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New Life for Ancient Grains: Improving Livelihoods, Income and
Health of Andean Communities

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INTRODUCTION

Agricultural biodiversity offers poor communities living in harsh environments options to improve their livelihoods, generate incomes, attain food security and enjoy better nutrition and health. The nutritional content of Andean grains, seen in their high quality proteins and rich micronutrient profile, their hardiness, good adaptability to environmental stresses, versatility in use, and rich associated food culture and traditions are among the reasons for their widespread use in the Andes and their appreciation by local civilizations over millennia. In spite of these positive traits, the role of these species as a staple food has dramatically changed in the last four decades due to their poor economic competitiveness with commodity cereal crops, lack of improved varieties or enhanced cultivation practices, drudgery in processing and value addition, disorganized or non-existent market chains and a widespread mistaken perception of their being the “food of the poor”.

Several projects and collaborative research frameworks at national and international level have been launched to contribute to reverting this trend and revitalizing these ‘forgotten crops’. To that end, an important role in demonstrating the value of NUS and the development of best practices, methodologies and tools for their use enhancement is being played by the ‘IFAD NUS Project’. Launched in 2001, this initiative represented the first UN-supported global programme dedicated solely to the use enhancement of these species, tackled through an international, participatory, multi-stakeholder and highly multi-disciplinary effort. With regard to the Bolivian and Peruvian components of the project, 34 project sites - each consisting of 20 to 120 families - have been involved so far during the first and second phases. As a whole, more than 1,170 families have been directly involved in the implementation of the project, a fact that underscores the wide community participation in the initiative. The global coordination of the Project is carried out by the international research organization Bioversity International based in Rome (Italy), while Fundación PROINPA, and CIRNMA are the two national agencies implementing the work in Bolivia and Peru respectively and coordinating activities undertaken jointly with a wide range of over twenty stakeholders from local NGOs and private enterprises such as food processing companies to universities, various research organizations and extension workers. The reach of the stakeholders covers a broad spectrum of expertise from grain production to nutritional analysis, conservation, marketing, eco-tourism, food quality standards and policy. Highlights of this international effort are presented under the eight main areas of focus of the project.

MATERIALS, METHODS AND RESULTS

Area 1: Participatory selection of higher yielding varieties, resistant to drought, frost, pests and diseases.

The lack of suitable varieties, or predominance of low yielding and /or pest and disease susceptible varieties is very often a major bottleneck hampering the promotion of neglected and underutilized species (NUS). Researchers and farmers have worked together to develop higher yielding varieties that are more resistant to pests and diseases. Building on available local material and breeding

lines, the project organized participatory selection activities targeting three species of Andean grains, viz. quinoa (*Chenopodium quinoa*), cañihua (*C. pallidicaule*) and amaranth (*Amaranthus caudatus*). More than 42 evaluation trials were carried out between 2001 and 2008 as a whole in Bolivia and Peru. Selection criteria included the identification of most useful market traits and relevance of traditional uses to peoples' livelihood. Gender-related criteria were also deployed as means to strengthen women empowerment. Six improved varieties were selected and distributed to communities across Bolivia and Peru. A special saponin-free quinoa variety was also developed in Peru and made available to farmers.

Area 2: Reintroduction of lost varieties to farmers

Important diversity of target species was found under severe genetic erosion as communities abandoned their traditional grains in favor of commodity crops. Surveys involving 467 families across 5 provinces in the department of La Paz in Bolivia showed that only 40 varieties quinoa and 20 of cañihua were being cultivated out of at least 200 varieties cultivated in the past. Between 2001 and 2008, 40 additional varieties obtained from genebanks were successfully reintroduced to farmers' fields.

Area 3: Strengthening of ex situ conservation through gap filling germplasm collections in centres of diversity and characterisation, multiplication and regeneration of genetic diversity.

