



Master of Science in Life Sciences / Applied Agricultural and Forestry Sciences

Effects of National Policies and Value Chain in potato seed diversity in the Municipality of Colomi (Cochabamba-Bolivia).



Master's Thesis

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List of abbreviations

APROS	Asociaciones de Productores de Semillas-
A.R.A.P.I	Asociación Rural de Agricultores Productores Independientes, Rural Association of Independent Producers
ASAR	Artisanal Rural Services
BOB	Bolivian Boliviano (currency)
CEPAL	Comisión Económica para América Latina y el Caribe), Economic Commission for Latin America and the Caribbean
CIP	International Potato Center
FAO	Food and Agriculture Organization of the United Nations
INIAF	Instituto Nacional de Innovación Agropecuaria y Forestal
IBTA	Institutio Boliviano de Tecnología Agrícola -Bolivian Institute for Agricultural Technology
MDRyT	Ministerio de Desarrollo Rural y Tierras –Ministry of Land and Rural development
NECSP	Normas Específicas para Certificación de Semilla de Papa- Specific Norms for Potato Seed certification
NGSEA	Norma General sobre Semillas de Especies Agrícolas- General Norm for Seeds and Agricultural Species
NGO	Non-profit Organization
NRNV	Normas de Registro Nacional de Variedades- Norms for National Registry of Varieties
ORS	Oficinas Regionales de Semillas- Regional Seed Offices
PNS	Programa Nacional de Semillas- National Seed Program
PROINPA	Fundación para la Promoción e Investigación de Productos Andinos
RUPE	Registro Único de Proveedores del Estado- Registry of State Suppliers
SEPA-UPS	Unidad de Producción de Semilla de Papa
SDC	Swiss Development and Cooperation Agency
SIDP	Sectorial Industrial Development Program
UPOV	The International Union for the Protection of New Varieties of Plants

Technical Glossary for the Master Thesis

Bioversity International: A global research-for-development organization, member of the CGIAR Consortium; founded in 1974 and based in Rome-Italy. It delivers scientific evidence, management practices and policy options to use and safeguard agricultural biodiversity.

Certified Seed: Bolivian terminology for the seed that has been produced by the formal potato seed system (See also Formal Potato Seed System and Seed Categories).

Formal Potato Seed System (Bolivia): System that encompasses the production, distribution, and commercialization of potato seed that meets the regulations (Norms), and requisites imposed by the governments' agricultural governing agencies: INIAF and MDRyT.

Improved variety: Crop (In the case of this master thesis potato) varieties that are produced following the formal potato seed production system. These are the varieties that are produced by formal seed producers like SEPA. The term does not imply that the varieties are "better" but it refers to the terminology used in Bolivia for these types of potato seed varieties.

Informal Potato Seed System (Bolivia): System that encompasses the production, distribution, and commercialization of potato seed that does not follow or meet the regulations (Norms), and requisites imposed by the governments' agricultural governing agencies: INIAF and MDRyT.

Introduced variety: Crop (In the case of this master thesis potato) variety that has been brought and planted into a different ecosystem than its original one.

Norm: List of regulations done by a Bolivian Government Agency in various subjects. In the case of this master study the Norms for seed Registration, Production and Certification were addressed.

Reform (Political): A political amendment or alteration that does not affect or substitute the established political or social order, therefore it tends to correct situations that are faulty.

Registration (farmer): Official enlistment done by the Bolivian government institution INIAF, of farmers to become part of the formal seed system as formal seed producers.

Registration (variety): Official enlistment done by the Bolivian government institution INIAF of a variety of a crop following the UPOV's standards.

Seed Categories in Formal Seed System: Categories in which formally produced potato seed are classified in Bolivia (See Figure 3) which are Basic, Registered, Certified and Controlled; however in Bolivia all of the seed belonging to these categories is referred generally as "**Certified Seed**", which should not be confused with the individual category called also Certified. It is important that this terminology is taken into account during this thesis.

Vendor: Informal Market sellers (Usually farmers) of potato seed in local fairs.

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Summary

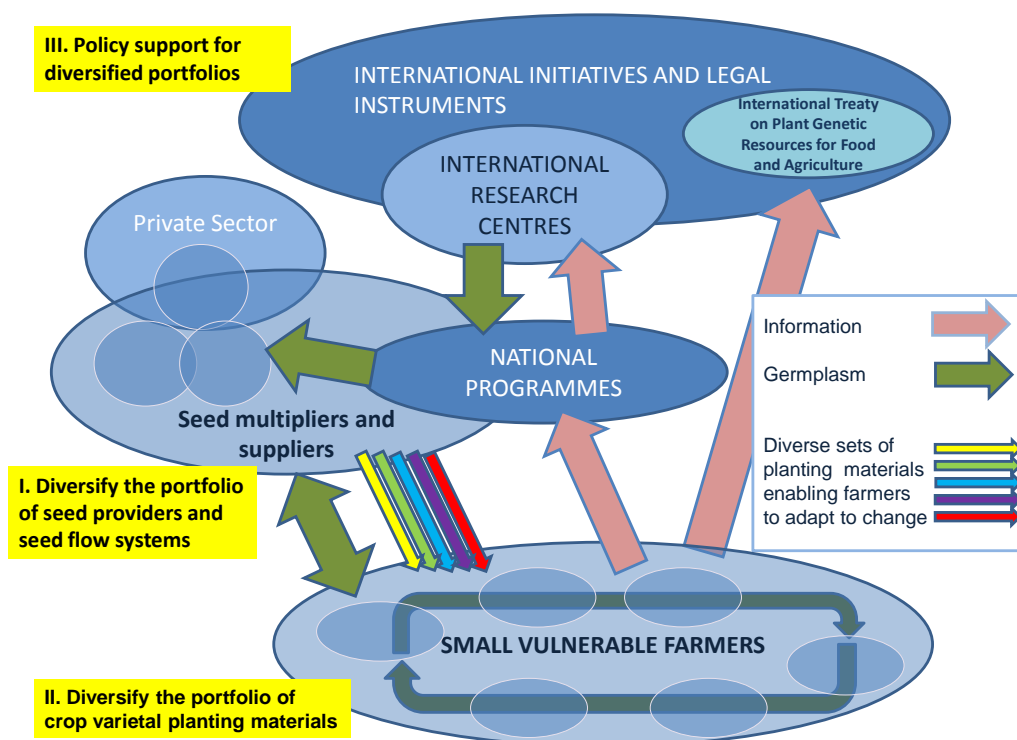
Potato (*Solanum tuberosum*) is one of the main staple foods in Bolivia and one of the most important cash sources for small-scale farmers at rural areas. Access to proper and diverse potato seed has become increasingly hard for small-scale farmers, augmenting their vulnerability. The adoption of foreign formal seed systems, disregarding the realities of local seed systems in developing countries is a latent problem that has not received enough attention of governing agencies. In order to reinforce diversified seed production, distribution and dissemination, Bioersivity International with funding of the Swiss Development and Cooperation Agency (SDC) developed the project: *Improving the availability and the use of diverse seed and other planting materials to reduce vulnerability and improve food security for smallholders in vulnerable ecosystems* in five countries. The project aims to reduce the vulnerability of smallholders enhancing seed distribution systems, supported by revised policies that promote the availability and adaptability of diverse planting materials. In Bolivia the project is being carried out by the Fundación para la Promoción e Investigación de Productos Andinos (PROINPA) at the Municipality of Colomi-Department of Cochabamba. In the context of the general project, and in collaboration with PROINPA, this master study seek to create a proper information baseline for the first stages of the project's implementation, to identify the main constrains of the potato seed system, as well as mapping, and understanding the key factors that affect the farmer's production, acquisition and distribution of potato seed. To achieve this two main objectives were established: 1) Provide full baseline information about the potato seed system in the Municipality of Colomi through a complete Potato Seed Value Chain Analysis in the region; and 2) Elaborate a thorough analysis of the legal context or policies, which affect the seed value chain in Bolivia. A survey using structured and semi-structured interviews with farmers of 8 different communities in the Municipality of Colomi and key informants were made. Monitoring of local informal fairs and as well as literature and secondary data analysis of the policies and legal framework were used to complement the information gathered. During the analysis of the data gathered it was found that farmers having their production sites at the Highlands have greater potential to become certified seed producers. Threats for a future and sustainable certified seed production at the study site are: young farmers migration, lack of accessible roads, and the possible unstable demand of certified potato seed in the region. The Colomi Market is solely an informal, and problems like varietal, quality and size mixes, as well as diseases and plagues are common in the seed offer. The current Norms for certified seed production in Bolivia are not adjusted to the reality of potato seed production not taking into account the high grade of diversity and the relevance of the informal potato seed system and markets. Effective alternatives for the certified potato labeling are necessary to reduce the grade of forging of labels in the market.

Key words: Bolivia, Potato, Seed, Laws.

1 Introduction and problem definition

Access to proper and diverse seed in vulnerable ecosystems has been one of the main problems for small-scale farmers in developing countries. Over the years, international policy frameworks on plant genetic resources have been created to protect farmers, however most of them focus on “ex situ conservation” and “formal breeding” (Bioversity International 2012, 3-10). The formal seed sector has been gradually increasing over the years as countries slowly adopt international models, yet they are also slowly disregard local seed systems, which are extremely important in developing countries (Santilli 2012). In Nepal the formal seed systems contribute to less than 5% of the main crop seeds (Joshi 2000), while in Bolivia only 3% of the total potato seed used in the country comes from the formal seed system (Zeballos et al. 2009).

In order to reinforce diversified seed production, distribution and dissemination, Bioversity International with funding of the Swiss Development and Cooperation Agency (SDC) developed the project: *Improving the availability and the use of diverse seed and other planting materials to reduce vulnerability and improve food security for smallholders in vulnerable ecosystems* (Bioversity International 2012, 3-10).



Source: Bioversity International, 2012

Figure 1: Expected outcomes (in yellow) from Bioversity Internationals' project and their relations with each other

Bioversity International's project seeks to reduce the vulnerability of smallholders through enhanced diversification of seed distribution systems, supported by revised policies that promote the availability and adaptability of diverse planting materials. There are three expected outcomes for the project (Figure 1): 1) A diversified portfolio of seed providers and seed flow systems for the involved countries to ensure provision of local seed 2) A diversified portfolio of crop varietal planting materials to guarantee sufficient local seed agro-biodiversity that increases productive gains and maintains resilience 3) Policy support for diversified portfolios: support for local, national and international institutions with strategies on seed systems by a global dialogue promoting plant conservation and research strategies. The project is currently conducted in five countries in Africa, South and Central Asia and South America: Bolivia, Nepal, Uganda, Burkina Faso and Uzbekistan (Bioversity International 2012, 3-10).

1.1 The problem with Bolivia's potato seed system

Bolivia, as one of the countries involved in the project has the highest rate of rural population living under extreme poverty prevalent in the highland areas in America. Around 75,8% of Bolivia's rural population lives below the poverty line, and a startling 59% lives under extreme poverty (CEPAL 2011).

Potato (*Solanum tuberosum*) is the main staple food in this country, making it an important source of cash income and food security for small-scale farmers (Devaux 2011). The highland areas in Bolivia (*Puna Alta* and *Puna*: >2500 msl) are the richest in genetic potato diversity (Balderrama and Terceros 2008; Almekinders et al. 2010). Farmers in the area are aware of this diversity and prefer to plant native varieties instead of commercial varieties, since they have greater adaptability to the arduous climatic conditions and are preferred for household consumption (Almekinders et al. 2010; Cossío et al. 2012). The importance of these local potato varieties however, has been reducing due to an increased use of improved commercial varieties (Bioversity International 2012), specially in lower altitude areas (Plains and Flatlands: <2500 msl) where climatic conditions allow more planting seasons per year having higher commercial purpose (Almekinders et al. 2010).

In matters of laws, the formal potato seed system in Bolivia forbids the selling, distribution or donation of seeds without the label of the National Institute for Agricultural and Forestry Innovation (Instituto Nacional de Innovación Agropecuaria y Forestal INIAF), yet this is hardly enforced since 97% of the total potato seed used in the country comes from the informal seed system (PNS 1999; Zeballos et al. 2009; INIAF 2012). Currently this law is partially enforced, being applied only to officially registered potato varieties (26 varieties registered in 2008 and 1 in 2011) (INIAF 2012). There are around 1075 cultivated potato varieties in Bolivia (Almekinders et al. 2010), showing a great disparity between the varieties that are used

in the informal seed system, with the varieties that are considered for official commercialization.

For a certain variety to be registered, the law asks for an extensive process that includes a Varietal Identity, the Agricultural Value of the variety and a proper Denomination followed by the proper documentation, 2-year field tests and payment of fees, making it a very long and expensive process (PNS 2005). On the other hand, the seed under the formal seed system in Bolivia has guaranteed quality since only registered producers can multiply potato seed on certified fields (PNS 1999). However the process of certification is long and complicated (Bioversity International 2012). SEPA (Unidad de Producción de Semilla de Papa) a semi-private institution born in 1984 is the main source of certified potato seed in Bolivia (Almekinders et al. 2010), and it's the sole producer of Pre-Basic potato seed (first level of foundation seeds) generated by in vitro tissue micro-propagation (PNS 1999) (See Chapter 2). Regular farmers can't produce this seed so they can only become registered potato seed multipliers (by tubers) to commercialize certified seed (PNS 1999).

There is a great contrast between the levels seed production of the different potato seed suppliers in Bolivia, ranging from less than one ton to nearly 3000 tons. This is due to the different types of seed providers in the region that go from individual farmers to associations and large institutions. Another important factor is that there is not clear connectivity between the seed multipliers and the seed source entities (PROINPA Report LoA 2014,1).

Seed suppliers in the Cochabamba region confirmed the main problems on the potato seed system in Bolivia in a survey conducted by PROINPA (Fundación para la Promoción e Investigación de Productos Andinos) during the national fair of potato seed suppliers in Cochabamba. Lack of promotion of the seed, limited availability of healthy soils, lack of training in seed production and marketing, high costs of Basic seed and transport were among the main difficulties mentioned (Cadima and Terrazas 2013, 14).

1.2 PROINPA's project partner and master thesis contribution

The Foundation for Promotion and Research of Andean Products (Fundación para la Promoción e Investigación de Productos Andinos - PROINPA) is a Bolivian non-profit organization, whose main mission is to "promote the conservation and sustainable use of genetic resources, food sovereignty and security, competitiveness in agriculture and livestock production that benefits farmers, the agricultural sector and society as a whole". To fulfill its mission it has developed three main objectives: 1) Promote the conservation and sustainable use of genetic resources 2) Contribute to food sovereignty and security and 3) Contribute to the competitiveness of the areas of national priority (PROINPA 2010). PROINPA has a two-decade trajectory in establishing development projects around the country, having 8 offices

and 7 different Departments nation-wide. PROINPA was selected by Bioversity International to conduct the project “*Improving the availability and the use of diverse seed and other planting materials to reduce vulnerability and improve food security for smallholders in vulnerable ecosystems*” in Bolivia and address some of the issues in the potato seed system. The project focuses on potato (*Solanum tuberosum*) and arracacha (*Arracacia xanthorrhiza*) seed production. For potato, the Municipality of Colomi located in the Department of Cochabamba, province of Chapare was selected as the study area. Two farmer groups located in the highland areas (Pico Central and Linde communities) were chosen as focus groups to implement the project.

To create a proper baseline of information to conduct the project it was imperative to identify the main constraints of the potato seed system, as well as mapping, and understanding the key factors that affect the farmer’s production, acquisition and distribution of potato seed in the area of study.

This master study was carried out in the framework of Bioversity Internationals’ project, in close collaboration with the project partner PROINPA. In order to contribute to the project, this master study defined two main objectives: 1) Provide full baseline information about the potato seed system in the Municipality of Colomi through a complete Potato Seed Value Chain Analysis in the region. 2) Elaborate a thorough analysis of the legal context or policies, which affect the seed value chain in Bolivia, to provide a detailed description of their effects in the seed value chain.

The expected outcomes of this study were: 1) a complete Seed Value chain Analysis, which includes: a) potato seed Market Map that identifies and classifies actors in the chain and the interactions with each other; b) an identification of issues like: constraints actors face, the elements that create disincentives for the development of a seed value chain, and factors that limit the market of seed of adaptive and adapted varieties; c) an identification of farmers’ preferences for seed purchasing and acquisition; d) a map of the major informal markets or community fairs in the study area and finally e) recommendations on how to improve quality seed accessibility for the farmers in the area. Another expected outcome was: 2) an analysis of the national and institutional policies and national laws in Bolivia and how do they influence: the varieties/seed/genetic diversity available for farmers, the farmers’ choices on what to acquire and from whom and the exchange of knowledge and genetic materials among actors in the seed value chain.

Taking into consideration the objectives specified, a number of research questions for every objective were formulated for this study:

In matters of the potato Seed Value Chain:

- Who are the main actors involved in the potato seed value chain in the Municipality of Colomi, and what is their main role?
- What are the main issues farmers have in the potato seed value chain, and how does that affect their preferences for seed purchasing?

In matters of the formal potato seed system in Bolivia:

- How do the national and institutional policies and national laws influence the production, availability, accessibility, and commercialization of potato seed varieties?
- What are the main problems that seed development institutions have in the area of study?

2 State of Research

2.1 Seed systems in developing countries

Seed systems have been the bases of agricultural production since the beginning of seed domestication by early civilizations (Tripp 1997). During the years researchers have tried to understand the importance of the seed systems, their structure and their role on food security, particularly in developing countries. A “seed system” according to Thiele, 1999 is an “interrelated set of components including breeding, management, replacement and distribution of seed”. There are many differences in literature, in matters of classifying the different seed systems into groups, but most of them identify two main groups, the “informal” or “local” seed systems and the “formal” seed systems (Louwaars and Marrewijk 1997; Tripp 1997; Thiele 1999; Zeballos et al. 2009; Santilli 2012).

In the formal seed system all the production, multiplication and distribution of seed is regulated by national legislation usually following international standardization or methodologies known as “certification” (Louwaars and Marrewijk 1997; Thiele 1999). In the “informal” or “local” seed systems the farmers produce their own seeds using local traditional knowledge and are directly involved in the improvement of varieties without governmental influence. “Informal” seed systems’ main characteristics are that they maintain genetic diversity and varieties that are adapted to local conditions in the field; they produce in remote and “hard to access-areas”; they are more adaptable to social and environmental changes due to the heterogeneity of seeds and are more affordable for low-income farmers (Santilli 2012; Boef 2007) (See Technical Glossary).

These positive aspects amongst others are the reason why “informal” seed systems are most widely used in developing countries. According to FAO (2010), informal seed systems are a key element in maintaining crop diversity on-farm, and are responsible for 90% of the seed movement in various countries. For example in the Aguaytia Valley in Peru, 75% to 100% of seeds used by farmers is exchanged within the community (FAO 2010). In Nepal the formal systems of seed contribute to less than 5% of the main crop seeds (Joshi 2000). In Latin America and the Caribbean 75% of the seeds used by farmers are supplied by informal seed systems (FAO 2001). In matters of potato seed, 95% of the demand in developing countries is covered by the informal system (Thiele 1999).

