradition of participatory technology development (Thiele et al., 2001). Papa Andina’s two coordinators (Devaux and Thiele) had complementary training and skills (plant physiology and social science, respectively) and were experienced in on-farm research. For many years, SDC had supported the use of participatory research methods, and had organized participatory planning workshops for many of the projects it supported. Several of Papa Andina’s members had learned participatory project planning methods in these workshops. In line with thinking in the New Paradigm Project, SDC also believed that agricultural research organizations needed to become more open and responsive, working with development partners (including NGOs) and private enterprises to innovate in market chains in ways that would benefit small farmers.

Encouraged by these ideas, Papa Andina’s coordinators and national partners conducted strategic planning exercises and explored different approaches for understanding and developing market chains. In Bolivia, this led to experimentation with an approach for market chain analysis developed by the Brazilian Agricultural Research Corporation (EMBRAPA). In Ecuador, strategic planning and market-chain analysis led to establishment of multi-stakeholder platforms that involved the potato researchers, other service providers and small farmers (Thiele, et al., 2011). This led to further work on farmer organization and empowerment. In Peru, experimentation began with a market chain approach that engaged not only small farmers and

agricultural service providers, but enterprises involved in potato processing and marketing. The market-chain work in Bolivia and Peru led to development of an approach known as the “Participatory Market Chain Approach” (Bernet et al., 2006; 2008).

In order to promote knowledge sharing among the different national groups, to strengthen the work of local teams, and to learn lessons of a more general nature, Papa Andina’s coordinators took the lead in developing a participatory evaluation approach that fosters learning, knowledge sharing, and improvement in the context of a network. This became known as “Horizontal Evaluation” (Thiele, et al., 2006; 2007).

As the micro-level work with farmers, service providers, and market chain actors advanced, national groups realized the importance of engaging with policy makers and influencing policy dialogue and decisions. This led to national initiatives, each of which reflected the particular policy context of the country (Devaux et al., 2010b). In Peru, when a multi-national corporation showed interest in processing and marketing native potato products, the Peruvian team began work on issues of corporate social responsibility.

Through these efforts, there was a gradual shift in the focus of Papa Andina from developing a *regional research agenda* – a set of technically oriented projects, the results of which would be shared across national boundaries – to developing a *regional innovation agenda* focused on strengthening the capacity of national agricultural research organizations to contribute to pro-poor innovation.

Making the shift was not a well-planned process that followed an elaborate strategy or a detailed script, but one that evolved in unexpected ways and that frequently involved disagreements, tensions, and conflict. When work on market chains and multi-stakeholder platforms was undertaken, each local team developed its own perspectives and approaches linked to underlying core beliefs about the nature of the development process, and there was a degree of rivalry among the teams. The diversity of initiatives and experiences and rivalry between the teams promoted methodological innovation. Horizontal Evaluation then served as a useful tool for understanding and learning from the local diversity of perspectives and experiences. Out of the different interests, perspectives, and experiences, shared new concepts and knowledge emerged. In this sense, horizontal evaluation was crucial for situated mutual learning.

It has taken time for the shift from doing research to facilitating situated mutual learning and brokering innovation to be incorporated into the way Papa Andina and its partners work, and the process is still incomplete. Changing the central focus of a partnership program and the ways in which it works is a complex process that involves controversy, interpersonal and inter-organizational conflict, and periodic setbacks. We return to this point in the concluding section of this paper.

In this rest of this section, we describe two of Papa Andina’s approaches for promoting situated mutual learning and brokering innovation, which are also the

most thoroughly systematized and documented: the PMCA and Horizontal Evaluation.

The participatory market chain approach

In 2003, CIP's Social Sciences Department and Papa Andina members in Peru began experimenting with a participatory approach known as *Rapid Appraisal of Agricultural Knowledge Systems* (RAAKS) that brings diverse stakeholders together to stimulate mutual learning, build trust, and foster innovation (Engel and Salomon, 2003). RAAKS was useful to bring those who make their living from a market chain – the so-called 'market chain actors' – together to identify market opportunities. However, it did not include the development of innovations – new products or processes – to exploit the identified opportunities. As steps and tools were added to foster commercial, technological, and institutional innovations, a new approach emerged, which was named the Participatory Market Chain Approach (PMCA). User guides and training materials for the approach were published in English and Spanish (Bernet et al., 2006; 2008; 2011; Antezana, et al., 2008).

Description of the approach

The PMCA applies principles of action research to foster market chain innovation. It engages market chain actors and agricultural service providers (including, for example, agronomists, post-harvest technicians, marketing specialists, extension agents, and enterprise development professionals) in facilitated group processes in which market opportunities are identified and assessed, and innovations are developed. The PMCA is implemented in 3 phases, which comprise the broad innovation brokering functions of demand articulation, network composition and innovation process management:

Phase 1. Familiarization with the market chain and the key actors

Phase 2. Joint analysis of potential business opportunities

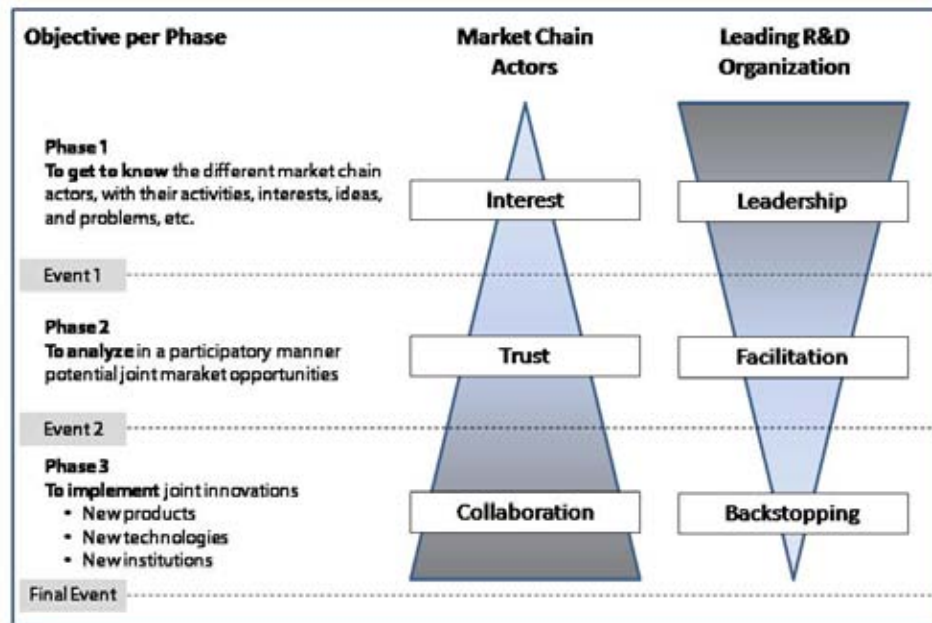
Phase 3. Development of market-driven innovations.

As illustrated in Figure 1, a research or development organization typically initiates work with the PMCA. Early steps include selecting the market chains on which to work, identifying potential R&D partners and carrying out exploratory, diagnostic market research. Key goals of Phase 1 are to become familiar with market chains and market chain actors, and to motivate market chain actors to participate in the PMCA process. In Phase 2, representatives of the R&D organization facilitate meetings that aim to build up mutual trust and knowledge sharing among participants. In Phase 3, the market chain actors work together to develop new market processes or products, with support from R&D organizations.

During Phase 1, diagnostic research is carried out to become familiar with key market chain actors and understand their interests, problems and ideas. This phase is expected to take two to four months and may involve 20 to 40 interviews with diverse market chain actors. This phase ends with a public event that brings together

individuals who have been involved in the PMCA process so far, including market chain actors and representatives of research organizations and other service providers, to discuss results of the market survey and to exchange ideas. Individuals who have not been involved so far are also invited, to share results with them, to stimulate their interest in the PMCA process, and motivate them to participate in future activities.

Figure 1. The three-phase structure of the PMCA methodology



In Phase 2, thematic groups are established to explore potential market opportunities. The lead R&D organization facilitates group meetings where market opportunities are identified and discussed. The main challenges during this phase are to engage a wide range of relevant stakeholders – including market entrepreneurs – and to keep participants focused on identifying and exploiting market opportunities, rather than, for example, addressing production problems of unknown importance for marketing. Six to ten meetings may be needed to analyze potential market opportunities. In some cases, specialized market studies may be needed to complement the group work. At the end of this phase, the market opportunities are discussed in a public event with a wider audience and new members with complementary knowledge and experience are encouraged to join Phase 3.

Phase 3 focuses on the activities needed to put in place joint innovations, with leadership from market chain agents. A challenge during this phase is to cultivate leadership within the market chain to lead the innovation process. The time required

may vary depending upon the complexity of the innovation, the capacity of the group, and biophysical, socio-economic, and institutional conditions. A rough estimate of the time needed, based on experience in Bolivia and Peru, is three to six months. Phase 3 closes with a large public event to which a much wider group is invited to present the commercial innovations or new market products. Invitees include, for example, political officials, donor representatives, commercial leaders, and members of the press.

Applications and results

Applications. The PMCA was developed to stimulate pro-poor innovation in potato market chains in Bolivia, Ecuador, and Peru. Subsequently, other organizations expressed interest in applying the approach in other regions and market chains. The Department for International Development (DFID) of the United Kingdom funded a project to introduce the PMCA into Uganda and apply it in market chains for potatoes, sweet potatoes, and vegetables (Horton et al., 2010). DFID later provided funding for experimentation with the PMCA and other participatory methods in a program known as the Andean Change Alliance (www.cambioandino.org). In this program, the PMCA was applied in value chains for potatoes in Bolivia and Ecuador, for coffee in Peru, for yams in Colombia, for dairy products in Bolivia and Peru, and for fruits and vegetables in Bolivia (Horton et al., 2011). The World Agroforestry Center has employed the PMCA with tropical fruits in Peru. The Australian Aid Agency has supported use of the PMCA in combination with farmer field schools in Indonesia.

Results. Studies in South America and Africa (Devaux et al., 2009; Horton et al., 2010; 2011) indicate that use of the PMCA has stimulated varying degrees of learning, interaction, innovative thinking, and changes in practices, which in some cases have resulted in commercial, technological, or institutional innovations. Many participants – including both poor farmers and small-scale market agents – have gained valuable new knowledge and experiences that have empowered them in their dealings with other market actors and service providers. Individuals learn a new way of approaching problems – with a more comprehensive market perspective – which they apply in their future work. Exposure to the PMCA also helps professionals appreciate the importance of focusing on practical results and contextualizing their work within larger systems such as value chains.

Experience shows that the main benefits don't come *during* application of the PMCA, but *later on* as a series of ideas are tried, adapted, fail, and succeed. This highlights the value of follow-up support to innovating groups after formal completion of a PMCA exercise.

Several organizations that have participated in PMCA exercises have incorporated elements of the approach into their work. A few have adopted use of the PMCA *in toto*. Since agricultural R&D organizations depend on external donors for a large part of their operating funds, they need to include the PMCA in their donor proposals. Recently, many donors are favoring projects that promise tangible results in very

short periods of time (sometimes in months, rather than years), limiting the possibility of applying a complete PMCA exercise.

A few universities have incorporated the PMCA into their academic curriculum for development professionals, providing an unexpected avenue for dissemination of the approach.

Success factors. A country's economic policies set the stage for local development efforts and can support or discourage use of value-chain approaches such as the PMCA. For this reason, international organizations need to work with local groups to determine which approaches are most appropriate for promoting innovation and development in their context.

Successful innovation is more likely in some market chains than in others, highlighting the importance of doing a thorough market analysis before investing heavily in market-chain innovation. Personal factors also influence results. Two types of "innovation champion" are important:

- The facilitator in the R&D organization that initiates and supports the PMCA exercise
- One or more respected individuals in the market chain who are committed to, and eventually lead, the innovation process.

Without both these types of champion, results of the PMCA may be limited. An especially critical factor is the engagement and commitment of market chain actors, who are expected to play a lead role in driving development of new business opportunities and generating demands for innovation. As *proactive leadership from within the market chain is essential*, engagement of the business community is an area that merits very careful attention in applications of the PMCA.

Horizontal evaluation

Horizontal evaluation is a flexible evaluation method that combines self-assessment and external review by peers (Thiele et al., 2006; 2007; Bernet et al., 2010). This evaluation approach was initially developed as a type of "product evaluation" to assess and improve the new R&D approaches that were being developing in Papa Andina (for example, the PMCA and multi-stakeholder platforms). More recently, horizontal evaluation has been used also to assess R&D processes and experiences as well as products.

In its early years, Papa Andina, like many other regional programs, organized study visits for local professionals to exchange knowledge and experiences. Expert-led evaluations were used to evaluate Papa Andina's work and make recommendations for improvement. The study visits were enjoyable and instructive for participants, but there were few clear outcomes and little follow-up. External evaluations provided interesting results, but Papa Andina's members often doubted the relevance or feasibility of the recommendations, and their implementation was patchy.

In view of the limitations of traditional study visits and expert evaluations, horizontal evaluation was developed as a participatory alternative that combines the positive aspects of both. Evaluation by peers is what makes the process “horizontal,” compared with the “vertical” evaluation typically provided by outsiders of perceived higher professional status. This method differs from the anonymous peer reviews used by professional journals and research funders, in that horizontal evaluation is open and transparent, with all the participants encouraged to learn and benefit from the evaluation process.

Horizontal evaluation neutralizes the power dimension implicit in traditional evaluation, in which the “expert” judge the “inexpert” and the “powerful” assess the “powerless.” Because of this neutralization, a more favorable learning environment is created. The involvement of “peers,” rather than “experts” creates a more favorable atmosphere for learning and improvement.

Description of the approach

The heart of a horizontal evaluation is a 3-day participatory workshop involving a local group (referred to as “local participants”) of 10–15 people and a similarly sized group of outsiders or visitors (referred to as “visitors”). Visitors are peers from other organizations or projects who are working on similar themes in other contexts or other countries and have a potential interest in applying in their own context the R&D approaches being developed or the knowledge acquired.

The role of local participants is to present, and with help from the visitors, critically assess the work undertaken and make recommendations for improving it. The role of the visitors is to critically assess the work, identifying its strengths and weaknesses and making suggestions that will aid the wider application of its results, if appropriate. The visitors may contribute to the formulation of recommendations, but the local participants must take the lead and actually propose and agree to them, since their ownership of the recommendations will be the key to implementation.

Planning the horizontal evaluation workshop. An organizing committee is established that includes decision makers from among both local participants and visitors. Workshop organizers are responsible for:

- Identifying an appropriate object for evaluation (in the cases we have supported, an R&D approach or specific experience of regional interest)
- Ensuring the participation of an appropriate group of local participants and visitors (the latter should have an interest in learning about the approach or experience)
- Designing the 3-day workshop and arranging for professional facilitation
- Developing preliminary evaluation criteria
- Arranging field visits that will demonstrate application of the methodology

- Sending both sets of participants background information prior to the workshop
- Making provision for writing up and using the workshop's findings.

Day 1 – Introducing the object of the evaluation. At the start of the event, the facilitator introduces the objectives of the workshop and the procedures to be followed, stressing that the workshop is not intended to evaluate everything the organization or project is doing but just the R&D approach or experience that has been selected for the evaluation. S/he encourages visitors to be critical but constructive, identifying the strengths and positive aspects of the work being reviewed as well as its weaknesses. S/he also encourages local participants to be open and receptive to comments and suggestions.

On Day 1, local participants present the context and background of the R&D approach or experience to be evaluated and describe the activities carried out and the results to date. Our experience has shown that interactive ways of presenting activities, such as knowledge fairs with poster exhibitions, are more effective than PowerPoint presentations. Visitors are encouraged to limit themselves to asking questions and are discouraged from voicing judgments about the value or merits of the work until they have acquired additional information and insights during the field visits on Day 2.

Near the end of the day, the evaluation criteria are discussed and finalized. Then the participants divide into small groups to prepare a short interview guide and make a simple plan for interviews and other forms of information gathering on Day 2.

Day 2 – Field visits. The field visit provides an opportunity for visitors to see at first hand the work carried out and its results, and to talk with those whose livelihoods are directly affected by it. Visitors conduct semi-structured interviews, make direct observations, and as far as possible try to triangulate different sources of information. After the field visit, groups synthesize their findings using the evaluation criteria and present them in a plenary session. It is an opportunity to illustrate observations made during the field visit with photos or videos.

Day 3 – Comparative analysis. Visitors and local participants work separately at the start of Day 3. For each evaluation criterion, the two groups identify strengths, weaknesses and suggestions for improvement. After this group work, visitors and local participants present their findings in plenary session. All participants, helped by the facilitator, then identify convergent and divergent ideas. Where the groups' assessments of strengths or weaknesses diverge, the reasons for the divergence need to be explored in order to reach a shared understanding of the issue (but not necessarily agreement on it). After this plenary session, local participants synthesize recommendations and identify lessons learned as a basis for improving the methodology in the future. Visitors analyze the potential and requirements for applying the approach in their own organizations and settings. Both groups then come together to present, discuss and modify their conclusions in a final plenary session. The workshop ends with the participants identifying specific and time-

bound steps to improve their work and facilitate the wider application of its results, if that is judged appropriate.

Applications and results

Participants in the seven horizontal evaluations organized by Papa Andina in Bolivia, Ecuador, Peru, and Uganda have identified the following types of result and benefit (Thiele et al., 2007):

- Horizontal evaluation demystifies the evaluation process for participants who have previously only been exposed to external evaluations by “experts”.
- It provides useful information, insights, and suggestions for improvement of the work or the R&D approach being evaluated.
- It motivates and builds commitment for change on the part of the local project team.
- It strengthens the local project team.
- It encourages experimentation by visitors with new ideas and approaches back home.

MIRRORING PAPA ANDINA’S EXPERIENCE WITH KNOWLEDGE MANAGEMENT AND INNOVATION SYSTEM THEORIES: CONCLUSIONS AND IMPLICATIONS

Our reflection on the Papa Andina experience leads us to the following conclusions related to perspectives on KM and innovation and to the potential application of the approaches we have developed in other settings.

Papa Andina’s approaches, centered on situated mutual learning, have produced new knowledge that has been valuable for both the international and the national organizations involved. Our experience supports the position of Ferguson, Huysman, and Soekijad (2010) that situated mutual learning can help bridge the gap between the internal, or active, KM programs of international organizations – which focus on the capture, storage, and transmission of universally valid codified knowledge – and their external or latent KM programs – which focus on learning and the use of locally relevant knowledge in decision making. Approaches such as the PMCA and horizontal evaluation have produced new knowledge that has been useful for both the international and the local organizations involved. Local organizations gained knowledge that could be put to immediate use in addressing development problems; CIP gained knowledge that it could use in its global research programs and disseminate in the form of international public goods (the present publication, for example).

This is not to say that the KM process has been free from tensions and conflicts. On the contrary, local researchers and development professionals have frequently been challenged to demonstrate the local relevance and payoff of their work with Papa Andina. Similarly, CIP professionals have been challenged by peers involved core

activities in the CG center itself to explain why scientists in an international organization should be involved in local market development efforts.

As tangible results have been produced and reported in international peer-reviewed journals – considered the “acid test” for international public goods in the CGIAR – and as Papa Andina has received public recognition and awards for its work,⁴ these challenges have diminished somewhat. However, situated mutual learning that involves work across organizational boundaries is inevitably accompanied by tensions within and between the organizations involved.

Development and application of Papa Andina’s approaches has helped members of the partnership understand the needs, interests, and limitations of other members as well as those of the intended beneficiaries. Regional research programs can be set up and their results transferred among researchers, in the form of research reports, publications, or seeds, without the individual members gaining knowledge of the circumstances, needs, interests, or limitations of other members. This is one reason why so many new technologies remain “on the shelf” and are not used by other researchers, development professionals, or the intended farmer beneficiaries. In contrast, developing and using such new R&D approaches as the PMCA and horizontal evaluation have brought individuals from different disciplines, organizations, and countries together in co-development processes that have allowed them to learn a great deal about other members of the partnership and also about the circumstances and interests of the small farmers and market chain actors who are the intended beneficiaries of these R&D efforts.

Combining decentralized experimentation with centralized analysis and documentation has led to healthy constructive conflict and competition, which stimulated learning and innovation. Over a relatively short period of time, Papa Andina developed several approaches for fostering learning, communication,

4 In 2005, CIP, INCOPA, and a private firm, A&L Exportaciones y Servicios SAC, won the *Peruvian Award for Entrepreneurial Creativity* (<http://creatividadempresarial.upc.edu.pe>), given by the Peruvian University for Applied Sciences for developing T’ikapapa (bagged native potatoes) through an initiative that “values the enormous diversity of Andean potatoes, brings them to urban consumers, and generates sustainable businesses for small farmers”. In 2008, INCOPA and Papa Andina won the award again, this time “for exploiting the diversity of native potatoes in expanding the competitiveness of products from the Andean region.” In 2007, INCOPA and Papa Andina won the international *SEED Award for Entrepreneurship in Sustainable Development*, an annual competition designed to support local, innovative partnerships in developing countries working to achieve poverty eradication and environmental sustainability (www.seedinit.org/about-the-seed-awards/index.html). In 2007 INCOPA, A&L Exportaciones y Servicios SAC, Cadenas Productivas Agrícolas de Calidad (CAPAC) Perú, Supermarket Wong, producer organizations, and Papa Andina won the *World Challenge Award*, a competition sponsored by BBC World News and Newsweek, in association with Shell, that rewards projects or small businesses that have shown enterprise and innovation at a grassroots level (www.theworldchallenge.co.uk/previous-winners.php). In 2008 INCOPA and Potato Andean won Peru’s *Ardilla de Oro*, awarded annually by Peru’s Catholic University for a marketing campaign that contributes to social development in Peru (www.infoandina.org/node/26072).

collective action, and pro-poor innovation involving diverse market chain actors, agricultural service providers, and policy makers. Combining decentralization of work on these approaches with horizontal evaluations and participatory planning has contributed to creativity and the productivity of the partnership. Decentralized experimentation has allowed national groups to develop approaches that met their local needs. Horizontal evaluations have allowed the national teams to share their ideas and expose them to constructively critical evaluation. They have also stimulated a degree of, usually friendly, rivalry among the national teams and between the national teams and Papa Andina's coordinators. Feeding the results of the local work and the horizontal evaluations into Papa Andina's planning cycle has contributed to continuous program improvement. At times, disagreements and tensions have flared in public, requiring mediation of conflicts and some "cooling-off" periods. But on balance the results of open communication and constructive conflict have been quite positive.

The approaches developed have led to many changes in individuals' perspectives and behaviors and to some organizational changes. Those involved in developing and using Papa Andina's approaches report a number of personal and professional benefits. They have gained useful new knowledge, learned new skills, and changed their attitudes and approaches to their work. For example, individuals who have employed the PMCA or participated in horizontal evaluations report having broadened their professional networks and improved their communication, negotiation, facilitation, and evaluation skills. Through involvement in PMCA exercises, they have learned the importance of commercial innovation and its power to drive subsequent technological and institutional change. This has led to changes in the way researchers and development professionals, and in some cases their organizations, plan, implement, and evaluate their own work. In this way, Papa Andina's approaches have gone beyond improving knowledge management to strengthen the capacity of innovation systems.

There have been programmatic changes in some organizations. In Peru, for example, the National Institute for Agricultural Research (INIA) now includes native potatoes in its seed production program. The PROINPA Foundation in Bolivia is now analyzing potential market opportunities when testing technologies with farmers. At the international level, recent conferences and symposia of the Latin American Potato Association and the International Society for Tropical Root Crops have included sessions on market-chain development and related issues, which have featured presentations on Papa Andina work.

Notwithstanding these changes, there have been relatively few structural changes in participating organizations. An organization's operating procedures for program and project planning, KM, and performance assessment are built up over time and resist rapid change. Additionally, R&D organizations are usually part of larger administrative systems, such as national governments or international bureaucracies, which have their own, relatively, inflexible, procedures. This is why many promising approaches for KM and innovation developed in externally funded projects or

partnership programs may take a long time to, or never, become mainstreamed in the host organizations.

Knowledge management tools have contributed to change in the context of innovation brokering. One of Papa Andina's main vehicles for promoting innovation has been the PMCA. Here, knowledge management techniques that foster the production, exchange, and use of relevant new knowledge have been invaluable. However, our experience indicates the importance of focusing not on the KM tools themselves but on their use to achieve broader innovation goals. One of the most important factors in the success of a PMCA application is the extent to which an appropriate innovation network is established, with adequate representation of, and ultimately leadership from, entrepreneurs within the market chain. Another important success factor is the extent to which the exercise is focused on innovation that is market driven, by which we mean innovation that is linked to a market opportunity and emerges from the interaction of actors along the value chain.

In most cases, PMCA exercises have been initiated and facilitated by R&D organizations, which have traditionally partnered with farmers and have limited experience working with market agents. Unless the innovation broker goes beyond his or her comfort zone and enlists the active engagement and eventual leadership of market entrepreneurs, a PMCA exercise is unlikely to result in successful market chain innovation.

Papa Andina's approaches were developed in response to specific needs and circumstances; they are likely to be useful in some other contexts, but not in all. Economic policies, local customs and institutions, and personal and other factors influence the utility and performance of R&D approaches. In Peru, the PMCA is compatible with current national economic policies, which promote market-based development, and here the PMCA has been embraced by public institutions and NGOs. Prior to 2006, this was also true in Bolivia. In contrast, when the PMCA was being developed in Peru and Bolivia, Ecuadorians were skeptical of an approach that would bring small farmers together directly with profit seeking market agents as partners, and preferred to strengthen farmer organizations so they could negotiate more effectively with these market agents as clients. This led to useful work on stakeholder platforms in Ecuador (Cavatassi et al., 2011) that later stimulated similar work in Peru and Bolivia. The PMCA has now been employed in several market chains in the Andes, Uganda, and Indonesia. However, neither this nor any other approach should be expected to be universally applicable.

Introducing complex, knowledge-intensive approaches for facilitating situated mutual learning and pro-poor innovation requires a systematic process with sharing of both codified and tacit knowledge. In order to facilitate the use of the approaches described above, we have prepared user guides, training materials, and publications. But our experience indicates that introducing these approaches into new settings requires more than sending a publication or user guide. A new group can learn to apply the horizontal evaluation approach in a relatively short period of time, if accompanied by a skilled evaluator – facilitator. In comparison, introducing the PMCA

is much more demanding, as the approach requires local facilitators / innovation brokers to lead multi-stakeholder groups through unfamiliar types of discussions, negotiations, and product-development processes over a period of months. Innovation brokers need to help groups focus on market-driven innovations. Market chain actors need to be actively engaged and take on a leadership role as the process goes forward. This is definitely not “business as usual” for most R&D organizations, including NGOs.

Given the needed transformations of perspectives, attitudes, skills, and behaviors, efforts to introduce the PMCA into new settings should be guided by a capacity-development strategy with the following elements (Horton et al., 2010):

- Participatory planning and decision-making involving local actors
- Negotiation with senior managers in lead R&D organizations to foster institutional commitment to the PMCA and to support fund-raising for its use
- South-South learning exchanges, via study tours to sites where the PMCA has been successfully used
- A training strategy that includes action-oriented PMCA training workshops, use of the *PMCA User Guide* and complementary training materials, practical hands-on work with the PMCA in commodity groups, and backstopping and coaching by experienced PMCA facilitators, involving both face-to-face and virtual communications
- Knowledge sharing among the PMCA practitioners working in commodity teams
- Periodic learning-oriented evaluations to improve the process and document results
- Continuing support after the completion of Phase 3.

Implementing a thorough capacity development process with these components takes time and resources. It should be seen as an investment in innovation capacity that will generate returns over years. Our experience is that the capacities developed – at the level of individuals and the innovation system – continue to be utilized long after the PMCA exercise formally ends. In most cases, the creative imitations that occur years after the initial efforts are the most important ones (Devaux et al., 2010a).

When introducing a new knowledge-intensive approach to a new setting, it needs to be kept in mind that each situation presents a unique combination of socio-economic, political, institutional, and technological conditions. For this reason, the approach will need to be customized for use in each new situation.

NOTES ON CONTRIBUTORS

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PART II

Papa Andina's approaches and their application

Phase 1: Diagnosis

Objective: Understand market chain actors' activities, interests, problems and ideas.

Phase 2: Analysis of opportunities

Objective: Analyze joint business opportunities in thematic groups.

Phase 3: Development of innovations

Objective: Develop demand-oriented new products, technologies and institutions in participatory way.

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Participants

Interest

Trust

Collaboration

R&D institutions

Leadership

Facilitation

Backstopping



the 1990s, the number of people in the UK who are employed in the public sector has increased from 10.5 million to 12.5 million, and the number of people in the private sector has increased from 17.5 million to 18.5 million. The number of people in the public sector has increased by 19% and the number of people in the private sector has increased by 11%.

There are a number of reasons why the number of people in the public sector has increased. One reason is that the public sector has become more important in the economy. The public sector provides a number of services that are essential for the well-being of the population, such as health care, education, and social security. The public sector also provides a number of services that are not provided by the private sector, such as the postal service and the railway.

Another reason why the number of people in the public sector has increased is that the public sector has become more efficient. The public sector has been able to provide a number of services at a lower cost than the private sector. This has been achieved through a number of measures, such as the introduction of competition and the reduction of bureaucracy.

A third reason why the number of people in the public sector has increased is that the public sector has become more attractive to workers. The public sector offers a number of benefits that are not available in the private sector, such as job security and a good pension scheme. The public sector also offers a number of other benefits, such as a good work-life balance and a good working environment.

There are a number of challenges facing the public sector in the future. One challenge is that the public sector will have to provide a number of services that are increasingly expensive, such as health care and education. Another challenge is that the public sector will have to provide a number of services that are increasingly difficult to provide, such as social care and mental health services.

There are a number of ways in which the public sector can meet these challenges. One way is to increase efficiency. The public sector can be made more efficient by introducing competition and reducing bureaucracy. Another way is to increase the number of people working in the public sector. The public sector can attract more people by offering a number of benefits that are not available in the private sector.

There are a number of other ways in which the public sector can meet these challenges. One way is to increase the number of people working in the private sector. The private sector can be made more attractive to workers by offering a number of benefits that are not available in the public sector. Another way is to increase the number of people working in the voluntary sector. The voluntary sector can provide a number of services that are not provided by the public sector.

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Participatory Market Chain Approach¹

Thomas Bernet, André Devaux, Oscar Ortiz and Graham Thiele

ABSTRACT

The rapid growth of the urban population presents special challenges for small-scale farmers in developing countries. They are under increasing pressure to fulfil the new market requirements of powerful supermarket chains and agroindustry, which demand product quality, volume, and continuity of delivery. Most farmers in rural areas agree: "The worst pest we face nowadays is low prices and researchers so far have not found adequate measures to help!"

Many agricultural research and development (R&D) institutions have realized that small-scale farmers' key concern is not only agricultural productivity but also better market access.

THE CHALLENGE: TO INVOLVE MARKETING CHAIN ACTORS

The strategy for R&D institutions seems obvious. Given existing or potential business opportunities, marketing chains must be modified so that all actors of the marketing chain benefits, particular small-scale farmers. Two options are possible:

- To gain efficiency in the marketing chain by lowering costs (i.e., production and/or transaction costs); or
- To add value in the marketing chain by increasing consumer prices (i.e., products and services supplied are of higher value).

What is less obvious to R&D institutions is how to create these new beneficial marketing settings that involve different marketing chain actors, who normally compete and mistrust each other in their daily business. Attempts in recent years to promote collaboration along marketing chains have often not generated the wished benefits. The main reasons for this limited success are:

The lack of market-oriented participatory method expertise of R&D institutions

Many agricultural R&D organizations have struggled with reduced funding, which has limited institutional investments to enhance capacities outside of the core (agricultural) activities. Few have staff trained in both marketing and action research.

¹ Originally published in BeraterInnen News 1, 2005, pages 8-13.

The lack of methods that effectively integrate the different marketing chain actors

Most participatory R&D methods focus on agricultural contexts and do not explicitly involve other market chain actors. In addition, many relevant diagnostic approaches such as Participatory Rural Appraisal (PRA) and Rapid (or Relaxed) Appraisal of Agricultural Knowledge Systems (RAAKS) stop with the elaboration of a work plan and do not move to implementation of development activities.

Much marketing chain analysis is very theoretical and lacks practical advice on how to implement a functional exchange of information and build trust, to make price-competing market chain actors collaborate.



Potato commercialization in Lima's wholesale market; the need for change is obvious but difficult to achieve!

THE PARTICIPATORY MARKET CHAIN APPROACH

The Participatory Market Chain Approach (PMCA) is a participatory R&D method that has recently been developed. Involving the different actors of market chains, it seeks to generate group innovations based on a well-led and -structured participatory process that gradually stimulates 1) interest, 2) trust and 3) collaboration among members of the market chain. These innovations can be new products and processes, new technologies or new institutions, benefiting the different actors of the marketing chain directly or indirectly. PMCA is a flexible method to be applied in different marketing chain contexts. Its use is not restricted to agriculture. The R&D institution needs to adapt PMCA to the specific market contexts and policy environment to ensure the desired types of impact (e.g., poverty reduction, gender enhancement, farmer empowerment).

The only fixed elements of this approach are its three phases, with flexible duration depending on how the process advances. Each phase has a specific objective and a closing event. At the final event of each phase, results are presented to a larger group of participants and further steps are discussed. It is important that the institution that leads the PMCA process understands the “sustainability logic” of this 3-phase structure, gradually seeking to empower key actors involved in the process on the cost of the R&D institution, which progressively reduces its importance and influence on decision making along the process (Figure 1).

Phase 1 of PMCA is diagnostic research, typically taking two to three months and involving between 20 and 40 qualitative interviews. In contrast to conventional market research, the gathering and evaluation of technical or quantitative information is less important than getting to know and understanding the key actors of the market chain, with their interests, problems, and ideas. Contacts established through the interviews help to motivate these actors to participate in the first public event of the project, where also other actors of the market chain, representatives of research and government institutions are invited.

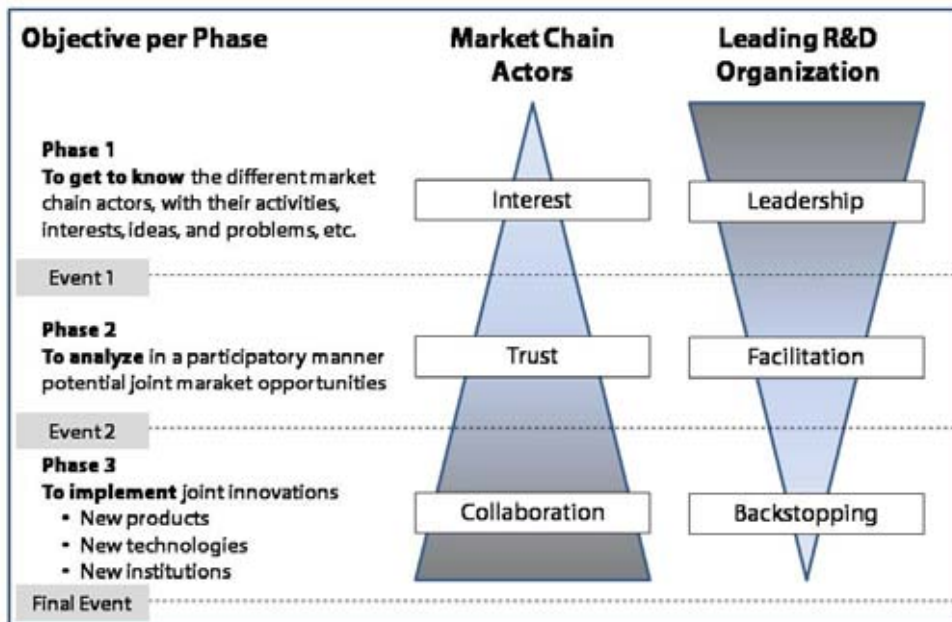
In the first part of the event, findings from the interviews are presented and discussed in plenary. Then two or three smaller working groups are formed, based on topics of joint interest identified through the interview session. In this sense, this event is used as a first occasion to share ideas and interests among the different stakeholders.

Phase 2 of PMCA aims to identify and analyze potential business opportunities. For every working group, the R&D institution provides a facilitator who guides interactions and mutual learning. The group meetings have a strong demand-oriented focus, not giving room for never-ending, supply-driven discussions. Six to ten meetings might suffice to analyze carefully the different joint opportunities. To support the working groups with in-depth studies, the leading R&D institution might want to contract marketing specialists at this stage.



Bringing the main message across: project leaders as market chain actors in the first public event (Phase 1).

Figure 1. Objectives and structure of PMCA



At the final event of this phase, the identified market opportunities are represented by each working group and discussed with a wider audience. This event provides an opportune momentum to integrate new actors into the R&D process, to complement the working groups with requested but lacking knowledge and capabilities.

Phase 3 of PMCA concentrates on the implementation of all activities needed to put in place the suggested market opportunities. The time needed for their implementation might vary according to working groups and projects: complex settings require more time, while availability of support staff and frequent meetings speed up the process. In any case, three to six months are necessary to satisfactorily implement the planned activities and launch the generated innovations at the closing event of the project. In contrast to previous events, invitations to this last event are sent to a much wider group, such as press people, politicians, and public donor agencies. The idea of this last big event is to optimally capitalize on the project's outcome and empower those actors who will be prominent to sustain the innovations over time.

PMCA explicitly finishes with this big last event, seeking to pass full responsibility over to those market chain actors who at this stage are the owners of the engendered products. Nevertheless, this does not impede the R&D institutions from following up with specific activities to help consolidate all achievements: new products, processes, and institutions. The degree of involvement will be different from case to case, depending much on the nature of the innovations and the capabilities of the market chain actors to move forward independently. Further support is especially necessary when new institutions are formed, which need initial resources to start to operate properly.

ADVANTAGES OF PMCA

PMCA has not been widely used yet, but the first application and its initial results were well analyzed in a participatory setting, where R&D experts from different Andean countries participated. The following advantages were identified:

PMCA achieves practical outcomes

The approach covers a range of activities from diagnostic to the implementation of coordinated concrete activities. Many participatory research methods tend to stop with the definition of a work plan of activities that should be implemented.

Our experience shows that research input is important during all three phases, being more conceptual in the initial phases and more technical to support initiatives during the implementation phase. In any case, the continued backstopping of the R&D institution in the implementation phase is crucial to avoid losing group dynamic until innovated products are launched and institutional innovations are consolidated.



Getting to know each other by finding common ground: first group meeting at the first public event (Phase 1).

PMCA is flexible

The approach consists of three explicit phases with a clear objective, but its implementation is highly flexible as it responds to different contexts and user needs. Many key actors are identified in later stages of the process, when concrete marketing opportunities are analyzed and implemented, but specific key knowledge and capacities might be lacking in the working groups. In this sense, the approach has shown to be very effective in functionally pooling information and skills during the different phases while optimally combining development with research activities.

PMCA focuses on real interests

The approach is strictly demand-driven and responds to collectively identified business opportunities, seeking to link consumer-oriented demands to technological innovation. Supply-driven discussions are minimized and put into the context of the market chain. This allows giving more room to those actors who are closer to consumers, and therefore crucial for identifying and analyzing valid joint marketing opportunities.

PMCA benefits participants in different ways

The approach generates differentiated and continuous benefits for all involved in the project. Group meetings generate tangible benefits for participants: access to new and relevant information, skills, and business contacts. The leading R&D institution is on the winning side as acquired knowledge and contacts help to better respond to concrete needs and opportunities. In this sense, PMCA provides an interesting

concept to determine technological innovation at the farm level based on market demands.

PMCA builds trust

PMCA has been very successful in bringing together actors with different backgrounds, such as traders, farmers, processors and R&D institutions, who previously mistrusted each other. It allowed the creation of confidence amongst them to point that they shared the same project interests and they were willing to invest considerable time and money to take forward the group's activities.

DISADVANTAGES AND CRITICAL SUCCESS FACTORS

PMCA per se does not guarantee a successful project. Failures might result from bad application or a difficult context, when, for instance, certain key actors dominate a whole marketing chain and alternative commercialization solutions do not seem feasible. In any case, the following factors need to be addressed to enhance PMCA's, successful future applications:

PMCA might appear too abstract

The approach works with new and rather unconventional mind sets and concepts that are not always easily understood, especially by R&D institutions related to agriculture, where most staff members have been trained in production sciences. If the R&D institution does not have the technical expertise and social skills to apply PMCA, it would be wise to access consultants who have the desired skills. The fact is that inadequate leadership frustrates voluntarily participating "market chain experts", putting at risk their active project involvement and thus mutual learning as a first important step in stimulating desired group innovations.

PMCA might challenge the direct involvement of main project beneficiaries

The approach is market-oriented and prioritizes the identification and implementation of marketing opportunities. This initially gives less attention to production-oriented problems and the actors behind them (i.e. farmers). These production-related activities are tack-led at a later stage when the marketing opportunity is constrained by production quality, volume or prices.

If the geographical distance between the production areas and the market impedes active participation of producers as the main beneficiaries, the R&D institution needs to maintain a firm position in favour of producers and focus only on those activities that ultimately generate direct and/or indirect benefits for this target group. More over field trips might be planned to improve the links with farmers.



Empowerment in practice: market chain actors present the achieved innovations to the public.



PMCA might be restricted by rigid funding

The approach requires a flexible allocation of funds to support those activities that participating actors jointly identify as important for the project. It will be important that donor agencies move away from activity-based towards objective- and process-oriented funding. This would help the R&D institution to better respond to demands from market chain actors and make research activities more relevant for achieving development goals.

Application of PMCA in the Peruvian Potato Sector

The International Potato Center (CIP) has been developing and applying PMCA in the Swiss Agency for Development and Cooperation (SDC)-funded INCOPA project that aims to create new marketing opportunities for small-scale potato farmers in Peru.

After the diagnostic study of Phase 1, and based on 24 qualitative interviews applied on different actors of the market chain (i.e., farmers, non-governmental organizations (NGOs), traders, processors), two working groups were formed to analyze existing and potential marketing opportunities during Phase 2. One working group developed a marketing system for a quality wholesale potato product. The other working group decided to analyze the development of a new industrial product. In this latter case, a marketing study was conducted to determine the market potential of native potato chips. After the public event of Phase 2, where the results were presented to a larger audience and new key actors were involved, both working groups started to implement step by step the necessary activities to launch the different innovative products. In the final event of the project, all these innovations were presented by the project participants themselves:

- “Papy Bum”: a registered potato chip brand made of native yellow potatoes
-  “Mi Papa - Seleccionada y Clasificada”: a registered brand name for a standardized 50-kg wholesale potato bag with well-selected and well-classified potatoes, to be applied on different commercial potato varieties
-  “CAPAC PERU”: a new formal association working as a platform involving actors from the whole agri-food chain with the objective to promote quality marketing of Andean crops, owner of the brand “Mi Papa” and with its own homepage: www.capacperu.org
- “Papa al día”: a daily bulletin with actual potato wholesale prices, including more than 20 potato varieties and classes
- A new potato grader: a flexible machine at relatively low cost to be used in different locations of the Andes, capable to grade different potato varieties and sizes

Altogether, PMCA was implemented in Peru to create a functional platform where farmers, private sector actors, and supporting R&D organizations could interact. PMCA became a mechanism not only for generating market chain innovations but also to make market chain actors’ demand more explicit to R&D institutions. The biggest challenge for CIP was to ensure that the PMCA enables farmers to express their needs. Given the distance between Lima and the main potato production areas, they could only sporadically be involved in the process, mainly in the closing events of each phase. CIP trusted the different NGOs to advocate farmers’ needs in the R&D process and build the last link in the market chain within the production region helping “their” farmers respond to the new business opportunities discussed in the working groups.

PMCA is a new method used so far in Peru, Bolivia, and Ecuador. Authors are currently validating the experiences. A PMCA user guide should be available in Spanish and English in the coming months

The Participatory Market Chain Approach: Stimulating pro-poor market-chain innovation¹

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ABSTRACT

Innovation in the food and agriculture sector is frequently short-circuited by a lack of trust and communication between actors in the market chain. To overcome these problems and stimulate innovation, the Participatory Market Chain Approach (PMCA) brings together small farmers, market agents, and service providers for an intense process of facilitated interaction. The PMCA uses a flexible three-stage participatory process to improve communication, build trust, and facilitate collaboration among participants so that they can jointly identify, analyze, and exploit new market opportunities.

The PMCA focuses on innovation in products, technologies, and ways of working together. By carefully selecting market chains and partners, and building in social responsibility, the PMCA can lead to favourable outcomes and impacts for poor farmers, typically the weakest link in the chain. The PMCA requires facilitation and technical support from professionals with good social skills, research experience, and marketing knowledge, based in a neutral research and development organization. To ensure that impacts are sustained, the PMCA is best used as part of a broader programme of market chain development.

INTRODUCTION

Food systems are evolving rapidly in developing countries. Supermarkets and sales of packaged food are expanding fast, impacting on production and the marketing practices and livelihoods of small farmers. There is a new consensus that agricultural research and development (R&D) should help small farmers link up with profitable markets. The PMCA was developed to address this need. The PMCA differs from other market chain approaches because of its focus on stimulating innovation and long-term partnerships among farmers, market agents, and service providers. It pays

1 Originally published as ILAC Brief 21, 2008. Institutional Learning and Change Initiative c/o Bioversity International, Rome.

2 The authors have been involved in developing and applying PMCA as part of the Papa Andina Initiative's activities in Peru, Bolivia and Uganda with support from the Swiss Agency for Development and Cooperation (SDC) and the United Kingdom's Department for International Development (DFID). Since 2005, they have also been actively involved in PMCA training activities in Colombia, Uganda, Laos, Nicaragua, and Indonesia. For further information, contact t.bernet@cgiar.org.

particular attention to engaging private sector actors, who are critical in identifying and making use of new market opportunities.

The PMCA was developed by the Papa Andina Initiative and its partners, the Foundation for Promotion and Research of Andean Products (PROINPA) in Bolivia, and the project for Technological Innovation and Competitiveness (INCOPA) in Peru, to improve the competitiveness of small potato producers in the Andes. The Papa Andina Initiative was keen to address one of the principal constraints to agricultural innovation: a lack of trust and knowledge sharing among different actors in the market chain. So, in 2003, Papa Andina carried out a 'Rapid Appraisal of Agricultural Knowledge Systems' (RAAKS) (Engel and Salomon, 1995) in Peruvian potato market chains. Based on this experience, the PMCA was developed to facilitate pro-poor market chain innovation. A key feature of the approach is that it brings together small farmers, market agents, and agricultural service providers who don't know each other or who distrusted one another (Bernet et al., 2006).

This Brief should interest R&D professionals wanting to help small farmers participate in dynamic markets. And, it provides useful information for donor agencies looking for more effective ways to intervene in market chains to reduce poverty and promote sustainable development.

THE METHOD

The PMCA has three phases, each with its own objective (Figure 1). This generic structure should be tailored to local conditions.

The PMCA engages those who make their living from a market chain ('market chain actors') and public and private service providers (researchers, credit providers, and development workers). It facilitates group processes in which market opportunities are identified and assessed, and innovations developed.

Three types of innovation may result:

- *Commercial innovations*, such as new or improved products
- *Technological innovations*, such as new production or post-harvest practices
- *Institutional innovations*, such as new ways for small farmers to work with market agents or service providers.

Experience with the PMCA in different countries indicates that it is sufficiently robust and flexible to help facilitate pro-poor innovation in many different types of market chain, and under a range of different geographical, social, and economic conditions. However, the PMCA should be led by skilled facilitators, belonging to a neutral R&D organization, who must pay careful attention to creating tangible benefits for actors participating in the process.

CONSIDERATIONS FOR APPLYING PMCA

Using the PMCA entails a holistic way of thinking about farming, marketing, and innovation, and a willingness to conduct joint R&D activities with partners in the market chain. Diverse stakeholders – with different interests – are involved, so good facilitation is key for building collaboration and trust.

Ideally, the R&D organization that takes on this facilitating role should have the following characteristics:

- Skilled PMCA facilitators
- A strategic vision to guide the overall process
- An openness to engage with private sector market actors
- Sufficient independence from any particular group of market actors (i.e. a neutral facilitator)
- Flexible funding to support different types of activities identified in the R&D process.

If these characteristics are lacking, the R&D organization involved can progressively build its capacities by using the PMCA over a period of time. During this period, an experienced PMCA practitioner and trainer should provide support and mentoring.

It is important to identify a market chain where the PMCA promises good results. This is generally where there are:

- *High transaction costs and potential to reduce these through innovation.* A market chain completely dominated by a single monopoly purchaser, for example, does not offer such an environment.
- *Potential for product differentiation and adding value.* A market chain for a low-value commodity with limited potential for improvement or processing may be a poor choice.
- *Good prospects for accruing substantial benefits for poor and primarily poor producers.* For example, in the Andes, we compared different market opportunities for potatoes and concluded that native potatoes grown by small farmers in highland areas offered the best prospects for the poor.
- *Long-term interest and commitment of facilitating R&D organizations in the market chain.* The PMCA is most appropriately applied as part of a broader and longer term programme for market-chain development.

Planning for the PMCA requires considerable administrative flexibility. As the PMCA is used to stimulate innovation processes; specific activities are impossible to predict at the outset. They emerge from the participatory process itself, driven by opportunities identified by the private and public actors involved. It is not advisable to begin using the PMCA until adequate funding has been secured. Whilst costs vary from case to case, an average cost for one application –taking about 12 to 16

months– is in the order of US\$25,000–30,000, in addition to staff time provided by participating R&D organizations. A substantial commitment is needed from the facilitating organization with at least one person assigned for 50% of their time during the PMCA.

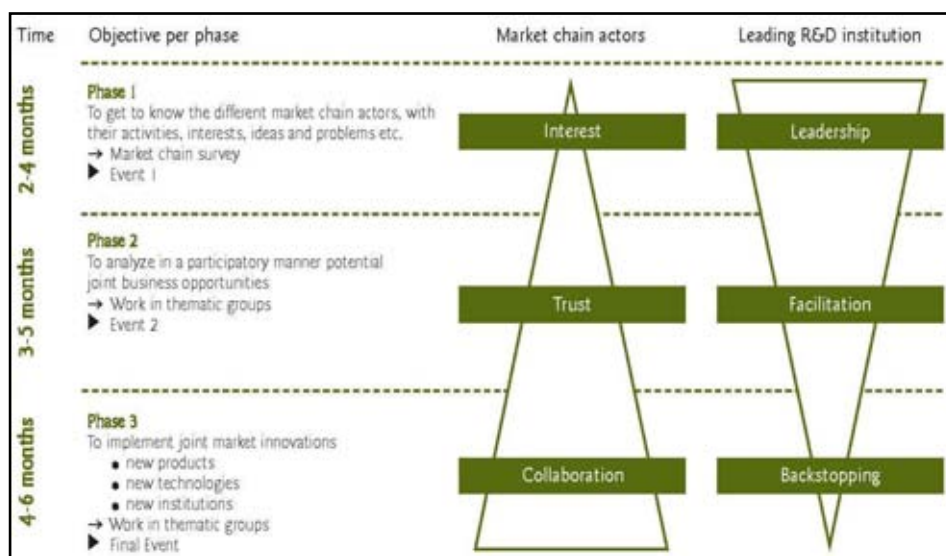
Partners might be able to share costs and, as the project generates encouraging results, it may be possible to leverage further investment, both from market chain actors and interested donors. However, ensuring continuity in innovation processes and engaging small farmers in new marketing activities might require additional long-term funding (see section Follow-up).

APPLYING PMCA

The PMCA involves three phases with specific objectives and activities. Each phase ends with an event where results are presented to and discussed with a wide group of stakeholders (Figure 1).

The R&D organization that facilitates the PMCA (the facilitator) initiates the process by identifying key market chain actors and supporting organizations. It carries out exploratory, diagnostic market research to get to know these actors and their activities, problems, and priorities (PMCA Phase 1). This is the basis of forming 'thematic groups' that focus on the market opportunities which have been identified. Facilitators lead group meetings to analyze market opportunities (PMCA Phase 2) and to carry out R&D activities needed to develop specific innovations (PMCA Phase 3).

Figure 1. Structure and objectives of the three phases of PMCA



As the participatory process advances, from Phase 1 to Phase 3, the facilitator progressively hands over responsibilities to market chain actors. It is important that

these actors take ownership of the innovations by the end of the PMCA process, when all innovations are presented to a wide audience in a final event.

Making demonstrable progress with market-chain innovations helps keep market chain actors motivated and actively engaged throughout the PMCA application. For this reason, it is essential that there is early progress in generating visible outputs for which the group feels responsible, and that the whole process is completed within a reasonable amount of time – 14–18 months at most.

Phase 1: Familiarization with the market chain and key actors

PMCA Phase 1 begins with a rapid market survey that includes 20 to 40 semi-structured interviews including key representatives of each stage of the selected market chain. These interviews allow the facilitator to get to know the different market chain actors and their activities, interests, problems, needs, and ideas for improving the chain's competitiveness.

All this information is presented at a first event, at the end of Phase 1, where the interviewees and others with a stake in the market chain discuss the survey results. Participants then form thematic groups to begin identifying and exploiting potential market opportunities.

Phase 2: Joint analysis of potential business opportunities

Those actors interested in continuing the interactions are invited to participate in 6 to 10 thematic group meetings during Phase 2. R&D professionals plan and facilitate these group meetings, which should each involve 10 to 20 stakeholders, to ensure active participation and group decision making. The objectives of these meetings are to clarify and evaluate market opportunities and to develop a work plan for exploiting these opportunities in Phase 3.

In the process of identifying and specifying the most promising market opportunities –from the point of view of those involved and from a development perspective (i.e. potential for poverty reduction)– the facilitators build mutual learning and trust among participating actors. Facilitators also seek to empower participating small farmers by giving them a voice in the decision making process. To support thematic groups' work and decision making, the facilitators may arrange for technical or market studies. At the final event of Phase 2, each thematic group presents its results and a work plan for exploiting the identified market opportunities during Phase 3. Moreover, this event is used by the facilitating R&D organization to engage new actors in the R&D process. These new actors bring knowledge and capacities to complement that of the existing groups to help the project move ahead with innovation in Phase 3.

Phase 3: Development of market-chain innovations

Phase 3 concentrates on the activities needed to develop the innovations proposed by the groups in Phase 2. Such activities may include: product development, improvement of production and marketing standards, or the creation of new working

arrangements (e.g. partnerships or contract farming). The time taken to develop the different types of innovation will depend on the time and resources participants can dedicate to the process, and also on the complexity of the problems to be solved. However, to keep motivation and participation at high levels, facilitators should try to finish all Phase 3 activities within a period of 6 months (continuing to meet every two to three weeks). The PMCA process finishes with a final event, where participants present their innovations to a wide group of invited guests, including such 'VIPs' as national policy makers, donor representatives, and the media.

FOLLOW UP

The PMCA should initiate a process of innovation that continues after its final event. Often, it leads to the creation of a more permanent platform for coordination between farmers and other market-chain actors. Small farmers, in particular, are likely to need additional assistance in organizing themselves, improving production practices, and developing business activities. Hence, the PMCA is best used as part of a broader programme of market chain development.

In the follow-up period, the facilitating organization assumes a different role, responding to demands from market-chain actors to help consolidate their innovations. Such follow up is particularly necessary where new institutions, created during the PMCA process, require external support to become fully consolidated. To sustain interaction and collaboration initiated during the PMCA process, and to involve new partners, market-chain actors may set in place 'multi-stakeholder platforms' (Devaux et al., 2007), broadening their scope for innovation.

APPLICATIONS OF THE PMCA TO DATE

The PMCA was first applied in 2002 in Peru to the potato sector, triggering commercial, technological, and institutional innovations (Box 1). In 2003, the Papa Andina Initiative replicated the PMCA elsewhere in Peru to validate and fine-tune its concepts and procedures. First applications focused on native potatoes grown by small farmers in the high Andes. This led to a marketing concept for selected native potatoes: attractive bags of potatoes sold in supermarkets as the gourmet product, 'T'ikapapa'. This product, launched in Lima's leading supermarket chain, has received considerable media attention and has won prestigious national and international awards, including the World Challenge Award in 2008 (www.theworldchallenge.co.uk).

In 2003, Papa Andina shared Peru's PMCA experience with partner organizations as part of a 'Horizontal Evaluation' exercise (Thiele et al., 2006). As a result, PROINPA Foundation staff decided to apply the approach in Bolivia. By applying the PMCA, farm communities developed commercial partnerships with potato processors and supermarkets, making native potato products available to consumers in Bolivia's principal cities.

In 2005, local groups promoting market chain development in Uganda visited PMCA projects in Bolivia and Peru and subsequently applied PMCA in commodity chains for potato, sweet potato, tomato, and hot pepper. In each case, PMCA

triggered product development and improved relationships among market-chain actors and R&D professionals. This has led to improved collaboration in other activities as well (Horton, 2008). More recently, the PMCA has been used in potato, coffee, and dairy market chains in Bolivia, Peru and Colombia, and for potatoes in Indonesia.

STRENGTHS AND LIMITATIONS OF THE PMCA

The PMCA not only stimulates innovation, but strengthens capacities for innovation within market chains. PMCA participants learn a great deal about the market chain and gain useful skills for communication, negotiation, facilitation, and teamwork. Positive interaction with other market chain actors also fosters social learning and the development of social capital, enabling market-chain actors and R&D professionals to collaborate effectively in other areas in the future. Participation in the PMCA empowers those involved, including low-income farmers, merchants and processors. It gives them a voice in discussions involving both market chain actors and R&D professionals, and allows them to gain knowledge, contacts, and the self-confidence to negotiate better agreements in the future.

The PMCA does have some limitations. Sometimes innovation processes are more complex than originally envisaged and an extended period of follow-up is required to generate successful innovations with tangible benefits. Farmers may require complementary capacity building (for example in organization and enterprise development) if they are to make full use of the opportunities created by the PMCA.

As innovation processes grow to involve a broader group of actors, it may be difficult to ensure that benefits flow mainly to the poor. For this reason, it is important that social responsibility is kept at the top of the agenda when developing marketing concepts and products with the private sector. In addition, the PMCA requires administrative flexibility. This may raise issues that are out of the control of the facilitating organization, which might be bound by regulations of the host government or donors. Here, broader engagement may create a more enabling environment for the PMCA. Finally, whilst many organizations and actors have benefited from using the PMCA, institutionalizing the approach remains a challenge. For this reason, we are now developing a programme for PMCA capacity development.

Box 1. First application of PMCA in Peru

In 2002, Papa Andina's main partner in Peru, INCOPA, began to use PMCA to enhance the competitiveness of small-scale potato farmers in Peru. The following activities were carried out during the three phases of PMCA:

PMCA Phase 1

An initial market chain survey included interviews with 24 individuals from different stages in the potato market chain, and supporting organizations, including non-governmental organizations (NGOs), the national agriculture research institute, and the Ministry of Agriculture. At the final event of Phase 1, nearly 100 stakeholders from the potato sector were present: market-chain actors, researchers, development workers, and representatives from the Ministry of Agriculture. After the

presentation of the survey results, three thematic groups were formed to explore potential innovations relating to: (1) fresh potatoes, (2) processed potatoes, and (3) export potatoes.

PMCA Phase 2

Because of similarities between the issues raised for export potatoes and those for processed potatoes, these groups were merged, leaving two thematic groups for Phase 2. These groups centered their discussions on identifying and clarifying market opportunities for each step of the product marketing chain. The 'fresh potatoes' group rapidly agreed to create a marketing concept for selected potatoes that would be sold wholesale in standardized bags. The 'processed potatoes' group was motivated by a processor's investment interest to focus on developing a new potato chip using native potatoes.

Once they had identified initial market opportunities, the groups shared information and took joint decisions to fine-tune their ideas. To obtain important additional data, the processed potatoes group hired experts to carry out processing trials and to conduct a market study for potato chips in Peru.

At the final event of Phase 2, the groups presented the innovations they proposed to develop during Phase 3. New actors with complementary skills were invited to join the groups.

PMCA Phase 3

Activities became more practical during this phase. Researchers from the International Potato Center (CIP) helped the processed potatoes group to conduct trials using the facilities of a processing firm. Focus group research explored the potential market for native potato chips. The fresh potatoes group formed sub-groups to tackle specific tasks in parallel: for example, different packaging options and collaborating with a wholesale marketing group to design market information products.

All the innovations were launched at the PMCA final event, attended by around 200 people including officials from the Peruvian government and the media. A series of stands representing the different links in the market chain visually presented innovations created by each group:

A 50-kg branded wholesale potato bag (compared to traditional unlabelled bags of up to 130 kg with potatoes of mixed calibre and quality)

A potato grader

Market information bulletins

Yellow native potato chips

CAPAC Peru (Cadenas Productivas Agrícolas de Calidad), a market chain association that would own and supervise the brand applied on the standardized potato bags as a means to promote the commercialization of quality potatoes within Peru.

Follow-up

INCOPA's role changed as it started to help project partners consolidate their innovations (e.g., launching yellow potato chips and standardized potato bags). Special support was provided to CAPAC Peru, considered to be a promising multi-stakeholder platform for promoting continuous collaboration among market-chain actors and an advocate for structural and institutional change in the potato sector. The positive experience with PMCA encouraged the INCOPA team to use the method again, focusing on market opportunities for native potatoes.

The social capital created in Peru as a result of the two PMCA applications led to the establishment of Peru's National Potato Day, celebrated annually since 2005 on May 30. This annual event, which stimulates private and public promotion activities and media coverage in favour of the potato sector, inspired the Peruvian authorities to ask the United Nations to declare 2008 the *International Year of the Potato*.

