Session XI

Market chain development for root and tuber crops

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Multi-stakeholder platforms for innovation and coordination in market chains

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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 analyses 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 2009)

Literature review and theoretical framework

The term "plataform" is in vogue. Sometimes it is used to characterize a methodology such as Farmer Field Schools. When used to refers groups it has sometimes been applied to any group which comes together for joint action. Building on previous work of Roling et al (2002) and Papa Andina (Thiele et al 2005), we define a multistakeholder 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 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 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 who make 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.

Multistakeholder 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 (Roling 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 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 empowerment of small-scale farmers and women in the market chain. In a similar vein, Critchly 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 electronic 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 and the disintegration of more hierarchically organized supply chains in developed countries has created a curious convergence with the need for new types of institutions which 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 in Bolivia, INIAP in Ecuador and CIP 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 that 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 sharing of ideas about platforms as they were being developed. Because it was new, there were few guidelines or 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 and Andibol 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 applications 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 NGOs, Universities and others as part of the search for a "New Institutionality" 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 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 Institutionality". Initially this was linked to the creation of a national level platform REDCAPAPA to improve equity and competitiveness in the whole potato chain (Reinoso and Thiele 2002). Whilst 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 (Reinoso et al 2006). In Ecuador, an experience led by CESA, an NGO, in Quisapincha of setting up a platform to link farmers to markets where INIAP had participated influenced thinking (Montes de Oca 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 group 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 begin in 2003 to articulate 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 and is the only one to have a 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 were restaurants serving french fries in Ambato and Riobamba.

Activities

Whilst 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 like 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 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 which 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. This had stands with information about research and training activities of the platform, production plans to assure regular supply and bags of Fripapa with the CONPAPA label. 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 to both 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 CSR (Thomann et al., 2009). They also provide expertise to private partners for the creation of new products (e.g. Ayllin Papa). . It 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 in press).

The Plataforma Chimborazo identified and developed a new market for the Fripapa variety amongst restaurants in Ambato and Riobamba who were looking for a potato which 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 to 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 involved 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 (Consortium of Small Potato Producers), which from 2007 took over the technical assistance functions, production planning, bulking up and marketing functions which 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 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 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 which 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 advances of working with platforms and there has been considerable cross-fertilization. Earlier work on platforms in Bolivia, influenced the development of 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 amongst 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 amongst 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 chain 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 timeliness 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 primarily about innovation, the platform in Ecuador primarily about market coordination. The case of Peru is more complex, whilst 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 whilst platforms as 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.

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Table 1. The platforms compared, coverage, mandate, objectives and coordination

	CAPAC Peru	**Plataforma Andina Boliviana (Andibol)** "business with social responsibility"	**Potato plataform Chimborazo**
Coverage	**National, Peru,** concentration Huancavelica, Junín, Ayacucho, Apurímac	**Department La Paz, Bolivia**	**Provincia Chimborazo, Ecuador**
When functioned	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 empresarial 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 a the most recognized institution for tubers at the national level.	• Design methodological tools which guide the empresarial 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 providing finance for business development.	• Group and organize small potato famers 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 potato through backstopping and technical support.
Facilitation/ coordination	• Backstopping INCOPA (CIP) • General manager • Technical manager • Board • General assembly	• Facilitation: PROINPA • Board: cordination, 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 Plataform
Stakeholders	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 Gastrotur, 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-Lays, Villa Andina, Gloria Group etc. • Research centers (CIP, INIA)	Members: • Producer associations: APEPA, APROECA, ASOPRACH, UNAPA and FLOR DE HABA • Private companies: DEZE Ltda. (loading and unloading), RICAFRUT (processing, marketing and export), ASCEX (processing and export) y BOLIVIA NATURAL (processing and export andean grains) • Support organizations: KURMI (NGO), Program of Business Development, PROFIN Foundation (finance) and PROINPA Foundation (research)	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-Lays for chips • restaurants in Riobamba and Ambato for french fries
Activities	• 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	• Monthly meetings of Platform. • Primarily project funded, but fund some joint activities with members own resources. • Implement strategic plan	• Monthly platform and zonal meetings of producers. • Fund support 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

Table 3. Platforms compared: outcomes and added value by Papa Andina

	CAPAC Peru	Andibol	Chimborazo Plataform
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 in waiting list for label • Diffusion 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 quinua 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-Lays 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 registry of native potato varieties • Exchange of experiences with partners from Ecuador and Bolivia in horizontal evaluations and study tours.	• Support in start up of plataform (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)

Linking research with pro-poor innovation: the Papa Andina Case

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Linking knowledge generation in international research centers with national innovation systems and policy processes is challenging and poor linkage often reduces the impacts of research efforts. It has been especially difficult to link researchers with small farmers who produce root crops in marginal areas. This paper describes the approaches used by *Papa Andina,* a partnership program hosted by the International Potato Center, to link knowledge generation (in both international and national spheres) with political action and pro-poor innovation processes. Papa Andina employs the *Participatory Market Chain Approach* (PMCA) and *Stakeholder Platforms* to foster for pro-poor innovation within market chains. It engages policy makers and other stakeholders in visioning exercises for the potato sector and in supporting local innovation processes. *Horizontal Evaluations* are used to promote collective learning and knowledge sharing among professionals at national and regional levels. These approaches have stimulated commercial, technological, and institutional innovation and have contributed to the development of new market niches for Andean potatoes with comparative advantage for small farmers. After describing Papa Andina's approaches and the types of results obtained with native potatoes in the Andes, the paper discusses actual and potential uses of these approaches in other settings.

Keywords: market chain, stakeholder platforms, boundary organization, Andes, potatoes, innovation systems, collective learning.

Introduction

This paper deals with a central challenge facing international agricultural research: How to link knowledge generation with policy-making and economic activity in ways that stimulate innovation and reduce poverty. Research often produces new knowledge that for one or another reason does not result in improved rural livelihoods. However, those who provide funds for research expect their investments to benefit poor people (Adato and Meinzen-Dick, 2007). This increases the pressures on research organizations to link more effectively with development efforts, to ensure that research contributes to sustainable poverty reduction. Several strategies have been employed over the years to link agricultural researchers and farmers, including agricultural extension, outreach, and participatory technology development. Recently, there has been experimentation with innovation systems approaches that shift attention from research per se to the use of new ideas, new technologies or new ways of doing things. More attention is also being paid to value chains, enterprise development, public-private partnerships, and policies that impact on farmers' livelihoods.

Since its inception in 1998, the Papa Andina Partnership Program has worked with partners in Bolivia, Ecuador, and Peru to foster pro-poor innovation with potatoes. In its work, Papa Andina has incorporated elements of the linkage strategies mentioned above, and it has also developed some promising new approaches to linking knowledge generation with practical action.

Papa Andina functions as what can be called a *boundary organization*[1] that works to improve knowledge sharing and collective action across the institutional boundaries that traditionally separate researchers from other agricultural service providers, policy makers, small farmers, and market agents. Papa Andina's overarching strategy is to engage these diverse actors in dialogue and innovation processes that benefit poor farmers as well as other actors. Papa Andina and its partners have developed approaches that stimulate commercial innovation,

[1] This term is defined and discussed in Section 2.

which in turn stimulates technological and institutional innovation. As trust and social capital are built up, they strengthen local capacity for pro-poor innovation. Based on successful experiences with potatoes, Papa Andina's approaches have been applied in other value chains in the Andes and elsewhere. In this paper, we describe the development and application of Papa Andina's approaches, the types of results obtained, and the actual and potential future applications of these approaches in other settings.

Development of papa andina as a boundary organization

Papa Andina was established in 1998 as a project managed by CIP and supported by the Swiss Agency for Development and Cooperation (SDC). It was originally conceived as a regional project to strengthen potato research in Bolivia, Ecuador, and Peru through development of a regional research program. In keeping with the CGIAR strategy (de Janvry and Kassam, 2004: 159), its coordination unit sought to develop "a regional approach to research planning, priority setting and implementation" involving CIP's traditional research partners in the Andes. As work got underway, however, it became clear that national potato researchers were less interested in developing a regional research agenda than in coping with the external pressures that were buffeting their organizations. Production-oriented agricultural research was being questioned, research funding was declining, and little-understood market chain approaches were being promoted as part of a new development agenda. To cope with these complex institutional issues, Papa Andina linked up with the New Paradigm Project of the International Service for National Agricultural Research (de Souza et al, 2001), which offered a theoretical framework for understanding and managing organizational change. In this framework, research organizations and the potential users of new knowledge generated through research operate in dynamic environments characterized by multiple, and often contradictory, social, political, and economic forces. For this reason, research organizations need to carefully monitor their external environment and respond with agility to changing demands and opportunities. In essence, *research organizations need to focus more on anticipating and responding to technology demands and less on increasing the supply of new technologies.* Sparked by these ideas, Papa Andina shifted its emphasis from developing a regional research agenda to developing national capacities for innovation through collaborative learning with partners, progressively incorporating new ideas, adapting them to local circumstances, and finding new ways to achieve goals. This shift involved the development and use of participatory approaches, facilitation of teamwork and group decision-making, and collaboration with new types of partners outside the usual circle of research organizations. Papa Andina's coordination unit began facilitating collective action at the regional level, initially involving three *strategic partners*[2] – one research organization in each country played a lead role in facilitating innovation in potato market chains. Over time, the collaboration broadened to also include *operational partners* – who worked directly with Papa Andina and its strategic partners – and *allies* – who interact with national partners but not directly with the Papa Andina coordination team.

A network of approximately 30 *operational partners* and *allies* was developed. By working with and through this network of partners, Papa Andina has reached a growing number of farm families, currently estimated to be around 6,000. The relationship among those partners and the interaction mechanisms are presented in Figure 1. Papa Andina can be characterized as a *boundary organization that* mediates between institutions of science, politics, and economic activity to promote pro-poor innovation. David Guston (2000) coined the phrase boundary organization to refer to organizations operating on the boundary between politics and science. In the Papa Andina case, we use the term to refer to an organization that facilitates interactions across multiple boundaries that traditionally separate agricultural researchers from other key stakeholders in innovation processes, including, for example, agricultural service providers (providers of credit, technical assistance, and market information), agricultural policy makers, farmers, agro-businesses (traders and processers), retailers (including supermarkets and culinary schools), and consumer groups. Based on a recent study on knowledge systems for sustainable development, Cash (2003: 8086) concludes 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." Three key functions of effective "boundary management" are communication, translation, and mediation (page 8088). Active, iterative and inclusive *communication* between researchers and decision makers

[2] Papa Andina's strategic partners are the Foundation for the Promotion and Research on Andean Crops (PROINPA) in Bolivia (http://www.proinpa.org/); the National Potato Program of Ecuador's National Institute for Agricultural and Livestock Research (INIAP) (http://www.iniap-ecuador.gov.ec/); and the INCOPA Project in Peru, a coalition of private and public partners that aims to improve small potato farmers' access to markets (http://www.cipotato.org/papandina/incopa/incopa.htm).

is crucial in efforts to mobilize knowledge in the service of practical action. In addition to open communication, *translation* is often needed to ensure that participants understand each other; such understanding between experts and decision makers is often hindered by jargon and differing assumptions about what constitutes a persuasive argument. And beyond translation, in the process of mobilizing science for practical action, stakeholders frequently have conflicting interests, which require *mediation*.

As a boundary organization hosted by CIP that aims to bridge gaps between research and sustainable development, Papa Andina has developed two main functions: i) Facilitation of pro-poor innovation in the context of market chains, ii) Promotion of collective learning and capacity development among partners and allies, particularly through South-South or horizontal learning.

Over time as described in the following section, Papa Andina has developed a number of approaches to perform these functions.

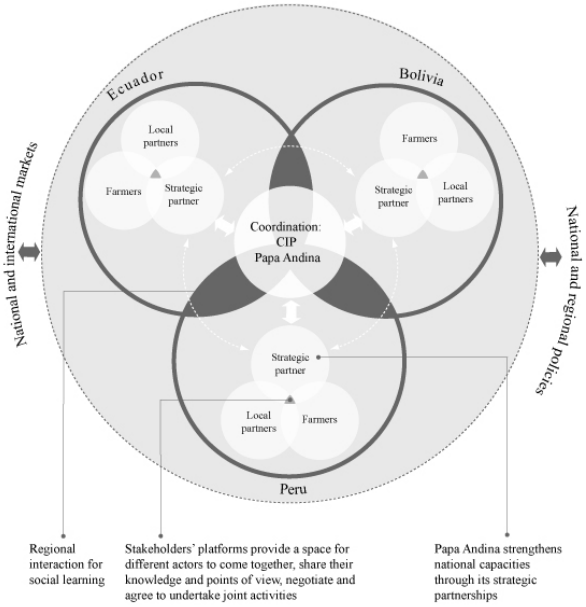

Figure 1. Interaction mechanisms among key actors in Papa Andina Partnership Program

PapaAndina's strategies

Identifying the assets of the poor: a pro-poor filter

In the Andes, as in many developing countries, the potato is often produced in poor, remote and mountainous areas, on small plots, by families with little land. But potatoes generate more added value and employment per hectare than any other staple. In order to help Andean farmers to build new livelihoods strategies, it was important to identify their comparative advantages such as the genetic diversity of potatoes, local knowledge, and social capital—assets that were often undervalued in the past. Until recently native potatoes, domesticated 8000 years ago and grown since then in the High Andes, received little attention in urban markets. But with their diversity in colors and shapes, high cooking versatility, nutritional profile, and traditional, low-input production practices, native potatoes represent a valuable asset for the small farmers who grow them. Native potatoes grow better in higher altitude (above 3,300 m) where small-scale farmers predominate. Hence, native

potatoes act as a "poverty filter," meaning that using them in developing new commercial products would give a comparative advantage to poor Andean farmers. Papa Andina decided to concentrate its activities around those potatoes to promote market innovation that would give a comparative advantage to small-scale farmers. But this could not be done in a vacuum; a range of policies and institutions were required, including collective action among farmers and interaction with outsiders such as market agents and agricultural service providers, to foster market chain innovation and to access and build markets opportunities. Accurate understanding of the changing context of producers, processors, and consumers was required to ensure that potatoes play a role in improving the welfare of the poor.

Promoting pro-poor innovation

Papa Andina found the market chain to be a very useful framework for helping its strategic partners prioritize their interventions and understand the need for working with diverse stakeholders – including private businesses – to promote pro-poor innovation. Market chain analysis and development were beyond the competence of CIP's traditional research partners, and became a central focus of Papa Andina's regional coordination activities. Papa Andina facilitated access to external sources of knowledge on innovation systems and market chain development, and provided small grants to promote partnerships between research organizations and other key stakeholders in innovation processes. Several complementary approaches have been developed over time.

The Participatory market Chain Approach (PMCA).