Strengthening the *ex situ* conservation of the genetic diversity of Andean grains is vital for their sustainable use. The project supported the upgrading of existing national seed collections of Andean grains through the improvement of their conservation capacities and the widening of their diversity holdings. Beneficiaries of these interventions were the National Andean Grains Gene Bank of PROINPA in La Paz (Bolivia), The Fito-ecogenetics Research Centre (CIFP) Gene Bank of Pairumani (Bolivia), the Gene Bank of the National Altiplano University of Camacani (Peru) and the Gene Bank of the Experimental Station of the National Institute of Agricultural Research and Extension (INIEA) of Illpa (Peru). These measures benefitted more than 7,000 accessions maintained as a whole in these collections. The multiplication of 536 accessions of quinoa maintained at the Illpa gene bank was also supported, along with the regeneration and characterization in the field of important agronomic traits.

Area 4: Documentation and rescuing of local knowledge and institutionalization of Diversity Fairs to promote exchange of knowledge and genetic material;

The loss of indigenous knowledge associated to plant genetic resources is a widespread phenomenon which raises great concern over the sustainable use of agrobiodiversity and the narrowing down of the cultural heritage and traditions within communities; which in turn reduces visibility, pride and self esteem of community members (Thies 2000, Rojas *et al.* 2009). Local communities have been surveyed to document local knowledge about cultivation methods and uses of Andean grains. Old and new recipes for cooking Andean grains were also gathered in a participatory manner through discussions and focus groups with local women. Andean grains are used for both human and animal consumption, and also for medicinal and religious purposes. Several diversity fairs have been organized to promote the exchange of knowledge and material. These events are important instrument to facilitate the sharing of information among value chain actors and strengthening their networking. Information shared during the fairs includes data on ethnobotanic uses, agronomic characteristics, commercialization and transformation, which is valuable for the promotion of agrobiodiversity, and NUS in particular (CIRNMA, 2004; FAO, 2006). In Bolivia, these were the first diversity fairs of their kind and have now become regular institutionalized events.

Area 5: Development of better cultivation practices, low cost technology for threshing and removal of saponin meant to reduce drudgery and increase household consumption of crops for nutrition security.

According to participatory surveys made with stakeholders, main obstacles to the use of Andean grains are to be found in post harvest and value addition. For that reason, special attention was devoted by the project to the development of technological solutions to improve threshing as well as saponin removal from quinoa (cañihua and amaranth not requiring this operation). In Bolivia two prototype threshing machines were designed, built and validated by community members.

Results showed optimal operation, with a performance of 95 kg/h of threshed grain, compared to 100 kg/day as achieved by existing manually-operated machines. These prototypes respond to farmers' demand for lower levels of contamination by stones and grit, reduced loss of grain, suitability for small and medium operations, and easily transported field equipment at accessible prices (PACOSILLO, 2003; QUISPE, 2004).

The drudgery involved in processing is a major obstacle for limiting the use of Andean grains by local communities (preparing quinoa for food can take women up to six hours of work).. Although saponin confers pest and disease resistance, it makes the grain bitter and can be toxic if consumed in large quantities. Machines to remove saponin have been manufactured and distributed to women associations, reducing processing time from 2 hours to seven minutes.

Area 6: Assessment of the nutritional variation of target crops in raw and processed products and awareness raising among urban consumers along with popularization in restaurant chains.

The nutritional value of cañihua, quinoa and amaranth has been widely promoted through radio, television and newspapers. The project promote the establishing of a strategic alliance between the 'Alexander Coffee' coffee-shop chain, the PROINPA Foundation and 'La Paz on Foot' (a Bolivian eco-tourism organization), the Italian NGO UCODEP and Bioversity International, aimed at raising awareness over the benefits of these grains. The campaigns launched by this alliance have had the purpose of informing customers about the nutritional benefits, agrobiodiversity, and recipes of the Andean grains through educational cards placed on the tables of the Alexander Coffee shops. Likewise, this company has developed novel products prepared with Andean grains. In the month destined for the promotion of quinoa, a quinoa cake, a quinoa "wrap", a quinoa salad and a new quinoa biscuits were also presented to the public with great success, which are now part of the daily menu.