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Strengthening competitiveness of the potato market chain: An experience in Peru¹

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ABSTRACT

Potatoes are the main crop in Peru's Andean region and for small producers, for whom they are an important source of income and food, and also a way of preserving ancestral customs. The "INCOPA Project" works to improve innovation and the competitiveness of the potato. It is hosted by the International Potato Center (CIP), funded by the Swiss Agency for Development and Cooperation (SDC), and works through an alliance with a series of public and private partners. It is demonstrating that research and development can work hand in hand to obtain an effective impact at the small producer level. The project applies the Participatory Market Chain Approach (PMCA), which promotes working with the potato chain actors and regional research and development (R&D) organizations for linking research to market chain innovation. The objective is to improve the competitiveness of selected market chains and enable the effective participation of small-scale farmers. The results obtained include: (a) commercial innovations or new products (selected fresh native potatoes, colored potato chips, yellow mashed potato and selected white *chuño* or *tunta*)²; (b) institutional innovations or new rules and standards (public-private alliances, National Potato Day, the Potato Wholesale Commerce Law and the Tunta Technical Standard, among others); and (c) technological innovations (post-harvest management, production of healthy seed, and sustainable potato production technologies, among others). The evidence indicates that the value of the native potatoes and the appreciation of these potatoes as a cultural heritage are essential for small producers. Their commercialization enables producers to obtain prices 20% above the prices offered by traditional channels; better performance per hectare has been achieved (from 10 to 14 tm/ha), and there has been quality improvement.

THE POTATO IN PERU

The potato is one of the main nutritional staples in the world. In Peru, it is one of the most important products in the agrarian system in both economic and social terms. An average of 3 million tonnes per year is produced and 270 thousand hectares are planted annually. Some 600 thousand families depend on its cultivation (MINAG, 2007).

1 Presented at the 15th Triennial Symposium of the International Society for Tropical Root Crops, 2009.

2 *Chuño* or *Tunta*: A traditional freeze-dried product made from bitter potato.

In Peru's Andean region, in particular, potatoes are the main crop for small producers, for whom they are a very important source of income and food, as well as being a way of preserving ancestral customs. But, they are also significant for the urban population, because this age-old tuber adds nutrients and diversity to the daily diet. The potato is a good example of how a product with high nutritional value can be obtained by combining agro-ecological factors with efficient handling. There is no other crop that produces so much energy and protein per hectare than the potato. Furthermore, it offers great culinary versatility. In 2007, the World Summit of Gastronomy Madrid-Fusión recognized the Peruvian potato as 'one of the eight emblematic products of international cuisine'.

In Peru, the potato production sector is not homogeneous. It displays different specific features according to the varieties grown. Analyzing this sector, we find three main segments: white potatoes, yellow potatoes and native potatoes. In the first case, during the last thirty years there have been periods of pronounced fluctuation in prices (although with a general downward trend) and the possibilities of industrialization have not been clearly investigated. In the second case, the varieties of yellow potato have good positioning in the local market and the processed product (peeled, precooked and frozen) has been exported to international markets such as the United States, Spain, and Japan, although in small quantities and oriented to the 'ethnic' market (Peruvians living abroad). Finally, in the case of native potatoes, recent endeavors have successfully introduced them in local supermarkets as a gourmet product, and processed products such as flakes and mashed potato have been developed, with good export potential (Ordinola, 2009).

Even though the nutritional value of the potato is excellent, consumption per capita among Peruvians has been irregular. During the 1950s it was 128 kg. But by the beginning of the 1990s, it had fallen to 32 kg, eventually rising to 70 kg by 2005. At the same time, over the past few years the sector has experienced decreasing competitiveness. This is reflected in the relatively low prices (and the lack of management of quality conditions in the production zones). The identified causes for this situation are negative environmental factors, inadequate technological resources, and the economic and social precariousness of the farmers. A key limitation is scant commercial development. The fresh product image has not been modernized and no added value has been generated in the last few years. In this context, one of the crucial aspects to determine is how to generate innovations to support the development of competitiveness in the sector, and to promote the coordinated involvement of all the various actors along the potato production chain.

STRATEGY FOR GENERATING INNOVATIONS IN THE POTATO SECTOR

During recent years, it has been demonstrated that research and development can work hand in hand to create impacts at the small producer level, which translate to a reduction in poverty, improvement in food safety, and the sustainable exploitation of natural resources (Devaux et al., 2008).

In this context, CIP's INCOPA Project (Innovation and Competitiveness of the Peruvian Potato), executed with SDC funds, and in alliance with a series of public and private partners, is geared to improving the competitiveness of the potato chain. Emphasis is on small producers, taking advantage of new market opportunities, and promoting the consumption of Peruvian potatoes, within a framework of public-private institutions, favoring the modernization of the sector. Through their work, it has been demonstrated that research and development can work together to achieve effective impacts at the small producer level. The project operates a Participatory Market Chain Approach (PMCA), seeking to involve all the actors in the potato production process so as to generate innovations that will improve the competitiveness in the production chain (Ordinola et al., 2007b).

The work at INCOPA is organized along four lines of action:

1. Promoting negotiation platforms between the chain actors, which are strong and operate sustainably
2. Promoting public awareness activities and policies jointly implemented by all the partners to reinforce the potato sector
3. Building the capabilities of the local partners to improve the competitiveness of small producers (local service markets)
4. Promoting a broader participation of the private business sector in the Peruvian potato market chain.

INCOPA is implemented in the Peruvian Andes, with a small coordinating team in Lima, and works through local partners in the following regions: Ancash, Junín, Huánuco, Cajamarca, Cusco, Pasco, Ica, Huancavelica, Apurímac, Ayacucho, and Puno.

The following graphic summarizes the strategy and shows how research and development can complement each other to obtain concrete results (innovations).

The model operates on three main levels. The *first* is the market chain approach (widespread in recent years), which focuses on contact among all the different actors in the market chain, such as producers, businesses, and service providers, in order for them to express their needs, mainly regarding innovations and technical assistance. The *second* area is research for development, which channels all this information so that research institutions –CIP, research centers, universities- can respond to what the markets require with a view to improving competitiveness. Finally, policy influence makes it possible to scale up results, and to generate trends that may enable policy-makers – ministries, regional and local governments – to adapt their actions and promote others that have already been approved at the different levels. These three major fields of action are synergetic. For example, while market chain actors promote public awareness and influence policies, policy-makers may legislate or regulate in ways that improve business performance. Similarly, introduction of a commercial innovation (such as a new processed product) may generate demands for new production technology (for example, to improve the quality of potatoes for

processing), and research organizations may change their research agendas in order to generate relevant new information and technological options.

The ‘visible’ results of the model are: commercial innovations, technical innovations and institutional innovations. Each one of these will be explained later.

Figure 1. Stimulating innovations along the market chain



THE PARTICIPATORY MARKET CHAIN APPROACH

As mentioned before, the project’s main intervention tool is the so-called Participatory Market Chain Approach (PMCA), which is a method developed in Peru by INCOPA together with Papa Andina. It is a method which is openly geared to involving all actors in the chain taking part in the production, marketing and consumption processes. The idea is to generate innovations that will improve competitiveness and support the creation of new businesses benefiting all the participants (Thiele and Bernet, 2005).

The PMCA strives to combine supple elements of leadership and decision-making that favor innovation in the production chains, based upon a participatory process. This can result in new rules of partnership and/or quality standards (institutional innovation), more efficient processes (process or technological innovation), or new products (innovation of products or commercial innovation). The procedure looks primarily to demand, emphasizing the needs and requirements of the consumers. Once innovations have been identified at this level, the changes are rolled out ‘backwards’, that is to the other members of the chain (retailer, processor, wholesaler

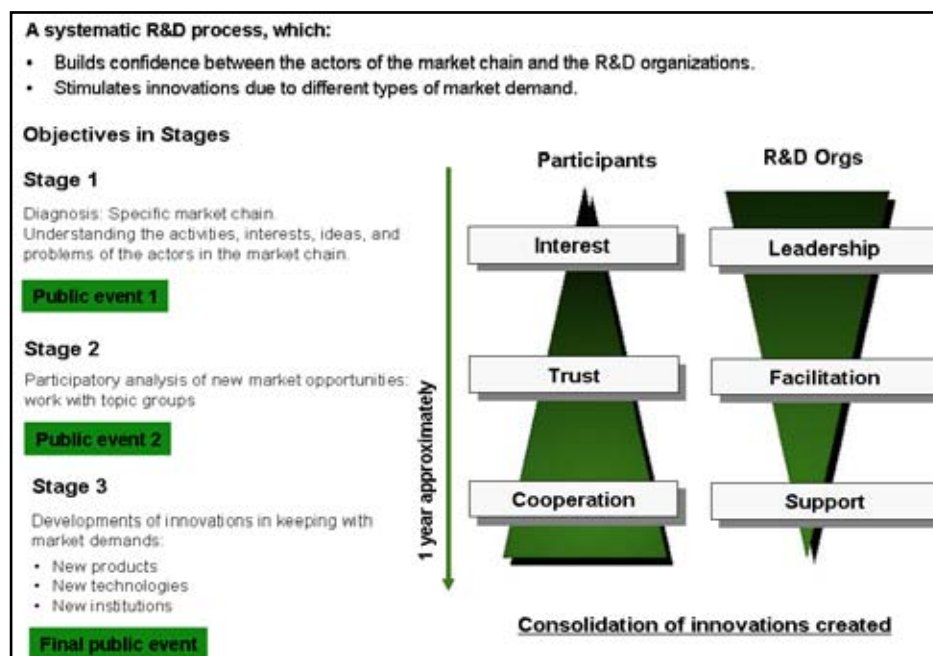
and producer) and so a qualitative and quantitative product that meets the market's need is manufactured. In the case of Peru, the PMCA has been applied in two instances (2002-2003 and 2003-2004).

INNOVATIONS GENERATED AND THEIR POTENTIAL BENEFITS

As a result of the implementation of the PMCA, the following innovations have been developed and applied.

Commercial innovations. These are the changes made to final products that improve small farmers' access to dynamic markets with increased added value. Examples are: Mi Papa, selected and classified potatoes (for the wholesale market), packed tunta (white chuño) (for the local market and export), *Puré Andino* (for export), T'ikapapa (for supermarkets), and Jalca Chips (for export). It should also be noted that new brands of snacks made out of native potatoes have been developed and launched recently in 2008. These are: Lay's Andinas, Inca's Gold, Natu Krunch, Nips, and Mr. Chips among others. These are all proposals with which the project works jointly.

Figure 2. The PMCA process



Institutional innovations. These are changes in the rules of the game played by all the agents of the chain and other public actors. They may be new institutions (CAPAC Perú- Cadenas Productivas Agrícolas de Calidad, Alianza Institucional de la Tunta, Iniciativa Papas Andinas), or new regulations (National Potato Day, the Technical Standard for Tunta and Ley de Comercio Mayorista de Papa [Potato Wholesale

Commerce Law] among others). At the same time, a key issue is the inclusion on the public and sectorial agenda of the need for sustainable development of the potato segment in Peru.

Technological innovations. These are the technological changes required to increase the efficiency or quality of production and the transformational processes aimed at meeting market demands. Some achievements attained in this area are the trials performed to define rules and regulations and quality standards for Mi Papa, the trials of sprout inhibitors, widespread dissemination of strategies for integrated harvest management, storage techniques, and seed production techniques.

The specific combination of these results makes for a significant impact. Regarding income increase, commercial innovations have an influence on the return small producers receive. Since the products target market niches, they move into a higher price range and improve the profit margins producers obtain. Technological innovations also have repercussions on prices, because with better quality and higher quantities of products, the level of performance rises and costs are reduced. Institutional innovations reduce transaction costs, mainly in commercialization, allowing access to identified market niches and improving the product's image among consumers. Establishing the National Potato Day is a good example of this. The resulting increases in demand, in turn, influence the size of the market.

Insofar as the combination of these results influences prices, quantities and size of markets for small farmers' products, it also influences their income levels and makes a reduction in their state of poverty.

RESULTS AMONG THE DIFFERENT ACTORS IN THE POTATO CHAIN

At the sector level

As mentioned before, the potato sector in Peru is not homogeneous. One of the key issues has been to insist upon the policy-maker's perceiving the potato sector as defined by certain characteristics. The following graphic summarizes the way to look at it. The important matter now is that it should be clear that there is potential for development and commercial positioning for native potatoes, a segment formerly neglected by different actors in the potato chain.

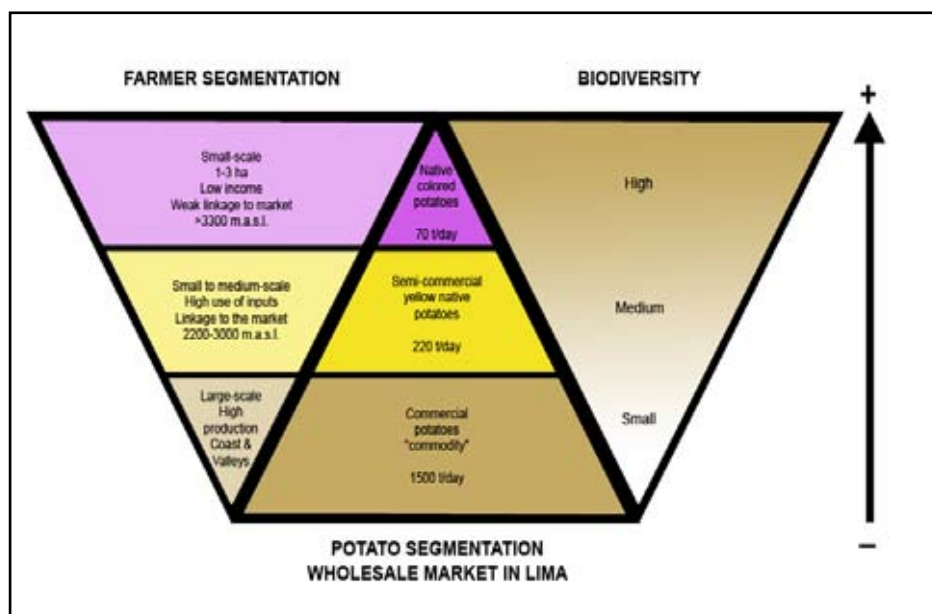
White potato varieties. Two of the main limitations in the case of fresh products are inefficient post-harvest handling, which causes losses, and the persistently inefficient wholesalers' markets that continue to use 120 kg containers of unselected unclassified product. Some important steps have been taken to change this situation by modernizing the potato wholesale market in Lima and introducing new products such as Mi Papa. It should be noted that Lima's wholesale market commercializes 600 thousand t of potatoes per year. Higher efficiency with this volume of production generates a whole chain of goods and services. At the retail level, supermarkets are applying the concept of selected,, classified, clean, washed and packed product so as to facilitate its access to consumers.

On a global scale, there are significant changes and the following results may be seen as consequences of the project.

Yellow potatoes. This product has gained position in an ‘exclusive’ segment of the market due to its taste and color differentiation. But it is equally consumed throughout all social classes, hence consolidating a high penetration level in the important fresh product consumers’ market. In the export segment, the ‘ethnic’ market, mainly Peruvian citizens living abroad, is significant, first within the United States, and more recently in Japan and Spain. In 2006, the export total of this product increased by 83%. An interesting fact is that during the first semester of 2007, potato exports grew by 42% compared to the same period in 2006, which, in turn, had increased 16% over the same semester of the previous year. We may well be on the brink of an export boom of this tuber (De Althaus, 2007).

At the same time, there are other options being developed to process mashed yellow potato, both with and without peeling, for the export market. A new yellow potato processing plant has recently been opened in Cajamarca. In 2008, the Gloria Group launched Mr. Chips Papa Amarilla, a line of yellow potato chips; while, as recently as mid-2009, Frito-Lay launched Lay’s Peruanísimas, a product also based on yellow potato. The challenge for yellow potato varieties is to cross from the ethnic segment to the general public of the targeted export markets.

Figure 3. Segmentation of the potato market in Lima.



Native varieties. These potatoes have become important and more visible since the joint ventures described in previous paragraphs came into being. There is a great

biodiversity of potatoes in the Peruvian Andes that has been inefficiently exploited in sustainable terms, and the majority of these varieties are unknown.

With reference to the consumption of fresh produce, there are some varieties that have been successfully introduced in supermarkets with the concept of 'fresh, selected, classified native potato, clean and packed, with brand'. This has gained endorsement thanks to the potatoes' extraordinary nutritional value and diversity of shape, size and color, as well as the texture and flavor of their pulp (Ordinola et al., 2007a). Furthermore, there are some processed products made from native potatoes on the market. They include a deluxe presentation of native potato chips that is sold in the duty free shops at Lima's international airport, and other brands that have been introduced in the supermarkets of Lima and in regional markets for the tourist segment. In May 2008, Frito-Lay, a transnational snack food corporation based in Peru, launched Lay's Andinas, potato chips made from native varieties, which implies a substantial improvement in market development for these products. At the same time, the Gloria Group, an important local company, has launched a new product, Mr. Chips Native Potatoes, which is also produced from native varieties. Another private sector company has developed a face cream with extracts of the purple potato variety. The next step is to explore the possibilities the export market has to offer for products processed from native potatoes.

It is imperative to take advantage of the gastronomic potential that the various Peruvian potatoes offer, especially the yellow and native varieties. There are many ways of cooking them, and their versatility in the creation of dishes is astonishing, as several haute cuisine schools in Lima and other Peruvian cities may well testify. Many recipes have been created in different ways with a diversity of potato varieties as their main ingredient (Ordinola et al., 2007b).

At the producer level

Many studies have been conducted to measure how the benefits of the actions implemented have impacted on the producers. Some of the most important results within the region of Huanuco (Bucheli et al., 2009) are described below:

1. The study substantiates that fieldwork has been performed with improved native potatoes and small producers
2. In Cayna (one of the project's areas of intervention) there has been an important increase in the average annual income due to the sale of potatoes (from US\$ 721 to US\$ 2,058), and there are qualitative signs that support this positive variation. Productivity is also increasing (from 10,830 kg/ha to 14,810 kg/ha), while there is a positive difference in prices of 20% in relation to other market alternatives
3. This increase in income results from technical assistance and training provided that have impacted on production improvement (quality and productivity). There is also the contribution of INCOPA/ADERS- (Asociación para el Desarrollo Sostenible) to the opening of new market opportunities: the commercialization of native potatoes not seen before, the use of

mechanisms such as Mi Papa and T'ikapapa and new commercialization channels such as supermarkets and the wholesale market of Lima

4. This situation means that there is a new window open for commercialization that did not exist before, and it remains open to the present day. The market incentives for these new opportunities are making perceptible changes possible, which will become stronger and continue in the future
5. The intervention of INCOPA/ADERS has made important contributions towards the situation of women, especially in the division of work, and their self-esteem. This involvement has made it possible for women to access new commercial spaces, and the work they perform in the field, particularly the classification, has been appreciated
6. The strategy of bringing together actors, promoted by the PMCA has been successful in Cayna, where greater confidence towards NGOs, businesses and producers' associations is observed; a situation which is not perceptible in other
7. The observed results are related to the innovations generated as a result of using the PMCA: technological (improved knowledge), commercial (new commercial channels, new products), and institutional (the strengthening of ECOMUSA- Empresas Comunales y Multicomunales de Servicios Agropecuarios)

CONCLUSIONS

In general, it may be said that the potato sector in Peru – particularly that of yellow and native potatoes – is in the process of changing. As observed, there are products already developed by private companies, or new products these companies are researching, because the markets are asking for them. To support the success of the project, which means improving the income of potato producers, it is essential that all the actors in the production chain share the common vision of selling quality products, fresh as well as processed, to cater to what the market demands. If the potato sector is developed competitively, this will have an effect on promoting the competitiveness of the Andean region as well, and the generation of innovations described here plays a key role in that process.

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T'ikapapa: A marketing scheme that uses potato biodiversity to improve livelihoods of Andean farmers in Peru

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Thomas Bernet and André Devaux*

ABSTRACT

Native potato varieties have been crucial for the subsistence and survival of Andean farmers over centuries. In today's globalized world, they are a unique asset and comparative advantage of Andean communities. T'ikapapa is a marketing concept and work scheme that resulted from collective action, an innovation process and public-private partnership promoted by the International Potato Center's *Papa Andina* (Andean Potato) project. Small-scale Andean farmers have accessed high-value urban markets and have increased their incomes, while providing a business case for social responsibility on the part of the modern food retail industry. Public awareness has been increased, as well as interest in the conservation of the Andean potato biodiversity, feeding back the research agenda on production and post-harvest technologies. This paper unveils the conceptual framework behind T'ikapapa's creation, presents a first balance of outcomes at the commercial, institutional and technological levels, discusses shortcomings, and outlines remaining challenges to link small farmers to market in a sustainable way as part of a poverty reduction strategy.

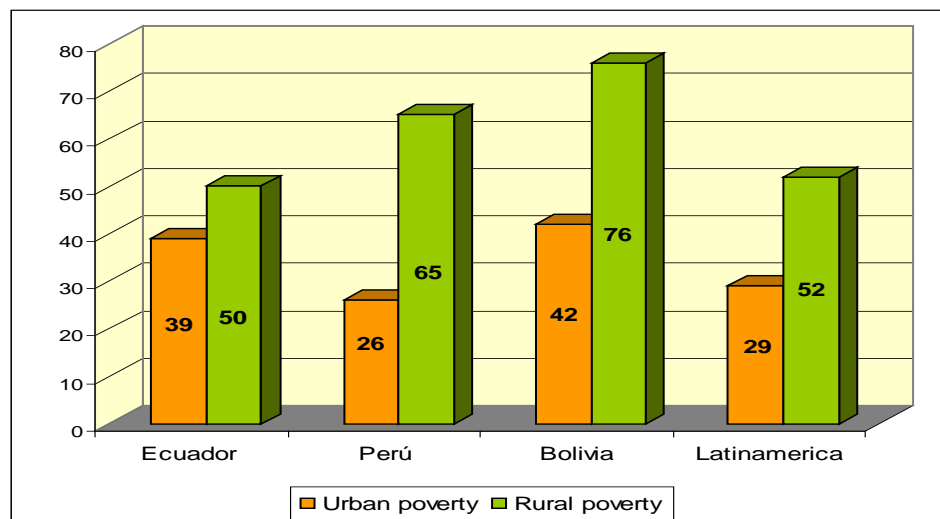
INTRODUCTION

The Andean region is one of the most diverse areas in the world and the home of a vast collection of biodiversity for a number of food crops, such as potato, maize, bean, tomato, etc. The Andes range is a vast mosaic of ecosystems with distinctive conditions, such as elevation (800 to 4,500 m.a.s.l.), rainfall, geology, and the distribution of particular plant and animal species. These diverse agro-ecosystems have allowed only in Peru the development of the widest collection of potato biodiversity, which is estimated at more than 3,000 native landraces. The close relationship between plant diversity and indigenous people in the Americas has been documented by several authors (Padoch and de Jong, 1991; Bellon, 1990; Boster, 1985). Brush et al. (1992) mention that in a single valley in the Peruvian Andes, peasant communities may grow between 70 and 100 different potato varieties, and a typical Andean household may keep up to 50 different varieties, including tubers from several potato species. Therefore, native potatoes are a unique asset and a comparative advantage of Andean farmers, since the harsh climatic conditions of the high Andean altitudes are the limiting factor for growing other crops.

However, Andean populations have suffered a process of continuous exclusion since the arrival of the first Europeans five centuries ago, keeping them apart from the

mainstream of modernity and access to the market. This situation resulted in the highest levels of poverty mainly in the rural areas in the Andes as compared to the overall average in Latin America (Figure 1), which, in the case of Peru, translates to two out of three rural inhabitants living in extreme poverty (less than US\$ 1 per day). Extreme poverty and biodiversity coexist in the same rural habitat, where rural populations are directly dependent on biodiversity for subsistence, as was pointed out in 2003 by former United Nations Secretary-General Kofi Annan during the International Day for Biological Diversity: "Biological diversity is essential for human existence and has a crucial role to play in sustainable development and the eradication of poverty. Biodiversity provides millions of people with livelihoods, helps to ensure food security, and is a rich source of both traditional medicines and modern pharmaceuticals" (www.biodiv.org).

Figure 1. Percentage of incidence of poverty in Ecuador, Peru and Bolivia vs. average in Latin America



Source: CEPAL (2009), Cuadro A1 p. 81.

This paper describes the experience in Peru of T'ikapapa, a brand name and a marketing concept to link small-scale farmers from the Andean highlands to supermarkets, to take advantage of potato biodiversity and tap new market opportunities.

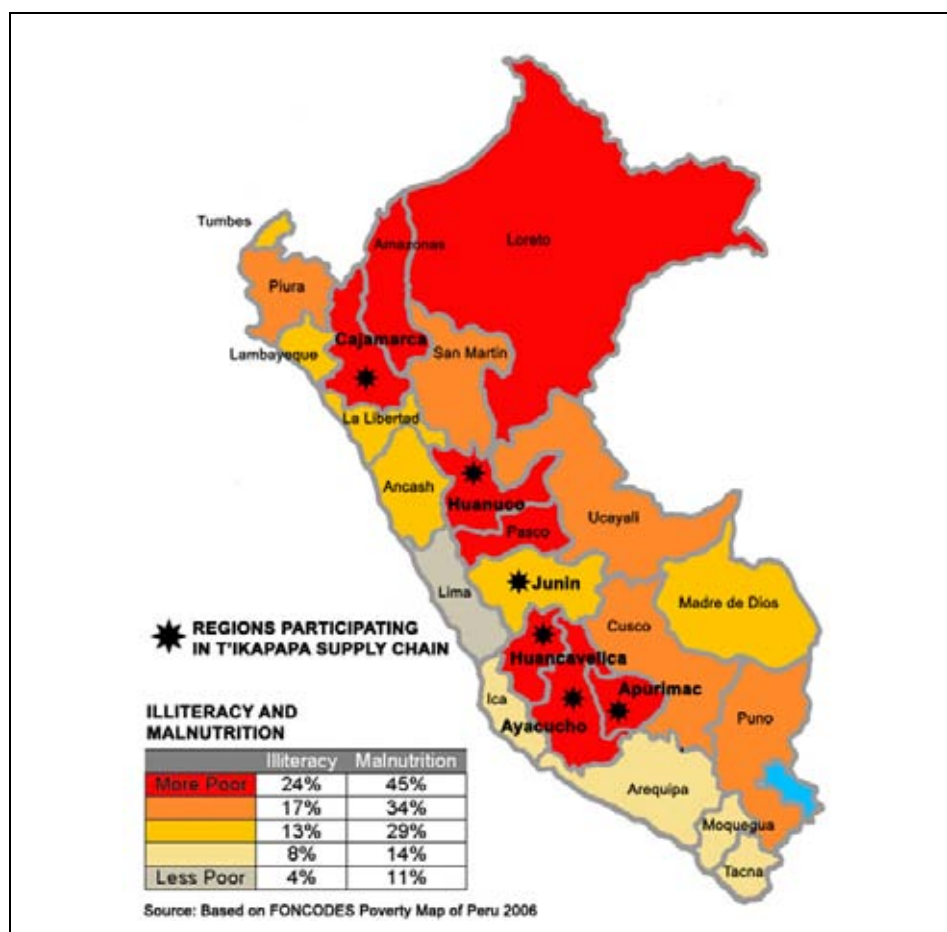
LITERATURE REVIEW

The potato crop in the Peruvian Andean poverty context

Since 2002, Peru has shown remarkable economic growth, with one of the highest gross national product growth rates (8%) in Latin America, and this trend is expected to continue. This economic expansion was reflected by the World Bank's country

economy classification where Peru ranks among the lower middle-income countries, with an average income per capita of US\$2,140, still below the average of Latin America (US\$3,260). However, despite this economic growth within the country there are still exceptionally inequitable distributions of income and wealth that are masked by the macroeconomic indicators. The poverty map of Peru (Figure 2) was developed in 2006 by a governmental agency (FONCODES, 2006) based on data of the national census of 2005. It shows five groups or quintiles identified by colors; these groups were defined by the lack of basic services such as: electricity, tap water and sewerage; other demographic variables considered were illiteracy and malnutrition rates.

Figure 2. The poverty map of Peru 2006 (FONCODES, 2006)



The poorest groups are identified with red and orange; an estimated 40% of the country's population (10,2 million) are in these two groups, where the highest levels of illiteracy and malnutrition can be found. Nine of the 13 regions considered in these two groups belong to the Andean highlands (Cajamarca, Huánuco, Pasco, Junín,

Huancavelica, Ayacucho, Apurímac, Cusco and Puno), and those marked with a star are the regions of the communities participating in the T'ikapapa supply chain (Appendix). The study also revealed that most of this population lives in rural areas where the poverty rate is 72.5%; other socio-demographic variables reveal that in rural areas 69% of under-five-year-olds suffer from chronic malnutrition, and 73 out of 1,000 children die at less than one year of age (UNDP, 2006). On the other hand, the least poor and wealthiest part of the population live in the coastal area, mainly concentrated in Lima.

The general profile of the population living in the Peruvian Andean highlands is characterized by the small landholdings, with less than 5 ha of land per family; a low adult literacy rate; and high child malnutrition levels. For these communities, the potato crop is an important cash crop and an important component of the Andean household diet for food security. In a recent survey study carried out in the Central Highlands of Peru by a group from the German Development Agency, 72% of the interviewees considered that the potato crop is a key livelihood strategy for escaping poverty and famine (Antezana et al., 2005). Another study carried out in Ecuador to determine the relationships of the nutritional status of pre-school children with 3 types of potato production systems (strong potato-based, intermediate, and less potato-based) in seven potato farming communities, revealed that the highest levels of severe to moderate malnutrition were observed in 51% of children under 3 years of age living in strong potato-based farming communities, whereas intermediate and less potato-based systems showed 30% of children with malnutrition (Orozco, et al., 2007). The same study also revealed that the diets in all the communities had excess energy intakes due to the high consumption of carbohydrates and fat; although the diet's profile is related to the type of crop rotations in each system, as well as the presence of livestock in communities with intermediate and less potato production systems.

High potato production helped farmers to improve their living situation. However, sole increased potato production cannot ensure the way out of poverty; for this to occur, the increase of potato production has to be associated with market-oriented strategies (Antezana, et al., 2005).

THE CONCEPTUAL FRAMEWORK BEHIND THE T'IKAPAPA CONCEPT TO PROMOTE COLLECTIVE ACTION FOR INNOVATION IN THE ANDES

In recent years, considerable effort has been devoted to developing new strategies, concepts, frameworks and approaches to reduce rural poverty in the context of a market-oriented innovation process that can focus on small-scale farmers. However, small farmers are often at a disadvantage in relation to larger commercial farmers, who can supply larger volumes of quality-assured products, possess superior bargaining power, and have better access to information, services, technology and capital (Johnson and Berdegué, 2004). Additionally, small farmers live in remote areas, have limited and non-homogeneous production surplus, and have a community-oriented organizational structure rather than a market-oriented organization, all of

which inflates marketing costs, increasing transaction costs and the per-unit costs of assembly, handling, and transportation. This situation leaves no room for innovation, contributing at the end to the little profitability of the small farmer as an economic agent.

There is a need to introduce new patterns of interaction and institutional arrangements among the diversity of actors involved in the value chain to start an innovation process at different levels of the market chain. The experience of Papa Andina has shown that this group of individuals, working collectively and in a coordinated manner, pursuing common objectives, have the potential to develop a synergistic force that can positively influence their external environment (government offices and policy makers) for the common benefit of the involved market chain actors and this economic sector as a whole. Meinzen-Dick and Di Gregorio (2004) add that this process can be encouraged or supported by external agents from governmental bodies, non-governmental organizations (NGOs), or development projects.

RESEARCH METHOD

In the light of this context, the International Potato Center (CIP) regional network “Papa Andina Initiative”, funded by the Swiss Agency for Development and Cooperation (SDC), promotes, together with its strategic partners, mechanisms and approaches to link technology supply with farmers’ needs, based on market opportunities within a market chain framework. Papa Andina has conceptualized new forms of collective action, namely the Participatory Market Chain Approach or PMCA (Bernet et al., 2006) and Stakeholder Platforms to foster market chain innovation in ways that benefit small farmers as well as other market chain actors.

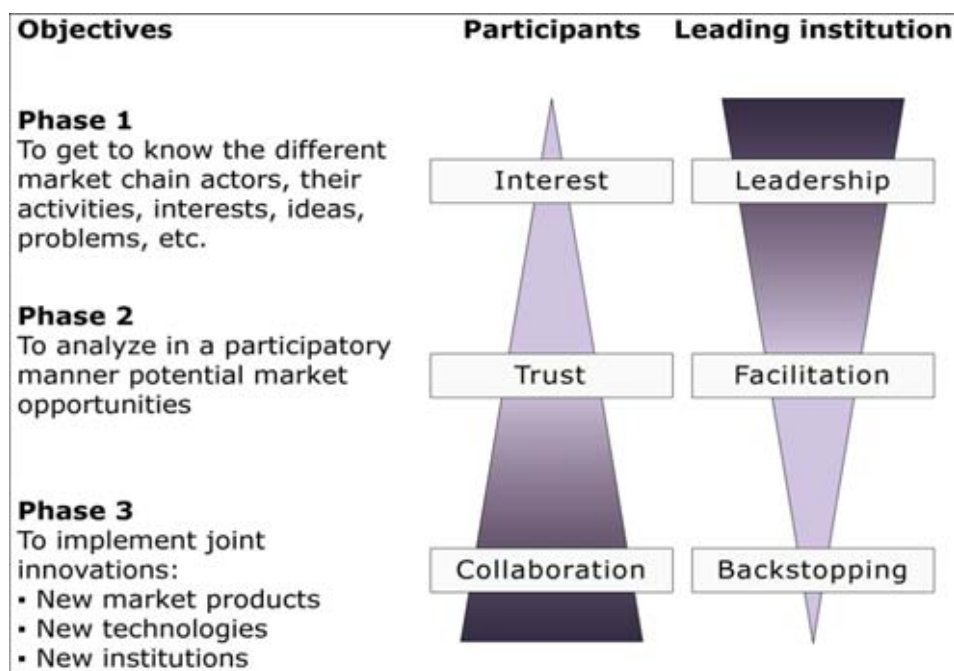
Participatory Market Chain Approach (PMCA)

Papa Andina and the INCOPA Project¹, its strategic partner in Peru, have developed and conceptualized the Participatory Market Chain Approach or PMCA (Bernet et al., 2006) as a structured three-phase participatory methodology to identify and exploit new business opportunities that can benefit the poor. The *first* phase of PMCA is a learning stage, where stakeholders are identified and common problems are discussed; and a qualitative assay of the market chain is performed. In the *second* phase or analysis phase, thematic groups are organized and facilitation is provided to analyze market opportunities. *Third*, the thematic groups use the feedback provided during public events organized after each phase to implement jointly commercial, institutional and technological innovations (Figure 3). Along the whole PMCA process, the information exchange among the stakeholders contributes to building trust as an essential condition for starting joint venture type of businesses.

¹ INCOPA, Spanish acronym of Project for Innovation and Competitiveness of Peru’s Potato Sector.

The premise with the PMCA approach is that commercial innovations are the driving force to promote other type of innovations -technological and institutional-, along the market chain, which are required for feeding the newly identified products. Technological innovation may include research for new product development or culinary uses. It also includes: the development of quality standards, variety selection for processing, improvement of production processes, storage and post-harvest techniques, and commercial information systems. Furthermore, in order to provide the enabling environment for these innovations to take place and to enforce new rules of relationship among stakeholders, institutional innovation becomes a key element to sustain this new innovation environment. Therefore, the concept of multi-stakeholder platforms has been defined as an organization where different stakeholders interact to understand each other better, for learning and developing shared priorities, defining roles and agreeing on joint actions (Devaux et al., 2005), and it becomes a necessary complement for sustainability.

Figure 3. PMCA: A methodology for mobilizing capacities for innovation



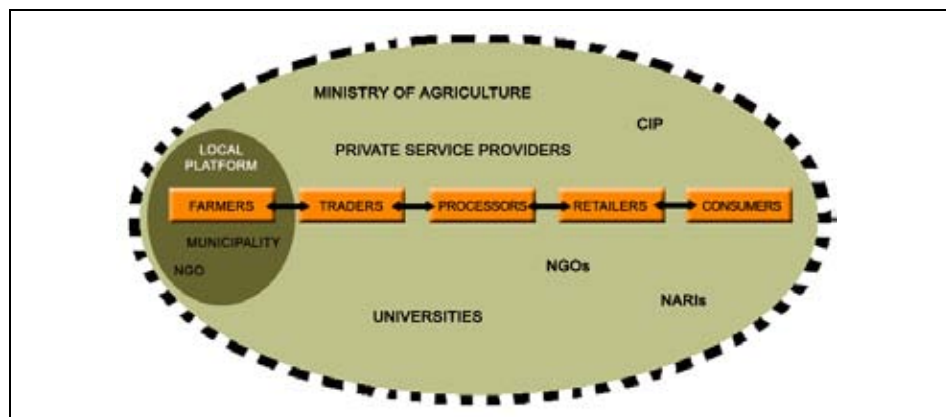
Stakeholder platforms

In the Andes, interactions among market chain actors and service providers are frequently characterized by a lack of trust, and successful private-public partnerships and alliances are rare (Hartwich and Tola, 2007). Agricultural research organizations usually keep their distance from NGOs, farmer groups and traders. The quest for market-led innovation made it necessary to look beyond the research community and

build relationships with a broader range of public and private actors. Papa Andina employs stakeholder platforms to promote interaction, social learning, social capital formation, and collective activities involving diverse actors in innovation processes (Devaux, et al., 2007).

Stakeholder platforms have been established at different levels. Local platforms facilitate interactions between potato producers, local authorities and service providers to empower small farmers, reduce marketing costs, and increase efficiency in service delivery. Market chain platforms bring farmer associations together with traders, processors, supermarkets, researchers, extension agents, chefs and others, to foster pro-poor innovation. In some cases, platforms also serve as representative bodies for interaction with policy makers.

Figure 4. Local stakeholder platforms help to articulate local market chain actors to foster pro-poor innovations and respond to market opportunities in the context of a market chain platform



APPLIED RESEARCH METHOD: APPLICATION OF PMCA TO DEVELOP T'IKAPAPA AS A MARKETING CONCEPT FOR NATIVE POTATOES IN PERU

Context

Although native potatoes represent about 80% of potato biodiversity in Peru, their presence in urban markets fell significantly behind improved or modern potato varieties. The initial rapid market survey in Lima revealed that urban consumers know very little about native potato varieties and other by-products such as white chuño or tunta (a traditional freeze dried potato), but also the survey showed that there was a general interest in promoting the use and learning more about native varieties, because consumers perceive them as natural products. Therefore, with the aim of promoting the utilization and improving the image of native potatoes in Peru, INCOPA project implemented in September 2003 the PMCA method in conjunction with the Ministry of Agriculture (Manrique, et al. 2006).

PMCA phase 1: understanding the native potato sector

The PMCA began with a rapid appraisal of the native potato sector that was obtained through a qualitative survey in order to: identify key actors, and understand their interrelationships and problems, as well as their expectations for a better collaboration among market chain actors. About 34 interviewees participated in the survey that comprised: potato growers, NGOs, governmental agencies, cooking schools, potato traders and other commercial agents. The results of the survey were presented in the first public event of PMCA where some 60 attendees representing major groups of stakeholders of the potato sector (i.e. producers, traders, processors, retailers, chefs, researchers and tourist agents) were present. The discussion following the presentation of results confirmed the general interest in promoting the use of native potato varieties mainly through novel dishes of Peruvian novoandino cuisine and improvements in commercial presentation. The study also revealed gaps in culinary research and lack of knowledge about the native potato varieties' production systems and seasonality. Afterwards a sketch enacted by the PMCA facilitators helped to emphasize the need for collaboration among market chain actors to promote native potatoes.

The participants were divided into two thematic groups: the "native potatoes" group and the "tunta" group, and both groups started deliberating possible ways to promote innovation with their respective products. Using a brainstorm technique and then labels to organize ideas, the work of both groups was supported and monitored by PMCA practitioners. The "native potatoes" group came up with three innovating ideas: production of a recipe book about native potatoes, development of a marketing concept to sell native potatoes in supermarkets, and the formulation of instant soups. On the other side, the "tunta" group decided to promote this ancient product through cooking and catering schools, and identified the need for a permanent supply of high-quality tunta. The one-day first public event of PMCA, finished with the presentation and discussion of these results in a plenary session. This article describes only the developments of the "native potatoes" group to explain the origin of the T'ikapapa marketing concept.

PMCA phase 2: analysis of the innovation options

After the first event, both groups worked in a parallel manner to develop commercial concepts for each product to test the commercial feasibility that was detected in previous market appraisal. Both groups met every two weeks for two months as a fixed routine, and a practitioner was responsible for keeping track of discussions and attendants. This period was very active in interactions and field trips.

The "native potato" group was made up of producers, processors, chefs, communication experts, researchers and extension agents. Considering the little information available about native potatoes and poor knowledge of the general public about potato native varieties, the group decided to revert this situation with a strong information effort to put native potatoes in the public eye. Therefore, the development of information materials was proposed, such as a catalogue of

“Peruvian native potatoes”, and a recipe book developed by cooking schools to promote the consumption and utilization of native potatoes. The group also realized the potential of selling these new and exotic types of potatoes in urban supermarkets where they had never been sold before. Then a discussion started to look for a proper brand name: after a brainstorming session, the group agreed on T’ikapapa (which means *potato flower* in Quechua). It was then analyzed which potato varieties would be the first to be introduced to the market and how production seasonality could be overcome by better crop planning across production areas. This is how a commercial prototype for fresh native potato, such as the T’ikapapa concept was developed and later become a commercial brand of processing company A&L Exportaciones y Servicios SAC for a bag with 1 kilogram of selected and classified native potatoes for retail sale. Additionally, “Puré Andino” a new concept for mashed potato was developed, which included the peel in the processing phase in order to avoid the excessive loss due to constrictions and deep eyes - a typical trait of the native yellow potato.

The second phase of PMCA ended with a public event where the advances of both groups were presented by the same group members. This event also served to motivate other actors to join the group and reinforce the initiatives that were under development.

PMCA phase 3: implementation of the business ideas

The implementation phase took about 6 months. In this period, important decisions were taken in the group, and the participation of specialists was required to draw up marketing strategies, design commercial brands and packages, and carry out shelf-life studies.

Among the attendees at the second public event, there were representatives of a local supermarket chain (Plaza Veja), who afterwards expressed to the group their interest in starting to sell fresh native potatoes. This exciting prospect prompted the completion of the T’ikapapa concept, which evolved into a commercial brand. Marketing specialists were hired to help with the initial packaging design to contain 1.5 kg of selected potatoes with a carton label. The processing company A&L Exportaciones y Servicios SAC started the registration process of T’ikapapa and signed purchase agreements with Andean potato growers, and promotional activities were carried out with the support of cooking schools in the retail store.

At the same time, tests for the development of the instant mashed potato (Puré Andino) were finally completed and the native yellow Tumbay variety was identified as the best input for this product. The final product was tested by chefs at international events in Germany and Switzerland with promising results. Two information flyers were produced: for T’ikapapa and Puré Andino.

The third and last public event was held at CIP Headquarters with a significant participation of governmental officials, international aid agencies, non-governmental agencies, businessmen, retailers, media and press. Nearly 200 participants attended the last event, which had wide press coverage so that it could be commented in

magazines and newspapers and watched on TV news by the general public; thus began a process of public awareness-raising that continues to this day thanks to the efforts of different partners. The program of the event included formal speeches by government officials (including Peru's Minister of Production) and then representatives of the thematic groups collectively presented the final results and accomplishments achieved during the PMCA process. The event concluded with a traditional social luncheon served by the participating cooking schools, serving innovative dishes made from the recipes they had developed during the PMCA process.

Beyond phase 3

The activities following the conclusion of the third phase were mainly wrapping up and consolidating activities, i.e. recipe pamphlets were published, as well as the native potato catalogue. The public events that were organized after each phase of the PMCA, offered the chance not only to motivate new interested participants, but also to interact with important key persons such as investors, businessmen, government officials or policy makers who can help the innovation process. It was during the last public event that it was possible to contact the Wong supermarket chain's chief executive officer and start negotiating the introduction of T'ikapapa in Peru's largest supermarket chain.

The application of the PMCA on native potatoes has made it possible to achieve innovation at three levels.

a. Commercial innovation: the development of T'ikapapa as a new marketing concept for native potatoes represents a milestone in commercial innovation in Peru's potato sector. The T'ikapapa concept has incorporated new marketing concepts such as social responsibility and fair trade while emphasizing the benefit to small-scale farmers. It is a modern marketing concept because it is environmentally friendly, since it promotes the conservation of potato biodiversity, and focuses on the gourmet market. The T'ikapapa concept represents a model of how biodiversity can be utilized in a profitable way.

b. Technological innovation: the thematic groups have identified a number of research issues (i.e. potato sprouting control, storage technology, quality seed production of native varieties, culinary research etc) that represent concrete bottlenecks for the development of a strong T'ikapapa supply chain. These topics had not been considered in the research agenda of any research institution. However, these issues are now being addressed by research partners and are under way.

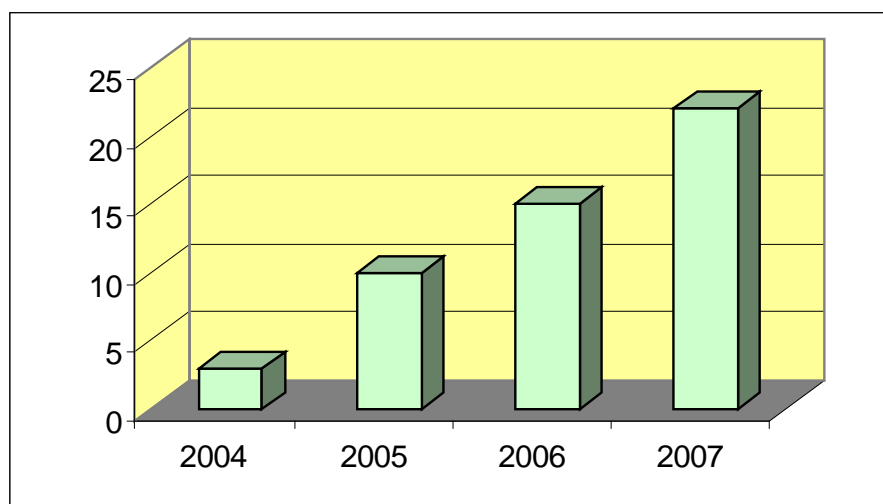
c. Institutional innovation: the PMCA on native potatoes has fostered new arrangements among different stakeholders based on contracts and/or clear quality standards for the potato supply. Participating in a value chain with access to technical assistance guarantees better prices for organized farmers. Therefore, local platforms and organized farmers are key to promoting not only commercial innovation but also technological innovation at different levels in the supply chain. Currently Fontagro (Fondo Regional de Tecnología Agropecuaria), another Papa Andina project, is

conducting a PMCA in Huancayo-Huancavelica with the specific goal of organizing a local platform to link a number of other projects that are either working in the same production area or have market-oriented activities with native potatoes and other Andean products.

RESULTS

Native potatoes have a strongly seasonal harvest time, therefore it was a challenge to organize the logistics to supply the processor continuously with quality raw material. The strategy involved CAPAC Peru (Cadenas Productivas Agrícolas de Calidad), a stakeholder platform that resulted from a previous PMCA application, to act as an organizer and linking entity working directly with farmer associations or communities. An increasing number of participating communities have joined in the supply chain every year since 2004 (Figure 5).

Figure 5. Accumulative number of communities supplying to T'ikapapa per ye

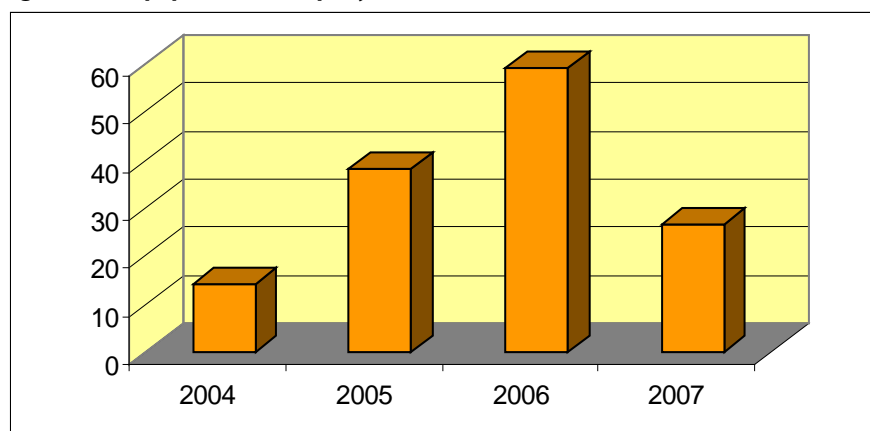


T'ikapapa was launched in 2004 as an exclusive product for Wong supermarket chain; only 14 MT were sold in the first year, and three Andean communities (72 families) were the suppliers of A&L processing company. In 2005, T'ikapapa was present in 26 outlets of Wong supermarket, 38 MT were sold and seven additional farmer associations (243 families) joined the T'ikapapa supply chain. The following year, five new farmer organizations joined the supply chain, and the year 2006 closed with a record sale of 59 MT to Wong supermarket. Then, seven new communities joined in the following eight months of 2007. It is estimated that in total, at least 500 families of native potato growers from 21 farmer organizations or communities from six Andean highland regions (Huancavelica, Junín, Huánuco, Cajamarca, Ayacucho

and Apurimac) were involved and benefited from the T'ikapapa supply chain, between 2004 and 2007 (Figure 6 and Appendix).

An important issue in this endeavor is the climatic change, the effects of which are devastating to the potato crop in the Andes. The weather in the Andean highlands in Peru fluctuates greatly: the day temperature can reach an average maximum of 20°C and a minimum of 5°C, although due to climatic change the frosts now have an erratic pattern and can hit any time. Usually in the highlands the winter season starts in June with an abrupt change of temperature. However, in recent years the occurrence of anomalous winters has caused temperatures to fall to between -25° C and -35°C. Snowstorms and cold winds caused by a polar air mass have mainly affected regions located 3,500 meters above sea level. This was the case of the frosts in July 2004 and February 2007, particularly the latter, where farmer communities involved in the T'ikapapa supply chain were severely affected, causing great losses in their native potato harvests, and affecting the volume of commercial tubers. The magnitude of the disaster is reflected in Figure 7 which shows the drop in average monthly sales from 4.9 MT in 2006 to 3.3 MT in 2007. This situation increases the vulnerability of poor farmer communities living in these areas. Some preventive measures have been taken for the next season such as the identification of less exposed growing areas, the use of field burners, and community-based early warning systems.

Figure 6. Tikapapa total sales per year (MT)



The T'ikapapa marketing concept of linking small-scale farmers from Andean highlands to urban markets, taking advantage of biodiversity, has succeeded in introducing native potato varieties from poor, indigenous, rural farming communities to an exclusive supermarket chain in Lima. This has brought increased revenue to the farming communities involved in the project and a great sense of achievement and pride. The prices received by small farmers selling their native potatoes to the supermarket as T'ikapapa were 20% higher than those of potatoes sold through traditional market channels during the 2005 pilot action. Formal agreements and contracts have been signed between A&L processing company and the organized

farmer communities to ensure stable prices and supply of quality raw material (Figure 8).

Figure 7. T'ikapapa monthly average sales per year (MT)

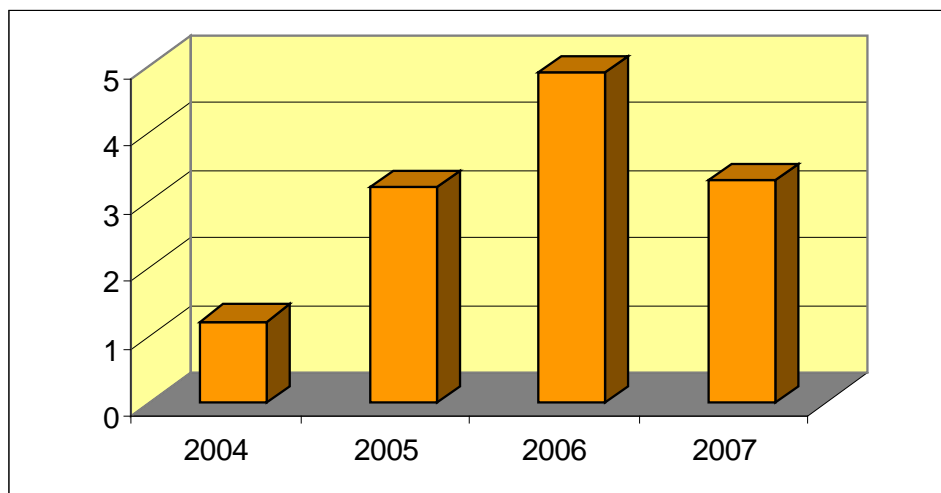
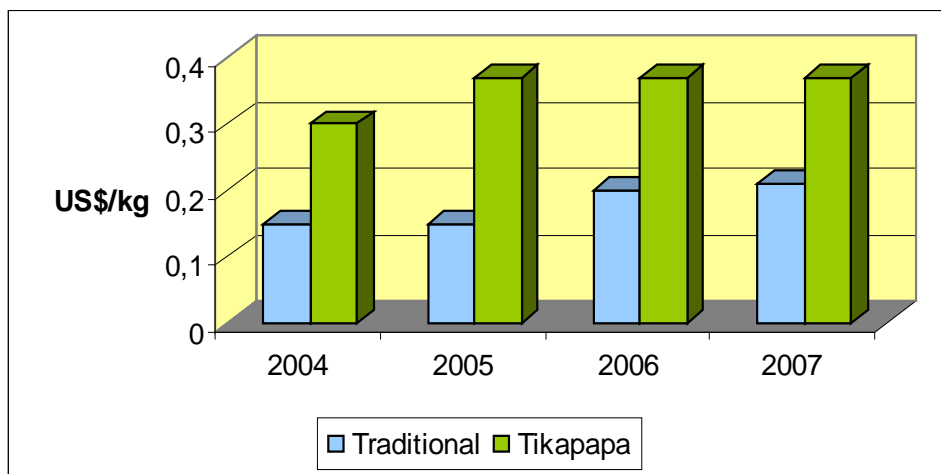


Figure 8. Sale prices (US\$/kg) paid through traditional market channels vs. platform

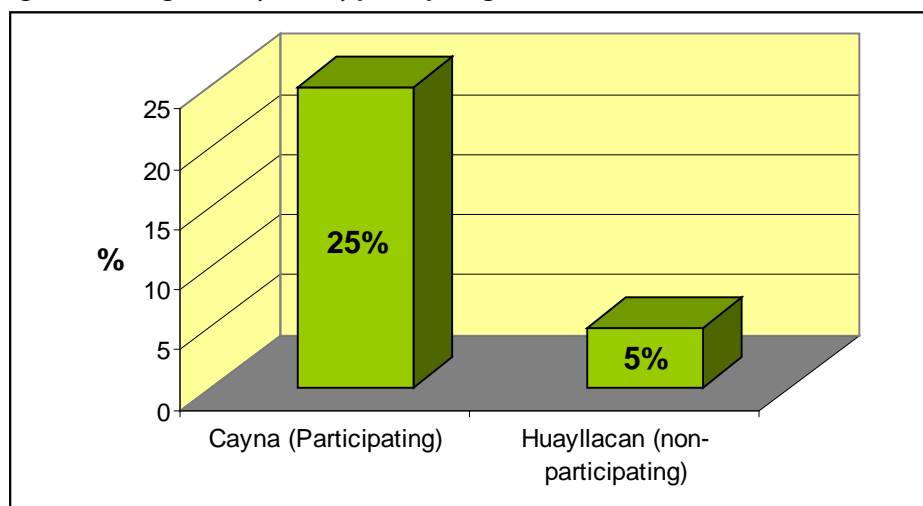


EVIDENCES OF IMPACT, PRELIMINARY RESULTS OF AN IMPACT STUDY

A recent impact study (Bucheli, et al., 2009) carried out in one of the supplying regions (Huánuco) compared the situation of Cayna, a community that participated in the T'ikapapa supply chain, and Huayllacan, a non-participating community. The study highlights the following benefits of participating as suppliers of T'ikapapa.

First, the participation in the T'ikapapa supply chain enabled Cayna to raise to 25% the volume of native potato tubers destined to the market (Figure 9), whereas the rest was used for home consumption and generated no income. Second, access to a new market that offered higher prices was the main reason given by more than half (53%) of Cayna farmers interviewed to explain higher incomes; increase in yields and better quality potato production (access to better seeds) is the second most important reason (cited by 37%). It is important to note that Cayna farmers have previously received technical assistance from the NGO ADERS-Peru that allowed them to improve their potato production system. This assistance included the setting up of community-based research groups (GIAL in Spanish)² that later evolved to become a community-based enterprise (Ecomusa San Pedro de Cayna).

Figure 9. Average tuber yields by participating communities



T'ikapapa, as the marketing concept for native potatoes, has succeeded in positioning native potatoes as a modern, quality and gourmet product in the mind of the consumer, where potato is usually perceived as a non-differentiated commodity. It has been the driving force for the development of technological and institutional innovations to sustain the development of T'ikapapa as a commercial new product.

AIMING AT IMPACT

Linking small-scale Andean farmers to new operative commercial circuits and new markets as a strategy for poverty alleviation is a valid assumption, but it can remain as a truncated approach unless other complementary skills and capacities are developed by farmers, and unless attitudinal changes are adopted by stakeholders to improve:

² GIAL is an adaptation from a similar methodology called CIAL (Spanish acronym for local agricultural research committee) to conduct adaptative field research.

efficiencies, equity, competitiveness, performance, and overall relationships among chain actors to develop a win/win situation. In this reference, the T'ikapapa case study shows that PMCA and stakeholder platforms have a significant potential to enable this powerful shift of attitude to occur, which can alter the whole course of communication among participating stakeholders that turn into social capital development, reinforcing institutional innovation.

Since its introduction to the market T'ikapapa's concept has been replicated by four different brands (Kusandina, Mi terruño, Cosechandina and Vivanda's native potatoes) owned by four entrepreneurs not involved in the PMCA process. This reflects the commercial viability of the original idea that emerged from the thematic groups.

Explicit quality standards have been set for the potato varieties involved in the T'ikapapa marketing scheme, and these are included in formal agreements and contracts, which under traditional marketing and trading schemes were inexistent. This allowed small farmers to gain reliable access to markets and prices, where otherwise transaction costs would be too high.

The project has achieved a significant public influence at the national and international level, reflected in public awareness and perception about potato biodiversity, and reinforcing its conservation (i.e. United Nations SEED Awards 2007, World Challenge 2007 award, National Potato Day in Peru, FAO Food Day Award 2006 and Entrepreneurial Creativity 2005 award). It was possible to maintain the interest of consumers and to promote potato consumption by improving the potato's commercial image and involving cooking schools as a new partner for innovation. Technological improvement for native potato production has become an issue in R&D organizations that want to tackle key topics such as: quality seed production, good agronomic practices in support of organic production, and adequate post-harvest management including storage technology.

The T'ikapapa marketing scheme is being replicated by new products such as native potato chips. On June 2008, Pepsico / Frito Lay presented "Lays Andinas", a new snack product that initially used 300 tonnes of native potato tubers from small-scale farmers to produce colored potato chips. The market response has been positive and there are prospects for exporting Lays Andinas to the U.S. and Brazil. New marketing concepts such as social responsibility and fair trade hold an untapped potential for the commercial development of biodiversity products, to deliver sustainable benefits to poor farmers; because they can be attractive concepts to consumers, and an interesting marketing component for the private companies, as they communicate to buyers the social benefits they generate for poor farmers with their purchase, appealing to their values and responsibility as modern consumers.

Therefore, in Peru the production area of native potato varieties has increased, although a major effort has to be made to coordinate production from different areas since the production of native varieties is seasonal and, identity and quality homogeneity has to be assured; especially if different communities participate as suppliers. Local platforms and market chain stakeholder platforms such as CAPAC can

play a key role to promote not only commercial innovation but also technological innovation at different levels in the supply chain, helping small farmers to engage in market opportunities.

However, the devastating damage caused by the frost in February 2007 has shown the extreme vulnerability of small Andean farmers when facing the effects of climate change, and how these effects also affect the rest of the supply chain. This extreme situation directly affects the food security, economic income, and family health of the most vulnerable communities. This experience shows that if a commercial innovation is not supported by an adequate technological backup to reinforce sustainability and post-harvest management, similar endeavors to link small farmers in the context of a market chain approach can be endangered.

Other intangible impacts have been attained: for example, the self-esteem of participating indigenous communities has been strengthened, since their products are appreciated in exclusive urban markets. Urban consumers have revalued the cultural heritage of Andean farmers; and urban supermarket chain owners are aware that including social responsibility in business adds value to their commercial image.

CONCLUSIONS

Local potato biodiversity and its by-products can be utilized in a profitable way by small-scale farmers, and its preservation is ensured by becoming an economic asset of the community. There are clear comparative advantages for Andean farmer communities to use their indigenous knowledge for biodiversity utilization to access niche markets, by getting organized in small enterprises and improving their ancient production systems.

Working in partnership is a new way of doing business for Andean communities, and to enter new routes of commercialization requires new partners and institutional schemes of relationship with stakeholders. The T'ikapapa experience reveals that it is a continuous learning process, which requires the development of new skills and capacities, particularly among small farmers. Their present weak organization and limited technology result in a poor quality product, and this limits their participation in market-oriented partnerships.

The development of an adequate organizational structure and new skills to become competitive are pre-requisites for other Andean communities that want to join market-oriented partnerships, since future commercial initiatives will involve working through market chains to create other partnerships needed to tap new market opportunities such as processed native potato by-products (i.e. potato flakes, chips) for gourmet and novelty snack food markets.

The high transaction costs of the initial period of introducing new products into the market can become a burden to small agro-industries and jeopardize further commercial development. Therefore, a careful strategy has to be designed to select the entrepreneur who can assure the commercial development and growth of the new products.

At the present time, 2011, the marketing scheme started by T'ikapapa has been replicated by other actors, and products with added value have been introduced. The public awareness activities that promoted the consumption of potato diversity have led to the creation of a new market segment that is now being exploited by other partnerships and productive chains to benefit small-scale Andean potato growers and enhance their livelihoods.