The PMCA triggers pro-poor innovation in value chains. By harnessing value chains as drivers of innovation, PMCA makes it possible for small farmers to work with market agents, researchers, and others to analyze needs and opportunities. This allows market chain actors to identify and take advantage of new business opportunities, stimulating innovation that benefits small farmers. The direct results of PMCA are different types of innovations (Figure 2). PMCA consists in a facilitated participatory process organized around three phases (diagnosis, identification and implementation of innovations). Together, participants analyze and implement new business ideas with comparative advantage for small-scale farmers, and develop other kind of innovations needed to develop the new market opportunities. These other innovations can be technological (to improve farm-level or processing processes) or institutional (new ways of working, such as new organizations or legal norms). The PMCA process enables different stakeholders to develop mutual trust and fosters public-private partnerships. The PMCA provides R&D institutions with a mechanism for identifying high-impact-potential research areas. From an experimental process, the PMCA has been consolidated as a well-documented methodology (Bernet, Thiele, and Zschocke, 2006; Bernet et. al., 2008). Papa Andina took the lead in developing the PMCA methodology and in encouraging its use, through technical and financial support. Key functions of the PMCA are facilitation of effective communication among diverse stakeholder groups, translation across the diverse groups (who have limited and often conflictive previous contacts), and mediation of conflicting interests in the development of common goals and joint activities. 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 approaches for working in complementary areas.

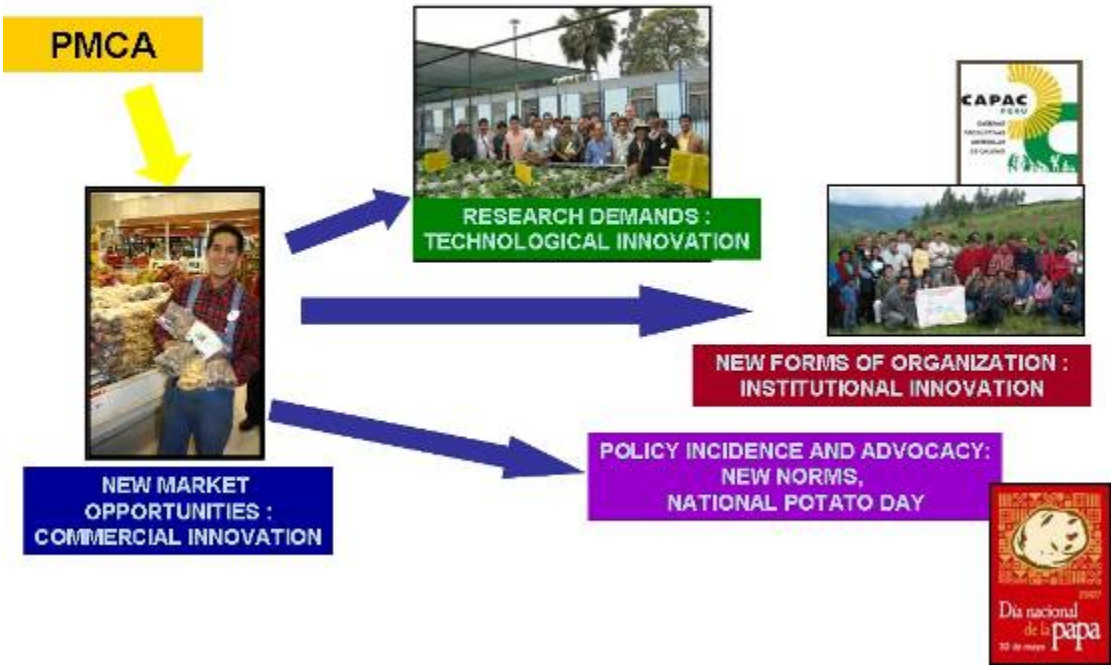

Figure 2. PMCA as a trigger for innovations

Multi-stakeholder platforms

Multi-stakeholder platforms provide spaces for communication, negotiation and joint action among value chain actors. They improve small farmer access to information, services, and training. Multi-stakeholder platforms have proven particularly useful to consolidate innovation process after a PMCA, helping to maintain dialogue and working relationships among stakeholders during and after its application of the PMCA. There are two different types of platform. The first is structured along the market chain and bring farmers together with traders, processors, supermarkets, 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 address market coordination problems, helping small farmers to meet the volume, quality, and timeliness standards demanded of particular market chains. They also address market coordination problems in the market for support services and complementary inputs, bringing NGOs and others in to provide technical support or access credit (Thiele et al. 2009). Papa Andina and its partners have promoted the establishment of multi-stakeholder platforms and supported capacity development for their leadership and facilitation.

Policy dialogue

Innovation in the value chain may fall short without policy support and corresponding changes in the legal framework. To influence pro-poor policies in the potato sector, Papa Andina has promoted dialogue and interaction between researchers, civil society organizations, the private sector and political decision-makers. Two strategies have been applied. The first is based on influencing public opinion through media coverage on the importance and challenges related to potato value chains, and bring these issues further to political decision-makers. The second is to directly engage policy makers in developing a vision and a strategy for the potato sector (Devaux et al. 2009). In this second case, Papa Andina's role has been to draw on methodological expertise developed with other value chains and, with its partners, to adapt and validate the approaches with potato value chains.

Corporate social responsibility (CSR)

In value-chain innovation processes, there is always a risk that the lion's share of the benefits will go to large commercial interests. CSR represents an entry door to address the issue of small farmers' interests with the

largest players in the value chain. CSR refers to a company's philosophy and ethical form of management that takes into account the expectations of its stakeholders in order to achieve sustainable development (Thomann et. al., 2009). In the context of a pro-poor value chain, two important areas for enterprise-level CSR work are: developing a market segment willing to pay a high price for a high-quality, environmentally, and socially-sustainable product; and developing the competitiveness of its suppliers while reducing the asymmetry in bargaining power. Papa Andina has been sensitizing its partners to CSR, facilitating dialogue and participative processes involving large companies to create innovative ways to apply their CSR to the market chain.

Technologies for sustainable production

Commercial innovations have stimulated demands for increased production and increased quality. They have also generated a risk of pressure on traditional farming systems and High Andean ecosystems. New technological solutions to supply problems, which are feasible under the conditions of resource-poor actors, are required to develop environmentally sustainable and inclusive value chain. As a boundary organization, Papa Andina's role is not to develop new technologies, but to communicate and translate research demands from small farmers and other value chain actors to national and international research organizations. In this way, market-driven priorities can be incorporated into the research agendas of national research organizations, CIP Research Divisions, and private partners. New technology needs can sometimes be tackled by adapting existing knowledge to local conditions and strengthening local capacity via Farmer Field Schools (Ortiz, et. al., 2008). In these cases, CIP, Papa Andina, or strategic partners provide the needed knowledge or capacity-building support, which operational partners then make available to farmers. Longer-term and more sustainable solutions generally require collaboration with researchers at CIP or other advanced research organizations and may require additional funding.

Promoting collective learning

Horizontal Evaluation was developed by Papa Andina to promote knowledge sharing and collective learning, by combining elements of self-assessment and external peer evaluation. Horizontal Evaluations are implemented via workshops, where a local project team and peers from other organizations independently assess the strengths and weaknesses of a R&D approach being developed, and then compare the assessments. Project teams formulate recommendations for improving their work with the R&D approach, and peers consider ways to apply back home the R&D approach as well as other lessons learned during the evaluation. 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 (Thiele et al. 2007).

Results

The main outputs of the Papa Andina Partnership Program are the new R&D approaches described in the previous section. These are what Lawrence, Hardy, and Phillips (2002: 281) call "proto-institutions" – new approaches, practices, and norms that transcend a particular collaborative relationship and may become new institutions if they diffuse sufficiently. The approaches developed by Papa Andina involve the use of participative processes to facilitate innovation and to develop capacities for innovation among participants. Some initial impacts on livelihoods can also be observed in the Andes.

Outcomes: innovations and innovation capacity

Innovations for the potato market chain

Papa Andina distinguishes three types of innovations: commercial, institutional and technological, and has found that successful commercial innovation often stimulates subsequent institutional and technological innovation.

C*ommercial innovations* are new products or marketing concepts that offer a comparative advantage to small farmers. Examples that involved Papa Andina's approaches include: gourmet, selected native potatoes, naturally colored chips, selected and bagged *chuño* and *tunta* (potato product dehydrated through a traditional method in the highlands).The PMCA has proven to be very effective in generating commercial innovations. Stakeholder platforms and CSR have played useful roles in further 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, seasonal basis, a large commercial firm developed a much higher-quality product that is now available year round in supermarkets, is marketed on TV, and is certified as "ethically produced" by an independent body.

Institutional innovations are new organizational arrangements or rules that favor competitiveness of the sector and empower small farmers. The PMCA has led to identification of the need for such new institutions as quality standards for potato products and stakeholder platforms. Stakeholder platforms are themselves institutional innovations and they also are springboards for further institutional innovations. In several cases, policy dialogue or specific working groups facilitated by Papa Andina and its strategic partners have been necessary to consolidate institutional innovations. This was the case, for example, in the inclusion of native potato varieties in Peru's official seed certification system, in the differentiation of the white and native potato sub-sectors in norms and standards, and in the establishment of a National Potato Day (by ministerial/presidential decree) in Peru and Ecuador, which inspired the FAO to proclaim 2008 as the International Year of the Potato.

Technological innovations consider issues that include the development of sustainable pro-poor technologies to improve farmers' competitiveness developing new practices for production or post-harvest management that resolve bottlenecks in inclusive value-chains. Commercial innovations generated by PMCA, more rigorous quality standards for small farmers' products, and improved communication among stakeholders in the platforms have highlighted priorities for research needed to help small farmers improve their productivity and the quality of their potatoes. Channeled towards CIP and other R&D organizations, these issues have been addressed with biological alternative for the control of the Andean potato weevil, a natural sprout inhibitor to increase shelf-life of native potato products, improved processing practices for the traditionally processed potatoes ("*tunta"),* and natural fertilization techniques improving tuber quality for the frying industry.

Strengthened innovation capacity

Innovations are the visible result of innovation processes promoted by Papa Andina. However, a potentially more significant outcome of Papa Andina's intervention is the strengthened capacities for innovation that are developed throughout the innovation process by diverse stakeholders working together – R&D organizations, public authorities, NGOs, private companies, and farmers. Although the challenge remains to "measure" the extent to which innovation capacity has been strengthened, some tangible results and impact pathways can be mentioned: i) In the Andes, over 20 *operational partners* are using Papa Andina's appraoches, generating innovation processes that involve further *allies*, ii) User guides have been issued for the PMCA and Horizontal Evaluation and numerous other publications have been published on Papa Andina's appraoches with the participation of R&D organizations in each of the three countries, iii) Approaches developed by Papa Andina have been incorporated into CIP's corporate plan.

Early impacts at farm level

The use of Papa Andina's approaches by its partners in the Andes has led to some observable impacts at farm level. The development of market opportunities around (native) potatoes has enabled small-scale Andean farmers to access dynamic markets for the first time, despite the high production and transaction costs associated with their traditional production and marketing systems. Increases in yields and product quality (thanks to technological innovations and quality standards) have also been recorded. The market for native potato products has been developed, as a result of public and private advocacy and marketing campaign. This market development has resulted in increased competitiveness, higher prices, and improved incomes for small-farm families. Some specific examples follow. *In Bolivia*, the PMCA and stakeholder platforms have enabled small farmers to sell processed chuño in local supermarket and start exporting to Spain at 20 to 40% higher price compared to alternative markets. *In Ecuador*, stakeholder platforms have enabled thousand of small farmers to increase their yields from 6.3 to 8.4 MT/ha and to sell their potatoes to fast-food restaurants, raising their gross margin from USD 63 to 259/ha (Cavatassi et al. 2009). *In Peru*, stakeholder platforms have enabled 100 organized farmers in the Lake Titicaca region to sell 200 MT of quality chuño blanco or *tunta* for a total value of USD 590,000. The establishment of a business model with CSR in alliance with Pepsico made it possible for farmer organizations of the Central Andes and the Andahuylas region to sell over 100 MT of native potatoes through contract with a profit margin over 20%, for a total value of over 230´000 USD and generating over 15,000 workdays. Additional non-monetary impacts on poverty reduction include the creation of social capital among farmer organizations and between value chain actors, an improved consciousness on sustainable agriculture

resulting in improved health among potato farmers, and increased capacities (e.g. negotiation) for farmer organizations (Cavatassi et al. 2009).

Scaling up and out

Papa Andina's experience in the Andes has shown how a partnership program can link researchers more effectively with other service providers, small farmers, market agents, and policy makers, and how results can be achieved in the following areas: i) Commercial, institutional, and technological innovations, ii) Increased capacities for pro-poor innovation and iii) Farm-level impacts on livelihoods. To go beyond these initial results at pilot level, additional efforts are needed for scaling up and out.

Scaling up

In the Andes, increasing impact requires scaling up the use of Papa Andina's approaches. Priority are: leveraging public investment and developing innovation capacities at a larger scale.

Public-sector investment

Papa Andina and its partners have been applying their approaches in specific regions in the framework of development projects. In the three Andean countries, on the basis of positive results achieved and thanks to advocacy work, these efforts to develop and revalorize a pro-poor, competitive potato market chain are being brought to a higher level, driven by public initiative. In Ecuador, the Ministry of Agriculture launched a five-year program to support potato production and strengthen the potato market chain with a budget of around US$ 7 million, to be complemented with an additional budget of $26 million for credits to small farmers. This investment will support several projects in the areas of information systems, technological innovation, potato seed systems, organization capacity of the potato sector, and participation of small farmers in the marketing system. In Bolivia a multi-donor program to develop pro-poor and impact-oriented innovations coordinated by SDC is planning to use Papa Andina's approaches.. In Peru, new projects to support the native potato market chain are being designed, funded by competitive public funds or private funds (mining companies).

Development of innovation capacity

These new initiative will require capacities for innovation at a larger scale. In some cases, there is an explicit demand for the support of Papa Andina in providing its methodologies and local capacity strengthening. Strengthening innovation capacity on a large scale requires documentation of the approaches developed by Papa Andina and its partners, and preparation of training guides so that knowledge, skills, and attitudes needed to use these approaches can be effectively transferred to others. It also requires a capacity development strategy and the resources needed for its application. Documentation of Papa Andina's approaches and experiences is well advanced. User guides have been prepared for the PMCA and Horizontal Evaluation. Strategies for capacity development in these approaches have been elaborated and could be applied provided resources for a large-scale capacity development program are available.