Despite the importance and wide recognition of the “informal” seed systems, Latin American countries have been “(...) increasingly adopting seed laws aimed at promoting formal seed systems, which leave little (if any) legal space for farmers’ and local seed systems (...)” (Santilli 2012). This means that the laws, despite of being different in any country always tend to

favor the growth of the private sector, establishing certification requirements that can only be met by the large seed industries or entities with high incomes (Santilli 2012).

Formal seed systems had a long history in the making. The commercial and intellectual value of seed varieties around the world was first acknowledged by The International Union for the Protection of New Varieties of Plants (UPOV) established in Paris in 1961 and enforced in 1968. UPOV's main purpose was to ensure that the member states acknowledge the achievements of breeders of new varieties of plants, granting them an intellectual property right. The convention defined concepts of plant variety protection that have to be included in the domestic laws of the member states. Currently UPOV has 72 member countries and is still one of the most important seed regulation intergovernmental bodies in the world (UPOV 2011).

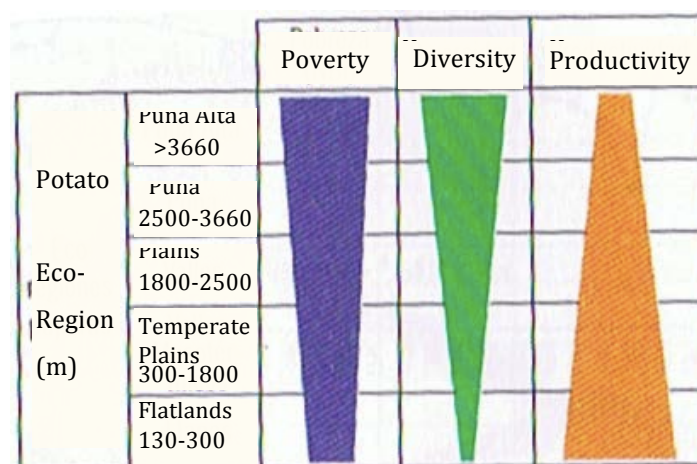
Alongside UPOV, a worldwide spread of the improved or "miracle seeds" took place. This trend came to be known as the "Green Revolution". This Revolution promoted and distributed high yielding crop varieties, with high-energy inputs such as fertilizer and controlled irrigation (Cleaver 1972; Brush 1992). Following this trend, the United States Agency for International Development (USAID), supported seed sectors in 57 developing countries from 1958 to 1987; as well as the Food and Agriculture Organization of the United Nations (FAO) with their Improvement and Development Program (SIDP) (1972 to 1984), which covered 60 countries (Louwaars and Marrewijk 1997). These "miracle seeds" were seen as the solution for world hunger and lack of productivity, yet without the fertilizer and the controlled irrigation usually yielded no more and sometimes less than traditional strains. Conversely, with the proper irrigation and fertilizer they had higher yields per acre (Cleaver 1972).

2.2 Bolivia: potato production and diversity

In the Andean Region potato (*Solanum tuberosum*) is the main staple food and it is an important source of cash income (Devaux 2011). It's a highly adaptable crop, and can be cultivated from 4000m to 800 m (Zeballos et al. 2009). Though potato has a high versatility and number of diverse varieties adapted to extreme conditions, it is still a high-risk culture. Farmers that produce at high altitudes in the region often have to face arduous conditions like frequent frosts and drought (Bolivian highlands) making them highly vulnerable (Thiele 1999). According to CEPAL (2011) around 75,8% of Bolivia's rural population lives below the poverty line, and a startling 59% lives under extreme poverty making it the highest rate of rural population living under extreme poverty in America prevalent in the highland areas. Paradoxically, the highland areas in Bolivia (*Puna Alta* and *Puna*: >2500 msl) are the richest in genetic potato diversity (Balderrama y Terceros 2008; Almekinders et al. 2010). Farmers in the highlands usually prefer to plant native varieties instead of commercial varieties, due to

their high adaptability to arduous climatic conditions, and also because are preferred for self-consumption (farmers believe that native potatoes are healthier) (Almekinders et al. 2010; Cossío et al. 2012). Conversely, farmers at lower altitudes (Plains and Flatlands: <2500 msl) tend to plant improved varieties, since the climatic conditions are less arduous than in the highlands, (Cossío et al. 2012), and are generally used for industrial processing; therefore having higher commercial purposes (Almekinders et al 2010). Balderrama and Terceros (2008) in their Diagnosis and Analysis of the Potato Situation in Bolivia defined clear differences between the Puna, Puna Alta, Plains and Flatlands in matters of potato production (Figure 2). The highlands or Punas have lesser productivity than the lower regions since the climatic conditions only allow one planting season a year. Contrarily, the lower eco-regions, (Valleys) have more planting seasons per year, making them highly productive and more focused on income-generating potato varieties (commercial). The Plains in Bolivia are mainly characterized for having highly extensive crops like soy, but potato has been introduced recently into the rotations. These disparities create an inverse relationship between the productivity in the different eco-regions with the amount of potato diversity and the poverty (calculated in unsatisfied basic needs) see Figure 2. (Balderrama and Terceros 2008).

Potato is the 4th most produced cultivar in Bolivia with an estimate of 975000 tons produced during the 2011-2012 period; surpassed by cultivars like corn in grain, sugar cane and soya, majorly produced in tropical climates (INE 2012). Currently there are about 1075 different cultivated varieties of potato in Bolivia (Almekinders et al. 2010).



Source: adapted from Balderrama and Terceros 2008

Figure 2: Relationship between diversity, productivity and poverty in different potato eco-regions in Bolivia.

2.3 Potato seed system in Bolivia

In Bolivia only 3% of the total potato seed used in the country is certified (See Technical Glossary) or comes from the formal seed system (Zeballos et al. 2009). This means that the farmers prefer to plant native varieties, mainly because improved varieties (See Technical Glossary) have limited adaptability to climate and soil conditions, as well as the consumers' preferences in Bolivia (Almekinders et al. 2010).

The formal seed system in Bolivia has been developing in the last decade during five different government terms in nine years. It started with the National Seed Program (*Programa Nacional de Semillas- PNS*) in 1997. The PNS developed the General Norm for Seeds and Agricultural Species (Norma General sobre Semillas de Especies Agrícolas- NGSEA), which was the first legal document in Bolivia, that promoted the use of good quality seeds by regulating the technical, administrative and legal processes that involve seed production and commercialization in Bolivia (PNS 2000). The NGSEA in the present days is still considered a baseline for seed certification schemes in the country, as well as the Norms for National Registry of Varieties (Normas de Registro Nacional de Variedades- NRNV), which was edited in the year 2008 during Evo Morales' first term as president. Other significant contribution of the PNS to the current seed certification system is the Specific Norms for Potato Seed Certification (Normas Específicas para Certificación de Semilla de Papa- NECSP), which is still enforced today, with some changes (PNS 1999).

In 2008 the Evo Morales' administration created the National Institute for Agricultural and Forestry Innovation (Instituto Nacional de Innovación Agropecuaria y Forestal INIAF). The INIAF, controlled by the Ministry of Rural, Agricultural and Environmental Development, is the main entity in charge of seed certification processes in Bolivia. When the INIAF was created all of the economical resources of the PNS were designated to it, as well as other public entities like the Bolivian Institute for Agricultural Technology (IBTA). Due to this change, all the Regional Seed Offices (Oficinas Regionales de Semillas- ORS) were closed and in all the norms for seed certification and registration the term "ORS" was exchanged for "INIAF". Currently, the INIAF offices implement the responsibilities and functions of the ORS (Consejo de Ministros 2008).

2.3.1 SEPA

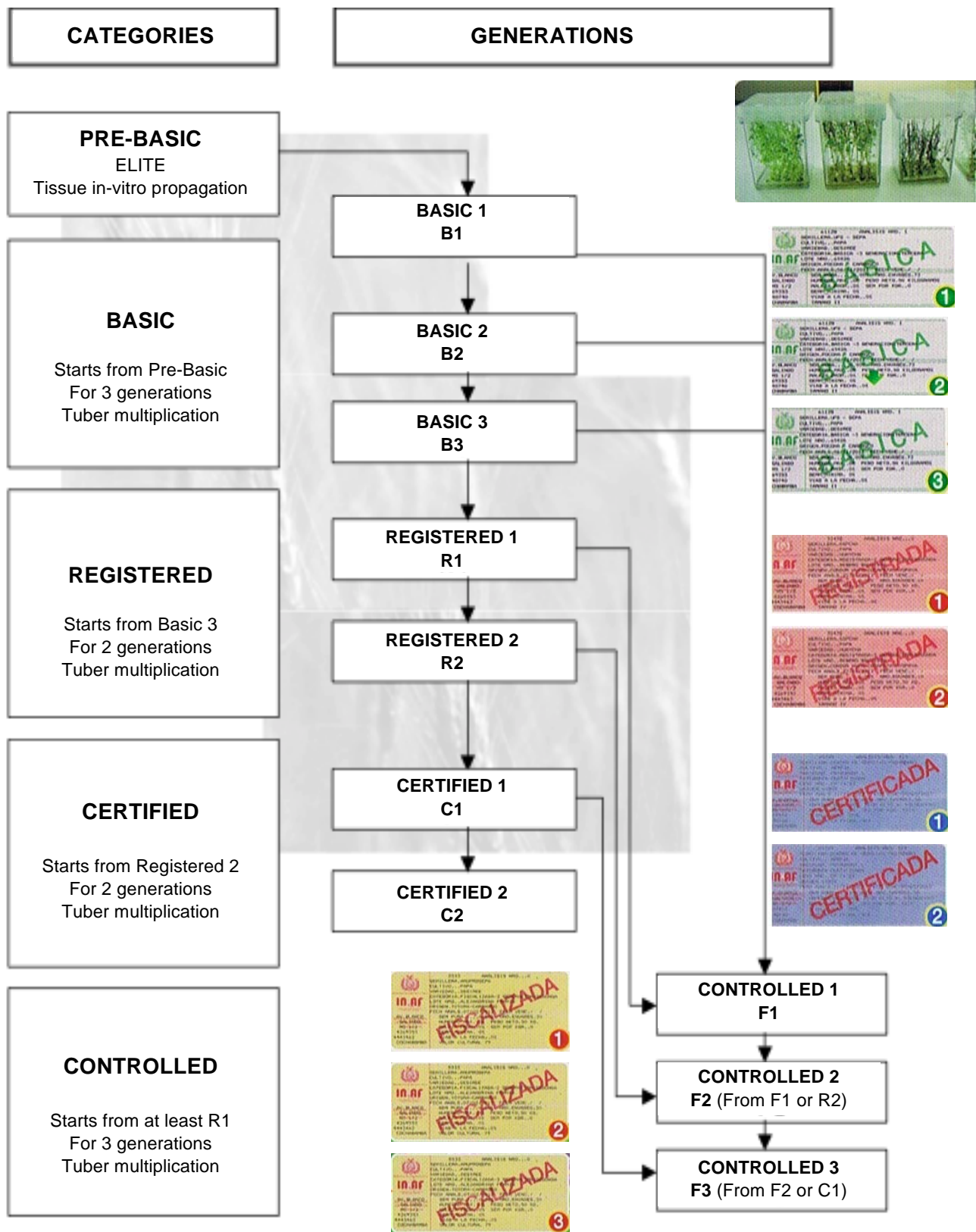
SEPA originated in 1984 as a project called "Unidad de Producción de Semilla de Papa", which worked with financial support of the Swiss Agency for Development and Cooperation (SDC) and the collaboration the Bolivian Institute for Agricultural Technology (IBTA), the Association for Artisanal Rural Services (ASAR) and the International Potato Center (CIP). The

main objectives of this project were to create a leading institution to improve the productivity of potato in Bolivia; having a systematic production of adequate seed varieties for the different agro-ecological zones of the country (highlands and lowlands), and producing seed with a high quality genetics, free of pathogens and adapted to the economical and technological level of the country. Over the years, SEPA managed to create modern facilities for the reproduction of potato seed. They built the first lab for in vitro cultures in the country, and by 1997 they produced already 2500 m/tons per year of high quality seed (Zeballos 1997). In 2006, with the new agricultural policy of Evo Morales, SEPA became a semi-private enterprise. It is the main source of certified seed in Bolivia (Almekinders et al. 2010). Around 46% of the national (annual) production of certified seed in Bolivia is from SEPA (Zeballos et al. 2009), and it is the sole producer of "Pre-Basic" category of potato seed (first level of foundation seeds) generated by in vitro tissue micro-propagation (PNS 1999).

There are four different categories in the formal seed system in Bolivia: Basic, Registered, Certified, and Controlled (See Technical Glossary). These categories are generated from the seed tuber multiplication of the SEPA Pre-Basic seed. The Basic category comprises three multiplied seed generations, the Registered two generations, the Certified two generations, and the Controlled three generations. This means that for the production of potato seed there are seven multiplications (generations) in four different categories. The categories vary in quality, and economical value, therefore they are assigned special color labels for their differentiation during commercialization (White for Basic, red for Registered, blue for Certified and yellow for Controlled) see Figure 3 (PNS 1999; INIAF MDRyT 2013).

2.3.2 Regulations for certified seed production and commercialization

For a farmer association to have the opportunity to be certified seed (See Technical Glossary) producers they have to enter a certification process closely guided by INIAF. They have to follow a three-step process: the Farmer Registry, Field Inspections, and the Warehouse Inspection (PNS 1999). During the registry stage the farmer association willing to enter the certification process has to first register in the National Registry for seed producers. To do so they need to establish a director and secretary for the association, and register themselves by paying 100 BOB at INIAF headquarters (PNS 1999; INIAF 2013). During this registration the farmers basically have a contract with INIAF to provide the service of a seed producer, have special labels assigned to their production and therefore be able to charge higher for their seeds in compare with other same grade of ware potatoes in the markets (Almekinders et al. 2010). During the Field inspection stage INIAF is in charge of making field inspections of the seed fields of the registered producers. The inspections are done 60 days prior the planting date for the early varieties and 100 days for late varieties (PNS 1999).



Source: adapted from the PNS 1999 and INIAF MDRyT 2013

Figure 3: Seed Categories for potato seed certification in Bolivia

The purpose of the inspections is to evaluate the plagues and diseases on the field, using a maximum tolerance scale for various problems using maximum tolerance indexes for different virus, bacteria and diseases (PNS 1999). Following the field inspection, INIAF staff has to inform the farmer if they passed or not the test field. If there is a case in which the farmer doesn't agree with the decision of the inspector, they can have the opportunity for an appeal process. A very interesting fact about this procedure is that if the field is rejected for a second time following the appeal the farmer has to pay for all the expenses of the visit to the INIAF inspector (PNS 1999).

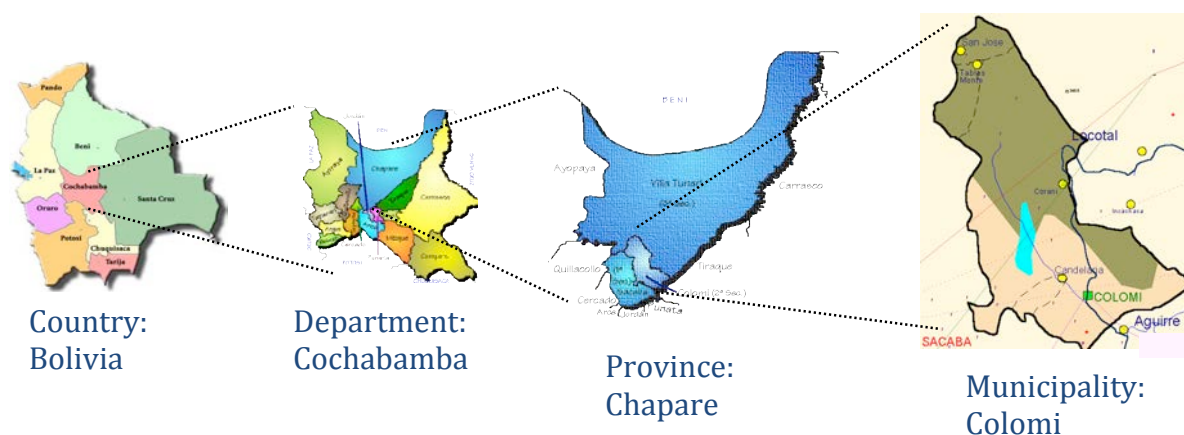
Once the field inspection is passed, the third stage will continue with INIAF's inspection of the warehouse, or shop in which the farmer association wants to store and sell the potato seed. The sampling officer takes 100 tubers from one bag selected from every 10 bags from each lot. It is very important that the farmers don't mix the seed categories; otherwise the officer assigns the lowest category (Controlled category) to every mixed bag (PNS 1999).

According to the NGSEA, the NECSP, and the NRNV, it is strictly forbidden to sell, distribute or donate seeds without the label of INIAF in Bolivia, as well as selling seeds, which are not listed on the National Registry of Varieties of Bolivia. Clearly this law is not enforced in Bolivia, since as mentioned before, only 3% of the total potato seed used in the country is certified (Zeballos et al. 2009). The National Registry of Varieties of Bolivia has 27 registered potato varieties. This means that the official system only supports the commercialization, development and distribution of 27 of the 1075 varieties currently being produced in Bolivia. Of the 27 varieties registered, only 11 are native from Bolivia: Waych'a, Imilla Blanca, Kallpa Runa, Malcacho, Marcela, Pinta Boca, Q'eto Luky, Runa, Runa Toralapa, Sani Imilla, Sani Negra. All of these varieties come from Cochabamba except Marcela, which comes from Tarija. Of the 27 varieties 26 were registered during the year 2008, 1 variety in 2011 and none since then (INIAF 2009).

2.4 Study Area: Colomi Municipality

The Colomi Municipality is the second municipal section of the Chapare Province of the department of Cochabamba in Bolivia. It is located 49 kilometers northwest of the capital of the Cochabamba department, in the main highway connecting Cochabamba and Santa Cruz. Colomi has an average altitude of 3400msl (Cadima and Terrazas 2013).

There are two ecological zones in Colomi, the "Puna" zone (>3200msl) and the subtropical zone (2000msl-2800msl). The puna a common zone for potato production. It is characterized for having a cold and humid climate. It has an annual mean precipitation rate of 534,9 mm and a mean annual temperature of 13,5°C. During winter it is common to have frosts in this area.



Source: Cadima and Terrazas (2013)

Figure 4: Location map of the Municipality of Colomi in the Province of Chapare in the Department of Cochabamba-Bolivia.

The subtropical zone on the other hand, has a temperate climate during winter and hot during the summer, with an annual precipitation of 2500mm to 3000mm, and a mean annual temperature of 21°C (Cadima and Terrazas 2013). Geographically the Municipality of Colomi is located in the south region of the Chapare province ($16^{\circ} 56' 02''$ - $17^{\circ} 23' 34''$ south latitude) ($65^{\circ} 33' 15''$ - $66^{\circ} 20' 34''$ de west longitude) (PDM Colomi 2008) (Figure 4).