ACKNOWLEDGEMENTS

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APPENDIX

Farmer organizations participating in T'ikapapa. Supply chain, between 2004 - 2007

No.	Farmer Organization	Province	Region
1	Comunidad de Saclaya	Andahuaylas	Apurímac
2	Asociación Tesoro de los Andes	Andahuaylas	Apurímac
3	Comunidad de Huinchos	Andahuaylas	Apurímac
4	Comunidad de Jaje	Andahuaylas	Apurímac
5	Asociación de Productores de Hatarisun Kishuara	Andahuaylas	Apurímac
6	Comunidad de Sipullhuay	Andahuaylas	Apurímac
7	Comunidad de Tintay	Andahuaylas	Apurímac
8	Comunidad de Laramaru	Andahuaylas	Apurímac
9	Comunidad de Cavira	Andahuaylas	Apurímac
10	Asociación de Productores de Chullcuisa	Andahuaylas	Apurímac
11	Comunidad de Natividad	Andahuaylas	Apurímac
12	Comunidad Campesina de Pomamanta	Concepción	Junín
13	Asoc. de Productores Agropecuarios de Atacocha	Jauja	Junín
14	Asoc. de Productores Agropecuarios de Bellavista	Tayacaja	Huancavelica
15	Comunidad Campesina de San José de Aymará	Tayacaja	Huancavelica
16	Comunidad Campesina de Huillca Alta	La Mar	Ayacucho
17	Comunidad Campesina de Huillca Baja	La Mar	Ayacucho
18	Ecomusa San Pedro de Cayna	Ambo	Huánuco
19	Comunidad Campesina de Chonta	Churcampa	Huancavelica
20	Comunidad Campesina de Cumuhuilca	Churcampa	Huancavelica
21	Comunidad Campesina de Namora	Cajamarca	Cajamarca

Multi-stakeholder platforms for innovation and coordination in market chains: Evidence from the Andes¹

Graham Thiele, André Devaux, Iván Reinoso, Hernán Pico, Fabián Montesdeoca, Manuel Pumisacho, Claudio Velasco, Paola Flores, Raúl Esprella, Alice Thomann and Kurt Manrique

INTRODUCTION

In the Andes, interactions among market chain actors and service providers are frequently characterized by a lack of trust, and successful private–public partnerships and alliances are rare. Papa Andina and its partners have supported different types of multi-stakeholder platforms to promote interaction, social learning, social capital formation, and collective action involving these diverse actors in innovation and market coordination processes. This paper analyzes experiences with platforms of different types, presents a general framework for characterizing platforms, and identifies key lessons learned for facilitation and securing significant outcomes. It complements a more general paper prepared about Papa Andina’s innovation approach also prepared for this symposium (Devaux et al., 2010).

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The term “platform” is in vogue. Sometimes it is used to characterize a methodology such as Farmer Field Schools. (FFS) When used to refer to groups, it has sometimes been applied to any group which comes together for joint action. Building on previous work of Röling et al. (2002) and Papa Andina (Thiele et al., 2005), we define a multi-stakeholder platform as a space of interaction between different stakeholders who share a resource or common interest and interact to improve their mutual understanding, create trust, learn, reach consensus over priorities, define roles, and engage in joint action. Henceforth we refer to this as a “platform”.

It is an intrinsic characteristic of a platform defined in this way that it involves stakeholders of diverse types, who have different visions, ways of making a living, and sets of resources. A producer cooperative would not be a platform in this sense because it includes only one type of actor. The platform is relevant and has value for these stakeholders because there is interdependence between them, either actually or potentially. This interdependence can create tension, conflict, maneuvering to seek advantage, and even group displacement. But it also opens up opportunities for mutual understanding, building confidence, social learning and joint action (Röling et al., 2002). Hence the platform makes it possible to achieve changes which none of its

¹ Presented at the 15th Triennial Symposium of the International Society for Tropical Root Crops, 2009.

members could have achieved on their own. A platform is a particular type of partnership with an especially diverse and complex membership (Horton et al., 2009). Because of its complex membership, potential for conflict, and differences of opinion, a platform is likely to require facilitation and may have a lengthy initial phase of mutual learning and role definition before it can get down to business (Thiele et al., 2005).

Stakeholders can have different roles in a platform. In this paper we distinguish platform “members”, who are the core partners making up the platform, from “partners” who interact with the platform and share information and other resources and “clients” and “providers” who may receive or supply goods or services to the platform on a strictly commercial basis. In practice, these categories may be somewhat blurred and some “members” may be more passive than “partners” who are not considered full platform members.

Multi-stakeholder platforms were first proposed in the context of natural resource management where a group of stakeholders share a common resource such as water access in a river basin (Röling et al., 2002). The use of the concept in the context of market or value chains is less common and has hardly been discussed in the literature. A recent overview of collective action for small farmer market access gave particular consideration to small farmer organizations, but did not mention platforms (Markelova et al., 2009). In a market chain context, platforms may perform two somewhat different but interlinked functions. First, they create a space for learning and joint innovation. Second, they provide a coordination function within the market chain to reduce cost. Each of these functions can be linked to separate bodies of literature.

Devaux et al (2009) presents a framework for analyzing innovation in market chains, where the innovation arena is shaped by external environment, biophysical/material characteristics of the market chain, characteristics of market actors, and institutional arrangements. The Participatory Market Chain Approach (PMCA) as a facilitated process contributes to social learning, social capital formation, and joint activities which underpin commercial, technical and institutional innovations. Consistent with this framework, platforms have been used by Papa Andina and its partners as a structured space where innovation can occur and be sustained, and in this sense they are complementary to the PMCA as a process. Together, they have contributed to the creation of new potato products from which farmers and other market chain actors can capture higher value. By stimulating learning and improving access to information, platforms have played a role in the empowerment of small-scale farmers and women in the market chain. In a similar vein, Critchley et al. (2006) have emphasized the role of platforms as a space or theater where innovation involving different stakeholders can occur.

Two other bodies of literature - one academic and the other applied - have concerned themselves with market chain governance. Dorward et al. (2009), writing from a New Institutional Economics perspective, note that coordination between market actors provided through different non-market mechanisms can help actors in

developing countries reduce transaction costs and escape what they call the low-level equilibrium trap associated with underdevelopment. Developed countries have seen the emergence of supply chain management, defined as the “integration of key business processes from end-user through original suppliers that provide products, services and information that add value for customers and other stakeholders” (Lambert 2008). Given the increasingly “disintegrated” nature of supply chains made up of different enterprises in automotive, textile and electronics industries, Bitran et al. (2006) postulate the need for a neutral third player or maestro to coordinate the network of suppliers. The need for increased integration in developing countries, as well as the disintegration of more hierarchically organized supply chains in developed countries, has created a curious convergence with the need for new types of institutions that provide a coordination function in the market chain. As we shall see below, platforms have provided one such institutional mechanism for this market coordination function.

THREE PLATFORMS COMPARED

Origins

All three platforms grew out of a lengthy prior process of interaction between the partners involved. This interaction was supported through project activities linked with Papa Andina and funded by the Swiss Agency for Development and Corporation (SDC), including the regional Papa Andina project, Fortipapa in Ecuador, and Incopa in Peru. For most of those involved in the three countries, working with markets by engaging market chain actors and a broader set of stakeholders was initially new, unfamiliar and challenging. Each case involved a research organization: PROINPA (Foundation for Promotion and Research of Andean Products) in Bolivia, INIAP (National Agriculture Research Institute) in Ecuador and CIP (International Potato Center) in Peru, which had experience with participatory approaches for on-farm research but had not engaged multiple stakeholders to work with markets. It was clear in this new context that technological innovation was only one part of the process, so the research organization had to assume a new role. The research organization took the lead in overall facilitation of the process of platform creation and also played a subsidiary role in research to address specific market constraints. Papa Andina’s coordination unit played an important backstopping role and promoted the sharing of ideas about platforms as they were being developed. Because it was new, there were few guidelines and little group knowledge to draw on. Partners in each country were aware of, and learned from, what occurred in the other locations; but the origins, membership, structure, and functions of the three platforms were all different.

In Peru and Bolivia, the CAPAC (Cadenas Productivas Agricolas de Calidad) and Andibol (Bolivian Andean Platform) platforms were established after cycles of PMCA which had already led to other commercial innovations, and there was a perceived need for a more permanent forum to support the innovation process. These platforms engaged private sector market actors as either members or partners for innovation.

In Ecuador, the INIAP team which facilitated the creation of market-oriented platforms was critical of the PMCA application they had seen in Peru, because they felt that it paid insufficient attention to farmer empowerment and that there was a risk of capture of the benefits of innovation by the private sector actors involved. Here the INIAP team guided a broad process of consultation with non-governmental organizations (NGOs), Universities and others as part of the search for a “New Institutionalality” which meant explicitly adopting a multi-stakeholder approach, recognizing that agricultural research and technological innovation was only one element. This sought to build on the existing mandates and interests of regional research and development (R&D) actors in the potato sector, recognizing that each had a particular competence, but with a new set of institutional rules about how they engaged – this was the “New Institutionalality”. Initially, this was linked to the creation of a national-level platform REDCAPAPA (Estratégica para el Desarrollo de la Cadena Agroalimentaria de la PAPA) to improve equity and competitiveness in the whole potato chain (Reinoso and Thiele, 2002). While REDCAPAPA was not successful in engaging a wide range of actors and never became fully operational, it stimulated interest in local-level platforms linked to specific market opportunities. The INIAP team was influenced by an earlier experience with a platform in the Colomi municipality of Bolivia which had been led by PROINPA and supported by Papa Andina. In Ecuador, an experience led by CESA (Central Ecuatoriana de Servicios Agrícolas), an NGO, in Quisapincha, of setting up a platform to link farmers to markets where INIAP had participated, influenced thinking (Montesdeoca et al., 2002). The INIAP team drawing on these experiences, developed a method for constructing platforms with the following steps: identification of local market opportunities, analysis of stakeholders, formulation of “shared projects” (*proyectos compartidos*) by farmers organizations and groups of R&D organizations, training, input provision, marketing, farmer organization and consolidation, (Monteros et al., 2005). In Ecuador, in contrast to Bolivia and Peru, platforms were conceived of as alliances between R&D organizations and farmers; other market chain actors, such as restaurants, supermarkets, and Frito-Lay, which purchases potatoes for chips, were perceived as clients to be consulted and informed, but not as full platform members who joined in regular meetings. Through the Fortipapa project, INIAP helped establish four platforms; this paper concentrates on the Chimborazo platform, which began in 2003 to link small farmers with markets for processed potato.

Mandate, objectives, stakeholder roles and facilitation

CAPAC and Andibol have general mandates to promote market chains for potato and other Andean tubers and Andean products respectively. CAPAC has a specific objective concerned with promoting the inclusion of small producers and Andibol has adopted social responsibility as part of its name. Plataforma Chimborazo focuses on strengthening small-scale potato producers and positioning them in the market for processed potato; it is the only one to have the specific objective of organizing small potato farmers.

These differences in mandate and objectives are consistent with different stakeholder roles. Andibol engages private sector market actors as platform members. CAPAC interacts with some private sector actors as members (formal membership) and others (Frito-Lay and Wong) as partners. The Plataforma Chimborazo has treated private sector actors mostly as clients, and has placed greater emphasis on the organization and empowerment of small farmers within the platform.

All of the platforms have had external support and backstopping provided by a research organization or project. CAPAC and Plataforma Chimborazo have full time managers or coordinators, who spend a considerable amount of their time in supply chain management. In the case of Andibol, platform meetings are facilitated by PROINPA. Each of the platforms also has an elected Board (*Directiva*) drawn from its partners.

All of the platforms engage a wide and diverse group of stakeholders. CAPAC and Andibol include private actors such as MiChacra and Gastrotur cooking school in Peru; and Ricafrut, AsceX, and Bolivia Natural in Bolivia. Plataforma Chimborazo includes many more farmer organizations with many farmers attending meetings. It also has more commercial relationships with private sector actors. Initially, the primary client was seen as Frito-Lay, but in practice it was difficult to meet the more demanding quality (levels of reducing sugars) and quantity requirements imposed by this large agroindustrial client, and the most important group of clients was that of restaurants serving French fries in Ambato and Riobamba.

Activities

While CAPAC emerged out of the application of PMCA and the promotion of innovation, its current activities are principally concerned with providing technical orientation, capacity building, and information to members (farmer organizations) and partners (public local authorities); and commercial services on a not-for-profit basis for linking farmers to the supply chain of processors such as Frito-Lay (e.g. contract management, quality control). CAPAC only has one annual general assembly, and other stakeholder interaction is project-specific. In practice, involvement of some private sector partners is more active than that of some formal members. CAPAC also plays a role in advocacy and promotional activities, and takes part in technical normative commissions.

Andibol has regular monthly meetings with a principal focus on stimulating new product development with its Chef Andino trademark, and coordinating supporting technological innovation.

Plataforma Chimborazo had monthly meetings that focused on planning production, meeting quotas for delivery, and overcoming technical constraints to improve the quantity and quality of potatoes produced. A business roundtable was held in 2004 with potential clients, primarily restaurants, for Fripapa (suitable for frying) and other varieties. Stands had been set up with information about research and training activities of the platform, and production plans to assure regular supply;

and bags of Fripapa with the CONPAPA (Consortium of Small Potato Producers) label were distributed to participants. The Cooking School from ESPOCH prepared french fries and other processed potato products; and at the end, representatives of restaurants were asked to estimate purchasing requirements by variety (Reinoso et al., 2007).

Outcomes and impacts

Each of the platforms has outcomes linked both to innovation in a market context and to market coordination.

All three platforms have led to market-linked innovation. CAPAC contributed to developing the “Mi Papa” collective trademark and a certification label for potato trade with Corporate social responsibility - CSR (Thomann et al., 2009). They also provide expertise to private partners for the creation of new products (e.g. Ayllin Papa). CAPAC has also linked with researchers at CIP to disseminate postharvest practices (e.g. handling, packing, technology to inhibit sprouting). Andibol has also developed a trademark: “Chef Andino”. Responding to a request from Ricafrut to improve cleanliness, grading, and peeling, PROINPA and Kurmi carried out participatory research to develop a potato peeler and grader (Velasco et al., 2009).

The Plataforma Chimborazo identified and developed a new market for the Fripapa variety among restaurants in Ambato and Riobamba that were looking for a potato that made good French fries. In the area of technological innovation, the Plataforma supported training in integrated crop management with Farmer Field Schools; it also supported specific research on planting densities and fertilization to increase tuber size; and on planting periods to lower the levels of reducing sugars in potatoes for chipping, with local universities.

Turning to outcomes linked with market coordination, the Plataforma Chimborazo provided technical assistance, developed and monitored production plans with farmer quotas by area, and managed supply of potatoes to clients, primarily to restaurants. This supply chain management function was very time-consuming and occupied most of the time of the coordinator of the Plataforma Chimborazo. In addition, the Plataforma Chimborazo empowered farmer organizations and associations to assume a greater leadership role; this began with Farmer Field Schools, which helped build social capital by creating trained and organized groups and included specific training in leadership with a particular emphasis on women. This led to the creation of CONPAPA, which from 2007 took over the technical assistance functions, production planning, bulking up, and marketing functions that the Platform had previously performed, leaving it with a more limited role of coordinating service provision.

In the case of Peru, CAPAC has neither the vocation nor the resources to coordinate the whole supply chain. However, in the regions where no local partner (NGO) is available (Andahuaylas, Ayacucho), CAPAC carries out marketing tasks (contract management, quality control, and delivery at the plant) that cannot yet be handled by farmer organizations, and provides them with orientation and capacity building

for planning, production, and postharvest management. At the beginning of every planting season, planning meetings among CAPAC and farmer representatives are held to establish quotas by area and planting times, in order to organize production supply. Alliances with local partners are sought in order to develop technical assistance, and greater organization at farmers' level is encouraged.

An impact study of the Plataforma Chimborazo and other platforms in Ecuador, based on questionnaires and a control group, found that it was effective in improving farmer incomes and welfare (Cavatassi et al 2009).

CONTRIBUTION OF PAPA ANDINA TO PLATFORM DEVELOPMENT

Papa Andina as a regional project contributed to developing ideas about platforms, provided backstopping as platforms were implemented, and contributed to systematization of experiences and the formulation of an explicit methodology for platforms in Ecuador (Reinoso et al., 2007). Papa Andina coordinators participated frequently in meetings of the R&D organization that facilitated the development of each of the platforms. Papa Andina stimulated discussions among those involved in the three countries during workshops such as the workshop on PMCA and platforms in 2005 (Bobadilla, 2005). It also supported horizontal evaluations of the Plataforma Chimborazo in 2005 and of Andibol in 2009, as well as systematization of work with the different platforms (Thiele et al., 2007 and Velasco et al., 2009).

CONCLUSION

Papa Andina has promoted a general concept of working with platforms as a space for bringing different kinds of actors together. Partners within the Papa Andina initiative have shared ideas and progress made working with platforms, and there has been considerable cross-fertilization. Earlier work on platforms in Bolivia influenced the development of the platform concept in Ecuador in 2003-4, and visits by partners to the Ecuador platforms, including the horizontal evaluation in 2005, led to new thinking about platforms in Bolivia.

Despite the generation of a general platform concept and several exchanges of ideas among partners, there has been little explicit theory behind the creation of the platforms. In contrast, development of the PMCA was based on a prior theoretical construct - Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) - which structured the process of bringing stakeholders together to stimulate innovation from an early stage (Engel 1995). One attempt to provide a more general explicit theory was published, but not widely read or applied among Papa Andina and its partners, perhaps because it was too theoretical (Thiele et al., 2005). Theory behind platforms has been mostly implicit, and the platform facilitators involved followed their noses in pragmatically developing the platforms. Only one platform (Ecuador) appears to have had a specific procedure for implementing platforms, but this lacked the theoretical basis of PMCA and was more fully described after the platforms had been implemented to promote wider use (Reinoso et al., 2007).

Our principal conclusion is that Papa Andina has worked with two broadly different types of platform in a market context, and that both have been effective:

1. Platforms structured along market chains bring farmers and their associations together with traders, processors, supermarkets, researchers, chefs, and others to foster the creation of new products with greater possibility of added value for small farmers, and pro-poor innovation. This type has been more widely described in previous publications (Devaux et al., 2009)
2. Platforms structured around geographically delimited supply areas have also addressed market coordination problems in assuring volumes and meeting quality and timeline constraints associated with a supply chain made up of many dispersed and small producers. They also address coordination problems in the subsidiary “markets” for support services and complementary inputs, bringing NGOs and others in to provide technical support or access credit

The platform in Bolivia is concerned mainly with innovation, and the platform in Ecuador with market coordination. The case of Peru is more complex: while it began primarily to stimulate innovation, at present its activities appear to concentrate more on improving market coordination. Both types of platforms have also served as representative bodies for interaction with policy makers.

There is a growing body of evidence that platforms can achieve significant outcomes and impacts, but more systematic impact evaluation is still needed (Cavatassi, 2009). So while platforms of heterogeneous groups may be more difficult to facilitate than homogeneous ones (e.g. producer associations), it seems likely that they may result in new products, processes, norms, and behaviors. So far, however, platforms have lacked a coherent theoretical framework, compared for example, to the PMCA. Hopefully, this paper should encourage more rigorous comparative analysis and stimulate wider use.

Table 1. The platforms compared: coverage, mandate, objectives and coordination

	CAPAC Peru	Plataforma Andina Boliviana (Andibol) "business with social responsibility"	Chimborazo platform
Coverage	National, Peru, concentration Huancavelica, Junín, Ayacucho, Apurímac	Department of La Paz, Bolivia	Provincia Chimborazo, Ecuador
When working	2003 - ongoing	2007 – ongoing	2003-2007 (from 2007 most functions assumed by CONPAPA).
Mandate or mission	A second-level organization for social, economic, and technological development with an orientation to provide highly specialized services for the development of market chains of potato and other tubers which are cultivated in the highlands of Peru	Promote and facilitate the development of businesses with Andean products	Achieve the positioning in the agro-processing market of the potato of the small farmers in the province of Chimborazo supporting production, improving marketing mechanisms, and strengthening their entrepreneurial structures.
Objectives	Promote the development of the small farmer and market chains for tubers. Support improving income and employment of the actors who take part in market chains for tubers, and small farmers in particular. Promote the consumption of potato with concepts of quality and competitiveness. Support a qualitative improvement in the policy environment for these crops. Position CAPAC as the most recognized institution for tubers at the national level.	Design methodological tools that will guide the entrepreneurial development of beneficiaries. Put in place quality standards for Andean products. Develop mechanisms for responding to demands for technological innovation. Jointly contribute to the organization of efficient mechanisms for product assembly operated by farmer associations. Engage actors who will provide finance for business development.	Group and organize small potato farmers in the province of Chimborazo. Stimulate potato agri-business, linking small potato farmer organizations with market opportunities. Participate actively, with strategic alliances, in the organization, production and marketing in the market chain of potato and processed products. Seek the improvement of the quality and productivity of the potato through backstopping and technical support.
Facilitation/ coordination	Backstopping INCOPA (CIP) General manager Technical manager Board General assembly	Facilitation: PROINPA Board: Coordination, business development, technological innovation and commercial development	Backstopping and general facilitation: INIAP Full time platform coordinator with NGO. Board selected from farmers.

Table 2. Platforms compared: stakeholders and activities

	CAPAC Peru	Andibol	Chimborazo platform
Stakeholders	<p>Members: 5 producer organizations (635 families) NGOs: FOVIDA, SEPRA, DESCO, ADERS-Peru, PROAANPE Small agro-industries: MiChacra, A&L, Colcahuasi Others: Union of Stevedores of Lima wholesaler market, cooking school Gastrotrur, Mi Chacra (market information service provider), 4 wholesalers (handle “Mi Papa” Brand) Partners: Govt. Bodies (MINAG, EMMSA) Regional govts., Junin and Ayacucho Private companies: Corporation Wong, Frito-Lay, Villa Andina, Gloria Group etc. Research centers (CIP, INIA)</p>	<p>Members: Producer associations: APEPA, APROECA, ASOPRACH, UNAPA and FLOR DE HABA Private companies: DEZE Ltda. (loading and unloading), RICA FRUT (processing, marketing and export), ASCEX (processing and export), and BOLIVIA NATURAL (processing and export Andean grains) Support organizations: KURMI (NGO), Program of Business Development, PROFIN Foundation (finance) and PROINPA Foundation (research)</p>	<p>Members: Associations and producer organizations (28 organizations and 324 families from Licto, Pungalá, Llucud, Cebadas, San Andrés in Chimborazo Province in 2006) NGOs: CESA, CECI, Foundation Marco Marketing company (SDC) Research organizations: ESPOCH and UNACH (Universities) and INIAP Clients: Frito-Lay for chips Restaurants in Riobamba and Ambato for french fries</p>
Activities	<p>CAPAC central office in Lima, 2 technical staff in Andahuaylas and Ayacucho based in offices loaned by municipal govts., give technical assistance to members and organize assembly with central office. Trade mark and information committees Leads the Papas Andinas (Andean Potatoes) Initiative and awards use of certification label.</p>	<p>Monthly meetings of Platform. Primarily project funded, but fund some joint activities with members own resources. Implement strategic plan.</p>	<p>Monthly platform and zonal meetings of producers. Fund supports activities and overall coordination with shared project. Training in integrated crop management in a market context with Farmer Field Schools Commercial production, farmer seed multiplication and production.</p>

Multi-stakeholder platforms

Table 3. Platforms compared: outcomes and added value by Papa Andina

	CAPAC Peru	Andibol	Chimborazo Plataforma
Outcomes related to innovation system	Owner of trademark "Mi Papa" (which resulted from PMCA). "Ayllin Papa" with supplier of Wong supermarket, supplied by CAPAC from Andahuaylas and Junín. Certification label with Lays Andinas. 3 companies on waiting list for label. Dissemination of new technologies: sprout inhibitors to extend period of availability and postharvest practices.	New trademark "Chef Andino" for all the products which are developed with the platform, currently with chuño processed products and quinoa flakes "Bolivia Natural". Technological innovation coordinated with members to respond to market demands: skinless chuño, mechanical peeler and a grading machine.	Identification of a new market for Fripapa as a potato apt for frying in restaurants in Ambato and Riobamba. Planting densities and fertilization to produce tubers with a higher percentage larger than 5cm (ESPOCH). Planting time to lower reducing sugars in potatoes for chips (UNACH).
Outcomes related to coordination in market system	Links small farmers with Frito-Lay providing native potatoes for colored chips under "Lays Andinas" product name. In 2009, sales to Lays estimated at 52ts by 68 families. Supplies potato, from farmers in Andahuaylas and Junín to Wong supermarket for "Ayllin Papa"	Pilot marketing of chuño flour for baking and soups with Chef Andino.	Provides farmers with quality seed. Coordination with credit agencies for production credit. Implementation of a production plan with quotas. Assembly and marketing of potatoes to restaurants and agroindustry (jointly with Marketing Company of SDC). Empowerment of farmers with CONPAPA.
Support and value added by Papa Andina	Development of concept of corporate social responsibility with a label of certification (www.papasandinas.org). Support in developing public awareness with INCOPA (National Potato Day), participation in the thematic seed group which achieved the official registration of native potato varieties. Exchange of experiences with partners from Ecuador and Bolivia in horizontal evaluations and study tours.	Support in start up of platform (backstopping). Support in systematization.	Contributed ideas about platforms to INIAP technical group and start-up of platform. Exchange of experiences in regional context and horizontal evaluation in 2005. Documentation and systematization of Platforms (e.g. Reinoso et al., 2007)

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Linking smallholder potato farmers to the market: Impact study of multi-stakeholder platforms in Ecuador^{1,2}

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ABSTRACT

This paper analyzes the impact of participation in multi-stakeholder platforms (*Plataformas*) aimed at linking smallholder potato farmers to the market in the mountain region of Ecuador. It describes and evaluates the *Plataformas* program to determine whether it has been successful in linking farmers to higher-value markets, and the effects that such connections have brought, particularly with regard to farmers' welfare and to the environment. The analysis is run comparing a set of different and carefully constructed control groups to beneficiaries and using various specifications. Results are strongly consistent across the different specifications and are sound across the counterfactuals, suggesting that impacts are adequately identified. Findings suggest that the program was successful in improving the welfare of beneficiaries, while potential negative environmental impacts, particularly with regard to agrobiodiversity and the use of agrochemicals, seem not to be a concern. Mechanisms through which impacts have been achieved are analyzed. Few spillover effects are found.

SMALLHOLDERS AND THE NEW AGRICULTURAL ECONOMY

The last two decades have witnessed profound changes in farming systems and the way in which agricultural production is organized in many developing countries. While changes affect the whole chain, they are most clearly manifested in the manner in which food is being retailed. Agricultural producers now supply long and complex value chains that are marketing high-value fresh and processed products to mainly urban consumers. On the input side, farmers increasingly rely on commercialized transactions in market venues to obtain seeds, and the use of agricultural chemicals, as the demand for product quality increases. These changes, referred to as the new agricultural economy, have led to new organizational and institutional arrangements within the food marketing chain, such as new forms of contracts, as well as the imposition of private grades and standards (Dolan and Humphrey, 2004).

The net effect of the new agricultural economy, both on the welfare of poor people and on the environment, is controversial. On the one hand, increased

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2 This paper is based on Cavatassi et al. (2009).

commercialization shifts farm households away from traditional self-sufficiency goals towards profit and income-oriented decision making. On the other hand, benefits to smallholders are by no means guaranteed and, indeed, the process may even exacerbate poverty levels through marginalization of the rural poor if they are unable to directly take advantage of new market opportunities or benefit from increased labor demand. Furthermore, the agricultural intensification that often accompanies market-oriented agriculture may lead to a focus on a few commercially-oriented varieties, increased use of chemicals, and intensified land use, and thus to potentially negative environmental and health consequences.

One approach that has been used in the Andean region to enhance the benefits to smallholders of linking with the new agricultural economy has been the multi-stakeholder platforms, *Plataformas de concertación* or simply *Plataformas* (Devaux et al., 2009). The *Plataformas* program in Ecuador has been implemented by the Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP) through the FORTIPAPA (Fortalecimiento de la Investigación y Producción de Semilla de Papa) project, supported by the International Potato Center (CIP) through its Papa Andina Partnership Program, and funded by the Swiss Agency for Development and Cooperation (SDC). The *Plataformas* program brought together potato farmers and a range of suppliers of research and development services, with the purpose of linking farmers to higher-value markets. High-value market purchasers included local fast food restaurants, supermarket chains, and the multinational food processor Frito-Lay. By establishing direct linkages of farmer organizations to these purchasers, platforms have displaced traditional intermediaries, potentially providing the smallholders with greater opportunities to obtain benefits from the changes in agricultural marketing systems.

The objective of this paper is to describe and evaluate the *Plataformas* program in order to determine whether it has been successful in linking farmers to higher-value markets and the effects, particularly with regard to farmers' welfare and to the environment that such connections have brought.

LINKING FARMERS TO MARKETS: THE LOGIC OF PLATAFORMAS

When smallholders have no apparent advantage in production, the challenge is to reduce the transaction costs associated with purchasing from large numbers of farmers producing small quantities to make them relatively competitive, or to devise a way to directly link smallholders to high-value purchasers. This requires organizing smallholders to overcome the costs of transactions, as well as providing them with the necessary information to meet market requirements. The *Plataformas* program does just this. The approach used is to provide support for smallholders from a range of institutions, through building a strong social capital. This latter function as a connector between groups and among individuals, thereby facilitating co-operation and mutually supportive relations; and, thus, it acts as an effective means of reducing transaction costs and linking associate farmers directly to high-value purchasers. The connection is reached in a manner that ensures that those buyers receive quality potatoes, of the variety they require, and in a timely fashion. The intervention

operates on the basis of a well designed program, through the whole potato supply chain, in such a way as to reduce inefficiencies, overcome barriers, and reduce costs in each link of the chain.

The logic of the program is to reduce transaction costs, so that smallholders can be a low-cost option for high-value purchasers and take advantage of the benefits of the new agricultural economy. The ultimate expected benefit of the intervention is to increase the income obtained from potato production, not only through increasing productivity, but also through higher output prices and through lower transaction costs. When transactions are taken care of by the Plataforma, single transactions requiring that each smallholder deals directly with final clients are avoided, and thus associated costs and burdens are dramatically reduced.

SETTING THE SCENE

In order to conduct a proper impact evaluation, it is crucial to have a clear picture of the intervention under scrutiny, its overall program and the context in which it operates. To this end, prior to the beginning of the evaluation, a qualitative study was conducted to inform and guide the research. This first phase was based on interviews with key informants, focus group discussions in the regions of interest, and a value chain analysis of the Ecuadorian potato market. This section describes the Ecuadorian potato market and the key elements of the *Plataformas*.

Ecuadorian potato market

The potato is the primary staple and one of the most lucrative market crops cultivated in the highlands of Ecuador. Farmers can be differentiated by the use of technology, chemical inputs, production efficiency, types of varieties farmed, and the degree of market integration (An, 2004). Cultivation is largely undertaken by small-scale farmers: 32.2% of farmers in the country grow potatoes in areas smaller than 1 ha (OFIAGRO, 2009), and about half of all potato farmers grow potatoes on less than 2 hectares of land (Mancero, 2007). Almost all potato production is for domestic consumption, with per capita consumption of around 32 kg per year (OFIAGRO, 2009).

Over the past decade, total production has fallen from more than 450,000 metric tons to less than 320,000 mt, while the cultivated area has shrunk from 65,000 ha to less than 50,000 ha (FAOSTAT, 2007). Average yields (6.8 t/ha) (INEC, 2001) are still far below the international average, not only when compared to Europe (17.27 t/ha) and North America (36.79 t/ha), but also when compared to nearby countries: 12.6 t/ha in Peru and 17.3 t/ha in Colombia (FAOSTAT, 2007). From 2002 to 2006, imports of potato-based products -- mainly frozen French fries --, have increased from 2,423 t in 2002 to 7,119 t in 2006 (OFIAGRO, 2009) in response to growth in demand, mainly from fast food restaurants. Although this still represents less than 2% of total consumption, it shows an interesting trend.

Description of the *Plataformas*

The *Plataformas* are multi-stakeholder alliances that bring farmers together with a range of agricultural support service providers, including INIAP, local NGOs, researchers, universities, and local governments. *Plataformas* are part of a comprehensive program involving practical intervention that pays special attention to improving the participation of low-income farmers in high-value producer chains, by providing them with new technologies, promoting their organization and social capital accumulation, and involving them in a “value chain vision” of production and commercialization that directly links them with the market.

The primary objective of the *Plataformas* was to “reduce poverty and increase food security, by increasing yields and profits of potato-producing smallholders” (Pico, 2006). The *Plataformas* program was undertaken in four provinces of the central highlands, two of which are the focus of the present study: Tungurahua and Chimborazo.

An integral component of the *Plataformas* was the training provided at the farmers’ field schools (FFS) in order to build the knowledge and capacity of farmers. FFS placed special emphasis on production technologies and integrated pest management (IPM) techniques aimed at improving quality and quantity of production while protecting the environment and farmers’ health. Farmers were taught techniques to efficiently manage soil, seed, insects, diseases, and pesticides using training materials adapted to resource-poor farmers. With regard to soil management, special emphasis was placed on techniques to reduce soil erosion, since most of the farmers are located in steep areas. Farmers were taught the importance of renewing seed of good quality and techniques to select their own stocks, considering the size, shape and health status of the tubers. Use of synthetic and organic fertilizers was also taught, including sources, methods and periods of application, and dosages. To efficiently manage Andean potato weevil (*Premonotrypes vorax*) and tuber moths (*Phthorimaea operculella*, *Symmetrischema tangolias* and *Tecia solanivora*), farmers learned the life cycle of the insects and different techniques to reduce the pest population and the damage it causes. Traps using low-toxicity insecticides are widely used to catch and kill Andean weevil adults. To manage late blight, farmers learned to recognize the symptoms of the disease, the life cycle of the pathogen, the use of resistant potato varieties, and the use of fungicides. Lastly, farmers were taught how to recognize the toxicity level of pesticides (by the color of the label), the main symptoms of intoxication, and how to protect the environment and themselves from risks associated with using pesticides. Hence, the training provided in the FFS with respect to the importance of preserving the environment and of protecting human health might reduce the over-usage of agrochemicals. However, pressure to reach market-required standards might operate in the opposite direction and the net effect on chemical use would need to be empirically determined.

Of particular importance among the varieties used is CIP clone 388790.25 (CIP, 2009) released by INIAP in 1995 as INIAP-Fripapa (Fripapa), and which is specifically suitable for processing and frying (Pumisacho and Sherwood, 2002). INIAP produces,

supplies and certifies high-quality Fripapa seeds, and has promoted their use in the *Plataformas* as they are demanded and preferred by fast food restaurants. Fripapa is particularly suitable for resource-scarce small producers, because it has a good degree of resistance to potato late blight and its use, therefore, reduces the need for frequent fungicide applications.

During harvest and commercialization, the Platforms carry out some quality control to ensure marketed potatoes meet clients' needs. They also identify potential clients who can make a commitment to make purchases as long as the produce meets their required standards. In this regard, the sales are on the basis of through pre-established verbal agreements.

CREATING A COUNTERFACTUAL: SAMPLE SELECTION, DATA COLLECTION AND DATA DESCRIPTION

Sample Selection

The challenge of evaluating the impact of a program, project or intervention is that it is not possible to observe what would have happened to participants in its absence. The key to identifying and measuring the impact is, thus, to have a proper counterfactual—that is, a comparison (control) group that is similar to the intervention (treatment) group with the exception that it did not receive the intervention. In the case of this study, the challenge in creating a counterfactual was complicated by the ex-post nature of the evaluation which required creating a counterfactual after the program intervention had been implemented. This entailed ensuring that the communities selected as controls had characteristics similar to the treatment communities at the initiation of the program.

The final sample includes three sets of households: i) beneficiaries of the program, ii) non-beneficiaries in the treatment communities (referred to as non-participants), and iii) non-beneficiary households in the control communities (referred to as non-eligible). Lists of households from each of these categories were provided by *Plataforma* coordinators and community leaders. Households from the lists were randomly selected to be interviewed (157 out of 227 in Tungurahua and 167 out of 232 in Chimborazo). The final sample included 1,007 households, of which 683 reside in beneficiary communities (324 participants and 359 non-participants) and 325 in control communities (non-eligible).

Data collection and description

The data were collected from June to August 2007 through a household questionnaire, which was designed to conduct an impact evaluation and which included a number of questions on participation in the *Plataforma*. The questions were developed based on qualitative information collected through an earlier value chain analysis and focus group discussions.

Description of indicators and impacts

In determining the success of the *Plataforma* program, we first wanted to find out whether the intervention it supported reached its primary objective of improving the welfare of participating farmers. To do this, we looked at the relevant primary indicators. If the answer was positive, that is, the intervention increased participants' welfare, the next step was to consider the mechanisms whereby this primary objective was reached; or, alternatively, to determine why the intervention might have failed to meet its objectives. Lastly, secondary indicators arising from *Plataforma* participation, particularly with regard to knowledge of precautionary measures in agrochemical applications and environmental impacts, are considered. These three sets of variables –primary indicators, mechanisms and secondary indicators– which measure the impacts we were interested in analyzing, are presented in Table 1 for the entire sample, as well as for the three distinct groups of households we are comparing. Tests of difference (t-test) for the equality of mean values are reported for participants versus non-participants, participants versus non-eligible, and participants versus all non-beneficiaries.

The first set of indicators in Table 1 shows that the group of beneficiaries, on average, obtained higher yields per hectare than the three possible counterfactual groups. The yields range from 6.3 t/ha for non-participants to 8.4 t/ha for beneficiaries. Although the average yield for beneficiaries is substantially below the average harvest in Latin America (16 t/ha), it is consistent with the average for Ecuador (6.8 t/ha) and about 2 t above the average of the focus region (6 t/ha) (INEC; 2001).

The mechanisms through which the platform achieves these outcomes are primarily through shortening and improving the efficiency of the potato value chain to decrease transaction costs and capture a higher share of final price for producers, as well as through the application of better agricultural techniques. Two transaction cost indicators are considered here - time per transaction, and price of sale - in addition to transport cost which is closely related to the transaction. Households on average sell almost half of their potato harvest (45%) at a price of about \$0.11/kg. The transport cost is about \$0.01/kg and the time spent on each transaction is around 1.29 hours. *Plataforma* beneficiaries appear to sell more, receive more value for their produce, and get a higher price per kg than non-beneficiaries.

The secondary indicators analyze the side impacts of participation in the *Plataforma*. The first, which considers both health and environmental impacts, is the use of agrochemicals. To assess the environmental impact caused by pesticides, a methodology -the Environmental Impact Quotient (EIQ)- to account for the toxicity level of the active ingredients contained in each pesticide and for their quantities has been used, as described by Kovach et al. (1992). The comparison of EIQ measures for fungicides (curative and preventative), insecticides, and total EIQ for the three household categories shows no significant differences (Table 1). This indicates that even if beneficiaries use more chemicals in terms of quantities and number of applications, their environmental impact is no different from that of the pesticides

used by other household groups, indicating that the types of pesticides beneficiaries use are less toxic.

Another environment-related indicator is the level of agrobiodiversity maintained at the household level, i.e., how the composition and share of potato varieties change due to market participation. The *Plataforma* program directs its attention towards commercial varieties. In particular, the Fripapa variety was introduced and supplied through the intervention of the *Plataforma* because of its market acceptance and resistance to late blight. If farmers are more specialized, the number of varieties cultivated may be reduced as farmers shift to the market variety. To measure this, four indices of diversity are used: the Count, the Margalef, the Shannon and the Berger-Parker index (Winters et al., 2006). On average they show that there is not a great diversity in the sample. Total potato planted per hectare is about 1,000 kilograms, or slightly more, with a large share represented by Fripapa (29%) and by INIAP-Gabriela (30%). While there appears to be no difference in agrobiodiversity between beneficiaries and non-beneficiaries, it does seem that beneficiaries have shifted toward Fripapa and away from INIAP-Gabriela.

In connection with the use of pesticides and their toxicity level, some health-related measures are considered. The percentage of households that use protective measures is in general very low: 19% use gloves, 13% use *ponchos* and 6% use masks (Table 1). Slightly higher is the percentage of farmers that use plastic protection for the shoulders (38%). The results show that on average 34% of farmers know that the red label indicates high toxicity level and 25% know that the green label indicates less toxic products. The results suggest that participating in the *Plataforma* did lead to more beneficiaries using precautions and having better knowledge about the toxicity of products.

THE EMPIRICAL APPROACH

The empirical problem faced in this analysis is the typical one of missing data to fill in the counterfactual. Propensity score matching (PSM) offers a potential solution to this problem if differences between the treatment and control are observable. The basic idea of PSM is to construct a control group that has similar characteristics as the treated group, through a predicted probability of group membership calculated via a logit or probit regression, and then compare the outcomes. An alternative to using PSM, particularly when control and treatment although not randomly assigned are reasonably comparable, is a weighted least squares procedure that uses weights calculated by the inverse of the propensity score (Todd et al, 2008).

We estimate the impact of the program using three approaches, i) a standard OLS (ordinary least squares) with multiple controls, ii) propensity score matching using a kernel weighting scheme and bootstrapped standard errors, and iii) an intermediate approach of weighted least squares with weights determined, as previously discussed, from the propensity scores. Additionally, we also reconsider the use of all non-beneficiaries as the best counterfactual and check the robustness of results using the four alternative counterfactuals: beneficiaries versus non-beneficiaries;

beneficiaries versus non-participants; beneficiaries versus non-eligible households; and treatment communities (beneficiaries and non-participants) versus control communities (non-eligible households).

IMPACT ANALYSIS AND RESULTS

Table 2 reports the results of the analysis of the least squares regression, propensity score matching and weighted least squares, comparing *Plataforma* beneficiaries to non-beneficiaries. An analysis using the weighted least squares with the alternative counterfactual groups was also made (not shown) to demonstrate consistency and robustness of results. The results are remarkably consistent across specification and make sense for the different types of counterfactual, indicating that the impact is well identified.

Table 2 shows that all three primary indicators of impact are positively and significantly influenced by participation in the program, with the estimated differences very similar across specification. The results suggest that yields are 33.3% percent higher as a result of the platform intervention, input-output ratios are about 20% higher, and gross margins per hectare were four-fold higher (Table 1). Overall, it appears that while beneficiary farmers paid more for some key inputs, they received the benefits of this investment through higher yields and higher prices, and thus higher returns to potato production.

Moving into the secondary indicators of impact, there is some concern that linking smallholders to market may lead to higher returns but at the cost of greater environmental and health problems. The increased use of inputs suggests that this might be a problem. The evidence is somewhat mixed, but does not seem to imply a widespread problem. Beneficiaries do not use significantly more fungicides, but do use significantly more insecticides and chemical fertilizers (Table 1). The evidence does not suggest, however, that they are using more toxic mixes of chemicals (see environmental impact, Table 1) and in fact suggests that they can identify toxic products better than before joining the *Plataforma*, most likely due to the training they received. The increased use of insecticides and chemical fertilizers may be due to quality requirement for tubers to be a certain size and free from any damage (including insect damage). Program participants are generally more likely to use protective gear, as evidenced by a greater use of a plastic *poncho* and mask.

A final concern relates to the influence on agricultural biodiversity of linking farmers to market. Market pressure may lead farmers to abandon traditional varieties and produce those varieties demanded by high-value markets. The evidence does not support this hypothesis, as indicated by the insignificant impact on any of the measures of agricultural biodiversity (Table 1). In fact, what appears to have happened is that farmers replaced one modern variety (Gabriela) with another variety (Fri papa), which is demanded for its frying qualities. Thus, this group of farmers is maintaining the same diversity level although changing the primary variety.

Table 1. Program Impact Indicators at household level+ for whole sample and comparing beneficiaries to counterfactuals

Indicators and mechanisms	Whole Sample	Benef.	Non-part.	Test vs. Benef.	Non-elig.	Test vs. Benef.	All non-benef.	Test vs. Benef.
Primary indicators								
Total harvest (kg/ha)	7006	8400	6290	**	6357		6323	*
Input-output ratio (planted/harvested)	8.24	8.89	8.98		6.86	***	7.92	
Gross margins (\$/ha)	112.7	259.5	63.1	**	18.4	**	40.8	***
Mechanisms								
Total potatoes sold (kg/ha)	3581	4961	2851	***	2958	**	2904	***
Total potatoes sold (% of harvest)	0.45	0.50	0.44	*	0.42	**	0.43	*
Value of potatoes harvested (\$/ha)	763	1085	590	***	621	***	606	***
Transaction costs (# observations)	475	167	158		150		308	
Transport (\$/kg)	0.01	0.01	0.01		0.01		0.01	
Time of transaction (hr)	1.29	1.27	1.07		1.56		1.31	
Price of potatoes sold (\$/kg)	0.11	0.14	0.11	***	0.10	***	0.10	***
Costs								
Input costs (\$/ha)	651	826	527	***	603		565	
Total seeds purchased (kg/ha)	196	255	179		156	**	168	*
Total seeds purchased (%)	0.20	0.25	0.17		0.18		0.18	**
Value of seeds planted (\$/ha)	181	247	155	***	144	***	149	***
Cost of seeds purchased (\$/ha)	49	82	43		21	***	32	***
Cost of paid labor (\$/ha)	97	147	49	***	97		73	***
Secondary Indicators								
Agrochemicals								
Preventive fungicide applied (kg or l/ha)	3.15	2.79	2.69		3.98		3.33	
Curative fungicide applied (kg or l/ha)	4.16	3.61	2.52	*	6.34		4.43	

Indicators and mechanisms	Whole Sample	Benef.	Non-part.	Test vs. Benef.	Non-elig.	Test vs. Benef.	All non-benef.	Test vs. Benef.
Insecticides applied (kg or l/ha)	2.22	2.95	1.71	**	2.02		1.86	**
Cost of chemical fertilizer (\$/ha)	124.68	153.75	121.49		99.33	***	110.44	***
Cost of organic fertilizer (\$/ha)	46.04	71.74	46.06	*	20.79	***	33.45	***
Applies traps (%)	26.7	59.4	13.1	***	8.1	***	10.6	***
Total traps used (#/ha)	26.32	66.50	5.57	***	7.71	***	6.64	***
Env. impact for preventive fungicide	39.18	27.43	31.43		58.50		44.93	
Env. impact for curative fungicide	32.25	20.60	17.29		58.72		37.96	
Env. impact for insecticide	23.81	27.53	19.77		24.21		21.99	
Total environmental impact	95.24	75.56	68.50		141.43		104.88	
Agrobiodiversity								
Number of varieties planted	1.66	1.66	1.66		1.65		1.65	
Margalef index of diversity	2.36	2.03	2.13		2.93		2.53	
Shannon index of diversity	0.36	0.37	0.35		0.36		0.35	
Berger index of diversity	1.45	1.44	1.45		1.47		1.46	
Most used variety: Fripapa (%)	29.0	53.4	15.9	***	18.2	***	17.0	***
Second most used variety: Gabriela (%)	30.1	19.6	38.4	***	32.1	***	35.2	***
Precautions with agrochemical applications								
Always use plastic protection (%)	38.2	42.9	36.5		35.3	**	35.9	*
Always use gloves (%)	19.1	24.0	15.8	**	17.6	*	16.7	**
Always use plastic <i>poncho</i> (%)	13.0	18.4	10.8	**	10.0	***	10.4	**
Always use mask (%)	6.4	10.1	4.1	**	5.0	**	4.5	***
Can identify most toxic products (%)	34.1	59.4	25.2	***	18.1	***	21.7	***
Can identify least toxic products (%)	24.7	43.3	18.9	***	12.2	***	15.6	***

Indicators and mechanisms	Whole Sample	Benef.	Non-part.	Test vs. Benef.	Non-elig.	Test vs. Benef.	All non-benef.	Test vs. Benef.
Observations	660	217	222		221		443	
Tests are differences in means (t-test); * significant at the 10% level; ** significant at the 5% level; *** significant at 1% level. + For households that have harvested.								

Table 2. Comparison of beneficiaries vs. all non-participants using different methods: ordinary least squares, propensity score matching, and weighted least square

Indicators and mechanisms	Ordinary least squares Diff.		Propensity score matching Diff.		Weighted least square Diff.	
Primary indicators						
Log of total harvest (kg/ha)	0.58	***	0.58	***	0.61	***
Input-output ratio (planted/harvested)	2.21	***	2.04	***	1.69	***
Gross margins (\$/ha)	204	***	232	**	194	***
Mechanisms						
Total potatoes sold (kg/ha)	1639	***	2011	***	1664	***
Total potatoes sold (% of harvest)	0.09	***	0.08	**	0.09	***
Value of potatoes harvested (\$/ha)	386	***	459	***	372	***
Transaction costs (# observations)						
Transport (\$/kg)	0.002	*	0.002		0.002	*
Time of transaction (hr)	-0.015		0.013		-0.031	
Price of potatoes sold (\$/kg)	0.029	***	0.031	***	0.030	***
Costs						
Input costs (\$/ha)	182		227	**	178	**
Total seeds purchased (%)	0.06	*	0.05		0.05	
Value of seeds planted (\$/ha)	91.9	***	94.8	***	83.9	***
Cost of seeds purchased (\$/ha)	47.7	***	47.6	**	33.0	**
Cost of paid labor (\$/ha)	46.8	**	85.2	***	32.5	*
Secondary Indicators						
Agrochemicals						
Preventive fungicide applied (kg or l/ha)	-0.32		-0.26		-0.235	
Curative fungicide applied (kg or l/ha)	0.48		0.40		-0.32	
Insecticides applied (kg or l/ha)	1.07	*	0.96		1.13	**
Cost of chemical fertilizer(\$/ha)	42.7	**	48.2	**	37.8	**
Cost of organic fertilizer (\$/ha)	17.8		24.0	*	16.1	
Applies traps (%)	0.50	***	0.47	***	0.52	***
Total traps used (#/ha)	55.9	***	55.5	***	57.8	***
Env. impact for preventive fungicide	-16.45		-17.27		-11.34	
Env. impact for curative fungicide	-4.77		-2.34		-12.69	
Env. impact for insecticide	5.28		4.41		7.78	

Indicators and mechanisms	Ordinary least squares Diff.		Propensity score matching Diff.		Weighted least square Diff.	
Total environmental impact	-15.94		-15.21		-16.26	
Agrobiodiversity						
Number of varieties planted	-0.01		0.01		-0.02	
Margalef index of diversity	-0.53		-0.64		-0.56	
Shannon index of diversity	0.01		0.02		0.01	
Berger index of diversity	-0.02		-0.03		-0.03	
Most used variety: Fripapa (%)	0.36	***	0.36	***	0.36	***
Second most used variety: Gabriela (%)	-0.15	***	-0.14	***	-0.150	***
Precautions with agrochemical applications						
Always use plastic protection (%)	0.08	*	0.07		0.06	**
Always use gloves (%)	0.05		0.04		0.03	*
Always use plastic poncho (%)	0.06	**	0.08	***	0.07	***
Always use mask (%)	0.04	*	0.06	***	0.04	***
Can identify most toxic products (%)	0.36	***	0.36	***	0.35	**
Can identify least toxic products (%)	0.26	***	0.26	***	0.25	*
Observations	660		660		660	

Tests are differences in means (t-test); * significant at the 10% level; ** significant at the 5% level; *** significant at 1% level.

CONCLUSIONS

The results are strongly consistent across the different specifications and the different types of counterfactuals, suggesting that the impact is well identified. Our findings suggest that the *Plataforma* program successfully improved the welfare of beneficiary farmers. All impacts related to the primary objectives of the *Plataforma* (gross margins and input-output ratio) are positive and significantly influenced by participation in the program. Since similar results are obtained when using the non-participants as a control group, the implication is that the program has very few or no indirect effects. The mechanisms through which the *Plataforma* achieves this success are: shortening and improving the efficiency of the potato value chain; and applying better agricultural techniques; decreasing transaction costs with the former, and improving yields with the latter. Results show that not only do beneficiaries sell more of their harvest as compared to non-beneficiaries, both in terms of percentage as well as quantity per hectare harvested, but they also sell at a price that is about 30% higher than those who were not in the program. To achieve these results, though, participant farmers have higher input costs, particularly for seeds (of which a higher percentage and quantity per hectare are bought) as well as for hired labor and fertilizers. Nevertheless, participants receive the benefits of this investment through

higher yields and higher prices, and thus higher returns to potato production. The existence of social capital has proved to be fundamental in implementing the program which, through its intervention, has strengthened the social tissue and has built or improved the capacity of farmers to link successfully to the market.

There is some concern about the increased use of inputs. While the results are somewhat mixed with respect to the use of agrochemicals, they do not seem to suggest a substantial problem. Our findings show that participants use significantly more insecticides and chemical fertilizers. However, they are most probably using less toxic products as the environmental impact is not significantly different from that of non-beneficiaries. These results might also be reinforced through the FFS and IPM approach used by the program, since it appears that through a better knowledge of risks and hazards associated with the use of agro-chemicals, participant farmers tend to use more protective gear, although overall the percentages are remarkably small. Likewise, the concern about potential impacts on agricultural biodiversity is unfounded, as seen by the insignificant effect on any of the four indices of agricultural biodiversity considered.

Overall, participation in the Plataforma suggests a successful way of linking smallholder potato farmers to the global market. While primary benefits are undoubtedly obtained, concerns relating to potential costs supported by the natural resource base with respect to varieties cultivated and agrochemical impact seem to be unfounded. The success of the Plataforma can be first explained by its patient and efficient intervention along the value chain, eliminating unnecessary transaction costs and intervening also on the input side, not only introducing and supplying market-demanded varieties but also, and above all, providing good quality seeds. Secondly, the importance of the social capital in determining participation in the Plataforma can explain its successful results, while suggesting the most effective way of overcoming entrance barriers. Finally, it is important to note that while the program proved very successful, it only applies to a small proportion of Ecuadorian potato producers. Thus, if any significant effects are sought at national level, successful programs and interventions such as this need to be scaled up, taking into account context-specific situations and using appropriately those elements that have proven successful.

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Fostering pro-poor innovation: The case of the Bolivian Andean Platform¹

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ABSTRACT

Agricultural development in developing countries is taking place in the context of rapid urbanization and increasing market integration. In this context, the question of how and to what extent poor farmers and other economic agents can face the challenges and opportunities posed by market transformations is still a challenging question in the current debate of agricultural development in developing countries; and it certainly concerns the role of research and development organizations.

In order to deal with this challenging context, working in partnership and other forms of inter-organizational collaboration (networks, alliances, coalitions, platforms) are becoming a growing practice in organizations concerned with agricultural research for development. However, the associated literature reports that in-depth cases studies are needed to expand knowledge on the role that these forms of inter-organizational collaboration play or could play in research, innovation and development in the agricultural sector of developing countries (Horton, D., et al. 2009).

Using the innovation system perspective as a conceptual framework, this paper reports on the experience of the Bolivian Andean multi-stakeholder platform (ANDIBOL) -a social network involving potato producers, regional research and development (R&D) organizations, non-governmental organizations (NGOs), and medium-scale enterprises-, in fostering pro-poor technological innovation to develop and exploit market niches for “*chuño*” (a traditional freeze-dried potato product) in the most demanding urban markets. After describing the case, the paper discusses some of the challenges that R&D organizations face when working in close cooperation and coordination with a wide range of actors.

INTRODUCTION

Changes in urban consumption habits and the growing importance of new actors in food markets (supermarkets, food industries and retailers) are increasingly exercising pressure on production practices and on the resources of small farmers and other small- and medium-scale market chain actors. These people, in turn, have limited access to market information, services, technology, and capital, as well as inferior bargaining power to compete in this evolving context.

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The panorama described above poses multiple challenges -as well as opportunities- not only to economic agents (including poor farmers) but also to agricultural R&D organizations and other development agencies. Although market opportunities have very often been signaled as a trigger for innovation, mainly in the private sector and recently in the small rural household sector in developing countries, the question of how and to what extent development programs and projects can help poor farmers to face those challenges and benefit from the opportunities posed by market transformations remains a challenging question in the current debate of agricultural development.

Bolivian farmers living in the Andean highlands are among the poorest in Latin America. Native potato varieties and the local knowledge for their cultivation and processing are perhaps the only resources possessed by farmers in these areas. Fresh native potatoes and the traditional freeze-dried potato product known as “Chuño” are normally used for home consumption, intra-household exchange, and trade in local markets. This paper reports on the experience of the Bolivian Andean multi-stakeholder platform (ANDIBOL),-a social network involving potato producers, R&D organizations, NGOs, and medium-scale enterprises- in fostering pro-poor commercial and technological innovation to develop and exploit market niches for this special processed product (chuño) in the most demanding urban markets.

The ANDIBOL experience has been analyzed from the perspective of the “Innovation system framework”. The analysis focuses on the associated processes of collective decision making and knowledge sharing undertaken by actors within ANDIBOL. The point of such processes is to provide insights about the potential, challenges, and implications for agricultural development programs and projects that entail bringing together a broad range of actors (and the inherent variety of social, cultural and economic background, interests, and expectations) for innovation in response to market opportunities and farmers’ needs at the same time.

CONCEPTUAL FRAMEWORK

This paper assumes the broad and flexible conceptualization of innovation offered by the Innovation System Perspective, whose main elements are developed below, in order to create a conceptual framework to analyze the experience of ANDIBOL in fostering commercial and technical innovation.

We start by introducing the concept of innovation as it is defined in terms of the innovation system perspective. Central to the innovation system framework definition of innovation is the presence of diverse agents playing different roles and interacting with each other in the process of generation, accumulation, dissemination, and use of knowledge in response to market opportunities or other social needs; and the formal and informal institutions in which such a process is embedded (Spielman, 2005; Johnson et al., 2003; Berdegúe, 2005; Hall, et al., 2001; World Bank, 2007).

The *first* noteworthy element in the previous definition is the fact that it explicitly recognizes that innovation is an interactive process that often requires quite

extensive relationships in order to sustain the acquisition of knowledge and permit interactive learning. Most of the literature on innovation systems mentions as of primary importance the flow of knowledge between actors in the process of technical change and the factors that condition these flows (Hall et al., 2000, 2001, 2003; Spielman, 2005; Johnson et al., 2003; Clark, 2002; Berdegué, 2005). Further, Johnson et al. (2003, p. 6) note that the flow of knowledge required for innovation necessarily involves “complex patterns of interaction and relationship between actors, generally characterized by reciprocity and feedback mechanisms in several loops”. Therefore, there is an important role for a broad spectrum of actors in the innovation process, and their different agendas and demands nourish this process.

Second, such recognition introduces a wider perspective concerning knowledge and its sources. Knowledge generation is no longer seen as separate from its context of use, as has been seen in more traditional approaches (Johnson et al., 2003; van Kerkhoff and Lebel, 2006). This consideration allows us to shift our attention from ‘basic research’ to the ‘processes of innovation’, where research becomes just one element of a wider process of transforming ‘new knowledge’ into goods and services (Barnett 2006, p. 2). This point of view – which can be expressed as “putting new knowledge into use” – means, among other things, that agricultural research organizations face the challenge of gaining new skills and capacities and changing their working schemes to cooperate and coordinate closely with actors from the demand side, if technological change is to be responsive to end users’ needs. It further signifies that the innovation process necessarily takes into account multiple sources of knowledge, both implicit and explicit, and that the existing stock of knowledge – possessed by each different actor – is a substantial source of innovation (either incremental or radical innovation).

The *third* remarkable element in the definition of innovation offered by the innovation system perspective is the institutional context in which the innovation takes place. If it is admitted that the pattern of interaction and interactive relationships among actors impinges on knowledge flows, there is an explicit recognition that the set of rules and regulations governing such relationships really matters for innovation.

Finally, under the innovations system perspective we can assert that improvements on the nature and extent of the interactions among farmers, R&D organizations and a broad range of other actors are widely important if innovation is to be responsive to poor farmers’ needs (Hall et al., 2001; 2007; Hall, 2006; 2007; Hartwich et al., 2005; Hartwich et al., 2007; Johnson et al., 2003; Spielman, 2005; Berdegué, 2005; The World Bank, 2007).

THE CASE: “THE BOLIVIAN ANDEAN PLATFORM (ANDIBOL)”

ANDIBOL is a market chain platform bringing farmer associations together with traders, processors, researchers, extension agents, service providers and others to foster pro-poor innovation. Papa Andina Initiative, a partnership program hosted by the International Potato Center (CIP), and the PROINPA Foundation, a private R&D

organization working in Bolivia, have promoted the use of stakeholder platforms as an approach to foster interaction, social learning, social capital formation, and collective activities involving diverse actors in innovation processes (Devaux, et al., 2009).

The efforts to build the ANDIBOL started in 2003. At this time, PROINPA Foundation used the Participatory Market Chain Approach² to foster innovation in the market chains for *"tunta"* and *"chuño"*, traditional freeze-dried potato products. These applications involved farmers, traders, food-processing firms, exporters, cooking schools and R&D organizations. In the first cycle, participants prepared a set of 'Bolivian Quality Standards for Chuño and Tunta'. In 2004, the PMCA was used again to identify new market opportunities for chuño and tunta, and ways to improve the products' image in markets other than the traditional ones. This exercise involved some participants from the first application plus chefs and the manager of a food-processing firm. It resulted in a new product: clean, selected and bagged chuño, marketed under the 'Chuñosa' brand. In 2005, participants established the 'Bolivian Chuño and Tunta Platform', formalized as the 'Bolivian Andean Platform ANDIBOL.

Among other activities, ANDIBOL has established links with market agents to develop better quality chuño-based products with a higher price and to explore the export potential of chuño. The platform has a strategic plan guiding its activities and has obtained additional financial resources to support new projects. The platform today is facilitated by PROINPA and represents 13 core members, including four farmer associations with around 200 members, processing firms, development projects, NGOs and other service providers (Devaux et al., 2009).

The following sections present the experience undergone by members of ANDIBOL in searching for, and adapting, two specific technologies to overcome chuño quality problems in response to market opportunities.

