

Characterization of traditional potato seed producers in Bolivia

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Abstract

Potato is strategic for food sovereignty and the economy of thousands of families in the Bolivian Andes who are dedicated to the production of this crop. The traditional seed-supply system provides more than 90% of the seed required for potato cultivation in Bolivia, and also a larger diversity of varieties than the formal seed-supply system offers. Farmers in charge of traditional potato seed production are usually farmers who stand out from other growers not only at personal level but also because of their accessibility to ecological and productive environments that allow them to produce quality seed. Seed growers also act on the basis of incentives, which are not necessarily monetary and also change according to the context and environmental, social, economic and political environment, which also influence the perspectives (threats and opportunities) of the seed farmers of the Bolivian Andes. This document reviews aspects that characterize traditional potato seed producers as well as a suggestion on what needs to be reinforced to allow seed growers to continue with their work.

Additional keywords: Potato seed, traditional system, high-Andean seed producers

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Introduction

Potato is the product with the highest economic contribution of the Andean area's peasant sector in Bolivia. This product has a significant impact on income generation, contributing to employment and is an important source of food for the population. Nationally, it is the fourth product with the highest production after sugarcane, soybean and corn, and also fourth with the largest area cultivated after soybean, corn and sunflower (INE 2016).

The current certified seed supply constitutes only 5% of the annual requirement for potato seed in Bolivia. The traditional seed system, on the other hand, has a high capacity to spread economically accessible seed and a broad portfolio of varieties that in Bolivia varies by region. Farmers have technologies to maintain seed quality, nevertheless not all of them follow best practices, which arise worries and doubts about the quality of seed from the traditional system regardless of origin or variety (Thiele, 1999). However, the traditional system offers seed of varieties that farmers want, through channels they know (de Hann, 2009). In this document, we made reference to the characteristics and arguments that make traditional seed producers continue their work as seed suppliers to the potato system in Bolivia.

What traits distinguish the seed producer?

Personal aspects

In the traditional seed system, producers involve the whole family, in which each member has specific roles. For example, the selection, maintenance and quality control of the seed is normally carried out by women. This role seems to be intrinsic to women since pre-Hispanic times in different cultures and with different crops (Tapia and De la Torre, 1997; Conlago et al. 2011; Díaz and Azurdia 2001). Children help the mother in these tasks. Man is responsible for field cultivation, harvesting and transportation.

Seed producers have a tradition that has been built in several generations, so they have a special prestige and confidence before the rest of the members of the community where they belong. Seed management is a practice acquired by traditional knowledge. The new seed producers, those of recent formation, are those who, based on a greater openness to new knowledge and skills, also gain prestige from their community.

A seed producers candidate must have land located in areas suitable for seed production and multiplication. These areas are located at more than 3500 m of altitude in the high Andean puna, they must be healthy land, free of all types of pathogens, better if they are virgin lands but also land with several years of rest (at least 5) is accepted, that are the conditions to ensure adequate fertility and health of the soils destined for seed production (Rioja and Barea 2004). In other words, seed producers are those who have the best land for potato production in their community.

In the event that a producer wishes to access the official certification of the seed produced, their land must be certified (by the competent authority) free of diseases such as bacterial wilt (*Ralstonia solanacearum*), wart (*Synchytrium endobioticum*), smut (*Thecaphora solani*) and pests such as nematodes (*Nacobbus aberrans*, *Globodera pallida*, *G. rostochiensis* and *Meloidogyne*). Some diseases are permissible but at very low incidences, such as rhizoctonia (*Rhizoctonia solani*), powdery scab, (*Spongospora subterranea*), scab (*Streptomyces scabies*) and bacteria soft rot (*Erwinia carotovora*) (Plata et al. 2016, Rioja and Barea 2004).

The base material for the production and multiplication of seed in these lands must be of the highest possible phytosanitary quality (Hidalgo et al. 1997), the tubers must be small in size (like an egg), with short, uniform and robust shoots. Seed producers use traditional or non-formal sources of potato seed to acquire base material for seed

production. A good producer makes a rigorous selection of the acquired seed, therefore he has better technical skills than other farmers for the selection of either his own crop or other traditional places where he obtains seeds either by monetary transaction, through barter or exchange of seed by seed, as a gift, loan, pay for work, among others.

Ideally to start a certified production, the seed origin should be optimally of pre-basic quality (obtained in a laboratory of plant tissues free of viruses) (Hidalgo et al. 1997). The cost of this seed is very high (250/kg Bolivianos or 36/kg USA dollars), practically inaccessible to small producers. However, modern seedlers have understood that it is worth the effort and in several cases, although they fail to have resources for pre-basic seed, they strive to acquire certified seed of inferior quality than pre-basic seed but still with excellent quality sanitary. In few cases, some producers acquire a few kilos of pre-basic every year. These are called "progressive farmers" because they appreciate a good investment.

Due to the costs involved in the seed certification process and the risk that during the certification process the seed fields and/or the seed produced will be rejected by the certifying authority, in several cases, the producers choose to adopt a semi-formal process to produce handmade seed (Bentley et al. 2002). This process consists of acquiring certified base seed from the formal system, following the formal production recommendations, but not certifying the seed production obtained. Under this process, the producers guarantee that the seed produced is still of good quality even if it does not have the seal of the formal system.