The Municipality of Colomi has 4 districts: Candelaria, Colomi, San José and Tablas Monte. For this project PROINPA will work with the Candelaria district. This district has an approximate of 3000 habitants and has around 25 to 30 indigenous communities with an approximate of 32 families per community. These communities are organized in well-structured syndicates, which prioritize the management of infrastructure, and land limits within the community and very little the agricultural productivity (Terrazas 2013, personal communication). The area has silt sand soil and an arable land surface that varies from 0.15m to 0.60m in depth. The soils' pH fluctuates between 5,5 and 6, which is an optimal range for the production of Andean tubers (Terrazas and García 2003).

2.4.1 Potato production in Colomi

In Colomi there are around 2500 ha of land destined for the production of potato, which are divided into approximately 1 ha per family (Terrazas 2013, personal communication). There are three altitudinal floors or ecological zones for potato production in the Municipality of Colomi: Lowlands or Plains (3000msl-3350msl), Intermediate or Slope sides (3350msl-3650msl) and Highlands (3650msl-4100msl) (Terrazas et al. 2003). This means that there is a presence of different microclimates as altitude changes, giving farmers a chance to program their planting in different periods of time, enabling them to widen their fresh potato offer season, improving the price (Terrazas and García 2003).

Table 1: Potato planting seasons in different agro ecological regions in Colomi

Pisos Agro-ecológicos	Épocas de siembra			
	Mishka tarpuy		Jatun tarpuy	
	Mishka	Chaupi mlshka	Nawpa tarpuy	Khepa tarpuy
Baja (uras) 3000-3350 msnm.		Papa (venta)	Papa, papalisa, oca, (venta, semilla, consumo)	Papa, oca (semilla)
Media (ladera) 3350-3650 msnm.	Papa Papalisa (venta)	Papa (venta, semilla)	Papa, oca, papalisa, isaño (venta y consumo)	Papa, Oca (semilla)
Alta (pata) 3650-4100 msnm.			Papa (venta, consumo y semilla)	Papa (semilla)

Source: Terrazas and García 2003

For potato there are four different planting seasons (Table 1), every season has a local name in Quechua: Mishka (winter-June), Chapui Mishka (late winter-July), Jatun Turpuy (Big planting, divided in 2 seasons- Sep-Oct) and Khepa Tarpuy (late year- Nov). The predominant rainy season happens during mid November and ends at March, while the driest months happen between June and October. Since the altitudinal zones for production in Colomi range between 3000msl to 4100msl, 80% of the production of tubers is made under moderate to hard slope areas (Terrazas and García 2003).

The Candelaria district is characterized by having a great a vast diversity of native potato varieties. During 2005, 50 cultivars were identified in this area, which corresponded to four species (*Solanum tuberosum* ssp. *andigena*, *S. x juzepczuki*, *S. stenotomum* y *S. phureja*) (Terrazas et al. 2003).

In matters of markets close to the area, the main producers or farmers market is the weekly Colomi fair, which serves as a distribution channel of potato. There are several other markets or weekly fairs in the Department of Cochabamba, close to Colomi: the Tiraque fair, El Puente fair, and Cochabamba cities' El Triángulo and Farmers' Market. The markets in Cochabamba don't sell certified potato seed from SEPA, yet SEPA has special distribution centers (Almekinders et al. 2010). Amongst the markets mentioned, Colomi has the largest offer of potato varieties, followed by Cochabamba cities' markets, meaning that it is a very important center for potato diversity in the region (Almekinders et al. 2010) (Zeballos et al. 2009).

2.4.2 Potato seed in Colomi

Social traditions play a very significant role in potato seed management in the communities living in Colomi. As mentioned before, the Municipality of Colomi has different ecological zones or altitudes for potato production, and this has a great influence on the movement of potato seed in the region. Traditionally the farmers exchange seed with farmers living at different altitudes to refresh the quality when their seed is “tired” (decrease in seed quality over several planting cycles) or to replace the seed for another variety. This exchange is greater for native potato varieties. Apparently the exchange of environment breaks the degradation cycle of the seed and reactivates the productive capacity (González 2003, 32).

The farmers in this zone have a very dynamic movement of seeds; therefore from year to another they can lose one to five potato varieties and add one to three new varieties to their stock. During the first planting year the seeds are transferred from the Highlands to the Plains. The second year the seed is transferred from the Lowlands to the Slope sides and/or Highlands. The third year the seed in the Slope sides is transferred to the Plains and/or Highlands or from the Highlands to the Slope sides and Plains. During the fourth year the seed is transferred from the Highlands to the Slope sides and/or from the Plains to the Highlands; were the cycle starts all over again (Terrazas and García 2003) (see Annex 8).

According to Almekinders et al. (2010) in their study of the potato seed supply and diversity in the Cochabamba province potato farmers located at higher altitudes purchase high-quality seed (either from SEPA or from a specialized seed multiplier) every four to six years to renew the seed, while farmers at lower elevations buy seed as frequently as every year. Farmers at lower elevations usually don't retain seed for the next planting season, thus farmers in the highlands do it more often since at higher altitudes physiological quality and phytosanitary health is easier to maintain.

Farmers in the highland areas divide their production into two groups, one for household consumption and other for sale. Seventeen percent of the production is for self-consumption (including retained seed for next planting season), 68 percent is destined for sale (of which 25 percent is sold as seed on the market), and 15 percent is lost or discarded. From the total destined for house consumption only 25 percent of it is used as food, while 75 percent is retained seed for the next planting season (Balderrama and Terceros 2008). Additionally, a smaller percentage of the potato used for consumption is used to produce *chuño* and *tunta* a very old traditional farmers' practice in the region.

Chuño is a dark-colored food product made out mostly of bitter native potato varieties (e.g.: *S. juzepczuki*, *S. curtilobum*), through a process of freezing (by natural frosts), dehydration and dried by sun exposure (Iriarte and Ugarte 2002; Cadima et al. 2003). *Tunta*, on the other hand, is a pale white-colored product made out of native potato varieties (e.g: *Solanum tube-*

rosu spp. *andigena*, *S. stenotomum*) through a process of freezing (by natural frosts), washing and sun exposure (Cadima et al. 2003). Due to their production process, *tunta* and *chuño* have long lasting time of preservation (Zeballos et al. 2009) and have a crucial role in maintaining food security by diversifying the diets, as well as serving as an economical backup income for the families in times of need (Cossío 2012).

3 Methods

Different methods and approaches were done to collect the necessary data addressing the two main objectives of this master study. The data collection was completed during the dry season in the area of study (July to October 2013), coinciding with the pre-harvest time in the region (seed purchase season).

3.1 Objective 1: Potato seed Value Chain Analysis

In order to gather proper information about the potato seed system in the municipality of Colomi, the methodology proposed by Anderson et al. (2010) in “Using Markets to promote the Sustainable Utilization of Crop genetic Resources” was used, complemented with the “Guidelines for Value Chain Analysis” by Hellin and Meijer (2006). Dialogues with key informants at PROINPA during beginning of the research were done. Key informant interviews, quantitative and qualitative informal vendor (See Technical Glossary) surveys, and key informant semi-structured interviews, were used to collect quantitative and qualitative data for the study. These methods are explained in the following sections.

3.1.1 Survey to members of indigenous communities

Prior to the data gathering, dialogs with key informants in PROINPA were made in order to get sufficient initial information of the study area, as well as defining which farmer groups will be involved in the project. Purposive sampling as explained by Benini et al. (2011) was applied to select the communities. The targeted communities were chosen by the following characteristics: involvement in current Bioversity International and PROINPA's potato seed project, reputation of active commerce of potato and/or potato seed, distance to local fair, and participation on PROINPA's projects in the past. Purposive sampling was chosen for this project given the reduced time lapse for data gathering, limited access, logistical constrains, and social constrains (language and cooperativeness) in the area.

Three communities: Linde, Pico Central and Khocha-Khochacha were involved in the general project with Bioversity International and PROINPA. These communities were considered due

to their location in the highland areas (3800msl-4000msl) having therefore virgin soils or “Phurumas”, optimal for potato seed production (reduced plague and nematodes infestations), as well as their strong structure, cooperation and willingness to participate in the project (Cadima 2013, personal communication). Following the purposive sampling method mentioned above, five additional communities located in the Lowlands of the Municipality of Colomi were selected (3200msl-3400msl): Alto San Isidro, Balcón, Jatún Rumi, Kanco and Chimpa Rancho. The five selected communities were scattered in a 20 km long area, covering the Lowland areas near the Pico Central, Khocha-Khochha and Linde (see Figure 5).

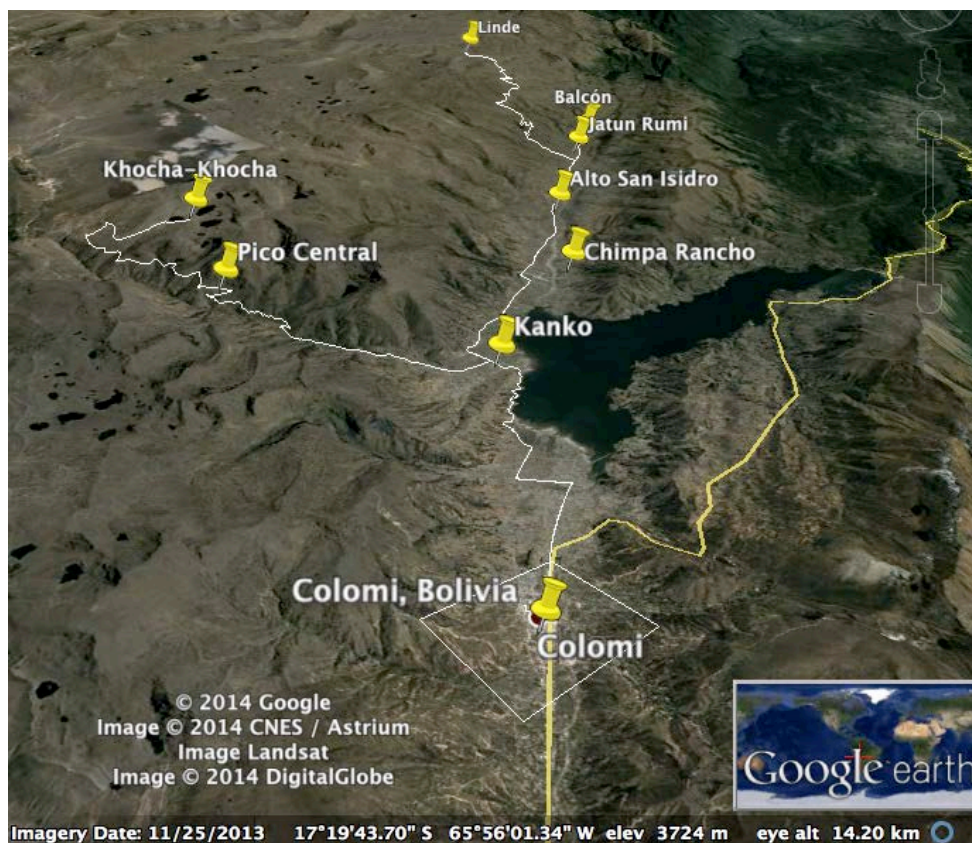
Given that the communities selected for the data gathering were located at different potato production eco-regions, they were classified into two groups: “Group A” for the communities in the Highland eco-region and “Group B” for the communities in the Lowlands eco-region (see Table 2). Purposive sampling was used to select the farmers within the communities for survey as well. Characteristics like: involvement in past projects with PROINPA, availability, and accessibility were key factors during the selection in Group B. Sampling size was set to a minimum of 4 key informant farmers per community. The survey unit was only the potato seed farmers. The selected farmers in Group A, were the ones involved directly with the current Biodiversity International and PROINPA project, meaning that they were all members of the same farmer association. The survey comprised open and closed questions considering the following topics (see Annex 2):

- General information: name, age, number of family members, gender.
- Potato seed: buying and selling of seed, own production of seed, presence or absence of seed exchange, seed varieties to be sold or bought, seed sources, why using such sources, existing problems to acquire seed, and seed transport, farmers’ needs to increase capacity to sell seed.
- Presence or absence of governmental or institutional help for seed acquisition, selling or production.

Table 2: Sampled communities for survey implementation

Location	Name of Community	Survey unit (Only potato farmers)
Group A Highlands “Phurumas” (3800m-4000m)	Linde	20
	Pico central	13
	Khochha-Khochha	5
Group B Lowlands and Slope-sides (3200m-3400m)	Alto San Isidro	6
	Balcón	4
	Jatún Rumi	4
	Kanco	8
	Chimpa Rancho	5
		Total = 65

Source: Own source



Source: Own source, tool: Google Earth

Figure 5: Spatial distribution of sampled communities in the Colomi Municipality

3.1.2 Complementary Survey for farmers' preferences

In order to provide sufficient information for Bioversity International and PROINPA's project in matters of the farmers preferences when acquiring potato seed, as well as serving as a small market probing for potential high quality seed buyers of the Pico Central, Khocha-Khocha and Linde's future seed production, 25 additional farmers' interviews with 3 open questions were made. The interviews were done with the cooperation of a key informant from the Kanko community. The farmers for the interview were chosen using purposive sampling meeting two main characteristics: active involvement in potato production, and having their production site at the Lowlands of the Municipality of Colomi. There was no restriction in matters of community association; members of any community in the area could participate in the interview.

During the interview farmers were asked about their desired potato seed varieties to buy; how do they know when the potato seed is viable and "good to buy" (attention to special morphological characteristics like shape, size, eyes, etc.); and whether or not they will buy high quality potato seed from Pico Central and Linde (given that Pico Central and Khocha-

Khochas are close to each other and Khocha-Khochas are not well-known by the communities in the Lowland eco-region, it was omitted in the question) (see Annex 3).

3.1.3 Informal vendor survey

An analysis of the different informal markets in and around the Municipality of Colomi was done using an adaptation of the methodology proposed by Almekinders et al. (2010) in their “Potato Seed Supply and Diversity: Dynamics of Local Markets of Cochabamba Province, Bolivia- A Case Study”. Based on the findings of the survey done at the different indigenous communities, three markets in the region were selected: Colomi Fair, Tiraque Fair and El Puente Fair. Market observations, and short vendor surveys were done in order to complement the information gathered in the farmers’ surveys. The data gathering was done during the specified fair days for every location, Thursday for Colomi, Friday for the Tiraque fair and Monday for the El Puente fair.

Market observations at the Colomi Fair were done in order to properly map the different selling sections of the fair, and identify where the potato seed was sold. An informal vendor survey was done using Almekinders’ et al. (2010) zigzag random sampling method to choose potato seed sellers in the market during 6 weeks (once per week). Using a voice recorder, three open questions were asked to the vendors comprising the following subjects: varieties of potato seed sold at the moment, selling price per “carga” (150-170 Kg bag), and origin of the seed being sold. The vendor surveys had to be kept short due to the short time lapse available for the vendors to cooperate with the survey. A minimum of 5 vendors per market day, were sampled for the analysis.

The Tiraque and El Puente fairs were analyzed using the same methodology for Colomi, yet due to lack of constant access and far distance from the regular study area, they were only sampled once. An approximate of ten different vendors per fair were interviewed.

It is important to understand that not all the vendors at the different markets analyzed were specialized seed vendors, therefore it was extremely difficult to sample potato seed vendors while the market was running. The timing to do the sampling at the markets was also of extreme importance. Only at the early hours of the market opening, vendors had a full stock of merchandise, therefore the sampling had to be done as fast as possible during a two-hour time lapse.

3.1.4 Key informant semi-structured interviews

To complement the data collected in the local fairs, semi-structured interviews with key informants in the transporting business were made. Transporters are usually intermediaries in

the potato commercialization chain in the region and therefore they were considered as key informants. Purposive sampling was used to choose the informants. They all need to have previous contact with PROINPA in past projects. This was done to ensure cooperation and accessibility during an extended time. Interviews of 20 to 30 minutes were done to two key informants deepening the short vendor survey subjects. A guidance questionnaire was done to address key issues during the interview (see Annex 7).

3.2 Objective 2: Formal seed sector analysis- policies and legal framework

To gather information about the formal seed sector affecting the Municipality of Colomi, a comprehensive bibliographical research of the policies and legal framework for potato seed production in Bolivia was done (see Chapter 2). The following documents were analyzed:

- Norma sobre el Registro Nacional de Variedades RM 0.45 (2005): Governmental policy for national registration of plant varieties (PNS 2005).
- Norma General de Semillas de Especies Agrícolas RM 121 (2000): General governmental policies on seeds of agricultural species (PNS 2000).
- Normas Específicas para la certificación de semilla de papa N° 101 (1999): Specific governmental policies for the certification of potato seed (PNS 1999).
- Manual de Procedimientos para el Registro de Variedades, Registro Nacional de variedades y de Variedades Protegidas, INIAF, Dirección Nacional de Semillas (2009): Manual of procedures for the national registration of varieties and protected species (INIAF 2009).
- Decreto Supremo N° 29611, 24 de junio 2008, Evo Morales Ayma Gobierno de Bolivia: Presidential decree from Evo Morales on the creation of the INIAF (Instituto Nacional de Innovación Agropecuaria y Forestal) and its role on agriculture and forestry areas in Bolivia (Consejo de Ministros 2008).

(For more information see Chapter 2)

To complement this information, and following the methodology proposed by Anderson et al. (2012), key informant semi-structured interviews were done after the completion of all farmer surveys in the study area. Two key informants were contacted, one a member of SEPA (Unidad de Producción de Semilla de Papa) and another a member of INIAF (Instituto Nacional de Innovación Agropecuaria y Forestal).

These interviews were done at the end of the data gathering to address questions and issues that surged during the different surveys, observations and key informant semi-structured interviews in the informal markets. Specific guidance questionnaires for each of the key informants were elaborated (see Annex 7).

The semi-structured interviews lasted around 30 minutes. Additional data, like market sells for the year 2012 from SEPA were obtained, as well as specific brochures for seed certification from INIAF.

3.3 Data Analysis

Given the fact that purposive sampling is a biased non-probability sampling method, it wasn't possible to extrapolate the data with the whole population living at the Colomi Municipality (Benini et al. 2011); therefore descriptive statistic analysis was done for the quantitative data using Microsoft Excel. Average, frequency, and percentage analysis were done to analyze the quantitative data gathered in the different surveys.

Since the qualitative data exceeded the quantitative in this research, a comprehensive analysis of qualitative data gathered was done. Data classification, helped in the presentation of results and formulation of conclusions. Homogenization of open question responses helped to quantify the repeated qualitative data using percentage calculations.

4 Results and Discussion

The findings of this master study have been presented in accordance to the methodological framework and objectives in the following subchapters. A short discussion for each finding is presented, complemented with the overall discussion in Chapter 5.