TECHNICAL INNOVATION IN RESPONSE TO MARKET OPPORTUNITIES

Market opportunities as a source of technical innovation

Based on the initial results in commercializing Chuñosa (clean, selected and bagged chuño) in supermarkets of La Paz and Santa Cruz (two of the main cities in Bolivia), the manager of RicaFrut, a medium-scale firm dedicated to the processing and commercialization of natural Andean products, revealed to its R & D partners in the platform the need to improve chuño quality to respond to urban customers' requirements, in particular: uniformity of size and shape; cleanness; and absence of

² The Participatory Market Chain Approach (PMCA) is another approach developed and promoted by the Papa Andina Initiative and its strategic partners in Bolivia, Ecuador and Peru. The PMCA was developed as an approach for identifying and exploiting new business opportunities that benefit the poor, by stimulating market-driven innovation of different types. It engages market chain actors, researchers, and other service providers in identifying and analyzing potential business opportunities (Bernet et al., 2006).

peel and pest damage. Since the quality of chuño stems essentially from the process of transformation of fresh potatoes into frozen and dried potatoes using traditional techniques at farmers' field level, meeting such demands made it necessary to search for technical alternatives that would enable farmers to improve their processing methods.

Interestingly, RicaFrut did not demand a specific technology. The demand was posed in terms of what can be called an "explicit demand", or the manifestation of a problem that needs to be solved (Bentley et al., 2004). In this case, the need was to solve quality problems.³ Once the demand was made, it was translated into what ANDIBOL denominates a "research mandate" and passed to the R&D organizations to search for technical solutions to overcome specific constraints hindering farmers and/or firms from taking advantage of market opportunities.

Looking for technical alternatives

According to the research mandate, PROINPA and the NGO Kurmi Cochabamba began searching for technical alternatives to solve quality problems at the field level. They found a local retailer using a manual machine invented by him to remove chuño peel. They also found that some years ago, CIFEMA (an R&D organization outside the platform dedicated to developing animal-drawn tillage implements) had already developed a prototype of a manual machine to classify fresh potatoes. The performance of this machine, however, had never been tested with the kind of potatoes that farmers use to obtain chuño. Both machines were taken as a starting point to carry out a process of participatory research to find out whether they solved marketing limitations and whether they were appropriate to farmers' working conditions.

Adapting and improving the potato peeler

PROINPA and KURMI researchers, working with a local mechanic, introduced the first changes in the manual machine used by the retailer. The new version was assembled changing the barrel of the first version for a cylinder made of metal sheet in order to make the peel remover stronger. Chuño producers from 4 communities tested the improved machine during 2 months. They tested aspects such as the time required to peel 1 *arroba* [®] (11 kg.) of chuño, the human effort required to operate the machine manually, the appropriate speed with which the cylinder need to be turned to achieve a good product, and the resistance of the materials that the machine was made of. Equally important was the participation of the manager of RicaFrut, who visited the production area to see how the machine performed and to verify that the chuño obtained met market quality standards.

³ Bentley et al. (2004:1) defines implicit demand as a research need that people do not ask for, but which they recognize if it is explained or shown to them in an appropriate way. Implicit demand must be identified by researchers on the basis of local problems and reconfirmed by the community. When implicit demands are correctly identified, they become explicit.

Two months later, in a meeting with farmers, researchers and local authorities, the results achieved were presented and the following suggestions were put forward:

- The material of the internal mechanism needed to be replaced with stronger material to prevent erosion.
- Introducing chuño into the machine was very difficult; therefore it would be necessary to install some kind of funnel on the top of the peeler.
- To facilitate the separation of removed peel, powder and clean chuño, it would be necessary to add a sieve on the bottom part of the machine.
- Finally, the peeler machine was extremely noisy.

It was not possible to work on these improvements with the local mechanic, so CIFEMA experts were contacted and the suggestions were passed on to them. Besides working on the aspects mentioned above, CIFEMA introduced modifications to improve durability, and to facilitate the repair and replacement of parts; they also investigated the type of cover material required to diminish noise.

Six new improved machines are now used by farmers. Interviewed by the researchers, chuño producers highlight the following initial results:

- Now we have more time available for other activities; the time required to peel 1 *arroba* (11 kg) has been reduced from 4 hours to 20 minutes.
- Normally, chuño was peeled by women; now with the machine, men and women share this work.
- We obtain clean chuño, without peel, and we are able to produce the quantity of chuño required by the “*empresario*” (Ricafrut manager).
- The firm (Ricafrut) no longer rejects our chuño.
- In the local market, our clean chuño also fetches a higher price.
- We need peeler machines in each community, however the price is high (400 US Dollars each) and we are not able to buy them.
- We will try to get funds from the local government to buy more machines.



Peeler machine first model

ADAPTING AND IMPROVING THE POTATO GRADER

To start the research process, PROINPA's researchers bought a classifier from CIFEMA and showed it to farmers. In order to make the machine usable for classifying chuño, the first idea that they proposed was to change the sieves used to classify potatoes in the original model for sieves especially designed to select chuño. However, the farmers refused this idea, arguing that the process of selection starts with the classification of fresh potatoes and therefore the only thing that they had to do was to adapt the shape and size of the sieves to suit the kind of potatoes that they use to obtain chuño.



Peeler machine second model

This information was communicated to CIFEMA experts, who transformed the sieves and then sent the classifier back to the farmers in the field. As with the peeler machine, the new classifier was distributed to be tested in four communities, and after two months the following suggestions were made:

- The new sieves worked properly with the potatoes used to produce chuño.
- It was necessary to reduce the inclination of the sieves to permit better selection.
- The classifier was too heavy to be transported; therefore four wheels needed to be added, instead of the two suggested by CIFEMA and PROINPA experts.
- The lateral metal sheets of the machine were too small and short; they needed to be enlarged in order to prevent losses.

Coming back to the CIFEMA's mechanics shop, the experts worked on introducing the changes proposed by the farmers, and additionally on modifications to improve the rotation mechanisms and to facilitate the sieve-changing operation.



Peeler machine final model

Twenty-four improved potato classifiers are currently being used in 16 different communities. Initial information about their performance has been gathered by interviewing farmers:

- The time required to classify potatoes was reduced from 12 hours to 5 hours.
- Normally, we women were in charge of this extremely hard work; our hands suffered injuries. Now we do this work together with the men and our hands no longer suffer.
- We have chuño of better quality, because when we work with selected potatoes the frost acts uniformly.
- We also obtain benefit from selling our fresh potatoes, because classifying potatoes by size we obtain better prices in the local market.
- As with the peeler, we cannot afford to buy this machine (350 US Dollars each), but we want it. We are going to try and get help from the local government.

VIEWING THE EXPERIENCE FROM THE INNOVATION SYSTEMS PERSPECTIVE: LESSONS LEARNED

At first glance, the experience of adapting and improving technology shown in the preceding sections does not significantly differ from other experiences of participatory research. Nevertheless, viewed from the innovation system perspective, this experience enables some lessons to be drawn to help agricultural R&D organizations and other development agencies to be responsive to farmers' needs and market opportunities at the same time.

Market opportunities have often been signaled as triggers for innovation. When participants in a well functioning market chain share information on market opportunities and challenges, they shape the direction of the innovation processes (Word Bank, 2007, p. 24). However, in developing countries, where poor farmers are marginalized from market chains or participate at a disadvantage, there is a need to strengthen farmers' capacity to organize and bargain, and to improve the flow of information on poor farmers' needs.



Classifier machine initial model



Classifier machine final model

In this sense, the experience has shown that ANDIBOL offered the opportunity to guide the direction of the technical innovation not only on the basis of farmers' requirements but also including the interests and knowledge of actors close to the demand side, thereby making market opportunities effectively work as triggers for innovation. The experience also illustrates the fact that in the context of stakeholder interaction, the participating R & D organizations have access to useful information to define and adjust their research agenda according to what end users really need. This last point has been highlighted by PROINPA and KURMI referring to the advantages in receiving specific assignments (ANDIBOL's "research mandates") to find technical solutions to solve specific constraints.

Taking advantage of market opportunities and allowing farmers to participate effectively in making profit from them require, among other things, that the process of technical innovation, and its associated research activities, follow the pace at which

the market evolves. ANDIBOL, as an institution where information and knowledge can be directly obtained from interested parties, and where market demand can be combined with information on what farmers require in order to respond to those demands, expedites the process of decision making on what needs to be researched and reduces the transaction cost associated with the search for useful information.

Moreover, the experience has shown that during the participatory research process, the combination of different sources and types of knowledge, tacit or codified, coming from farmers, firms and scientists, as well as the use of feedback mechanisms, speeds up the finding of technical solutions to specific problems and opens up the possibility of further adoption of technologies. This point has been illustrated by the fact that both machines have been adapted during a short period of time (less than one year) and because farmers have demonstrated their willingness to adopt them.

Working in the context of multi-stakeholder platforms like ANDIBOL means that agricultural research organizations face the challenge to gain new skills and capacities and to change their working schemes to cooperate and coordinate closely with a wide range of actors.

Different groups have different internal laws, rules, regulations, standards, cultural habits, values, attitudes, practices and interests. It is necessary to understand the institutional context in which innovation takes place and identify those components that are either an impediment or a potential for innovation. This task involves developing skills and capacities to:

- Interpret different institutional contexts and harmonize different agendas
- Include different sources and types of knowledge in the process of innovation
- Create mechanisms that enhance information and knowledge flows
- Enhance different forms of interaction
- Create incentives to participate and innovate collectively.

The fulfillment of these functions could result in the formation of “innovation opportunities” in which social learning, social capital formation and joint activities can be fostered.

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Horizontal evaluation: Stimulating social learning among peers^{1,2}

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ABSTRACT

Horizontal evaluation is a flexible evaluation method that combines self-assessment and external review by peers. We have developed and applied this method for use within an Andean regional network that develops new methodologies for research and development (R&D). The involvement of peers neutralizes the lopsided power relations that prevail in traditional external evaluations, creating a more favourable atmosphere for learning and improvement. The central element of a horizontal evaluation is a workshop that brings together a group of 'local participants' who are developing a new R&D methodology and a group of 'visitors' or 'peers' who are also interested in the methodology. The workshop combines presentations about the methodology with field visits, small group work and plenary discussions. It elicits and compares the perceptions of the two groups concerning the strengths and weaknesses of the methodology; it provides practical suggestions for improvement, which may often be put to use immediately; it promotes social learning among the different groups involved; and it stimulates further experimentation with and development of the methodology in other settings.

Experts come and experts go

Experts come and experts go
 They leave a list of things to do
 But the list's not ours, we weren't involved
 We put it in a drawer 'til
 They come again to test our skill
 Visits are a wondrous thing
 To go and see what's happening
 But memory's frail and time is short
 So on return we forget all heard
 Except the warmth of good times shared
 Experts come and experts go
But knowledge stays with us to grow
Horizontal 'valuation' 's not a quirk or aberration
Try it out and you will see
The method works like one two three

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INTRODUCTION

The authors of this ILAC Brief coordinate Papa Andina, a regional network of the International Potato Center (CIP) that promotes knowledge sharing among R&D partners in Bolivia, Peru and Ecuador in order to reduce poverty and foster sustainable development in the Andes.

For several years, we organized study visits for local professionals to exchange knowledge and experiences, and conventional expert-led evaluations to assess our work. The study visits were enjoyable and instructive for participants, but there were few clear outcomes and little follow-up. Evaluations by outside experts provided interesting results, but the implementation of their recommendations was patchy.

In view of the limitations of these two approaches, we developed the horizontal evaluation method with our partners as a participatory alternative that combines the best aspects of both. So far, we have organized four horizontal evaluations, improving the method each time. Further improvements are likely, so this brief describes work in progress.

Evaluation by peers is what makes the process 'horizontal', compared with the 'vertical' evaluation typically provided by outsiders of perceived higher professional status. This method differs from the anonymous peer reviews used by professional journals and research funders, in that horizontal evaluation is open and transparent, with all the participants encouraged to learn and benefit from the evaluation process.

Horizontal evaluation neutralizes the power dimension implicit in traditional evaluation, in which the 'expert' judge the 'inexpert' and the 'powerful' assess the 'powerless'. Because of this neutralization, a more favourable learning environment is created.

Most of those involved directly with Papa Andina have been specialists who work with potato R&D organizations. They come from broadly comparable social and professional backgrounds, with similar types of knowledge about potato R&D, and they see each other as peers. As stakeholders in Papa Andina they share an interest in the methodologies developed with support from the network. This gives them the motivation to participate, learn and contribute. Another motivation for active involvement is that some of those who serve as peer evaluators during one horizontal evaluation know that their own work may later be evaluated by other peers within the network.

THE METHOD

Horizontal evaluation is a flexible method which can be applied in a range of settings to facilitate: the sharing of information, experiences and knowledge; the building of trust and a sense of community, which in turn fosters knowledge exchange; the social or interactive learning and corrective action needed to improve R&D methodologies; and the adaptation and wider use of these methodologies.

Experiences: To learn about and improve the R&D methodologies under development in our network, we have done four horizontal evaluations to date:

3. An evaluation of the Participatory Market Chain Approach (PMCA), conducted with the Promoción de la Producción Competitiva de la Papa Peruana (INCOPA) project in Peru (2003)
4. An evaluation of methodologies designed to articulate the demands of small-scale producers and match these with the supply of new technologies, conducted with the Innova project in Bolivia (2004)
5. An evaluation of the use of multi-stakeholder platforms to link small-scale farmers with markets, conducted with the Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP) in Ecuador (2005)
6. An evaluation of the initial application of the PMCA in Uganda, conducted with the Programme Régional d'Amélioration de la Culture de la Pomme de Terre et de la Patate Douce en Afrique Central et de l'Est (PRAPACE), a regional network for the improvement of potato and sweetpotato (2005).

The next box gives a brief description of the first of these experiences.

In 2005, we also used elements of the horizontal evaluation approach in an evaluation of the Papa Andina network itself.

We believe the approach can be applied in different types of projects and programmes, especially those that operate in a network mode.

Combining self-assessment with external review: The heart of a horizontal evaluation is a participatory workshop, typically lasting 3 days, involving a local or internal group (referred to as 'local participants') of 10–15 people and a similarly sized group of outsiders or visitors (referred to as 'visitors'). Visitors are peers from other organizations or projects who are working on similar themes and have a potential interest in applying the methodology under evaluation.

The role of the local participants is to present, and with help from the visitors, critically assess the methodology and make recommendations for its improvement. The role of the visitors is to critically assess the methodology, identifying its strengths and weaknesses and making suggestions that will aid its wider application. The visitors may contribute to the formulation of recommendations, but the local participants must take the lead and actually propose and agree them, since their ownership of the recommendations will be the key to implementation.

Planning the workshop: We work with our partners to identify an appropriate methodology to be evaluated, select participants and prepare for the event. An organizing committee should be established and should include decision makers from among both local participants and visitors.

We have learned that it is very important that the topic of the evaluation should be clearly defined: it is the methodology that should be evaluated, not the project or

organization that developed it. Defining and maintaining the scope of the evaluation is critical for its success.

Workshop organizers are responsible for:

1. Identifying an appropriate object for evaluation (in the cases we have supported, a methodology of regional interest)
2. Ensuring the participation of an appropriate group of local participants and visitors (the latter should have an interest in learning about and perhaps using the methodology)
3. Designing the 3-day workshop and finding a facilitator (who should be familiar with the horizontal evaluation method)
4. Developing preliminary evaluation criteria (these are often based on the criteria of the organization or project using the methodology)
5. Arranging field visits that will demonstrate application of the methodology
6. Sending both sets of participant's background information prior to the workshop
7. Arranging a 'dress rehearsal' of key moments and presentations for the workshop
8. Making provisions for writing up and using the workshop's findings.

Day 1– Introducing the methodology: The workshop works best if professionally facilitated. At the start of the event, the facilitator should introduce the objectives of the workshop and the procedures to be followed. The facilitator should stress that the workshop is not intended to evaluate everything the organization or project is doing but just the methodology that has been selected. S/he should encourage the visitors to be critical but constructive, identifying the strengths and positive aspects of the methodology as well as its weaknesses. S/he should also encourage the local participants to be open and receptive to comments and suggestions.

During the morning of Day 1, local participants present the context and purpose of the methodology, explain the stages involved in applying it and describe activities and results to date. Our experience has shown that interactive ways of presenting activities, such as a knowledge fair with a poster exhibition, are more effective than Power point presentations.

Applying horizontal evaluation to the Participatory Market Chain Approach in Peru

We helped the INCOPA Project, which led the evaluation, to design and prepare for the workshop. The partners identified the following criteria for analysing PMCA:

- Potential for developing new products for market
- Potential for empowering small-scale farmers and alleviating poverty
- Capacity to stimulate technological or organizational innovation
- Cost-effectiveness

Local workshop participants included market chain actors from Peru, while visitors came from Puno in southern Peru, from Bolivia and from Ecuador.

On Day 1, local participants explained the PMCA methodology and activities and achievements in entering two new markets: yellow potatoes to make crisps and standardized bags of selected and classified potatoes for the Lima wholesale market.

On Day 2, visitors went to two sites:

- A factory where yellow potatoes are processed into crisps. Visitors interviewed the factory owner about his impressions of the PMCA process
- The wholesale potato market in Lima. Visitors interviewed market authorities, intermediaries and members of the trade union who carry overweight sacks

The evaluation found the following:

Strengths:

- Rapid implementation using a participatory approach involving various sectors of the potato market chain
- Facilitation of shared investment and generation of a platform for future collaboration
- Empowerment of participants, who are active in the process and assume new responsibilities

Weaknesses:

- Need for complementary interventions to ensure impact on the poor

Recommendations:

- Training materials should be made available for those facilitating the PMCA;
- Experiences of application need to be properly written up and shared.

The workshop stimulated a learning process about the PMCA as well as an exchange of relevant knowledge. After the workshop the visitors applied and further developed the approach in Bolivia and Ecuador. Papa Andina supported this process, and documented both the approach and the outcomes (Bernet et al., 2005).

On Day 1, visitors should limit themselves to asking questions for the purpose of clarification and to requesting information that has not been presented. They should be discouraged from voicing judgments about the methodology at this point, and asked to wait until they have acquired additional information and insights during the field visits on Day 2. Our experiences have shown that even carefully prepared and rehearsed presentations usually provide insufficient information for evaluating an

R&D methodology. Hence, field visits are a critical component of the workshop and the evaluation.

During the afternoon of Day 1, after the initial presentations about the methodology, the list of tentative evaluation criteria prepared before the workshop is presented in plenary for discussion and revision. These criteria are extremely important, as they will be used throughout the rest of the evaluation exercise. Many aspects of the methodology could be evaluated, but as time and resources are of necessity limited, it is of the utmost importance to reach consensus on a short-list of criteria that are considered both to be good indicators of the methodology's usefulness and to be practical in the context of the workshop. We have found it useful to select no more than four criteria, which can then be used throughout the rest of the workshop and can provide a logical thread that holds the whole process together. The evaluation criteria should be used systematically by both groups of participants to structure their analysis at each subsequent stage of the workshop, including the field visit. This is a key point, since it ensures comparability of analysis across the groups.

Examples of the evaluation criteria we have used include:

- Effects on empowerment and gender equity
- Advantages compared to similar methods
- Cost-effectiveness
- Relevance

At the end of the first day the participants divide into small groups (6–7 members), each of which includes local participants and visitors.

These groups will visit different field sites and observe different aspects of the development and application of the methodology. In our cases, field sites have included communities, markets, local government offices, trade union offices and processing factories. Before going to the field, visitors in each group prepare a short interview on the basis of the evaluation criteria and make a simple plan (deciding, for example, who will introduce the group and explain the purpose of the visit, and what questions will be asked).

A 'workshop process group' should be set up and should meet at the end of each day to check on logistical aspects, assess how things are going and make any necessary adjustments for the next day. At the end of Day 3, this group should also assess how the workshop went as a whole and make recommendations for future horizontal evaluations.

Day 2 – Field visits: The field visit provides an opportunity for visitors to see at first hand the methodology under development and to talk with those whose livelihoods are directly affected by it. Visitors conduct semi-structured interviews, but should, in addition, carefully observe what they see and as far as possible try to triangulate different sources of information.

For example, if farmers say that participatory trials have been set up at a number of sites in the village, these should be visited.

Within each small group, visitors take the lead in asking questions. Local participants may act as guides, but should only provide information if explicitly asked to do so by visitors. Above all, they should resist the temptation to answer on behalf of those interviewed or to influence their answers.

After the field visit, each small group synthesizes its findings in tabular form using the evaluation criteria. At this point local participants may make comments and provide their interpretations of what occurred during the visit.

The small groups then come together in a plenary session and each presents its findings for each evaluation criterion in a table (see example in Figure 1), so that the findings can be compared and contrasted across sites by the whole group. Using digital photos to show the most important aspects of each visit gives findings credibility and retains people's attention during the session. The table is recorded and photocopied as a resource for participants on Day 3.

Figure 1. Table for comparing evaluation results across sites

Evaluation criteria	Site 1	Site 2	Site 3
Effects on empowerment and gender equity			
Advantages compared to similar methods			
Cost-effectiveness			
Relevance			

Day 3 – Comparative analysis and closure: Visitors and local participants work separately at the start of Day 3. For each evaluation criterion, the two groups identify strengths, weaknesses and suggestions for improvement. We have found it useful to work with 10 cm x 30 cm cards, which can be moved and grouped by evaluation criteria. The notes from the field visit help participants prepare the cards. To keep the exercise manageable, we have usually asked each group to limit itself to identifying no more than six strengths, six weaknesses and six suggestions for each evaluation criterion.

After this group work, visitors and local participants present their findings in plenary session. All participants, helped by the facilitator, then identify convergent and divergent ideas. Where the strengths converge or coincide, the local participants can feel confident that they are on the right track. In contrast, where weaknesses coincide for both groups, this probably indicates the need for corrective action. Where the groups' assessment of strengths or weaknesses diverge, the reasons for the divergence need to be explored in order to reach a shared understanding of the issue (but not necessarily agreement on it).

For example, in one workshop local participants identified 'a business plan' as a strength, whereas outsiders identified it as a weakness. After some discussion the

local participants realized that the farmers in fact had a 'production plan', with specific areas being sown each month, but that this was not the same as a business plan, which should instead deal with markets and profits. In this case the local participants changed their strength card to 'production plan' and the apparent contradiction was resolved. In other cases the divergence may be more deeply rooted, reflecting differing underlying values or mental models of the development process. In such cases the facilitator should not try to force a consensus, but rather to enable participants to reach a better understanding of the causes of differences.

After this plenary session, the participants again divide into two groups – visitors and local participants. Drawing on the previous plenary session, local participants synthesize recommendations and identify lessons learned as a basis for improving the methodology in the future. Visitors analyse the potential and requirements for applying the methodology in their own organizations and settings. Both groups then come together to present, discuss and modify their conclusions in a final plenary session. The workshop ends with the participants identifying specific and time-bound steps to improve the methodology and facilitate its wider use, if that is judged appropriate.

At the end of the workshop it is helpful to have each participant identify the positive aspects and outcomes of the workshop and what improvements could be made for similar events in the future. Such an exercise could be open, in plenary session, or it could employ a simple one-page questionnaire with two questions:

- What in your view are the most positive aspects of the workshop?
- What are your suggestions for making future horizontal evaluation workshops better?

The process group should also meet at the end of the workshop to analyse the event and its key outcomes and to suggest ways of improving the horizontal evaluation method for the future.

After the workshop: The organizing committee should establish clear responsibilities and deadlines for editing and distributing the workshop report. It is important to distribute the report soon after the event, while participants are still interested in its outcomes.

Local participants use the workshop's recommendations to make changes in the methodology being developed. Horizontal evaluation promotes ownership of the recommendations, making implementation more likely than in conventional evaluations. In all four workshops that we helped organize, horizontal evaluation led to significant changes.

Where the horizontal evaluation forms part of a broader network, such as Papa Andina, network coordinators may follow up by facilitating the exchange of information and the application or adaptation of the methodology by visitors (for example, they may provide consultancy support for more in-depth training in the

methodology, organize longer exchange visits, commission the development of training materials, etc).

ADVANTAGES AND CRITICAL SUCCESS FACTORS

We have found that horizontal evaluation has the following advantages over traditional external evaluations and study tours:

- It is adaptable to different objects of evaluation (including fairly complex R&D methodologies)
- It is enjoyable for participants who, as part of the process, learn a great deal in a dynamic yet structured environment
- Local participants accept critical feedback and observations more easily from peers than from external evaluators
- It fosters social learning, as local participants and visitors are actively engaged throughout the review process, which guides analysis and synthesis and generates new knowledge and proposals for action
- It stimulates experimentation with and further development of the methodology elsewhere
- It can be used in conjunction with a more traditional external evaluation, to generate additional information and insights

We have identified the following factors as critical for the success of a horizontal evaluation:

- Selecting the right moment for the workshop – one when the new R&D methodology is sufficiently advanced so that there is real substance to review but not so finished that there is little scope for modification
- Careful selection of visitors to ensure that they have diverse perspectives, possess adequate knowledge and experience, and are perceived as peers rather than superiors
- Good facilitation, so as to create an environment of trust, focus the attention of participants and manage time efficiently
- Identifying a limited number of clearly defined evaluation criteria
- Well prepared presentations and field visits that ensure the visitors have all the information they need to understand the methodology.

CONCLUSIONS

Horizontal evaluation has become a central element in our approach for developing R&D methodologies and sharing knowledge across the region in which we work. It is especially relevant for networks such as Papa Andina that seek to bring together peers for social learning in ongoing processes.

After each workshop we have reflected on and improved horizontal evaluation as a tool. We believe horizontal evaluation is now ready for use by others who are developing new R&D methodologies with partners in different locations and who are keen to learn from their experiences.

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Horizontal evaluation: Fostering knowledge sharing and program improvement within a network¹

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ABSTRACT

Horizontal evaluation combines self-assessment and external evaluation by peers. Papa Andina, a regional network that works to reduce rural poverty in the Andean region by fostering innovation in potato production and marketing, has used horizontal evaluations to improve the work of local project teams and to share knowledge within the network. In a horizontal evaluation workshop, a project team and peers from other organizations independently assess the strengths and weaknesses of a research and development (R&D) approach being developed and then compare the assessments. Project team members formulate recommendations for improving the R&D approach, and peers consider ways to apply it back home. Practical results of horizontal evaluation have included strengthening the R&D approaches being developed, experimenting with their use at new sites, improvements in other areas of work, and strengthened interpersonal relations among network members.

INTRODUCTION

Changes in information and communication technology have led to the emergence of a new paradigm of knowledge generation and sharing based on networks (Castells, 2000). Participatory evaluation involving different types of stakeholders has become increasingly common (Alkin, 2004; Cousins, 2005; Estrella, 2000; Fitzpatrick, Sanders, and Worthen, 2004; Jackson and Kassam, 1998; Whitmore, 1998). Where networks form the primary audience, different types of participatory evaluation are called for (O'Sullivan, 2004). This article introduces a new type of participatory evaluation that we have developed and applied with colleagues in the Papa Andina research and development (R&D) network. Established in 1998, this network fosters pro-poor agricultural innovation and sustainable development in the highlands of Bolivia,

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Ecuador, and Peru. We refer to this new type of participatory evaluation as “horizontal evaluation” (evaluación horizontal in Spanish) because it is based on a “horizontal” and reciprocal relationship between the members of a project team whose work is being evaluated and colleagues from other organizations in the network who participate in the evaluation process as external peers.

The article begins by outlining the origins of horizontal evaluation, the process through which it was developed, and the applications to date. The main section of the article describes the procedures used to conduct a horizontal evaluation. After this “how to” section, the article presents participants’ views on horizontal evaluation. It then describes how horizontal evaluation relates to other types of participatory evaluation. The article concludes with a discussion of conditions under which we believe others may find horizontal evaluation useful and some limitations for its use.

ORIGINS OF HORIZONTAL EVALUATION

The Andean highlands are home to some of the poorest people in Latin America. The region is characterized by extreme social and economic inequalities, reinforced by policy and institutional arrangements that exclude poor and vulnerable groups from decision making and governance. Around three fifths of the rural population in Ecuador and nearly four fifths in Bolivia and Peru are poor (Economic Commission for Latin America and the Caribbean, 2004).

Potato is the principal staple food and cash crop for most small Andean farmers. For this reason, international development agencies and national governments have supported a number of R&D programs specifically targeting the crop. Reflecting a broader paradigm change, agricultural R&D has shifted from a dependence on independent research institutes to a situation in which many organizations are engaged in knowledge generation and sharing through networks. Consistent with this new paradigm, the Papa Andina network (<http://papandina.cip.cgiar.org>) was created to promote pro-poor innovation for development in the Andean potato-based production and marketing system. The network is financed by the Swiss Agency for Development and Cooperation and other donor organizations and is hosted by the International Potato Center, one of 15 centers affiliated with the Consultative Group on International Agricultural Research. These centers pursue sustainable food security and poverty reduction in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment (www.cgiar.org).

Until recently, the Papa Andina network focused on applied research aimed at technology development. Innovation, however, requires a broader set of activities and processes. Whereas research aims to generate new knowledge, and technology development seeks to create a supply of new production methods of potential use to farmers and other economic actors, innovation refers to the application of new knowledge to achieve economic outcomes. Innovation processes often involve changes not only in production techniques but also in marketing and institutional arrangements—changes in the ways production is organized or business is

conducted. Innovation involves doing something new in a specific context, regardless of whether it is new elsewhere in the world (Perrin, 2002; World Bank, 2007).

The Papa Andina network includes approximately 30 partners in the three countries; in each country, one of these partners plays a coordinating role. By working with and through this network of partners, Papa Andina reaches a growing number of poor rural households, currently estimated to be around 4,000. The Papa Andina network has encouraged the development and testing of participatory R&D approaches to promote innovation. As partners in one country developed something different, the network encouraged collective learning to improve the approaches and share new knowledge. Three of the most important R&D approaches to be developed are described below.

1. The participatory market chain approach. Weak links between farmers and other market chain actors limit farmers' capacity to access new markets and secure higher incomes. Organizations in Peru that form part of Papa Andina began developing the participatory market chain approach as a response. This approach engages market chain actors, farmers, researchers, and other service providers in identifying and analyzing potential business opportunities (Bernet, Thiele, and Zschocke, 2006). It helps to build trust among market actors and R&D organizations and to empower small farmers. Enhanced trust unleashes the potential for innovation around new business opportunities, which creates possibilities for small farmers to raise their incomes.

2. Multistakeholder platforms for linking farmers and providers of agricultural support services. Small farmers need to organize for collective action and receive a range of agricultural support services to be competitive in a rapidly changing and globalizing environment. Partners of the network in Ecuador developed the concept of multistakeholder platforms as the basis for a project intervention in several provinces. Multistakeholder platforms were established as spaces for farmers and agricultural service providers, including research institutes and nongovernmental organizations, to share knowledge and experiences, develop a common vision, and work together more closely. This helps farmers to become more competitive and meet the quantity and quality requirements that new markets demand.

3. A set of methods for capturing small farmer demands for technology and linking this with the supply of technology. One of the "Achilles heels" of agricultural research has been the limited use of many new technologies developed by researchers. Papa Andina's Bolivian partners have taken the lead in developing a set of methods for improving the identification of farmers' demands for new technology and articulating this demand with what R&D organizations supply (Bentley et al., 2007). This should improve the effectiveness of agricultural R&D in providing technologies that farmers will actually use.

As members of Papa Andina's coordination unit (the first three authors of the article), we sought a type of evaluation that would stimulate experimentation with R&D approaches throughout the network. Horizontal evaluation emerged out of our

frustration with the evaluation practices and collective learning methods commonly used in the agricultural R&D programs with which we were involved. Agricultural R&D projects and programs funded by international donors are generally evaluated by teams of external experts selected for their substantive expertise and links to the donor agencies rather than for their knowledge or expertise in the field of program evaluation (Cracknell, 2000; Horton, 1998). Although their reviews are generally considered to be an accountability mechanism, with the donor as a principal audience, the reports also contain numerous recommendations that program staff are expected to implement. In practice, staff is often unenthusiastic about implementing these recommendations because they have not been involved, and as a result, the recommendations may not actually be feasible, a problem reported elsewhere (O'Sullivan, 2004).

When Papa Andina began, study visits were frequently organized for professionals from each country to visit project teams working with novel R&D approaches in other countries to foster knowledge exchange among members of the network. During a typical study visit, three or four professionals from one country would visit a novel experience in a neighboring country, and on return, they were supposed to share lessons learned with colleagues. The study visits were enjoyable for participants, and participants always learned something, but there were few identifiable outcomes. The trip reports they wrote tended to be superficial, few people read them, and there was little follow-up after the visits.

At this time, Papa Andina and partners frequently used "SWOT analysis" (analysis of strengths, weaknesses, opportunities, and threats) in the early phases of strategic planning exercises. SWOT analyses were carried out in a workshop setting using cards completed by participants who assess the strengths and weaknesses of a project or organization in relation to the opportunities and threats in its external environment.

We developed horizontal evaluation with network members as a way to improve knowledge sharing, collaborative learning, and program improvement within the Papa Andina network. We built on elements of traditional evaluations, study visits, and SWOT analysis. We progressively developed horizontal evaluation by trying out ideas and modifying them after each application. We return later in the article to a discussion of how horizontal evaluation can be situated in the broader family of participatory evaluation.

PROCESS BY WHICH HORIZONTAL EVALUATION WAS DEVELOPED

The development of horizontal evaluation has become an important activity for Papa Andina's network coordination unit. As many members of the network have participated in two or more of the workshops, there has been an iterative process of collective learning about, and improvement of, the approach. Each application of horizontal evaluation has been evaluated, and the results have been used to improve and refine the method. Reports on the horizontal evaluations carried out are available on the Papa Andina Web site (<http://papandina.cip.cgiar.org>).

Horizontal evaluation was first tested in 2003 to evaluate the participatory market chain approach. During a 2-day workshop in Lima, Peru, 11 members of the local project team met with 11 peers from Peru, Bolivia, and Ecuador. Local project team members provided an overview of the approach and organized field visits to local potato processors and markets. Peers talked with a range of people who had been involved in developing and applying the participatory market chain approach. The local team and the peers assessed the approach separately and compared assessments. Animated discussions around differing perceptions led to proposals to improve the participatory market chain approach and to try it out in Bolivia.

These initial positive results motivated us to continue developing horizontal evaluation. Observations during the workshop and the evaluation at the end led to the following process lessons about horizontal evaluation:

- More information should be provided prior to the workshop on the R&D approach to be evaluated and the horizontal evaluation process
- A 2-day workshop was too short to allow a thorough evaluation of the R&D approach being developed.

These lessons were incorporated into the design of the second horizontal evaluation, carried out in Cochabamba, Bolivia, in 2004. This time, the evaluand was a set of methods developed to improve the identification of farmers' demands for technology (Bentley et al., 2007). In this case, 15 members of the Bolivian project team came together with 13 peers from Peru and Ecuador to evaluate these methods in a 3-day workshop. On the second day, small groups of peers, guided by local project team members, visited different communities to talk with the farmers who had been involved in using the methods. An evaluator attended the workshop to gather information for a donor evaluation of the Bolivian project. The workshop produced a number of important ideas that the local team used to improve its work and information that was used for the external evaluation.

The following process lessons were learned:

- Clear presentations the first day are vital and the local team needs to carefully prepare and rehearse these.
- Presenting too many cards (based on the argument "we can't lose information") made it difficult to compare the perspectives of the local team and peers—one of the central features of the workshop.
- Maintain the focus of the evaluation on the R&D approach and do not drift into evaluations of other aspects of the project or the organization that manages it.
- Careful planning and preparation are needed to formulate appropriate questions and procedures for the field visits and to systematically analyze and compare observations at different sites.

The third experience with horizontal evaluation was an evaluation of methods for establishing multistakeholder platforms to link small farmers with markets, held in Riobamba, Ecuador, in 2005. During the workshop, 12 members of the local project team, including four farmers' leaders, came together with 12 peers from Bolivia, Peru, and Ecuador. In this case, a professional facilitator helped to plan and to organize the evaluation and report on the results. The project team in Ecuador developed a preliminary short list of evaluation criteria and organized and rehearsed presentations and field visits prior to the event. The more careful preparations and process management paid off handsomely, in terms of the high level of energy displayed by participants, the richness of discussions, and the clarity of conclusions reached. Two important process lessons learned this time were as follows:

- Using a limited number of carefully selected and jointly agreed evaluation criteria at all moments in the workshop provides a logical thread that links the different parts together.
- Do not assume that information provided prior to the workshop will be read, particularly if it is in the form of lengthy reports.

Up to this point, local project teams in each workshop employed PowerPoint presentations in dimly lit rooms to provide information on their work and results. Members of the audience frequently became bored and felt that they were being bombarded with too much information that could not be fully absorbed. As a result, in the next horizontal evaluation workshop, we introduced a knowledge-sharing method known as a "knowledge fair."

In the fourth horizontal evaluation, carried out in Kampala, Uganda, in December 2005, 19 members of a local project team met with nine professionals from neighboring countries and staff members of the International Potato Center from Peru and Bolivia to review the process of introducing the participatory market chain approach from the Andes to Uganda. Digital photographs taken during field visits were used to illustrate key points and helped stimulate discussions later.

The approach outlined in the following section includes the improvements identified by workshop participants to date.

DESCRIPTION OF THE HORIZONTAL EVALUATION APPROACH

As mentioned earlier, the heart of horizontal evaluation is a participatory workshop. The following discussion assumes a 3-day event that we have found to be most appropriate.

Farmers are the ultimate beneficiaries of the R&D efforts being evaluated, and they are consulted during the evaluation process, but they are not the direct intended users of horizontal evaluation. In the context of Papa Andina, two types of network members are the intended users, and it is they who are the principal participants in the evaluation process: local project team members who are developing and testing the R&D approach under review and peers from other organizations in the network

who are working on similar R&D issues and are interested in learning about the approach being evaluated, for potential application in their own work.

The principal roles of local project team members are to organize information about the process and outcomes of the methodology being developed, present this information at the workshop, and (stimulated by the assessment of peers) autocritique the methodology they are developing and identify ways to improve it.

The main roles of peers are to critically assess the strengths and weaknesses of the methodology under review, make suggestions for its improvement, and assess its potential application in their own circumstances. Our role as Papa Andina's coordinators has been to work with local team members to provide guidance on how to carry out horizontal evaluation, help define the evaluand, prepare for the workshop, select appropriate peer participants, stimulate critical but constructive thinking during the event, and ensure adequate follow-up after the evaluation.

It should be noted that although peers feature prominently in horizontal evaluation, their role differs from that of anonymous peer reviewers used by many research funding bodies and professional journals. Rather than playing the role of a faceless judge of the merit or value of the evaluand, in horizontal evaluation, peers present their assessments directly to the local project team members. The evaluation is an open process in which all participants are encouraged to share their knowledge and perspectives and to identify areas for improving the evaluand.

Preparing for the Horizontal Evaluation Workshop

The first task is to clearly define the evaluand. Our horizontal evaluations have focused on R&D approaches being developed and applied by local teams. Focusing on the R&D approach, rather than on the performance of project teams or the local organization, has reduced sensitivities during the evaluation process and allowed more critical assessment of strengths and weaknesses than is customary in such settings.

In addition to focusing on an appropriate evaluand, the following key tasks need to be accomplished during the planning phase:

1. Select an appropriate moment for the evaluation during the pilot phase when the new R&D approach is sufficiently advanced to allow a meaningful evaluation, but not so fully developed that there is little room for modification.
2. Contract an experienced facilitator to aid in planning and managing the workshop process.
3. Design the workshop with the facilitator.
4. Select an appropriate group of (10 to 15) local project team members and a similar number of peers who have an interest in learning about and perhaps using the methodology under development. Where beneficiaries form part of the team, they should be included, too. Peers need to be carefully selected

to ensure that they have adequate knowledge and experience related to the topic of the evaluation and also diverse interests and perspectives. It is also important that they are perceived and will behave as “peers” rather than “superiors”.

5. Develop a preliminary list of evaluation criteria, to be finalized during the workshop.
6. Prepare presentations, field visits, and background documents to ensure that all participants have access to the information they need to critically evaluate the methodology under development.
7. Make arrangements for documenting the workshop process and results, including responsibilities and deadlines for editing and distributing the workshop report.
8. Make all needed travel and logistical arrangements for the workshop. In the cases described here, international travel was needed for about half of the participants. An adequate venue is needed for plenary and breakout sessions, including accommodation for all participants.

SETTING THE STAGE AT THE BEGINNING OF THE WORKSHOP

The facilitator opens the workshop by presenting the objectives of the workshop, explaining horizontal evaluation, and outlining the logical flow of sessions in the workshop (see Table 1). The facilitator emphasizes that it is not the organization or project team that is being evaluated but a specific R&D approach. He or she encourages peers to be constructively critical in identifying strengths and weaknesses of the R&D approach under consideration. He or she encourages project team members to be open and receptive to criticisms and suggestions rather than defensive. Several features of horizontal evaluation should promote this open and constructive criticism: Making the approach, and not the project, the evaluand helps members of the local team to identify and analyze possible weaknesses; careful selection of outside participants to ensure that they are perceived as friendly peers and not potentially hostile superiors; participants form part of a broader network or community of practice, which builds confidence; and the knowledge that in the future, peers may themselves be subject to review encourages them to frame criticism in a constructive manner.

ESTABLISHING A “BAROMETER GROUP”

Volunteers are sought for a “barometer group” that will meet at the end of each day to assess the day’s work and suggest improvements for the next day. At the end of the workshop, this group will also meet to assess the workshop as a whole and to make recommendations for improving future horizontal evaluations.

PRESENTING THE EVALUAND (THE R&D APPROACH)

During the morning of Day 1, local project team members provide background information on the local setting and on the relevance of the R&D approach being

evaluated. They explain how and why the approach is being developed and what it is supposed to accomplish. They describe its key features and identify the main results achieved to date. Plans for further development and application of the approach are also outlined.

Our experience has shown that interactive modes of presentation, such as “knowledge fairs,” are valuable ways to share knowledge and should be included in the workshop schedule, in addition to the PowerPoint presentations that have become the norm in many meetings. A knowledge fair involves four to seven stands, as in a local fair or market. A stand typically includes a poster illustrating one case or element of the R&D approach, photographs, guides, and new products or materials under development. Peers are divided into small groups and accompanied by locals, visit different stands. A project team member takes 10 to 15 min to explain the stand, and peers ask questions. All groups rotate to the next stand after a fixed time until all stands have been visited. Whatever types of presentation will be used, they need to be carefully prepared and rehearsed to ensure that key points are communicated effectively.

Table 1. Workshop sessions

Day 1: Presentation of R&D Approach

1. Facilitator presents workshop program and procedures.
2. Local team presents R&D approach and results of its application. Peers ask clarifying questions.
3. Participants agree a short list of evaluation criteria to be used during the workshop.
4. Facilitator forms small groups combining local project staff and peers for field visits. Groups prepare for field visits .

Day 2: Field Visit

1. Small groups travel to different field sites.
2. Project team members introduce visitors to farmers and local people at the field site.
3. Peers interview farmers and local people and look for opportunities for triangulation of information through direct observation.
4. Peers construct a results matrix using the evaluation criteria to compare results across field sites.

Day 3: Synthesis and Recommendations

1. Peers and local project team work in separate groups to identify strengths and weaknesses in relation to each evaluation criterion and suggest improvements.
 2. Groups present findings in plenary. Similarities and differences are explored.
 3. Local project team members draw up a short list of recommendations and possible improvements. Peers discuss possible applications of the R&D approach in their own settings .
 4. Plenary to identify specific, time-bound steps to improve the R&D approach and make suggestions for promoting wider testing and use.
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(Knowledge-sharing techniques for meetings and workshops are provided by Chambers [2002] and Russell and Staiger [2005] and the Web site of the Knowledge Management for Development Community [www.km4dev.org] and the Web site for Knowledge Sharing in the Consultative Group on International Agricultural Research [<http://www.ks-cgiar.org/toolbox/>].)

During the first day, peers are requested to observe and listen carefully, ask questions for clarification, probe for deeper understanding, and request additional information. They are discouraged from voicing judgments about the R&D approach being evaluated until after the field visits on Day 2.

DEVELOPING A SHORT LIST OF EVALUATION CRITERIA

On the afternoon of Day 1, after presentations on the local setting and the R&D approach being evaluated, the facilitator presents a tentative list of evaluation criteria for discussion and revision. Deciding on good evaluation criteria is extremely important, as these will guide the rest of the evaluation exercise. Many aspects of the R&D approach could be evaluated, but as time and resources for evaluation are limited, it is essential to agree on a short list of evaluation criteria that will be used by all participants to guide information collection and analysis. For instance, the evaluation criteria agreed on by participants to evaluate the approach for developing multistakeholder platforms in Ecuador were (a) the extent to which the platforms are effectively linking small farmers with the market, (b) contributions to empowerment and gender equity, (c) quality of services provided to small farmers, and (d) sustainability of the platforms established. For each of these criteria, information will be collected during the evaluation process to identify strengths and weaknesses of the approach being developed and to make suggestions for improvement.

PREPARING FOR FIELD VISITS

Near the end of the first day, workshop participants form small groups with five to eight members each, including both local team members and external peer evaluators. On Day 2, these groups will visit different field sites to interview beneficiaries of the R&D approach, and other key actors, and observe its applications and results. Field sites have included small farms, rural communities, markets, food-processing facilities, restaurants, government offices, and nongovernmental organizations. Before going to the field, the peers in each group, helped where necessary by the local team, prepare a plan for fieldwork that indicates who will introduce the group, what should be observed, and what key questions asked. This helps structure the visits to generate useful information related to the evaluation criteria.

INTERVIEWING AND MAKING OBSERVATIONS DURING FIELD VISITS

The field visits provide an opportunity for all participants to see at first hand how the R&D approach has been developed and applied and to talk with those whose livelihoods are directly affected by the use of the approach. Peers conduct interviews and observe closely, triangulating different sources of information to reach judgments related to each of the evaluation criteria. For example, in the Bolivian horizontal

evaluation, peers not only talked with farmers but also visited some of the agricultural experiments they were managing to check that what they said was consistent with what they were in fact doing. Local project team members are instructed to guide the group and introduce the visitors to local people. They are requested not to answer questions on behalf of those interviewed or to influence their answers in any way. In our evaluations, groups have generally accepted and maintained this division of roles.

INITIAL ANALYSIS AND DISCUSSION OF RESULTS OF THE FIELD VISITS

On Day 2, after the field visits, each small group, led by peers, meets to summarize its findings in relation to the evaluation criteria. At this point, local team members are encouraged to comment on the findings and provide their own interpretations of what was observed in the field.

At the end of Day 2, all the workshop participants come together in a plenary session where each group reports its findings using cards, building up a matrix of results with the evaluation criteria on one axis and the field sites on the other. This matrix allows the comparison of results of the field visits across the sites (see example in Table 2, which shows the degree of detail that is appropriate). In these sessions, digital photographs have proven useful to illustrate points and maintain interest. As the results matrix is built up, presenting results for the different sites, discussion generally become quite lively, even though participants are tired from the fieldwork. Many consider this to be the most productive and enlightening session of the workshop. The matrix of results is recorded and distributed to participants the next morning, to serve as a resource for the final day's work.

CONTRASTING PERSPECTIVES OF THE LOCAL TEAM AND PEERS

On the morning of Day 3, local team members and peers work separately in newly formed groups. For each evaluation criterion, the groups identify strengths and weaknesses of the R&D approach being evaluated and make suggestions for improving it. For this exercise, we have found it useful for participants to summarize each of their points on a 10 cm × 30 cm card that is pinned on a poster board or taped on a flip-chart or the wall, so that all participants can see it well. The cards are then grouped by evaluation criteria and by similarity of content. Only one idea should be put on each card, and writing should be sufficiently clear that it can be read in the plenary session. Participants use notes from the field visits and the results matrix as inputs for this exercise. To keep the exercise manageable and to establish priorities, we have found it useful to ask each group to limit itself to identifying no more than five strengths, five weaknesses, and five suggestions for improvement for each evaluation criterion.

After the small group work, project team members and peers present their findings in the plenary session. The results of these two perspectives are compared and contrasted, and the facilitator helps participants in identifying points of convergence and divergence. When assessments coincide, there is little need for discussion. For example, where project team members and peers agree on strength, it is likely that the

project team is on the right track in this area. Similarly, where both groups agree on a weakness, it is likely that improvement is needed.

More time and effort are needed to discuss cases in which there is disagreement on strengths or weaknesses. The reasons for divergence need to be probed and discussed in plenary to reach a common understanding of the divergence. However, it is not always possible or appropriate to reach an agreement on the issue or what to do about it. In cases of profound differences in perspective, the facilitator should not attempt to force a consensus but seek a shared understanding of the underlying issues.

In one evaluation workshop, local participants identified business planning as a strength, but peers identified it as a weakness. After some discussion, project team members realized that although farmers had a production plan with monthly planting and harvest targets, this was not a business plan based on an analysis of markets, costs, benefits, and returns on investment. In this case, when local participants learned the difference between these two types of plans, they accepted the peer critique and the apparent contradiction was resolved.

In other cases, divergences have been more substantial, reflecting different underlying values or assumptions. In one case, peers from Ecuador and Bolivia felt that the participatory market chain approach being developed in Peru paid insufficient attention to issues of empowerment and poverty reduction. The issue was hotly debated during the workshop, and the two groups never agreed on the extent to which the approach was addressing these important issues. Nevertheless, after the workshop, the local project team began to pay much more attention to issues of empowerment and poverty reduction.

In another case, in the evaluation of the approach for establishing multistakeholder platforms in Ecuador, peer evaluators from Bolivia and Peru felt that insufficient attention was being paid to involving market agents in the platforms. Members of the local project team disagreed strongly because they viewed the platforms as spaces for collective action between small farmers and organizations providing agricultural services, which should strengthen farmers' bargaining power vis-à-vis market agents, who could be involved as clients rather than active members. In contrast, the Peruvians and Bolivians viewed the platforms as mechanisms for collective action involving small farmers, organizations, and market agents. In this case, the local project team and the peers from other countries agreed to disagree about the purpose of the platforms and the role of private market agents in them. Nevertheless, participants report that the discussions that took place during the horizontal evaluation made them aware of the range of possible purpose and structures for the platforms. After the horizontal evaluation workshop, participants from Peru intensified their work on small-farmer organization, and those from Ecuador began working more closely with market agents.

REACHING CLOSURE AND ACTION PLANNING

After the plenary session in which internal and external perceptions are contrasted, the participants divide into two groups for a final exercise. One group consists of all project team members, and the other consists of all the peers. Drawing on the results of the previous sessions, project team members draw up a short list of recommendations for improving the R&D approach they are developing. The peer evaluation group discusses potential application of the approach in its own settings. Both groups present their conclusions in a final plenary. The workshop ends by identifying specific, time-bound steps to improve the R&D approach and suggestions for promoting its wider testing and application in the region, if judged appropriate.

EVALUATING THE HORIZONTAL EVALUATION WORKSHOP

At the end of a horizontal evaluation workshop, participants are asked to identify the most positive aspects of the workshop, the main weaknesses, and ways to improve future events. We have used different methods for this, including questionnaire surveys and facilitated discussions in plenary along the lines of an after-action review (see <http://www.ks-cgiar.org/toolbox/>). Just after the event closes, the barometer team meets one last time for an overall assessment of the event and to formulate suggestions for future events. Based on this review process, horizontal evaluation has been improved and refined over time.

PARTICIPANTS' VIEWS ON HORIZONTAL EVALUATION

After the third horizontal evaluation workshop in Ecuador, one of the authors of this article (D.H.) interviewed 8 of the 24 workshop participants to elicit their views on the horizontal evaluation method and its results. Later, he interviewed 4 other people who had participated in horizontal evaluations in Bolivia, Peru, or Uganda. Most of those interviewed had, in fact, participated in two or more of the horizontal evaluations. In these interviews, participants identified results and benefits of horizontal evaluation.

HORIZONTAL EVALUATION DEMYSTIFIES THE EVALUATION PROCESS

Participants noted that participation in a horizontal evaluation helped to demystify the evaluation process for them. Previously, they viewed evaluation as a somewhat mysterious process carried out by high-level experts (*personas de altísimo nivel*)—often foreigners—who visited the project site, interviewed a few people, and then wrote a report for the donor organization, which presented a number of recommendations that the project team was expected to implement. Participants in horizontal evaluations were pleased to learn that an evaluation could be conducted as a transparent team effort, leading to valuable new insights and improvements in their work.

With a traditional evaluation, one or two so-called “experts” meet briefly with you, and maybe they go for a field visit, and then they deliver a report that has little to do with your work. It often seems to reflect more their own interests and points of

view than what you are doing in your project. In contrast, with a horizontal evaluation, the experience and the information are much richer and more relevant. One reason is that many more people are reviewing your work, and as they are working on similar things in their own organizations, they know what they are seeing and talking about. A second reason is that the process involves open and transparent information gathering and dialogue. There are no mysteries. Since you all go to the field together, everyone sees what is going on. So when the criticisms come—and they are bound to—you know where they come from. If there are mistakes, you can correct them, but more often than not, the “outsiders” have simply seen things that you hadn’t seen, because you were too involved in your work. (Ecuadorian project team member)

Table 2. Sample evaluation results by site and evaluation Criteria, Ecuador 2005

Criterion	Pilahuín Area	Píllaro Area	Quero Area	Licto Area
Contribution to linking small farmers with the market	<ul style="list-style-type: none"> • Growing a new variety suitable for French fries • Selling in a new market, not yet properly linked with that market • Organization coordinating platform has assumed a direct marketing function • The platform does not include private market agents 	<ul style="list-style-type: none"> • The platform improved linkages to market: • Moved from individual to group sales • Farmers are aware that they are selling a unique type of potato 	<ul style="list-style-type: none"> • Much interest in the market area • Lack clarity in the strategy for developing a brand • Farmers appreciate collective marketing • Limited participation by farmers in the market process 	<ul style="list-style-type: none"> • Planned supply • Stable prices • Established clientele • Confidence • Production based on market opportunity • Link to and valuation of services (technical assistance) • Serious commitment of farmers to supply quality potatoes to businesses • Farmer leadership is incipient
Contribution to empowerment and gender equity
Quality of services provided to farmers
Sustainability				

IT PROVIDES USEFUL INFORMATION, INSIGHTS, AND SUGGESTIONS FOR IMPROVEMENT

Participants noted that the experience of participating in a horizontal evaluation was very rich in terms of the new insights and knowledge gained and the relationships developed. In comparison, they characterized their previous experiences with external evaluation as less enriching and frequently negative.

The experience and the information are super rich (“riquísima”). The contrast with a traditional external evaluation couldn’t be greater. Right after our horizontal evaluation, the donor contracted an external evaluation, as a requisite for renewing our project grant. The report was of very little use to us. In comparison, the information in the horizontal evaluation was much more valid and useful. (Ecuadorian project team member)

IT MOTIVATES CHANGE

Project team members often reject the recommendations in external evaluations because they feel the evaluators do not understand local conditions and suggest things that are inappropriate or not feasible. In the horizontal evaluations, project team members have accepted critical feedback and observations more easily as they came from peers who they felt were better informed and more sensitive to local circumstances. Moreover, as team members were involved in all aspects of the evaluation and formulated recommendations for improving their own work, by the end of the evaluation workshop, they were committed to implementing changes. Two examples are as follows:

The horizontal evaluation really motivated us to document the participatory market chain approach. We thought it was all clear, but the Bolivians and Ecuadorians had so many questions that obviously we needed to spell things out in writing. This was the initial motivation for us to prepare the user’s guide for the participatory market chain approach. (Peruvian project team member)

Before the horizontal evaluation, we thought our approach to developing stakeholder platforms was quite alright. But when our colleagues went to the field and met with the people involved, they quickly saw that we were playing too proactive a role, and not giving enough responsibility to local producers’ groups. So now, when I’m talking a lot, I remember what they said and try to keep quiet, facilitate discussion, and not intervene so much. (Ecuadorian project team member)

IT STRENGTHENS THE LOCAL PROJECT TEAM

In all the cases, participants noted that preparing for the horizontal evaluation, participating in it, and taking follow-up actions helped to strengthen the local project team. The following is an example from Uganda:

Preparing for the horizontal evaluation was really the first chance we had to put our thoughts together in coherent presentations. This helped us to reflect on our work and on what we had and hadn’t accomplished. Later, participating in the horizontal evaluation workshop helped us all reach a common understanding of our goals,

activities, accomplishments, and priorities for the future. Before this, we had never had the opportunity to get together, review our work, and plan our work as a team. It was most valuable. (Ugandan project team member).

IT ENCOURAGES EXPERIMENTATION BACK HOME

Participants report that they have learned things that they later tried out in their own work. In some cases, participants began working with the new R&D approach they had evaluated. For example, as a result of the 2003 evaluation of the participatory market chain approach in Peru, Bolivian participants began experimenting with this approach. Previously, they had been attempting to use a more traditional research approach to analyze market chains, which they found difficult to implement and ineffective in stimulating market innovation. When they saw the positive results of using the approach in Peru, the Bolivians were eager to try out the approach back home. In response to this interest, the Papa Andina coordination unit organized follow-up visits for Bolivians to Peru to learn more about the participatory market chain approach. Peruvians also traveled to Bolivia to provide training and to backstop initial work with the approach. Since then, Bolivians have participated actively in further development and application of the approach, with quite positive results. Similarly, the 2005 evaluation of work with stakeholder platforms in Ecuador stimulated considerable interest in farmer organization and led to several follow-up visits of Bolivians and Peruvians to Ecuador to learn more about these new institutional arrangements.

IT STIMULATES IMPROVEMENTS IN OTHER AREAS OF WORK

Participants also reported learning lessons that they have applied in other areas of work. For example, in the evaluation of methods to identify farmers' demands for technology in Bolivia, participants felt the lack of involvement of local government officials was a weakness of the work. As responsibilities for agricultural R&D were being devolved to local government throughout the Andean region, the absence of local government involvement could limit essential political support for the work. Motivated by this observation, Ecuadorian participants paid particular attention to involving local governments in their future work to establish multistakeholder platforms with considerable success. In the evaluation of multi-stakeholder platforms in Ecuador the following year, the involvement of local government was considered to be a strength. Observing this, the Peruvians subsequently strengthened their work with local government.

DISCUSSION

Horizontal evaluation is a type of participatory evaluation, following the definition of Cousins and Whitmore (1998) as one in which "researchers, facilitators, or professional evaluators collaborate in some way with individuals, groups, or communities who have a decided stake in the program, development project, or other entity being evaluated" (p. 5). Horizontal evaluation involves the key principles of participatory evaluation as outlined by Burke (1998, pp. 44-45), the evaluation methodology respects and uses the knowledge and experience of the key stakeholders, the

evaluation favors collective methods of knowledge generation, the evaluator (facilitator) shares power with the stakeholders, and the participatory evaluator continuously and critically examines his or her own attitudes, ideas, and behavior.

As Cousins and Whitmore (1998) note, the term participatory evaluation covers two rather different types of evaluation: practical participatory evaluation, which aims to support program or organizational decision making and problem solving through the use of evaluation; and transformative participatory evaluation, which is concerned with emancipation and social justice and in reallocating power in the production of knowledge and promoting social change. In terms of this framework, horizontal evaluation falls within the first type, as it aims primarily to support decision making and problem solving within the Papa Andina network.

Within the evaluation literature, there are debates about how different types of participatory evaluation relate to one another and how participatory evaluation relates to such close relatives as “collaborative” and “empowerment” evaluation. For example, Cousins and Whitmore (1998) view participatory evaluation as one type of collaborative inquiry, but O’Sullivan (2004) views collaborative evaluation as a participatory approach that has evolved out of “responsive evaluation” (Stake, 1983).

We developed horizontal evaluation from within the discipline of agricultural R&D, which has worked less closely with the professional evaluation community than other disciplines such as health and education (Horton, 1998). During this process of developing horizontal evaluation, we were not aware of many of the types of participatory evaluation. We developed horizontal evaluation through a number of applications by paying close attention to the needs of stakeholders so that it was intuitively “responsive evaluation.” In our case, the goal was to evaluate an R&D approach of interest to members of the Papa Andina network to improve it and promote its use. This meant that the principal audience for the evaluation was the Papa Andina network of R&D professionals. We actively involved these network members as the principal audience to improve the use of results, one of the main outcomes sought by use-focused evaluation (Patton, 1997). Because the principal audience for the evaluation was made up of network members, Andean farmers—the ultimate intended beneficiaries of our work—were involved to a lesser degree, mostly in a consultative fashion during field visits. Although where beneficiaries have been part of project teams, for example, farmers’ leaders in Ecuador, they have also participated in all stages of the workshop.

We observed at the beginning of this article that networks are part of a new paradigm for knowledge generation and sharing. As O’Sullivan (2004) has noted, networks require new types of participatory evaluation. Horizontal evaluation is a novel approach to participatory evaluation in a network context. Its novelty lies in the systematic contrast of the assessments of those involved in developing and piloting a new approach and those of peers from other parts of the network. This contrast stimulates social learning.

Horizontal evaluation has become a central element in Papa Andina's approach for developing R&D methodologies and sharing knowledge among collaborating professionals and organizations. Our experience indicates that horizontal evaluation is particularly useful for formative evaluations of programs implemented via decentralized networks with activities at multiple sites. The horizontal evaluation approach may be useful for other initiatives that wish to bring collaborators together to promote social learning and capacity development. In such cases, horizontal evaluation can provide a structure for combining the perspectives of the local team engaged in piloting an approach and peers interested in using it. It encourages critical reflection, learning, and program improvement and fosters knowledge sharing and experimentation with the new R&D approach at new sites.

Horizontal evaluation is most appropriately used during the pilot stage of developing a new approach, when definitive evidence of success or impact is not yet available. In such cases, the primary concerns of the evaluation are the relevance and potential utility of the new R&D approach and early results of applications of the new approach. Horizontal evaluations neither require nor generate reliable quantitative information on program impacts.

Horizontal evaluation can complement other forms of participatory or external evaluation. Each has its place, and we have used horizontal evaluation in combination with the other types. In Peru and Ecuador, external evaluations employed results of horizontal evaluations along with other sources of information. In Bolivia, an external evaluation was timed to coincide with the horizontal evaluation so the evaluators could attend the horizontal evaluation workshop and observe the discussions, interact with participants, and visit field sites. In 2005, the Papa Andina network was evaluated by two external evaluators who collected information from several primary and secondary sources, including horizontal evaluation reports and a participatory evaluation workshop carried out by network members.