Area 7: Development of national quality standards for the commercialization of target crops, allowing communities to enter into lucrative export markets.

In both Peru and Bolivia seminars were held involving representatives of the Ministries of Agriculture and Commerce and from the private sector to discuss ways of promoting quality introduction of standards for Andean grains while maintaining diversity in production systems.

One fundamental task to promote quinoa, cañihua and amaranth in national and international markets is support in the development and review of technical regulations that determinate quality standards of Andean grains. Through a coordinated work with the Bolivian Institute of Quality and Standardization (IBNORCA), technical regulations for cañihua and quinoa were developed (IBNORCA, 2002), the first of their kind in the country. These achievements were later supported by other projects managed by the PROINPA Foundation and, in the framework of the NOREXPORT Programme, a regional trade and capacity-building group, work is being done for the development of Andean technical regulations. The Projects for Andean Cereals Regulations are being negotiated, with the participation of representatives from the IBNORCA network and its counterparts in Colombia (ICONTEC), Ecuador (INEM) and Peru (INDECOPI). Furthermore, a project has been developed for the regulation of popped quinoa. The regulations developed allow quality standardization (in this case related to quinoa and its processed products), contributing to better commercial flows, thus eliminating possible customs barriers (SOTO, 2008).

Area 8: Capacity building of community members over enhanced practices, value addition, nutrition and marketing, and development of collaborative platforms to scale up experiences and reinforce sustainability of use of target species.

Greater consumption at the family level (particularly among children) has been promoted by the project through novel and more attractive recipes for cookies, cakes, juices and other products. Participatory culinary aptitude tests were organized to test biscuits and cakes prepared with quinoa, cañihua and amaranth, including a variety of juices made of these grains combined with fruits.

In order to broaden the impact of the project beyond its pilot sites, Bioversity and its partners have developed a strategy for the up-scaling of tools and methodologies through the involvement of national value chain actors. An important step in that direction is represented by three stakeholder consultation meetings planned for November 2009 on "*Strategies to Exploit the Value Adding Potential of Andean Grain Diversity*". During these meetings, case studies of successful marketing

and value adding strategies of these species (such as processed products, certification schemes and the potential of geographical indications) will be presented and analyzed to collectively identify the most strategic areas of intervention for furthering the sustainable conservation and use of these species in Bolivia and Peru. The meeting will also promote strategic and innovative alliances among different value chain actor groups (public and private sector, research organizations, development projects, farmer associations).

CONCLUSIONES AND OUTLOOK

The IFAD NUS results have proven that Andean grains, like many other native crops from the Andes, can offer local populations profitable income opportunities provided that a more holistic and multi-disciplinary approach is though deployed for their promotion.

For quinoa, increased demand for export to Europe is leading to booming cultivations both in Bolivia and Peru. These are being made often without any crop rotation, following very unsustainable production systems. The impact of these practices on the fragile soils of the Andean region needs to be assessed in order to avoid negative repercussions on the agro-ecosystems that would jeopardize future cultivation. More sustainable cultivation practices are needed to allow farmers to seize emerging income opportunities while maintaining both diversity and ecosystems functionalities.

Over the last five years, the variation in climate patterns has been very high in the Andes with profound effects on local cultivation. Surveys made by the project have revealed an increase of production losses in Andean grain cultivations in the order of 23% on average. Urgent studies are thus necessary to shed more light on this phenomenon and better understand how local varieties can be better mobilized to mitigate risks associated with climate changes.

As demand for functional foods and alternative non-food products (such as the industrial use of saponin) from Andean grains rises, more research is also needed for the development of community-based technologies along with capacity building interventions in order to empower farmers to benefit from these emerging opportunities. Greater linkages should be created between biodiversity-rich but economically poor regions of the Andes and tourism companies so as to promote sustainable, community-based eco-tourism initiatives.

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