Scaling out

Based on results with potato in the Andes, there has been considerable interest in the approaches developed by Papa Andina and experimentation with them has begun in other settings. Through partnerships with other organizations and CIP's global network, the PMCA has been used in different contexts and with a range of market chains in the Latin America, Africa, and Asia. The first pilot application of the PMCA outside of 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 with locally relevant commodity chains in Sub Saharan Africa (Horton, 2008; Horton et. al., 2010). Through alliances with other organizations, including Practical Action (http://practicalaction.org) and in collaboration with CIP research Divisions and Projects (Cambio Andino) with the support from other donors including DFID and Inter-American Development Bank through Fontagro projects, the PMCA has also been applied in the market chains for milk, coffee, potatoes and other commodities in the Andes. Through a project supported by the Australian Center for International Agricultural Research, the PMCA is now being used in Indonesia to develop and promote dynamic potato market_chains. Since the PMCA is knowledge-intensive and approaches agricultural R&D in a new way, its successful introduction requires a well-planned and structured capacity-development process that promotes changes in attitudes and organizational culture as well as knowledge and skill acquisition. The horizontal evaluation

approach has been also been applied by other regional projects in the Andes (for example, the InnovAndes and Cambio Andino projects), and some professional evaluators have picked up the approach from specialist publications (Thiele et. al., 2006; 2008). Beyond the one-off application of PMCA or horizontal evaluation to a specific market chain or experience, consolidating and scaling-up innovations in other contexts will require the intervention of an institution that can play the functions of a boundary organization. There is a role to play here for R&D organizations.

Conclusions

Papa Andina and its partners have developed approaches for linking research with practical efforts to improve the livelihoods of poor farmers in marginal rural areas. These approaches capitalize on local assets such as the genetic diversity, indigenous knowledge, and social capital – assets of poor farmers that are often undervalued. Central to Papa Andina's overall strategy is the PMCA, which brings researchers together with other providers of agricultural services and with small farmers, market agents, and policy makers to foster innovation processes that benefit small farmers as well as other market chain actors. The PMCA is structured yet flexible enough to be applied to stimulate pro-poor innovation processes in a wide range of situations. The crucial role of Papa Andina as a boundary organization is to facilitate constructive dialogue and collective action processes at three levels. At the *local level*, Papa Andina promotes interactions and joint activities among diverse stakeholders to develop specific market chain innovations. Papa Andina has developed several tools for work at this level, including the PMCA and multi-stakeholder platforms. It has also facilitated the communication and negotiation of technology demands from small farmers to research organizations and other agricultural service providers and it has promoted CSR to increase the commitment of the private sector. At the *national level* Papa Andina has also promoted the development of multi-stakeholder platforms, policy dialogues, and the development of a strategic vision for the potato sector. At the *international level*, Papa Andina has disseminated its approaches through publications and other international public goods, it has supported the use of its approaches in other settings, and it has sought to build up a community of innovation facilitators. Horizontal evaluation has proven to be a useful tool to support knowledge sharing and capacity building. The Papa Andina case illustrates that facilitation of pro-poor innovation is a promising role for R&D organizations, including those involved with tropical root crops grown by small farmers. However, developing this new role requires additional investment for capacity development and large-scale implementation. 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 foster marker chain innovation. These professionals represent a potentially valuable resource, which could be mobilized to facilitate innovation processes on a larger scale. Support for facilitation of pro-poor innovation processes would be a high-payoff area for international donor organizations as well as national and local governments and NGOs in developing regions.

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Native potato market chain and poverty reduction: Innovation around Corporate Social Responsibility

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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 get formal access to dynamic markets and increase their income, despite the high transaction costs generated by their traditional production and marketing systems. Yet demand and competition are increasing rapidly in the native potato market chain therefore 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) institutions that foster innovation to develop inclusive and competitive market chains by taking advantage of potato biodiversity. This article describes the innovation process conducted by the Papa Andina Partnership Program of the International Potato Center (CIP) and its partners CIP-INCOPA, FOVIDA and CAPAC PERU to integrate Corporate Social Responsibility (CSR) into the native potato market chain, and harness private sector strengths to reduce poverty.

Outcomes include a tripartite partnership between the transnational company PepsiCo Foods, R&D institutions and farmer organizations that is generating substantial increase in income, yields, capacities for organization and production, safety and empowerment for farmers. It is also triggering a dialogue on the private sector's role in supporting specific research to improve the quality of smallholders' production. Further outcomes are public-private innovations, such as a social marketing initiative and a certification label for native potato trade with CSR. By involving final consumers, both these mechanisms are starting to create incentives for market chain actors to develop current socially and environmentally-responsible pilot practices into standard practices, turning native potato trade into a sustainable vehicle for poverty reduction.

Keywords: Market Chain, Corporate Social Responsibility, Native Potato, Poverty Reduction.

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 gaining weight in 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 3000 varieties are cultivated in the High Andes), their cooking versatility and high nutritional profile (higher content of dry matter, C vitamin and natural anti-oxidants like carotenoids, flavonoids y antocianins than improved varieties), and their traditional production practices (small-scale farming with low inputs), native potatoes fit perfectly into these new consumption patterns. Domesticated 8000 years ago by High Andean populations, these potatoes produce the highest yields in farming systems located at high altitudes (between 3000 and 4200 masl). They therefore constitute a comparative advantage for small-scale farmers who live in these remote and marginalized areas of the Andes, that today concentrate the highest levels of extreme poverty. However, until 2002, native potato growers were not fully taking advantage of their crop: it was largely destined for self-consumption or for the local markets, and was not considered a valuable source of income. As a result, native potatoes were largely unknown in 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. From 2003 on, thanks to participatory innovation processes facilitated in Peru by CIP-INCOPA, 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 potatoes — which marketing concept was awarded several international prizes (Ordinola *et al.*, 2008) — and the naturally colored native potato chips (Bernet and Amoros, 2004). Processed by small agro-enterprises and distributed through the most exclusive channels (supermarkets, airport duty free shops), these products have made it possible to cut down intermediaries and secure high prices, providing resource-poor farming families with access to new, high-value market channels and therefore with increased income. The intervention of research and development (R&D) actors in the process (CIP, NGOs) contributed to improve the competitiveness of farmers' traditional production and marketing system 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.

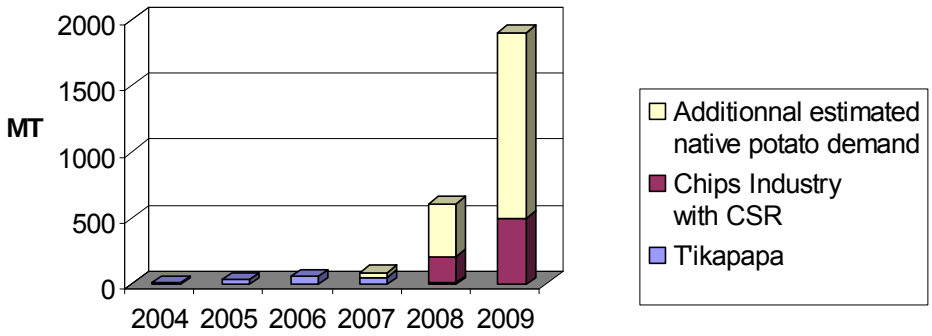

Figure 1. Growth of the demand for native potatoes, led by the chips industry

Native potato demand and competition has been growing at a fast pace since then, making room for larger-scale farmers, which in turn threaten the unique selling position of small-scale farmers in the native potato market chain. In order to keep a competitive edge, 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-INCOPA, FOVIDA and CAPAC PERU, that foster innovation to develop inclusive and competitive market chains taking advantage of potato biodiversity, with the aim of reducing poverty. They identified CSR as an entry door to develop private sector's commitment towards this objective (Hermes, 2005).

Integrating csr in the market chain: the business model

Papa Andina and its partners base their work on the broadly accepted definition of CSR as a company's 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 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), Fig. 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 reduce poverty.

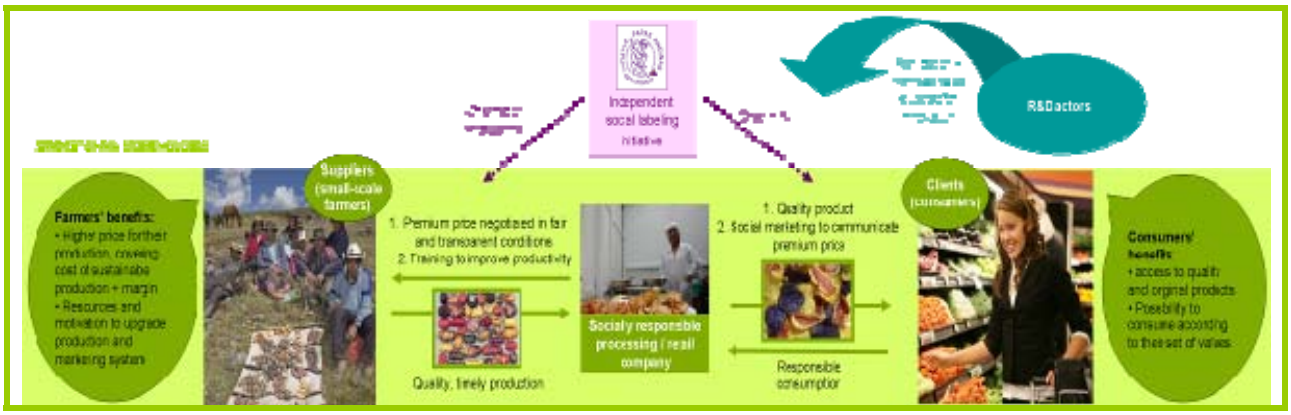

Figure 2: CSR applied to the (native potato) market chain

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 get a share of profitability despite their low negotiation capacity.

This business model is certainly neither the fastest nor the most profitable track for the company to develop its business in the short term ("business as usual"). However, it is bound to develop new, high-value market niches and increase providers' reliability and competitiveness in the medium term ("business for development"). In addition, by communicating on 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 following contributions:

- Capacity building for farmers to increase their competitiveness;
- Orientation to companies on business with 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 competitiveness of small farmers.

Outcomes: public-private partnerships for development

In 2008, the multinational company Pepsico Foods entered the growing native potato market that had been impulsed 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 validate 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 and were little competitive. In this process, several innovations were introduced in the native potato market chain. Commercial conditions were negotiatied with regards 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 of 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 heavily invested in the development of a niche market for a product that not only boasted a high intrinsic quality, but that was also socially responsible – and relatively expensive too (price/kg up to twice that of competitors). Pepsico developed a social marketing campaign (packaging, TV commercial), appealing to the sensitiveness 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 have been necessary to make this an impact-oriented business model, yielding benefits to both the company and small-scale farmers, and bound to do so over time. The first partnership was formed in 2007 between Pepsico and the Peruvian non-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] constituted by 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 self-consumption. In addition, the multinational did not have the resources to provide the initially requested day-to-day monitoring and capacity building on 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 and Integrated Crop Management 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 setting up 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 integrated by FOVIDA, CAPAC, the NGO Aders-Peru, 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 interested in getting it right with an impact-oriented CSR strategy towards their new providers, as well as to obtain 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 results were to secure benefits for farmers and prevent unfair competition from companies conducing "social" marketing not based on CSR practices. The "Andean Potatoes Label" was made available mid-2009, and two companies are currently in the process of being certified against this standard.

Early impacts: results at farmers' level

Participation in the supply chain of a product like Lay's Andinas has generated benefits for farmers in terms of access to a high value market for their potato biodiversity.

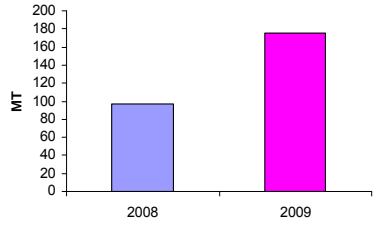

Figure 3. Native potatoes sold to the chips industry through contract

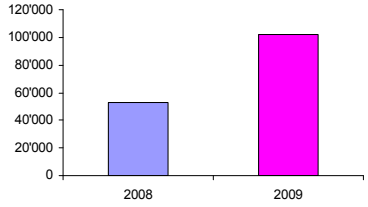

Figure 4. Total value in USD

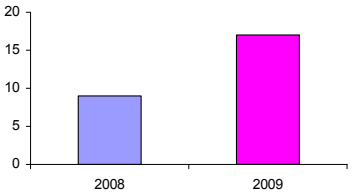

Figure 5. Number of different varieties validated for the chips industry

The strong growth between 2008 and 2009 in terms of volumes (Fig. 3), corresponding business value (Fig. 4), number of varieties accepted by the industry (Fig. 5) and workdays generated for farmers (from 7´500 in 2008, to 16´700 in 2009) gives evidence of the potential of this type of market chain to improve sustainable means of living in High Andean comunities. In absolute terms (brought down to cash benefits at an individual scale), results are still modest. But they are quite satisfaying in relative terms (compared with opportunities farmers had before, see fig. 6).

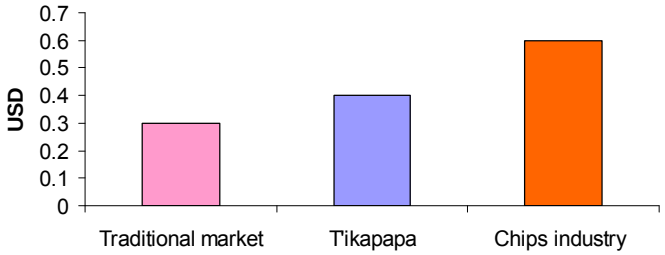

Figure 6. Price paid to farmers in 2008 by the chips industry means a 100 % increase compared to local market

Estimated business profitability for farmers is between 20% and 50% depending on local conditions. Moreover, the contract guarantees market and a stable price to farmers. Besides, business is extending beyond this successful commercial relationship. On the one hand, farmer organizations involved (from the Department of Huancavelica, Junin and Apurimac) have started to diversify their clients and enter new high-value markets (selected fresh potatoes, seeds) using potatoes that don't 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, 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 High Andean remote 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 Huancavelica, farmers have been developing their capacities for production with the support of FOVIDA, driven by the motivation to supply the industry, and obtained an increase in average yield from 6 to 12 MT thanks principally to an adecuate use of inputs.

In regards 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.

Perspectives and conclusion

The public-private partnerships and institutional innovations around T'ikapapa and Lay's Andinas have validated the approach of Papa Andina and its partners to integrate CSR into the native potato market chain. In the current conjuncture, where demand for quality native potatoes still exceeds offer, 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 farmers, Pepsico will have to strengthen its CSR commitment towards its initial High Andean providers although larger suppliers of native potatoes are entering the market. 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 possibility to access new, export markets, where ethical consumption is more developed, shall favor this process.

This experience also highlighted priorities for a demand-driven research targeted 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 stabilizing reducing sugars 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 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 yet be defined for a direct relation between the industry and farmer organizations. The modest situation of High Andean farmers (in terms of educational levels and resources) is likely to slow the transfer of responsibilities from the NGOs to farmers' organizations.

Safeguarding benefits for small-scale farmers in the development of the native potato market chain

The inclusive and sustainable character of the native potato market chain is subjected to many potential threats. Examples are given below in the form of possible scenarios, yet their relevance will become clear as the market develops:

- Ethical products face the unfair competition from products boasting to benefit small-scale farmers without necessarily walking the talk;
- Small-scale farmers are unable to remain competitive with the appearance of larger-scale farmers, generating a shift in demand. This threat could be heightened by improved colored varieties suitable for lower altitudes;
- Recently-formed farmer organizations are undermined, as individual farmers get capitalized through native potato trade and leave their organization to operate as independent providers, generating exclusion from the market chain of the most marginalized producers;
- Overproduction generates pressure on price and exclusion of less competitive actors;
- As a result of market pressure, increase in productivity is sought at the cost 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 like the sustainability and credibility of the Andean Potatoes Initiative and its institutional framework, the stakeholder platform CAPAC PERU. Their ability to get companies committed with the vision embodied by the label and to position that label on the market will of course be crucial. Finally, the market response will be decisive.