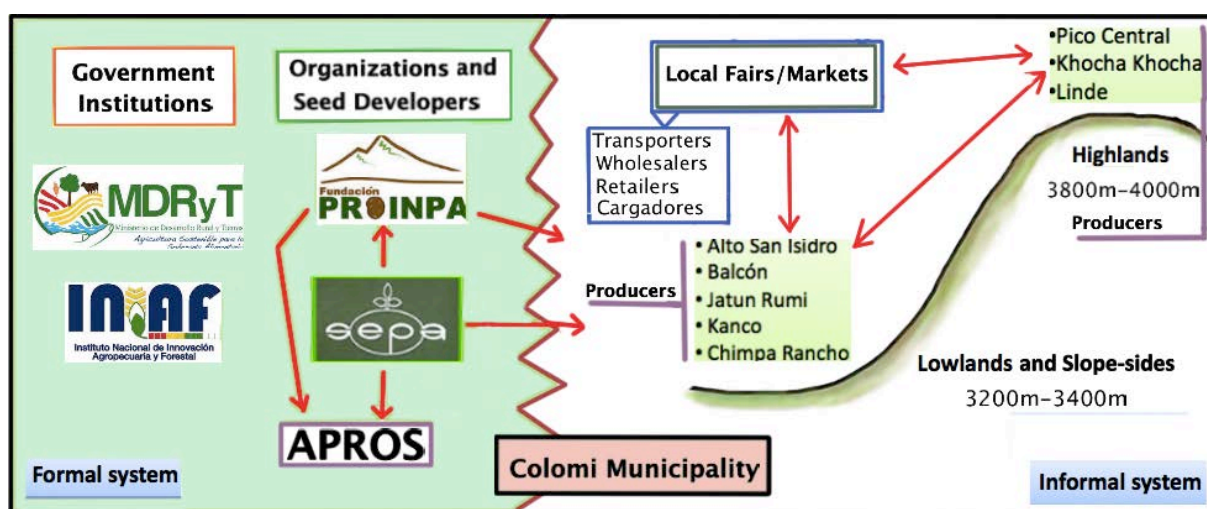
4.1 Findings: Potato seed Value Chain Analysis

The potato Seed Value Chain Analysis for the study area was done in several parts, starting with the Market Mapping to identify the main actors in the chain that are related to the Municipality of Colomi. Complementing the information gathered for the Market Map, the different farmer preferences survey, farmer and key informants interviews, as well as the informal vendor survey were analyzed. The results for every activity have been described and analyzed in the following sections.

4.1.1 Market Mapping

It is important to recall that the observations done during this part of the study, particularly for the informal potato system, and the identification of the Market Actors; was done at the study area's Colomi Fair and not at the Fairs of El Puente and Tiraque, which can have very different dynamics and actors.

As seen on Figure 6, the potato seed market in the area of study is characterized for being mainly informal, confirming the findings of Almekinders et al. (2010) in their study of Seed Market Dynamics in the area of Colomi, Tiraque and Cochabamba. The Colomi area has an active informal commerce of potato seed, having a weekly Fair or Market done in two plazas and adjacent streets close to Colomi's main square. Since Colomi is the transit zone between the Chapare's sub-tropical region and Cochabamba (the Departments' capital city), it is one of the main commercial meeting points for farmers and non-farmers in the Tropical areas and Puna regions. This is also one of the main reasons why most of the farmers in Colomi divide their agricultural practices between the two regions, owning land at the sub Tropics as well as in Colomi. Some of the main production crops in Colomi involve potato, oca or yam (*Oxalis tuberosa*), papalisa (*Ullucus tuberosus*), oats (*Avena sativa*) and cherry (*Prunus cerasus*) often used to produce "Guindol" (alcoholic drink). In the tropical area of the Chapare the main crops are pineapple (*Ananas comosus*), banana (*Musa paradisiaca*), *lo-coto* or pepper (*Capsicum pubescens*), *palmito* or heart of palm (*Beatrix gasipaes*) and coca leaves (*Erythroxylum coca*).



*APROS: Seed producer associations / MDRyT: Ministry of Rural Development

Source: Own source

*Red arrows indicate seed flow.

Figure 6: Market Chain Map of Actors in the potato seed Value Chain for the sampled communities at the Colomi Municipality (formal and informal systems).

For the sampled communities, the Colomi Fair is one of the main markets to access and sell potato seed, as well as the Tiraque Fair and El Puente Fair. At the weekly fairs, the Wholesalers, which are intermediaries with usually own means of transportation, trade large quantities of both potato for consumption and seed and trade it on other markets, sometimes as far as La Paz, located 11 hours away from Colomi.

The Retailers, which are also intermediaries, sell smaller quantities of potato (mainly for consumption and not seed) to final consumers or agro-processors, and they buy mostly from the Wholesalers (Almekinders et al. 2010). At the Colomi Fair, retailers are less numerous since most of the potato is sold by the farmers directly to the wholesalers or to other producers (when it is seed), trait established by Zeballos et al. (2009), and confirmed during the time of market observations during this study.

Transporters on the other hand have a major role in Colomi area since they are the main connection between the farms and the market when producers don't have own transportation. Rural transporters (sometimes members of cooperatives) charge farmers per transported "carga" (150 Kg -170 Kg bag), and the price varies according to the distance from the Colomi Fair to the different communities located at the Lowlands. There is no official transportation for the farmers living at the Highlands, meaning that they rely on neighbors in the community or relatives with own transportation to take their products to the fair. The variation of costs per transported "carga" and distance could be seen on Table 3 based on consultations with interviewed farmers.

It is also important to recall that the access ways for the different communities at the Lowlands are "second-hand" rows, meaning that they have no asphalt, yet have proper stone paving with water channelization. On the contrary, with the rows going to the communities located at the Highlands, where there is no road maintenance whatsoever, making it practically impossible to access during the rainy season (only by truck or motorbike), which is also partly the harvest season. Since the price for the transportation of products can be a quite significant investment for the farmers without own transport, and accessibility can be very complicated, most farmers have been inclining to enter the transportation business, having a greater income than just farming itself (Guaman 2013, personal communication).

Transporters, on the other hand, have to pay the service of the *Cargadores*. The *Cargadores* or "carriers" are the people in charge of weighting the "cargas" to make sure the weight is correct and the farmers pay the right amount for the delivery. *Cargadores* are paid 4 to 5 BOB per loaded carga (at the farmers' field) and unloaded carga (at the Colomi Fair). They are also in charge of counting the amount of loaded and unloaded cargas on the truck to avoid loses or stealing while the Fair is running. Usually the farmers also ride on the same truck with their production to prevent stealing as well (Guaman 2013, personal communication).

Table 3: Transportation costs per “carga” (150 Kg -170 Kg bag of product) for the different sampled communities at the Colomi Municipality.

Location	Community	Distance to Colomi Fair (Km)	Type of available Transport	Price per “carga” (150-170 Kg bag)
Group A Highlands “Phurumas” (3800m-4000m)	Linde	28,20	Own and In community	-
	Pico Central	7,17	Own and In community	6-7 BOB
	Khochá-Khochá	14,10	Own transport	-
Group B Lowlands and Slope-sides (3200m-3400m)	Alto San Isidro	15	Rural transporters	5 BOB
	Balcón	20	Rural transporters	7-8 BOB
	Jatún Rumi	18,3	Rural transporters	5-6 BOB
	Kanco	8,26	Rural transporters	3-4 BOB
	Chimpa Rancho	12,9	Rural transporters	4 BOB

*BOB: Bolivians / 1 BOB = 0,13 CHF

Source: Own source

The other side of the Market Map involves the formal seed system (Figure 6). Though it is not involved directly in the informal system itself, it does have certain interactions with it. As mentioned earlier in Chapter 2, SEPA, being the main source of certified potato seed and sole producer of “Pre-Basic” category of potato seed, is one of the main actors; as well as governmental institutions like the Ministry of Rural Development (Ministerio de Desarrollo Rural y Tierras- MDRyT) and its main institution INIAF (in charge of seed certifications). PROINPA as a developmental non-profit organization is one of the main bridges of action of SEPA and INIAF in this Value Chain, introducing the formal potato seed production to the actors in the informal seed system that haven’t formed yet Seed Producer Associations (Asociaciones de Productores de Semillas- APROS).

In the past Colomi had a Potato Seed Producer Association called APROTAC that produced and distributed certified potato seed at the different areas of the Municipality, however due to internal problems between the different members it dissolved around the year 2012 and wasn’t added to BioversityInternational and PROINPA’s project (Terrazas 2013, personal communication). No other formal certified seed producers associations were identified in the area of study.

The Municipality of Colomi has its own governance institution and democratically elected authorities, yet the Colomi Fair, hasn’t had any type of regulations to be met by the government of the zone. By the time of the study, the local government was in the process of building new infrastructure for the weekly Fair to be conducted in proper facilities (and not in the streets). This incentive will allow more regulations, yet the results of the implementation and functionality of these facilities haven’t been confirmed and future inquiries are recommended.

4.1.2 Potato Seed value chain for the Colomi farmers

As seen in Figure 7, the Value chain of potato seed for the farmers of Colomi has very intricate and complicated relationships. The Value Chain is characterized for having actors that can have multiple functions. Farmer seed producers can be informal or formal, as well as having other functions like transporters, direct vendors in the informal market or cargadores. These multiple functions can also be extended to the Farmer seed consumers. The formal system affects the informal seed system directly through the intervention of PROINPA by providing formal seed production information and advisory, as well as certified seed from SEPA. Other Non profit organizations (NGO's) have the same interaction with informal seed producers as well. There were no direct connections found between the INIAF staff with the farmers (seed producers and consumers) in Colomi.

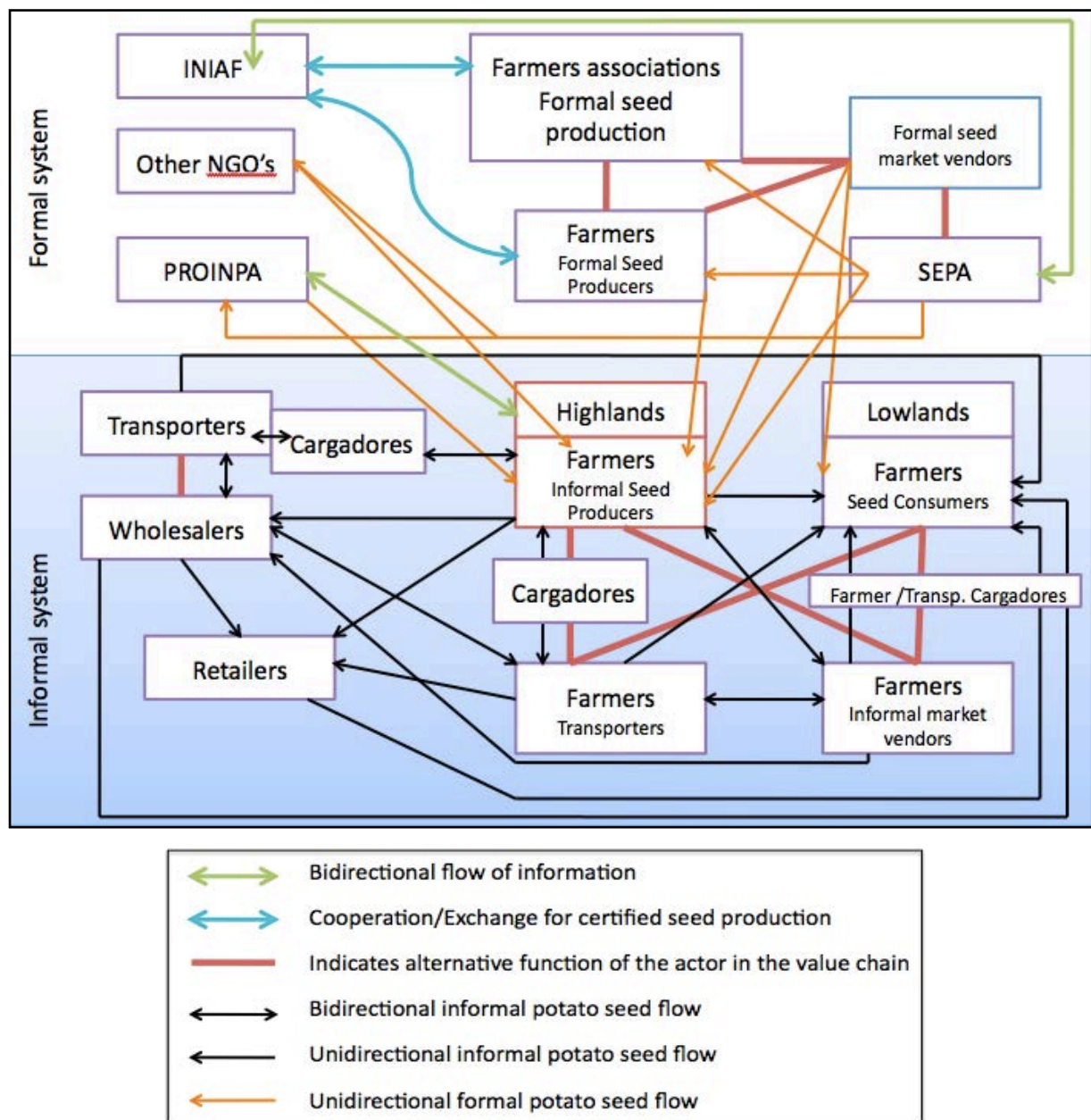


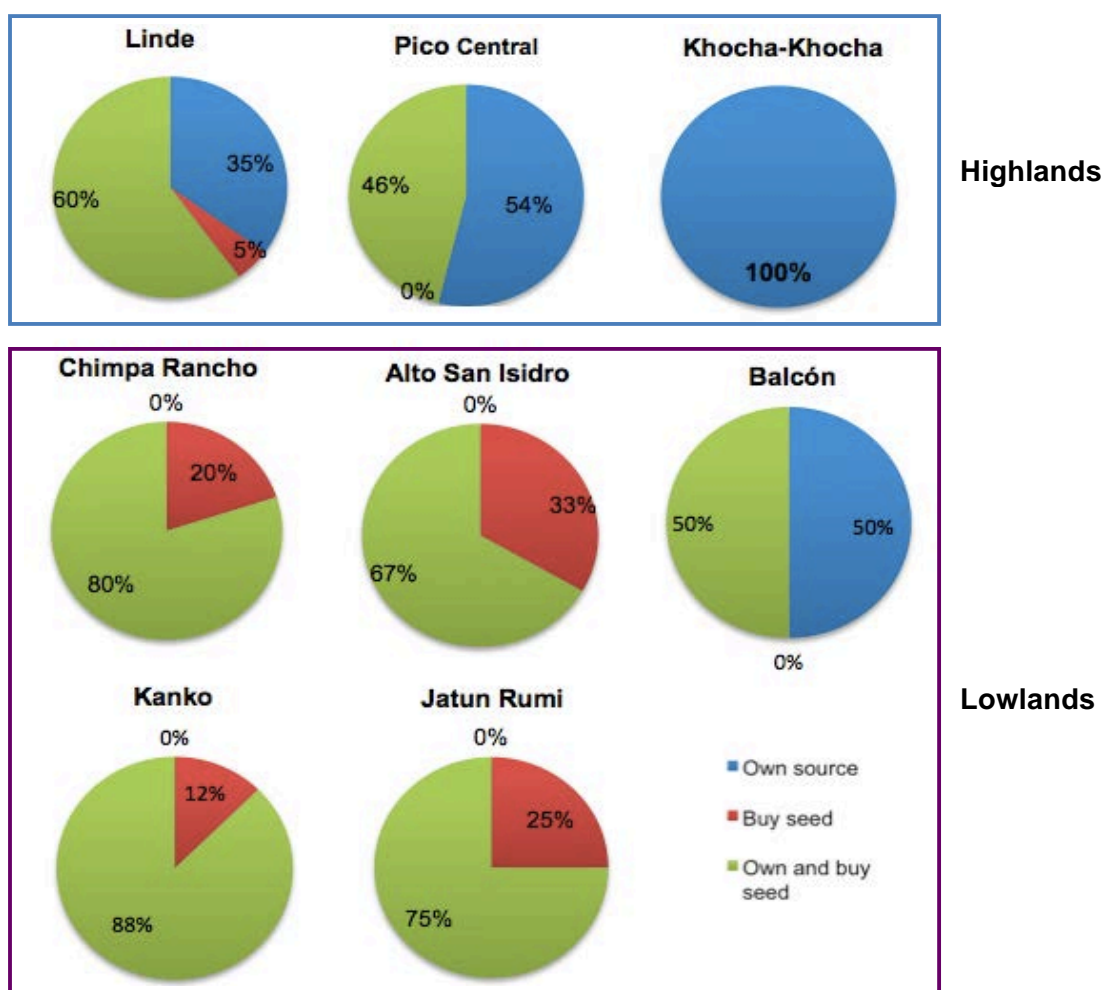
Figure 7: Potato Seed Value Chain for the farmers in the Municipality of Colomi.

4.1.3 Findings: Survey to members of sampled indigenous communities

The survey to the farmers of the sampled communities was done during the whole three-month period of stay at the Colomi District. The surveys had to be modified through the process in order to gather more information, as new important aspects surged in the initial interviews. A total of 65 farmers were interviewed (49 men and 16 women), with an average age of 46 years and an average household members of 5,5 people. The different aspects analyzed in the survey can be found below.

4.1.3.1 Findings on types of seed sources

The interviewed farmers were asked to state if the potato seed they acquire comes from their own source of production (meaning that they are capable to meet their needs of seed), or they buy it or both options combined. As seen in Figure 8, there was a clear difference between the communities located at the Highlands of the region (Linde, Pico Central and Khocha-Khocha) with the communities located at the Lowlands (Chimpa Rancho, Alto San Isidro, Kanko and Jatún Rumi) with the exception of Balcón.



Source: Own source

Figure 8: Comparison between different communities in types of seed sources

Farmers living at higher altitudes preferred to grow their own seed, or combine that activity with buying seed as well. On communities like Khocha-Khochha the entire sampled population had own potato seed. These results confirmed that the aptitude of soils located at higher grounds having virgin soils (“Phurumas”), which are optimal for potato the seed production (reduced plague and nematodes infestations) (Cadima 2013, personal communication). This affirmation though, didn’t applied completely to Linde, since it did have 5% of the sampled farmers solely buying seed. This may be due to the situation of the farmers interviewed. Some farmers interviewed in Linde have been owners of land in the area, yet not all of them lived there, having land at the Lowlands of the Candelaria District, closer to Colomi, as well as in Sacaba and the tropical zone of the Chapare Region. The differentiation of production zones could have been a reason why they didn’t focus in their own potato seed production like Pico Central and Khocha-Khochha, where farmers lived in the land that they produced.