For those interested in using horizontal evaluation in their own programs, some practical requirements should be kept in mind. The first requirement is a skilled evaluator/facilitator who can work with the project team to plan the evaluation process, facilitate the evaluation workshop, and document the results. The second requirement is an understanding of the horizontal evaluation method. In this regard, Papa Andina is preparing a user's guide for horizontal evaluation. The third requirement is the time and resources required to plan and implement a horizontal evaluation. It is necessary to budget participants' time as well as financial resources for facilitation and travel expenses and lodging for participants. The fourth requirement is that local project teams need to allocate adequate time and resources to planning and preparing for the evaluation workshop. We have found that the best way to convince project managers and local staff to make the needed investment is to have them join a horizontal evaluation at another site to experience the process and benefits.

In networks such as Papa Andina, most activities are carried out by members operating at decentralized locations. There are few truly regional activities. This

distribution of activities fosters capacity development at the individual and organizational levels, but cross-site knowledge sharing among individuals and organizations is often rather limited. In such a context, horizontal evaluations have served as valuable mechanisms for network participants to learn about activities being carried out at other sites, while strengthening the individual projects. Over time, through their participation in the horizontal evaluations, participants have built up knowledge, interpersonal relationships, trust, and a sense of community, all of which have strengthened the Papa Andina network. In this sense, horizontal evaluation has contributed to the effectiveness of the network as a whole and has become an integral part of its intervention strategy.

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Developing a strategic vision for the potato sector in the Andean region^{1,2}

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ABSTRACT

The potato crop is a vital component of the economy and diet in highland areas of Bolivia, Ecuador, and Peru. As one of their priority activities during the International Year of the Potato (2008), Papa Andina and its partners worked to develop a strategic vision for the potato sector in the Andean region. This work was done with Papa Andina's strategic partners – *Fundación para la Promoción e Investigación de Productos Andinos* PROINPA (Bolivia), *Instituto Nacional Autónomo de Investigación Agropecuaria*-INIAP (Ecuador) and the *Proyecto Innovación y Competitividad de la Papa* - INCOPA Project (Peru) and with representatives of the public and private sectors of each country. The strategy process involved three main steps:

1. An international diagnosis
2. National surveys and analyses
3. Workshops to build up a joint strategic vision for the potato in each country.

In each country a strategic vision has been drawn up and/or priorities have been defined for the sector. Partners in each country have used these results to support the development of the sector. A common factor in the three countries is the instability of public authorities responsible for making and implementing political decisions. This paper explains the diverse dynamics and the extent of progress in developing the vision and implementing concrete actions in each country. A book based on this work, which compares and contrasts the potato sector in the three countries, is now used as reference document in technical and political circles in the region.

INTRODUCTION

The potato is a central element in the economy of highland rural families in Bolivia, Ecuador and Peru. The Swiss Agency for Development and Cooperation (SDC), the International Potato Center (CIP), and national organizations in the three countries, have supported development of the potato sector in the Andes for several years.

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2 The authors would like to thank Felipe Balderrama, Gladys Triveño and OFIAGRO for their collaboration in the implementation of the national diagnostics in Bolivia, Peru, and Ecuador respectively. We would also like to express our acknowledgement to the Swiss Agency for Development and Cooperation (SDC) for its support and contribution to the work and results presented in this paper.

Priorities for this work have evolved over time, from a rather narrow focus on production, based on improved potato varieties, to a wider concern for development of market chains for products derived from both improved and native potatoes. Native potato-based processed products have started to reach national and international markets.

In 2008, coinciding with the celebration of the International Year of the Potato, SDC worked with CIP and representatives of the potato sector in each country to promote development of the sector, nationally as well as internationally. The CIP-based Papa Andina Initiative and its partners – INCOPIA in Peru, PROINPA in Bolivia and INIAP in Ecuador – worked together to implement a project entitled “*Celebration of the International Year of the Potato in the Andean Region*,” with two objectives:

1. To implement a diagnostic of the potato sector in Bolivia, Ecuador and Peru; support the participatory development of a strategic vision for this sector; and define priorities of action to strengthen it
2. To create and promote regionally, nationally and internationally, awareness about native potatoes and their culinary, cultural and economic potential for promoting sustainable development in the Andean region.

This project was coordinated by Papa Andina, which aims to improve the linkage of research with pro-poor innovation in Andean potato based systems (Devaux et al., 2009).

METHODOLOGY

The work carried out was based on an approach devised by the Quito-based consultancy firm OFIAGRO, which has three main steps:

1. A diagnostic study of the potato sector and its market development in the international context. The main idea was to show and analyze world trends in potato production and trade, and relate them to the Andean region context, suggesting possible implications for the development of the potato sector in this region
2. Surveys and analyses of the potato sector in Peru, Bolivia, and Ecuador
3. Workshops in each country, involving public and private stakeholders of the potato sector, to develop a strategic vision.

The methodology was adapted in each country according to the local context, local public policies, and requirements that arose from participants during the participatory process. But a general common methodology was adopted containing the following elements: A SWOT analysis (analysis of strengths, weaknesses, opportunities, and threats) was carried out and the strategic vision was formulated, including offensive and defensive issues, strategic areas to be worked out, and strategic objectives. A summary of the general methodology based upon the Ecuadorian experience is shown in the following graphic. The main strength was the

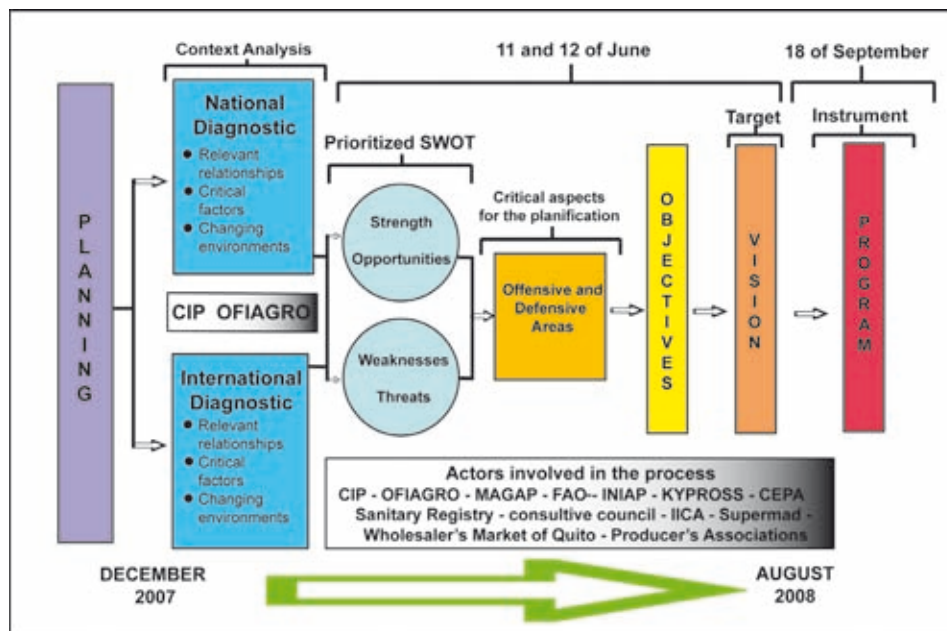
participatory approach that made it possible to work with a wide range of public and private partners.

RESULTS

The potato in the Andean region

Considerable effort went into documenting key aspects of the potato sector in each country. The potato crop contributes 7%, 11% and 10% of the agricultural Gross Domestic Product (GDP) in Ecuador, Peru, and Bolivia, respectively. This is equivalent to a total value added of US \$1,056 million in 2006. It is estimated that there are more than 820,000 potato farmers in the three countries, representing around 5% of the agricultural economically active population. Potato production generates more than 52 million workdays each year. These figures indicate that the potato crop is one of the main sources of rural employment and income in rural Andean areas.

Figure 1. Methodology for developing the strategic vision of the potato sector



Source: OFIAGRO, 2008a.

During the period of 2002-2006, Peruvian farmers produced roughly 3,248,000 metric tons of potatoes per year. This exceeds the total production of both Bolivia and Ecuador. However, Peruvian potato production is largely static, whereas Ecuador's production has grown at an annual rate of 2.0% and Bolivia's farming area has grown at 1.5% annually.

Although they represent the center of origin of the potato, the three Andean countries together produce only about 1.4% of the world's potatoes on less than 2.3% of land area under this crop (see Table 1). In the same period (2002-2006), 82% of the potato's world production was concentrated in Asia and Europe; with only five countries (China, Russia, India, the USA and Ukraine) accounting for more than half of global potato production.

Table 1. Socio-economic and production indicators of the potato sector in Bolivia, Ecuador, Peru and worldwide

	Bolivia	Ecuador	Peru	World
A. SOCIO-ECONOMIC IMPORTANCE				
<i>[period]</i>	<i>[2002-2006]</i>	<i>[2002-2006]</i>	<i>[2001-2006]</i>	...
Contribution of potato to Agricultural GDP (%)	10.0%	7.4%	11.0%	
[year]	[2003]	[2000]	[2002]	...
Nr. of potato producers (in thousands)	240.0	88.1	597.2	
Small-scale producers	85% < 3ha	61% < 3ha	55% < 3ha	
Nr. of days/ha/year	157	115	105	...
B. PRODUCTION				
Area [2002-2006]				
Area harvested (1,000 has)	132.1	43.3	260.1	18,973.3
Growth rate (% per year)	1.51%	-2.7%	-0.5%	-0.1%
Yield [2002-2006]				
Yield (TM/ha)	5.7	9.5	12.0	16.8
Growth rate (% per year)	0.0%	4.7%	0.5%	0.3%
Production [2002-2006]				
Volume (1,000 TM)	747.8	409.8	3,248.4	319,188.7
Growth rate (% per year)	1.51%	2.0%	0.0%	0.2%
Production cost – Fresh potato [year]	[2007-2008]	[2006]	[2006-2007]	[2006]
[Technological level]	[Medium]	[Semi-Technified]	[Medium, Highlands]	[a]
Cost (USD/ha)	1,500	2,329.1	1,922.0	4,379.6
Unit Cost – fresh potato (USD/kg)	0.18	0.11	0.12	0.12
Producer's margin (%) ^b	14	35	25	...

Source: OFIAGRO, 2008a; 2008b; Pro-Expansión, 2008; Valderrama et al., 2008.

Notes: a. Reference of Idaho, U.S.A.: Total of direct and indirect costs, without fumigation or storage. b. [Price to producer – Unit price] / Price to producer, without taking into account transaction costs or risks.

Production trends differ sharply between developed and developing countries, with potato production falling at an annual rate of -2.4% in developed countries and rising by 8.4% annually in developing countries. China and India are the largest developing-country producers of potatoes.

Potato yields in Bolivia, Ecuador, and Peru are well under the world average (17 t/ha) and very far behind countries like New Zealand (45 t/ha), Belgium (43 t/ha) or the Netherlands (43 t/ha). Many factors – agronomical, climatic, socio-economic, and institutional - explain those differences.

In these three Andean countries, potato production is widely dispersed in many different, and highly diverse, production zones and systems, which are influenced by such factors as: type of producer and producer organization, ecological zone, weather and growing season, altitude, rural and urban consumer preferences, and access to technology, credit, and other services. At the same time, most potatoes (90% or more in the three countries) are consumed unprocessed. Fresh potatoes are still a basic staple for most poor people, particularly in rural highland areas. From 2002-2006, annual per capita fresh potato consumption was 32, 43 and 68 kg in Ecuador, Bolivia and Peru, respectively. In comparison, the world average is 36 kg/per year.)

In the Andean zone of the three countries, thousands of varieties of native potatoes (sub-species *Andigena*, *Curtiobum*, and *Juzepczukii*) are being grown by small Andean farmers, together with “improved varieties” of the sub-specie *tuberosum*, which have been selected by national and international research programs. Although the native potatoes have a lower potential yield than the improved white potato, they offer several advantages in relation to production (tolerance to low temperatures and resistance to pests and diseases), processing (high starch content, less consumption of frying oil) and consumption (color, texture and flavor). These attributes of native potatoes are highly valued by the small producers in the Andes and mitigate the multiple agricultural risks (freezing temperatures, hail and drought), phytosanitary threats, and market conditions they face on a daily basis to ensure their food supply. Recently, **native potatoes are beginning to position themselves in urban market niches** with high purchasing power, processed as potato chips and snacks, and as ingredients with interesting gastronomic characteristics for gourmet food and “*Novoandina* cuisine”. This new tendency should benefit small Andean producers, who will require better coordination with the market chain actors in order to respond to the interest of the target consumers for their product (and to comply with the preservation of the environment and the biodiversity).

Process of developing the strategic vision in Ecuador, Peru, and Bolivia

Ecuador

The process was coordinated by OFIAGRO and implemented with CIP-Papa Andina, INIAP, FAO (Food and Agriculture Organization), the Ministry of Agriculture (MAGAP, *Ministerio de Agricultura, Ganadería, Acuacultura y Pesca*), the Consortium of Smallholder Potato Farmers (CONPAPA) and several universities, which formed a committee to organize the IYP in Ecuador.

The strategic vision was based on a previous diagnostic study that recommended:

- Strengthening farmers' organization
- Improving access to technologies to reduce production costs
- Increasing productivity and reducing environmental and health impacts
- Improving the relationships among potato market chain actors to reduce price fluctuations
- Promoting domestic consumption
- Consolidating potato supply within the country.

With this information, a workshop to construct the strategic vision for the potato sector in Ecuador was carried out following the methodology mentioned above. Thirty-two people representing public and private organizations attended the meeting, allowing the identification of strategic areas to be worked out, and the strategic objectives to be identified.

The diagnostic and the strategic vision were presented at a public meeting to celebrate the IYP in Ecuador (Quito, June 2008) in a positive political context, as the national government had significantly increased its social investment, especially for the poorest sectors of Ecuadorian society. As a result of these efforts, a high official of MAGAP in charge of the highland region where potatoes are grown (*Subsecretaría de la Sierra*) decided to use the strategic vision as the basis for constructing an ambitious initiative: a Program to Strengthen the Potato Sector, focusing on low-resource smallholders. CIP-Papa Andina and OFIAGRO supported this initiative and coordinated its implementation. The public and private partners involved in the development of the strategic vision participated in the construction of this program.

A year later (June 2009), the same MAGAP authorities launched the program under the name "*Programa de Desarrollo Productivo y Fortalecimiento de la Cadena Agroalimentario de la Papa*", and a few months later the National Secretary for Planning and Development (Spanish acronym; SENPLADES) approved the budget to implement the program in 2010 (MAGAP, 2010). This program was to be implemented by MAGAP³ over a period of 60 months, with a budget of US \$6,720,630 and support to the following projects: (i) promotion and dissemination of information systems; (ii) promotion of scientific research and dissemination of adequate technologies; (iii) production and use of quality seed; (iv) strengthening the organizational capacity and partnerships in the potato sector; (v) strengthening MAGAP's institutional capacity; and (vi) improving the participation of small-scale farmers in the marketing system.

3 In practice the program was postponed several times and was not executed because of changes of priorities in the Ministry of Agriculture.

Peru

In the case of Peru, the process was coordinated by INCOPA. The situation of the potato market chain was analyzed from different perspectives and a SWOT analysis carried out. The following themes were identified as requiring policy attention: (i) reevaluation of potato biodiversity and response to climate change threats; (ii) orienting the market according to consumer needs; (iii) promoting technological innovation as the basis of competitiveness; (iv) implementation of innovative and differentiated strategies for commercial development; (v) re-launching the potato's image nationally; (vi) promoting different forms of entrepreneurial organizations and public-private alliances focusing on farmer organizations.

In Peru, the First National Congress of the Potato "Science, art and business" was organized in the context of the International Year of the Potato 2008 in Huancayo. The congress objectives were to promote a process of knowledge-sharing about scientific, productive, commercial, industrial and gastronomic experiences with the potato. After the congress, two additional events involving public and private actors of the potato sector were organized in close coordination with the Ministry of Agriculture and with the different institutions that were part of the Multisectoral Commission for the International Year of the Potato (IYP 2008).

The first event was the "**Entrepreneurial Meeting for the Development of the Potato Sector**", conducted in August 2008, bringing together all the main entrepreneurial actors of the potato chain to discuss the present state, projections, and the policies required to develop, from the entrepreneurial point of view, the potato sector in Peru. The Minister of Agriculture and his technical team related to policies of the potato sector attended the meeting, as well as 47 other people, mainly from the entrepreneurial sector.

Some of the most important private companies that are working in the potato sector analyzed the situation based on the following questions: (i) what are the main potato products?; (ii) what are the main problems facing these products?; (iii) what are the prospects in the long term (10 years) for these products?; (iv) what policies are considered necessary to stimulate entrepreneurial development for these products? With these inputs it was possible to obtain a matrix of various business plans and identify policies required to support the entrepreneurial sector linked to the potato sector in Peru.

The Workshop "**Elements for the Strategic Vision for the Potato Sector in Peru to 2015**" was the second event that was conducted in August 2008 aimed at defining priorities and strategies for the development of the potato market chain, taking as references the following aspects: production, processing, commercialization, and research and development.

This meeting took advantage of the conclusions of the Entrepreneurial Meeting for the Development of the Potato Sector, the conclusions of the First National Congress of the Potato, and information from the national and international diagnostics. Sixty-three participants representing several organizations working in the potato sector

(producers, NGOs, research centers, public institutions and cooking schools among others) attended the meeting. A SWOT exercise was run, defining the strategic vision and identifying strategic working areas, strategic objectives, action plans and budget.

As a result of the previous process, several actions were proposed for the potato sector, differentiating white potato and native ones including the yellow potato. These actions included technological, institutional and commercial areas based on the defined strategic objectives. With this input, the Ministry of Agriculture decided to develop several studies designed to identify the competitiveness factors in promoting the potato sector: (i) key factors to increase potato consumption in Peru; (ii) market chains for French fries in Lima; (iii) key factors to increase the use of high-quality seed; (iv) reception centers for potatoes to be marketed to urban markets in the Peruvian highlands and the need to support a new wholesale market in Lima. The details of these studies can be found on the following web page: <http://www.minag.gob.pe/congreso-de-la-papa/congreso-de-la-papa/4.html>.

Bolivia

In Bolivia, the national diagnostic was completed with the PROINPA Foundation. It was shared with the *Ministerio de Desarrollo Rural, Agropecuario y Medio Ambiente* (MDRA and MA) for analysis and further comments before taking the next steps in building and implementing the vision. The Ministry has prioritized the potato sector in the context of the creation of the *Instituto Nacional de Investigación Agraria y Forestal* (INIAF). A strategy to support the potato sector within INIAF based on a strategic vision has still to be defined.

Regional level

An important achievement has been the publication of results of the diagnoses and analyses of the potato sector in the three countries with recommendations for implementation of a strategic vision for this sector (Devaux et al., 2010).

Progress made on building the strategic vision and the prospects for each country

As a product of the processes described above, each of the three countries has drawn up a vision for the sector and strategic elements for its development, as follows:

Ecuador

The vision is to become, by 2015, an efficiently organized, well planned, innovative potato agri-food chain that guarantees differentiated requirements (of quality, quantity, and price) of the national market, as well as the sustainability of this activity, influencing the generation of policies to benefit the sector.

The following strategic lines of action were identified to realize this vision:

- Recover the leadership and protagonism of the State in the planning process, as occurred in the case of the potato, has been a key factor for designing programs in accordance with the National Development Plan (known as the

“National Good Living Plan”). The decision makers now have an operational instrument, the Programa de Desarrollo Productivo y Fortalecimiento de la Cadena Agroalimentaria de la Papa [Program for Development of Production and Strengthening of the Potato Agri-Food Chain] in keeping with the guidelines and fiscal demands of the public sector’s budget.

- Give priority to Ecuador’s food security and sovereignty with the potato, first consolidating the supply to domestic markets, and then looking at export possibilities.
- Reinforce the Consultative Councils, at the canton, provincial, or national level, that have played an effective role in defining a concrete vision and strategy involving public and private actors, and targeting the sustainable development of the potato chains.
- Design the research projects based on the demand for innovation on the part of the producers, with particular attention to the poorest people (e.g. promoting the consumption of native potatoes), and by means of alliances among the INIAP, universities, and private organizations or companies.
- Motivate and support the producers, in particular the small-scale farmers, to become better organized for the market, by providing training in the management of their organizations.
- Facilitate producers’ access to quality seed at reasonable prices, especially for the multiplication of new varieties.
- Give support to proposals for setting up and operating a pertinent, reliable and opportune information system for the private sector, stressing the importance of quality based on technical potato standards (varieties, size, plant health, etc.), to be drawn up with the participation of the actors along the chain.
- Adapt micro-finance instruments to the needs and risks of the potato sector, managed by local savings and loan associations or community banks. The most recently created small-scale producer organizations could be given the backing of a trust fund of limited duration (3-5 years), subject to the approval of a business plan.

Peru

The vision is to have a more competitive market chain for potatoes, with quality products, both fresh and processed, designed to meet the market’s demands, and potato producers, including small-scale ones, with a higher level of income, by revaluing the biodiversity and the role it can play in confronting climate change; orientation of the chain to the global consumer; promotion of technological innovation; the application of modern, differentiated strategies; re-launching of the potato image at the national level; and the promotion of different types of entrepreneurial organization.

Of the three countries, Peru has the most favorable conditions for private-sector development of the potato. The government's economic strategy has been to stimulate private investment in the development and exploitation of market opportunities. This has a number of implications including the following:

- Take advantage of the shared strategic vision to give greater visibility to new actors, in particular the producers of native potatoes and processing companies, in the design and execution of the sector's policy.
- Promote public-private alliances, like those formed since 2005, which were reinforced during the International Year of the Potato 2008. In the strategic vision process, the MINAG used funds from International Cooperation to finance four studies with a business plan approach, and these have served as a basis for several private companies to develop specific business lines.⁴
- Periodically re-launch the campaign "Papea Perú" with global advertising for the sector ("*este pechito come papa*"), a campaign that has had an effect on potato consumption estimated at an additional 300 million USD, from 2008 to the present.
- Increase in social capital, reinforcing the participation and facilitation role of the MINAG and its Regional Branches, for strengthening the constitution and implementation of the National Potato Council, with nation-wide initiatives, such as the National Potato Day (May 30), the National Potato Congress (every two years), and support for groups drawing up technical standards for seed and consumer potatoes, among others.

Bolivia

The vision is to have strengthened potato market chains, particularly in the Andean regions that have the highest levels of poverty and malnutrition. Increased productivity will lower the price of potatoes, benefitting low-income urban consumers and reducing imports of potato substitutes.

To realize this vision, the following initial strategic lines of action were proposed:

- Improve the production and productivity indices by strengthening decentralized research and development programs in areas with potato production potential (e.g. Toralapa, Colomi, Los Negros, Lequezana, Morochata, El Rosal, etc.), with national and international public funding and a participatory approach.

4 In 2009, the Gloria company decided to invest in a plant for frozen pre-fried potatoes (white, yellow, and native varieties), due to start up in 2011; and the "Viva la papa" company supplies a market niche of native potatoes with different flavors in the United Kingdom. These experiences complement other private experiences that were already under way (Frito Lay, Wong Supermarket, and other companies that have launched native potato-based products on the market).

- Improve communication between chain members, using existing networks and creating multi-stakeholder platforms, to meet the differentiated demand of urban and rural consumers; and give support to the operation of an information system that seeks to reduce the risks of the different actors, especially those of the farmers.
- Retrieve the results achieved on the different ecological tiers by previous Research and Development programs (SEPA, PROINPA, Programa de Semillas, SIBTA, CIPCA) and incorporate the lessons learned into the design of the strategies of the programs of INIAF and other organizations.
- Reinforce the positioning of the native potato, in both external and domestic markets, valuing the interest shown by the people in this flavorsome traditional tuber, associated with nostalgia for the flavors of one's childhood or youth and the culture.
- Intensify research on the genetic potential of the potato to permit a more efficient use of the imported inputs (fertilizers, agricultural chemicals, etc.) and of the water, and make full use of the potential of native potatoes to mitigate the risks associated with climate change at the different ecological tiers.

CONCLUSIONS

The strategic vision exercise implemented in the Andean region has made it possible to identify several priority areas requiring action for the development of the potato sector, such as: (i) organizing the potato sector, promoting local consortia that could join forces in a national potato council involving actors of the potato market chain and organizations supporting the potato sector, (ii) developing lobbying abilities at producer, entrepreneur, and businessman levels for policy influence in favor of the potato sector, (iii) defining policies, programs and actions for managing the risks generated by significant price fluctuations; (iv) developing technologies adapted to the context of each actor in the market chain to improve the efficiency of the potato production system in both the economic and environmental contexts.

The partners in each country are using the information generated in the process, in coordination with the Ministry of Agriculture, to propose concrete approaches for the development of the sector. In Peru, promotion policies and technical norms for the potato were promulgated, indicating the commitment of the public and private sectors. Private investments were made to develop new potato-based products and to build processing plants. In Ecuador, the strategic vision and the priorities identified were to contribute to the development of a program supporting potato production and marketing systems with public funding, but finally political priorities did not allow this program to be implemented specifically for the potato sector. A broader program promoting capacity-strengthening and technology promotion designed for small-scale farmers was implemented, and this included the potato farmers. In Bolivia, building the vision of the potato sector was considered by INIAF a methodological

tool to develop its strategy for this commodity, but it still needs to be put into practice.

A common factor in the three countries analyzed in this exercise is the instability of the authorities or public leaders who are responsible for making and assuming political decisions. This explains the diverse dynamics and the different levels of progress achieved in building the vision and its implementation in each country. But, undoubtedly, as it is a participatory effort, the different actors motivated by this process, who are also the true implementers, are responsible for continuing the promotion and execution of these actions in support of the sector in the medium and long term. The book published on the basis of this work and with the production and socio-economic data of the potato sector in Bolivia, Ecuador, and Peru, with a synthesis comparing the situation in the three Andean countries has been promoted in the region and is used as a reference document at technical and political levels.

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Native potato market chain and poverty reduction: Innovation around corporate social responsibility¹

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ABSTRACT

Over the past years, new market opportunities have been developed for native potatoes in Peru. Pilot products have enabled small-scale Andean farmers to access dynamic markets and increase their income, despite the high transaction costs associated with traditional production and marketing systems. Rapid increases in demand and competition in the native potato market chain are challenging small farmers to turn their initial comparative advantage (native potatoes inherited from past generations) into a sustainable competitive advantage. This challenge is shared by research and development (R&D) organizations that seek to foster innovation as well as more inclusive and competitive marketing of products that take advantage of potato biodiversity. This article describes an innovation process promoted by Papa Andina and its partners CIP-INCOPA (Project for Innovation and Competitiveness of the Potato), FOVIDA (Support for Life) and CAPAC PERU (Production Chains for Quality Agricultural Products) to integrate Corporate Social Responsibility (CSR) into the native potato market chain, and harness the private sector in efforts to reduce poverty. Outcomes² include: (a) a tripartite partnership between PepsiCo Foods, R&D organizations and farmer organizations, which has generated substantial benefits for farmers; (b) a dialogue on the private sector's role in supporting research to improve smallholders' production; (c) new institutional arrangements, such as a social marketing initiative and a certification label for native potato trade with CSR.

BACKGROUND

All over the world, urban markets are evolving rapidly. Demand for quality and processed foods is growing and health, environmental, and social concerns are increasingly influencing consumers' buying decisions. These trends have created new opportunities for agricultural products from small-scale farmers. Native potatoes (landraces) are one example. With their amazing diversity in colors and shapes (more than 3,000 varieties are cultivated in the High Andes), their cooking versatility and high nutritional profile (higher content of dry matter, vitamin C and natural antioxidants such as carotenoids, flavonoids and antocyanins than improved varieties),

1 Presented at the 15th Triennial Symposium of the International Society of Tropical Root Crops, 2009.

2 These outcomes are as of September 2009. See Postscript at the end of the article.

and their traditional production practices (small-scale farming with low inputs), native potatoes fit perfectly into these new consumption patterns. Domesticated 8,000 years ago by High Andean populations, these potatoes produce the highest yields in farming systems located at high altitudes (between 3,000 and 4,200 m.a.s.l.). They therefore constitute a comparative advantage for small-scale farmers who live in these remote and marginalized areas of the Andes that today have the highest concentration levels of extreme poverty. However, until 2002, native potato growers were not fully taking advantage of their crop: it was largely destined for home consumption or for the local markets, and was not considered a valuable source of income. As a result, native potatoes were largely unknown in the domestic urban market (Lopez et al., 2002).

In order to unleash the potential of native potatoes for poverty reduction, CIP-Papa Andina started focusing its efforts on promoting commercial innovation. Since 2003, and as a result of the participatory innovation processes facilitated in Peru by CIP-INCOPIA, pilot products were launched in high-value domestic niche markets (Ordinola et al., 2007). The most successful examples were the “T’ikapapa” fresh selected and bagged native potatoes³ and the naturally colored native potato chips (Bernet and Amoros, 2004). Processed by small agri-businesses and distributed through the most exclusive channels (supermarkets, airport duty free shops), these products have made it possible to cut out intermediaries and secure high prices, providing resource-poor farming families with access to new, high-value market channels and increased income. The intervention of research and development (R&D) actors in the process (International Potato Center- CIP, non-governmental organizations- NGOs) contributed to improving the competitiveness of farmers’ traditional production and marketing systems by increasing trust among market chain actors, and strengthening capacities for quality and productivity in farmer organizations.

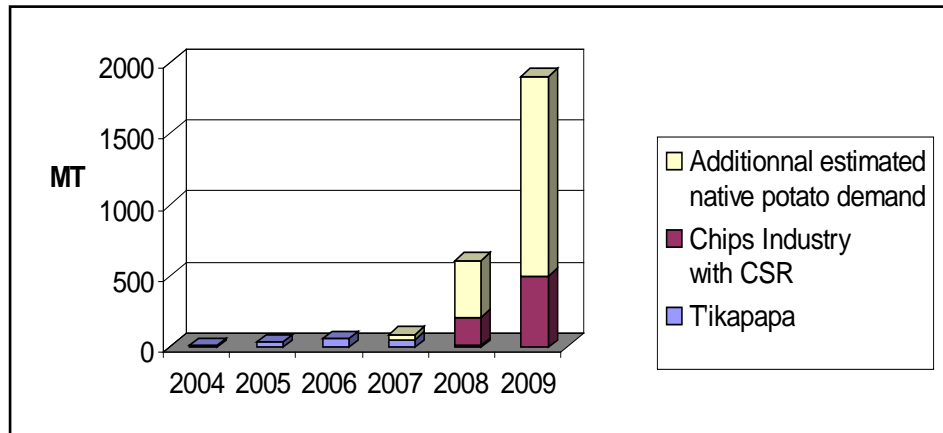
By 2007, the success of these pilot experiences had started to interest both consumers and larger food industries.

Demand for native potatoes has grown at a fast pace since then, creating opportunities for larger-scale farmers. This threatens the unique selling position of small-scale farmers in the native potato market chain. In order to remain competitive, small farmers must turn their initial comparative advantage (native potatoes inherited from past generations) into a sustainable competitive advantage by producing a quality product that meets the supply requirements of large industries without losing sight of environmental concerns. This challenge is shared by R&D organizations like CIP-Papa Andina and its partners CIP-INCOPIA, FOVIDA and CAPAC PERU, which foster innovation to develop inclusive and competitive market chains that take advantage of potato biodiversity, with the aim of reducing poverty. They identified CSR as a basis

3 T’ikapapa’s marketing concept was awarded several international prizes (Ordinola et al., 2008).

to develop a dialogue with the private sector on its commitment to this objective (Hermes, 2005).

Figure 1. Growth of the demand for native potatoes, led by the chips industry



INTEGRATING CSR INTO THE MARKET CHAIN: THE BUSINESS MODEL

Papa Andina and its partners base their work on the broadly accepted definition of CSR as a corporate philosophy and ethical form of management that takes into account the expectations of its stakeholders in order to achieve sustainable development (Canessa and Garcia, 2007). According to this definition, CSR should be confused neither with philanthropy (understood as donations corresponding more to the company's values than to its stakeholders' interest), nor with mere marketing. CSR should be strategically linked to a company's core business and should aim at strengthening a long-term relationship between the company and its stakeholders, resulting in economic, environmental and social benefits for both in the long run.

Drawing on examples of CSR applied to market chains in the context of high value products (Hermes, 2005), Figure 2 summarizes how a food company can establish an innovative, mutually-beneficial relationship with small-scale farmers to take advantage of market opportunities for native potatoes while contributing to poverty reduction.

In a CSR framework, the company focuses its investment on:

- Developing a market segment willing to pay a high price for a high-quality, environmentally and socially-sustainable product (investing in the quality of the product, and in social marketing campaigns that convey credence attributes to consumers)
- Developing the competitiveness of its suppliers and reducing the asymmetry in bargaining power (providing fair buying conditions including price and payment delay, and investing in capacity building).

In that model, high production and transaction costs (e.g. cost of searching for information on native potato offer; cost of negotiation; cost of planning and monitoring the product transfer without clear quality criteria) generated by small-scale farmers' systems (e.g. numerous plots scattered in remote areas, weak organization, and distinctive business culture) are:

- Reduced through training and trust established in the framework of a long-term relationship
- Transferred to the consumer
- Absorbed by the company and turned into image benefits.

By applying CSR to the market chain, the company makes it possible for poor, small-scale providers to increase their income and standards of living by accessing new markets despite their initial lack of competitiveness; and to receive a share of the profits despite their low negotiation capacity.

This business model's objective is not to maximize short-term profits ("business as usual"). Rather, it seeks to develop new, high-value market niches and increase providers' reliability and competitiveness in the medium term that will lead to long-term profitability ("business for development"). In addition, by publicly communicating this strategy, the company may draw benefits for its brand value.

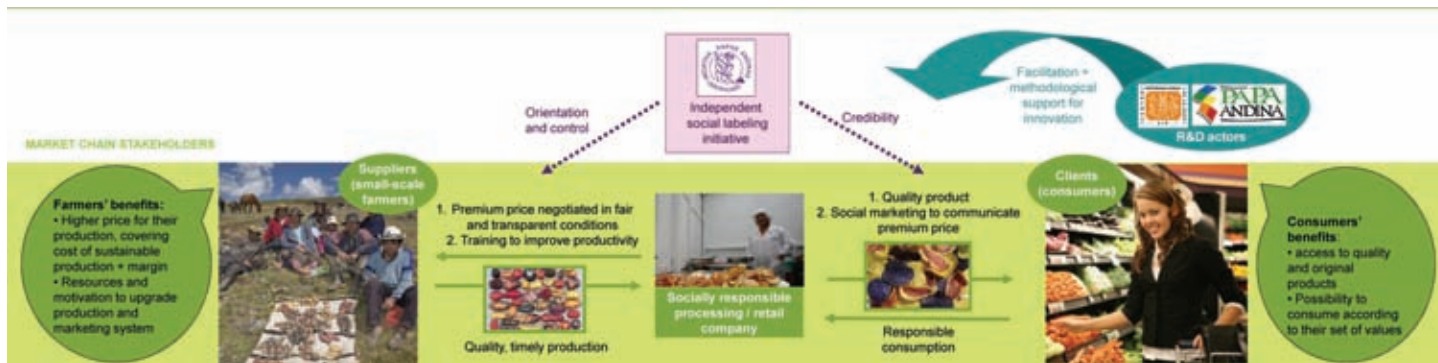
Social labeling initiatives (certification schemes and public advocacy campaign) driven by an independent party can consolidate this model, providing the company with:

- Credibility to back up its own social marketing towards its client
- Orientation on how to invest in its providers' competitiveness in an impact-oriented way.

To implement such a business model, innovation and capacity building are required at different levels. R&D institutions can provide the following contributions:

- Capacity building for farmers to increase their competitiveness
- Orientation of companies about CSR
- Generation and provision of marketing services for all market chain actors (as an initial investment into kick-starting the business and building trust among market chain actors)
- Identification of pro-poor commercial practices and facilitation of innovation processes to develop social labeling initiatives
- Demand-oriented research for sustainable and affordable technologies that increase the competitiveness of small farmers.

Figure 2. CSR applied to the (native potato) market chain



OUTCOMES: PUBLIC-PRIVATE PARTNERSHIPS FOR DEVELOPMENT

In 2008, the multinational company PepsiCo Foods entered the growing native potato market that had been boosted by the efforts of Papa Andina and its partners. On Peru's National Potato Day, PepsiCo launched "Lay's Andinas", naturally-colored native potato chips. A market leader with more than 80% share of the Peruvian snacks market, the company turned the idea of native potato chips into a top-quality product available at any supermarket in Lima, and contributed to validating the business model presented above.

PepsiCo's CSR investment focused on two aspects. First, PepsiCo invested in a transparent, mutually-beneficial business relationship with providers that had a lower bargaining power. In this process, several innovations were introduced in the native potato market chain. Commercial conditions were negotiated with regard to the situation of High Andean farmers: the price was set to leave farmers with a profit margin - taking as a reference production costs (including workforce) plus marketing costs -, and certain flexibility was introduced for non-compliance with agreed volumes. Despite finding itself in an almost monopsonistic position for buying native potatoes, the transnational company maintained the conditions that it usually offers to its providers. So for the first time, native potato producers were offered a contract at the beginning of the growing season guaranteeing demand for their production; a transparent quality control; short payment delays (maximum one week); technical assistance at critical moments of the campaign; and the opportunity to visit the processing plant in Lima.

Second, the company positioned the product in a high-end niche market. The product not only boasted a high intrinsic quality, but was also socially responsible and relatively expensive (price/kg up to twice that of competitors). PepsiCo developed a social marketing campaign (packaging, TV commercial), appealing to the sensitivity of the top consumer segment on issues such as health, social development in the High Andes, cultural legacy and active conservation of biodiversity. Linking these issues to a food product also constituted an innovation in the Peruvian market.

Launching Lay's Andinas was a private initiative by PepsiCo. However, partnerships at two different levels with R&D actors were necessary to make this an impact-oriented business model, yielding benefits to both the company and small-scale farmers. The first partnership was formed in 2007 between PepsiCo and the Peruvian not-for-profit organizations FOVIDA (an NGO with extensive experience in promoting pro-poor market chains) and CAPAC PERU (a stakeholder platform [Devaux *et al.*, 2007] made up of NGOs, farmer organizations and companies, and chaired by FOVIDA). In this framework, both FOVIDA and CAPAC have been covering part of the initial investment involved in linking small-scale farmers to the agro industry. Indeed, among the challenges that arose from setting up PepsiCo's native potato supply chain was the unavailability of counterparts with an adapted legal and fiscal status to sign the supply contract, since most farmer organizations were still in the process of formalization. Definition of quality parameters and referential production costs were also lacking for these not-yet-commercial varieties traditionally used by producers for

home consumption. In addition, the multinational did not have the resources to provide the initially requested day-to-day monitoring and capacity building of dozens of scattered small farms. Services provided by FOVIDA and CAPAC PERU to bridge these gaps fall into two categories:

- Capacity building in production and post-harvest management, organization and business management in order to increase farmers' productivity and competitiveness with a criteria of environmental sustainability.
- Business services, including legal representation of small-scale individual or organized farmers, contract management, and credit for inputs and transport.
- These services are provided on a non-profit basis justified as an initial investment in the setting-up and consolidation of a new, inclusive market chain. They are financed by development cooperation funds from Switzerland, New Zealand, and USA, and imply technological and methodological expertise from CIP (Farmers Field Schools (FFS) and Integrated Crop Management (ICM) practices) and the National Institute for Agricultural Innovation (INIA). Particular care is taken to make the corresponding costs visible to both farmer organizations and the agroindustry. There is a shared perspective to transfer them to market chain actors as business develops.

The second partnership was formed in parallel to the development of Lay's Andinas business; CSR and advocacy were the core issues. It led to the establishment of the Andean Potato Initiative (www.papasandinas.org), launched officially in May 2008 with the aim to promote a native potato trade based on values such as culture, history, biodiversity, health and poverty reduction. The Initiative is a public-private open alliance, currently comprising FOVIDA, CAPAC, the NGO ADERS-Peru (Asociación para el Desarrollo Sostenible), PepsiCo, Wong supermarkets, representatives of the gastronomical sector and market-oriented farmer organizations. It receives technical back-stopping from CIP-Incopa. Hosted by CAPAC-Peru, the Initiative has led an award-winning advocacy campaign and co-organized the celebration of the 2009 National Potato Day with CIP and the Ministry of Agriculture.

The Initiative soon recognised the need for precisely defining the content of native potato trade with CSR. As market leader and an observed player, PepsiCo was willing to implement an impact-oriented CSR strategy towards its new providers, as well as obtaining independent and high profile institutional backup to maximize their external credibility. After identifying a similar demand from other private actors processing or distributing native potato products and recognizing the need for a label relevant to the domestic market, CIP-Papa Andina facilitated a public-private workgroup in the framework of the Initiative to establish a specific certification scheme for Andean native potato trade with CSR. The objective was to set a standard for responsible practices and develop a communication tool to make companies' compliance visible to consumers. Intended outcomes were to secure benefits for farmers and prevent unfair competition from companies conducting "social"

marketing not based on CSR practices. The “Andean Potatoes Label” was made available early in 2009 and Pepsico successfully went through the certification process¹, obtaining the right to use the label for its 2009-2010 production. Several other companies have expressed interest in the label.

EARLY IMPACTS: RESULTS AT FARMERS’ LEVEL

Participation in the supply chain of a product such as Lay’s Andinas has generated benefits for farmers in terms of access to a high value market for their potato biodiversity.

The strong growth between 2008 and 2009 in terms of volumes (Figure 3), corresponding business value (Figure 4), number of varieties accepted by the industry (Figure 5) and workdays generated for farmers (from 7’500 in 2008, to 16’700 in 2009) give evidence of the potential of this type of market chain to improve sustainable means of living in High Andean communities. In absolute terms (brought down to cash benefits at an individual scale), results are still modest. But they are quite satisfying in relative terms (compared with opportunities farmers had before, see Figure 6).

Estimated business profitability for farmers is between 20% and 50% depending on local conditions. Moreover, the contract guarantees the farmers a market and a stable price. Besides, business is extending beyond this successful commercial relationship. On the one hand, farmer organizations involved (from the Department of Huancaavelica, Junin and Apurimac) have started to diversify their clients and enter new high-value markets (selected fresh potatoes, seeds) using potatoes that do not fit industrial requirements. On the other hand, the agroindustry is seeking to extend its supply chain to other Andean regions.

From a qualitative point of view, the farmers’ commitment to quality criteria like PepsiCo’s encouraged them to acquire new skills and adopt new attitudes, especially in post-harvest management (selection). In the remote High Andean areas, where communities have had a growing tendency to rely on external aid (in many cases due to extended development cooperation or public support), interesting changes towards a more entrepreneurial attitude could be observed: for the second campaign and in the context of soaring prices on the input market, farmers negotiated a price increase of 20%; they also increasingly incur the costs of frying trials at farm gate in order to minimize the risk of rejection upon delivery in Lima. Additionally, in Junín and Huancaavelica, farmers have been developing their capacities for production with the support of FOVIDA, driven by the motivation to supply the industry, and they

1 The certification process was carried out by a professional, ISO-certified independent company. Certification costs were borne by PepsiCo.

have obtained an increase in average yield from 6 to 12 MT as a result of an adequate use of inputs².

Figure 3. Native potatoes sold to the chips industry through contract

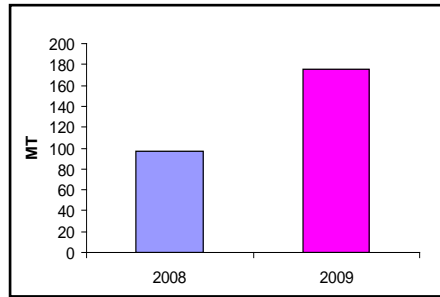


Figure 4. Total value in USD

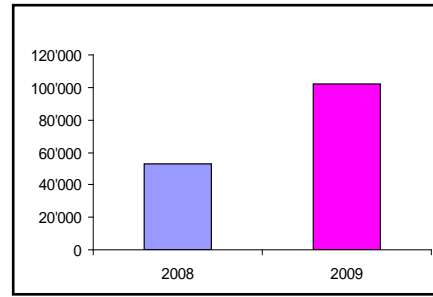
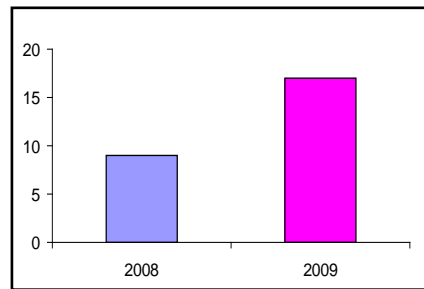
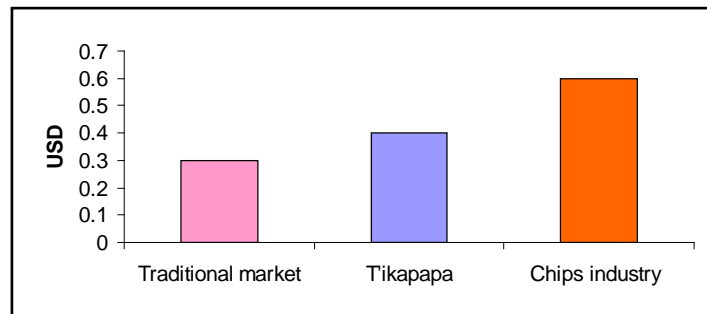


Figure 5. Number of different varieties validated for the chips industry



2 With regard to native potato trade and *in situ* biodiversity conservation, early evidence shows a positive influence through the extension of cultivation areas and a general revalorization among farming communities of native potato varieties, going beyond varieties demanded by the industry. A more detailed study is needed.

Figure 6. Price paid to farmers in 2008 by the chips industry means a 100 % increase compared to local market



PROSPECTS AND CONCLUSIONS

The public-private partnerships and institutional innovations around T'ikapapa and Lay's Andinas have provided evidence that the approach of Papa Andina and its partners to integrate CSR into the native potato market chain is a promising one. In the current conjuncture, where the demand for quality native potatoes still exceeds the supply, the agreement reached by farmers and R&D actors with the market leader in a CSR framework has set a benchmark for the whole native potato market, and competitors have been aligning prices offered to farmers (on both fresh and processed markets).

However, to make benefits sustainable for small-scale farmers, and eventually scale up the volumes and number of suppliers involved, it is essential that PepsiCo consolidate its commercial strategy and that the product be financially viable over time. As for competitors in the potato industry, they will have to institutionalize the high price they currently offer to farmers into a comprehensive, proactive CSR strategy. Finally, consumers will also have to be responsible in their purchases in order to make this trade with CSR viable. This is the main objective of the Andean Potatoes certification label. The emerging possibility to access new, export markets, where ethical consumption is more developed, will favor this process.

This experience also highlighted priorities for a demand-driven research aimed at improving the competitiveness of small-scale farmers. Issues currently tackled by Papa Andina and its partners in collaboration with other CIP research divisions and private partners include: controlling reducing sugar accumulation in native potatoes to minimize rejections from the chips industry; defining Good Agriculture Practices for High Andean farming systems to ensure environmental sustainability and protect farmers' (and consumers') health; facilitating access to sprout inhibitors to improve supply regularity of this seasonal product; and improving pro-poor quality seed production systems to enable farmers as a way to increase yields. The opportunity

and modalities of the private sector's participation in this research agenda are currently being debated case by case.

There are, nevertheless, a number of unresolved issues linked to sustainability in the current experience of Papa Andina and its partners. While the Andean Potatoes Initiative provides an institutional framework to address them in a constructive and practical way, the following issues ought to be further investigated to prevent "business for development" from turning into a more cynical "development as a business".

TRANSFER OF COSTS AND RESPONSIBILITIES TO MARKET CHAIN ACTORS

Based on previous positive experiences (Escobal, 2003), there is consensus that subsidizing the competitiveness of small-scale farmers is a necessary initial social investment taken on by NGOs, and that market chain actors in the long run should cover these costs without aid funds. However, in the recently established native potato chain, no reasonable horizon and agenda could be defined for a direct relation between the industry and farmer organizations. The circumstances of High Andean farmers (high levels of poverty, low educational levels and limited resources) is likely to slow the transfer of responsibilities from the NGOs to farmers' organizations.

SAFEGUARDING BENEFITS FOR SMALL FARMERS IN THE DEVELOPMENT OF THE NATIVE POTATO MARKET CHAIN

There are many threats to the inclusiveness and sustainability of the native potato market chain. Some possible future scenarios:

- Ethically-sourced products face "unfair competition" from products claiming to benefit small farmers without necessarily doing so
- Small farmers are unable to compete against larger farmers. This threat could be heightened by the development of colored potato varieties that are suitable for lower altitudes
- Recently-formed farmer organizations are undermined, as individual farmers leave their organizations to operate as independent providers, excluding the most marginalized producers from the market chain
- Overproduction generates downward pressure on prices, marginalizing the less competitive producers (likely to be poor small farmers);
- As a result of market incentives, productivity is sought at the expense of biodiversity, human health and the environment.

The certification scheme is an attempt to consolidate a market for responsible products, but the success of this strategy will depend on factors such as the sustainability and credibility of the Andean Potatoes Initiative and its institutional framework, and the stakeholder platform CAPAC PERU. Their ability to get companies committed to the vision embodied by the label and to position the label in the market will be crucial. Finally, the market response will be decisive.

RESPONSIBILITY TOWARDS CONSEQUENCES OF CLIMATE CHANGE

The increase of erratic and severe droughts and frosts is making High Andean agriculture increasingly risky. The industry has adopted a relatively flexible attitude towards small-scale farmers, tolerating non-compliance with agreed volumes. However, the risk of crop losses is still basically incurred by producers. Ideas such as the creation of an insurance scheme for farmers, to which companies would contribute in the framework of their CSR strategy, have been brought to discussion, but no concrete solution has been drafted. In the meantime, diversification of crops and other sources of income is being encouraged.

The research agenda to increase the competitiveness of small-scale farmers on the native potato market is broad. The case presented here highlights how meaningful it is to involve CSR-conscious private companies in the innovation process. Only with their commitment – and that of consumers – is the native potato trade able to develop into a viable vehicle for poverty reduction.

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POSTSCRIPT

After this paper was presented at the 2009 ISTRC Symposium, PepsiCo reported poor sales of Lay's Andinas and did not further invest in promoting the product, which gradually disappeared from the market. In 2010, the company bought only half the 2009 volume of native potatoes from small-scale farmers; it has refrained from making any formal commitment to purchasing native potatoes for the 2011 season and has commented that it is redesigning the product. In the meantime, PepsiCo and other large processing firms have developed other native potato products for the domestic and export markets. Papa Andina is now conducting a study of the outcomes and lessons of this experience with CSR, small farmers and potato biodiversity.

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Cinderella's slipper: *Sondeo* surveys and technology fairs for gauging demand¹

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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 problems (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.

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- 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.

INTRODUCTION

Demand² 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 organization, 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

² Douglas 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).

unions, indigenous organizations, etc.).³ 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.⁴ 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 organizations which were involved in projects from before SIBTA⁵:

The Foundation for Promotion and Research of Andean Products–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 regional research and development (R&D) institution affiliated with the prefecture of Santa Cruz Department).

3 <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.

4 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).

5 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 (Integrated weed management) projects.

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. *Sondeos* (which will be explained in the Section on Methods), 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,⁶ 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).

⁶ We are grateful to André Devaux for first pointing this out to us.

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. 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.⁷ 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

⁷ 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.

- 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 next 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* in Pomposillo

Local names ⁸	Technical names	Number 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

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 (local agricultural research committee), 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

⁸ 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.

- 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 organizations (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.

‘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.

Table 2. Origin of technologies tested 2002-03

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 <i>Rhizoctonia solani</i> in potato ⁹	PROINPA & CIAT

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.

⁹ A fungal disease. According to the Crop Protection Compendium (CABI 2000), the old scientific name, *Rhizoctonia solani*, has been replaced by *Thanatephorus cucumeris*.

The high valleys of Cochabamba

These 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 600 mm 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.

The low valleys of Santa Cruz

These are sometimes known as the 'mesothermic valleys'. They are still high, at some 2,000 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%

RESULTS

Results of the *sondeos*

We did three *sondeos* in late 2002, 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.

Table 3. Explicit demands identified during the *sondeos*

Kinds of Demands	Pomposillo (Umala, La Paz)	Place 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, blight plus weeds ¹⁰ Broad beans: q'epicha (aphid)	Potato: blight, moth, aphid Maize: rust Wheat: rust and cominillo (weed, <i>Spergula arvensis</i>) 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: foot-and-mouth disease, parasites, altitude sickness, timpanismo Sheep: parasites, lice, mange, ticks, etc. Chickens: suffer from a winter disease called moquillo, which the team could not identify	Cattle: blue flea Sheep: tick	Cattle: foot-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	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	

¹⁰ Especially: Puka qhora (*Rumex acetosella*), comino qhora (*Spergula arvensis*), ajara (*Chenopodium album*), nabo (*Brassica campestris*).

Implicit demands identified in the sondeos

In Section 2 we discussed how we identified implicit demands. Some of these demands, identified through *sondeos*, 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.

Table 4. Implicit demands identified during Qolqe Qhoya *sondeo*

Implicit demands	Reasons 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, without first analysing the soil, and without technical recommendations.

Table 5. Implicit demands identified during Pomposillo *sondeo*

Implicit demands	Reasons 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 <i>aynuqas</i> .	Most pasture lands are fallowed <i>aynuqas</i> , 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, <i>lluk'i</i> potatoes for <i>chuño</i> ¹¹	People still plant some 20 or more varieties of potatoes, but they have lost some, which PROINPA can supply..
Vegetable growing: varieties the people can reproduce themselves, without buying seed every year	Currently the local people buy fruit and vegetables to eat. However, an institution (not linked to INNOVA) is now promoting home gardens in the community. The local people accept these gardens, even though they are planted with foreign seed, which they will end up having to buy if they want to continue with the gardens.

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

Results of the technology fairs

INNOVA held three technology fairs in March 2003, in the three areas where *sondeos* 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 really was 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.

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 ¹²	✓	✓	✓
Forages for improved fallow ¹³		✓	
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 ¹⁴			✓
Plant-meds (home remedies for animals, made from plants)	✓	✓	

12 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.

13 A trial and a demonstration of mixed forage crops planted in fallow land, instead of allowing weedy pioneer plants to re-colonise the soil.

14 *Bokashi* is a cleverly-made, but extremely labour-intensive organic fertiliser.

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



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 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).

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



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.

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 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).

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 watching them during the hilling up trial). The acceptance of bokashi is an anomaly, since it is an expensive compost, 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.

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



Table 7. Comparison of demand and supply of technology in Pomposillo

Explicit demands (from the <i>sondeo</i>)	Supply of technology from INNOVA	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)	51 (48%)
	Grains intercropped with legumes	33 (31%)
	Phalaris grass	31 (29%)
More quinoa production	Quinoa varieties	94 (89%)
Control of pests (especially Andean potato weevil, hail, frost and drought)	Not yet	NA
Higher prices for produce.	Not yet	NA
Implicit demands (themes not identified in the <i>sondeo</i>)	New implements	45 (43%)
	Improved hilling-up	54 (51%)

NA: Not applicable (the technology was not offered at the technology fair)

Most of the technologies won the interest 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).

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

Explicit demands (from the <i>sondeo</i>)	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)	33 (72%)
	Grains intercropped with legumes	22 (48%)
	Phalaris	8 (17%)
Implicit demands (themes not identified as demands during the <i>sondeo</i>)	Higher hilling up	16 (35%)
	New agricultural implements	21 (46%)

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).

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 samples seeds 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 the International Maize and Wheat Improvement Center, Mexico (CIMMYT) have developed something similar, which they call the voting method. They present many maize varieties to campesinos, 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.

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

Explicit demands (from the <i>sondeo</i>)	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 & 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 <i>Cyperus rotundus</i>)	10 (11.8%)
	Control of cominillo (the weed corn spurry, <i>Spergula arvensis</i>)	7 (8.2%)
Forage	Pasture garden	28 (32.9%)
Improved household diet	Not yet	NA
Raise animals		
Windbreaks		
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 <i>sondeo</i>)	Tillage systems	23 (27.1%)
	Animal drawn tillage implements	34 (40.0%)
	Hilling up	22 (25.9%)

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 *sondeos* 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 discarded a lot of potentially good technology, wasting a considerable research investment and potential for assisting poor farmers in Bolivia and elsewhere.

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Unspoken demands for farm technology¹

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ABSTRACT

For three years in Bolivia (2002–2005) the INNOVA Project finished researching several technologies for sustainable agriculture, started by earlier DFID-funded projects. Before INNOVA started, critics suggested that these technologies should be discarded in favour of a demand survey. Instead, INNOVA kept the existing technologies, but judged the demand for them with several methods (CIAL, sondeo, technology fair, and others). INNOVA found that there was demand for some of the technologies, but that a survey would have missed much of the demand, which is implicit. That is, people are not initially aware of all their problems or of all the possible solutions. Over the years, farmers made more specific, sophisticated demands on the technologies, which evolved as a result. Demand and supply of farm technology are like two sides of an unfolding conversation.

INTRODUCTION

Smallholder farmers need new technologies from the formal sector if they are to stay competitive and sustainable in a rapidly changing world (Tudge, 2004). There is a growing awareness among researchers and policy-makers that research should be 'demand-led,' meaning that farmers should help set the research agenda (Beye, 2002; Royal Society, 2004). 'Demand' for research is not the same as the market demand for goods and services. In competitive markets, prices send signals between buyers and sellers about the demand of goods and services. Most of the products of agricultural research, such as IPM principles, or new tillage practices etc., are public goods which can be freely and widely shared with no loss in their value. Many of them cannot be sold, so no private market will promote them². At the same time, smallholder farmers in tropical countries have little contact with researchers and have little scope for expressing demand for research (e.g. new farm tools, crop varieties or pest control techniques) through non-market means. Participatory diagnoses have been proposed as ways to see what people want (Bellon, 2001; Gill, 2002; Horne and Stür, 2005), often with an emphasis on easing the adoption of technologies (Smale and De Groot, 2003). In Vietnam, researchers interviewed farmers, learning the history of fruit trees,

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2 Public goods in the economic literature are defined as those goods which are non-excludable and non-rivalrous (Dalrymple 2005). The classic example of a public good is a light house, no user can be excluded from access to the good (non-excludable) and however many ships make use of the light signal there is no reduction in its value (non-rivalrous).

and how farmers manage them, which helped scientists understand why some farmers were getting more serious pest problems. Only then could researchers make detailed recommendations, in a way which farmers would accept (Van Mele and Van Chien, 2004). As this example shows, farmer demand co-evolves with research. Demand for research is not like an object in the real world, which can be discovered; rather it is more like one side of a conversation which will only unfold if there is someone else to talk to.

This paper discusses a three-year experience to describe and meet farmer demand in Bolivia. In 2001, Bolivian agricultural scientists had many technologies which were considered almost ready to disseminate. These were the fruit of several earlier projects funded by DFID in potato growing areas. However, the Bolivian Agricultural Technology System (SIBTA) had been established the previous year: it was explicitly 'demand-led,' which presented the scientists with new challenges.

SIBTA was a public-sector, competitive-funding organization, following similar models created elsewhere in Latin America and an emerging paradigm for national agricultural research systems (Byerlee, 1998; Hall et al., 2003). SIBTA replaced IBTA (the Bolivian Institute of Agricultural Technology); IBTA was disbanded in 1998 (Gandarillas et al., 2007). Competitive bidding seeks to improve the accountability and relevance of agricultural research. Calls for research and funding come from farmers, in written petitions, preferably from organized groups (cooperatives, farm unions, indigenous organizations, etc.) and is elicited from farmers, as a 'raising of demands' (*levantamiento de demandas*). Most of SIBTA's work is channelled through four Foundations which manage extension projects known as PITAs.

In this context, policy-makers in La Paz suggested that technologies which researchers had already developed should be abandoned and a fresh start made, by collecting demand from smallholder farmers. However:

- First, capturing farmer demand may not be as simple as SIBTA's architects believe. The idea of 'collecting demand' supposes that farmers know their needs, and will voice them. It also supposes that farmers are aware of potential technical options that could respond to this demand, the costs, and the pros and cons of each one.
- Second, what should be done with research that is already underway and in which much time and money has already been invested?

Learning farmer demand requires a deeper interaction with farmers than a survey, petition or a village meeting. Besides, the scientists insisted that their nearly ready 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* (Bentley et al., 2004). INNOVA was implemented through three partner organizations which were involved with DFID before SIBTA (see Table 1). INNOVA was managed by the regional partnership programme of the International Potato Centre (CIP), known as Papa Andina.

INNOVA worked with farmers in pilot areas in three distinct agro-ecozones, hundreds of kilometres apart (the high valleys of Cochabamba in central Bolivia, the low valleys of Santa Cruz in the east and the high plains or Altiplano of La Paz in the west). INNOVA lasted for three years (2002-03, 2003-04, 2004-05). Its goal was to find methods to capture farmer demand for research, and to refine technologies that had been recently invented.

Table 1. INNOVA partner organizations

Institution	Brief description
CIAT/Santa Cruz	The Centre for Tropical Agricultural Research, Santa Cruz, a public agricultural R&D institution affiliated with the prefecture of Santa Cruz Department, not to be confused with the international centre in Colombia
UMSS	The Public University of San Simón, Cochabamba, which includes an agricultural college
PROINPA Foundation	A private non-profit institution for research on Andean crops, which evolved out of the IBTA potato programme, with support from the Swiss Agency for Development and Cooperation (SDC)

STARTING TECHNOLOGIES

In 2002, INNOVA proposed validating ten technologies with farmers (Table 2), and began developing methods to compare this supply of technology with farmer demand, as discussed in the following section.

METHODS TO CREATE TECHNOLOGY AND ADJUST IT TO DEMAND

The researchers used several methods (described below) to hone their technologies, always with farmers, never on-station. INNOVA adapted most of these methods from existing ones. What was novel was a coherent set of methods for linking the supply and demand for technology (Doug Horton, personal communication).