Responsibility towards consequences of climate change

The muliplication of erratic and severe droughts and frosts is turning High Andean agriculture into an increasingly risky venture. The industry has adopted a relatively flexible attitude towards small-scale farmers, tolerating non-compliance with agreed volumes. However, the risk of losing the crop is still basically carried by producers. Ideas like 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 of sources of income is further encouraged.

The research agenda to increase the competitiveness of small-scale farmers on the native potato market is broad. The case presented here shall highlight how meaningful it is to involve CSR-conscious private companies in the innovation process. Only with their commitment – and that of consumers – is native potato trade bound

to yield long-term benefits for the smallholders who have been maintaing potato biodiversity over centuries, and to fulfill farmers' and R&D actors' expectation to see it develop into a viable vehicle for poverty reduction.

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Linking smallholder potato farmers to the market: Impact study of multi-stakeholder platforms in Ecuador

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A full version of this study is available at ftp://ftp.fao.org/docrep/fao/011/ak231e/ak231e00.pdf (Cavatassi et al., 2009).

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 impacts are adequately identified. Findings suggest that the program was successful in improving the welfare of beneficiaries, while potential negative environmental impacts, particularly with relation to agrobiodiversity and use of agrochemicals seem not to be a concern. Mechanisms through which impacts have been achieved are analyzed. Little spillover effects are found.

Keywords: New agricultural economy, impact evaluation, food-security, agro biodiversity.

Smallholders and the new agricultural economy

The last two decades has 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 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 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, to increased chemical use and to intensified land use, and thus to potentially negative environmental and health consequences.

One approach that has been used in the Andean 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, *Plataformas* 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 functions as a connector between groups and among individuals facilitating co-operation and mutually supportive relations and, thus, as an effective means to reduce transaction costs and link 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 manner 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 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, of its overall program and of 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. 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 in 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, while the cultivated area has shrunk from 65,000 ha to less than 50,000 (FAOSTAT, 2007). Average yields (6.8 t/ha) (INEC, 2007) 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 2423 t in 2002 to 7119 t in 2006 (OFIAGRO, 2009) in response to growth in demand from

fast food restaurants mainly. 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 which 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 which involves 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, through 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 knowledge and capacity of farmers. FFS made special emphasis on production technologies and integrated pest management (IPM) techniques aimed to improve 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 given to techniques to reduce soil erosion as most of the farmers are located in steeped areas. Farmers were taught the importance of renewing seed of good quality and techniques to select their own stocks, considering 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 potato Andean weevil (*Premonotrypes vorax*) and tuber moths (*Phthorimaea operculella*, *Symmestrischema tangolias* and *Tecia solanivora*), farmers learned the life cycle of the insects and different techniques to reduce the population and damage of the pests. 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 diminish 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 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 its use in the *Plataformas* as it is 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 done 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 1007 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 was 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 wanted to first find out whether the intervention it supported reached its primary objective of improving the welfare of participating farmers. To do this we look 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* through which this primary objective was reached; or alternatively 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 on 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 show that the group of beneficiaries, on average, obtained a greater amount of yields per hectare than the three possible counterfactual groups. The range in yields goes 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; 2007).

The mechanisms through which the platform achieves these outcomes is 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 in each transaction is around 1.29 hours. *Plataforma* beneficiaries appear to sell more, receive more value for them 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 show 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 not different than the pesticides used by other household groups, indicating that the type 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 changes 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 indexes 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 1000 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 among beneficiaries and non-beneficiaries, it does seem that beneficiaries have shifted toward Fripapa and away from Gabriela.

In connection to the use of pesticides and to their toxicity level, some health related measures are considered. The percentage of households that use protective measures is in general very low: 19% uses gloves, 13% uses 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 indicate less toxic products. The results suggest that participating to 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 who 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 using the alternative counterfactual groups was also done (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 a cost of greater environmental and health problems. The increased use of inputs suggests 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 of linking farmers to market on agricultural biodiversity. Market pressure may lead farmers to abandon traditional varieties and produce those 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 (Fripapa), which is demanded for its frying qualities. Thus, this group of farmers is maintaining the same diversity level although changing the primary variety.

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's* 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 very little or no indirect effects of the program is implied. The mechanisms through which the *Platforma* achieves this success is 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. Results show that not only 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 is 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 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 likely using less toxic products as the environmental impact is not significantly different than non-beneficiaries. These results might also be reinforced through the FFS and IPM approach used by the program, as it appears that through a better knowledge of risks and hazards associated to the use of agro-chemicals participant farmers tend to use more protective gears, although overall the percentages are remarkably small. Likewise the concern related to potential impacts on agricultural biodiversity is unfounded as seen by the insignificant effect on any of the four indexes 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 related 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 to 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 aimed 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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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 fung. applied (kg or l/ha)	3.15	2.79	2.69		3.98		3.33	
Curative fung. applied (kg or l/ha)	4.16	3.61	2.52	*	6.34		4.43	
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	

Indicators and mechanisms	Whole Sample	Benef.	Non-part.	Test vs. Benef.	Non-elig.	Test vs. Benef.	All non-benef.	Test vs. Benef.
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 var.: Fripapa (%)	29.0	53.4	15.9	***	18.2	***	17.0	***
Second most used var.: 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 poncho (%)	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	***
Observations	660	217	222		221		443	

Tests are differences in means (*t*-test); * significant at the 10% level; ** 5%; *** = 1%

[+] 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 fung. applied (kg or l/ha)	-0.32		-0.26		-0.235	
Curative fung. 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	
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 var.: Fripapa (%)	0.36	***	0.36	***	0.36	***
Second most used var.: 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	***

Indicators and mechanisms	Ordinary least squares Diff.		Propensity score matching Diff.		Weighted least square Diff.	
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; ** 5%; *** = 1%

An analysis of the efficiency of the marketing system for yams in Nigeria

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Abstract

This study deals with an analysis of the level of pricing efficiency of yam marketing system in order to provide data for appropriate improvement policies for increased production and export. The broad objective is to determine the channels and level of efficiency of the marketing system for yam in Nigeria. Data were collected through farm and market level surveys conducted in 2008. A combination of analytical tools involving econometric and descriptive techniques was used. This includes the bivariate correlation coefficients in the estimation of yam prices in pairs of yam markets to determine how spatially integrated the yam markets were. The result shows that the yam market participants include the producers, rural assemblers, commissioned agents, urban and semi-urban wholesalers as well as retailers who abound mostly in urban areas. There is a low degree of spatial market integration for yam in Nigeria as indicated by 80 out of 171 pairs of markets. This implies therefore low level of market integration for yam throughout the country. The marketing system of yam in Nigeria is less competitive and therefore less efficient

Introduction

Background and Justification

Nigeria is the largest producer of yam in the world producing an average of 26.9 million metric tonnes per annum (FAO, 2002). In 1997 alone, Nigeria accounted for 75% of World production (Manyong et al, 2001). The annual growth rate for the same period was 6% for the yield and 10% for the area planted. Although Nigeria is the largest producer of yam in the world, the need arises for increasing production to satisfy domestic and export demand for yams. The major yam growing areas of Nigeria extend from the rain forest zone to the southern limit of the Northern Guinea Savannah. However, the marketing and export of yam has not received adequate attention in Nigeria. There is insufficient knowledge as to the efficiency of the yam marketing system.

Inefficiency in the yam marketing system may arise from high cost of transportation of yam between producing and consuming areas or points of sale. Transport cost may be high because of poor feeder road networks between producing and consuming areas leading to high transport cost such that transport costs may exceed price differences between markets.

Storage may pose a problem during the peak harvest period, since it is a tuber crop. The difficulty in storage raises the problems of farmers benefiting from the incidence of seasonal price increases for yam.

If the efficiency of the marketing system for yam is to be improved so as to facilitate its contribution to increased marketing and export, there is the need for better understanding of the level of pricing efficiency and integration of yam marketing system and the constraints to efficient marketing of the crop.

In this respect, certain questions are necessary. First, how highly organized is the marketing system for yam in Nigeria? What are the channels through which yam moves from producers to consumers? What is the relationship between prices of yam in different markets? What is the level of market integration in the yam trade? What are the major constraints to efficient marketing of yam? This study is designed to provide answers to the above questions.

Available information on yam marketing in Nigeria was on study conducted in southeastern Nigeria (Eluagu *et al*, 1990). Eluagu et al described the yam marketing channel as long, consisting of the farmers, agents/wholesalers, wholesaler-retailers, itinerant assemblers, retailers and consumers. In this case, the wholesaler-retailer controlled 75% of the yams flowing through the yam marketing channel. According to the authors, the flow of yam trade was in the North-South direction.

A structural analysis of yam trade flow into Abia State using total value of purchases as index of measurement of the market share was conducted in Abia State in Eastern Nigeria (Anuebunwa, 2002). According to the result, the northern states of Nigeria contributed 67.97% of total yams supplied to Abia State while the Southern States 32.03% of which Abia accounted for 2.7%. Correct decision making and planning in trade also depend on reliable information on market conditions (Shepherd, 2000). The above two studies were done in Eastern Nigeria. There is therefore need for comprehensive information on yam flow nationally. Comprehensive data on the volume of yam flow will guide policies on marketing, and export in Nigeria.

Objectives of the study

The broad objective of this study is to determine the channels and level of efficiency of the marketing system for yam in Nigeria. The specific objectives are to:

- describe the marketing system for yam;
- determine the relationship between yam prices in different markets;
- isolate the major constraints to efficient marketing of yam, and
- derive policy implications for improving the efficiency of the marketing system.

Methodology

Study location

The primary study locations were three major yam producing and marketing States of Benue, Nasarawa, and Southern Plateau (in the North), and four States in the South (Delta, Ebonyi, Ondo and Abia) The choice of the study locations was based on some criteria. First the areas were major yam producing and marketing areas. The second was that the markets chosen in these locations were markets where yam is traded (both bulking and bulk-breaking markets).

Sample selection

Urban and rural markets in the selected States were studied. Four spatially separated markets in each State as mentioned above were selected purposively to permit spatial pricing efficiency analysis. With respect to traders, five yam traders were randomly selected from each of the study markets giving a total of 140 traders (wholesalers and retailers) in the spatially separated markets in Nigeria. Also 140 rural producers who sell the commodity either by themselves or through members of their families were interviewed in the study areas. In addition, some yam transporters responsible for the movement of yam between the different States were interviewed.

Data collection

There were two major sources of data. These were primary and secondary data. Primary data were collected from yam traders, yam farmers, key informants and yam transporters. Structured questionnaires were used to undertake personal interview of the respondents. Before data collection began, questionnaires were pre-tested in a major market using randomly selected respondents. Interviews were conducted by the investigators themselves. In addition to questionnaire interviews, observations of marketing activities were made.

Data collected from traders include sources of yam supply, yam varieties purchased, quantity bought and frequency of visits to source markets, mode of transportation, distance covered, markets and market prices, number of markets covered and distributional channels, other disposal outlets, Also elicited were the costs of transportation and handling, source of market information, trading experience and marketing problems. Others include levies/taxes paid.

From the farmers, information were elicited on frequency and quantity of yams sold in the different village markets, means of transportation used and the transportation cost, agent used for the disposal of yam, marketing function performed, other locations where yams were sold, and membership of social organizations.

The transporters were interviewed on the cost of transportation and factors affecting it, regular markets visited, origin and destination of goods carried, membership of transporters union and influence of the unions on the transporters.

Data collected also include nature of roads, market distribution, bulking and type of competition, availability of marketing facilities, seasonal pattern of yam supplies from different areas, major supply areas to consumer preferences for different varieties, and problems of yam marketing.

These data collection from the traders was approached from three perspectives:

- The purchase transactions,
- The sales transactions
- The cost structure

Analysis of data

Econometric and statistical techniques were used in data analysis.

Specification of the empirical model. In testing pricing efficiency, the bivariate correlation coefficients between yam prices for the spatially separated markets were computed following the pattern of Trotter (1992), Mendoza and Rosegrant (1993) and Diavosavvas (1995). Bivariate correlation still remains a useful starting point for testing integration of spatially integrated markets and remains the most commonly used approach in agricultural marketing (Dahlgran and Blank 1992).

This model is specified generally as:

Pij, Pik . . . . . Pim
P2j, P2k P2m
.
Pnj, Pnk . . . . . Pnm (1)
where
Pi = average price in period I
J = 1 ....m = location of the market

A more simplified form of the above equation can be re-written as:

Pij = bo + bi Pik + e where
Pij = price series of market j;
Pik = price series of market k;
bo,bi = coefficients, e = error term.

This equation is estimated for pairs of yam markets. The closer bi to unity, the more spatially integrated the yam markets. The size of this coefficient and its significance shows the level of the intermarket dependence.

Testing hypothesized pricing behaviour. Based on equation (1), three behavioural pricing relationships were tested:

Hypothesis 1: Market Independence
$H_o : B_o = O$
Hypothesis II: Perfect and Cooperative Pricing
$H_o : B_o = +0.99$

In the first hypothesis, prices in market j do not affect prices in market k. Accepting this hypothesis suggests that yam traders exercise a form of spatial price discrimination. The alternative hypothesis is that some -ve or +ve correlation exists. Hypothesis II indicates an organized, collusive pricing arrangements between yam marketing agents. Such collusive pricing behaviour has been reported to be an effective marketing strategy in maintaining a secured share in the market (Mendoza and Rosegrant 1993).

It is customary, following other studies, to use a level of greater than +0.9 as evidence of strong association and by implication the region of acceptance of spatial integration.

Results and discussion

Market chains and distribution channels

With respect to yam, the identified categories of market participants include the farmer, rural assemblers and commission agents, urban and semi-urban wholesalers and retailers as shown in Figure 1. There are eight possible flow channels for yam. These are numbered as distribution channels in Fig. 1. The movement of yam gets through these distribution channels to complete the marketing chain. In the northern study areas, it was observed that yams move from Middle Belt to Urban markets in the North, East and South.

The producer usually retains some seed yam for planting in the next season. The rest is supplied to the markets or sold through one of the intermediaries. The quantity exchanged here is usually substantial. It is either sold to the rural assembler at the farm gate or in the rural village market.