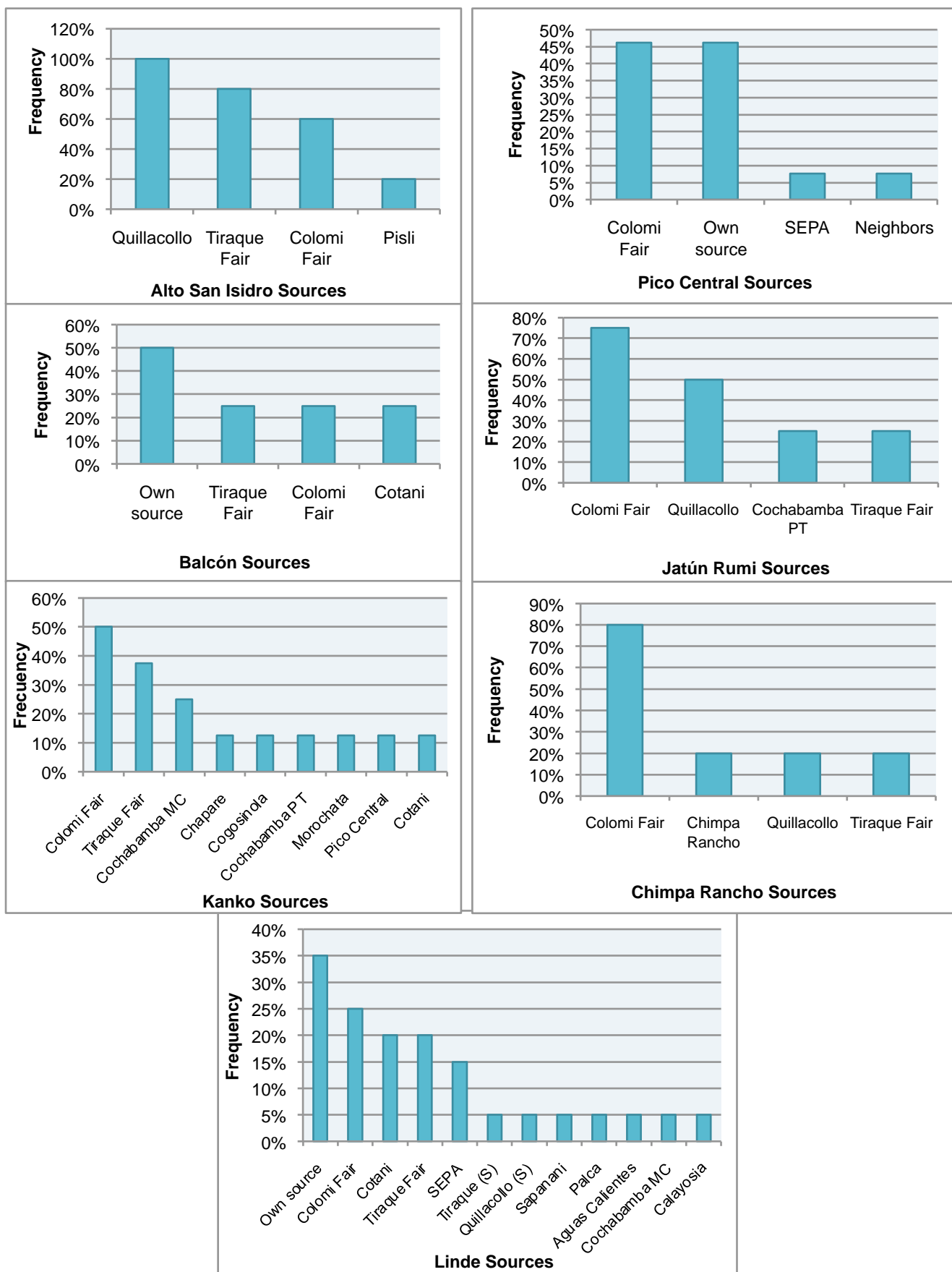
On the other hand, in the majority of communities at the Lowlands there was no sole own seed production, but farmers preferred to combine it with seed purchase. This is due maybe to the higher rate of seed replacement in the area. Farmers at the Lowlands preferred to buy and replace the seed every 1-2-3 years since the rate in which the seed gets “tired” (accumulative effect of plagues, diseases and virus on same seed used in several planting seasons) (Terrazas et al. 2003) is faster at the Lowlands than at the Highlands, where farmers have longer resting periods of the soil (up to 10 years) between every potato planting season (Terrazas and Cadima, personal communication, 2013).

The different results gathered at Balcón may be due to long distance of the community in comparison to the other sampled communities, however it can also be due to the small sample size of farmers in the area.

4.1.3.2 Preferred Potato Seed Market sources

The farmers that bought seed on regular and irregular bases were asked during the interview to determine which were their main potato seed market sources. Farmers were given the opportunity to mention two main sources. Frequencies in accordance to the number of mentions per Market source were calculated and can be appreciated in Figure 9, except for the Khocha-Khochha community since they didn’t mention other seed sources, but their own. The sample sizes of farmers vary per community and can be observed in the Annexes. Own seed production sources for the communities in which they play an important role were added in the frequency calculation and graphs.

As seen in Figure 9 the Colomi Fair was one of the main potato seed market sources, mentioned in all the communities analyzed. Other sources like the Tiraque Fair was mentioned in 5 of the 8 sampled communities. Sources located in distant regions like Quillacollo as well as the Cochabamba’s Markets “Plaza Triángulo (PT)” and the “Mercado Campesino (MC)” (farmers’ market), were also mentioned.



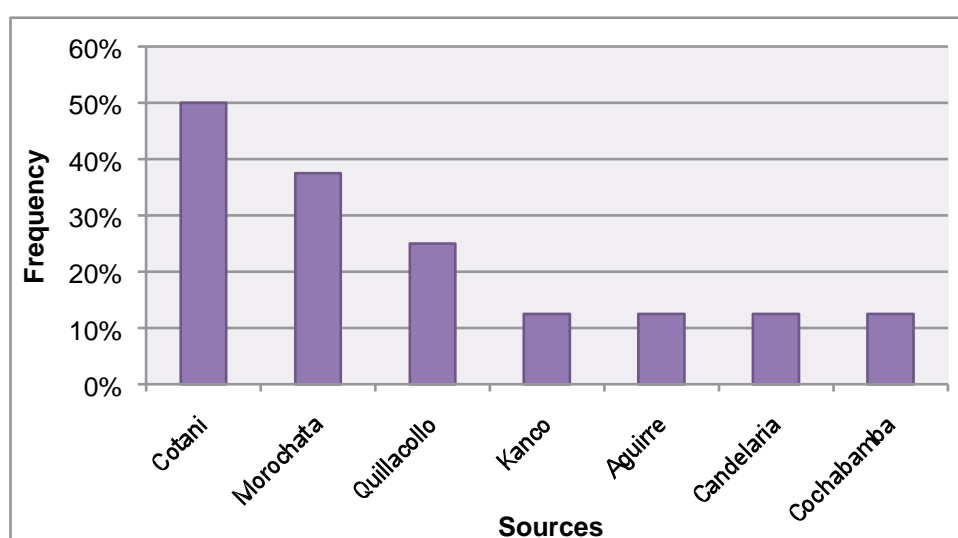
Source: Own source

Figure 9: Comparison of preferred Potato Seed market sources in sampled communities of the Municipality of Colomi

Differences between the seed sources for the communities located in the Highlands and in the Lowlands were also identified. The sampled farmers at Pico Central and Linde showed greater predisposition to gather seed coming directly from SEPA or from other certified seed producers in Tiraque (S) and Quillacollo (S). This meant that they were aware and informed of the benefits of acquiring certified potato seed, contrary to the farmers at the Lowlands, whom didn't mentioned SEPA during the interviews.

Farmers were also asked the reasons why using the sources they mentioned. It turned out that that interviewed farmers of the communities located at the Lowlands had similar reasons to purchase in certain markets, as well as the farmers living at the Highlands. Given the case, the results were analyzed dividing the communities by the eco-region they belonged: Group A for the Highlands (Pico Central and Linde) and Group B for the Lowlands (Kanko, Alto San Isidro, Chimpa Rancho, Jatún Rumi and Balcón).

Of the 27 farmers interviewed in Group B, 53% preferred to go to the Colomi Fair because they could find seed from other sources within the same Fair (Figure 10). Alternative sources like Cotani (a community located in the highlands of the Municipality Colomi area), where the most preferred for the farmers, meaning that there was a high trend of farmers coming from Cotani to sell potato seed at the Colomi fair. This information was verified during the vendor surveys made at the Colomi Fair. Morochata as well was also confirmed by the vendor surveys as one of the main sources of seed for the Colomi Fair. Farmers stated the importance of NOT buying seed from other communities located at the lowlands of Colomi since they know that if they use the seed from the same area where their production is located, could lead to accumulative problems like the presence of pathogens like *Phytophthora infestans* causing potato blight, bacterial infections like *Erwinia tracheiphila* causing bacterial wilt, as well as parasitical nematodes like *Globodera rostochiensis*. (PROINPA Report LoA 2014, 6)



Source: Own source

Figure 10: Alternative potato seed sources searched at the Colomi Fair by farmers of communities in Group B(Alto San Isidro, Kanko, Chimpa Rancho, Balcón, Jatún Rumi)

Thirteen percent of the farmers in Group B claimed their preference for the Colomi Fair due to its proximity to their communities, reducing transportation costs and accessibility, not taking into account the quality of the potato seed.

The farmers in Group B had two other main sources besides the Colomi Fair: the Tiraque and Quillacollo fairs. Seventy percent of the farmers interviewed in Group B preferred the Tiraque Fair since the potato seed sold there had higher productivity, bigger size potatoes and an overall better production in comparison with the seed sold at the Colomi Fair. A smaller percentage preferred Tiraque to find seed from other regions like Caspicancha and Villa María. Around 80 % of the farmers interviewed in Group B complained directly of their low potato productivity when using seed coming from the Colomi Lowlands, therefore it was understandable that they searched other potato seed sources far from the study area, some even as far as a 2 to 3-hour car drive (Cochabamba and Quillacollo).

For Group A (Pico Central and Linde omitting Khocha-Khochá) and differing from Group B, 36% of the interviewed farmers preferred the Colomi Fair due to its proximity and accessibility; while a smaller 27% preferred it due to the affordable prices of potato seed found there. Other reasons like the necessity to exchange seed because of the “tired seed” phenomenon and search for seed from other sources like Cotani were also mentioned, but in smaller number. The longer distance and hard accessible roads to and from the communities in the highlands could be a main factor of why the farmers chose the closest seed source, the Colomi Fair.

4.1.3.3 Main problems with potato seed at the study area

The survey for the farmers at the sampled communities also tried to identify the different problems per community to acquire and/or purchase seed.

Kanko is a community characterized by its very active commercial movement due to its proximity to Colomi. The main problem mentioned by the 8 farmers interviewed in this area was the presence of “mixed cargás”. They referred as “mixed” to the “cargas” that brought nice potato seed at the top, while in the middle and bottom, rotten or very small potatoes of different potato varieties. Diseases and presence of “gorgojos” or Andean weevils (*Premnotrypes latithorax*) inside the “cargas” were also identified as main problems, as well as white worms (*Premnotrypes vorax*). Other important issue mentioned by the farmers of Kanko was the lack of regulations and frivolousness of the seed sellers at the local Markets. According to the interviewed farmers, the vendors at the markets sell ware potatoes meant for cooking as “seed”, and farmers, sometimes due to the lack of other options and seed scarcity are forced to buy. They also complained that the prices of seed had gone up in the past year and it's getting harder to purchase seed.

The 5 farmers interviewed at Chimpa Rancho concurred that their main problem with the potato seed is its unstable production through the years. The “tired seed” phenomenon was

identified as a significant problem that forces them to buy new seed to renovate their production every 2 or 3 years, though some farmers mentioned that their seed exchange is yearly, since they produce every year potato on their fields without any type of crop rotation. Problems with bad quality of seed, and presence of diseases like potato blight, bacterial wilt and white worms were also mentioned.

While interviewing the 6 farmers in Alto San Isidro the majority knew very well the seed market, and had come used to the idea that they should exchange the seed more regularly in order to get the best production and avoid the “tired seed”. Most of them had no problems to buy or obtain seed since they knew where to obtain it, and refused as well to buy seed at the Colomi Fair. As seen in Figure 9, markets like the Tiraque Fair and Quillacollo were preferred by most by the farmers in Alto San Isidro, however during times of seed scarcity they had been forced to buy at the Colomi Fair, having bad experiences with poor quality seed, “mixed cargás”, presence of plagues like the Andean weevil, and diseases like bacterial, potato blight and white worms.

As the Alto San Isidro farmers, the producers of Jatún Rumi preferred to buy seed from Tiraque and Quillacollo, trying to completely avoid buying seed at the Colomi Fair. All 4 farmers interviewed clearly stated that they don't trust anymore to buy seed from Colomi, since the vendors have been tricked by with “mixed cargás”. The majority of farmers interviewed in Balcón usually produce their own seed and had no problems with it, however some mentioned the same generalized problems already referred by the other communities.

None of the farmers interviewed at the communities located at the Lowlands mentioned pathogens like nematodes in the soil; a recurring problem in the Candelaria district (PROINPA Report LoA 2014, 6).

Unlike the communities of the Lowlands, a greater number of farmers at Pico Central, Linde and Khocha-Khochá experienced no problems with potato seed, 58% of the farmers interviewed at the three communities said to not have experienced any problems. However, they also mentioned similar problems stated by the farmers at the Lowlands.

At Linde, seed scarcity was one of the most common problems mentioned by the sampled farmers. Distinctively, seed scarcity is a problem in Linde because seed vendors can't deliver the product so far away. Linde is more than 25 Km away from the Colomi Fair, making accessibility, one of the main issues for this community (Arias 2013, personal communication). Farmers in Linde were very aware of the quality of the certified seed from SEPA, and praised its productivity and results, however they feared its price was too high for them to afford it.

The presence of “mixed cargás” in the local markets was also a concern for the farmers at Pico Central. The increasing prices for potato seed are also a big concern for the farmers at this community, particularly for farmers like Abdón Choque who implied during the interview:

“Before we didn’t have to worry so much about getting seed, now its complicated” (Choque A 2013, personal communication). Though farmers in Khocha-Khochá had no problems to acquire potato seed, they had other problems affecting their potato production in general. Javier Enzinas, one of the 4 farmers interviewed in Khocha-Khochá stated the following:

“I’m going to stay in Khocha-Khochá for only 2 more years, then I will leave. I don’t make enough money selling potatoes. I can’t plant Canastillo or any of the Q’oyllus because I have too much gorgojo (weevils). I will only come back to plant Waych’a. Planting ware potato is in vain since I can’t afford to buy the fertilizer. It is more rentable to work in the construction business in Sacaba, the climate is better and I will take my family there”

(Enzinas 2013, personal communication,)

The rest of Javier’s family has migrated already away from Khocha-Khochá, so he is practically alone with his wife and kids in the area. It is important to recall that Khocha-Khochá has a very small population in compare to the rest of the sampled communities. Only 5 families in total live in the area during the time of the study, Javier’s family being one of them.

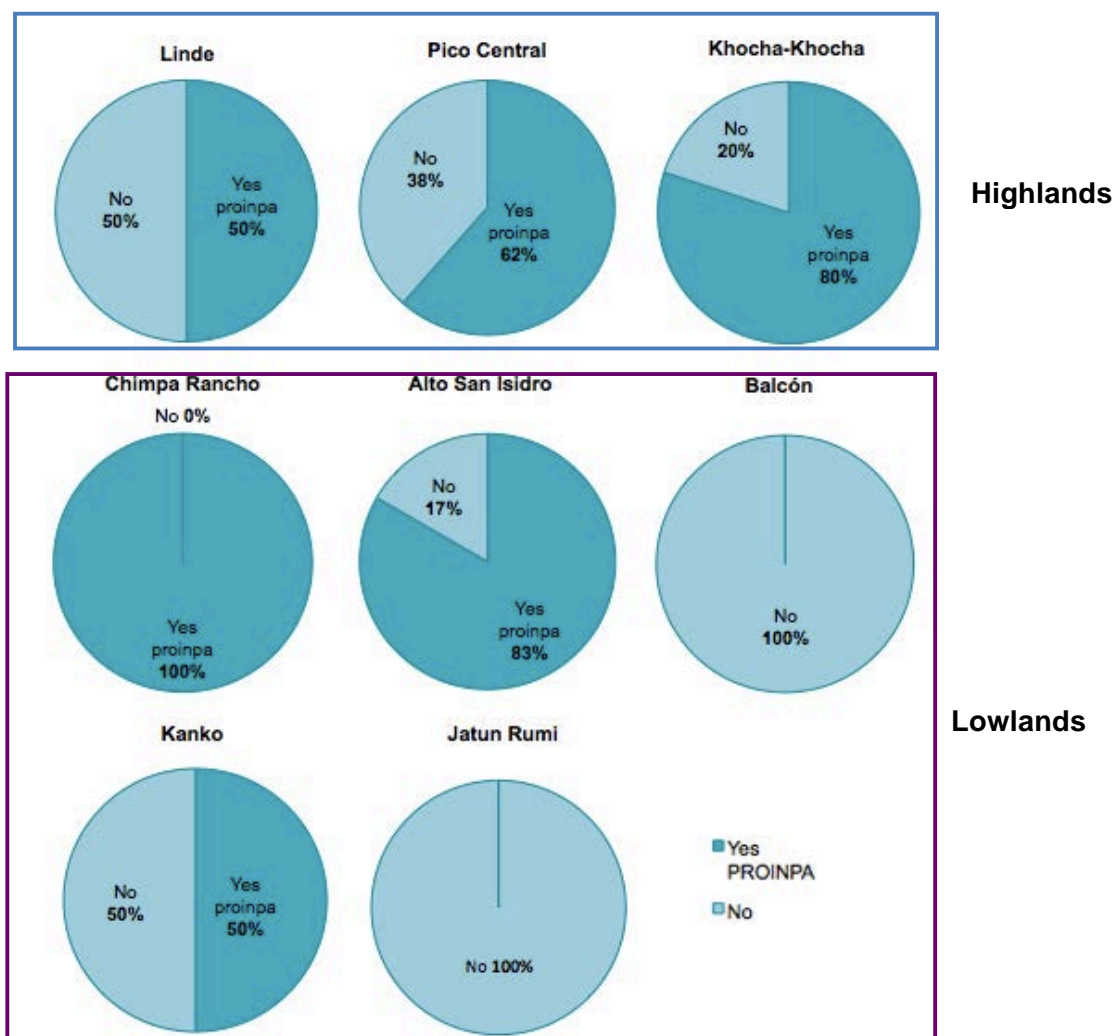
Farmers in all the sampled communities stated that they usually produce 15 to 20 “cargas” per 1 planted “carga” on a “good” season, however it can lower down to 10 or less when having problems with the seed quality and arduous climatic conditions. Nonetheless, this is only a generalization, since potato productivity can be linked to other factors, like type of potato variety planted, local conditions and farming practices.

4.1.3.4 Presence or absence of Institutional aid to acquire potato seed

Farmers in the sampled communities were asked if they had ever gotten any form of Institutional or Governmental aid in the past to acquire or purchase potato seed. Some farmers at six of the eight sampled communities affirmed to have had some sort of help, and only coming from PROINPA. No other institution working in the area was mentioned (like for example Visión Mundial).

As seen on Figure 11, the interviewed farmers at the communities of Balcón and Jatún Rumi haven’t received any type of aid. The reason for this is unknown, however it can be linked to accessibility since those communities are located more than 19 km away from the Colomi town center and the main road, yet this is only a supposition.