INNOVA coined the idea of explicit and implicit demand. *Explicit demands* are the ones that people recognize and can express loud and clear (“We need more grass for our sheep in the dry season”). *Implicit demands* are for problems that the people themselves do not recognize (they will not demand control of potato viruses if they do not know that viruses exist), or for techniques which they have not imagined (for example, they did not demand metal ploughs until they saw them). INNOVA used the following methods to study demand.

CIAL and GET

CIALs are groups of about five local people who conduct field trials with a few replications, and uncomplicated trial designs on topics the communities have agreed upon, and present the results back to them afterwards (Ashby et al., 2000; Braun et al., 2000; Thiele et al., 2005; Pretty 2002). Before INNOVA, both PROINPA and CIAT/Santa Cruz had already organized several CIALs. In other areas, INNOVA used the GET (technology evaluation group). A GET is like a CIAL, except that instead of asking farmers to define their research topics, the agronomists present their research topics and the community decides which to try. The GET and the CIAL both evaluate the

technologies with committees of farmers, who use simple tables with flipcharts ('participatory evaluations') to register and analyse committee members' preferences for different technologies, and for which characteristics (Ashby, 1992). INNOVA used CIAs and GETs during all three years. An unanticipated advantage of the CIAs and GETs was that they helped INNOVA with the other methods described below (see Table 4). The committee members were like promoters (Bunch, 1982), suggesting that most methods for working with rural communities can be enhanced by personal contacts between researchers and some individual community members.

Table 2. Supply of technology at the start of INNOVA

Family of technologies	Technology proposed, 2001	Brief description
Fodder and soil conservation	1. Improved fallow	Mixtures of purple clover (legume: <i>Trifolium pratense</i>) with grasses (<i>Lolium perenne</i> , <i>Festuca arundinaceae</i> , <i>Dactylis glomerata</i>) to plant after harvesting oats or barley, as the field enters fallow, to produce fodder and manage weeds.
	2. Grains-plus-legumes	Mixes of legumes (vetch, purple clover) with grains (oats, barley) for fodder, to conserve soil and water, control pests, diseases and weeds and stabilise yields.
	3. New fodders	Some 14 varieties of several species of legumes and grasses, planted in small demo plots called 'pasture gardens'.
	4. Phalaris grass	Live barriers of phalaris grass (<i>Phalaris tuberoarundinacea</i>) planted in rows for soil conservation. The live barriers form a wall that traps runoff, slowly forming a terrace. The grass is good fodder.
IPM (integrated pest management)	5. Chicken manure for nematodes	Integrated management of the nematode <i>Nacobbus aberrans</i> by applying chicken manure to the soil.
	6. Potato IPM	IPM of potato pests and diseases in the low valleys (Santa Cruz). Some 10 ideas including insecticides and plant extracts to kill insect vectors of disease (aphids, whiteflies etc.), control of tuber moth in the field and fungicides for Rhizoctonia.
	7. Herbicide for purple nut sedge	Weed management (<i>Cyperus rotundus</i>). Trials of the herbicide glyphosate.
Animal traction and tillage	8. Improved tillage	Several ploughs had been designed, and a few trials were needed to learn the best ploughing dates.
	9. Adoption of implements	Promote adoption of animal-drawn implements.
	10. Home remedies for cows	Better nutrition for livestock, remedies made from local plants to kill cattle parasites.

Back-&Forth (*Ir-y-Venir*)

This is a method that PROMETA (part of UMSS) had developed and used previously, which was used during all three years of INNOVA. Researchers take an implement, e.g. a plough, to the field. They try it with the *campesinos* who suggest changes. The mechanical engineer redesigns the implement, and the team takes it back to the field, until people are satisfied with it. In the final stages, PROMETA may leave an

implement in a community so they can try it for several days. For example in 2003, INNOVA showed metal ploughs that had been developed in the valleys to *campesinos* in the Altiplano. They liked the plough, but asked for wider wings, to heap more earth around the potato plants. They also said the 13 kg plough was too heavy for their oxen, which are smaller than the ones in the valleys. INNOVA returned with a lighter, 8.5 kg plough, but it was too fragile, and could not work the rocky soil of the Altiplano. By 2004, INNOVA returned with a heavier plough, 10.5 kilos, with a stronger, sharper point. It worked well and people began to buy it.

Sondeo

The *sondeo* (literally ‘sounding,’ the nautical term for finding the depths of the water) is known by its Spanish name even in English-language literature (Hildebrand, 1981). It involves six researchers going to the field for a week to observe farms and talk to farmers. Some of the partner organizations had used the sondeo for several years. CIAT started using the sondeo in the 1980s and PROINPA used it in the 1990s. INNOVA used a sondeo early in the first year (2002-03), but changed it, making it shorter (two days instead of six), going to one community in each of three regions (instead of many communities in a single region) and added a final session to discuss the results with the community (Bentley et al., 2004). Semi-structured interviews on crops, pests, livestock etc. led to ample descriptions of local agriculture, including problems and demands.

INNOVA’s technologies fit reasonably well with the explicit demands voiced in the sondeo. For example, the farmers said they wanted more fodder for their cows, oxen and sheep (Bentley et al., 2004), and four technologies were on fodder (Table 3).

Table 3. Summary of INNOVA’s supply of technology, versus farmers’ demands

Technology supply	Main demands from the sondeo (Nov 2002—Jan 2003)
1. Improved fallow	Fodder: Altiplano, high valleys
2. Grains-plus-legumes	Fodder: Altiplano, high valleys
3. New fodders	Fodder: Altiplano, high valleys
4. Phalaris grass for soil conservation	Soil conservation was not an explicit demand. Later, INNOVA adapted phalaris, emphasising it more as fodder
5. Chicken manure for nematodes	Was not an explicit demand
6. Potato IPM	Several pests and diseases, especially potato late blight (all 3 areas)
7. Herbicide for purple nut sedge	Weeds, especially purple nut sedge (low valleys)
8. Improved tillage	Was not an explicit demand
9. Adoption of implements	Was not an explicit demand
10. Home remedies for cows	Various diseases of several livestock species (all areas)
	Irrigation (all 3 areas)

However there was little explicit demand for nematode control, improved tillage, animal traction or soil conservation, which were all important for researchers in INNOVA (Table 2). This does not mean that the technologies were trivial. Nematodes are a serious pest in Bolivia, even though they are so difficult to observe that

smallholders tend to be unaware of them unless the little worms are brought to farmers' attention (Bentley et al. 2003) *Campesinos* seldom complain of soil erosion, even when it is serious and chronic, but may show concern over extreme gulley erosion (Thiele and Terrazas, 1998).

Stratified sondeo

A study funded by SDC found that almost everyone in Bolivia is poor (Quiroga et al., 1999). So the real question is not if the *campesinos* are poor, but if they are all equally poor, and if they all have the same needs for innovations. The study indicated more poverty in the Altiplano than in the low valleys. In three of the municipalities where INNOVA worked, the rate of poverty was 98% (in Umala, on the Altiplano), 97% (in Tiraque in the high valleys) and 85% (in Comarapa in the low valleys) (Quiroga et al., 1999). The 15% who are not poor tend to live nearest to the highway. They are more visible, have more contacts, more time and may be more likely to collaborate with INNOVA. So after the first sondeo, discussed above, INNOVA planned a stratified sondeo to distinguish between the demands of the poor, the poorer and the poorest. In Tanzania and Ethiopia, researchers held meetings to ask farmers to rank demands by income groups. Wealthy farmers were more concerned about the shortage of grazing land in Ethiopia, because they had more cattle. The poor were more concerned about access to irrigation water in Tanzania because the wealthy had the water. But many issues were of concern to most community members (e.g. declining soil fertility, deforestation, deteriorating water quality (German et al. 2005).

INNOVA conducted a stratified *sondeo* in four communities the second year (December 2003—March 2004), identifying economic levels with wealth ranking (see Grandin, 1988). The stratified sondeo showed some differences between the 'rich' and the poor, e.g. on the Altiplano, the poorest felt most strongly the shortage of irrigation water. In the high valleys the least poor were the most concerned about the high price (\$50) of metal ploughs. And in the low valleys the poor were not interested in the problems of cattle or fruit trees. However, the poorest shared many demands with their wealthier neighbours (e.g. everyone wanted to control diseases of potato: a staple food of the Andes). But the stratified sondeo annoyed the local communities, which have a sense of moral equality. All community members are regarded as equal, even though they are well aware of wealth differences and it was upsetting for them to see this differences made so starkly obvious, when the facilitators asked people of different economic levels to sit in different workgroups. INNOVA found that the communities have just a few relatively prosperous households, with more land than the others, and just a few very poor households, mainly of elderly people. Most households are of middle income: poor but not destitute, food producers with a small surplus to sell, much as scholarly studies have shown for the Peruvian Andes (Mayer, 2002).

Local notions of equality may be a kind of polite fiction, but glossing over some economic differences helps avoid problems like envy among community members, and allows them to respect each other and work together. In the future it will be important to learn about local economic differences, and the various demands for

research per each group, but in slightly more discrete ways, not by physically arranging the 'strata' into highly visible workgroups ("all the poor people over here").

Technology fair (*feria tecnológica or encuentro tecnológico*)

Before harvesting their field trials, the researchers and the CIALs and GETs showed the test plots to hundreds of their neighbours and to people from other communities. They divided the visitors into three to five more-or-less random groups, who visited each trial (in a bus or on foot), where the farmer-experimenter explained the technology. Some technologies were presented as stands, which were not as convincing as the ones shown in the field, but stands saved time. Each technology fair took about six hours, but they were fun, 'a party without booze'. They started with a sign-in, and a welcome by municipal authorities. After seeing the field trials and stands, there was an exit questionnaire, a big lunch and a farewell. They included other fun events, like music, skits or a football match. Besides the lunch, farmers were also provided transportation to the technology fair (in a chartered bus). The technology fair was inspired by the field day, with the difference that INNOVA used short questionnaires to see which technology people preferred. The one-page forms could be filled out in two minutes, and they asked which technologies people wanted to try (and why) and which technologies did they not like (and why not). At a typical fair, 12 to 14 project staff members gave the questionnaires to over 100 people. INNOVA held technology fairs the first year in one community in all three regions, in two regions the second year (Altiplano and low valleys), and in two the third year (Altiplano and high valleys). The first year, INNOVA also used voting, with small 'ballots' which farmers dropped into boxes representing each technology. However, this gave similar results to the short questionnaires (see Bellon, 2002 for another voting method) and in following years INNOVA just used short questionnaires.

Forage was an explicit demand, however during the first technology fair (2003) on the Altiplano the fodder trial of grains-with-legumes had been planted late and the plants were barely growing. Questionnaires showed that the farmers were not convinced (only 31% expressed interest). In the sondeo on the Altiplano, people demanded more forage; quinoa was a secondary demand. However, during the fair, people actually preferred quinoa to fodder. In part this was because a woman and man from the area showed a healthy field of quinoa (they had used chemical fertilizer, not a local practice) (see Figure 1a) People also liked quinoa perhaps because at a stand, agronomists gave a convincing talk, and handed out pieces of quinoa cake (see Figure 1b). People are attracted to well-presented technology, even if it is not high on their list of demands.

In the fairs, the farmers gave high scores to improved tillage and animal-drawn implements, even though these were not demanded in the sondeo. The technologies responded to implicit demands; people did not request the implements until seeing them. By the third year INNOVA knew how to show its techniques to best effect: in the field, with a thriving crop, explained by farmers in the local language (Spanish, Quechua or Aymara), and giving away little (50 gram) bags of seeds, so farmers could try the new crops or varieties at home (see Figures 2 and 3).

Figures 1a and 1b. It was hard to compete with quinoa in the technology fair in Pomposillo, with a thriving crop, explained in Aymara (above), followed by cake (below). Presentation matters, as does demand.



Figure 2. People like to experiment. Farmers at the technology fair in 2003 in Qhochimit'a rush to get 50 g bags of alfalfa seed, which they can plant at home.



Feedback (*retro-información*)

CIALs and GETs have a final event where the farmer-experimenters explain their preferences for each technology. But INNOVA used this feedback (during all three years) to encourage farmers to suggest changes in the technologies and plan the next year. The farmer-experimenters and the agronomists outline key points the day before on a large sheet of paper, which the farmers present in their own words.

Discussions with the audience often helped improve the technology. For example in Pomposillo, on the Altiplano, people said it was important to plough, adding that the grains-plus-legumes failed in 2003 (year one) because they were planted late. INNOVA followed their recommendations and in 2005 (year three), the oats-plus-vetch on the Altiplano were tall and green for the technology fair, and visiting farmers wanted to plant the mix (see Figure 4).

During the feedback in Sank'ayani, in the high valleys of Cochabamba, farmers said they liked vetch, but they would like it more if the seed were not so expensive. They proposed trials to grow their own vetch seed. INNOVA started doing trials with farmers to grow seed.

Figure 3. An innovation is more convincing if it is shown in a thriving crop. In 2003 the grains-plus-legume mixes grew poorly on the Altiplano, seen here in the technology fair.



MIPITA

SIBTA uses an extension method called PITAs (applied technology innovation projects) where agronomists extend technology to organized groups, especially associations (tomato growers, onion growers etc.) usually linked to market opportunities. In its third year, INNOVA created the MIPITA (INNOVA model of PITAs) to extend the most promising technologies and to adjust methods to link technology supply and demand. INNOVA funded and implemented three MIPITAs, one in each pilot area. Some MIPITAs included several communities and were organized (for example) to buy seeds, so people could adopt forages.

As Table 4 shows, INNOVA made the effort to use various formal methods to gauge farmer demand in an integrated way. The methods themselves evolved over time (e.g. the sondeo gave rise to the stratified sondeo, and the technology fair improved every year).

Figure 4. Technology fair, 2005 in Kellhuiri, on the Altiplano. Humberto Cachaca shows the barley-and-vetch he grew with the MIPITA. The mix grew better than in 2003, thanks to suggestions made by farmers in the GET. Now the visitors wanted to try the idea.



While the Bolivian farmers happily agreed to take part in semi-structured interviews, questionnaires, and other formal methods, researchers learned at least as much from farmers incidentally, simply by working with them in the field trials. For example, while spreading dry chicken manure with farmers in the low valleys, agronomist Ernesto Montellano saw that the manure got in people's eyes, and it burned. The farmers suggested placing the manure in the bottom of the furrow instead of scattering it over the surface, which they did, and that became the technical recommendation. Unfortunately, their university training usually does not prepare researchers to write about conversations held on ditch banks or while following an ox team around a field. The following section tries to remedy that by recapturing some of the lessons that farmers and agronomists learned, with formal methods, and informally.

CASE STUDIES

From improved fallow to purple clover

This technology did address explicit demand, even so it changed a great deal as the farmer-experimenters and the agronomists adapted it. Purple clover (*Trifolium pratense*) has been in Bolivia since the 1970s, when it was introduced by earlier projects. PROMETA tried planting mixes of purple clover, white clover (*T. repens*) and

vetch (*Vicia sativa*) with various grasses (*Lolium*, *Festuca*, *Dactylis*, *Eragrostis curvula* and *Bromus unioloides*) in farmers' fields in Qolqe Qhoya and elsewhere in the high valleys of Cochabamba in 1996.

Table 4. Evolution of methods

	Before INNOVA: 1990s-2001	INNOVA Year 1: 2002-03	INNOVA Year 2: 2003-04	INNOVA Year 3: 2004-05
Methods used	CIAT and PROINPA used CIALs. CIAT did sondeos. UMSS held field days. PROINPA had on-farm trials and field days, led by farmers from FFS	CIALs & GETs. Sondeos & technology fairs in the 3 zones 6 feedbacks, 2 per zone	CIALs and GETs continued. Used the 'back-&-forth method and 4 stratified sondeos. Technology fairs in high & low valleys	INNOVA formed MIPITAs. Technology fair on the Altiplano & the high valleys.
Results of methods		Showed that there was demand for most technologies created by earlier projects, but that other demands were not being met. Staff doubted that the project reached the poorest farmers, and planned a stratified sondeo	Some demands are shared by all economic levels, but in all 3 zones, the poorer farmers do have different demands.	INNOVA presented the technologies in a way that smallholder farmers understood. Some technologies began to be adopted
Technical results	Research started on most technologies that INNOVA would promote	Improved phalaris, oat-plus-vetch, purple clover and other technologies	Developed multiple mountain plough, high tillage, soap to manage insects in potatoes	Control of potato tuber moth in storage

After 2000, another project, PROMMASEL, inherited purple clover from PROMETA and continued trying it in Qolqe Qhoya. PROMMASEL started with botanical and ethno-botanical surveys. After planting potatoes, farmers typically plant other crops for two or three years, and end with oats or barley; then fallow the land. Weeds build up each year, and are abundant in the first few years of fallow, although many of the weeds are fodder for livestock. Several of the authors were involved with a study of weeds (Bentley et al., 2005), and we thought that the fallow could be improved by planting purple clover and other plants. So for several years PROMMASEL conducted on-farm trials of 'improved fallow', mixes of grasses and legumes.

During the first sondeo in November 2002 in Qolqe Qhoya, people said they were tired of doing little field trials with clover. "We want to try big fields", they said. INNOVA agronomist Salomón Pérez dutifully returned four days later and tried selling the seed at a meeting of the *sindicato* (village organizations with elected leaders and

a monthly meeting with a representative from each household). Pérez even went door to door, and still only four families bought purple clover seed. In other words, they had explicitly demanded seed, and then showed little interest in buying it. Some said they did not have the money. Others said they would wait to see their neighbours plant it first.

INNOVA kept studying 'improved fallow' and in the first technology fair, in Qolqe Qhoya, presented a participatory trial, in a farmer's field, with three treatments of different mixes. But at the same technology fair, another farmer, Nelson Vallejos, showed a plot of about 1000 square meters he had planted on his own (see Figure 5). As soon as Vallejos and the others started planting purple clover on their own, they changed it radically. Instead of planting it at harvest time, they planted it at the regular planting time, and they sowed it with oats, instead of with festuca or lolium, since they knew oats better, and had the seed. They planted purple clover in good soil, not in hillside fields. INNOVA recommended another change, irrigation. Farmers and agronomists realised that they should plough carefully when planting, instead of simply broadcasting the seed. Later farmers began manuring the clover (see Figure 6).

The members of the GET mentioned these changes at the first feedback in Qolqe Qhoya, and with the agronomists, redesigned purple clover so it yielded fodder, which was what they demanded. Mr Vallejos and the others in the GET may well have benefited from their five or six years' experience with purple clover and other fodders during earlier projects, but they made big changes in the technology once they began planting purple clover on their own. It has long been known that farmers modify what they learn (Johnson, 1972; Denevan, 1983); the advantage here was having the agronomists there to see what the farmers were doing, and collect some hard data. This way the agronomists themselves accepted the changes, and would later recommend them to other farmers.

By 2005 the MIPITA in the high valleys helped 17 farmers from various communities get 36 kilos of purple clover seed, enough to plant small parcels on their own. At the technology fair in 2005, Nelson Vallejos once again showed his small plot of clover, only this time the sign did not say 'improved fallow'. It said 'managing purple clover,' because farmers and agronomists realized that the technology had changed from a type of fallow to a kind of permanent pasture. INNOVA even printed pamphlets for farmers, describing the purple clover as pasture.

Phalaris grass

The above case suggests that farmers and researchers working together may make major changes in a technology. But change is not always so dramatic. Sometimes the researchers create appropriate technology essentially on their own, in response to explicit demand, later making only minor adjustments with farmer-colleagues.

1970s. IBTA introduced a small lot of phalaris from Colombia to the experimental station at Patacamaya, on the Altiplano, as forage (Mendieta, 1979). The agronomists lost interest in phalaris, but the hardy grass survived anyway. In the early 1980s, CIF

(Fodder Research Centre) promoted it in the valleys and high country of Cochabamba.

1996-99. The Hillsides Projects (PROLADE) rediscovered phalaris and tried it for live barriers to conserve soil in Cochabamba and Santa Cruz. The grass thrived and farmers and NGOs started to accept it.

2002. In December 2002, INNOVA took phalaris to the Altiplano. At first, proposing it as a live barrier, looking for small slopes to plant it on. The GETs in Pomposillo and Mamaniri planted live barriers and 40 people took plants.

2003. During the technology fair in Pomposillo the phalaris grass was still only three months-old, and not well established yet, so INNOVA decided not to show it. Two farmers explained phalaris in a stand, and gave away a few plants. But five months later, 16 August 2003, when the phalaris was better grown, they presented it again in Pomposillo at the feedback, and six people asked where they could get more.

In December 2003, INNOVA sold 10,300 phalaris plants to 66 households in six communities (two in each pilot area.) In participatory evaluations in the GETs people had only good things to say about phalaris: It stayed green after frosts. It was easy to transplant, took root readily, grew back well after being cut, was cheap to establish, animals liked to eat it and it even kept the Andean potato weevil out of the fields (see Figure 7).

2004. INNOVA started the forage MIPITA in the Altiplano and 71 households bought 18,500 plants. The GETs made one change; they no longer planted phalaris as a live barrier, but in open fields, on flat land, as forage.

2005. INNOVA introduced the idea of making hay from phalaris, and 130 families tried it. In the technology fair at Kellhuiri, Umala, farmers Javier Condori and Gladys Condori gave a glowing account of phalaris. Even though they spoke at a stand, not in a field, people in the crowd asked "Where can I get it to plant?"

High hilling up

In the first two cases, the technologies were adapted to fit an explicit demand. But in this next case, the farmers did not ask for the technology; it responded to an implicit demand, and through a sustained conversation changed it into an explicit one.

2000. The MIPAPA Project started a scientific survey of pests and diseases in the low valleys (Santa Cruz).

April 2001. In Comarapa, Santa Cruz, CIAT found the small beetle *Epitrix* damaging seed potato in the CIAL in Verdecillos. Agronomist Ernesto Montellano, Pablo Franco and colleagues decided to try managing it with a technique they had learned from CIP: higher *aporque* (hilling up: after potatoes sprout, farmers heap soil up onto the plants as they weed). But it was hard to do well with a wooden plough.

Figure 5. Nelson Vallejos, 2003 in his plot of purple clover.



2002. People in the CIALs and GETs started using a higher *aporque*. Previously, they had heaped the soil when the potatoes were big, which damaged many tubers. Now, they heaped the soil just as the plants were sprouting, and again when the plant had grown but the tubers were still small. This damaged the potato plants less and gave room in the soil for the tubers to bulk up. INNOVA planted tillage trials in all three areas, and showed them at the technology fairs.

2003. The PROMETA agronomists came to Comarapa and designed a plough with wings, with the CIAL, using Back-&-Forth, and showed the plough and trials at the technology fairs (see Figure 8).

2004-05. INNOVA taught high hilling up in the MIPITA, to 80 families. The new plough lowered costs, because it was faster. Yields increased 15 to 20%, in part because there was less tuber moth, weevil and *Epitrix*. People also liked it on the Altiplano and in the high valleys. "The potatoes don't turn green and there are more large potatoes." In the technology fair in Kellhuiri on the Altiplano, in 2005, farmer-

experimenter Rogelio Cachaca López showed how he had doubled his potato harvest, among other things, by using high hilling up.

Figure 6. The same plot in 2005.



CONCLUSIONS

All of the INNOVA technologies changed as they responded to demand, but in different ways. After years of working with scientists on purple clover, farmers made several big changes, which they never would have made if researchers had not shared the crop with farmers. Phalaris changed much less; after scientists introduced it farmers made only one change, planting it in small fields instead of in live barriers. Researchers accepted this in good faith, and responded with a further change of their own: making hay from phalaris. High *aporque* (hilling up) was researcher-led, and did not respond to an explicit demand; it was invented by CIP researchers to grow bigger potatoes, but bigger potatoes are not always what Andean farmers demand (Zimmerer, 2003). Furthermore, while adapting high *aporque* to Bolivia, researchers made most of the changes, although they did all of their trials with farmers, who then accepted the technology.

Perhaps the clearest evidence that INNOVA responded to demand was that it had the honesty to end fruitless lines of research (two out of 10 in Table 5) and that technologies evolved as the conversation with farmers was developed (eight out of

10 in Table 5). INNOVA's methods contributed to the conversation and the changes (all 10 in Table 5), although as we mentioned earlier, spending time with farmers and looking and listening were equally important.

Figure 7. A thick row of phalaris in the high valleys of Cochabamba.



Demand for innovation is not a static phenomenon which can be discovered and then acted upon. Demand co-evolves with research, and must be monitored as the technologies develop; that is how commercial products are developed, either with focus groups or with individuals (Morgan, 1997; Bernet et al 2005), even with interviews in consumers' homes (Sunderland et al., 2004).

Successful innovation is not the work of solitary heroes, but of groups and institutions, linked in relationships of trust, where the users can make their demands known and be involved in the research (Barnett, 2004). Innovation, like conversation, goes in stages. This brings us back to two concerns posed at the beginning of this paper.

Figure 8. High hilling up and the new plough at the technology fair in Verdecillos, Comarapa, Santa Cruz, 2003.



First, capturing farmer demand may not be as simple as some policy makers suppose. Gauging demand requires more than a petition from farmers. Demands are of different types: explicit demands can be more easily captured than implicit ones. Farmers may voice explicit demands, and researchers may have to intuit some of the implicit ones. Researchers respond with some technology, although even the strongest research institutes would be unlikely to meet all of farmers' demands. The farmers then respond to the new 'supply' of technology, which researchers must then adapt to an increasingly focussed, more sophisticated set of demands. Appropriate methods such as the sondeo, technology fair and others, particularly when ordered into a coherent set, help to guide the evolution of supply and demand, but just as important are the insights that come from working closely with farmers.

Second, what should be done with research that is already underway and in which a high investment has already been made? In this case, most, but not all, the technology generated by the previous projects responded to either an explicit demand or to an implicit one. Throwing away existing technologies and starting from scratch would have scuttled potentially functional technology, wasting a research investment and potential for helping poor farmers in Bolivia and elsewhere.

Table 5. Changes in technologies and the methods that influenced the change

Technology	How it changed	Where	Methods involved
1. Improved fallow	Adopted as forage, not as improved fallow	Low and high valleys	Technology fair, GET, feedback
2. Grains-plus-legumes	Farmers like it, if they can produce vetch seed, but few are actually growing it	High valleys	GET, feedback, Technology fair, MIPITA
3. New fodders	Included with technologies 1, 2 and 4	Being diffused in high valleys, with subsidized seed	Technology fair, GET, CIAL, MIPITA
4. Phalaris grass	Planted for fodder, not for soil conservation	Being adopted, especially on the Altiplano and in the high valleys	Feedback, GET, technology fair
5. Chicken manure for nematodes	Place the manure in the bottom of the furrow instead of broadcasting it, to keep it out of one's eyes	Being adopted in low valleys	CIAL
6. Potato IPM	Soap and detergent to control insect vectors. Fungicides and insecticides are still under study. Control of moths in seed	In diffusion in the low valleys	GET, CIAL, MIPITA, technology fair
7. Herbicide for purple nut sedge	Glyphosate used by farmers, but new lines of research to refine application methods were abandoned		Technology fair
8. Improved tillage	Invented high tillage, and a new plough to do it with	Adopted in low valleys	Technology fair GET, MIPITA, CIAL
9. Adoption of implements	Extended implements, but also invented the multiple mountain plough	High and low valleys	Back-&-forth, GET, CIAL, technology fair, MIPITA
10. Home remedies for cows	Abandoned		Technology fair, short courses in communities

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Seed systems for native potatoes in Bolivia, Ecuador and Peru: Results of a diagnostic study¹

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ABSTRACT

The Papa Andina Initiative of the International Potato Center (CIP) and its partners in Bolivia, Ecuador and Peru promotes technological, commercial and institutional innovations along the potato chain to link small-scale farmers to new urban markets, taking advantage of potato biodiversity. Markets are responding and demanding significant volumes of high-quality native varieties. In order to meet this demand, farmers are challenged to improve the yield and quality of their crops, but one of the main limiting factors is availability of seed. A diagnostic of potato seed systems in these three countries was carried out in early 2008. Main conclusions:

- The availability of most native varieties in the three countries depends on small farmers, who preserve these varieties in situ.
- In most cases, seed of native varieties is produced and distributed through informal or mixed systems, rather than through formal seed certification systems.
- Seed of native varieties is mainly consumed on the farm where it is grown.
- Factors causing seed degeneration are well understood for improved varieties, but not for native varieties.
- Many projects and organizations are currently helping farmers improve their seed quality.
- Sustainability of a seed system depends on the quality requirements of the consumption potato market, which becomes the driving force for the development of a market for quality seed.
- Mixed and informal seed systems are more likely to be able to meet the seed requirements of small Andean farmers than are official seed certification systems.

INTRODUCTION

The potato is a staple food in the Andean countries. Hundreds of native varieties are very well appreciated by farmers and their families because of their excellent culinary

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qualities. These varieties have now better and increased commercial prospects as big companies, like Frito Lay, have developed new commercial products. In addition, the consumption of fresh tubers is increasing. Part of the production is sold in urban markets, and another part is used for home consumption, which make native varieties very important for food security. Unfortunately, small farmers obtain very low yields, partly due to poor seed quality. In order to accomplish new plans to expand markets, farmers are required to improve the production and quality of seed tubers.

The Papa Andina Initiative of the International Potato Center and its partners in Bolivia (PROINPA Foundation, Promoción e Investigación de Productos Andinos), Ecuador (INIAP, Instituto Nacional Autónomo de Investigaciones Agropecuarias) and Peru (INCOPA Project, Innovación y Competitividad de la Papa) implemented this study to diagnose the current situation of the production systems of tuber seeds, focusing on native potato varieties of Bolivia, Ecuador and Peru, in order to propose actions for improving these systems, especially for small farmers.

METHODOLOGY

Secondary information was collected. Recent information was obtained in early 2008 through direct observations in the field and interviews with farmers and officials of governmental and non-governmental organizations. Interviews were based on visit guidelines and a work plan previously established. The information received was mainly qualitative.

It was difficult to obtain information about volumes of native potatoes for fresh consumption, because official statistics on native potato production are inexistent. However, it was possible to obtain information on the volumes of certified seeds of improved and native varieties produced in Peru and Bolivia, but not in Ecuador. After the field visits and interviews had been completed, a workshop was conducted in each country to discuss the situation of the seed potato production. These meetings allowed the experts to discuss the results of this study and also to implement some actions to improve the tuber seed production of native varieties.

RESULTS AND DISCUSSION

The results of this study relate to: (1) the situation of native varieties in each country; (2) the formal, informal and mixed seed potato production systems; (3) the potential demand and seed needs of native varieties; (4) problems affecting seed quality of native varieties; and (5) seed renewal practices.

Situation of native varieties in each country

The availability of native varieties in each country was established. In Ecuador, there are approximately 400 native varieties grown by indigenous communities (INIAP, 2006), but only 20 of them are present in local markets. Unfortunately, the original collections were lost, but INIAP is collecting these materials again. A publication of INIAP (INIAP-PNRT - Papa, 2005) mentions 17 commercial varieties grown in the central provinces of the country. FONTAGRO (Fondo Regional de Tecnología

Agropecuaria) is supporting a project to eliminate pathogens from several native varieties and multiply them for use in processing. FONTAGRO and two CIP projects (Cambio Andino and InnovAndes, Strengthening Capacity for Innovation and Poverty Alleviation in the Andes) are also promoting the production and commercialization of native varieties in the central Andes of Ecuador.

In Bolivia, the PROINPA Foundation maintains a gene bank with approximately 1,750 accessions. Of those, approximately 1,050 are multiplied (“refreshed”) to produce seed tubers which are also used for commercial purposes. Every year approximately 150 to 200 accessions are cleaned-up. A catalog of potato varieties, mostly native ones, was produced in 2002 (Ugarte and Iriarte, 2002). Another catalog of potato and oca varieties of the Candelaria area was published in 2004, where 32 native varieties are included (Cadima et al., 2004).

Each region in Bolivia has its own native varieties that are utilized mainly for local consumption. In the north of Potosi, 200 native varieties were characterized and four were selected to promote their use. Another five varieties are being used by APROTAC (Asociación de Productores de Tubérculos Andinos de Candelaria), which has successfully consolidated the production and commercialization of seed and fresh tubers for the Cochabamba markets (Oros et al., 2007).

In Peru in the department of Huánuco, Mr. Victoriano Fernández (Jr.), a farmer that preserves native varieties in the district of Quishki, indicated that he grows 437 native varieties for traditional home consumption and periodic sale. He also indicates that there are 14 other farmers who preserve native varieties, and that each farmer maintains around 200 to 300 varieties. It is also known that CIP has returned 104 virus-free native varieties to the local communities in Chogobamba (3,800 m.a.s.l.). In Junín, 15 native potato varieties are being multiplied by the on-governmental organization (NGO) FOVIDA (Fomento de la Vida) and the CAPAC (Cadenas Agrícolas Productivas de Calidad) platform, for further process testing by Frito Lay. In addition, INIA (Instituto Nacional de Innovación Agropecuaria) maintains an in-vitro collection of 18 pathogen-free native potato varieties, which was multiplied in Huancayo for the NGO ADERS (Asociación para el Desarrollo Sostenible), to be used for the industry and fresh consumption. In the region of Aymara (Huancavelica) there are several farmers who maintain native potato varieties; each farmer maintains approximately 400 varieties. A FONTAGRO project is supporting the evaluation of the processing aptitude of 12 native varieties for chips and for mashing. In Paucarbamba, ADERS is conducting a seed project for multiplying five native varieties for industrial purposes. Farmers involved in this project attend farmer field schools (FFS) to receive training on seed production techniques. Some of these varieties are for fresh consumption in urban markets. It is also important to mention that UNALM (Universidad Nacional Agraria La Molina), CIP, and INIA have set up breeding programs designed to select improved varieties with colored flesh pigmentation for industrial and fresh consumption purposes.

Finally, CIP maintains under custody the world potato gene bank made up of samples of the potato germplasm collected in the countries of the Andean Region.

This material is available to the scientific community upon request. For example, there are 758 accessions collected in Ecuador: 557 correspond to native varieties and 211 are pathogen-free accessions that could be returned to this country. The three countries are particularly benefited with the presence of CIP, because of the availability of pathogen-free native potato varieties in the germplasm collection, as well as technical assistance. CIP has returned the collected material to farmers and scientists for their use. Tuber seed production can easily be started up because the materials available are pathogen-free.

Formal, informal and mixed seed potato production systems

Formal and informal seed potato systems are defined in relation to the improvement, management, replacement and distribution of seeds. In the formal system, these elements are regulated by the public sector through a seed certification process. In the informal systems, the above-mentioned elements are freely managed by potato farmers, with or without previously established regulations with any participation of a seed certification entity. Mixed systems combine both formal and informal systems (Thiele, 1997).

The use of certified potato seed in Bolivia is relatively low: 3.01% in 2005 and 2.37% in 2006. This figure is even lower in Peru: 0.34% in 2005, 0.24% in 2006, and 0.46% in 2007. In Ecuador there is no information about the coverage of certified seed.

In Ecuador, seed certification is done on a low scale and, therefore, the formal system is not fully operative. There is, however, an efficient mixed system (formal/informal) practiced with improved varieties by a farmers' organization (CONPAPA, Consorcio de la Papa).

In Bolivia, the formal system is practiced in five departments and it is implemented by the National Seed Office (ONS), which operates through Regional Seed Offices (ORS). In 2006-07, there were 15 native varieties under certification process (Programa Nacional de Semillas, 2006) distributed in Cochabamba (11 varieties), La Paz (5 varieties), Chuquisaca (2 varieties), Potosí (5 varieties), and Tarija (2 varieties). However, most native varieties are not officially certified and farmers use seed produced by informal systems. In 2006, 68 farmers were registered to produce certified potato seeds of native varieties (Programa Nacional de Semillas, 2006). The size of the seed lots in Bolivia is still small.

In Peru, the formal seed certification system was implemented by SENASA (Servicio Nacional de Sanidad Agropecuaria) up to December 2008, and by INIA as from January 2009. The seed potato certification system is being implemented in nine regions, and in six of them there is certification for native varieties (Ayacucho, Apurímac, Puno, Cusco, Huancavelica and Junín). In these regions, the certified native varieties are: Ccompis, Peruanita, Huayro, Tumbay and Amarilla. In Huancavelica, Cusco, Junín and Apurimac there is an active market of native varieties, but the seed used is non-certified or common seed. Through the InnovAndes project, the NGO FOVIDA and organized farmer communities are supplying Frito Lay with quality potato production of native varieties: Cceccorani, Gaspar, Huayro Macho, Wencos,

Kallhuay and others. Seeds of these varieties come from Andahuaylas and have been planted in the communities of Chicche, Pomamanta and Chuquitambo. In Andahuaylas, at least five varieties (Ccompis, Peruanita, Huayro, Tumbay and Amarilla) are certified by INIA. Under Peruvian seed legislation, the commercial varieties must be registered in the Register of Commercial Varieties in order to produce certified seed. At present, 61 Peruvian native varieties have already been registered.

Potential demand and seed needs of native varieties

In none of the three countries is there any specific reference regarding the potential demand for seed of native varieties. In Bolivia, it was estimated that 5000 t of seed tuber is required for the country's highlands region, and this amount can be supplied initially with 300 t of basic seed (Programa de Semilla de Papa, 1998). In Ecuador there are no references on any potential demand. In Peru, it was determined that the chip industry would require approximately 500 t of flesh-colored native varieties annually. In order to produce this amount, it would be necessary to produce 20,000 pre-basic tuberlets in beds under rustic screen-house conditions or in aeroponic facilities (see below).² In this country there are a large number of rustic screen-houses that can be used for the production of high quality pre-basic seed.

Problems affecting seed quality of native varieties

In none of the three countries are there any studies indicating the problems that reduce the sanitary quality of the seed tubers of native varieties. It is recognized, however, that certain diseases caused by fungi, bacteria, virus or nematodes, among others, can cause severe losses to the crop and the seed (Rioja and Barea, 2004 and 2006). For seed production purposes, it is essential to begin the process using pathogen-free materials (Rioja and Barea, 2004 and 2006; Iriarte et al., 2001).

In Peru, it is estimated that diseases caused by viruses are an important factor in the degeneration of native varieties (Scheidegger et al., 1995). These authors, working with improved and some native varieties, estimated at 50% the crop losses in plants with 100% incidence of viruses PLRV (Potato Leafroll Virus) and PVY (Potato Virus Y) transmitted by aphids. The contact viruses PVX (Potato Virus X), PVS (Potato Virus S), APLV (Andean Potato Latent Virus), and APMoV (Andean Potato Mottle Virus) did not affect the yield significantly. Due to the fact that potato producers use their own seed, virus incidence increases and consequently degeneration occurs, which makes it necessary to perform periodic renewal with pathogen-free seed.

In the lower parts of Huánuco, Peru, two potentially serious pathological problems persist, and these should be taken into consideration if native varieties are multiplied in this zone: PYVV (Potato Yellow Vein Virus) and Bacterial Wilt (*Ralstonia*

² Aeroponics is the process of growing plants in an air or mist environment without the use of soil or an aggregate medium.

solanacearum). The latter has not been reported in most seed production areas, but its absence needs to be verified constantly.

In Ecuador, Fankhauser (2000) demonstrated that the main causes of seed degeneration are not viruses, but soil pathogens and insects, such as *Rhizoctonia solani*, *Streptomyces scabies* and *Premnotrypes vorax*, with incidences from 17% to 78% and losses from 17% to 30%. Viruses such as PLRV, PVY and PVV had low incidence (< 3%), affecting individual yield (per plant), but not affecting total yield because of a compensation effect.

Another limiting factor for potato production in the Andean zone, as well as for seed production, is the Potato Cyst Nematode (PCN, *Globodera rostochiensis*) (Pacajes et al., 2002; Franco et al., 1999). Losses caused by this nematode are very important (Franco et al., 1999), not only for commercial potato productions, but also for seed production. An obvious problem at present is that the rotation periods are too short, which makes it almost impossible to multiply seed in areas with PCN incidence.

Seed renewal

For native varieties, seed renewal is performed through “refreshing” procedures, i.e., periodic reintroduction of pathogen-free materials every four to five years. In Bolivia, in the Toralapa Experimental Station of PROINPA, approximately 2.0 t to 2.5 t of certified seeds of native varieties are produced. In addition, a FONTAGRO project is in the process of producing certified seeds of eight native varieties.

In Peru, CIP has repeatedly reintroduced native varieties into communities, since many of them had been lost due to social turbulence, natural disasters and abiotic factors. From 1998 to 2006, CIP restored to their original places 3182 samples of 1350 native varieties in 38 communities in 7 departments of Peru (R.Gomez, CIP, personal communication). In Andahuaylas, seed renewal is effected by buying certified seed of five commercially produced varieties (Ccompis, Peruanita, Huayro, Tumbay and Amarilla). This is not the case with the rest of native varieties that are produced by individual request. Seed is also “informally” produced when special projects request seed for specific varieties. This is the case of the production of the Cceccorani variety for a project of the NGO FOVIDA in Junín. Seed exchange in local fairs is a common source of seed renewal in Peru and Bolivia.

In Ecuador, seed renewal of native varieties is almost inexistent, as there is no production of certified seed. However, INIAP is cleaning up several native varieties. Exchange in local fairs is also low, as most native varieties are not present in markets.

Technical alternatives for producing high-quality seeds of native varieties

In order to improve the seed production systems for native varieties in the three countries, it is necessary to take into consideration that most seed comes from informal seed systems. Exceptions are certified seeds produced under the supervision of the ORS in Bolivia and by INIA in Peru. Farmers do not usually practice any type of plant selection (positive or negative) due to the lack of knowledge on limiting factors

and also because of cultural beliefs. For example, killing a cultivated plant (i.e., negative selection) is not accepted by many Andean cultures. The following alternatives are proposed to produce high-quality seed of native varieties:

Develop a formal system

With this alternative, production is conducted under the regulations of a seed certification scheme based on existing seed laws. It requires a lot of personnel, knowledge, and investment from the public sector. Previous experiences in Bolivia, Ecuador and Peru (and in many developing countries) show that this alternative is feasible for large farmers, but not for small farmers. The expected sustainability of these systems is low, since it implies the need for a market that demands quality potato production, which acts as a driving force to develop demand for certified seed. Low multiplication rates of conventional techniques are not capable of lowering the price of pre-basic mini-tubers to start a seed multiplication program. An innovative technology called aeroponics is being tested in Ecuador and Peru for the production of pre-basic mini-tubers. Early results suggest that this technology could dramatically reduce the cost of mini-tubers, making certified seed more affordable.

Develop a mixed system

These systems are suitable for small farmers connected to dynamic markets. They include the following components:

- Using seed produced in a formal system (e.g., pre-basic, basic, registered, certified) every certain number of years (usually four or five)
- Training farmers to re-use the seed that they receive
- Implementing an internal quality-control system (e.g., Montesdeoca, 2005).

There are good examples of such systems in the three countries, which apply at least one of the components: APROTAC in Bolivia, ADERS in Peru and CONPAPA in Ecuador. The expected sustainability of these systems is medium term, as farmers depend on seed from outside every certain number of years.

Develop an informal system

These systems are particularly suitable for small farmers with low connection to markets, and living in remote areas with high climatic risk. In this case, farmers are trained to select and manage their own seed in order to become self sufficient and to secure a seed supply. The expected sustainability of these systems is high, although the quality of seed stocks can decrease rapidly with poor cultural practices. Examples of these systems are described elsewhere (e.g., de Haan, 1999).

In mixed and informal systems there are at least three points to be considered. *First*, in regions with high climatic risk, rustic greenhouses or protected beds (e.g., PROINPA, 1998) could be used to produce small amounts of high-quality seed, but the requirements of water, labor and cash could be too high for small farmers. *Second*, positive, negative and clonal selections are key elements in both systems and,

therefore, training farmers in these simple techniques is crucial. *Third*, small farmers have to be organized in order to implement mixed or informal systems.

CONCLUSIONS

The availability of most native varieties in Bolivia, Ecuador and Peru depends on small farmers, who preserve these varieties in situ. Small farmers use these varieties mainly for home consumption, and also to supply the increasing demand of the industry and the fresh market.

Seed of native varieties is mostly produced and distributed through informal systems. Although poor cultural practices and free exchange of planting material derived from these systems are some of the main factors for pathogen dissemination, mixed and improved informal systems are the most promising alternatives for potato seed production for small farmers in the Andes to respond to market demands.

A limitation for using formal systems is that native potato varieties need to be registered officially in order to produce certified seed. This represents an administrative constraint since bureaucratic paperwork is demanding and time-consuming, and it is not clear whether this is the responsibility of a national or private entity. The work done under the leadership of INCOPA in Peru illustrates how private partners have worked together towards the official registration of native varieties.

Seed-production techniques and agronomic technologies for seed production have been developed and are well identified for improved potato varieties, but need to be adapted to improve seed-production systems for native varieties. New techniques, such as aeroponics, are promising and can have an impact on seed systems. Nevertheless, simpler technologies, such as positive and negative selection, training, and technical assistance remain the key factors for strengthening the existing seed systems in order to respond quickly to market demands. Similarly, factors causing seed degeneration are well identified for improved varieties, but need to be validated for native varieties.

After the International Year of the Potato, an increasing demand for native potatoes has become evident. In response, a growing number of NGOs, governmental organization (GOs) and projects are helping small farmers to produce seed. It is, therefore, urgent for CIP and its partners to guide these efforts in order to avoid costly mistakes, such as implementing formal systems, which have proved to be inadequate for small farmers.

Finally, the sustainability of any seed-production system depends on the quality requirements of the market. A quality-demanding potato market (for fresh or processing) will be the driving force for the development of a quality seed market and, therefore, market requirements are a crucial variable when designing and implementing seed systems.

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Promoting innovations in the Peruvian Altiplano: The case of tunta¹

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ABSTRACT

Since ancient times, potato processing has been a key strategy for small producers in the Peruvian Andes. It allows them to diversify their consumption patterns, preserve this staple food item, and connect with the market. *Tunta* (*chuño blanco*)² is produced at altitudes of more than 4,000 m.a.s.l. during the winter by exposing the potatoes to frost, solar radiation and flowing river water. This process produces a dehydrated and highly nutritious staple. It is estimated that 70% of the national production of tunta is concentrated in Puno. Previous diagnostics have shown deficiencies in tunta quality, an elementary traditional market, and a weak producers' organization. In this context, the INCOPA project (Innovation and Competitiveness of the Potato), financed by SDC (Swiss Agency for Development and Cooperation), has been promoting a stakeholder platform in Puno since 2005, together with public and private institutions. This platform has been endorsed with the following participatory and innovative actions: (a) technological improvements to the development and dissemination of good manufacturing practices for tunta processing, certifying its quality; (b) formation and strengthening of the "Aymaras Consortium", which has assembled 100 small producers from eight communities in llave; and (c) linking the consortium to different markets with the commercial brand "Los Aymaras". In 2008, they sold 220 t, mainly to Bolivian markets, at a price of US\$ 2,600 per tonne (about 32% higher than the traditional market price). Currently, producers are empowered and report a substantial increase in each farmer's income, which translates to improvement in their livelihood, an increase in their crop land, and investment in livestock.

TUNTA AND ITS CHARACTERISTICS

The potato is one of the most important crops for the communities in the Andes, where its biodiversity has been preserved. Processing gives added value to the product, allowing the communities to diversify its consumption, preserve food, and achieve effective coordination with the market. One of the processed products is tunta, also known as *moraya* (in the Quechua-speaking areas) or *chuño blanco* [white chuño] (in the urban centers) to distinguish it from black chuño. This product may well be one of the oldest processed products obtained from the potato, as documented in historical investigations of pre-Hispanic societies (Zapata, 2009). It is mainly harvested in the Aymara areas of the Peruvian highlands (Puno region). Tunta

1 Presented at the 15th Triennial Symposium of the International Society for Tropical Root Crops, 2009.

2 Chuño blanco: a traditional freeze-dried product made from bitter potato.

is a white dehydrated potato tuber (14-16% humidity), round or elongated (according to the variety of potato used). It has a high concentration of starch (80%) and fiber (20%) and is rich in calories and minerals (calcium and iron). See Table 1.

Tunta is processed from fresh potato and has a conversion factor of 7:1 or 6:1, according to the variety used, which means that 6 to 7 metric tonnes of fresh potato are needed to produce 1 t of tunta. The varieties most frequently employed are the sweet native variety called Imilla, and the bitter varieties such as Locka. Other contemporary varieties are also used, such as Ch'aska. See Table 2.

Table 1. Nutritional composition of tunta (per 100 grams)

Basic elements	Quantity
Energy (Kcal)	323
Water (g)	18.10
Protein (g)	1.90
Carbohydrates (g)	77.70
Fiber (g)	2.10
Calcium (mg)	92
Phosphorus (mg)	54
Iron (mg)	3.3

Source: Peruvian Tables of Food Composition, Ministerio de Salud, Instituto Nacional de Salud, Centro Nacional de Alimentación y Nutrición, 1996.

Table 2. More frequently used potato varieties

Type of potato	Species	Common name
Bitter native (contains glycoalcaloidis)	<i>S. Juzepczukii</i>	Piñaza, Lucki, Locka
	<i>S. Curtilobum</i>	Choquepito, Parina
Sweet native	<i>S. tuberosum</i> spp andigena	Imilla negra, Imilla blanca, Sani imilla, Peruanita, Palita
Modern varieties	<i>S. tuberosum</i> spp andigena	Canchán, Ch'aska, Perricholi, etc.

The major production area of tunta is the region of Puno, mainly concentrated in communities at an elevation of more than 4,000 meters above sea level, where "heladas" (freezing spells with drastic temperature drops to -5° C) occur in the winter time, and water is available in rivers or lakes: these being the key elements for producing tunta. It is estimated that the province of El Collao (the most important area in Puno) produces around 5,000 t/per year and 4,000 t/per year is commercialized. 80% of the production is destined for the Bolivian market and 20% is sold in Peru (Arequipa, Cusco, Puno and, in lower quantities, Lima). Tunta has started

being exported to Spain and the United States to cater to the Bolivian and Peruvian communities living there.

The studies conducted in these areas (Villena and Caro, 2002; Lacour and Guiet, 2003) indicate that tunta is basically prepared by small producers, for whom it is an important source of income. But they face serious technological restrictions in its production, which, in turn, affect the quality of the end product. At the same time, the weak organization of the producers does not allow a coordinated operation to produce technological and commercial improvements. In addition to these disadvantages, the market for this product is restricted to the traditional regional sector.

In this context, the INCOPA project, implemented by CIP (International Potato Center) with funds from SDC, has, since 2005, supported the work platform “Alianza institucional para el desarrollo competitivo de la tunta”. This project strives to integrate public and private institutions from Puno, including organizations from the Ministries of Agriculture and Production, professional associations in Puno, non-governmental organizations (NGOs) and private producers’ firms. The aim is to promote improved competitive production of tunta through technological innovation and through the strengthening of organizations, as well as linkage to the market with a quality product. (Gianella, 2004; Fonseca and Ordinola, 2009).

TECHNOLOGICAL INNOVATION

Quality improvement work began in 2005. This was based on analyses (Cota, 2005) drawing on local experience, and it brought together a group of leading producers from El Collao to jointly develop innovations in the tunta production process. Several participatory trials were conducted, in which critical points affecting the quality of the end product were identified. With the results of these trials, traditional “good practices” [*“buenas prácticas”*] relating to tunta were developed, keeping in mind the ancestral technology of the producers. These include practices related to:

- Selection of the potato (raw material), discarding pieces that were damaged by pests such as the Andean weevil (*Premnotripes spp*) and rotting diseases caused by fungus
- Use of floor mats (*mantas*) to avoid direct contact of the product with the soil during freezing and drying phases
- Immersion of the product in the river in cages made out of fishing net instead of in stone-walled ponds, which helped to obtain sweet-smelling tunta free of stains
- Practices for peeling and cleaning processes.

At the same time, the use of appropriate working clothes, such as overalls, rubber boots, gloves, hats and face masks was emphasized, which improved safety conditions for the producers and ensured the cleanliness of the end product.

The results of the investigation were used to prepare training material such as a poster allusive to good practices for processing and the guide entitled *Guía de las Buenas Prácticas de Procesamiento Artesanal de la Tunta* [Guide to Good Practices for the Traditional Processing of the Tunta] (Fonseca et al., 2008). Technical personnel and producers participated actively in these events, and the guide has become an important item of training material for improving the quality of tunta both in the target group and in adjacent communities within the project's sphere of influence.

The producers' leaders received coaching lessons on good practices for processing tunta. They were trained as "farmer promoters", who, in turn, would then teach primary producers. The advantage to this is that promoters can communicate in the local language (Aymara), thus guaranteeing the learning and communication process (see Figure 1).

Figure 1. Training farmer promoters in good practices for tunta, Ilave, Puno



The following basic aspects of good practices were emphasized during training:

- Cleanliness and hygiene in the production of tunta
- Recommendation of tools that protect the product from direct contact with contaminants (floor mats), and also tools that help in obtaining a quality product (fishing nets)
- Use of appropriate attire .

The producers who have been trained and their neighbors are adopting the good practice rules. As a result, they are obtaining a good quality tunta product characterized by its intense white color, light weight, pleasant smell and easy

rehydration (less than 10 minutes) before cooking. All of this has brought direct benefits, increasing both the demand and the market price.

In addition to the training, on a larger scale, between 2007 and 2008 the work platform developed two Peruvian Technical Standards for tunta, in conjunction with PRODUCE (Ministry of Production) and INDECOPI (National Institute for the Defense of Competition and Intellectual Property). This was done to control the quality of the product and to help position it in more demanding markets. (Representatives of the productive, commercial and consumer sectors of the region of Puno participated in the process). The approved Technical Standards are: NTP 011.400: 2007: Processed tubers. Dehydrated potato. Tunta (INDECOPI, 2007) and NTP 011.401:2009: Processed tubers. Dehydrated potato. Tunta: Proficient practice of the traditional process (INDECOPI, 2009).

STRENGTHENING THE ORGANIZATIONS

Initially, in 2005, organized groups of producers were identified within the work platform. In subsequent years several other groups have joined, and the organizations have been strengthened through management training and advice on legal aspects such as business definition, organizational business development principles, and the business tax system.

The training sessions have been the bases for the development of good practices for tunka processing and the organization of supply links to access the market.

Consortio Los Aymaras is a small business formed by the leaders of eleven producer associations. The Consortio brings together 100 producers, mainly small farmers, coming from eight rural communities and three micro-basins in Ilave (Table 3). They produce on average 1.25 t of tunta per year, using 7 t of fresh potato, of the sweet native varieties as well as bitter and contemporary hybrids such as the Ch'aska, acquired in Andahuaylas. 60 % of their production is destined for market consumption.

Table 3. Rural communities connected with Consortio Los Aymaras, through producer organizations

Micro basin	Camillaque	Huenque	Ilave
Community	Churomaquera	Concahui	Chijichalla
	Quellicani	Cutimbo	Jarani
		Jalamilla	
		Yarihuani	

A very important initiative for the creation of the Consortio was the involvement of the leaders as commercial drivers in the cities of Arequipa, Cusco, Lima and Tacna. Here, they contacted different venues such as fairs, wholesale food markets and food stores, as well as local authorities, and convened the press to promote the product's image. As a result of these contacts, the producers felt motivated to improve the

quality of their tunta. They also captured the interest of supermarkets, leaving open doors for future commercial transactions (Fonseca and Julca, 2006). See Figure 2.

Figure 2. In Lima organized producers participate as commercial drivers. The D' Gallia Cooking School supports the initiative



THE MARKET CHALLENGE AND THE GASTRONOMIC POTENTIAL OF TUNTA

While the organization was improving and traditional good practices for processing the tunta were being implemented, the work platform, together with Consorcio Los Aymaras, designed strategies to expand market access and develop a commercial brand, “Los Aymaras.” As a result of good processing practices, the Consorcio now had a product of excellent quality. They were able to obtain their sanitary registration (R.S. DIGESA:N16036N/TECNLS), and had greater potential for linkage to different markets.

In 2006, the Consorcio began commercial transactions with supermarkets to introduce tunta as a quality product targeting consumers in a higher income bracket. The aim was to improve its image and to widen its consumption. Thus, the Los Aymaras brand is commercialized in 300-gram packets at supermarkets in Arequipa (Franco and Super), Cusco (Mega), Lima (Tottus) and Puno (commercial stores). In all these cities, the producers also sold directly to consumers at regional fairs during the National Potato Day. Sales reached 6,000 packets (1.2 t), which has prompted a change in the concept of quality and has motivated other producers’ micro businesses to sell tunta in half-kilo packets.

The Los Aymaras commercial brand (see Figure 3) has significantly improved the image of tunta, and this has been reflected in the increase in demand and prices year after year in the markets of Arequipa, Cusco and Puno. In Puno, a study of the production chain, conducted during 2003 (Lacour and Guiet, 2003), indicated that the price of tunta in the llave fair was between S/. 1.5 and S/. 3.0 per kilo (depending on quality). Signalling a significant increase since the Consorcio began working in 2006, by 2009 prices had risen to as much as S/. 9.00 per kilo (a 200 % increase).

In 2007, this commercial experience was expanded by the wholesaling of the Los Aymaras brand in 50 kg sacks for the markets in llave, Puno, and Desaguadero on the border with Bolivia. Consequently, the Consorcio's small producers commercialized an average of 1.0 t of guaranteed quality tunta in 2008, mainly at llave's weekly Sunday fair. They sold a total amount of 70 t of tunta at US\$ 2,600 per ton. Another group of 30 larger producers sold a total of 150 t at the markets of llave and Desaguadero. A combination of these figures means that the 100 producers connected to the Los Aymaras consorcio achieved a sales volume of US\$ 583,300 during 2008.

Tunta is one of the most significant gastronomic contributions of the pre-Hispanic cultures (Olivas, 2008; MIMDES, 2008), and it is still consumed today, in both rural and urban areas, mainly in the southern parts of the country: Arequipa, Cusco and Puno. It is eaten in typical dishes, the most popular of which is *chuño pasi* (boiled tunta served with cheese and an assortment of deep-fried meats). It is also used to prepare *sopa blanca* (white soup), *chairo* (a traditional soup with pork and pieces of tunta) and tunta pudding.

Aware of the culinary benefits of tunta, and in an attempt to promote its consumption, the project sponsored haute cuisine schools in their work on gastronomic innovations using tunta. Research was done at Escuelas D'Gallia and Gastrotur Perú in Lima, the Cordon Bleu school in Cusco and La Casa de Avila in Arequipa. Other restaurants which participated were: El Rocoto in Lima, Ukucus, Los Balcones de Puno and Mojsa in Puno. These endeavors demonstrated the great culinary versatility of tunta. The flavor adapts equally well in sweet and savory dishes, so it can be used for soups, stews and desserts. Several chefs declared that tunta was a highly malleable product, easy to combine with different ingredients: "Tunta is like a sponge: it absorbs the flavor of the ingredient it accompanies. In a *"chupe de camarones"* (shrimp soup), it takes on the flavor of the shrimp, and it also blends very well with aromatic herbs" (Anabel Augusto).

As a result, more than 20 recipes were created, among which we can note: *ñoquis de tunta y trucha ahumada* - -tunta gnocchi with smoked trout; *manjar de tunta* - a sweet tunta delicacy; *humitas de tunta* - small tunta tamales; and *chocotunta* - a sweet made out of tunta, chocolate, sugar, and milk.

Figure 3. Tunta: Los Aymaras in Tottus supermarket – Lima. Commercial promotion sponsored by Gastrotur Perú



These tunta innovations have been demonstrated at different events in Lima as well as in other regions, where they have been very well received. Several well known chefs from haute cuisine schools and restaurants participated in these activities and are contributing to improving tunta's image. In Puno, this ingredient has been included in dishes on the menu of tourist restaurants that want to promote Peruvian food (see Figure 4).

ON THE WAY TO GENERATING IMPACT

The combination of improved technology, organization, and market linkage has started to show results among small producers. A qualitative survey (through personal visits and talks to the producers' leaders exploring achieved goals, has established that the capability-building of the producers has had a significant influence. This has affected both men and women, and has led to the creation of a network that has an impact on their families and their communities. The producers point out that they have doubled their production and sales due to the improved tunta quality, which resulted from applying good practices for processing and a better understanding of the market. The testimony of one producer (Teresa Ramos) claims "I learned a lot at the training events; I feel I have grown; I like to teach others what I have learned; besides, my tunta now has better value in the market; people recognize its good quality."

At the same time, the majority of the producers report that the increase in sales has had positive repercussions on their family incomes. They have used their revenues mainly for:

- Increasing the area used to grow potato, to produce more tunta
- Buying livestock to fatten and sell for slaughter
- Improving their houses or building houses in the town of Ilave.

Twenty percent of the producers connected to the Consorcio turned into producer-dealers, as in the case of one associate (Constantino Flores) who declared: “With my wife’s help, I now buy tunta from my neighbors to sell it in Ilave and Desaguadero at a good price for us all.”

Figure 4. A simple and innovative dish: ‘encebollado de tunta con queso’ (tunta served with Andean cheese and fried onions, tomatoes and chili)



CONCLUSIONS

As seen from this experience, tunta offers great potential, and the results achieved thanks to its improved competitiveness provide the foundations for commercial growth in both national and international markets (Bolivia, Spain and the United States). It should be noted that tunta has already been given a customs classification: 0712.90.90.00 (Project BID-ADEX –RTA, 2009), which means it can be launched in different international markets. This is in addition to the culinary development that the product has been experiencing (the most important gastronomic schools and

restaurants are working on its promotion as part of an integrated effort sponsored by INCOPA), and therefore the product can be firmly placed in more demanding markets.