The Marketing System for Yam in Nigeria

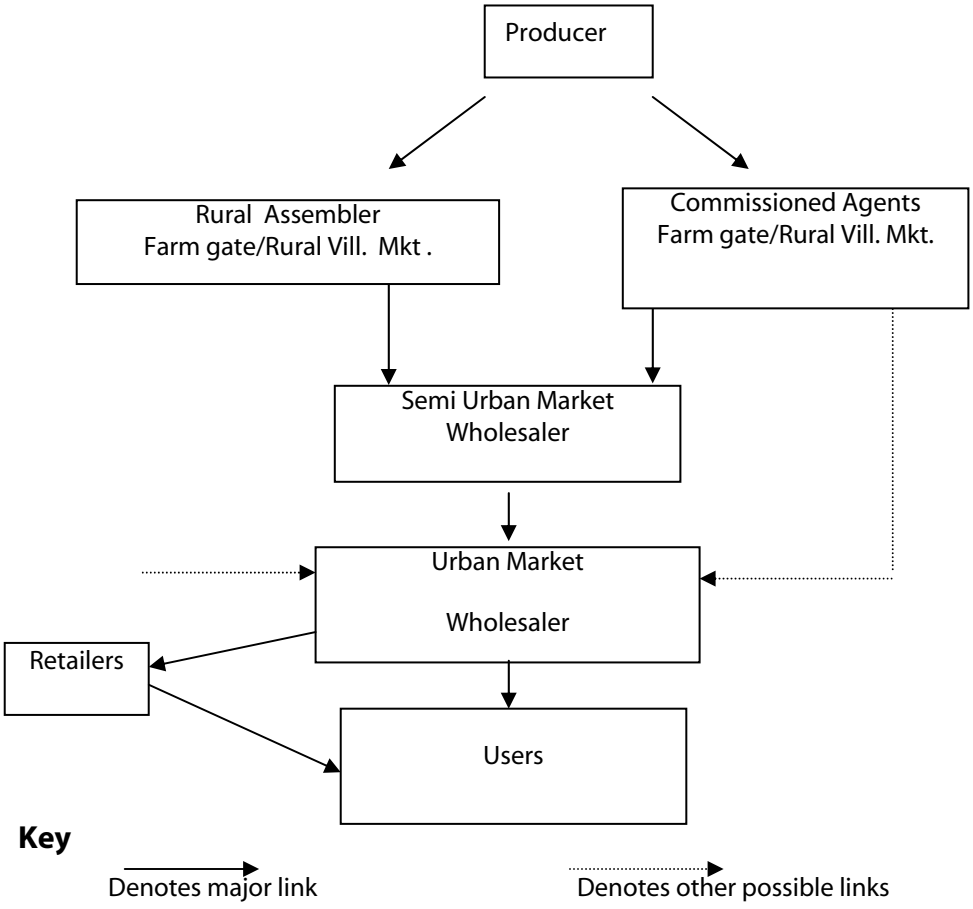

Figure 1. Marketing Channels for yam in Nigeria

Yam could also be sold by the producer to a commission agent at the farmgate or village market. This commissioned agent is usually paid by the semi urban based wholesaler to purchase yam. The commission fee ranged from N50 - N100. Sometimes, the agent may operate under the rural assembler or the urban market wholesalers. The latter are based in towns. Some of the urban wholesalers from Lagos, Ibadan, Abia, Uyo, and Port Hacourt are known to go to the village markets to purchase yam. The wholesalers usually have better access to price information in terms of normal or expected price of yam at any time. At the village markets, therefore, they fix the price level below the expected price, while at the wholesale/retail levels they force prices above the expected levels. This is the point where the efficiency of the price mechanism is undermined.

In all the markets visited in the northern States, yams were sold in heap of 100 tubers and prices fixed based on tuber sizes. The tuber sizes were classified into small (≤1.5kg) (sometimes seed tuber), medium (≤3.2kg) and large (≤5.9kg). This period of survey coincides with lean period in the markets.

The urban wholesalers transport yam purchased using hired vehicles to their different locations and sell to retailers as is the case in most of the southern states of the country.

Whether the producer markets straight to wholesalers or relies on the assemblers sometimes depends on how far the producer is located from the market and whether he has means of transportation. Sometimes, the middlemen especially the semi-urban wholesalers go from village to village to buy yam using pickups. This is prevalent in the major producing areas of the nothern States.

The rural-urban link for yam:

The yam rural assembler. According to Hays (1973), the rural assembler is an individual residing either in a rural or urban area who moves around the rural areas purchasing a commodity from village retailers at rural markets and occasionally directly from farmers. In the case of yam, the rural assembler limits his purchases to accessible rural markets and transport yam purchased using pick-up vans. In other instances, the rural assembler at the rural village market buys from the farmer on the spot and sells to available semi-urban and urban market wholesalers at a mark-up on buying price. The rural assembler is characterized by a large geographical area covered, as well as the size of his purchase. Also an average of about 20 km is covered. The capital for this business is sometimes provided by the wholesaler. The assembler rarely stores before disposal.

The yam wholesaler. The yam wholesaler handles bulky quantities of yam. These wholesalers come to the village markets weekly or every market day and meet the assemblers for supply of yam. The wholesalers come mostly between October and February - the period of harvest and hence peak period of sale for yam. They either come with trucks (trailers and lorries) or hire one to convey their purchases. Each wholesaler has about 5 or more assemblers supplying yam to him. There is Sarki Kazua (Chief of Market) in the northern markets at the helm of affairs in these markets.

The yam retailer. The yam retailers comprise of individuals based and selling in the urban markets in small quantities to the consumers. The retailer normally purchases from the wholesaler who travels to these village markets. Sometimes, the retailers have direct supply from the more adventurous rural assemblers.

These retailers display the yam and sell to the consumers. The peak period of sale is usually during the harvest time during the dry season.

On market information on yam prices, the wholesalers however have fair knowledge of yam prices in other markets. Their source of information about prices in these markets were mainly due to the fact that they sometimes travel to these markets to purchase yam, or their colleagues (other traders) kept them abreast of prices.

Efficiency of the marketing system for yam in Nigeria

Bivariate Correlation Coefficients for Prices of Yam between different Yam Markets in Nigeria were estimated.

This table shows a matrix of correlation coefficients for yam prices in markets in Nigeria. The essence is to determine how well information on prices is communicated among these markets and how freely the traders move between the markets (Asumugha, 1999).

The results indicated that only 54 pairs of yam markets out of 171 yam pairs showed a strong correlation with r-values ranging from 0.805-1.000 while 26 market pairs showed a moderate correlation with r-values of 0.613-0.799 (Table 1.). This implies that only 80 market pairs were integrated out of 171 pairs. There is therefore low level of market integration.

Most yam markets pairs had very weak correlation with r-values ranging from 0.012-0.592. It could be deduced from this analysis that the marketing system of yam in Nigeria is less competitive and therefore less efficient.

Constraints in yam marketing

Transportation and lack of good motorable road networks constitute the major problem.

The traders complained of too many check-points and extortion as yam is moved from one market to the other.

Acknowledgement

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Bivariate Correlation Coefficients for Prices of Yam between different Yam Markets in Nigeria

	Camp	Orome	Tsekigh i	Tor-donga	Zakibiam	Wukari	Namu	Lafia	Igboho	Kishi	Dawanua	Iziogo	Iboko	Mile 12	Boni	Jalingo	Niger	Zaria	Ikwim
Camp, Delta	1																		
Orome	-0.965	1																	
Tsekighi	0.798	-0.613	1																
Tor donga	-0.420	0.642	0.212	1															
Zakibiam	0.824	-0.998	0.667	-0.587	1														
Wukari	-0.937	0.898	-0.898	0.239	-0.928	1													
Namu	1.000	-0.970	0.785	-0.438	0.985	-0.978	1												
Lafia	0.451	-0.308	0.941	0.531	0.184	-0.43	0.529	1											
Igboho	-0.940	0.818	-0.956	0.085	-0.857	0.988	-0.933	-0.799	1										
Kishi	-0.391	0.128	-0.862	-0.678	-0.294	0.491	-0.364	-0.928	0.675	1									
Dawanua	0.730	-0.875	0.153	-0.933	0.116	-0.350	0.732	-0.197	-0.438	-0.039	1								
Iziogo	-0.117	0.497	0.381	0.984	-0.084	0.031	-0.273	0.428	-0.092	-0.682	-0.176	1							
Iboko	-0.513	0.998	-0.568	0.684	-0.534	0.520	-0.955	-0.020	0.785	0.078	-0.544	0.633	1						
Mile 12	0.934	-0.849	0.938	-0.141	-0.258	0.238	0.952	0.194	-0.998	-0.116	-0.202	0.321	0.822	1					
Boni	0.454	-0.562	0.998	0.273	-0.075	-0.295	0.745	0.904	-0.935	-0.717	-0.263	0.188	-0.661	0.378	1				
Jalingo	-0.277	0.518	0.359	0.988	-0.457	0.088	-0.296	0.654	-0.064	-0.782	-0.867	1.000	0.565	0.012	0.416	1			
Niger	-0.550	0.442	-0.980	-0.404	-0.849	0.805	-0.646	-0.231	0.877	0.468	-0.570	-0.517	-0.434	-0.791	0.119	0.539	1		
Zaria	0.630	-0.405	0.971	0.441	0.468	-0.766	0.614	0.995	-0.857	-0.959	-0.089	0.592	-0.353	0.837	0.984	0.573	0.999	1	
Ikwim	0.180	0.208	0.645	0.883	0.247	-0.424	0.034	0.705	-0.392	-0.896	-0.198	0.956	0.440	0.484	0.337	0.945	-0.663	0.810	1

Source: Field Survey Date, 2007

R > 0.8 = strong correlation

R 0.6 – 0.8 = moderate correlation

R < 0.6 = weak correlation

Source: Koutsoyianis (1985)

Generating innovations for the competitive development of potato in Peru

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Abstract

In Peru, potato is the main crop in the Andean region and for small producers, for whom it is an important source of income and food, and also a way to preserve ancestral customs.

The INCOPA Project (Innovation and Competitiveness of the Potato) of the International Potato Center (CIP), funded by the Swiss Agency for Development and Cooperation (SDC) in alliance with a series of public and private partners, is demonstrating that research and development can go hand in hand to obtain effective impact at the small producers level. The project effectively applies the Participatory Market Chain Approach (PMCA) that promotes working with the potato chain actors and 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 refer to

3. commercial innovations or new products (selected fresh native potatoes, colored potato chips, yellow mashed potato and selected white *chuño* or *tunta*)
4. institutional innovations or new rules and norms (public-private alliances, National Potato Day, Potato Wholesale Commerce Law and the Tunta Technical Norm, among others)
5. technological innovations (post-harvest management, production of healthy seed and sustainable potato production technologies, among others).

The evidence indicates that native potatoes' value and their appreciation as cultural heritage is essential for small producers. Their commercialization enables producers to obtain prices 20% above the prices offered by traditional channels, as well as better performance by hectare (from 10 to 14 tm/ha) and quality improvement.

Keywords: production chains, innovation systems, small farming, products development, market articulation.

The potato in Peru

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

Particularly, in the case of the Andean region, it is the main crop for small producers, for whom potato is a very important source of income, food and also a way to preserve ancestral customs. But, it is also significant to the urban population, because this millennial tuber provides nutrients and diversity to the daily diet. The potato is a good example of how, by combining agro-ecological factors with efficient handling, a product with high nutritional value can be obtained. There is no other crop that produces so much energy and protein per hectare than 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, there are 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 decreasing tendency) 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 have been developed such as flakes and mashed potato, with good export potential (Ordinola, 2009).

Even though the nutritional value of potato is excellent, consumption per capita among Peruvians has been irregular. During the 50s it was 128 kg. But by the beginning of the 90s,it had fallen to 32 kg eventually rising to 70 kg by 2005. Along with this during the last few years the sector has experienced decreasing competitiveness. This is reflected in the relatively low prices (and the lack of management in 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 aggregated value has been generated in the last few years. In this context, one of the crucial aspects to determine is how to generate innovations supporting the development of competitiveness in the sector, as well as promoting articulated 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 impact at the small producers' level, which translate to a reduction in poverty, improvement in food safety and sustainable exploitation of natural resources (Devaux *et al.*, 2008).

In this context, CIP's INCOPA Project , 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 potato, 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 producers level. The project operates a Participatory Market Chain Approach (PMCA), seeking to involve all the actors within the potato productive process so as to generate innovations that will improve the competitiveness in the chain production (Ordinola *et al.*, 2007).

The work at INCOPA is organized along four intervention lines

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

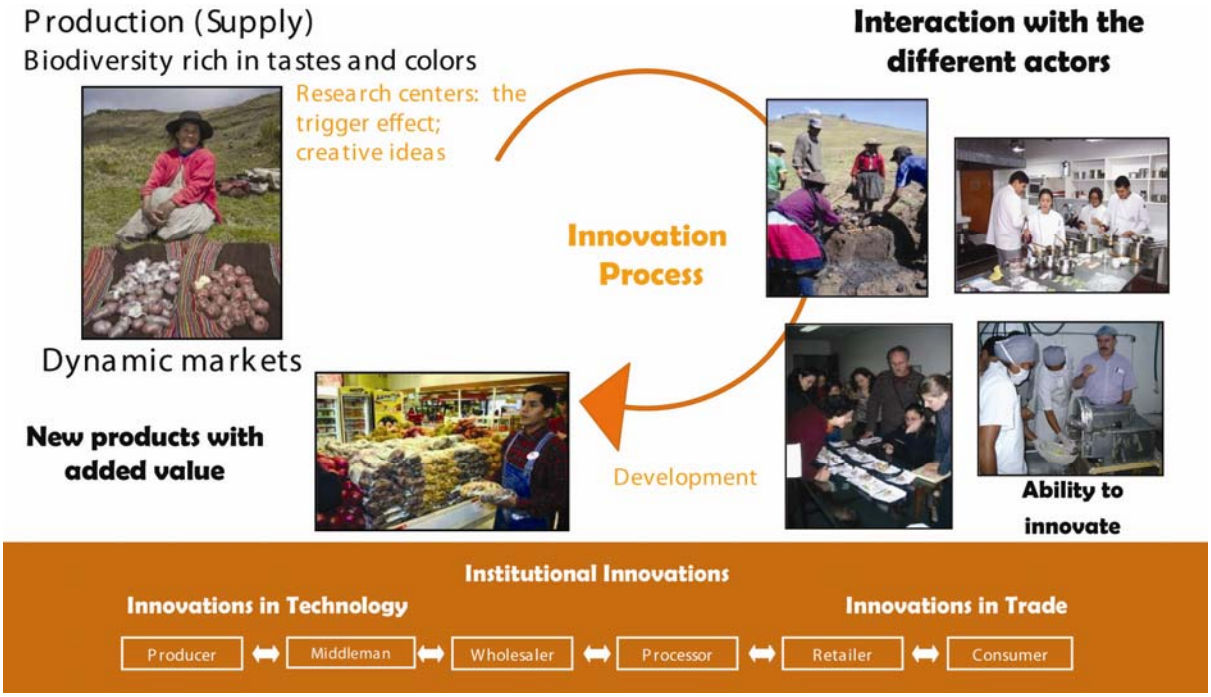

Figure 1. S timulating innovations along the market chains

The model operates on three main levels. The first is the chain approach (widespread in recent years), which focuses on contact amongst 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 to improve competitiveness. Finally, the incidence of policies would allow bringing the results and approaches to bigger scales, and generating trends that may enable policy makers –ministries, regional and local governments- to adjust their actions and promote others that have already been approved at the different levels. These three major fields of action generate synergies among them. For example, while the actors of the chain promote incidence, the policy makers may generate norms that enable better business performance for these actors. The chain participants need innovations and the research institutions adjust their response (offers of technological) to this demand.