Potato seed storage should be carried out under conditions other than potato consumption, that is, in aerated environments and with diffused light (potato consumption should not receive light to avoid greening) (Rioja and Barea 2004, Bentley et al. 2002). Traditional seedlers usually store their seed in

rustic silos, either in their homes in *phinás* in a corner with straw and pest-repellent herbs, or also near homes in hollows or *trojes* that are prepared on the ground and covered with straw, repellent herbs and earth. The "modern" seedlers with the support of development projects, have access to silos built with the characteristics recommended to store quality seed.

Incentives for the seed producer

Traditional incentives

Seed production normally requires greater investment of time and effort, which is an incentive for seed producers because they get access to additional labor to meet the requirements of the production process, and because of this labor they expand their social relations and can also access to seeds from other varieties or other crops.

The social relations of production and reciprocity are strengthened, such as *ayni*, which consists in the reciprocal provision of the labor force in times of harvest and sowing; the *minga*, which is a provision of labor power by products; and the *umaraka*, which consists in providing the labor force for food and drink (Aramayo 2007).

Current incentives

Due to the economic and social importance of the potato in Bolivia, the demand for seed is constant, not only for the traditional cultivation areas of the Andean part, but also for winter cultivation of the low mesothermic valleys of the country. Production for the 2005-2007 period was carried out in an estimated area of 126,943 ha (Zeballos et al. 2009). This reference makes it possible to estimate that the approximate national seed requirement is approximately 190,000 t of seed per year considering that 1.5 t of seed per hectare is used on average.

Monetary benefits from the sale of seed are attractive to seed producers, when they have the potential to insert the seed into local and regional markets. According to recent

calculations, it is estimated that seed production costs increase up to 10% compared to the production costs of potato for consumption, which is significant for small producers who have to acquire high quality base material for the production process of seed, but in compensation could generate more income (even double) by the sale of seed compared to potato consumption².

The production of healthy and diverse seed increases the value of the seed area, because it opens up the possibility of greater investments, for example to improve conditions for residents with access to basic services like electricity, roads, bridges, irrigation systems, among others.

Perspectives of the seed farmer

Threats

Climate change consequences and unpredictable climate variability, such as the irregularity of rainfall (changes in the rainfall pattern and greater intensity in shorter times), make productive systems more vulnerable due to the almost total dependence on production with climate conditions.

The given climatic conditions during an agricultural cycle also influence the price of potato seed. When it is a “good year”, there is good production, there is a lot of supply for the surpluses generated, which reduces the price. In “bad years,” there is little production, high demand, and therefore, prices increase (Aramayo 2007).

There is also the danger of reducing traditional seed areas due to soil health problems. According to recent studies, it has been verified that diseases not previously present in high Andean areas above 3000 m of altitude, due to climate change, are already affecting these soils, like the bacterial wilt

disease which was previously only found in valleys of Bolivia (<2300 m of altitude) now it is located in high areas (puna, high plateau, headwaters of the valley) (Castillo and Plata, 2016; Plata et al., 2016). In some situations it is not possible to detect this disease because it is asymptomatic in high areas, but the problem increases when the seed of those areas reaches low areas of commercial potato production. Once the wilt infects seedlings, it is discarded as a seed producing area.

The current strict regulation on seed certification is a disincentive for producers, because the reality is that practically all soils producing potatoes are affected with phytosanitary problems. Many traditional seed production soils have been disqualified by current regulations due to the presence of pests and diseases, although they are in very low percentages.

The indiscriminate movement of seed between different high and low zones, driven by unscrupulous traders, means that there is a greater diffusion of diseases also affecting the seed areas.

The rugged topography of the potato areas and the poor conditions of the communication routes (Aramayo 2007) make transport more expensive, increasing the costs of seed production.

Another threat is the high migration of farmers from rural areas to cities and the subsequent abandonment of the countryside. Situation that is leaving only elderly people or economically non-active population in the countryside³.

Opportunities

Climate change, on the other hand, at least in the case of potatoes, is causing crop areas to be expanded to higher areas because climatic conditions are less drastic than before due to

² According to data from the 2015 Technical Report. Project Improvement of seed systems for food security for small producers - Bolivia Component. PROINPA Foundation.

³ Before the Agrarian Reform of 1952 the rural population in the country was 74%, to date this population was reduced to less than 33% (Population Census Data 2012, INE).

an increase in temperature (Jarvis et al. 2008). These areas were usually dedicated to grazing, they are virgin soils with abundant organic matter, therefore suitable for potato seed production.

The current political and social context in Bolivia that favors greater openness to the use of native products, is also an opportunity to expand the portfolio of varieties and native diversity, and therefore to demand seed of those products that are normally in the hands of small seed producers. The conservation of biodiversity, genetic resources and the revaluation of local knowledge are components substantially incorporated into strategies and public policy such as Law 144 of the Community Productive Revolution, and Law 300, Framework of Mother Earth (Pacheco 2013). The emerging public policy context that is in the process of being implemented represents an opportunity to revalue the seed of native potato varieties traditionally produced by small farmers, the local knowledge and knowledge that together with their cultural and social values make the traditional system of production that feeds the vast majority of Bolivians.