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Gender relationships in production and commercialization of potato seed with small-scale farmers in the Central Andes of Ecuador¹

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ABSTRACT

A gender analysis was conducted in the central Andes of Ecuador with the following objectives (i) to identify and analyze gender relationships and benefits in potato seed producers of the farmers' organization CONPAPA (Consorcio de la Papa) and (ii) to propose recommendations to improve the relationships among the actors of CONPAPA's seed system. A rural participatory diagnostic with gender approach was used to gather information about general characteristics, participation in community activities, potato-related activities, decision making, and personal, family and unpaid activities. This method promoted reflection among farmers about their roles according to gender. Main conclusions were the following: first, women are a critical component for seed production in CONPAPA; second, women are being empowered by becoming part of CONPAPA seed producer groups; third, becoming part of the CONPAPA seed producer groups might be overloading women's capacity; and fourth, men are still attending the most important events and are in charge of taking the most important decisions. Several recommendations were made. (i) take extra care to use training materials adapted for women and to conduct the training events in their native language; (ii) promote women's access not only to knowledge, but also to other resources, mainly credit, so that they can run their own businesses; (iii) practice affirmative action and promote women's leadership; (iv) be aware that new activities could be overloading women's capacity and, therefore, start the intervention with few and simple activities; and (v) publically recognize the contributions made by women to specific activities.

INTRODUCTION

The potato is the main source of energy in the Central Andes of Ecuador, especially for low-resource farmers. Some 80,000 families depend on this crop for food and income. Yields are low and farmers' organizations are weak. In 2003, the National Agricultural Research Institute of Ecuador (INIAP) with the support of the Papa Andina project at the International Potato Center (CIP) and funding from the Swiss Agency for Development and Cooperation (SDC) started the construction of multi-stakeholder platforms which helped to develop the CONPAPA, a farmers' organization aimed at

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strengthening the entrepreneurial capacity of potato producers (Cavatassi et al, 2009).

One of the strongest points of CONPAPA is the implementation of a seed system. This includes using high-quality seed from INIAP, training farmers on how to re-use their own seed, and setting up an internal quality-control protocol (Montesdeoca et al., 2006). Women participate actively in CONPAPA's seed system and, therefore, INIAP and CIP-Papa Andina agreed to implement a study to analyze gender relationships. This document presents the results of the analysis.

Gender analysis helps to explain the mechanisms and dynamics of agricultural research and extension problems in a certain context, in order to understand them and obtain sustainable and equitable results. The objectives of this study were (i) to identify and analyze gender relationships and benefits in seed producers of CONPAPA and (ii) to propose strategies to improve the relationships among the actors of CONPAPA's seed system.

METHODOLOGY

This study was done in the provinces of Cotopaxi, Chimborazo, and Tungurahua located in the central Andes of Ecuador. This region concentrates 55% of potato production of Ecuador and is among the poorest in the country. One location was sampled in Cotopaxi (Cumbijín), two in Chimborazo (Calerita and Ballagán), and three in Tungurahua (San Andrés and Pilahuín). All these locations are at elevations of between 2,500 and 3,600 m.a.s.l.

Farmers were selected using the following criteria: producers of potato seed, and belonging to the CONPAPA association of seed producers (hereafter referred to as 'CONPAPA seed producers'). In addition, a group of potato seed farmers not belonging to the CONPAPA seed producers was selected (hereafter referred to as 'individual seed producers'). In the CONPAPA seed producers, 21 families (17 represented by women and 4 by men in the association) and 118 of their family members (64 women and 54 men) were included in the study. In the individual seed producers, 21 families and 114 family members (58 women and 56 men) were included in the study.

A rural participatory diagnostic with gender approach (Adamo et al., 1998) was used to gather information about general characteristics; participation in community activities; potato-related activities; decision making; and personal, family, and unpaid activities. This method promoted reflection among farmers about their roles according to gender. Several techniques were used: interviews, workshops and direct observation. Descriptive statistics were used to analyze the information.

RESULTS

Table 1 shows the main characteristics of the families included in this study. Gender is balanced in the CONPAPA seed producers and in the individual seed producers. Distribution across age shows that most members are between 18 and 56 years of

age. Most family members have incomplete primary education, and the percentage of illiteracy is relatively low in both groups. There are three sources of income: potato seed production, off-farm employment and agriculture in general. In the CONPAPA group, potato seed production is the most important one, followed by off-farm employment and agriculture in general. A remarkable 18% of women participate in potato seed production, while off-farm employment is dominated by men. In the individual seed producers, there is no formal business of producing potato seed and, therefore, agriculture in general is the main source of income. As in the CONPAPA group, off-farm employment is dominated by men.

Table 1. Characteristics of family members: CONPAPA seed producers and individual seed producers (%)

Characteristics	CONPAPA seed producers (n = 118)		Individual seed producers (n = 114)	
	Women	Men	Women	Men
Gender distribution	46	54	51	49
Age				
Between 1 and 11 years	15	10	4	9
Between 12 and 17 years	7	3	6	8
Between 18 and 56 years	21	27	36	24
Older than 56 years	8	9	4	9
Education				
Adult literacy courses	7	1	3	3
Primary incomplete	24	25	13	18
Primary complete	8	9	8	16
Secondary incomplete	2	3	12	12
Secondary complete	4	5	5	3
Undergraduate	0	2	1	0
None	6	4	3	3
Source of income				
Potato seed production	18	25	0	0
Off-farm employment	2	29	3	33
Agriculture in general	15	11	35	29

On average and in both groups, women's participation in general community activities is higher than men's participation (Table 2). General activities are, for example, assemblies, election of authorities and task groups, strikes, and *mingas* (collaborative community work traditional in the Andes). In the CONPAPA seed producers group, election of task groups, strikes and *mingas* are attended mostly by women, while assemblies and election of authorities are attended mostly by men, though women's participation is high. In the individual seed producers group, women's participation is higher than men's participation in strikes and *mingas*, while there is no clear trend regarding gender for participation in assemblies or election of authorities and task groups. In specific activities for the CONPAPA seed producers group, men dominate participation (Table 2).

Table 2. Participation by gender (%) in community activities for two groups of potato seed producers in the central Andes of Ecuador

Community activities	CONPAPA seed producers (n = 21 families)		Individual seed producers (n = 21 families)	
	Women	Men	Women	Men
General activities				
Assemblies	43	57	76	24
Election of authorities	43	57	62	38
Election of task groups	71	29	29	71
Strikes	81	19	71	29
<i>Mingas*</i>	76	24	76	24
Average	63	37	63	37
Specific activities for CONPAPA seed producers				
Training workshops	38	62	N.A.**	N.A.
Assemblies	43	57	N.A.	N.A.
Meetings with authorities	48	52	N.A.	N.A.
Task groups	43	57	N.A.	N.A.
Field visits	43	57	N.A.	N.A.
Average	43	57		
Average for all activities	53	47		
* Collaborative community work traditional in the Andes. ** N.A. Not applicable				

In the CONPAPA seed producers group, women tend to decide on topics relating to food, clothing, and vegetable and animal management, while men tend to decide on the children's education, the sale of products, cash management, input use, and practically all the activities relating to potato production as an organized group (Table 3). In the individual seed producers group, all decisions are taken mostly by men.

In the CONPAPA seed producers group, most potato-related activities are performed mostly by women (Table 4). Exceptions are soil preparation, pest control and selling the production. In the individual seed producers group, all potato-related activities are performed mostly by men. It should be noted that women in the CONPAPA seed producers groups participate much more in pest control and especially in selling the production than their peers in the individual seed producers group.

Table 3. Participation by gender (%) in decision making for two groups of potato seed producers in the central Andes of Ecuador

Topic to be decided:	CONPAPA seed producers (n = 21 families)		Individual seed producers (n = 21 families)	
	Women	Men	Women	Men
Family decisions				
Children education	38	62	33	67
Food	67	33	52	48
Clothing	67	33	43	57
Vegetable and animal management	62	38	43	57
Selling products	43	57	33	67
Cash management	14	86	40	60
Input use (manure, water, etc.)	5	95	22	78
Average	42	58	38	62
Decisions relating to seed production as organized group				
Area planted and seed	38	62	N.A.	N.A.
Variety	28	76	N.A.	N.A.
Planting date	26	74	N.A.	N.A.
Pest control	29	71	N.A.	N.A.
Harvest	67	33	N.A.	N.A.
Selling seed	29	71	N.A.	N.A.
Cash management	24	76	N.A.	N.A.
Income distribution	24	76	N.A.	N.A.
Average	33	67		
Average for all topics	38	62		

Family and unpaid activities in the CONPAPA seed producer groups are carried out overwhelmingly by women (Table 5). Men do one activity at a time, while women do several activities simultaneously. For example, women take care of babies while shepherding and spinning wool. This explains why women spend 46 hours per day on these activities, while men spend 24 hours.

Finally, qualitative information showed that most women are not able to fully understand the training they receive from INIAP and other organizations, as women prefer to communicate orally in Quechua and not in Spanish and in writing, as often occurs in training events. Women also complained about limited access to credit.

Table 4. Participation by gender (%) in potato-related activities for two groups of potato seed producers in the central Andes of Ecuador

Potato-related activities	CONPAPA seed producers (n = 21 families)		Individual seed producers (n = 21 families)	
	Women	Men	Women	Men
Soil preparation	24	76	23	77
Buying inputs	76	24	1	99
Planting	73	27	43	57
Hilling and weeding	75	25	38	62
Pest control	24	76	0	100
Harvesting	76	24	38	62
Selling	43	57	2	98
Average	56	44	21	79

Table 5. Time spent per day (hours) by gender in personal, family, and unpaid activities for CONPAPA seed producers in the central Andes of Ecuador

Activities	Women	Men
Sleeping	7	7
Personal care	0.5	0.5
Milking*	1.5	1
Preparing and serving breakfast*	1.5	0
Breakfast	0.5	0.5
Off-farm employment	0	8
Housekeeping*	1	0
Shepherding*	8	0
Sending children to school	0.5	0
Babycare*	10	0
Cutting forage*	1.5	0
Feeding small animals*	1.5	0
Feeding large animals*	2	0
Preparing and serving lunch*	1.5	0
Lunch	0.5	0.5
Receiving children from school	0.5	0
Laundry, sewing clothes, spinning wool*	1	0
Managing vegetable garden*	6	2
Homework with children	0	1
Rest	0.5	0.5
Supper	0.5	1
Commuting	0	2
Total	46	24

* Activities done by women simultaneously with other activities

DISCUSSION

Although the sample size was relatively small and the data were mostly qualitative, this study suggests the following conclusions. *First*, women are a critical component for seed production in CONPAPA. They attend events such as assemblies, training workshops, etc. (Table 2), decide on important aspects of seed production (Table 3) and, more importantly, carry out most of the seed-production tasks (Table 4). As result, this activity is becoming the single most important source of family income, displacing off-farm employment by men (Table 1). *Second*, women are being empowered by becoming part of CONPAPA seed producers groups. For example, they decide in a higher proportion and on more topics than women who do not belong to the CONPAPA groups (Table 3). They also sell the production almost as often as men do, and nearly twenty times more than their peers who do not belong to CONPAPA (Table 4). *Third*, becoming part of the CONPAPA seed producers groups might be overloading the women's capacity. The women carry out an incredibly large number of activities, which seems not to be matched by or compensated for by the men (Table 5). *Finally*, men are still attending the most important events (Table 2), and are in charge of taking the most important decisions (Table 3).

Taken as a whole, the intervention of INIAP for training women to become seed producers seems a good decision. However, several recommendations could be made. (i) take extra care to use training materials adapted for women, and conduct the training events in their native language; (ii) promote women's access not only to knowledge, but also to other resources, mainly credit, so they can run their own businesses; (iii) practice affirmative action, since 'treating unequals as equals is to perpetuate inequality', and promote women's leadership; (iv) be aware that new activities could be overloading the women's capacity and, therefore, start the intervention with few, relatively simple activities (e.g., growing small potato plots); and (v) publicly acknowledge the contribution made by women, if not to all activities, at least to those relating to potato production.

The capacity of CONPAPA to organize farmers and to provide access to markets was not part of this study; nevertheless, this is a critical point if we are to understand the success of women seed producers. CONPAPA provides access to new technologies, training, technical support, credit, and markets that demand high-quality tubers. Seed is produced only on demand; it is checked by an internal quality-control process, and is sold to other CONPAPA farmers at a convenient price for both parties. In that manner, seed producers are encouraged to produce high-quality tuber seeds, because they are rewarded with a good price. In addition, seed producers are seen as top potato producers within their communities, which in turn increase their self-esteem.

ACKNOWLEDGEMENTS

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Preserving biodiversity of Andean roots and tubers: working with women¹

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ABSTRACT

PROINPA, CIP-Papa Andina Initiative, and the Bolivian Ministry of Agriculture have worked together in promoting women's participation in producer associations. These associations seek to increase their members' income through the use and promotion of the biodiversity of Andean roots and tubers, highlighting their nutritional and medicinal properties. Traditional knowledge, especially that of the women, regarding the different uses of roots and tubers such as achira (*Canna edulis*) and arracacha (*Arracacia xanthorrhiza*) was combined with new information on additional uses of such products. Results were presented at several food fairs and other events, thus disseminating the knowledge to other communities. The project has contributed to increasing the income of the whole family, and, in particular, women's income (since they were the ones commercializing the products). It has also contributed to improving women's social capital, including self-esteem and increased recognition from other community members.

BACKGROUND

Rural women, while pursuing food security for their families, have been contributing since ancestral times to the preservation of native roots and tubers. They have passed on to their children their knowledge and skills regarding resource management, seed selection and the use of several agricultural products (Estrada, 2000; Tapia and de La Torre, 1997).

However, in most of the cases, rural women have been performing their duties in silence, without proper recognition. In Andean communities, women's participation in decision-making comes up against barriers imposed by a world predominantly governed by men, in which women play a subordinate role. Those women can often communicate only in their native language, which further limits their possibilities.

It is a real challenge, therefore, to carry out activities with female community members for strengthening the use and conservation of biodiversity. PROINPA (Foundation for Promotion and Research of Andean Products) and the Bolivian Ministry of Agriculture, with the support of the CIP-Papa Andina Initiative, have accepted this challenge involving the participation of women in different experiences in the area of genetic resources; the idea is to restore the important role of Andean

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roots and tubers in the family diet, and to make it possible to increase the family income with these products.

AREAS OF INTERVENTION

Activities were carried out in three Bolivian areas: Coroico and Cariquina Grande (in La Paz); and Colomi (in Cochabamba). In all, approximately 700 families have benefited from PROINPA's activities in the three areas (direct and indirect beneficiaries).

STRATEGY

Even if biodiversity loss in countries with ancestral cultures such as Bolivia is not considered so dramatic as in other countries (Sevilla, 2006), such loss still takes place. The strategy to stop this process was based on developing social and economic incentives for in situ conservation of the agrobiodiversity in microcenters with high biodiversity. Rural women played a key role in this process.

The strategy included following activities:

- Selection of microcenters with high biodiversity of Andean roots and tubers (Coroico and Cariquina Grande in La Paz; Colomi in Cochabamba). Microcenters are geographical areas whose environmental and socio-cultural characteristics contribute to the existence and conservation of a diversity of species and varieties (García et al, 2003a)
- Identification of communities and families, particularly women, with extensive traditional knowledge in the use of Andean roots and tubers
- Use of participatory methodologies for the characterization of Andean roots and tubers as well as for raising the people's awareness of their properties. These methodologies are particularly useful for gaining a better understanding of people's interaction in their own context (Almanza et al, 2003)
- Campaigns (local radio, workshops and lectures) to point out the importance of the use and conservation of Andean roots and tubers both to improve family nutrition and to generate additional family income
- Workshops with female community members to promote recovery of traditional uses, development of innovative new uses, and dissemination of recipes including Andean roots and tubers. At this stage, emphasis was on the role of preserving biodiversity for food security (Terrazas and Iriarte, 2009). According to Fries (1997), training is a key element to improve nutrition and promote more extensive use of edible species
- Promotion and organization of biodiversity and nutrition fairs with the participation of health and local education representatives. In recent years, local fairs have become an important element to promote the conservation of genetic resources (Tapia and De la Torre, 1997; García et al, 2003b; PROINPA, 2005)

- Promotion of women's active participation in producer associations, in order to open up their market opportunities. Currently there is a large demand for non-traditional and organic products, providing a good opportunity for products such as roots and tubers (Hermann and Heller, 1997). As Tapia (2006) points out, market links may provide an incentive for conservation.

ACHIEVEMENTS

Andean roots and women in Coroico (Yungas of La Paz)

People in the municipality of Coroico, 95 kilometers from La Paz, traditionally produce and consume several Andean roots, such as the achira (*Canna edulis*), ajipa (*Pachyrhizus tuberosus* and *P. ahipa*), walusa (*Xanthosoma saggitifolium*), aricoma or yacon (*Smallanthus sonchifolius*), and racacha (*Arracacia xanthorrhiza*) (Figure 1). This tradition has, however, been neglected in recent years because of the widespread consumption of commercial products such as coffee and orange.

Figure 1. Racacha, an Andean root grown in Coroico



Thanks to the persistence in maintaining their natural resources of some farming families, in which women play a leading role, and thanks to the support of several institutions during the past decade, these root crops are being recovered and reinstated in the family diet; and they are also generating additional income.

The project identified interest groups (producer associations) and local promoters to work in the rescue of available knowledge on the management and use of the roots. Men showed little or no interest in the experience. Women, on the contrary,

showed a high personal commitment and played an active part in the associations. One of three associations in the area is currently composed exclusively of women.

Work with these women has contributed to recovering the traditional uses of those roots and proved to be a good way of introducing innovations for culinary purposes.

Participating women told PROINPA, that they are proud of their achievements. They mention that before the project, the use of the roots was limited to a couple of recipes and their families were tired of them. Whereas nowadays they are more aware of the nutritional value of these root crops and have learned to use them in different ways. Women also participate actively in local and regional fairs selling their products and thus improving their own income and that of the family.

ANDEAN ROOTS AND WOMEN IN THE SUBTROPICS OF COCHABAMBA

The town of Tablas Montes in the subtropics of Colomi is approximately 100 km from the city of Cochabamba,. The basis of the economy is agriculture, particularly the cultivation of “locoto” (hot peppers) and potatoes, although there are a variety of other Andean crops.

The objective in this area was to promote the local use of biodiversity. The strategy was to engage teachers, school students, personnel from local health centers, and the women’s associations of Tablas Montes. The project organized and implemented biodiversity and nutrition fairs with these actors (Figure 2). Training workshops on traditional and innovative uses of the local products were conducted. Women from Coroico (La Paz) came to the area to share their knowledge and experiences, acting as trainers. This further contributed to the empowerment of women, improving their knowledge and self-esteem.

During the fair, female community members and students gathered together to make with their own hands the traditional and new recipes using their root crops (Figure 3). They wrote their own recipe booklets and shared their knowledge with members of neighboring communities.

Participants are currently selling the products in other regional fairs to raise funds for their organization. At the same time, thanks to the training, they are now better endowed to plan and conduct other businesses, such as providing snacks for school breakfasts in Colomi.

ANDEAN TUBERS AND WOMEN IN CARIQUINA GRANDE (HIGHLANDS OF LA PAZ)

Cariquina Grande is an Aymara community in the northern highlands of La Paz, close to Lake Titicaca. Cariquina has a large variety of native potatoes and other Andean tubers such as the oca (*Oxalis tuberosa*), papalisa (*Ullucus tuberosus*), and isaño (*Tropaeolum tuberosum*), which have grown in the community since ancient times. The conservation of these crops is strongly linked to food security and to cultural relationships among people, and between people and nature (“Mother Earth”).

Figure 2. Biodiversity and Nutrition Fair with the participation of the health and education sector in Tablas Montes (2007)



PROINPA worked with local women searching for incentives for increased consumption of Andean tubers, especially among younger generations. Traditional, but also innovative, forms of consumption were promoted, such as cakes baked from native potatoes, and bread made of oca (Figure 4). Recipes also included new ingredients such as quinoa (*Chenopodium quinoa*) and tarwi or lupine (*Lupinus mutabilis*). The feasibility of delivering such products to local schools as part of the school breakfast is currently being explored.

The project also promoted women's participation in the local producers association. Currently, female members are actively engaged in the production and marketing of native potatoes.

LESSONS

- Rural women in the Andes seem to be better informed than men with regard to the use and properties of agrobiodiversity.
- Working with rural women to promote the use and conservation of biodiversity seems to be a good approach, since they are motivated and interested partners.

- Engaging other sectors in the Project, such as the health sector and the education sector, contributes to further promoting the use and conservation of Andean roots and tubers.
- Rural women have increased their income through the marketing of root and tuber products. This has helped improve women's social capital, including their self-esteem and increased recognition from other community members.
- Rural women appear to be willing to try technological innovations. Through the participation of women, it is also possible to draw the attention of male community members and involve them in the project.

Figure 3. Women making products out of Andean roots



Figure 4. Native potato cake and oca “qayapalala” bread



Figure 5. Planning the production in the Producers Association at Cariquina Grande



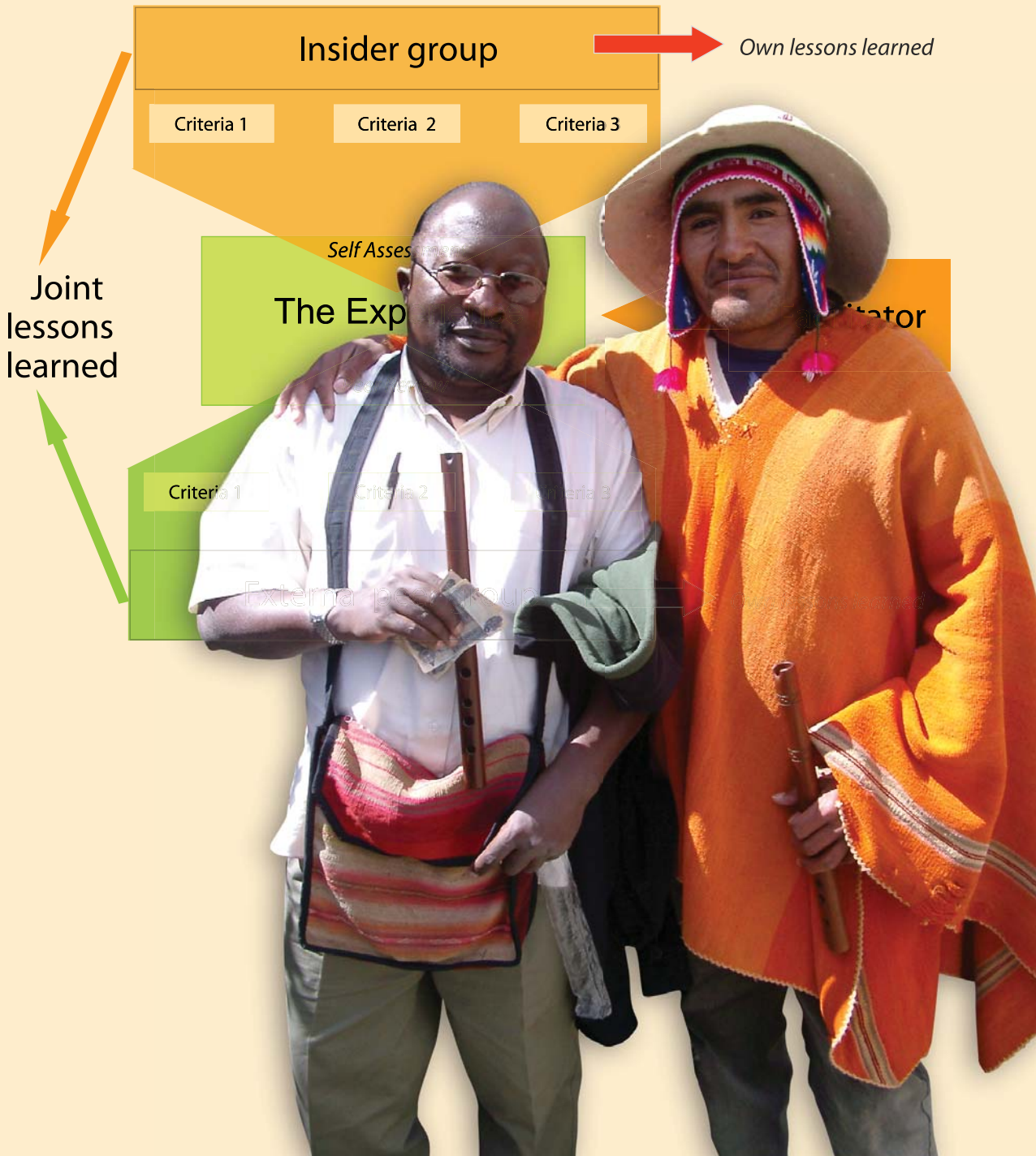
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PART III

South-South knowledge sharing



Promoting pro-poor market chain innovation with the Participatory Market Chain Approach: Lessons from four Andean cases¹

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ABSTRACT

This paper presents results of a study of four applications of the “Participatory Market Chain Approach” (PMCA) in Bolivia, Colombia, and Peru. In these cases, the PMCA was used to stimulate pro-poor innovation in value chains for coffee, dairy products, native potatoes, and yams. Local and national groups affiliated with the Andean Change Alliance used the PMCA to explore and promote the use of participatory methods in agricultural innovation processes, in order to improve the livelihoods of poor farmers. In this paper, we outline the conceptual frameworks and case study methods used to gather and analyze information on the cases and summarize case-study findings for each of the four applications of the PMCA. We then discuss the case-study findings in relation to six themes: (1) fidelity of implementation of the PMCA in the four cases; (2) results of the PMCA; (3) factors that have influenced implementation and results; (4) institutionalizing use of the PMCA; (5) validity of the PMCA theory of change; and (6) contributions of participation to the results observed. This discussion is followed by general conclusions and suggestions for improving the PMCA and its future application.

INTRODUCTION

The Andean Change Alliance is a collaborative regional program in Bolivia, Colombia, Ecuador, and Peru that pursues three objectives:

1. Improve the capacity of national agricultural research systems to identify and respond effectively to the demands of poor farmers for agricultural innovation
2. Promote collective learning and knowledge sharing with participatory methods in the Andean region
3. Influence policy formulation and implementation related to participatory methods and approaches

One of the participatory methods that national and local organizations affiliated with the Andean Change Alliance have experimented with is the “Participatory

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Market Chain Approach.” The PMCA is a participatory-action-research approach that is designed to: (a) identify business opportunities in market chains that are important to small farmers; and (b) develop economically viable ways to exploit these opportunities and benefit small farmers as well as other market chain actors. A central feature of the PMCA is that it brings diverse stakeholders together to identify and exploit new business opportunities. The PMCA involves a facilitated process that seeks to improve communication, build trust, and foster joint activities that stimulate commercial, technological, and institutional innovation around new business opportunities.

The Andean Change Alliance tested the PMCA in several value chains with local groups in the region. This study focuses on the following four cases:

- Case 1: Developing a local market for high-quality coffee (San Martin, Peru)
- Case 2: Developing and marketing a new dairy product (Oruro Bolivia)
- Case 3: Conserving and marketing native potatoes (Northern Potosi, Bolivia)
- Case 4: Developing new markets for yams (North Coast of Colombia)

STUDY METHODS

The study was carried out to assess six aspects of the PMCA:

1. Fidelity of implementation of the PMCA in the four cases
2. Results of the PMCA
3. Factors that have influenced implementation and results
4. Institutionalizing use of the PMCA
5. Validity of the PMCA theory of change
6. Contributions of participation to the results observed.

Based on the case-study analysis, we have formulated general conclusions and suggestions for improving the PMCA and its future application.

Two analytical frameworks were selected to guide the research. One is the “Program Theory Framework” developed by Chen (1990; 2005), which illustrates how an intervention like the PMCA is designed to operate – the “action model” – and how it is assumed to bring about the desired changes – the “change model”. In 2006, the Andean Change Alliance used the program theory framework to formulate hypothesized “impact pathways” for the PMCA in workshops with partners using the Participatory Impacts Pathway Approach (Alvarez et al., 2008). In the present study, we now look back to test the validity of this construct in four cases.

The second analytical framework we employ is the “Institutional Analysis and Development Framework” (Ostrom, 2005; 2010), which posits that repetitive human behavior – “institutional behavior” – is influenced by three main sets of independent variables:

- Biophysical / technical factors

- Characteristics of the population or community
- The “rules in use”

These frameworks have guided our information collection and analysis. Our study employs a comparative case study methodology. It draws on the abundant documentation generated by the Andean Change Alliance, including monitoring and evaluation reports. Information was also gathered during visits to four study sites.

CASE STUDIES

Brief reports are presented on four case studies. These include information on the following aspects of the cases:

1. Context in which the PMCA exercise was implemented (the macro context, the market chain, market chain actors and service providers, and norms and customs)
2. Implementation of the PMCA exercise (main participants, timeline and roles)
3. Outcomes of the exercise (changes in knowledge, attitudes, and skills; commercial, technological, and institutional innovations; inclusion, empowerment, and wellbeing; institutionalization of the PMCA; prospects for the future)
4. Lessons and suggestions for improvement.

While the four PMCA exercises were all carried out within countries of the Andean region, there have been significant differences in the macro setting of each case. One important difference refers to the national economic policy environment. Recent governments in Colombia and Peru have pursued neo-liberal economic policies that promote market-led development through promotion of competitive markets, international trade, and investment. In contrast, the Bolivian government has emphasized regional and indigenous development, food security, and conservation of natural and cultural resources. These differences in government policy have influenced the attitudes and behavior of public servants and NGOs related to use of such value-chain approaches as the PMCA. The Colombian and Peruvian economic policy regimes have been more favorable to use of the PMCA than the Bolivian regime.

Case 1. Developing a local market for high-quality coffee (San Martin, Peru)

Peru’s San Martin province produces some of the best coffee in the world. Yet the region has no “coffee culture.” People consume little coffee, and most of what they do consume is imported instant coffee. The international NGO (non-governmental organizations) Practical Action has worked in Peru’s San Martin department for more than a decade to promote sustainable and equitable development of the coffee industry. Until recently, virtually all efforts focused on improving production and post-harvest practices for export coffee. Beginning in 2006, Practical Action and local partners applied the PMCA to promote development of the local market for locally

produced coffee. The PMCA was applied over a period of 16 months, from June 2007 – October 2008. Public events held at the end of each phase of the PMCA attracted 70 or more participants representing different links in the market chain as well as governmental and non-government research and development organizations. Results of the PMCA exercise included enhanced knowledge and skills for producing and processing high-quality coffee, improved relations among market chain actors, and a new brand of coffee sold on the local market. Since completion of the PMCA exercise in 2008, several new brands of coffee have appeared in local and regional markets, and an association of the artisanal coffee processors who produce these new brands has been established. A recent event to promote the new local brands of coffee attracted the Regional President, other “VIPs,” local radio, TV and newspapers, and about 500 members of the public.

Case 2. Developing and marketing a new dairy product (Oruro Bolivia)

The Oruro department in Bolivia’s altiplano is famous for its silver and tin mining and its legendary carnival. Agriculture is dominated by extensive livestock production on semi-arid high, flat grasslands. Agriculture and livestock herding are challenged by the region’s cold, dry environment, and rural population density is low. Over the past 30 years, development of micro irrigation has stimulated small-scale cropping and dairy herding near the capital city, Oruro. The Danish International Development Agency (DANIDA) and other development organizations – both foreign and national – have encouraged and supported farmer self-help groups that operate community-based dairy processing plants. Dairy specialists who worked in aid programs have established a foundation (SEDERA - Fundación de Servicios para el Desarrollo Rural Agropecuario, Bolivia), linked to the departmental federation of dairy producers. This group now offers technical services and support to small herders and dairy processors. From October 2007 – April 2009, SEDERA and local partners applied the PMCA with the goal of diversifying the products produced and marketed by community-based dairy plants. One focus of the exercise was to develop a new mozzarella cheese product, to supply pizzerias in Oruro city. The exercise faced several obstacles. It was difficult to bring stakeholders together in face-to-face meetings, in part because small herders are scattered over the rural landscape, often in remote locations. Midway through the PMCA exercise, the farmers’ organization that was originally involved withdrew and had to be replaced by another organization. Perhaps the most fundamental obstacle was the marginal, low-yielding nature of local dairying and the resulting high cost of locally produced milk, which makes locally produced mozzarella cheese costly relative to a competing product from Santa Cruz. As a result of the PMCA exercise, SEDERA and a local farmers group (INPROLAC- Industrializadora de Productos Lácteos – Cercado, Bolivia) were successful in developing a new dairy product that met local quality requirements and is now being marketed on a small scale in high-end markets in Oruro under the “Vaquita Andina” brand. Due to the high cost of production, the sales and subsequent benefits to small producers, remain small. One of the main benefits of the PMCA exercise has been the experience gained by SEDERA with market-chain innovation processes and the new market-orientation with which it now works. Another benefit

has been that members of SEDERA and INPROLAC now have a much greater awareness of the importance of establishing and maintaining high quality standards for their dairy products. They are applying this principle in their entire menu of dairy products now.

Case 3. Conserving and marketing native potatoes (Northern Potosi, Bolivia)

The main economic activity in Northern Potosi is mining, and most of the region's population is concentrated in mining centers. Agriculture and livestock herding are limited by the region's harsh climate and mountainous topography with small areas suitable for production on valley bottoms and sides. Rural population density is low and the rural population is among the poorest in the country (and in Latin America). One of the region's underexploited resources is the genetic diversity of its native potatoes, which exceeds that found in any other region in Bolivia. The PROINPA Foundation and the Center for Agricultural Development (CAD) have worked for several years to conserve biodiversity in the region's potatoes and other Andean crops and to reduce poverty. From May 2007 – October 2008, CAD and local partners implemented the PMCA to promote the development of markets for the native potatoes produced by small farmers in the region. This effort was backstopped by PROINPA and Papa Andina. A new potato product branded "Miskipapa" was developed, which consists of selected and washed native potatoes sold in net bags. Miskipapa has been marketed in supermarkets in La Paz and Cochabamba, in the store of a mining union, in two tourist hotels, and in farmers' markets. Results have been mixed, due to limitations in both the supply of native potatoes and the demand for them. During and after the PMCA exercise, CAD has played crucial roles in establishing farmers' organizations, linking them with potential buyers, and assisting with specific market functions. Governmental bodies have stated their commitment to supporting the efforts of farmers' organizations to market their produce, and have offered facilities for processing native potatoes and other Andean crops. However, little governmental support has materialized. After the end of the PMCA exercise, CAD has continued to support the marketing initiative. Participating households have benefitted, but the scale of benefits has been limited by the small volume of native potatoes marketed in the region. Additional benefits have accrued from the increased value attributed to native potatoes in local food systems. Perhaps the most significant outcome of the exercise has been that CAD has shifted its emphasis from production to market development and has strengthened its capacity to support market chain innovation and development among the region's small farmers.

Case 4. Developing new markets for yams (North Coast of Colombia)

Yams were introduced to the Caribbean region together with the slaves from West Africa. They are now one of the main crops grown by poor farmers on small plots of rented land in the northern coastal region of Colombia. Here, and in other parts of Colombia, the distribution of land holdings is extremely skewed, contributing to rural poverty and conflict. This social milieu, combined with the presence of drug traffickers, led to an eruption of rural violence at the end of the 1990s, which

continued for nearly a decade. Despite the extreme insecurity, a few development organizations continued to work in the areas. One was the PBA Foundation, which has worked with small farmers in participatory agricultural research and development projects related to yams and other crops for nearly 30 years. In 2006, the PBA Foundation launched an exercise to improve the marketing of small farmers' commodities in the region, and it incorporated the PMCA into this process. Cambio Andino supported the Corporation's efforts by providing training in the PMCA and backstopping the work with yams. Three potential areas for commercial innovation were identified: production of yam flour for specialty uses in cosmetology and baking; exportation of fresh yams to the USA; and domestic marketing of selected fresh yams. Applied technical and market research was carried out in these areas, business plans were developed, and new products were pilot tested with potential buyers. After completion of the PMCA exercise, in May 2009, the PBA Foundation has continued to work with local farmer organizations and has supported development of network of local associations to promote development of yam sector. Some progress has been made to improve the domestic marketing of selected yams. There have also been a few shipments of fresh yams to the USA, but development of this market has been limited by the recent appreciation of the Colombian peso and steep competition from other Caribbean suppliers. There is now interest in testing micro irrigation for off-season production and exports. Commercial testing of yam processing has been hampered by lack of funds for a pilot plant. The PBA Foundation continues to actively seek opportunities to advance the work begun with the PMCA, and has incorporated elements of the PMCA into its portfolio of participatory methods.

COMPARATIVE ANALYSIS

Fidelity of PMCA implementation

In all cases, the main phases and steps of the PMCA methodology were implemented. However, there were some important qualitative differences in implementation across the cases. One of the main differences was the degree of involvement of different types of market chain actor. In most cases, the emphasis was on working with smallholders and their organizations. Relatively few business people (such as processors, and vendors) were involved, and their participation was less active than that of smallholders. The main exception to this rule was the coffee processing case in San Martin, where processors and market agents were actively involved from the start. Here, the lead organization, Practical Action, has a tradition of value chain development work. In the other cases, the lead organizations' mandates focused on improving rural welfare through work with smallholders, and working in market chain development was quite a new experience. One feature of the coffee case that distinguishes it from the others is the large extent to which networking was promoted among diverse market chain actors, service providers, and political authorities in the regional government who were concerned with expanding the market access of regional products. In the other three cases, more effort has gone into strengthening farmer organizations than networking and relationship building among diverse stakeholders. In Oruro, the recent marketing activities of SEDERA are

beginning to build useful relations between dairy processors and retailers. This illustrates how relationships are built up over time and can take years to mature. In Northern Potosi, where the initial goal was for indigenous farmers to market their native potatoes in supermarkets, hotels, and other urban outlets, differences in language and culture appear to have hampered effective communication and problem solving.

In all the cases, work initially focused on a single group (smallholders in Northern Potosi and the north coast of Colombia, processing groups in Oruro and San Martin). In San Martin, networking expanded and deepened over time, during the PMCA exercise and afterward, mainly because of continued attention to this point from Practical Action and Papa Andina. In the other cases, multi-stakeholder collaboration appears to have been limited by the traditional focus of the facilitating organizations on smallholder development. Another common barrier to getting all the actors together in the same room to talk about marketing opportunities appears to have been differences in language and culture, which have been especially problematic in Northern Potosi.

Results of the PMCA

Useful knowledge was acquired by participants in each of the cases, along with useful contacts with other market chain actors and service providers. Smallholders report gaining valuable information on the needs and priorities of consumers as well as knowledge of other market chain actors. R&D organizations gained valuable information and perspectives on market innovation and development. Learning that occurred within the lead R&D organizations appears to be one of the most important results of the PMCA exercises. In particular, the local lead organizations in Northern Potosi and Oruro (CAD and SEDERA), gained valuable experience with market-chain innovation and development, and they now approach their development activities with a more integral market-chain perspective.

The most visible commercial innovation is the new brand of coffee marketed by the women's processing group in San Martin, Peru. Its success appears to have motivated several other groups to launch or upgrade their own brands of coffee. The new mozzarella cheese marketed under the Vaquita Andina brand in Oruro is another important commercial innovation. Work with the PMCA in this case has also motivated local dairy producers to diversify the types of cheese they produce and to upgrade their quality. In Northern Potosi, farmers have marketed small quantities of Miskipapa for three years now. The economic impact of these sales on farmers' welfare appears to be relatively small. However, the expanded marketing of native potatoes has also helped to increase the value of native potatoes in the eyes of both smallholders and consumers, which has contributed to efforts to conserve the biodiversity of native potatoes in the region.

The work with yams in northern Colombia has not produced a clearly defined commercial innovation to date. This may reflect the importance of developing a tangible new product with a brand name.

Commercial innovation has gone hand in hand with technical and institutional innovation. The new brand of coffee produced by the women's processing group in San Martin incorporated improved selection, roasting, grinding, and packaging. Similarly, local production of mozzarella cheese in Oruro required R&D to adapt an Argentine protocol to local environmental conditions and available coagulants. Sale of Miskipapa in Potosi and improved yams in Sincelejo has required farmers to modify their post-harvest practices, to improve selection and cleaning of harvested tubers.

The pursuit of commercial innovations has led groups in each case to seek changes in institutional arrangements. In San Martin, seven artisanal coffee processors have established an association to pursue common interests, representing an institutional innovation. In Oruro, in order to support high-quality dairy processing and efficient marketing, SEDERA has taken over these functions. In northern Potosi and in Sincelejo, in light of the small size of local farmers' organizations, there have been moves to establish regional networks of local groups that can perform marketing functions more efficiently and effectively.

The PMCA exercises have tended to strengthen farmers' organizations in each case. In San Martin, success with coffee marketing has helped consolidate the women's processing group and raise its visibility in public and policy circles as well as in emerging fairs and markets for organic produce. The group now plays a much more prominent role in public discussions on the local food system than previously. In the other three cases, farmers report having gained confidence in dealing with market agents, development professionals, and government officials.

Factors that have influenced implementation and results

Forces at play in the macro context appear to have strongly influenced the implementation and results of the PMCA. The pro-market policies of Colombia and Peru provided a more favorable environment for use of the PMCA than did the policies of the Bolivian government, which emphasize the role of the state and "communitarian socialism." The cases' more favorable agro-ecological environments in Colombia and Peru also appear to have favored implementation processes and results. In the Bolivian altiplano, where poverty is more severe than in practically any other part of Latin America, there appear to be limits on the potential impact of development approaches that center on innovation in agricultural value-chains.

Characteristics of the market chain have also influenced PMCA implementation and results. In the cases involving coffee, and to a somewhat lesser extent dairy, it has been possible to mobilize extensive external knowledge to improve processing technology. In contrast, in the cases of native potatoes and yams, the global knowledge base is more restricted. And for yam, the available scientific knowledge is more difficult to mobilize for Colombian smallholders, because the main research center is in Africa² and very little scientific information on this crop has been

2 The International Institute for Tropical Agriculture in Nigeria.

translated into Spanish. Coffee and dairy products are also more amenable to processing and product differentiation than are potatoes and especially yams.

The attributes of participants involved in the different exercises have also had strong influences on PMCA implementation and results. It appears that two types of “champions” are essential for success: one type of champion is needed in the entity that initiates and facilitates the PMCA exercise; the other type is needed within the market chain itself. In the coffee processing case in Peru, Ivo Encomenderos (based in Practical Action) played a key role in identifying and supporting local actors and facilitating change processes. Delicia Guivin, founder and leader of the women’s processing group, played a key role within the market chain, in developing the new brand of coffee and in networking with others to develop the local coffee sector.

The local organizational and institutional environment also appears to have played a role. The relative strength of the women’s coffee processing group in San Martin provided a favorable springboard for innovation. In contrast, the recent organizational and management problems in community-based dairies in Oruro seems to have discouraged local herders from committing their time and energy to the PMCA.

The mandates, priorities, traditions, and established relationships of the entity that facilitates the PMCA appear to strongly influence the course of the work. The fact that CAD, SEDERA, PROINPA, and the PBA Foundation have traditionally worked with smallholders to improve rural wellbeing helps to explain why they have tended to continue working with smallholder organizations during the PMCA, rather than working more actively with market agents.

Institutionalizing use of the PMCA

Many members of the participating organizations see the value of implementing comprehensive PMCA exercises with other commodities, but have not done so, for lack of opportunities to include them in other donor-funded projects. When the PBA Foundation implemented the PMCA with yams, it also applied it in six other commodity chains with which it was working at the time. Since then, it has included informal market diagnoses in other projects. PROINPA is applying elements of the PMCA in the context of a large-scale Dutch-funded project. CAD and SEDERA report incorporating elements of the PMCA into their work.

Validity of the theory of change

The PMCA theory of change, or impact pathway, corresponds reasonably well with the types of changes observed. In each of the cases, there was an attempt to identify the main market chain actors, to identify the main problems and potentials in the market chain, to identify promising market opportunities, to involve market chain actors, to develop appropriate innovations, and to motivate public authorities to support pro-poor market-chain innovation and development. To the extent that these results have been obtained, there has been movement in the direction of the expected outcomes.

The cases have progressed to different points along this impact pathway, and many factors external to the PMCA itself – variables in the macro context, the nature of the market chain, characteristics of participants in the exercise, and the prevailing norms and practices – have influenced the degree of success of the exercise.

Contributions of participation to the results observed

Participation has been central to generation of the results observed. For example, a protocol for mozzarella production was introduced to Oruro by Argentine cheese experts, but it required an extensive local process of adaptation to local conditions, and all this work was done by local people from SEDERA and INPROLAC. In Peru, local participation and capacity development have been crucial for production of results with coffee and for empowerment of the women's food processing group. This group, which gained experience and public recognition through its participation in the PMCE exercise, has later played important roles in the coffee processors' association and in organizing public events to promote the development of the local coffee market. In Colombia, participation of the manager of the Sincelejo market motivated him to organize market vendors in the market, in order to improve the flow of market produce and reduce price fluctuations. In Northern Potosi, farmers who were involved in the PMCA have been motivated to increase the diversity of their stocks of native potatoes, which they produce and conserve in situ, on their farms. None of these results would have been possible without active participation of small farmers, processors, and others in the PMCA exercises.

CONCLUSIONS AND SUGGESTIONS

In this section, we present the main conclusions of the study and suggestions for improving future applications of the PMCA.

Results of the PMCA

In the cases studied, the PMCA has stimulated varying degrees of learning, interaction, innovative thinking, and practices, which in some cases have resulted in commercial, technological, or institutional innovations – new practices that have become mainstreamed in economic and social life. Many participants – including both poor farmers and small-scale market agents – have gained valuable new knowledge and experiences that have empowered them in their dealings with other market actors and service providers. Less progress, however, has been made in improving welfare, in terms of cash income.

These studies and other experiences (Devaux et. al. 2009; Horton et. al, 2010) indicate that the main benefits of the PMCA come not during the application of the approach but later on, as a series of ideas are tried, adapted, fail, and succeed. For this reason, follow-up support to innovating groups can be very valuable after the PMCA formally ends.

It is also important to recognize that in areas of severe poverty, where households engage in multiple on-farm and off-farm activities just to survive, and where there is

very little agricultural surplus for the market, approaches such as the PMCA that focus on innovation in a single value chain may have a limited measurable impact on overall household welfare.

Factors that influence success with the PMCA

In the cases studied, the success of the PMCA in fostering pro-poor market chain innovation has been influenced by numerous factors related to the macro context, the market chain, the participants, and customary rules and practices. The economic policy environment sets the stage for local development efforts, and can support or present challenges to use of value-chain development approaches such as the PMCA.

Successful innovation is more likely in some chains than in others. This highlights the importance of doing a thorough market analysis before investing heavily in market-chain innovation. Where the market surplus of a commodity is limited and strongly influenced by local natural and climatic factors, where the potential demand for new products is limited, or where the costs of introducing an innovation are high, the short-term results of the PMCA may be limited.

Personal factors also seem to be of critical importance. Results of these four cases highlight the importance of two types of “innovation champion”: (1) the facilitator in the R&D organization that initiates and supports the PMCA exercise; and (2) one or more individuals in the market chain who champion the innovation process. Without both these types of champion, results of the PMCA may be limited.

Customary rules and practices also influence the success of the PMCA. For example, a history of failed development projects makes people skeptical and can discourage them from committing their time and creativity to a PMCA exercise.

Implementation issues

In all the cases, the main steps in the PMCA were implemented. However, in some cases there was limited engagement and commitment of some market chain actors. In the PMCA, market chain actors are expected to play a proactive, lead role in driving development of new business opportunities and generating demands for innovation. But this doesn't always happen. This sort of engagement and proactive leadership from within the market chain is the essence of the “P” in the PMCA, it is a defining feature of the approach, as envisaged in the original protocol, distinguishing it from other market chain approaches. So ensuring the engagement of the business community is an area that merits very careful attention in future applications of the PMCA.

Continued use of the PMCA by participating organizations

Several organizations that have participated in PMCA exercises have incorporated elements of the approach into their work. But few have adopted use of the PMCA in toto. An important result of participating in a PMCA exercise seems to be that individuals learn a new way of approaching problems – with a more comprehensive market perspective – which they apply in their future work. Most of the organizations

involved in the four cases analyzed depend on external donors for a large part of their operational funding. In some cases they have been able to incorporate elements of the PMCA – for example the informal market diagnosis in Phase 1 – into new projects. In 2 cases (PBA Foundation and PROINPA) they have been able to obtain funding for comprehensive PMCA exercises in other market chains. In some cases, universities and research organizations have incorporated the PMCA into their academic curriculum. In future, it would be important to elaborate a strategy for institutionalizing use of the PMCA.

Value added of participation

The learning and capacity development that result from participation in a PMCA exercise have a strong influence on the ultimate success and benefits of the exercise. This is partly because the most important results are produced after completion of the formal PMCA exercise, by local groups that continue with innovative activities. For this reason, it is crucially important to ensure the active participation of all relevant stakeholders, not just small farmers, but including other key market actors and service providers.

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Developing capacity for agricultural market chain innovation: Experience with the 'PMCA' in Uganda¹

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ABSTRACT

The Participatory Market Chain Approach (PMCA) was developed originally to foster pro-poor innovation in potato market chains in the Andean highlands of South America. After promising results in Peru and Bolivia, two questions emerged: (1) Could the PMCA be successfully used to stimulate innovation outside the Andes and in other commodity chains? (2) What would it take to successfully introduce and apply the PMCA in a new setting? The first test application of the approach outside of the Andes was in Uganda. This paper outlines how the PMCA was developed in the Andes and its main features. It then describes the strategies used to introduce the PMCA to Uganda and some of the results to date.

The Ugandan experience indicates that the PMCA can, in fact, stimulate technological and institutional innovation in locally relevant agricultural commodity chains in Africa. Since the PMCA requires researchers and development professionals to work in new ways with diverse stakeholders, including not only small farmers but also market agents and policy makers, its successful introduction requires an intensive capacity-development process that fosters the development of social networks, changes in attitudes, and the acquisition of social as well as technical knowledge and skills.

INTRODUCTION

In Africa as elsewhere, agricultural development is taking place in the context of rapid urbanisation and market integration. As a result, the livelihoods of small farmers are increasingly influenced by the demands of urban consumers, market intermediaries and food industries. In modernizing agricultural markets, small farmers are often at a significant disadvantage relative to larger commercial farmers, who benefit from economies of scale and better access to market information, services, technology and capital (Weatherspoon and Reardon, 2003; Wilkinson and Rocha, 2006).

Collective action, usually in the form of farmer cooperatives, has been proposed as one way to improve the market participation of small farmers (Shepherd, 2007). While of undoubted importance, small-farmer organization is only part of the solution.

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Market-chain innovation is also needed to allow small farmers to benefit from participating in emerging high-value markets. Numerous value-chain approaches have been developed to foster pro-poor market development (Kamplinski and Morris, 2001; Merlin, 2004; Roduner, 2005). However, there is little documentation on their introduction, use and results. This paper aims to begin filling this information void by describing the introduction, use and results of one value-chain approach in Uganda.

THE PARTICIPATORY MARKET CHAIN (PMCA)

The PMCA was originally developed by the Papa Andina partnership program, hosted by the International Potato Centre (CIP), to promote pro-poor innovation in potato marketing chains in the Andean highlands of Bolivia, Ecuador and Peru. The approach has proven its usefulness in the Andes, particularly in applications with native potatoes that are grown by small farmers in high mountainous areas using traditional production techniques. Nevertheless, some observers have questioned whether the approach would be effective when applied in other commodity chains and in other regions, where socio-economic, technical and institutional features differ significantly from those of the Andes. They also wondered how a new research and development (R&D) approach like the PMCA could be effectively introduced in a new setting.

To test the feasibility and potential utility of the PMCA in sub-Saharan Africa, beginning in 2005 Papa Andina partnered with the Regional Potato and Sweet Potato Improvement Network in Eastern and Central Africa (PRAPACE) and with several local R&D organizations to introduce the PMCA into Uganda and apply it in the commodity chains for potatoes, sweet potatoes and vegetables. Funding for this work was initially provided by the Department for International Development of the United Kingdom (DFID), and later was supplemented with resources from CIP and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA).

The present paper addresses two main questions: (1) Can the PMCA be useful in promoting market-chain innovation outside of the Andes and in a range of commodity chains (or was its early success a 'special case', owing to the circumstances of its development and application with native potatoes in the Andes)? (2) What does it take to successfully introduce and apply the PMCA in a new setting? The paper briefly describes the development and main features of the PMCA and the process whereby this approach was introduced and tested in Uganda. Since the PMCA is a novel, knowledge-intensive approach to R&D, its introduction required an intensive process of capacity development for individuals to acquire new knowledge, attitudes and skills and to build social capital and institutional commitment.

After describing the capacity-development strategy employed in Uganda, the paper outlines some results of the PMCA. These include both innovations and strengthened capacity for innovation. The final section summarises our results in

relation to the two questions identified above and discusses future prospects for the PMCA in Uganda and beyond.

The Innovation Challenge

Innovation involves ‘the use of new ideas, new technologies or new ways of doing things in a place or by people where they have not been used before’ (Barnett, 2004: 1). Until recently, it was commonly assumed that agricultural research would automatically lead to innovation, which in turn would increase yields and production and benefit the poor. In essence, research results were assumed to flow through an ‘innovation pipeline’ from basic research (conducted by ‘advanced research institutes’ in the north) to strategic research (conducted by CGIAR centres), on to applied and adaptive research (conducted by national programs) and finally to farmer adopters.

In fact, the relationship between research and innovation is not simple and linear but complex and interactive. As Hall (2009: 31, 36) notes:

- Innovation is rarely triggered by agricultural research and instead is most often a response of entrepreneurs to new and changing market opportunities.
- Innovation requires knowledge from multiple sources, including from users of that knowledge.
- It involves these different sources of knowledge interacting with each other in order to share and combine ideas.
- These interactions and processes are usually very specific to a particular context.
- Each context has its own routines and traditions that reflect historical origins shaped by culture, politics, policies and power.

Advocates of participatory research in the 1970s and 1980s believed the main challenge was to persuade biological scientists of the importance of including farmers in research teams (Ashby, 2009: 40), and considerable effort went into the development of methods for engaging farmers and researchers in participatory technology development. However, subsequent research in Europe and elsewhere has highlighted the importance of involving a much broader range of stakeholders and focusing attention on innovation per se, rather than more narrowly on research activities (Hall et al., 2001; World Bank, 2007).

Development of the PMCA

The PMCA addresses the innovation challenge by bringing diverse stakeholders together in facilitated processes that are structured to improve communication, build trust and engage in joint activities that produce technological and institutional innovations in the market chain. The stakeholders involved may include small farmers; various types of market agents (for example, commodity transporters, wholesalers, processors, domestic retailers and exporters); chefs and restaurateurs;

researchers; food technologists; extension agents; and specialists in enterprise development, packaging, labelling and quality control, among others.

Papa Andina has worked since the late 1990s with CIP and R&D organizations in Bolivia, Ecuador and Peru to improve the competitiveness of small potato farmers in the Andean highlands of South America. In the early years, a traditional R&D approach was pursued that centred on improving production technology. However, after frustrating results due to marketing problems, Papa Andina began to search for new ways to improve the participation of small farmers in market chains.

In 2002, CIP social scientists, Papa Andina, and the Project for Potato Innovation and Competitiveness in Peru (INCOPA Project) began working with a participatory approach to stimulate agricultural innovation known as 'Rapid Appraisal of Agricultural Knowledge Systems' (RAAKS). This approach, developed by Engel and Salomon (2003), brings diverse stakeholders together in a flexible, participatory process to stimulate social learning, build trust and foster innovation. Papa Andina used RAAKS to bring market chain actors together to get to know one another, build up trust and explore market opportunities that could be of mutual benefit. Approaches (such as rapid market assessments and focus groups) were added to RAAKS for developing new products. Gradually a new approach emerged, that was named the 'Participatory Market Chain Approach'. This was documented in a PMCA User Guide (Bernet et al., 2006, 2008). In 2003, when the INCOPA market chain work was reviewed in an Andean regional workshop, participants from Bolivia became interested in the approach and decided to begin experimenting with at home. Over the next few years, the PMCA was further developed and documented based on the work in Bolivia and Peru (Devaux et al., 2009).

Characteristics of the PMCA

The PMCA engages those who make their living from a market chain (the 'market chain actors') and public and private service providers (such as researchers, credit providers and development workers) in facilitated group processes in which market opportunities are identified and exploited, leading to technological and institutional innovations. As outlined in the PMCA User Guide, the PMCA is implemented in a highly structured process with three phases.

Phase 1: Familiarisation with the market chain and the key actors

Phase 2: Joint analysis of potential business opportunities

Phase 3: Development of market-driven innovations.

As illustrated in Figure 1, an R&D organization initiates the PMCA by selecting the market chains on which to work, identifying potential R&D partners and carrying out exploratory, diagnostic market research. Key goals of Phase 1 are to become familiar with market chains and market chain actors, and to motivate market chain actors to participate in the PMCA process. In Phase 2, the R&D organization facilitates meetings that are designed to foster mutual trust and knowledge sharing among participants

and to identify potential market chain innovations. In Phase 3, the market chain actors collaborate in practical innovation processes, with support from R&D organizations.

During Phase 1, diagnostic research is carried out in order to become familiar with key market chain actors and understand their interests, problems and ideas. This phase is expected to take 2–4 months and may involve 20–40 interviews with diverse market chain actors. This phase ends with a public event that brings together individuals who have been involved in the PMCA process so far, including market chain actors and representatives of research organizations and other service providers, to discuss results of the market survey and to exchange ideas. Some individuals who have not been involved so far may also be invited, to gain their interest in the PMCA process and motivate them to participate in future activities.

In Phase 2, thematic (commodity) groups are established to explore potential market opportunities. The lead R&D organization facilitates group meetings where market opportunities are identified and discussed. The main challenge during this phase is to keep participants focused on market opportunities (rather than, for example, production problems). Six to ten meetings may be needed to analyse potential market opportunities. In some cases, specialised market studies (for example, focus groups) may be needed to complement the group work. At a final event, the market opportunities are discussed with a wider audience and new members with complementary knowledge and experience are encouraged to join Phase 3.

Phase 3 focuses on the activities needed to launch specific innovations. The time required may vary depending upon the complexity of the innovation, the capacity of the group, and biophysical, socio-economic, and institutional conditions.

A rough estimate of the time needed, based on experience in Bolivia and Peru, is 3–6 months. Phase 3 closes with a large event to which a much wider group is invited, including for example, political officials, donor representatives and members of the press. Based on experiences with the PMCA in Peru and Bolivia, 12–15 months seems to be adequate to implement the three phases of the PMCA.

In practice, as discussed below, implementation of the PMCA has not followed this three-phase process in a well-planned and linear fashion. Unpredictable processes have been triggered that have evolved at different paces. Some groups disbanded in the middle of the process; some perceived opportunities early in the process and launched successful innovations during Phase 2; others that appeared to be 'on a roll' during Phase 2 lost momentum and failed to generate feasible innovations in Phase 3; and yet others have continued to interact and innovate years after the end of Phase 3.

To validate the PMCA and build capacity for its use in a country, one has to complete the three phases. However once you get underway the innovation process starts to be cyclical... Some developments will make us start the cycle again or jump from one phase back to the previous one: You expect to build up relations and trust in Phase 1, but even

in Phase 3 the trust might be lost and you need to start over again. Nothing in real life is linear!

Berga Lemaga, PRAPACE Coordinator

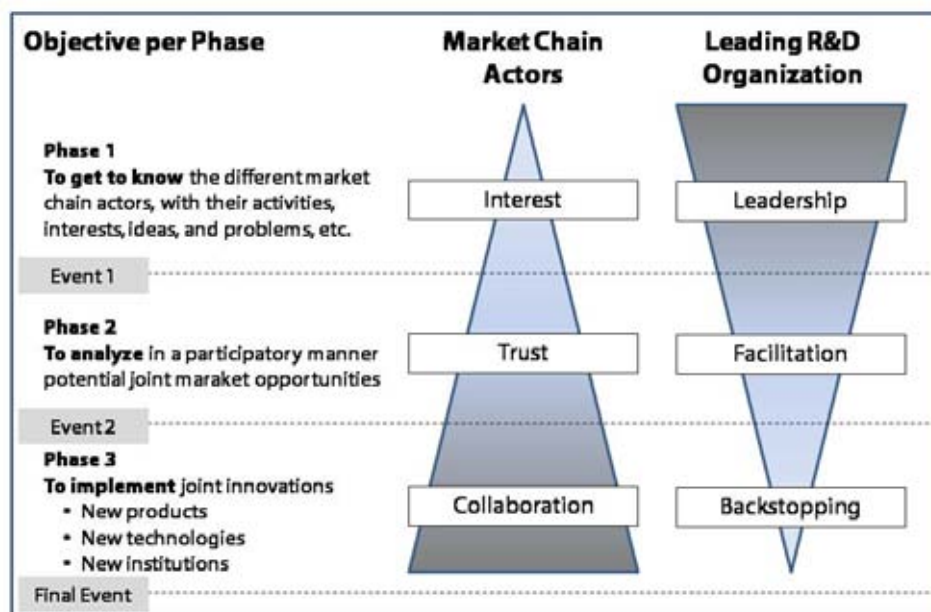
DEVELOPING CAPACITY FOR THE PMCA IN UGANDA

Based on early successes with the PMCA in the Andes, in 2004, the Crop Post-Harvest Programme of the United Kingdom's Department for International Development (DFID) encouraged Papa Andina to introduce and test the PMCA in Uganda, where the results of sweet potato research and development (R&D) were being constrained by marketing problems. To accomplish this, Papa Andina developed a joint project with PRAPACE. Initially this project included only Phase 1 of the PMCA, because DFID support was available only for 2005. After Phase 1 was completed at the end of 2005, there was a break in activities until Papa Andina, PRAPACE and CIP's Sweet Potato Project in Uganda were able to bring together the funding needed for Phase 2. Later, when Phase 2 was completed in August 2006, there was another delay until funding for Phase 3 was obtained from ASARECA. PRAPACE took the lead in negotiating this funding, with support from Papa Andina and CIP's Impact Enhancement Division. Implementation of Phase 3 began in February 2007 and was completed in September of the same year.

Key Actors and Timeline

Many organizations and individuals have played key roles in introducing, validating and refining the PMCA in Uganda. These include an international agricultural research centre (CIP), an Andean-based partnership program (Papa Andina), an African regional commodity program (PRAPACE), a national agricultural research organization (NARO), a ministry-level project (Competitiveness and Investment Climate Strategy, CICS), a non-governmental organization (Africa 2000 Network, A2N) and a private company (the Ssemwanga Group). The diversity of organizations involved reflects the important role of partnership in promoting pro-poor innovation (Hall et al., 2001; Horton, Prain and Thiele, 2009).