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

The Participatory Market Chain Approach (PMCA)

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 along with Iniciativa 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 participative 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).

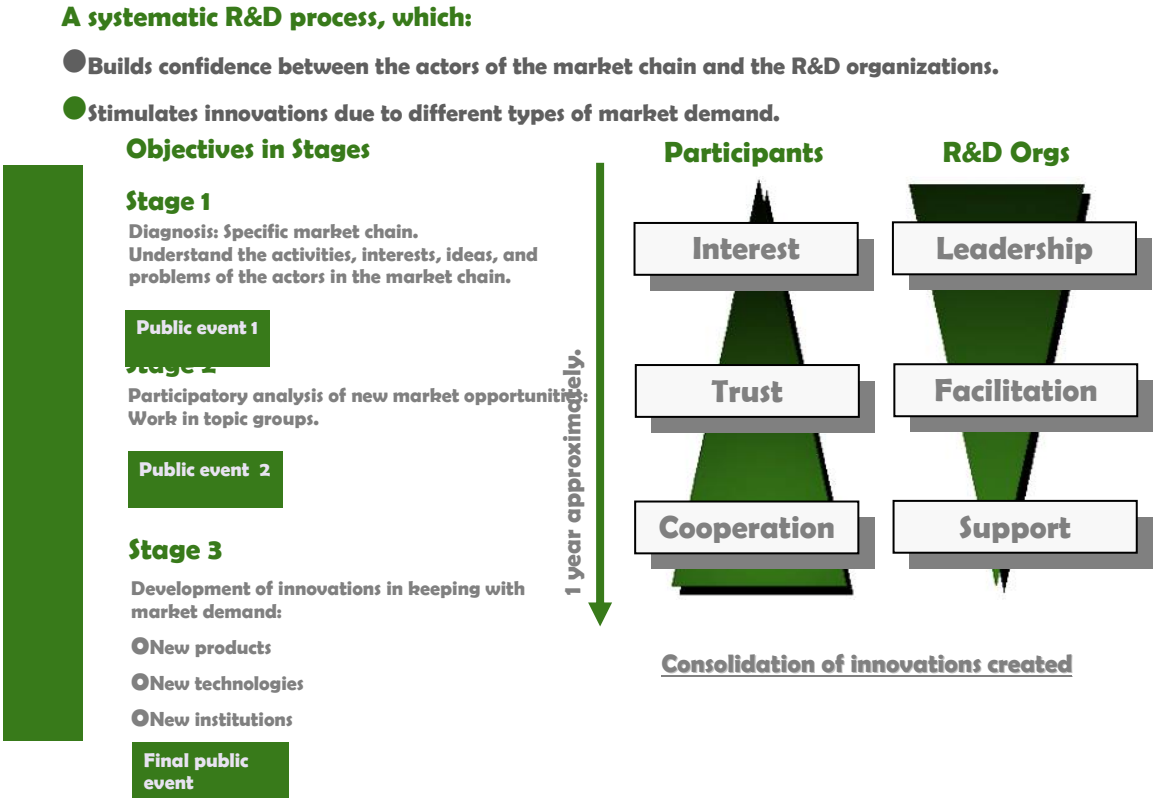

Figure 2. The PMCA process

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 allow bigger and better access for small producers to dynamic markets with increased added value. Examples in this area are: Mi Papa, Seleccionada & Clasificada (wholesalers' trade), packed tunta (white *chuño*) (for local market and export) Puré Andino (for export) T'ikapapa (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 all represent initiatives with whom the project jointly works.

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, Alianza Institucional de la Tunta, Iniciativa Papas Andinas), or new regulations (National Potato Day, the Technical Norm for Tunta and Ley de Comercio Mayorista de Papa 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 norms and quality standards for Mi Papa, the trials of sprouts inhibitors, widespread diffusion 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. T**echnological innovations** also have repercussions on prices, because with better quality and higher quantities of products the level of performance rises and costs are reduced. I**nstitutional innovations** diminish transaction costs, mainly in commercialization, allowing access to identified market niches and improving the product's image amongst consumers. Establishing the National Day of the Potato is a good example of this. With the resulting increases in demand, this, in turn, influences the size of the market (

Insofar as the combination of these results influence prices, quantities and size of markets for small farmers' products, they also influence their incomes level and effect a reduction in their state of poverty.

Results among the different actors in the potato chain

At sector level

As mentioned before, the potato sector in Peru is not homogeneous. One of the key issues has been to insist upon 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 there is potential for development and commercial positioning for native potatoes, a segment that was neglected by different actors in the potato chain.

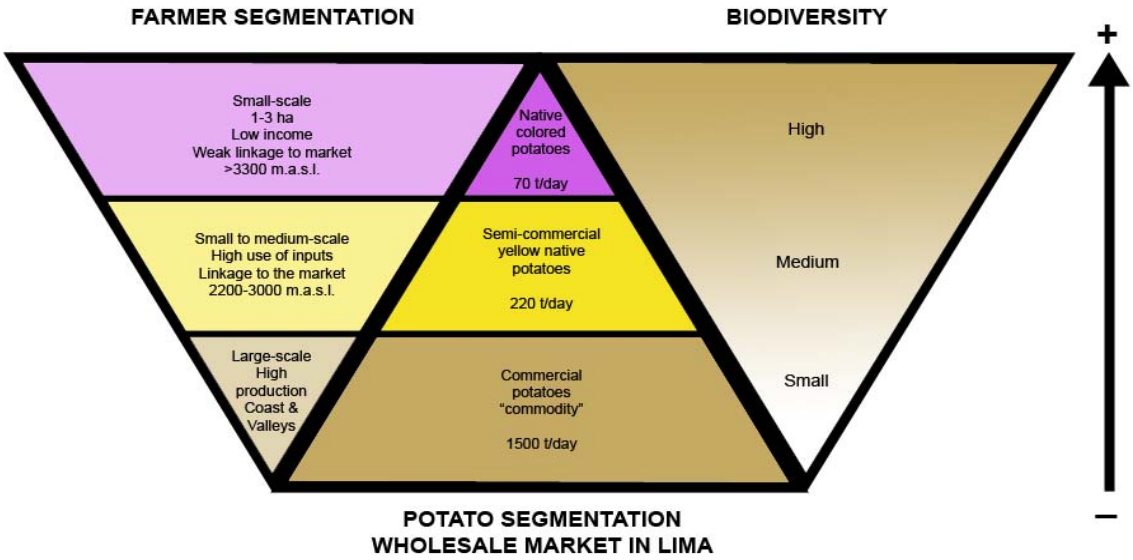

Figure 3. Segmentation of the potato market in Lima

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

White potato varieties. Two of the main limitations in the case of fresh products are inefficient post-harvest handling, which cause losses, and the persistently inefficient wholesalers' markets that continue using 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 wholesalers' 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 retailers' level, supermarkets are applying the concept of selected product, classified, clean, washed and packed so as to facilitate its access to consumers.

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 Frito-Lay has launched as recently as mid 2009 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.

Native varieties. These potatoes have become important and more visible since the joint ventures described in previous paragraphs. 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.

In the case of fresh produce consumption, 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 forms, size and color, as well as the texture and flavor of their pulp (Ordinola *et al.*, 2008). Furthermore, there are some processed products from native potatoes on the market. They include a deluxe presentation of native potatoes 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 snack food transnational 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 facial 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 to cook 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.*, 2007).

At the producers level

Many studies have been conducted to measure how the benefits of implemented actions have impacted on the producers. Some of the most important results within the region of Huánuco (Bucheli *et al.*, 2007) 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 intervention zones) 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 income increase comes from technical assistance and training provided that has impacted on production improvement (quality and productivity). There also is the contribution of INCOPA/ADERS 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 wholesalers' 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 enabling perceptible changes that will strengthen 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, their self esteem and self appreciation. 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 EPCP, has been successful in Cayna, where greater confidence towards NGOs, businesses and producers' associations is observed; a situation which is not perceptible in other intervened communities.
7. The observed results are related to the innovations indicated in the EPCE approach: technological (improved knowledge), commercial (new commercial channels, new products), and institutional (the strengthening of ECOMUSA).

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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Sweetpotato export market development to the European Union

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Abstract

Sweetpotatoes (*Ipomoea batatas*) are significantly increasing in import volume and consumer demand in the European Union (E.U.) The leading suppliers of sweetpotatoes to the E.U. are the United States (U.S.) and Israel, with lesser volumes originating from Egypt, Jamaica, Brazil, Honduras, and China. The principal European importing country is the United Kingdom (U.K.), with sweetpotatoes currently experiencing one of the most rapid increases in British per capita consumption among all fresh produce items. Although sweetpotatoes are still a minor vegetable in other E.U. nations, demand is rising as the major supermarket retailers throughout Europe now stock sweetpotatoes throughout the year. Orange-skin and orange-flesh roots are preferred among all the major supermarket retail chains. Large size roots (350 to 450 gm) are preferred for bulk displays, while medium size (150 to 200 gm) roots are preferred for pre-weighed 500 gm to 1 kg consumer packs. Three to 5 roots are typically put in a perforated polyethylene bag, depending on total pack weight. Blocky shaped roots are preferred over elongated ones. The principal constraints in sweetpotato arrival quality in the E.U. are root shrivel, surface mold, root skinning, bruising injury, dull skin coloration, *Rhizopus* soft rot, and *Penicillium* surface mold. Significant market opportunities exist for those suppliers who can provide the E.U. market with consistent supplies of high quality sweetpotatoes.

Keywords: international trade, marketing, postharvest quality.

Introduction

Increasing domestic sweetpotato consumption and developing additional market outlets are necessary for sustained growth of the international sweetpotato industry. Expansion of the export market represents a significant opportunity for immediate strengthening of the industry. The U.K. is currently the most rapidly developing consumer market for sweetpotatoes. Over the last 5 years, sweetpotatoes have evolved from a mostly exotic produce item with limited availability in supermarkets to a mainstream vegetable allocated large display space. As British consumers become more familiar with sweetpotatoes and their positive nutritional characteristics, demand will continue to rise. At the same time, additional sources of supply from different producing nations will result in more competition for the lucrative E.U. export market. Importers seek producers who can offer consistent supplies of high quality product at competitive prices.

Another potential export market with considerable potential for development is mainland Europe. In the E.U. countries, consumers are much less familiar with sweetpotatoes and roots are not stocked by all supermarkets. In addition, it is marketed as an exotic vegetable and given only a very small display space. Nevertheless, opportunities for increased market expansion exist in all 27 E.U. member states.

Methodology

An analysis of the sweetpotato import and market situation in each of the 27 member states of the E.U. was conducted. All the major sweetpotato importers, wholesalers, and retailers were identified and interviewed to obtain information on the past, present, and forecasted sweetpotato market situation. The current demand and supply situation was determined in each E.U. member state, along with cultivar preferences, retail market packaging, root quality requirements, and product arrival quality constraints.

Results and discussion

The E.U. is the world's most rapidly expanding import market destination for sweetpotatoes. It represents a large and expanding market for those growers/exporters that can provide consistent supplies of high quality sweetpotatoes. Sweetpotato import volume by the E.U. member states has increased from slightly over 20,000

metric tons in 1996 to over 65,000 metric tons in 2006. The demand for orange flesh type roots is fueling the significant increase in E.U. sweetpotato import volume. The U.K. is the leading European importing country, followed by the Netherlands and France, with similar import volumes (Table 1). Together, these three countries import over 80 % of the total E.U. sweetpotato import volume. However, a significant portion of the sweetpotato volume recorded as official imports into the Netherlands and France is re-exported to other European countries. In the case of Britain, nearly all of the sweetpotato import volume is consumed within the country. During the last 5-year period, a consistent trend in import volume has occurred in 20 out of the 27 countries in the E.U. The only countries which have not realized a sustained pattern of import growth are Italy, Germany, Austria, Greece, Malta, Lithuania, and Slovakia. Sweetpotato consumption is highest in the U.K., followed by the western European countries, and Scandinavia. Consumption remains very low in the eastern E.U. nations.

Table 1. E.U. sweetpotato import volume by country (metric tons)

Country	Year										
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
U.K.	4,195	4,272	5,065	6,145	7,431	9,604	11,578	13,290	15,426	25,382	35,122
Netherlands	1,129	1,315	1,081	2,064	2,286	3,034	3,925	4,970	5,037	7,360	9,871
France	2,799	3,455	4,356	4,859	5,367	5,121	6,479	6,591	7,704	7,804	9,511
Italy	3,485	7,648	15,931	10,029	14,811	10,595	13,290	5,305	2,428	2,968	3,437
Spain	138	25	11	1,192	1,117	1,041	998	899	2,234	1,712	1,925
Belgium					167	282	324	360	739	1,442	1,139
Germany	479	317	603	447	444	912	1,302	713	1,097	1,034	999
Finland	23	56	103	117	127	177	243	332	390	539	785
Portugal	147	137	115	176	141	442	325	293	293	1,966	733
Greece	328	1265	465	1,539	939	469	113	1,266	531	249	565
Ireland	21	29	26	129	150	270	326	351	198	365	433
Sweden	97	42	128	113	152	105	144	114	130	141	308
Denmark	15	14	18	31	59	41	50	87	109	88	221
Poland	20	136	6	50	0	120	0	0	5	468	162
Austria	257	82	247	244	213	238	224	256	209	130	79
Czech Rep.	3	6	7	12	8	13	13	14	29	57	44
Slovenia	23	0	0	0	0	1	2	0	40	14	41
Cyprus					1	5	8	10	9	21	31
Hungary	40	4	7	27	0	7	9	0	60	0	20
Luxembourg					48	17	5	5	13	8	18
Estonia		1			1	1	1	1	1	9	11
Bulgaria			1	0	0	0	0	1	2	4	8
Latvia				0	19	9	3	3	2	3	7
Romania	1,061	433	1,430	0	30	18	0	0	6	1	7
Malta				1	1	4	3	6	13	4	4
Lithuania					0	2	2	8	4	4	3
Slovakia	0	2	13	0	0	0	0	3	9	0	1
Belgium/Lux.	5,801	286	123	379							
Total	**20,061**	**19,525**	**29,736**	**27,554**	**33,512**	**32,528**	**39,367**	**34,878**	**36,718**	**51,773**	**65,485**

source: EUROSTAT

Sweetpotatoes are marketed through either retail or wholesale channels. The retail market channel dominates fresh produce sales in the E.U, with an estimated 80 % of the total volume. Within the retail market channel, the supermarkets and hypermarkets control the majority of the retail grocery trade. On average, they represent about 70 % of total E.U. retail sector trade, although this percentage varies between countries. The wholesale market channel is used in marketing an estimated 20 % of the sweetpotato volume in the E.U. However, the sweetpotato exporter to the E.U. can no longer rely on placing product into wholesale markets on a consignment basis as a sustainable marketing strategy.