It is clear that Colomi and the district of Candelaria have been important centers for aid coming from the PROINPA foundation, and farmers in the area still recognize the technicians working at the organization (even though some projects were implemented years ago). This was an advantage for this master study since most farmers of the area were eager to cooperate with PROINPA’s technicians, however this also meant more demands from the farmers as well. Most of them demanded or expected seed and additional aid for their *own* communities, independently from the current project.

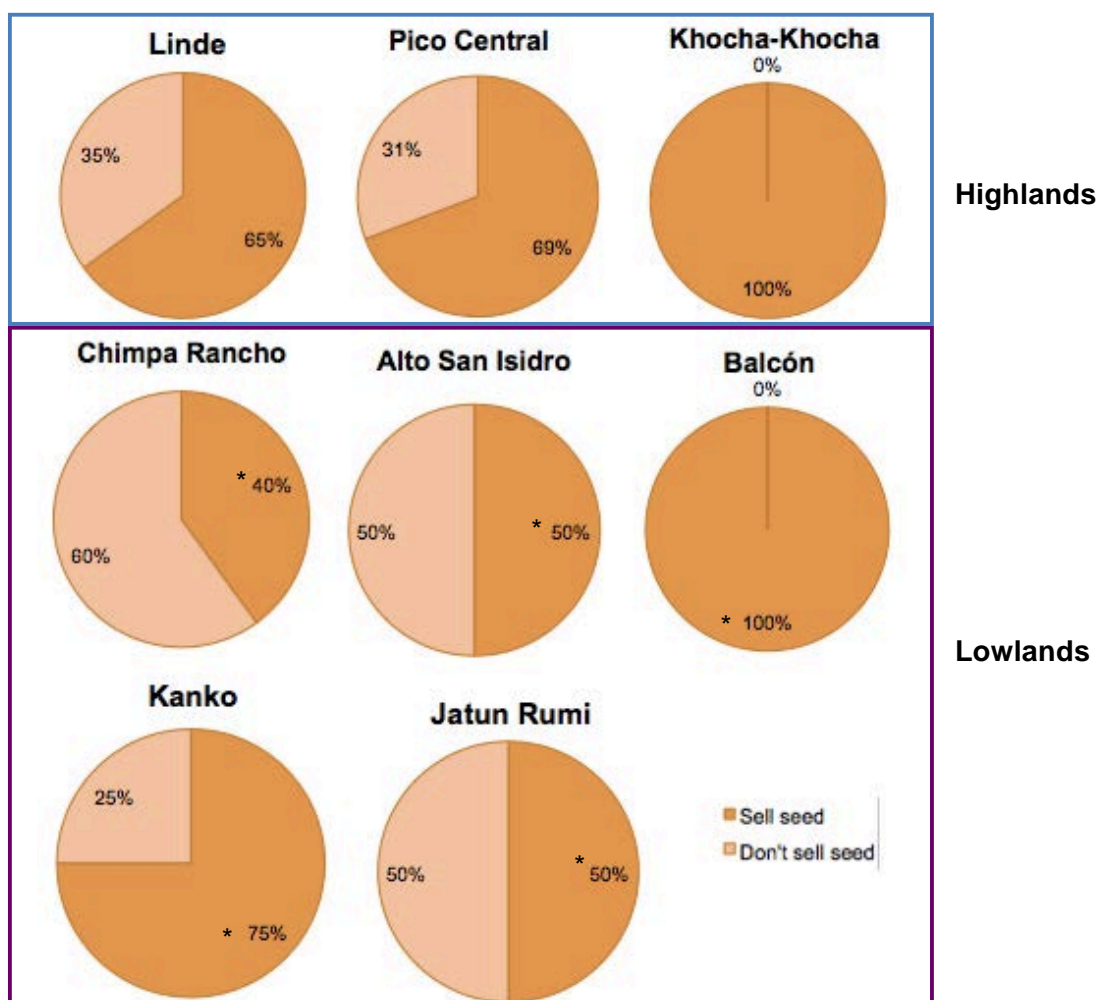


Source: Own source

Figure 11: Comparison of presence or absence of Institutional aid to acquire potato seed in the sampled communities

4.1.3.5 Potato Seed selling: varieties and market destinations

Potato seed selling was one of the most important aspects evaluated during the survey. The interviewed farmers were asked if they sold potato seed and if they did, where was this production sold. As seen in Figure 12 all communities interviewed had farmers who sold seed, however there was a clear difference between the communities located in different eco-regions. Farmers in the Highlands (Linde, Pico Central and Khocha-Khochá) sold their potato seed on the regular bases, meaning that it played a significant role in their household income. On the contrary, farmers in the Lowlands (Chimpa, Rancho, Alto San Isidro, Balcón, Kanko and Jatún Rumi) sold potato seed only when they had leftover quantities after planting their own fields. They also mentioned that they didn't specialize on potato seed production, but more on ware potato for consumption.



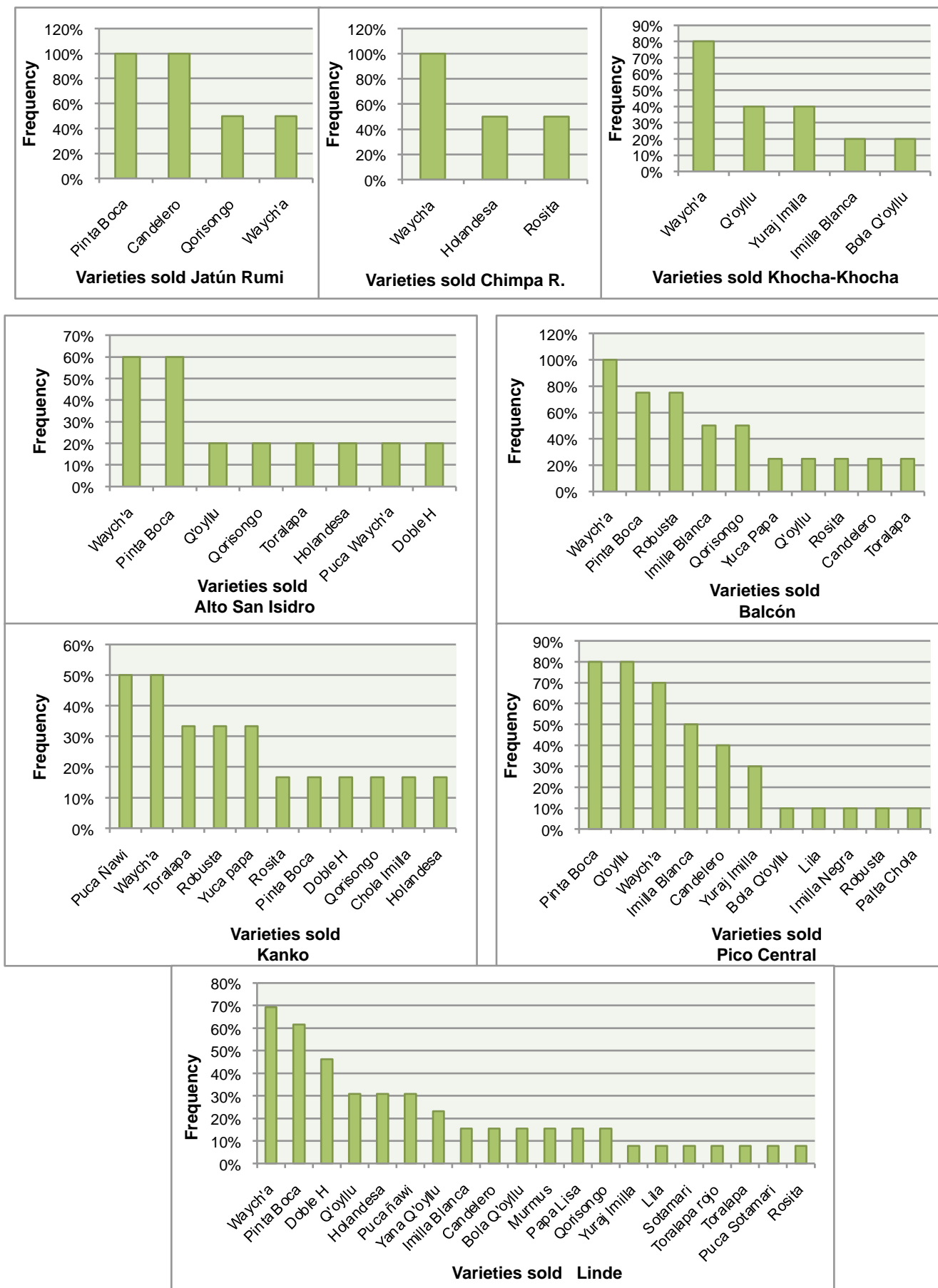
* Farmers sold seed only when a certain quantity was left.

Source: Own source

Figure 12: Potato seed commercialization in different sampled communities

In matters of which seed potato varieties were sold per community, during the interviews farmers were asked to name some of the varieties they usually sell. Frequencies in accordance to the number of mentions per Variety where calculated. The greatest number of varieties mentioned where at Linde and Pico Central communities (Figure 13). It is important to recall that during the surveys only varietal identity was used, meaning that farmers mentioned the varieties they knew by name, and no morphological characterization was made. This could have lead to discrepancies since some varieties in the sampled communities could have been known by one or two different names, or farmers could have associated one variety with another, calling them by the same name (Lipper et al. 2010).

Some potato varieties are characterized for having one name, yet have subtle differences in their morphological traits, like slight variations in the color of the skin, and interior, as well as variations in the disposition of the potato's eyes. The knowledge of these differences has been lost through the generations, and proper potato morphological characterizations are still necessary in Bolivia (Gonzales 2013, personal communication).



Source: Own source

Figure 13: Frequency of potato seed varieties sold per sampled community

The preference of seed varieties to be sold by the farmers was directly related to the varieties they preferred to sell as ware potatoes as well. The predominant potato seed variety sold by the farmers was Waych'a. Though Waych'a is a native variety from Bolivia, it is not native from the zone of Candelaria. It was introduced in the 1960's and has been established as one of the most important in the past years (Salazar 2000, 124). Pinta Boca was a predominant variety for farmers in Linde and Pico Central, maybe due to its resistance to hail, and frosts, more frequent in the Highlands (Terrazas et al. 2003).

All four improved varieties found in the area: Toralapa, Doble H, Holandesa and Robusta, were more frequently mentioned at the communities located at the Lowlands. Kanko, Alto San Isidro, Balcón and Chimpa Rancho. The sampled farmers at Pico Central and Khocha-Khocha didn't mention any improved varieties. This is due to the native varieties adaptability to the conditions at the Highlands.

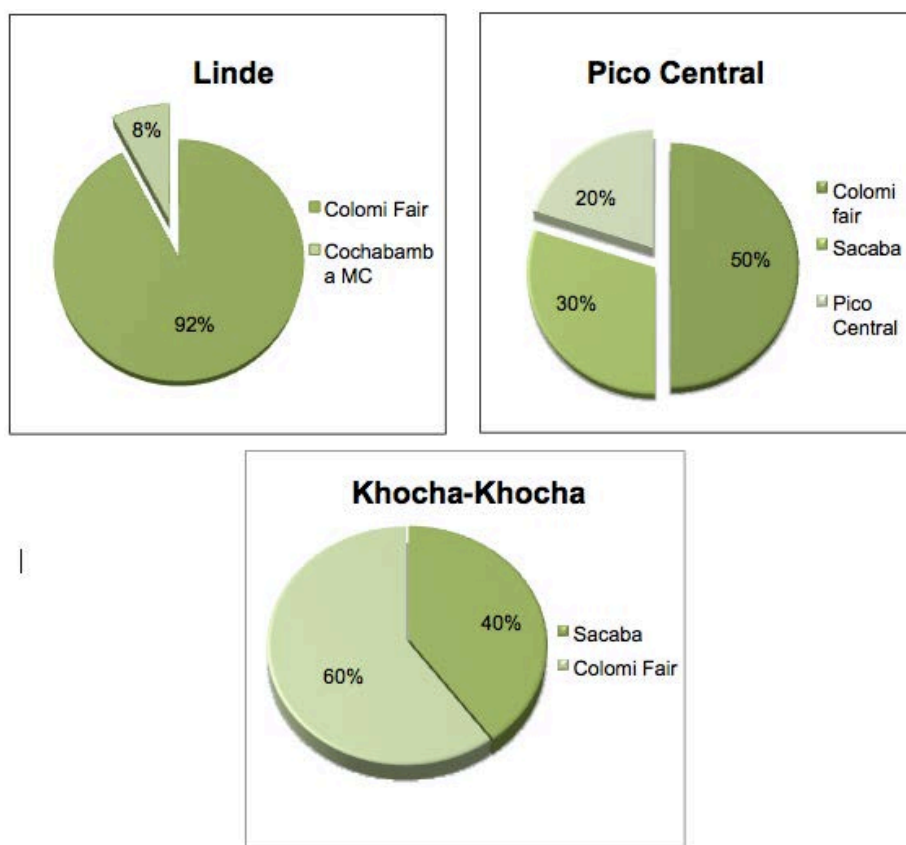
"Farmers in the Highlands prefer more to plant native varieties than the improved ones. They yield more, while the improved don't grow. In the Lowlands the improved are better than the native. The L'ukis (native variety) for chuño have no chance in here (Lowlands), that is why people are growing more Toralapa and Doble H"

(Arispe 2013, personal communication)

The interviewed farmers also showed preference for native varieties for their household consumption like Waych'a, Pinta Boca, and Q'oyllu, yet some stated that it wasn't imperative to have them. Farmers' households usually consumed the potato varieties left from the product they were producing at the moment.

All the farmers in the communities located at the Lowlands, sold seed (when available) at the Colomi Fair. There was no other market mentioned. Farmers like Anita Ledezma from Alto San Isidro clearly stated that she was not a potato seed producer, yet when she had "murus" (normal to small size ware potatoes) she went to the Colomi Fair to sell them, emphasizing to the buyers that they were NOT seed; however other farmers do not inform the buyers of the difference (Ledezma 2013, personal communication).

For the farmers living in the communities located at the highlands, the situation was different. Fifty percent of the farmers interviewed in Pico Central sold seed at the Colomi Fair, while 30% preferred to sell at Sacaba (a city with higher commercial activity than Colomi, and last stop before reaching Cochabamba city). The remaining 20% of the farmers at Pico Central sold the seed in the same community. Sacaba was also a focal market point to sell seed for the farmers of Khocha-Khocha; 40% of the farmers interviewed sold their seed there, while the remaining 60% sold at the Colomi Fair. At Linde on the other hand, 92% of the interviewed farmers sold their seed at the Colomi Fair, while a small 8% went to the Mercado Campesino at Cochabamba (Figure 14).



Source: Own source

Figure 14: Destination markets of seed produced in sampled communities of the Highlands

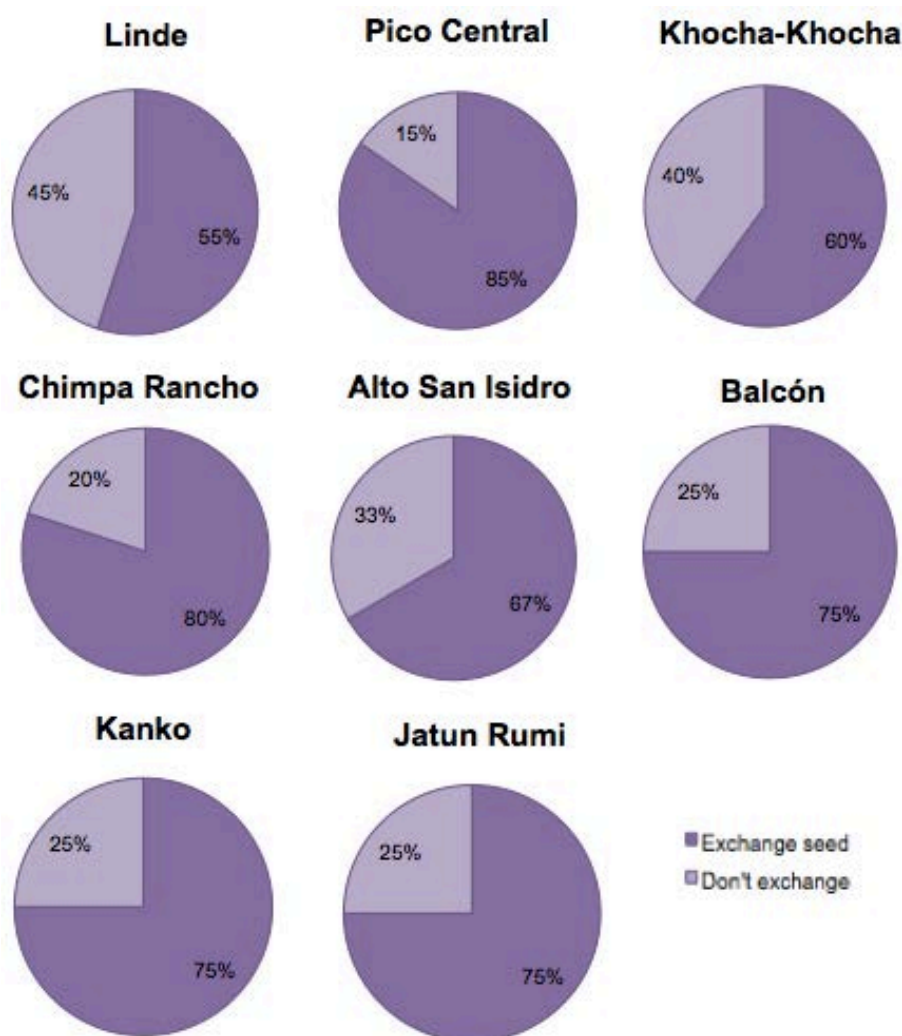
Farmers at the communities were also asked to list some of their necessities or suggestions to improve their income selling potato seed. The farmers, mainly at the Highland communities mentioned needing better access roads to their fields, in order to transport their production easier, faster and cheaper. Market diversification was also another suggestion, since the Colomi Fair, according to the farmers, is overflowed with intermediaries. Farmers mentioned needing a higher production volumes, yet their small parcels didn't allowed them to do so, or they didn't have enough time to make good agricultural practices since they owned other parcels in other localities like in the subtropical Chapare. The farmers also mentioned proper quantities of fertilizer, and agrochemicals, as well as good quality seed from more commercial varieties like the Doble H and Waych'a, during the survey.

4.1.3.6 Potato Seed exchange

Potato seed exchange was the final aspect analyzed in the farmers' survey in the sampled communities. In this master study, "exchange" refers to the occasions were farmers give their potato seed to neighbors, friends or relatives in order to receive potato seed of a different

potato variety, with no use of money. Seed exchange was analyzed separately from the other types of seed sources (like seed purchase and own seed production), since it was considered a sporadic practice done by farmers, varying from planting season to planting season.