Figure 1. The three-phase structure of the PMCA methodology. This figure is available in colour online at www.interscience.wiley.com/journal/jid

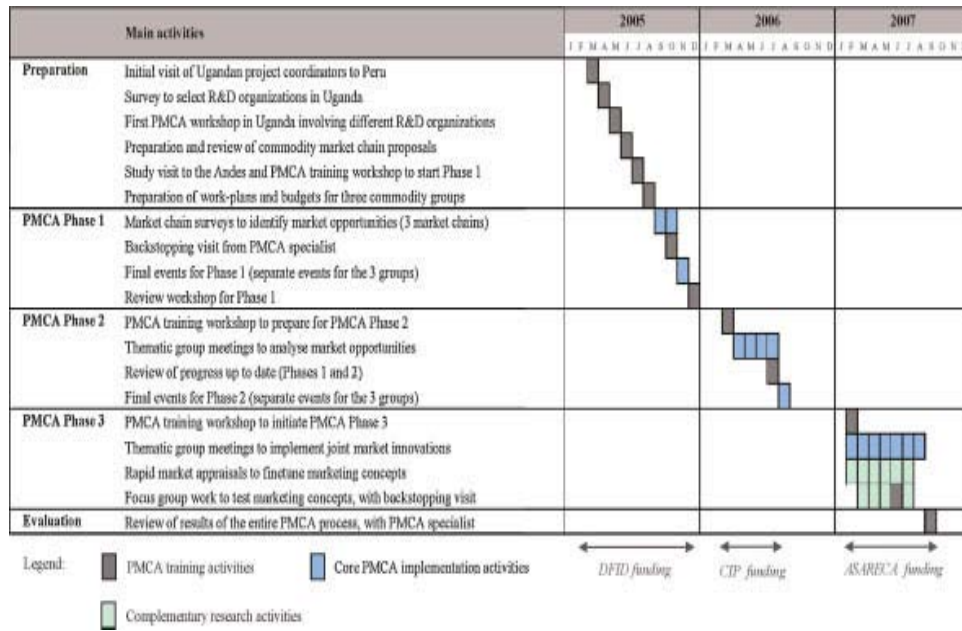


Source: Bernet et al., 2008

Altogether, developing capacity for the PMCA in Uganda involved a sequence of activities spread over 2½ years (Figure 2). The process was much longer than it had been in the Andes because separate funding sources had to be negotiated for each of the three phases. The process involved a preparation period, in which Ugandan partners familiarised themselves with the PMCA, and an application period, in which they used the method on their own. In applying the PMCA, participants worked in three commodity teams that focused on the market chains for potatoes, sweet potatoes and vegetables. During this period, training activities were combined with hands-on implementation of the PMCA to foster development essential knowledge, attitudes and skills among Ugandan partners.

Initially, CIP and Papa Andina took the lead in defining the steps to introduce the PMCA. But as the process advanced and Ugandan stakeholders became more involved in planning and implementing their own work, responsibilities shifted to the local PMCA Coordinator based at PRAPACE and to three commodity teams. The person selected by PRAPACE to serve as the PMCA Coordinator was a woman who had previously coordinated a sweet potato project that had been successful in its technical work but had faced marketing challenges.

Figure 2. Overview of activities implemented in Uganda. This figure is available in colour online at www.interscience.wiley.com/journal/jid



One of the first tasks of the new PMCA Coordinator was to conduct an institutional survey of 40 R&D organizations that were engaged in agricultural marketing work in Uganda. Of these, 20 were invited to the first PMCA workshop where future work with the PMCA was planned. During the workshop, participants formed three commodity groups, which developed proposals for applying the PMCA. Based on the proposals, each participating organization was invited to nominate one person to continue to work on the PMCA, and to travel with a group to Peru and Bolivia to learn more about the approach. The Mukono Zonal Agricultural R&D Institute (ZARDI) of Uganda's National Agricultural Research Organization paid the way for a second participant — the Institute Director — to participate in the study tour.

Once work with the PMCA got underway in Uganda, the PMCA Coordinator served as an interface between individuals who had developed and used the PMCA in the Andes (mainly Bernet and Velasco) and three 'commodity groups' that were implementing the PMCA in Uganda. Each commodity group selected a leader to coordinate meetings, visits to markets and processing facilities, focus groups and other activities of the commodity groups.

Women were selected by group members to lead each of the three thematic groups, largely because they had shown interest and aptitude for leading group activities. They were also interested in learning new skills and approaches that would

advance their careers, and were willing to dedicate the (considerable) time needed to implement the PMCA, with minimal financial compensation.

The ladies were more interested in PMCA, were more eager to see results, and also more willing to invest their time. That is how the ladies ended up leading each commodity team.

Berga Lemaga, PRAPACE Coordinator

Women always work hard to do a good job. They have to prove that they are capable, and they are known to be trustworthy as well as careful in spending money.

Harriet Nsubuga, Vegetable Commodity Group

When commodity groups were formed and each group had to select a representative, the ladies were selected. I must say that most of these ladies were professional, committed and loved their work. They had mobilisation and facilitation skills and wanted to see the programme succeed.

Immaculate Sekitto, Uganda Project Coordinator, Phases 1 and 2.

I think it was the social benefits that kept us women [the Commodity Team Leaders] glued to the process. I am proud to have these ladies as my friends — some are more like my sisters. We still look out for each other.

Sarah Mayanja, PMCA Coordinator, Phase 3

The commodity group leaders represented the following local R&D organizations:

Potato Commodity Group

- The Africa 2000 Network (A2N) — a non-governmental organization operating in 13 African countries, with headquarters in Kampala.
- The Ssemwanga Group — a consulting and trading firm owned and operated by a food technologist who specialises in marketing of agricultural commodities

Sweet potato Commodity Group

- The Mukono Zonal Agricultural R&D Institute — one of seven zonal institutes responsible for adaptive research and technology dissemination within Uganda's National Agricultural Research Organization (NARO).

Vegetable Commodity Group

- The Competitiveness Investment Climate Strategy Secretariat, based in Uganda's Ministry of Finance, Planning and Economic Development.

During application of the PCMA, the commodity teams grew to include 20 'Core Team Members' representing 14 R&D organizations. These were mainly non-governmental organizations (NGOs) but also including research organizations, extension projects and private firms. Many R&D professionals participated in the

PMCA exercise — often investing significant amounts of unpaid time and effort — to learn the PMCA and to acquire new skills and tools they could use in their work.

More than 100 market chain actors — including representatives of farmers' groups, local market agents, processors, managers of urban markets and exporters — participated in the commodity group meetings. Some of these were active early in the process and then dropped out; others joined or became active later on. Relatively few market agents participated throughout the entire process. Those who did often gained considerable influence in their group. For example, one potato processor and one vegetable exporter participated throughout the process, influencing the groups' decisions on which market opportunities to pursue. In the potato commodity group, more than 10 potato crisp processors participated throughout the entire process. Despite being competitors, they found PMCA an interesting mechanism to share and access new information, thus finding enough common ground to work together in improving their products and business practices. In the sweet potato group, traders from the Kalerwe market in Kampala were also very steady participants, providing important marketing insight to the group on sweet potato marketing.

The owner of TomCris, a family-run potato crisp processor, had the following to say about his experiences in the PMCA:

I have gotten a lot of knowledge by participating in the PMCA that is helping me now to manage my business and improve the quality of my products and packaging. This allows me to access more markets and has won me recognition by the Ugandan National Bureau of Standards and the government. The UNBS is now basing standards for crisps on my products and I got a barcode for my products about which I am very proud.

Thomas Bukena, owner of TomCris Enterprises

Farmers participated in the commodity groups to meet other market chain actors, to make business contacts, and to get new ideas for processing and marketing their products in urban markets. They also valued the technical information and advice they obtained from R&D professionals or others present at PMCA events.

Overall Capacity Development Strategy

In Uganda and elsewhere, agricultural research organizations and NGOs are often hesitant to engage with market agents, to avoid becoming 'tainted' by commercial interests. Agricultural researchers usually work alone or with other researchers; and only occasionally with farmers in participatory technology development. They seldom work with NGOs or market agents. Similarly, professionals in NGOs frequently work with other NGOs and sometimes with farmers, but seldom with market agents or researchers. Farmers interact with market agents in the context of commercial transactions, but the relations between these two groups are typically characterised by distrust. Few farmers come into contact with researchers.

Given these infrequency and commonly distrustful nature of interactions between the different groups that have a stake in market innovation processes in most

developing areas, introduction of the PMCA implies significant changes in the way the stakeholders view one another and interact. As a result, developing capacity for use of the PMCA requires more than knowledge and skill acquisition; it requires profound changes in attitudes, patterns of interaction, and in many cases in organizational culture.

To promote the needed changes, the capacity-development strategy implemented in Uganda included a number of complementary components. The overall strategy was designed to expose Ugandan partners to the PMCA in ways that would allow them to discover for themselves the strengths and weaknesses of the approach and the knowledge, skills, attitudes and other factors needed to apply it successfully. The strategy employed reflects a model of capacity enhancement that Pidatata (2004) has described as ‘creating space for the client to learn by doing, finding the best local fit and nurturing effective behavioural competencies. This process is designed to promote local/country ownership and help bridge the knowledge adaptation gap by leveraging local and global knowledge to bring just-in-time and just-enough expertise to help enhance client capacity’.

One key feature of the capacity development strategy employed in Uganda was ‘South– South learning exchange’ that involved two study tours for groups of Ugandans to the Andes. The study tours allowed the Ugandans to see how the PMCA had operated in the Andes and to reflect on how this approach might perform in the context of Uganda. Another key feature of the strategy was ‘action learning’ — an educational process in which participants reflect on their own actions and experiences, in order to improve performance².

Opportunities were provided for Ugandans to experiment directly with the PMCA in the context of local commodity chains, with methodological supervision and support from PMCA specialists from the Andes. PMCA training workshops involved both theoretical and practical sessions with group work and personal experimentation with PMCA tools. This allowed Ugandans to acquire both knowledge and practical skills needed to apply the knowledge under real-life conditions. After individual and group work, reflection in workshops was designed to consolidate learning and to trigger a more demand — and market-oriented way of thinking — a key capacity for fostering market-chain innovation.

² A useful introduction to action learning and up-to-date references are available at http://en.wikipedia.org/wiki/Action_learning.

Component Strategies

Within the overall strategy of South–South learning exchange and action learning, a number of component strategies were used, which are described and assessed in this section³.

Participatory planning and decision making

Throughout the process of introducing the PMCA and developing capacity for its application, core team members from R&D organizations were involved in planning, implementing and evaluating each phase of the work. The core team members, in turn, engaged market chain actors in planning and reviewing each commodity group's activities. Participation fostered teamwork and empowerment and ensured that the capacity development process responded to the needs and interests of those involved. The utility of engaging intended beneficiaries in all stages of a capacity development intervention is supported by experience with capacity development in research and development organizations elsewhere (Horton et al., 2003).

South–South learning exchange visits to the Andes

Two study tours to the Andes were central to the capacity development strategy. In March 2005, the PRAPACE coordinator, the recently recruited Ugandan PMCA coordinator, and a representative of the International Centre for Tropical Agriculture (CIAT) visited Peru for initial orientation and to plan initial PMCA activities in Uganda, including a survey of Ugandan R&D organizations and the initial market study.

In July of the same year, 15 Ugandans who had participated in an initial PMCA training workshop in Uganda visited Peru and Bolivia, where they met with the people who had developed and applied the PMCA in the Andes and saw the results in situ. This visit played a crucial role in stimulating interest and sharing tacit knowledge on the PMCA — the type of knowledge that is difficult to write down and transmit via written guidelines or classroom teaching.

The Ugandans observed how the PMCA had been applied and the results it had produced in a setting that was comparable in many ways to their own. They were not visiting ultra-modern facilities in North America or Europe — of little relevance to Uganda — but small-scale processors that made simple yet significant improvements in processing and marketing under conditions not so different from those back home. Ugandan participants consider the Study Visit to have been crucial for the entire process of introducing the PMCA in Uganda.

People saw that PMCA was not just theory but something that can be put into practice to benefit the communities... Seeing that it worked in Boliva, convinced that would also work in Uganda... The interesting take-home message was that it was possible to create trust among the different actors that normally don't trust

³ At the end of Phase 2 and again at the end of Phase 3, we reviewed these strategies in participatory workshop. For additional information see Horton (2008).

each other and work collaboratively to support themselves and others. Seeing that markets can actually be developed by bringing people together also was a good incentive to really work for it.

Berga Lemaga, PRAPACE Coordinator

The use of visiting Bolivia was seeing things like we see here, but having success in the market. Previously, we were always thinking we needed new crops to get ahead. But in Bolivia we saw that we could make a difference with what we had. . . We also found out the importance of the middleman. Here we've always said that if we eliminate the middleman the farmer will be rich. But we began to see things differently in Bolivia.

Peter Lusembo, Director, Mukono-ZARDI

Sometimes when you read or hear about things, you still don't really understand them. But seeing is believing. We saw what they had done in Bolivia, the successes and the high level of motivation. We saw this and said, 'If they can do it, why can't we?'

Immaculate Sekitto, Uganda project coordinator, Phases 1 and 2

Ugandan researchers and market chain actors were surprised to see farmers and traders working together to develop innovations.

What was useful for me was to see that a farmer can sit and talk with a trader and come up with something useful for both of them. That was really an eye opener for me.

Beatrice Akello, Researcher, Mukono ZARDI

We saw that the PMCA had worked in the Andes, and were anxious to try it out since the conditions (poverty levels etc) were quite similar to those at home. We also had to work hard to show that the investment in the trip was worth it.

Sarah Mayanja, Coordinator, Phase 3

Another important result of the study visit to the Andes was the bonding that occurred within the Ugandan group and the commitment to succeed upon their return to Uganda. This helped to strengthen teamwork upon their return back home.

An important benefit of the trip was that it created a sort of 'PMCA family'. We were all experiencing the same marketing problems and wanted to have them solved through the new approach. Since we were working in the same field (agricultural development), the trip to the Andes brought us together and inspired us to work as a family to the benefit of all... After Bolivia, my work became much easier. The trip led to a major improvement in teamwork."

Immaculate Sekitto, Uganda project coordinator, Phases 1 and 2

Refinement and adaptation of the PMCA User Guide

A PMCA User Guide had been drafted in Spanish for use in the Andes. An important element of the work in Uganda was to involve Uganda colleagues in revising the User Guide and adding examples and illustrations from Uganda. The final version was published by CIP (Bernet et al., 2006). Participation of the Ugandan colleagues helped to improve the User Guide and also to improve their understanding of PMCA and its practical application. Dealing with theoretical issues and its practical application in the Andes provided the Ugandans with important insights and it also generated a sense of involvement in the development of the PMCA itself.

The highly structured information and guidelines on the PMCA was especially key to commodity team leaders who were most concerned about 'what to do' in each stage of the PMCA process. Since the Uganda experience helped to clarify and improve this document, it is now a clearly valuable source of information for introducing the PMCA in other areas.

Action-oriented PMCA training workshops

Adult learning is most effective when the subject matter relates to participants' felt needs and when learning opportunities are linked to practical action. For this reason, classroom training has greatest value when it relates to issues of importance to learners and when it incorporates exercises that illustrate the practical application of abstract theories and principles. Learning is essentially a social process and adults generally learn more rapidly in groups where participants bring diverse knowledge, perspectives and experiences to bear on an issue of common interest and importance. With adequate facilitation, diverse groups have greater potential for interactive learning than do more homogenous groups of individuals with similar backgrounds and experiences⁴.

Each phase of the PMCA began with an action-oriented training workshop. These workshops provided the initial motivation and knowledge needed to implement the phase and also provided opportunities for skill development. The PMCA training was especially effective because it was delivered by individuals (mainly Bernet and Velasco) who had developed and applied the PMCA in the Andes and who possessed deep personal knowledge of the approach. In these training events, trainees performed learning exercises involving focus group research, rapid market appraisal and other methods useful for product development. Experimentation with applied R&D methods during visits to local markets, processing facilities, food technology laboratories, or other settings that were 'new' for many participants generated personal, subjective insights that could not be effectively gained from reading publications or studying training materials (Von Krough et al., 2000: Chapter 2).

4 Useful information on these and related aspects of learning is available on the website of the 'Learning Innovations Laboratory' of Harvard Graduate School of Education (<http://lila.pz.harvard.edu>). Chambers (2002) presents a useful sourcebook of ideas and activities for participatory workshops in the context of international development.

Because these workshops combined class room sessions with field visits to local markets, supermarkets, processing facilities, and other relevant locations, — which participants found to be valuable ‘eye openers’ — participants also developed a common, shared understanding about the market chains, and how specific PMCA tools might perform in such settings.

Hands-on learning with the PMCA in Uganda

With the knowledge and skills obtained during the workshops at the beginning of each phase, the commodity teams were responsible for implementing the PMCA on their own, receiving guidance and feedback from a PMCA specialist (Bernet) based at CIP in Peru. Commodity team members concur that their practical work with the PMCA combined with feedback from a PMCA specialist was indispensable for developing their understanding of the PMCA and their capacity to apply it.

Backstopping and coaching from PMCA specialists

Technical support was provided mainly by a single PMCA specialist based in Lima. He came to Uganda six times to provide training and to assist in the organization of major events, and provided backstopping for the teams mainly via email from Lima. The Ugandan team leaders place high value on the training received and the quick e-mail responses from Lima. Nevertheless, they would have appreciated having more frequent face-to-face support and feedback from a PMCA specialist based in Uganda. At some points during Phases 2 and 3, team leaders were concerned that their teams were under-performing, as one leader noted: ‘We were not always sure we were on the right track’. Especially at these points of uncertainty, core team members would have valued more direct, personal access to a PMCA specialist.

Knowledge sharing among the commodity teams

During Phase 2 and later on, the commodity teams worked independently. Although team leaders communicated frequently with the local project coordinator, there was little direct communication among the leaders or members of the different teams. In some cases, the team leaders found it difficult to translate the principles and tools outlined in the PMCA User Guide into practical action and to solve problems that arose with the groups — for example how to get producers and traders to communicate openly, when they distrusted each other. It is likely that more interaction among the teams would have helped them share experiences and support one another in solving problems and advance more rapidly with their innovations. The benefits of knowledge sharing among practitioners working in a new area have been widely documented in the literature on organizational learning and knowledge creation (Von Krogh et al., 2000; Collison and Parcell, 2005). After discovering this deficiency in a review of Phase 2, the local PMCA coordinator started to call meetings of commodity group leaders to share information about progress in each group. These meetings were also helpful for planning the final PMCA event at the end of Phase 3, where all groups participated.

Learning-oriented evaluations

Learning-oriented evaluation was intensively used in the process of introducing the PMCA to Uganda. The PMCA User Guide encourages team leaders to evaluate major events and to periodically reflect on their work and performance. At the end of each phase, participants in the PMCA exercise reviewed their work together with PMCA specialists. At the end of Phase 1, a 'horizontal evaluation' (Thiele et al., 2006, 2007) was organised with participants from Uganda, Kenya, Tanzania, Bolivia, Peru and the Netherlands. This exercise allowed the Ugandan PMCA practitioners to share their experiences with local and foreign R&D professionals who were interested in the approach. The external participants contributed to the discussions and assessment of the PMCA process with their own perspectives and experiences. One of the major challenges identified for the commodity groups was 'to strengthen their business and marketing skills to put in practice a strong market and demand focus' (Bernet and Lemaga, 2006: 3). At the end of Phases 2 and 3, an evaluator (Horton) facilitated participatory reviews of the work carried out during these phases and the results obtained. These evaluations produced recommendations that were subsequently used to improve the process of introducing and refining the PMCA (Horton, 2008).

RESULTS OF THE PMCA EXERCISE

The applications of the PMCA in Uganda produced a number of 'islands of success', in terms of the commercial, technological and institutional innovations that were at various stages of development at the time the PMCA exercise formally ended in September 2007. Individual and organizational capacities were also strengthened. Technical and institutional innovation that benefits poor farmers is an important goal of the PMCA.

However, such innovations inevitably have a limited 'shelf life'. In contrast, strengthening the capacity to innovate — through the development of knowledge, attitudes, skills and social capital — is likely to have greater social and economic impacts in the long run. Innovation processes are continuous and dynamic. In the Andes after completion of PMCA exercises, many 'creative imitation' processes have been observed in which market actors imitated, often with rather small modifications, innovations developed during the PMCA exercise. Such creative imitation should be fostered wherever possible.

Technological and Institutional Innovations

Nevertheless, experiences with the PMCA in Bolivia and Peru have shown that new product development can stimulate subsequent innovation in production technologies and in new institutional arrangements, such as marketing contracts.

Innovations with potato

The main innovation developed by the potato commodity group was improved packaging and labelling of a potato crisp product. Focus groups indicated that the quality of the product was excellent, even compared to imported potato chips, but that improvements were needed in packaging and labelling. The new packaging is

now in use, and sales of this product have increased significantly. About 1,000 packs of 750 g are now sold daily in Kampala supermarkets and the Kampala International Airport. Smaller packs are also being sold to lower-income consumers and students. The producer has increased his labour force from 22 to 27 employees, and has increased his income significantly. According to the owner, the main constraints to increasing the quantity and quality of production are now in the supply chain of fresh potatoes available for processing. Consequently, after the PMCA application formally ended in late 2007, the potato commodity group organized a meeting of potato processors, market agents and farmers in Uganda's main potato producing area, Kabale, to explore ways to improve the supply of potatoes to Kampala-based processors. This illustrates how commercial innovation stimulates the search for technological and institutional solutions to subsequent production bottlenecks.

Innovations with sweet potato

The sweet potato group worked on a number of innovations. During Phase 2, Sulma Foods sent samples of the new variety Naspot 1 to the Uchumi supermarket in Kampala. After a positive market test and orders were placed for this variety, Sulma Foods engaged contract farmers to produce this variety, in addition to a red-skinned variety they were supplying previously. Naspot 1 is now being marketed for fresh consumption in the Uchumi supermarket and in four smaller supermarkets. A new snack food product based on orange-fleshed sweet potatoes was developed, and the producer (TomCris) has received many requests for this product. However, production is constrained by the limited supply of orange-fleshed sweet potatoes for processing. The processor and NARO continue to explore means to increase the supply of fresh orange-fleshed sweet potatoes for processing. Composite flours containing orange-fleshed sweet potatoes were developed and pilot-marketed by two Ugandan processing firms. However, their production is constrained by the high cost of the final product and the limited and uneven supply of orange-fleshed sweet potatoes available for processing. After the end of the PMCA process, the sweet potato commodity team leader, based in NARO, has continued to organise quarterly stakeholder meetings, bringing in new members over time. NARO's sweet potato work has also been expanded into additional production zones, where Phases 1 and 2 of the PMCA have been applied. Another project that works to promote the production and use of orange-fleshed sweet potatoes (HarvestPlus) hired one of the PMCA facilitators and has applied the approach in its work.

Innovations with vegetables

The vegetable group improved the quality, packaging and labelling of an existing tomato paste product. The group also developed three new products — a tomato chili appetiser, hot pepper paste and pickled hot peppers. The first of these is now being sold by Sulma Foods in local markets including supermarkets, and the demand is steadily growing. A processor who participated in the potato group has also started making a tomato chili appetiser and selling it locally. He is currently discussing with Makerere University and the Uganda National Bureau of Standards ways to upgrade this product so that it can be sold in supermarkets. Motivated by his participation in

the vegetable group, an influential Ugandan exporter established a system of contract farming for hot pepper, which continues to function.

Strengthened Capacity for Innovation

Social capital

Social capital refers to forms of social organization, such as networks, interpersonal relations and trust, which facilitate coordination and cooperation for mutual benefit (Putnam, 1995: 67). During the application of the PMCA, participants' capacity to innovate has been gradually improved as trust and connectedness were fostered and knowledge, skills and attitudes of participants were strengthened. Many researchers, farmers, local traders, processors and exporters came together for the first time during PMCA exercises. The commodity teams gave many market chain actors their first opportunity to meet and discuss issues of common interest with others in the same market chain. The PMCA also provided many R&D professionals with their first opportunity to develop productive interpersonal relations and to work together on joint projects of mutual interest.

At the beginning of the PMCA exercise, the PMCA facilitators hardly knew each other. During the first and second workshops, they built relationships that greatly helped them work together in the future. During the PMCA, the facilitators and other group members also mobilised their own personal networks to support innovation processes. When specialised expertise was needed (for example in product testing or selection of packaging materials) professionals known to group members were brought in on a pro-bono basis. Such expertise, which was essential for new product development would have been very expensive to obtain through strictly commercial means.

Socially, a PMCA family has been built, and even today, when the headmistress (I. Sekitto) makes a call or sends out a notice to help out in a situation of need, the response is still overwhelming. In a nutshell, the PMCA family is a social network in which we all look out for each other.

Sarah Mayanja, PMCA Coordinator, Phase 3

In early commodity group meetings, farmers and traders were sometimes suspicious and accused each other of bad dealings in the past. Over time, as group members got to know one another, exchanged information, and worked on common tasks, they began to trust and respect one another. Communication became more open and fluid and collaboration became possible. In several cases, market chain actors developed personal and business relationships with people they met in the commodity meetings, which continued until now. Trust building has been a key feature and result of the PMCA.

We've been telling government that we need R&D to work together with the private sector. Thanks to the PMCA, we've built a platform for R&D where we can get answers to our questions and needs. I always tell my colleagues that when they

have a problem they should tell me, and I know where to go for the solution — to the PMCA fraternity.

John Kavuma, President, Federation of Associations of Ugandan Exporters

When you trust each other you can work together and more importantly, you can learn together. One of the key aspects of the PMCA is that it builds that kind of relationships.

Dan Kisauzi, Research into Use Programme

Knowledge and skills

Working with the PMCA has led to improvements in many individuals' knowledge and skills. Core team members gained confidence in dealing with a range of market chain actors, with whom they previously had little or no contact. The team leaders strengthened their ability to manage complex group processes, boosted their self-confidence and leadership skills, and improved their facilitation, communication and presentation skills. Team members also learned specific applied research skills in such areas as rapid market assessment, key informant interviewing, and focus groups.

Whenever I came to these meetings I got new ideas, knowledge, and approaches, and when I went to the field people wondered where I got them. They thought I'd been abroad! I combine what I learn here and there, and now when I talk about marketing and innovations, people think I'm knowledgeable.... I also learned so many useful new ways to present things to groups...

Sylvester Nganda, Uganda National Farmers Federation

PMCA practitioners often report feeling empowered by the experience, and it has been observed that farmers, small-scale traders, and processors gained self-confidence and became more assertive during the process. At the outset, they could not imagine sitting at a table with researchers or businessmen, much less expressing their views in public. By the end of the process, many of these same individuals had developed a voice and expected to be heard.

Attitudes

In Uganda, as elsewhere, most rural development programs (whether organised by the government, local NGOs, or international donors) are concerned primarily with improving the livelihoods of poor farmers, and most of them have focused on working directly with farmers, rather than working to develop market chains. Farmers as well as government officials, donor agencies and NGOs frequently consider traders as unscrupulous middle men who play little or no useful role in commodity chains.

Working with the PMCA has led to significant changes in attitudes concerning the importance of working to develop market chains and the benefits of working with diverse groups, including traders, to promote pro-poor market chain innovation. Through their work with the PMCA, many participants realised the importance of developing market chains and of working not only with small farmers but also with

market agents, rather than attempting to eliminate or bypass them. Many participants have felt ‘enlightened’ by their experiences and have become ‘true believers’ in the PMCA.

While I am myself a biological scientist, I have come to realize that all our work must be driven by the market. If the farmer cannot sell what we help him produce, we haven’t really helped him.

Peter Lusembo, Director of Mukono ZARDI

Use of the capacity developed

The application and results of the PMCA have stimulated considerable interest in Ugandan R&D organizations, in donor agencies, in policy circles, and among market chain actors who have participated in the work or heard about it.

For example, the Zonal Agricultural R&D Institute of the NARO in Mukono has continued to organize meetings of the sweet potato commodity group, and the institute director has expressed interest in mainstreaming use of the PMCA throughout the organization. A2N-Uganda has received funding from the Catholic Organization for Relief and Development Aid to implement a 3-year project entitled, ‘Poverty eradication through the PMCA’ in eight districts of the country. In 2008, the African Technology Centre invited several Ugandans to share their PMCA experiences with colleagues from Ghana, Kenya, Malawi, Senegal, Tanzania, Uganda and Zambia at workshops on value chains and technology development that were held in Kenya and Uganda. In 2009, one of the PMCA commodity team leaders, a finalist in a regional competition for young professionals and women in science, was invited to Ethiopia to present her paper on experiences with the PMCA in Uganda (Akello et al., 2009). Some of the team leaders have used the PMCA in consultancy work. The PMCA Coordinator during Phases 1 and 2 has gone on to work with the Belgian development organization VECO⁵ where she has continued to mobilise local PMCA experts and promote use of the PMCA in value chains.

I have appreciated the team spirit and willingness of commodity team groups to share information and knowledge acquired through PMCA. Wherever I call upon them, they respond positively ... I must say I use my PMCA knowledge in all my work and activities, and I have continued to preach the gospel.

Immaculate Sekitto, PMCA Coordinator, Phases 1 and 2

In 2008, VECO organised an international workshop on the topic of understanding the role of traders and middlemen in the development of agricultural market chains, which brought together 76 participants from 45 organizations in six African countries. Uganda’s PMCA experience was presented to illustrate ‘a useful tool to engage small-scale farmers with other market chain actors to improve market access’ (VECO, 2008). In 2009, The Royal Tropical Institute in The Netherlands has been developing a

5 VECO is the acronym of ‘Vredeseinlanden Country Office’.

curriculum and program for 'Agricultural Innovation Coaching' in Africa. Professionals who had recently promoted significant innovations in Ethiopia, Ghana, Kenya, South Africa and Uganda were invited to serve as resources, and among them one core PMCA practitioner from Uganda. The PMCA served as a major input into development of the curriculum for preparing innovation coaches.

CHALLENGES FACED BY PMCA PRACTITIONERS

As seen in the previous sections, the strategies employed to introduce the PMCA to Uganda were effective in motivating people and developing individual capacities for fostering market chain innovation, and there have been practical results in terms of the innovations produced. Notwithstanding these results, the PMCA practitioners faced a number of challenges in applying the approach in Uganda. Some of these challenges relate to intrinsic features of the PMCA; others relate more to implementation issues.

Features of the PMCA

The PMCA is not intrinsically 'pro-poor.' The approach can be used to stimulate and nurture innovation in any market chain, and the benefits can be captured by any group. Therefore, to ensure that use of the PMCA benefits poor farmers, those who lead the exercise and facilitate thematic groups need to apply 'poverty filters' that focus efforts on market chains in which there are significant potential benefits for poor farmers. In the Andes, the PMCA has been used most successfully to develop new high-value products based on native potatoes that are grown by small farmers in remote areas using traditional, low-input practices. Here, use of a poverty filter led to the decision to focus on native potatoes, rather than the improved varieties for which large commercial farmers have a comparative advantage. In future applications of the PMCA in Africa and elsewhere, attempts should be made to employ similar poverty filters.

In contrast to the prominent role played by women in facilitating the PMCA process, men have been more prominent in innovation processes: In future, more attention should be paid to ensuring that women and other disadvantaged groups are more fully engaged in and benefit from the results of the PMCA.

Innovation processes are inherently unpredictable: This made it more difficult for PRAPACE and local R&D organizations to manage and administer resources and activities than is the case with traditional research or extension projects, which are guided by work plans or logical frameworks with clearly defined objectives, timetables and budgets. Innovation does not finish with the Final Event of Phase 3: The PMCA should be viewed as a trigger for innovation processes that need to be nurtured after the initial exercise is completed. Essentially, we are saying that the mode in which R&D is carried out needs to change. Bringing about such a vast cultural change is a daunting challenge. Some progress has been made, but considerable work is still needed.

Mechanisms for scaling up are yet to be fully understood and implemented: Most of the results of the PMCA in Uganda were at the pilot stage at the end of Phase 3. More recently, some innovations have expanded their role in the market and some new ‘copy-cat’ innovations have emerged. A similar pattern has been observed in the Andes, where the most significant innovations have actually occurred long after the formal completion of the initial PMCA exercise. We do not yet have a systematic strategy for supporting innovation processes or scaling them up after completion of the PMCA.

Implementation issues

Funding could not be obtained for the entire PMCA exercise: Instead it had to be cobbled together phase-by-phase. This led to substantial uncertainties and delays in the process. In retrospect, it is remarkable that most of the core participants — both the group facilitators and key members — continued throughout the process which stretched over 2 years, rather than the 12–15 months it had taken in Peru and Bolivia.

Facilitation of the commodity groups was not in the work plans of most team leaders: Implementing the PMCA requires a substantial input of time by the commodity team leaders, and it was difficult to justify this use of time within many of the team leaders’ organizations. In future, when a PMCA exercise begins, more effort should be made to enlist the commitment of participating organizations and to negotiate needed adjustments in work plans.

The teams found it difficult to put into practice some of the concepts and methods presented in the PMCA User Guide: Consequently, they would have benefited from closer supervision and more extensive and practical training materials.

It was difficult to convince some market chain actors to invest the time and effort needed to engage in the PMCA and to invest in new, untested processes or products: Consequently, some of the innovation processes progressed slowly and some participants who could have made significant contributions to innovation processes dropped out of the PMCA exercise.

CONCLUSIONS

In this final section, we return to the two questions posed in the Introduction and reflect on the prospects for future use of the PMCA in Uganda and elsewhere.

Can the PMCA be useful outside the Andes and in other commodity chains?

The results of the work reported on here with the PMCA in Uganda demonstrate that the approach can be usefully applied outside of the Andes and in a range of commodity chains.

In fact, the results with the PMCA in Uganda exceeded our initial expectations. The PMCA has proven useful both for strengthening innovation capacity and for fostering market chain innovation.

The commodity teams initiated the development of a number of commercial innovations that have been further developed after the formal end of the PMCA exercise in late 2007. Examples of successful commercial innovations include improved packaging and labelling for a leading Ugandan potato crisp product, a new sweet potato variety successfully introduced into Ugandan supermarkets, and an improved commercial tomato sauce product.

Development and expanded sales of new high-value food products have stimulated both institutional and technological innovations. For example, an exporter who participated in the vegetable group has established a contract-farming scheme for producing and exporting fresh hot peppers. This scheme (an institutional innovation) includes the provision of improved planting material and technical assistance to small farmers (technological innovations). Potato processors who wished to expand sales of new products have also developed new arrangements with producers and market agents to secure more reliable supplied of fresh potatoes for their businesses.

Valuable capacities for innovation have been created in the realms of knowledge, skills, attitudes and social capital. And these new capacities have been applied in various ways with a growing number of local and international organizations.

What does it take to successfully introduce and apply the PMCA in a new setting?

Several strategies were employed to introduce, validate and refine the PMCA in Uganda. These included: participatory planning and decision making; South–South learning exchanges, via study tours to Peru and Bolivia; action-oriented PMCA training involving use of a PMCA User Guide, participatory workshops, hands-on work with the PMCA, backstopping and coaching; knowledge sharing among practitioners; and learning-oriented evaluations. These strategies motivated people to become involved with the PMCA and to persevere until the completion of the exercise. They promoted the exchange of tacit and explicit knowledge and fostered the development of skills, attitudes and interpersonal relationships needed for successful pro-poor innovation.

Work with the PMCA in Uganda has highlighted some areas where our capacity-development strategies should be improved. The commodity team leaders would have benefited from access to more practical training materials (including case studies). They would also have valued more frequent and direct access to guidance, coaching and feedback from a PMCA expert. CIP and PRAPACE could have also provided more assistance in building commitment and funding support for the PMCA at senior management level within the participating organizations. A priority for CIP is to simplify the PMCA and reduce the time and cost required to implement the approach. Provision should also be made to provide follow-up and support after teams complete the three phases of the initial PMCA exercise.

Based on our self-assessment and experiences in the Andes (Devaux et al., 2009), we believe that future efforts to introduce the PMCA into new settings should be guided by a capacity-development strategy with the following seven elements:

1. Participatory planning and decision-making involving local actors
2. Negotiation with senior managers in lead R&D organizations to foster institutional commitment to the PMCA and to support fund-raising for its use
3. South–South learning exchanges, via study tours to the Andes, Uganda, or other sites where the PMCA has been successfully used
4. A comprehensive training strategy that includes action-oriented PMCA training workshops, use of the PMCA User Guide and complementary training materials, practical hands-on work with the PMCA in commodity groups, and backstopping and coaching by experienced PMCA facilitators, involving both face-to-face and virtual communications
5. Knowledge sharing among the PMCA practitioners working in different commodity teams
6. Periodic learning-oriented reviews and evaluations to improve the process and document results
7. Continuing support after the completion of Phase 3.

Implementing a thorough capacity development process with these components takes time and resources. But it should be seen as an investment in innovation capacity that will generate returns over a number of years. Our experiences in Uganda and even more so in the Andes, where work with the PMCA began in 2003, is that the capacities developed — at both individual and innovation-system level — continue to be utilised long after the PMCA exercise formally ends. In many cases, the creative imitations that occur years after the initial efforts are the most important ones.

When introducing the PMCA to new settings, it needs to be kept in mind that each situation presents a unique combination of socio-economic, political, institutional and technological conditions. For this reason, the approach will need to be customised for use in each country and market chain. Institutional sustainability issues should be dealt with as priorities from the outset of any process of introduction.

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Humans: The neglected corner of the disease tetrahedron - developing a training guide for resource-poor farmers to control potato late blight¹

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ABSTRACT

Late blight, caused by *Phytophthora infestans*, continues to be one of the major threats to potato (*Solanum tuberosum*) production, especially in developing countries. Resistant cultivars and fungicides are the main tactics used to fight the disease, however, it was not clear which competencies resource-poor farmers needed to best control this disease. A competence is a “standardized requirement for an individual to properly perform a specific job, including a combination of knowledge, skills and behavior”. This study describes how competence analysis was used to develop a training guide for extension workers in Ecuador. A group of farmers, extension workers and plant pathologists identified five competencies needed to manage late blight efficiently: i) capable of recognizing the symptoms of disease and know which organism causes it; ii) know how this organism lives; iii) identify the characteristics and benefits of using resistant potato cultivars; iv) use fungicides appropriately; and v) by periodically visiting the potato field, be able to select practices that control late blight efficiently. Mental abilities, physical skills, attitudes and information specific for each competence were identified and from those, learning objectives were defined. Based on the objectives, the contents for each training session were defined, after which learning strategies and evaluation questions were developed. A Spanish version of the training guide was developed and iteratively tested and improved in three farmer field schools in the central highlands of Ecuador. The guide was then published in Spanish, and subsequently translated to and published in Ecuadorian Quechua and English.

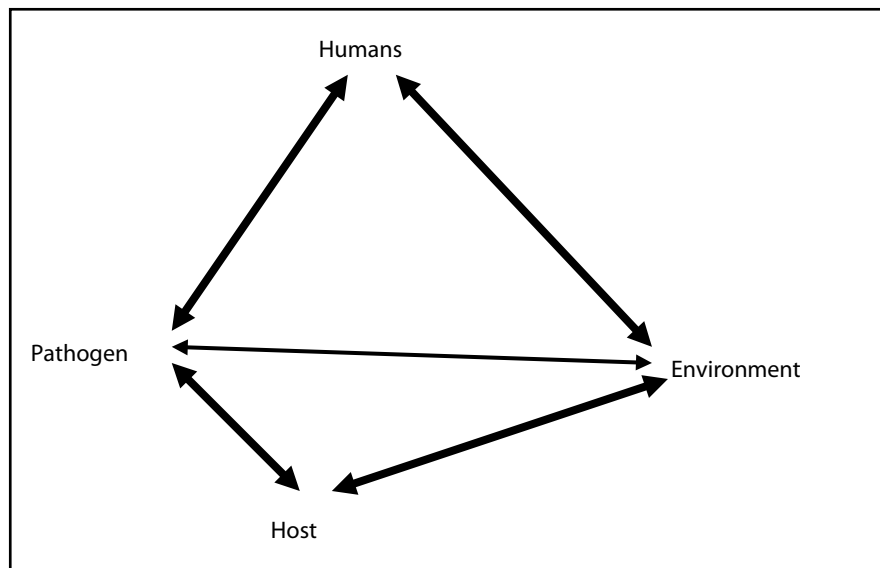
INTRODUCTION

One common characteristic of most resource-poor potato farmers in developing countries is that they know very little about the processes which cause plant disease. Farmers know much about biological entities they can see, such as crops and animals, less about insects -some stages of which they don't see- and almost nothing about microorganisms (Trutmann et al., 1993; Ortiz and Forbes, 2003). The common answers to the question of “what causes blight” will be anything but correct:

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lightening, low temperature, rain, sun while it rains, stages of the moon, bad seed, or mystical explanations (Ortiz and Forbes, 2003). Therefore, in spite of having access to new technologies, particularly agro-chemicals, many rural people have not gained new knowledge from agricultural science. For this reason, humans seem to be the neglected corner of the disease tetrahedron (Fig. 1).

Figure 1. The disease tetrahedron (after Zadoks and Schein, 1979)



The limited knowledge that resource-poor farmers have about pesticides, together with other factors that affect potato late blight (PLB), has led to an epidemic of pesticide poisonings and other chronic health problems in the developing world. The Food and Agriculture Organization (FAO) (Anonymous, 2003) produced an International Code of Conduct on the Distribution and Use of Pesticides. Based on this code, highly toxic pesticide (Class-I, WHO system) should be banned, because necessary protective clothing is cumbersome, expensive and almost never used (Eddleston et al., 2002; Wesseling et al., 2005). The most recent version of the code promotes corporate responsibility in pesticide trade, but we have not been able to find documented examples where the industry willingly removed hazardous pesticides from a market. A recent study has indicated that adherence to the code is very low in Peru and Ecuador (Orozco et al., 2009), and this is undoubtedly the case in most developing countries. While the majority of dangerous pesticides are not fungicides, three of the most commonly used late blight fungicides (mancozeb, maneb and chorothalonil) were recently included in a list of pesticides considered to be dangerous to developing country farmers (Wesseling et al., 2005). The increasing number of technical and development workers decrying the current pesticide crises

in developing countries concurs that in addition to effective regulation, integrated pest management and natural pest control methods are required.

The lack of knowledge about basic aspects of the disease itself makes it difficult to simply teach farmers how to manage fungicides or other technologies. For that reason, extension workers in developing countries have been using knowledge-intensive, participatory techniques to help farmers increase their understanding of how disease occurs and how it can be managed. The most commonly used participatory approach is probably the farmer field school (FFS). The International Potato Center (CIP) and partners initiated a FFS program in the late 1990s with support from the Food and Agriculture Organization of the United Nations (FAO) (Sherwood et al., 2000; Nelson et al., 2001).

To provide FFS facilitators with materials related to potato, a guide was developed by CIP and partners in Peru with a strong focus on PLB (Nelson et al., 2002). Initially, the FFS were intended to focus primarily on PLB, but this rapidly evolved into a focus on potato integrated pest management (IPM) and potato production in general in response to needs expressed by farmers. Subsequently, a number of other materials were developed in other countries, including Bolivia (Gandarillas et al., 2001), Ecuador (Pumisacho and Sherwood, 2000; Pumisacho and Sherwood, 2005) and El Salvador (Anonymous, 2000). All of these were focused on potato and contained some information and/or activities related to PLB management.

In 2006, CIP initiated a comparison of FFS guides dealing with PLB. Many commonalities were found and are discussed in more detail later. This work was initiated in part by a need expressed by FFS facilitators to produce more thorough materials for PLB management. It was assumed that a farmer-focused approach, which emphasized the capacities farmers need to manage the disease, would produce more balanced and thorough materials, which would have greater impact in the field.

This paper describes the process followed since 2006 that has resulted in the production of a new PLB guide for FFS facilitators (the users) who work with resource-poor farmers in developing countries (the beneficiaries). We also discuss some of the issues related to use of the guide and the general problem of building capacity of farmers for PLB management.

MATERIALS AND METHODS

The approach that was taken to develop the capacity building guide consisted of three stages described in the next paragraphs.

Collection and analysis of existing materials

Previously published materials related to building farmer capacity for PLB management in developing countries (Anonymous, 2000; Pumisacho and Sherwood, 2000; Gandarillas et al., 2001; Nelson et al., 2002; Pumisacho and Sherwood, 2005) were compared for content and methodology. A synthesis of the materials was developed to facilitate access for the following step.

Participatory workshop

A workshop was organized in February, 2006, in Quito, Ecuador in which 25 people participated. These included FFS facilitators, extension workers, and plant pathologists. In this workshop participants followed a methodology refined by V. Zapata which relies heavily on knowledge management theory (Zapata, 2006). The methodology consisted of: i) identification of the competencies farmers need to control PLB; ii) analysis and description of the components for capacity building; iii) development of the learning objectives; iv) selection of content and information sources; v) selection of strategies and resources, vi) identification of the facilitators functions; and vii) development of the evaluation questions.

The farmer competencies were identified by a participatory process in which the following concept was developed: “to effectively manage PLB, a farmer needs to be capable of....” This was done by working in groups and then evaluated in plenary sessions. Once the competencies were identified, the participants identified the capacity building components, which were: mental abilities, physical skills, attitudes, and information. These components then gave rise to different learning objectives. For each component (e.g., mental ability) at least one learning objective was developed. Each objective had the same structure, consisting of a subject (to whom is the objective directed), verb (what is the nature of the action the subject will do), conditions (under which the subject does the action) and the criterion (used to evaluate the action). Special care was given to use verbs representing actions that later could be evaluated. For example, instead of using verbs like ‘know’ or ‘understand’, verbs such as ‘describe’ or ‘draw’ were used.

Guided by the learning objectives, the participants then identified the information that was needed as content to support the development of the abilities, skills and attitudes. The content was found in a number of sources, including the previously published guides that had been synthesized, other pamphlets, books and Internet. The next step was to develop strategies to deliver the content to the end user. Here a number of existing participatory activities were evaluated and the best were included. In many cases, groups also developed new approaches to facilitate learning of particular capacities and knowledge.

The final part of the process involved defining the role of the facilitator. Here clear instructions were developed to assist facilitators in the implementation of the sessions. Questions were also developed that would guide the facilitator in the evaluation of success of the learning objectives.

Validation and publishing

The results of the process described above were formulated into modules using the guidance of experienced facilitators. The modules were then validated and iteratively improved in three FFSs in the central highlands of Ecuador (68 farmers; 49 men and 19 women) and in two workshops of facilitators, one in Peru (10 participants) and the other in Pyongyang, Democratic People's Republic of Korea (DPRK) (seven

participants). Finally modules were assembled into a guide with appropriate technical design, and published.

RESULTS

Collection and analysis of existing materials

A total of 25 activities related to PLB management were compiled from the earlier sources. The sources varied but generally dealt with one or more of seven themes: symptoms and diagnosis, host resistance, factors affecting disease severity, fungicides, dissemination of the pathogen, disease development in a humid chamber, and integrated management (Table 1). The most complete work was that of Peru (Nelson et al., 2002), which had 12 practices related to PLB.

Competencies and learning objectives

Participants in the workshop identified five competencies that farmers need to effectively manage PLB. These were: i) capable of recognizing the symptoms of disease and know which organism causes it; ii) know how this organism lives; iii) identify the characteristics and benefits of using resistant potato cultivars; iv) use fungicides appropriately; and v) by periodically visiting the potato field, be able to select practices that control late blight efficiently. Fifteen capacity building components were identified and then 15 learning objectives were developed (Table 2). Learning objectives for the use of appropriate protection while mixing and applying pesticides and for pesticide application technology were not developed, as these subjects are generic and it was felt that they would be better developed in a separate facilitator's guide.

Table 1. Summary of activities for potato late blight management compiled from earlier sources and used for content in the elaboration of the facilitator's guide

Theme	Nelson et al., 2002	Pumisacho and Sherwood, 2000, 2005	Gandarillas et al., 2001	Anonymous 2000
Symptoms and diagnosis	3	1	1	
Resistance	2	1		
Factors affecting disease severity	1	1	1	
Fungicides	2	1		
Dissemination	2	1	1	
Disease development in a humid chamber	1	2		2
Integrated management	1		1	
Total	12	7	4	2

Based on the learning objectives, scientific resources, learning strategies and specific functions for the facilitator were developed. Different techniques were used to facilitate learning, for example, observation, analogies, skits, discussions, experimentation and simulation. The five competencies with learning objectives were formulated into five modules. Annexes were also developed to provide supporting

material on: i) how to construct a “knowledge test” using simple resources; and ii) basic fungicide information formulated in a fungicide guide.

Once all the material was developed, much emphasis was put on formatting. A specific format was used for each module that gave consistency and facilitated use of the guide. Page size, paper quality, font, figure content and quality, design, and language were chosen in function of field utility, user, beneficiary and gender considerations. The format of each module included: i) instructions for the facilitator before the session (prerequisites, time needed, introduction, objectives, structure of the module, and preparation for the facilitator); and ii) activities to be developed with the participants during the session (revision of the preceding module, evaluation of the existing knowledge, expectations of the participants), which included at least one practical session (objective, materials, procedure, technical notes for the facilitator, and handouts to give to participants) and final activities (synthesis of the module, final knowledge evaluation, feedback, and questionnaire). The guide was initially published in Spanish (Cáceres et al., 2007) and then translated into Ecuadorian Quechua Cáceres et al., 2007 and English (Cáceres et al., 2008).

DISCUSSION

What was gained?

One valid question as a consequence of this multi-year process is: “what was gained”? As noted earlier, a number of materials for intensive farmer capacity building already existed. Why was there a need for yet another? This endeavor grew out of a realization by facilitators, communicated to the authors (S. Sherwood, pers. commun.) that the existing materials were not covering all the necessary areas, nor were they achieving the necessary learning objectives. This can be seen in Table 1, where several existing guides do not cover key themes for PLB control. PLB is the most serious biotic constraint to potato production and arguably the most serious yield threat in many regions. If not properly managed, PLB can easily destroy a crop and leaving little or no yield.

This endeavor differed from earlier ones in the approach taken. While a number of earlier PLB publications were used as resources and for inspiration, the final content of this guide was decided by a structured and highly participatory exercise. Perhaps one of the unique qualities of the exercise was not so much its participatory nature, but rather the structured competence-based approach. One can only hope that this gives a solid underpinning to both the scope and balance of the modules. In the 2006 workshop in Quito, five competencies were identified. In a more recent workshop in Beijing, 2008, with different participants coming from a different context, a very similar set of competencies was also identified (unpublished data).

The endeavor described herein also differed from earlier ones in the way the competencies were translated into learning objectives. Here, expert guidance based in knowledge management theory assisted the process to ensure that the objectives, once met, would result in the identified competencies.

When the facilitator’s guide is compared content wise with earlier versions one can see that it is similar to them, particularly the one from Peru (Nelson et al., 2002). To the extent that this guide, with its systematic methodology, resembles the earlier ones, it also validates them; to a large extent the experts who created them were on the mark. This strengthens the idea that the present guide does not represent a revolutionary change, but rather an evolutionary step in PLB capacity building.

What was learned?

The process of developing this guide was in itself edifying. INIAP, Ecuador’s national agricultural research system, adopted the process to develop guides for other aspects of potato production, and was able to convince the national government to fund the process. CIP is also currently discussing how to use this approach to improve and standardize existing capacity building materials.

Overall, the process of identifying competencies, capacity building components (mental, physical and attitudinal), information and then learning objectives was very intuitive to those who participated in the workshop. Most participants left the workshop confident that the work they had done was founded in a solid strategy and that the outputs would be effective if implemented with farmers.

Table 2. Competencies for effectively managing potato late blight, capacity building components and learning objectives of the facilitator’s guide

Mental ability (MA), physical skill (PS) or attitude (A)	Information	Learning objective
Competence 1: Identify the disease symptoms		
MA: identify the symptoms of PLB and distinguish them from those of other diseases	Concept of symptom	Explain the concept of symptom and give an example related to animal diseases
	Symptoms of <i>P. infestans</i>	Describe late blight symptoms on leaves, stems and potato tubers under field conditions and how to distinguish them from those of other diseases
MA: identify <i>P. infestans</i> as the causal agent of PLB	- <i>P. infestans</i> as a potato pathogen -Structures of <i>P. infestans</i> (mycelia and spores) -Role of spores	Draw the agent causing late blight and describe how to recognize it on plants Explain what <i>P. infestans</i> spores are and how they function
Competence 2. Know how <i>P. infestans</i> lives		
-MA: understand the life cycle of <i>P. infestans</i> including its sources -MA: relate environmental conditions to <i>P. infestans</i> growth	Life cycle and sources of <i>P. infestans</i> Role of environmental conditions on <i>P. infestans</i> growth	Explain the <i>P. infestans</i> life cycle by using a drawing, including sources of <i>P. infestans</i> and the environmental conditions that favor the various phases of the pathogen’s growth
Competence 3. Identify the characteristics and benefits of using resistant potato cultivars		

Mental ability (MA), physical skill (PS) or attitude (A)	Information	Learning objective
-MA: Discriminate among immune, resistant and susceptible potato varieties. -MA: Identify the benefits of using resistant varieties -A: Prefer resistant varieties	-Concepts and main characteristics of immune, resistant and susceptible potato varieties -Advantages of using resistant varieties for controlling PLB -Resistance levels of local varieties -Break-down of immunity (optional)	-Explain through a diagram the concepts of resistant and susceptible varieties, depicting the three main characteristics that differentiate them and the benefits of using resistant varieties to control late blight -Explain the concept of immune cultivars and the reason why immunity is lost (optional) -Identify the main characteristics of local potato varieties in relation to late blight using a table
Competence 4. Use fungicides appropriately		
MA: identify the type of pesticide needed to control PLB	Concepts of pesticide and fungicide	Explain what a fungicide is and provide an example
MA: understand the following concepts: active ingredient, commercial name, working principle (contact or systemic), and formulation	Concepts of active ingredient, commercial name, working principle, and formulation	-Identify the active ingredient, commercial name, working principle, and formulation of at least two fungicides -Identify in the Guide of Fungicides provided the active ingredients, commercial names, working principle and doses of fungicides used to control late blight
MA: understand the main criteria used in deciding which fungicide to apply and the frequency of its application	-Concepts of prevention and fungicide effectiveness -Effect of the following factors on fungicide use: amount of late blight in and around the crop, environmental conditions, potato cultivar, crop growth stage and period since the last application	-Explain the criteria used in deciding which fungicide to apply and the frequency of its application -Decide which fungicide to apply and the application frequency in a specific situation, considering the criteria explained before
A: use appropriate protection while mixing and applying	Knowledge of risks involved	Not considered
MA: understand concepts of pesticide application technology PS: apply pesticides correctly	Backpack calibration, selection of nozzles, etc.	Not considered

Mental ability (MA), physical skill (PS) or attitude (A)	Information	Learning objective
Competence 5. By periodically visiting the potato field, be able to select practices that control late blight efficiently		
-A: visit the potato field frequently -MA: decide a control measure for PLB	-Late blight evaluation under field conditions -Practices for PLB control other than fungicide use (high hilling, defoliation, etc.)	-Explain the importance of frequently visiting the potato plot for late blight evaluation -Identify practices for controlling late blight based on field observations

This guide can be used in different participatory learning approaches, particularly in FFSs and short courses. It utilizes several different techniques to facilitate learning. It also emphasizes the importance of building on the existing farmer knowledge and subsequently developing with farmers improved knowledge by strengthening the competencies they need to control PLB. For this reason, the facilitator should act as an intermediary of knowledge and not as a traditional professor.

This guide is not intended to be highly technical in the different aspects of control of late blight. Other sources such as books, scientific articles and technical sheets (e.g., Pérez and Forbes, 2007) can be used if greater knowledge is needed. The objective of this guide is to present the information that is essential for the participants to be able to adequately manage potato late blight.

Considering the educational level of the projected users and beneficiaries of this guide, it was essential to use simple language. For example, while the pathogen that causes late blight, *P. infestans*, actually belongs to the group of microorganisms known as oomycetes, in the guide it is referred to as a fungus, which is much more familiar to most people. Other simplifications have also been made in language.

The users of this guide should be able to read and write. Also it is highly recommended that they have some experience in potato cultivation and in processes of participatory capacity building. The beneficiaries do not necessarily have to know how to read and write. Therefore, it's highly recommended that users of this guide participate in a course on how it should be correctly used. This course might last two or three days and could be given by people with experience in PLB control, the use of this guide, and in the pedagogical principles that make FFSs successful. To date, three workshops were held in Ecuador to train extension workers to use the guide.

Finally, the guide should be tried and adapted to the local social and agro-ecological conditions. Furthermore, some contents are specific to each location, as for example lists of cultivars or lists of fungicides. Adaptation of the guide for dissemination in South America, Asia and Africa is foreseen.

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Abbreviations

ACIAR	Australian Centre for International Agricultural Research
ADERS	Association for Sustainable Development, Peru
AIS	Agricultural innovation systems
ANDIBOL	Bolivian Andean Platform
APEPA	Association of Ecological Producers, “Primero Aroma,” Bolivia
APROTAC	Association of Andean Tuber Producers, Bolivia
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ATICA	Smallholder Water and Land Programme, Bolivia
BBC	British Broadcasting Corporation
CAD	Center for Agricultural Development
CAPAC	Production Chains for Quality Agricultural Products, Perú (Cadenas Productivas Agrícolas de Calidad)
CESA	Equadorian Center for Agricultural Services (Central Ecuatoriana de Servicios Agrícolas)
CGIAR	Consultative Group on International Agricultural Research
CIAL	Local agricultural research committee
CIAT	Center for Tropical Agricultural Research, Santa Cruz, Bolivia
CIF	Fodder Research Centre
CIFEMA	Center for Research, Training and Extension in Agricultural Mechanization, Bolivia
CIMMYT	International Maize and Wheat Improvement Center, Mexico
CIP	International Potato Center
CIPCA	Centro de Investigación y Promoción del Campesinado
CONPAPA	Consortium of Small Potato Producers, Ecuador
CSR	corporate social responsibility
DANIDA	The Danish International Development Agency
DFID	Department for International Development, United Kingdom
ECOMUSA	Communal and Multi-communal Enterprises for Agricultural Services, Peru
EIARD	European Initiative for Agricultural Research for Development
EIQ	environmental impact quotient
EMBRAPA	Brazilian Agricultural Research Corporation
FAO	Food and Agriculture Organization, United Nations

FFS	Farmer field school
FONTAGRO	Regional Fund for Agricultural Technology
FORTIPAPA	Project for Strengthening Potato Research and Seed Production, Ecuador
FOVIDA	Support for Life, Peru
GDP	gross domestic product
GIAL	Is an adaptation from a similar methodology called CIAL (Spanish acronym for local agricultural research committee) to conduct adaptative field research
GO	governmental organization
HYV	high-yielding varieties
IAD	institutional analysis and development
IBTA	Bolivian Institute for Agricultural Technology
ICM	integrated crop management
ICT	information and communication technology
INCOPA	Project for Innovation and Competitiveness of the Potato, Peru
INIA	National Institute for Agricultural Research, Peru
INIAF	National Institute for Agricultural and Forestry Innovation, Bolivia
INIAP	National Agriculture Research Institute, Ecuador
INNOVA	Project for Strengthening Technical Innovation Systems for Potato-Based Agriculture in Bolivia
INPROLAC	Processor of Dairy Products, Bolivia
IPG	international public good
IPM	integrated pest management
IPR	intellectual property right
IS	innovation systems
ISNAR	International Service for National Agricultural Research
ISTRC	International Society for Tropical Root Crops
IYP	international year of the potato
KM	knowledge management
MA	medio ambiente
MAGAP	Ministry of Agriculture, Livestock, and Fisheries, Ecuador
MDG	millennium development goal
NARI	national agricultural research institute
NGO	non-governmental organizations

NZAID	New Zealand's International Aid and Development Agency
OFIAGRO	Office for Agricultural Studies, Ecuador
OLS	ordinary least squares
ORS	Regional Seed Office
PITA	Applied Technological Innovation Project, Bolivia
PLB	potato late blight
PMCA	participatory market chain approach
PNRT-Papa	Programa Nacional de Raíces y Tubérculos - Papa
PRA	participatory rural appraisal
PRAPACE	Regional Potato and Sweet potato Improvement Network in Eastern and Central Africa
PROINPA	Foundation for Promotion and Research on Andean Products, Bolivia
PROMETA	Animal Traction Improvement Project, Bolivia
PROMMASEL	Sustainable Hillside Weed Management Project, Bolivia
PSM	propensity score matching
R&D	research and development
RAAKS	rapid appraisal of agricultural knowledge systems
REDCAPAPA	Strategic Network for Development of the Potato Food Chain, Bolivia
S&T	science and technology
SDC	Swiss Agency for Development and Cooperation
SEDERA	Foundation for Services for Rural and Agricultural Development, Bolivia
SEDERA	Fundación de Servicios para el Desarrollo Rural Agropecuario
SEFO	Forage Seed Company, Bolivia
SENASA	National Service for Agricultural Health, Peru
SENPLADES	National Secretary for Planning and Development, Ecuador
SEPA	Unidad de Producción de Semilla de Papa
SIBTA	Bolivian System for Agricultural and Livestock Technology
SMART	specific, measurable, achievable, realistic, and time-bound (indicator)
SWOT	strengths, weaknesses, opportunities, and threats
UMSS	Universidad Mayor de San Simon
UN	United Nations
UNALM	National Agraria University, La Molina, Peru

Note: The first letters of names of organizations are capitalized; abbreviations for technical terms are in lower case.

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CIP'S MISSION

The International Potato Center (CIP) works with partners to achieve food security and well-being and gender equity for poor people in root and tuber farming and food systems in the developing world. We do this through research and innovation in science, technology and capacity strengthening.

CIP'S VISION

Our vision is roots and tubers improving the lives of the poor.

CIP is supported by a group of governments, private foundations, and international and regional organizations known as the Consultative Group on International Agricultural Research (CGIAR).

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