In conclusion, it can be indicated that:

The specialized seed producer families, the men and women involved in the process, as producers, rescuers and diversity providers, developed this activity for generations, but given the current incentives and disincentives, the question remains: to what extent can they continue doing it?

It is important to expand the current incentives, in the sociocultural field, promoting the recognition of the experience of the seed producers through, for example, their inclusion in the official national regulations and/or also more in the local scope through municipal or regional regulations.

Local public policies should be generated to avoid further degradation of the soil due to the expansion of phytosanitary problems, and

to promote their protection with local, municipal and regional regulations.

It would be good to expand economic incentives, strengthening the marketing capabilities of seed producers, so that they can enter the market with the necessary skills to establish seed businesses with differentiated prices with respect to potato consumption. It is therefore essential to carry out greater management and control of production costs to increase the efficiency and positioning of potato seed in the market.

References

- Aramayo J. (2007). Control de costos de producción para una gestión eficiente caso: pequeño productor de semilla de papa en Cochabamba. Instituto de Estudios Socioeconómicos IESE – Universidad Mayor de San Simón UMSS. Cochabamba, Bolivia. Disponible en: http://promex.iese.umss.edu.bo/uploads/docs/articulo_1275658447.pdf
- Bentley J.; Paz A., Juanes G.; Quiruchi J.L.; Martínez J. (2002). La Semilla Artesanal de Chuquisaca: Un Sistema Semi-Formal, Creativo y Funcional. Proyecto Manejo Integrado de la Marchitez Bacteriana. DFID-PROINPA-CIP-CABI. Fundación PROINPA, Cochabamba, Bolivia. Disponible en: <http://www.jefferybentley.com/Semilleristas%20de%20Chuquisaca.pdf>.
- Castillo J.A.; Plata G. (2016). The expansion of brown rot disease throughout Bolivia: possible role of climate change. *Can. J. Microbiol.* 62: 1–7 dx.doi.org/10.1139/cjm-2015-0665.
- Conlago M.; Montesdeoca F.; Mayorga M.; Yumisaca F.; Antezana I.; Andrade-Piedra J. (2011). Gender relationships in production and commercialization of potato seed with small-scale farmers in the Central Andes of Ecuador. En: Devaux A.; Ordinola M. and Horton D. (Eds.) *Innovation for Development: The Papa Andina Experience*. International Potato Center, Lima, Perú. 346-353 p.

De Hann S. (2009). Potato Diversity at Height: multiple dimensions of farmer-driven in-situ conservation in the Andes. PhD thesis Wageningen University, The Netherlands, 2009.

Díaz E.; Azurdia C. (2001). El papel de la mujer en la conservación de los recursos genéticos del maíz – Guatemala. FAO - Organización de las Naciones Unidas para la Agricultura y la Alimentación. IPGRI - Instituto Internacional para los Recursos Fitogenéticos. Roma. Disponible en: <http://www.fao.org/3/a-y3841s.pdf>

Hidalgo O.; Marca J.; Palomino L. (1997). Producción de Semilla Prebásica y Básica usando Métodos de Multiplicación Acelerada. Manual de capacitación Fascículo 4.3. Centro Internacional de la Papa. Lima, Perú.

INE (2016). Estadísticas por actividad económica. Consulta 07 junio 2016: <http://www.ine.gob.bo/indice/general.aspx?codigo=40104>

Jarvis A., A. Lane and R.J.Hijmans. (2008). The effect of climate change on crop wild relatives. *Agriculture, Ecosystem & Environment* 126:13-23.

Pacheco D. (2013). Vivir Bien en armonía con la Madre Tierra: una propuesta para el cambio de las relaciones globales entre los seres humanos y la naturaleza. Universidad de la Cordillera/ Fundación de la Cordillera, La Paz, Bolivia.

Rioja R., Barea O. (2004). Manual para la producción de semilla de papa. Fundación PROINPA. Cochabamba, Bolivia.

Plata, G.; Gandarillas, A. & Cadima, X. (2016). Certified potato seed production supported by soil diagnostics techniques. Poster presented at Plant and Microbe Cold Adaptation meeting 22-25 May, Seattle, Washington, USA.

Tapia M.; De la Torre A. (1997). La mujer campesina y las semillas andinas: Género y el manejo de los recursos genéticos. IPGRI - Instituto Internacional para los Recursos

Fitogenéticos. FAO - Organización de las Naciones Unidas para la Agricultura y la Alimentación. Disponible en: <http://www.fao.org/docrep/x0227s/x0227s00.htm>

Thiele G. (1999). Informal potato seed systems in the Andes: Why are they important and what should we do with them? *World development* 27(1): 83-99.

Zeballos H., Balderrama F., Condori B., Blajos J. (2009). Economía de la papa en Bolivia (1998 -2007). Fundación PROINPA. Cochabamba Bolivia.