Unlike the other evaluated aspects, seed exchange was not influenced by the eco-region where the communities were located. Pico Central and Chimpa Rancho had the highest rate of seed exchange (85% and 80% respectively). The high rate was understandable for Pico Central, since all of its farmers belonged to the same farmers' association and almost all were related to each other (familiar ties), allowing social alliances to form and permitting seed exchange in times of need. Jatún Rumi, Balcón and Kanko had all a 75% rate of seed exchange in the community, while for Linde, Alto San Isidro and Khocha-Khocha varied from 55% to 67% (Figure 15).



Source: Own source

Figure 15: Presence or absence of seed exchange at different sampled communities

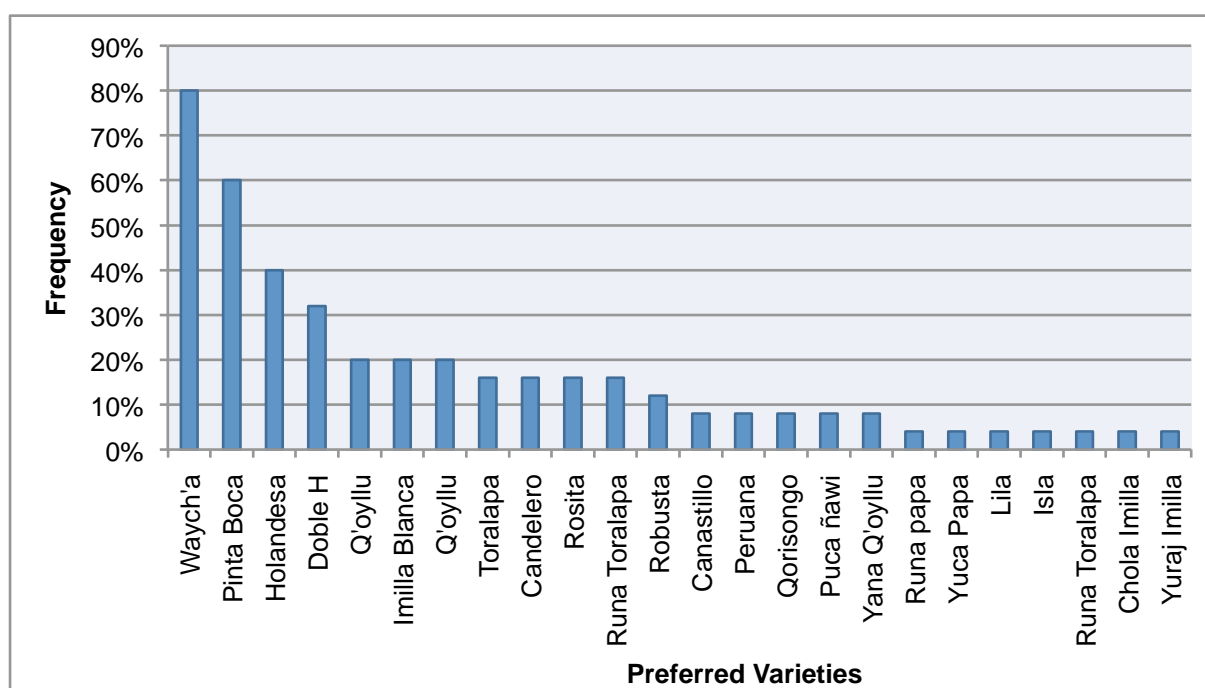
The lack of seed exchange at the Linde community was probably due to the fact that not all farmers in the community lived near the planting fields. As mentioned before, some farmers of Linde lived at the Lowlands the Colomi Municipality or even Sacaba, affecting the relations with the farmers permanently living in the area. As depicted by the results, seed exchange was a better indicator of the grade and quality of social relations within the sampled communities.

4.1.4 Findings: Complementary survey for farmer's preferences

The complementary survey to define the farmers' preferences evaluated three different aspects: preferred potato seed varieties to buy, preferred characteristics of the seed while purchasing, and whether or not they will buy potato seed from Pico Central and Linde. The results found on the survey can be observed in the following sections (See Annex 3).

4.1.4.1 Preferred potato seed varieties

During the survey farmers were given the choice to list their most preferred potato seed varieties. Frequencies in accordance to the number of mentions per Variety were calculated and can be appreciated in Figure 16. Two native potato varieties topped the list of results Waych'a and Pinta Boca. It can be inferred that the varieties mentioned by the farmers in this question, were directly linked with the market trend of the last production cycle in the area. Meaning that the varieties that have high selling price during the current season, could have higher probabilities to be planted at higher volumes in the next season.



Source: Own source

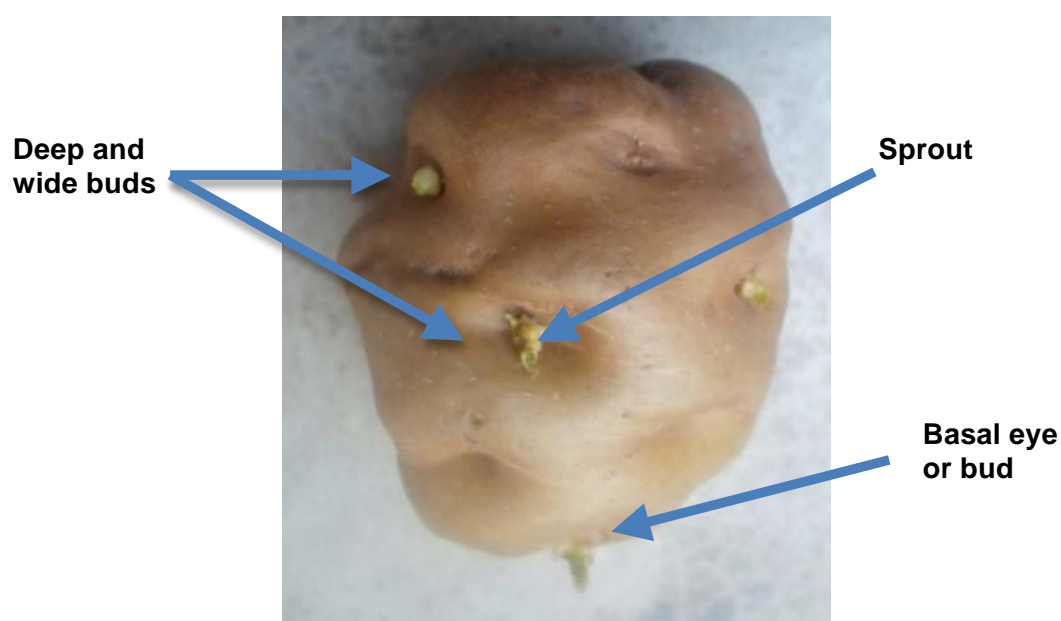
Figure 16: Preferred potato seed varieties mentioned by seed users during the survey

Following the native varieties farmers also mentioned two important improved varieties Holanda and Doble H, which show a growing trend of demand for these varieties in the area of study. The seed demand of these varieties was confirmed in the vendor survey and informal market during this study.

4.1.4.2 Preferred potato seed characteristics

There were several preferred morphological characteristics mentioned by the farmers during the survey. The disposition of the eyes or buds of the potato (sections of the potato where sprouts grow) was the main characteristic. According to the farmers, the bigger, wider and deep the potato buds are the better the seed would be. The presence of a specific bud on the basal part of the potato was crucial for some farmers (Figure 17). The reason for this desired trend, according to the farmers interviewed was a better sprouting, however no experimental trials, or specific manuals were found to substantiate this affirmation. Apparently this knowledge was passed thru the generations, since the older farmers (bordering 75 to 80 years of age) clearly stated during the interview that the main desire characteristic was the location of the basal bud.

Some farmers mentioned specific desired morphological characteristics for certain varieties. For Pinta Boca for example, the buds should have a greater separation with each other, while for the Waych'a and Chola Imilla a basal bud is imperative. The Chola Imilla should not have red-colored buds, as well as a red coloring on the basal part. Further investigation on these on the effects of these characteristics is necessary.



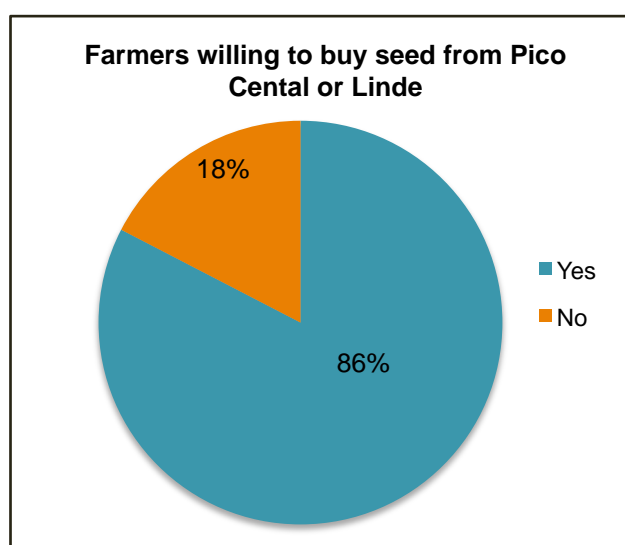
Source: Own source

Figure 17: Disposition of eyes or buds on healthy potato seed

4.1.4.3 Pico Central and Linde seed purchasing

The vast majority of the 25 farmers interviewed agreed that they would purchase potato seed at Linde or Pico Central if they ever had a chance to do so in the future (Figure 18). The reasons were very varied. The majority of farmers praised the quality of the soils at the “Phurumas”, yet others had other concerns. Saturnina Rodriguez from Alto San Isidro, a farmer living for more than 70 years in the area, alleged that the potato seed coming from Linde produce plants with higher foliage and lesser tubers, since the seed produced at the Highlands has elevated levels of humidity. No scientific reviews or backup from the technical staff at PROINPA were found to support this allegation (Rodriguez 2013, personal communication). Farmers also mentioned that the Waych'a potato seed coming from the Highlands was of far better quality than the one found regularly at the Lowlands, however the seed from the Candelero variety was worst, even though it is far known to be a variety fitted to produce at the Slope sides and Highlands of the region (3300msl to 3650msl) and it is a native variety from the locality not like Waych'a, which was introduced in the area during the 1960's (Cadima et al. 2004).

As price is concerned, farmers agreed to buy the seed from Linde and Pico Central if it would be affordable. Some of them were misinformed saying that *all* seed coming from the Highlands is cheaper, since it is produced in “Phuruma” soils (virgin soils), and therefore *do not* need fertilizers or agrochemicals. The majority of the farmers interviewed didn't knew where Linde was located or its existence, yet the majority knew Pico Central, since its farmers have a fairly active commercial activity at the Colomi Fair. The farmers of Linde on the other hand, had higher activity at the fairs of Tiraque and Sacaba and therefore weren't very well known at the Lowlands of the Candelaria district.



Source: Own Source

Figure 18: Willingness of farmers to buy potato seed at Pico Central and Linde

4.1.5 Findings: Informal vendor surveys and informal market analysis

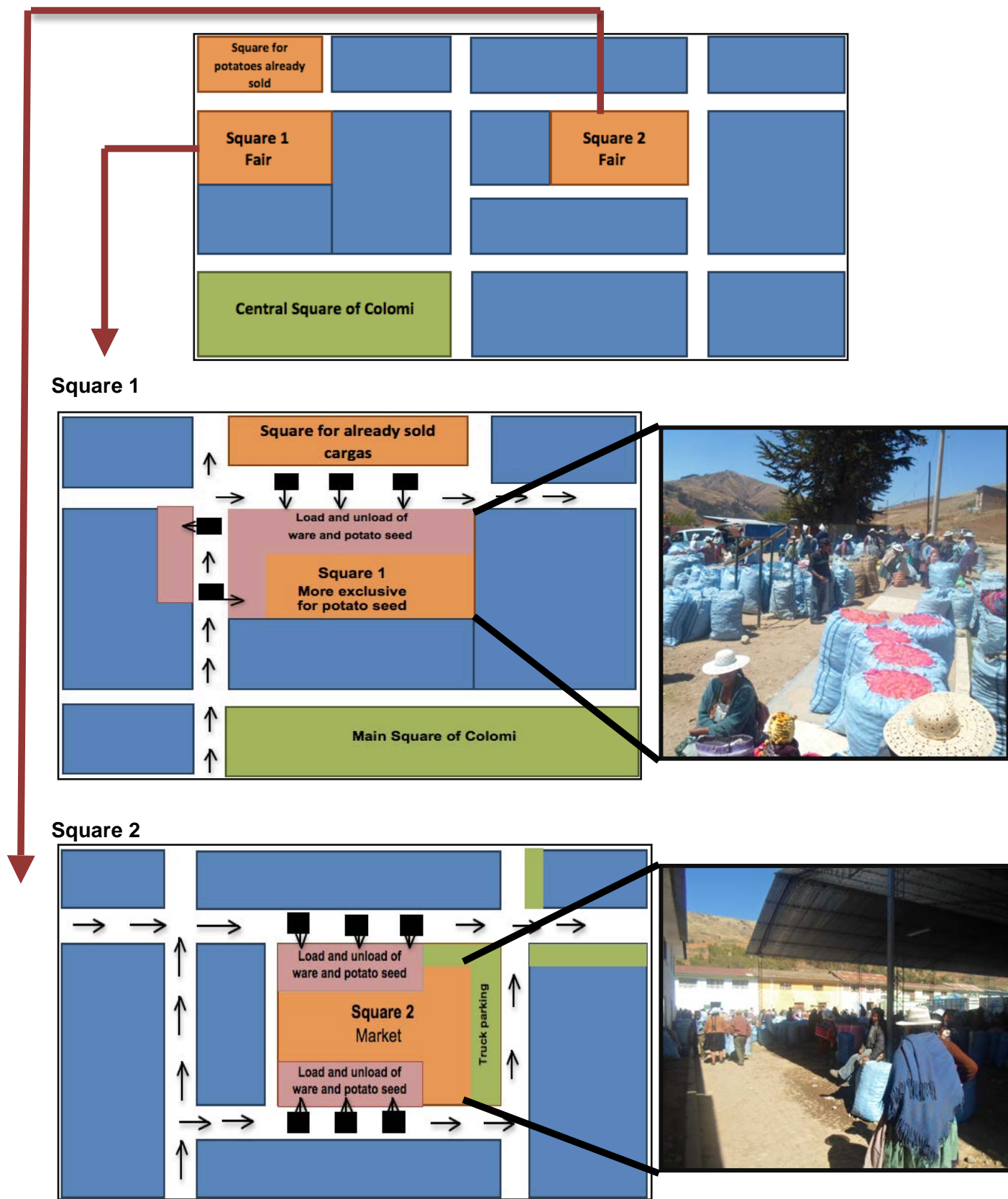
As confirmed in the Market Mapping, and during the interviews with the farmers, the Colomi Fair played a very important role in the potato seed trade in the region. During the informal vendor survey at the Colomi Fair, a total of 54 vendors of potato seed were interviewed during a time lapse of 6 weeks. Three quick questions were formulated about the following topics: potato seed varieties they sold, origin and price of the seed.

The vendor surveys were also performed at two additional fairs, the Tiraque Fair and El Puente Fair, during one occasion. Nine vendors were interviewed at the Tiraque Fair, while in El Puente 5. Though the El Puente fair wasn't mentioned as frequently as other markets in the area, it was considered due to past studies like the one done by Almekinders et al. (2010). Interviews with key informants in the transportation business were done as well.

4.1.5.1 The Colomi Fair

The Colomi Fair, as mentioned in the Market Map of this study, was a weekly informal fair, located a few blocks near the main square of Colomi. The fair happened two days per week (Thursdays and Sundays). Vendors from the tropical zone of the Chapare, as well as Sacaba, came to the fair to sell their products. They ranged from food products, like vegetables and fruits, to spices, personal hygiene products, as well as meat, fish and dairy. Ware potato was the most common product sold at the fair, occupying the majority of the space available.

The disposition of the different divisions of the fair can be seen on Figure 19. The fair was carried out in two main street squares. Square # 1 happened in a park, usually destined as a playground for kids on regular bases. A cemented basketball court in front of the part was used to separate the already sold "cargas" from the un-sold ones. All the space of Square #1 and its surroundings was destined for potato selling. Most of the vendors who offered potato seed during this fair were located on Square #1, and most of them came from Cotani, offering mostly the Waych'a variety. This observation confirmed the results gathered during the interviews with the farmers, who searched seed at the Colomi Fair, coming from Cotani. Around 53% of the farmers interviewed had seed coming from Cotani. When interviewing the Cotani vendors most stated that they had "SEPA seed", yet it wasn't possible to confirm. Square #2 was larger than Square #1 and hosted not only potato vendors but also others coming from a variety of other regions, like Tiraque, Chapare, and Sacaba selling all assortments of vegetables and products. Ware potatoes from different varieties were the most sold product in this Square, yet potato seed was harder to find, because the vendors were not specialized seed producers. Most of them just sold "what they got" at the moment, and didn't allowed a further inspection of the cargas they were selling, confirming the problem with "mixed cargas" mentioned early by the farmers' interviews.



Square 1

Square 2

*Black arrows indicate transport flows (autos and trucks)
 *Areas in white indicate streets, where informal selling posts are located

Source: Own source

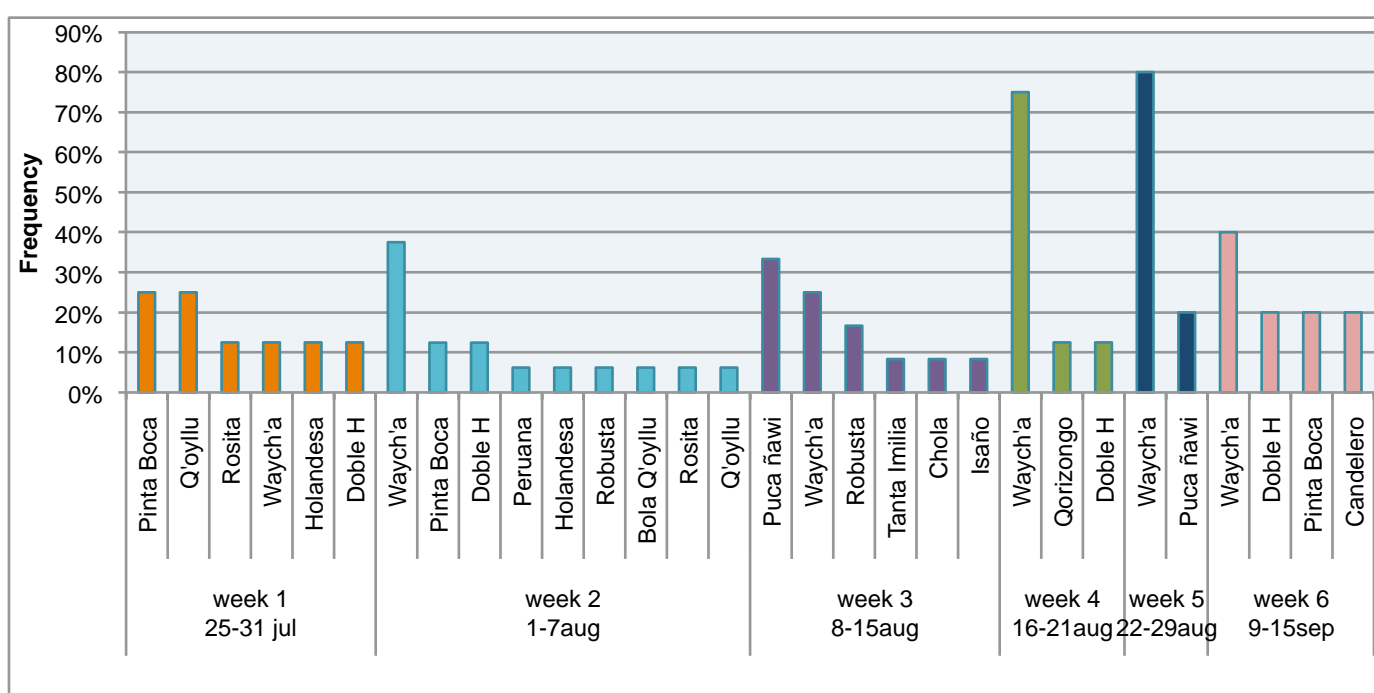
Figure 19: Map of the different sections of the Colomi fair at the time of the study

In Squares 1 and 2 it was very common to find the members of the communities grouped to sell, mainly the farmers of Pico Central, who occupied all the north side of the Square #1, while the farmers of Cotani, occupied most of the area of Square #2.