Within the wholesale market channel, the traditional wholesalers, who are typically located at or near the fresh produce terminal markets in the larger E.U. cities, and the foodservice distributors control the majority of the trade. The wholesalers are the main suppliers of produce to the catering distributors, who in turn provide produce items to the foodservice establishments, including restaurants, hotels, airlines, bars, cafes, schools, hospitals, prisons, and other institutions. Wholesale market merchants also provide sweetpotatoes to

independent grocers, street market vendors, and small shopkeepers. Demand for sweetpotatoes continues to grow within the catering segment, as the foodservice industry requires increasing amounts of convenient and ready-to-prepare/serve forms of sweetpotato. Orange flesh sweetpotatoes are the preferred type in this market segment, although significant volumes of white flesh roots are sold to independent grocers and ethnic market shop owners.

The retail supermarket sector is the principal marketing channel for sweetpotatoes in the E.U. The U.K. supermarkets dominate all other E.U. retailers in import volume. All of the major British retail supermarket stores stock orange flesh sweetpotatoes on a year-round basis. In addition, the foodservice sector is utilizing increasing amounts of sweetpotatoes. In the U.K., four major supermarket chains (Tesco, Asda, Sainsburys, Morrisons) control nearly 75 % of total domestic retail produce sales. Three other retail chains (Somerfield, Waitrose, Marks & Spencer) control slightly over 10 % of British retail produce sales and also stock sweetpotatoes in their retail outlets year-round. Even the emerging discount retailers like Aldi and Lidl have begun to offer sweetpotatoes. Within the last 5 years in British supermarkets, sweetpotatoes have evolved from an exotic vegetable given limited shelf space, to a mainstream fresh produce item with large bulk and consumer pack displays. This represents a dramatic shift from the situation prior to 2002, in which few retailers stocked sweetpotatoes, and the ones who did offered mostly white flesh type roots. Sales of orange flesh sweetpotatoes have recently been one of the leading fresh produce growth items in the U.K. Continued market growth is projected, as consumers become more familiar with the product and its nutritional value, along with the multiple ways of preparing sweetpotatoes for consumption.

Purple or white-skinned sweetpotato types with a white or cream flesh color have very limited demand in retail market outlets. The fresh produce category managers for the leading supermarket chains prefer only orange flesh roots. However, white or cream flesh root types are still popular within certain ethnic groups and are widely found in the wholesale markets, in ethnic-oriented grocery stores, on street markets, and in small shops frequented by immigrants from Asia, Africa, and the Caribbean. This demographic sector of the population comprises less than 5 % of the population, but has the highest per capita consumption of sweetpotatoes.

Organically-grown sweetpotatoes constitute only a very small percentage of the E.U. sweetpotato market and are generally stocked by only a few retailers in the U.K. Nevertheless, this niche market item is experiencing a steady growth in demand. Although no official statistics are available on organic sweetpotato sales, trade sources interviewed indicated less than 3 % of all sweetpotato purchases are for organically-grown product.

The market situation for sweetpotatoes in continental Europe is quite different than in the U.K. There is much less consumer familiarity with the product and the majority of mainland Europeans have never eaten a sweetpotato. Although sweetpotatoes are known and commonly consumed within various immigrant communities, the ethnic market comprises only a small percentage of overall fresh produce sales.

Similar to the situation in the U.K., the retail supermarkets are the dominant market outlet for fruits and vegetables in continental Europe. Sweetpotatoes are typically available only in the exotics area of the fresh produce section of the largest supermarkets and hypermarket stores. Where available, they are typically presented only in small bulk displays. Mainland E.U. retailers do not market sweetpotatoes in consumer bags. Market growth for sweetpotatoes has occurred in mainland Europe and import volumes are increasing, but in smaller quantities and at a much slower rate compared to Britain. Regional differences in demand also exist. Sweetpotato consumption is higher in the western E.U. countries and Scandinavia, compared to the eastern E.U. and Baltic states. Nevertheless, the sweetpotato remains a minor vegetable in all of the E.U. member states outside of the U.K.

Considerable opportunity exists to increase the market penetration and consumption of sweetpotatoes throughout the E.U. Although the demographics and per capita incomes vary between countries, urban populations in each of the E.U. countries represent significant potential growth market opportunities for sweetpotatoes. An analogous situation to what has occurred in the U.K. sweetpotato market this decade is possible within other E.U. countries. However, promotion, advertising, and product preparation information needs to be more widely disseminated in order to obtain significant market growth. Sweetpotatoes are not a domestically grown vegetable in most E.U. countries. Therefore, there is a lack of familiarity with this product among the consuming public. More awareness by consumers on the positive nutritional properties of sweetpotatoes will help to increase consumer demand. The forecast among importers and retailers in continental Europe is for continued growth in the sweetpotato market.

Consistency of supply, high quality product, and competitive price offerings are three essential elements required for success in the E.U. export market. Service support, experience, and established marketing networks are also important. All the E.U. supermarket chains obtain their sweetpotatoes through an importer, rather than purchasing directly from the grower/exporter. However, the supermarket chains set their own grade standards and quality requirements which the importer must adhere to. All suppliers must be Global GAP certified in order to sell sweetpotatoes to the major European retail chains.

The standard container used for marketing sweetpotatoes to E.U. wholesalers and retailers is the 6-kg corrugated carton. This is a widely used container in bulk displays of sweetpotatoes sold in the retail supermarkets. Some retailers also opt to transfer the roots from the 6-kg carton into re-usable plastic containers. Demand is strong for a diversity of root sizes, ranging from small 150-200 gm roots marketed in 500, 750, or 1,000 gm pre-packed bags to large-sized 400- 600 gm roots marketed individually in bulk displays. Three to 5 roots are typically put in a bag, depending on total weight. Blocky shaped roots are preferred over elongated ones, which are prone to tip breakage and concomitant decay. The foodservice (i.e. catering) sector in the U.K. also purchases extra-large roots (700-900 gm size) for minimally-processed products, including chips and fries.

Competition among sweetpotato producing countries for the U.K. and continental E.U. export market is intense. The U.S. is the leading supplier, followed by Israel (Table 2). Both of these countries only export orange flesh roots. 'Covington' and 'Beauregard' are the main cultivars exported by U.S. growers, while 'Georgia Jet' is the primary cultivar supplied by Israeli growers. It is a low dry matter cultivar (typically between 15-16% dry matter) that is not amenable to long-term storage. The majority of the Israeli export volume occurs from August through February. Other countries which supply significant volumes of orange flesh roots to the E.U. are Honduras (Beauregard cultivar) and Egypt (Mabruka cultivar). In addition, China, Egypt, Brazil, South Africa, Jamaica, and Honduras are all suppliers of white or cream flesh sweetpotato types to the wholesale and ethnic markets. Minor quantities of white and orange flesh cultivars are sent to the E.U. from New Zealand, Peru, and Uganda. Among the E.U. nations, Spain and Italy are the leading producers, although production volume is limited and mostly confined to the fall season. Growers in Italy primarily produce white flesh roots, while Spanish growers produce orange flesh roots. Minor quantities of sweetpotatoes are also produced in Portugal and Greece.

Table 2. Source of U.K. sweetpotato import volume

	Year									
Country of Origin	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
	Metric Tons									
U.S.	915	1,148	2,273	2,756	3,215	5,034	5,958	6,886	8,539	13,885
Israel	7	83	50	176	559	576	682	1,280	3,482	6,101
France	661	404	563	870	1,077	1,065	1,674	1,503	711	1,466
Egypt	229	164	101	191	415	829	1,050	1,065	997	875
Jamaica	1,058	723	957	896	557	706	618	694	375	541
Honduras										401
South Africa	1,166	1,046	802	924	1,142	913	847	608	312	372
Brazil	4	3		34	45	63	242	267	422	337
Belgium-Luxembourg			1	7	18	4	16	274	33	314
Netherlands	59	272	126	36	51	81	154	187	139	309
New Zealand									56	278
Spain	67	39	91	160	80	93	114	87	66	244
Ghana		12	26	31	19	21	60	72	52	136
China	0	0			1	2	35	151	39	76
Peru						23	78	83	114	

source: FAO Statistics Division

The E.U. is an expanding market for sweetpotatoes and represents an excellent market opportunity for those producers capable of providing consistent supplies of high quality roots at competitive prices. It will be imperative for sweetpotato producers to continue to make improvements in cultural practices, postharvest care, and packing technologies in order to maximize the quantity of export quality roots.

Promoting innovations in the Peruvian Altiplano
The case of tunta, an ancestral product

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Abstract

Since ancient times, the transformation of potato has been a key strategy for small producers in the Peruvian Andes. It allows them to diversify their consumption patterns, preserve their foodstuff and articulate to market. Tunta (*chuño blanco*) is produced at altitudes of over 4000 meters asl during winter by exposing the potatoes to frost, solar radiation and river flowing 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 along with public and private institutions.

This platform has been endorsed with the following participatory and innovative actions.

- technological improvements to the development and diffusion of good manufacturing practices for tunta processing, certifying its quality
- the formation and strengthening of the "Aymaras Consortium", which has assembled 100 small producers from eight communities in Ilave
- the articulation of 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$ 2,500 per tonne (a higher rate than the traditional market). Currently, producers are empowered and report a substantial increase in each farmer's income, which translates to improvement in their livelihood, increase in crop land and investment in livestock.

Keywords: Tunta quality, stakeholder platform, good manufacturing practices for tunta processing, articulation to markets.

Tunta and its characteristics

Potato is one of the crops of great importance for the communities in the Andes, where its biodiversity has been preserved. Processing it gives aggregated value to the product, allowing the communities to diversify its consumption, preserve food and attain effective coordination with the market. One of the processed products is tunta, also known as *moraya* (in the Quechuan zones) o *chuño blanco* (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 zones of the Peruvian highlands (Puno region). Tunta 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.

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
Sour native (contains glycoalcaloids)	*S. Juzepczukii*	Piñaza, Lucki, Locka
	S. Curtilobum	Choquepito, Parina
Sweet native	*S. tuberosum* spp andigena	Imilla negra, Imilla blanca, Sani imilla, Peruanita, Palita
Contemporary types (hybrids)	*S. tuberosum* spp andigena	Canchán, Ch´aska, Perricholi, etc.

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 more regularly employed are the sweet native called *Imilla*, and the sour varieties such as the *Locka*. Other contemporary varieties are also used, such as the *Ch´aska*. See Table 2.

The major production area of tunta is the region of Puno, mainly concentrated in communities located above 4,000 meters above sea level, where "heladas" (freezing spells with drastic temperature drops to -5° C) occur in the winter time, and water supply is available (such as rivers or lakes), which are the key elements for producing tunta. It is estimated that the province of El Collao (the most important zone 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 less quantity, Lima). Slowly, tunta is being exported to Spain and the United States to cater to the Bolivian and Peruvian communities residing in those countries.

The studies conducted in these zones (Villena & Caro 2002; Lacour & 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 producers does not allow a coordinated operation to generate technological and commercial improvements. In addition to these disadvantages, there is a market which is restricted to the traditional regional sector.

Within this context, the INCOPA project, implemented by CIP (International Potato Center) with funds from the Swiss Agency for Development and Cooperation (SDC), has, since 2005, supported the work platform "Alianza institucionál para el desarrollo competitívo 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, NGOs and private producers' firms. The aim is to promote improved competitive production of tunta through technological innovation and through the strengthening of organizations and articulating the market with a product of quality (Gianella, 2004; Fonseca & Ordinola, 2009).

Improvements in technological innovation

Quality improvement work was initiated in 2005. This was based on analysis performed (Cota, 2005) drawing on local experiences, and brought together a group of leading producers from El Collao to jointly develop innovations in the tunta production process.. Several participative trials were performed, in which critical points affecting the quality of the final product were identified. With the results of these trials, traditional "proficient processing practices" ["*buenas prácticas de procesamiento* (*BPP*)"] relating to tunta were developed, keeping in mind the ancestral technology of the producers.

BPP influenced such aspects as

- the selection of the potato (raw material), discarding pieces that were damaged by plagues, such as the Andean weevil (*Premnotripes spp*) and rotting diseases caused by fungus
- the use of floor mats (mantas) avoiding 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 water ponds of stones (pircas), which helped to obtain sweet-smelling tunta free of stains
- adequate practices for peeling and cleaning processes.

At the same time, the use of adequate working clothes, such as overalls, rubber boots, gloves, hats and face masks were emphasized, which improved safety conditions for the producers and ensured the healthiness of the final product.

The results of the investigation were used to prepare training material such as a poster for *BPP* and the Guía de las BPP Artesanal de la Tunta (Fonseca *et al.*, 2008). Technical personnel and producers participated actively in these events and the guide has become an important piece of training material for improving the quality of tunta both within the target group and in adjacent communities within the project's sphere of influence.

The producers' leaders received coaching lessons on tunta BPP. They were trained as 'farmers' 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 in tunta BPP by farmers' promoters. Ilave, Puno

The following basic aspects of BPP 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 thathelp in obtaining a quality product (fishing nets)
- use of appropriate attire.

The producers that have been trained and their neighbors are adopting the BPP 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 demand and the market price.

Alongside the training, and on a larger scale, between 2007 and 2008 the work platform developed two Peruvian Technical Norms for Tunta, in conjunction with PRODUCE (Ministry of Production) and INDECOPI (Instituto Nacional de Defensa de la Competencia y de la Protección de la Propiedad Intelectual). This is to control the quality of the product and to contribute to its positioning in more demanding markets. (summoning representatives of the productive, commercial and consumer sectors of the region of Puno). The approved Technical Norms 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. , During 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 of tunta BPP development and the organization of supply links to access the market.

Consorcio Los Aymaras is a small business formed by the producers' leaders of eleven associations. "The Consorcio unites 100 producers, mainly small farmers, coming from eight rural communities and from three micro basins from Ilave (Table 3). They produce on average 1.25 t of tunta per year, using 7 tm of fresh potato, of the sweet native varieties as well as sour 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 Consorcio Los Aymaras, through producers' organizations

Micro basin	Camillaque	Huenque	Ilave
Community	Churomaquera	Concahui	Chijichalla
	Quellicani	Cutimbo	Jarani
		Jalamilla	
		Yarihuani	

A very important initiative for the creation of the Consorcio, has been the involvement of the leaders as 'commercial driversin 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 & 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

At the same time as the organization was improving and traditional BPP for tunta was implemented, the work platform designed, along with Consorcio Los Aymaras, strategies to expand market access and develop a commercial brand, Los Aymaras As a result of BPP practices the Consorcio had a product of excellent quality. They were able to obtain sanitary registry (R.S. DIGESA:N16036N/TECNLS) and greater potential for articulating different markets.

In 2006, the Consorcio began commercial transactions with supermarkets to introduce tunta as a quality product oriented to higher economic bracket social levels. The aim was to improve its image and to widen its consumption. Thus, the brand Los Aymaras is commercialized in packages of 300 grams 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 Day of the Potato. Sales reached 6,000 packs (1.2 tm), which has prompted a change in the concept of quality and has motivated other producers' micro businesses to sell tunta in packages of 0.5 kg., (although they were generic.)

The commercial brand Los Aymaras (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 productive chain, done during 2003 (Lacour & Guiet, 2003) indicated that the price of tunta in the Ilave fair was between S/. 1.5 and S/. 3.0 per kilo (according to quality). Signalling an important increase since the Consorcio began working in 2006. by 2009 prices had risen to up to S/. 9.00 per kilo (an increase of 200%).

Figure 3. Tunta Los Aymaras in Tottus supermarket – Lima. Commercial promotion supported by Gastrotur Perú

In 2007, commercial experience was expanded through the wholesale of the Los Aymaras brand in 50 kg sacks for the markets in Ilave, Puno and Desaguadero on the border with Bolivia. Consequently the Consorcio's small producers commercialized an average of 1.0 tm of guaranteed quality tunta in 2008, mainly at Ilave's weekly Sunday fair. . They sold a total amount of 70 tm of tunta at US$ 2,600 per ton. Another group of 30 larger producers sold a total of 150 tm at the markets of Ilave 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, 208; MIMDES, 2008), and it is still consumed today, in rural as well as in 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* (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 supported 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 well in sweet as as salty dishes meaning it can serve as the base for soups, stews and desserts. Chefs declared that tunta was a very 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 of camarones" (shrimp soup), it takes on the flavor of the shrimp and italso blends very well with aromatic herbs" (Anabel Augusto).

As a result, more than 20 recipes were developed out of which some stand out: 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.

These culinary 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 culinary schools and restaurants participated in these activities and are contributing to improving tunta's image In the case of Puno, they have introduced this ingredient on the menu of tourist restaurants that want to promote Peruvian food (see Figure 4).

Figure 4. A simple and innovative dish: 'encebollado de tunta con queso' (tunta served with Andean cheese and fried onions, tomatoes and chili)

On the way to generating impact

The combination of improved technology, organization and market articulation 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 strengthening of the producers has had a significant influence. This has affected men as well as women and has resulted in the positive generation of a network that impacts their families and their communities. The producers point out that they have doubled production and sales due to the improved tunta quality, which resulted from applying BPP and a better understanding of the market. The testimony of one female producer (Teresa Ramos) claims "with the trainings I learned a lot; I feel I have grown; I like to teach others what I have learned; besides, my tunta 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 families' incomes. They have used their revenues mainly for

- increasing their farm land to grow potato to produce more tunta
- the acquisition of livestock to fatten and sell for slaughter
- improving their households within their communities and the construction of dwellings in the city of Ilave.

Twenty percent of the producers connected to the Consorcio turned into producer-gatherer, as in the case of one associate (Constantino Flores) who declared: "with the support of my wife, now I buy tunta to my neighbors to sell it in Ilave and Desaguadero at a price profitable to all of us."

Conclusions

As seen from this experience, tunta offers great potential, and the achievements accomplished by improving its competiveness provide the foundations for commercial growth within national as well as international markets (Bolivia, Spain and the United States). It should be noted that tunta already has its custom classification: 0712.90.90.00 (Project BID-ADEX –RTA, 2008), 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 advancement as part of an integrated effort promoted by INCOPA) and therefore the product can be firmly placed in more demanding markets.

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Dealing with innovation in response to market opportunities and poor farmers´ needs: The case of the Bolivian Andean Platform promoting technical and commercial innovation in the native potato market chain in the Andean highlands in Bolivia

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Abstract

Agricultural development in developing countries is taking place in the context of rapid urbanization and increasing market integration. Such context poses multiple challenges as well as opportunities to economic agents (including poor farmers) but also to agricultural R&D organizations and other development agencies if agricultural innovation is to be responsive to poor farmers´ needs. Using the innovation system perspective as a conceptual framework, this paper presents and analyzes the experience of the multi stakeholder platform ANDIBOL in fostering pro poor technical innovation in response to market opportunities.

Keywords: Bolivia, innovation system, potato, chuño, market chain, stakeholder platform.

Introduction

Changes in urban consumption habits and the increasing importance of new actors in food markets (supermarkets, food industries and retailers) are exercising increasingly pressure over production practices and resources of small farmers and other small and medium scale market chain actors, which in turn have limited access to market information, services, technology and capital, and inferior bargaining power to compete in this evolving context.

The panorama described above, not only poses multiple challenges as well as opportunities to economic agents (including poor farmers) but also to agricultural R&D organizations and other development agencies. Although very frequently market opportunities have been signalled 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 still a challenging question in the current debate of agricultural development.

Bolivian farmers habiting Andean highlands are among the poorest in Latin America. Native potatoes varieties and the local knowledge for their cultivation and transformation are perhaps the unique resources possessed by farmers in these areas. Fresh native potatoes and traditional freeze – dried potato product known as "Chuño" are normally used for home consumption, intra household exchange and trade in local markets. This paper report 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 transformed product (chuño) in most demanding urban markets.

The ANDIBOL experience has been analyzed from the perspective of the "Innovation system framework" focussing on the associated processes of collective decision making and knowledge sharing undertaken by actors within ANDIBOL in order to provide insights about the potentialities, challenges and implications for agricultural development programs and projects that entail bring 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 in the fallowing lines in order to create a conceptual framework to analyse the experience of ANDIBOL in fostering commercial and technical innovation.

We start 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 between them in the process of generation, accumulation, diffusion and use of knowledge in response of 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; Berdegué, 2005; Hall, et al, 2001; World Bank, 2007).

The first element in the previous definition that deserve attention is that explicitly recognizes that innovation is an interactive process which often requires quite extensive relationships to sustain knowledge acquisition and permit interactive learning. Most of the literature on innovation system 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) notes 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 whose different agendas and demands nourish the process.

Second, such recognition introduces a wider perspective about knowledge and their sources. Knowledge generation is no longer seen as separate from its context of use as it has been seen in more traditional approaches (Johnson et al, 2003; van Kerkhoff and Lebel, 2006). This consideration permits move the 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 "put new knowledge in to use" - means among other things that agricultural research organizations confront the challenge to gain new skills and capacities and to change their working schemes to closely cooperate and coordinate with actors from the demand side if technological change is to be responsive to end users´ needs. On the other hand signifies that the innovation process necessarily takes in to account multiple sources of knowledge; 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 corresponds to the institutional context in which innovation takes place. If it is admitted that the pattern of interaction and interactive relationship between actors impinge on knowledge flows, there is an explicit recognition that the set of rules and norms governing such relation really matter for innovation.

Finally, under the innovations system perspective it is possible to assert that improvements on the nature and extent of the interactions between 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, 2007; Hall 2001; 2006; 2007; Hartwich et al, 2005; Hartwich et al, 2007; Johnson et al, 2003; Spielman, 2005; Berdegué, 2005; The Wold Bank, 2007).

The Case: "The Bolivian Andean Platform (ANDIBOL)"

ANDIBOL is a market chain platform bringing farmers' 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 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, 2008).

The efforts to build the ANDIBOL started in 2003. At this time PROINPA Foundation used the Participatory Market Chain Approach[3] 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 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, participants established the 'Bolivian Chuño and Tunta Platform', formalized as the 'Bolivian Andean Platform ANDIBOL'. (Devaux, et al, 2008. p. 35).

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 their activities and has got additional financial resources to support new projects. The platform today is facilitated by PROINPA and represents 13 core members including four farmers' associations with around 200 members, processing firms, development projects, NGOs and other service providers (Devaux et. al, 2008).

The following sections present the experience carried out by members of ANDIBOL in searching and adapting two specific technologies to overcome chuño quality problems in response to market opportunities.

The process of technical innovation in response to market opportunities: Details and results

Market opportunities as 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 scales firm dedicated to the transformation and commercialization of natural Andean products, revealed to its R & D partners in the platform the necessity to improve chuño quality to respond urban costumers´ requirements specially in terms of size and shape uniformity, cleanness and absence of peel and of pest damages. 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, achieving such exigencies signified the searching of technical alternatives that permit farmers to improve their process of transformation.

It is interesting to see that Ricafrut didn´t articulate a demand for a specific technology; the demand was posed in terms of what can be named an "explicit demand" or the manifestation of a problem that need to be solved (Bentley, J. et al, 2004); in this case the necessity to solve quality problems. Once the demand was set up, it was translated in to what ANDIBOL denominates a "research mandate" or the commission passed to the R&D organizations to search for technical solutions to overcome concrete constraints hindering farmers and/or firms make profit of market opportunities.

Looking for technical alternatives

According to the research mandate, PROINPA and KURMI started the hunt for technical alternatives to solve quality problems at field level. They found the existence of a local retailer using a manual machine invented by him to remove chuño peel. They also found that some year ago CIFEMA (a R&D organization outside the platform dedicated to develop animal drawn tillage implements) had already developed a prototype of a manual machine to classify fresh potatoes. The performance of this machine, however, was never tested with the kind of potatoes that farmers use to obtain chuño.

[3] The Participatory Market Chain Approach (PMCA) is another approach developed and promoted by 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).

Both machines were taken as starting point to carry out a process of participatory research to find out if they solve marketing limitations and if they were appropriate to farmers work conditions.

Adapting and improving the peel remover machine

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 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@ (11 Kg.) of chuño, the human effort necessary to operate the machine manually, the appropriate velocity with which the cylinder need to be turned to achieve a good product, and the resistance of the materials with which 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 verify if the chuño obtained fulfill market quality standards.

Two months after, in a meeting with the presence of farmers, researchers and local authorities the results achieved were presented and the following suggestions were offered:

- The material of the internal mechanism needed to be replaced with stronger material to avoid erosion
- Introduce chuño into the machine was very difficult; therefore there was a need to install a kind of funnel on the peeler top.
- To facilitate the separation of removed peel, powder and clean chuño, it was necessary to add a sieve on the bottom part of the machine.
- Finally, the peeler machine was extremely noisy

There was not possibility to work on those improvements with the local mechanic, so CIFEMA experts were contacted and the suggestions were passed to them. Aside from working on the aspects mentioned above, CIFEMA introduced modifications to improve durability, to facilitate the reparation and replacement of parts and also investigating on the type of cover material 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 @ has been reduced from 4 hours to 20 minutes
- Normally chuño was peeled by women; now with the machine, men and women we share this work.
- We obtain clean chuño and without peel and we are able to satisfy the quantity of chuño required by the “empresario” (Ricafrut manager)
- The firm (Ricafrut) no longer refuses our chuño
- In the local market our clean chuño also receive 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 it.
- We will try to get founds from the local government to buy more machines.

Peeler machine first model

Peeler machine second model

Peeler machine final model

Adapting and improving the classifier machine

To start the process of research, PROINPA´s researchers bought a classifier from CIFEMA and exposed it to farmers. In order to make the machine usable to classify chuño, the first idea that they proposed was to change the sieves used to classify potatoes in the original model for sieves specially designed to select chuño. However, the farmers refused this idea arguing that the process of selection starts with the classifications of fresh potatoes and therefore the only think that they had to do was to adapt the shape and size of the sieves according to the kind of potatoes that they use to obtain chuño.

This information was communicated to CIFEMA experts, who transformed the sieves and then sent it back to the farmers´ field. As with the peeler machine, the new classifier was distributed to be tested in 4 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 there was the necessity to add 4 wheels, instead of the 2 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 avoid looses.

Coming back to the CIFEMA´s mechanic shop, the experts worked introducing the changes proposed by farmers and additionally on modifications to improve the mechanisms of rotation and to facilitate the operation of changing sieves.

Twenty four improved potato classifiers are currently used in 16 different communities. Initial information about its performance has been gathered interviewing farmers:

- The time required to classify potatoes was reduced from 12 hours to 5.
- Normally women were in charge of this extremely hard work; our hands suffered injuries. Now we join this work with men and our hands no longer suffer.
- We have chuño of better quality because working with selected potatoes the frost acts uniformly.
- We obtain benefit also from selling our fresh potatoes, because classifying potatoes by size we obtain better prices in the local market.
- As well as with the peeler we are not able to buy this machine due the price (350 US Dollars each), but we want it. We are going to look for support from the local government.

Classifier machine initial model

Classifier machine final model

Viewing the experience from the innovation systems perspective: Lessons learned

At first glance the experience of adapting and improving technology shown in the precedent lines doesn´t differ in a significant manner from other experiences of participatory research. Nevertheless, viewed from the angle offered by the innovation system perspective, this experience permits to draw some lessons to aid agricultural R&D organizations and other development agencies to be responsive to farmer´s needs and market opportunities at the same time.

Very frequently market opportunities have been signaled as a trigger for innovation mainly in the private sector and recently in the small rural household sector in developing countries. When participants in a well functioning market chain share information on market opportunities and challenges, they also provide important information to shape the direction of the innovation processes (Word Bank, 2007, p. 24). However, in developing countries where poor farmers are marginalized or have disadvantages to participate in market chains, there is a need to strength farmers´ capabilities to participate in favourable conditions and to have a feedback flow of information on poor farmers´ needs.

In this sense, the experience has shown that ANDIBOL offered the space to guide the direction of the technical innovation not only on the base of farmers demands but also incorporating the interests and knowledge of actors close to the demand side, making in this way that market opportunities effectively function as triggers for innovation. The experience also illustrates that in the context of stakeholder interaction, the participating R & D organizations have access to useful information to define and adjust its research agenda according to what end users really need. This last point has been highlighted by PROINPA and KURMI referring to the advantages to receive concrete assignments (ANDIBOL´s research mandates) to look for technical solutions to solve specific constraints.

Take advantage of market opportunities and allow farmers to effectively participate in making profit from it, requires among other things that the process of technical innovation, and its associated research activities, follow the pace with which market evolves. ANDIBOL as a space where information and knowledge can be directly obtained from interested parties and where market demand can be combined with information on what farmers require to respond to those demands, speeds the process of decision making on what has to be investigated and reduce the transaction cost associated with the search of useful information.

On the other hand, the experience has shown that during the process of participatory research the combination of different sources and types of knowledge, tacit or codified, coming from farmers, firms and scientists, and the use of feedback mechanisms, speeds the achievement of technical solutions to concrete problems and opens 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 stakeholders platforms like ANDIBOL, means that agricultural research organizations confront the challenge to gain new skills and capacities and to change their working schemes to closely cooperate and coordinate with a wide range of actors.

Different groups have different internal laws, rules, regulations, norms, 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 constitute an impediment or a potential for innovation. This task involves the development of skills and capacities to:

- Interpret different institutional contexts and harmonize different agendas.
- Integrate 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 fulfilment of these functions could result in the formation of "spaces for innovation" in which social learning, social capital formation and joint activities can be fostered.

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