In matters of potato seed offer in the fair, frequencies were calculated for the different varieties mentioned by the vendors interviewed during 6 different weeks. As seen on Figure 20, during the last week of July and first week of August 2013, there was a greater diversity of potato seed varieties at the Colomi Fair, however during the following weeks the diversity of varieties decreased, having a greater number of vendors selling the same variety, like Waych'a. It can be inferred that the greater offer of certain varieties in a period of time were linked to their production cycles, meaning that the some varieties had specific production cycles and were offered at the Fair at the same time by the farmers.

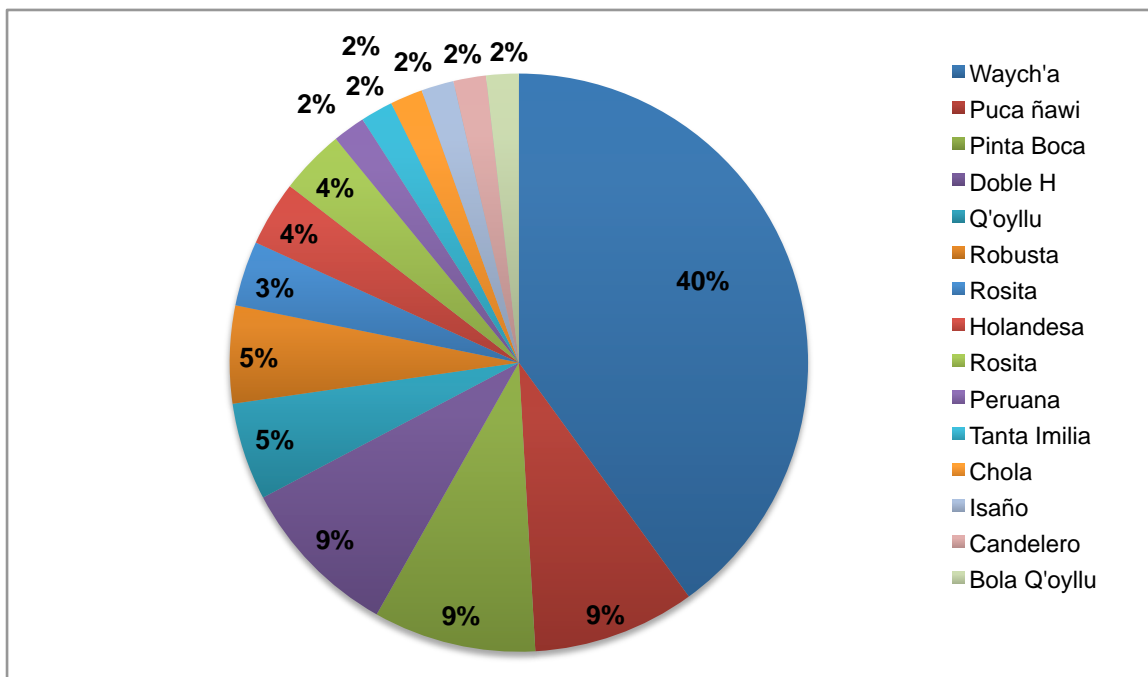
As seen on Figure 21 there was a total of 15 different potato seed varieties offered at the fair during the sampling period. Three native varieties topped the seed offer, being Waych'a the most prominent one. According to Almekinders et al. (2010), the weekly fair of Colomi has one of the largest offers of potato varieties in the region in compare to markets close to the region, like the market of Tiraque, El Puente, and Cochabamba's' Farmers market and El Triángulo.

Since there was not a constant offer of the same potato varieties across the sampling period, it wasn't possible to elaborate a proper analysis for their price variations, however the Waych'a variety was available during the 6 sampling weeks, therefore it was possible to graph a projection of its price variation (Figure 22).



Source: Own source

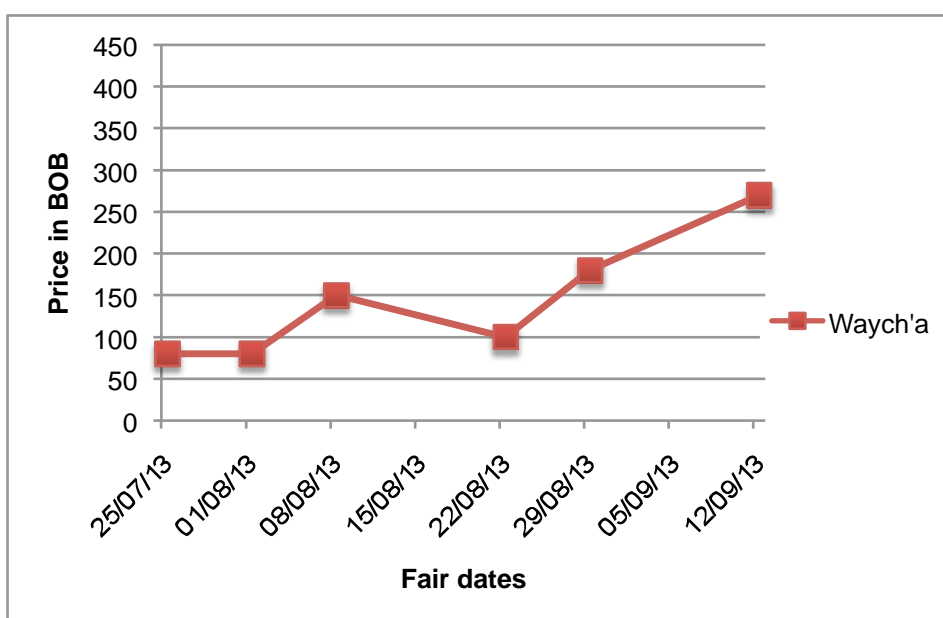
Figure 20: Potato seed varieties offered at the Colomi Fair during a 6-week time lapse



Source: Own source

Figure 21: Frequency of potato seed varieties found at the Colomi fair during a 6-week sampling period

As seen on Figure 22, the price of Waych'a showed an increasing trend of price, varying from 100 BOB per "carga" (150-170 Kg bag) of potato seed to almost 300 BOB per "carga". It is important to understand that the price of the seed varied in accordance to its perceived quality by the vendors. Some vendors considered their seed to be of high quality, and therefore charged more for it. During the fair there was no presence of any regulatory entity to set minimum or maximum prices for potato seed, nor a set of quality standards to meet.



Source: Own source

Figure 22: Price variation of potato seed from the Waych'a variety

4.1.5.2 *Tiraque and El Puente Fairs*

Since the Fairs at Tiraque and El Puente were evaluated during one occasion, no sufficient data was gathered to make proper seed variety frequency calculations, however the market observations served to understand the differences of these markets with the Colomi Fair. The Tiraque fair was characterized for its grand size. Around three different halls destined for the selling of vegetables, clothing, and meat and dairy products respectively formed the overall conformation of the Fair. A sole section of the fair was intended for only potato, making it the biggest of the three evaluated fairs. Potato seed was hard to find while interviewing the vendors and only seed from the varieties Waych'a, Bola Q'oyllu, Llana Q'oyllu and Papa Runa were found. Of the 9 vendors interviewed 4 brought the seed from Juno, a community located in the highlands of the Tiraque region. The prices of seed varied from 200 to 300 BOB per carga, yet this depended on the variety and size of the potato, being Waych'a the most expensive at the time of the interviews. It is important to recall that the Tiraque fair is located near a well-known seed producers association called A.R.A.P.I, specialized in producing certified potato seed of the Desiree variety.

The El Puente Fair located at the Municipality of Pocona (Carrasco Province) had some differences with the previously analyzed fairs. Unlike the fairs of Colomi and Tiraque, it possessed an own hall for ware potato selling (with a communal scale to control the weight of the "cargas"), as well as a separated small warehouse only meant for potato seed. Patricia Torres from Morochata the vendor in charge of the potato seed warehouse, stated that during the time of the year of the interview (August-September) they only sold seed of Waych'a in the fair, while the rest of the year they only sold seed of Desiree. She confirmed that the potato seed was brought from Morochata and Quillacollo and it was "SEPA seed", however no labels were found on the "cargas" being offered (Torres 2013, personal communication). The price for the Waych'a potato seed was offered at 300 BOB; while for the Desiree ware potatoes sold at the moment was 500 BOB, an elevated cost for the region (Figure 23).

El Puente Fair



Tiraque Fair



Source: Own photography

Figure 23: Ware and seed potatoes being sold at the El Puente and Tiraque Fairs

4.1.5.3 Interviews with Transporters at the Colomi Fair

The business of transportation in Colomi has been a growing economical activity during the past years. According to Javier Fernandez, a transporter and farmer from Tablas Monte (community located at the Lowlands of Colomi), most of the farmers living at the Candelaria District now have their own vehicle, and are focusing more on public transportation than farming since they have higher incomes. Generally a transport truck can carry up to 80 “cargas”, yet Javier mentioned that he only carries a maximum of 40 to 50 “cargas” during the high season of production (February), and during the normal season 20. Transporting is a family business in the area, since Javier stated that all of his relatives do business with the truck (Fernandez 2013, personal communication).

As for the potato varieties preferred by his customers, Javier mentioned that the native varieties like Pinta Boca and Waych’a are the most demanded; additionally he affirmed that most farmers plant their entire fields with Waych’a without any crop rotation and that can hurt their levels of production in the future.

In matters of potato seed, he stated that finding good quality seed at the Colomi Fair could be hard due to the frivolousness of the vendors. Javier strongly rejected the idea to buy SEPA seed, since he knew farmers that had produced SEPA seed and sold the “carga” for 250 BOB, which is the same price for the regular seed, giving no additional income for the investment (a 50 kg bag of Basic 3 category SEPA seed costs around 220 BOB) and being insufficient to cover the costs of fertilizer and agrochemicals. According to Javier, the only way for a farmer to become a certified seed producer is through developmental institutions, since no regular farmer could afford to buy the certified seed. Additionally, many requirements have to be met for a community to be applicable for the aid from institutions. Disagreements between the members of the communities are the main reason why farmers don’t enter the registry and certification processes. Javier confirmed during the interview that the farmers selling Waych’a seed from Cotani, in-fact sold SEPA seed.

Claudio Guaman, a transporter from La Paz (Waina-Potosi) was also interviewed at the Colomi Fair. He had a very active involvement at the Colomi Fair, and mentioned going there on a regular bases to trade. He stated that the potato seed from the Waych’a and Holandesa varieties are most adequate for the market in La Paz, since the native potatoes from Colomi apparently don’t produce so well there. However, Claudio stated that he preferred not to transport seed, but ware potato instead. For each carga transported to La Paz, this trader earned 10 BOB per “carga” deducting the 5 BOB for the *cargadores* (workers that load and unload the trucks) and the 22 BOB for the transport expenses during the 11 to 12 hour ride to La Paz from Colomi. Normally Claudio earned around 1770 BOB for 80 cargas transported from Colomi to La Paz (Waman 2013, personal communication).

The interviews with the transporters gave a better sense of the problems mentioned by the farmers interviewed at the communities, and provided a different perspective of the potato seed market at the Colomi Fair and the district as well.

4.1.6 Final Analysis and Market-Shed mapping

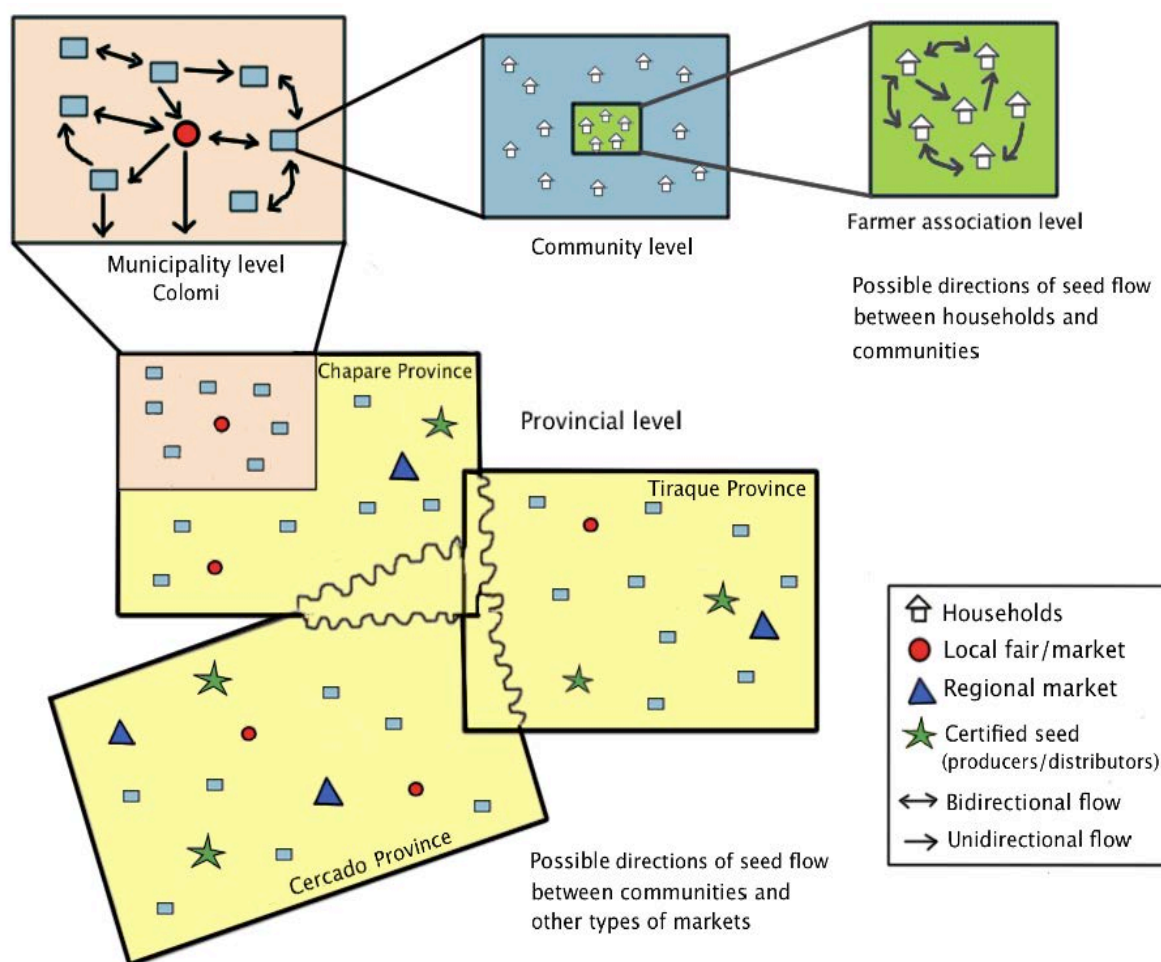
During the course of the Seed Value Chain Analysis, and after completing all the activities mentioned in the methodology, a graphical representation of the Colomi market shed was done. A market-shed, as defined by Anderson et al. (2012), is a trading network with links between market outlets. A market-shed describes: “the links and nodes between the market outlets within the market shed, as well as the size and nature –variety characteristics and sources- of seed flows in and out of this markets”.

As seen in Figure 24 all the levels of seed flow are represented, starting from the Farmer association level (e.g. the 15 farmers associated in Pico Central for Bioversity International and PROINPA’s project); later moving towards the Community Level (e.g. the Pico Central community syndicate with a total 55 members) (INE 2011), and onwards moving to the Municipality level (e.g. Municipality of Colomi) and Provincial level (e.g. Chapare Province). The seed flows were bidirectional and/or unidirectional within and amongst all the considered levels and actors.

The graph also shows the presence or absence of interactions with other provinces or regions. For the case of the Chapare Province and based on the results of the Seed Value Chain in the Municipality of Colomi, the provinces of Tiraque and Cercado had the most relation to the potato seed flows than any other province, given that they hold local markets as important as the Tiraque Fair. The Province of Carrasco, where the El Puente fair happens, wasn’t included on the graph since this market wasn’t of importance for the farmers sampled at the Colomi region. Larger regional markets were also represented on the graph. For the Chapare Province the regional market of Sacaba was represented. As for the Cercado Province, the Mercado Campesino and El Triángulo both at Cochabamba, as well as the Quillacollo market were also considered (Figure 24).

Certified seed producers and/or SEPA distributors were also considered in the graph, though they weren’t present in the area of study (The Colomi Municipality), they were identified at the Tiraque and Cercado regions. The purpose of this was to show the current situation and limited accessibility for the farmers in rural areas to proper sources of certified potato seed in the different regions, mainly at the study area.

The market-shed representation clearly was evidence of the complexity of the potato seed distribution and availability in the area of study, and specially the accessibility problems for the farmers to other markets.



Source: Adapted from Hodgkin and Rodriguez, cited by Anderson et al. (2012)

Figure 24: Distribution of markets, communities and seed flows in the area of Colomi

4.2 Findings: Formal seed sector analysis- key informant interviews

In order to complement the information gathered during the bibliographical research about the policies and legal framework of the potato seed production and commercialization in Bolivia, semi-structured interviews with representatives of SEPA (Eng. Epifania Macías- responsible for production of Pre-Basic seed (See Chapter 2-Figure 3) at the SEPA facility of El Paso-Cochabamba and INIAF (Eng. Yuri Antezana-responsible of the seed area at a the INIAF offices in Quillacollo-Cochabamba) were made.

During the interviews it was possible to focus on the different issues addressed by the diverse actors sampled during the previously mentioned seed value chain analysis stages; as well as understanding the situation within institutions like SEPA and INIAF, and how these situations could affect the future of the formal seed system in Bolivia. The results of these interviews can be observed in the following sections.

4.2.1 SEPA (Unidad de Producción de Semilla de Papa)

4.2.1.1 *Organization of the company at the present time*

SEPA (“Unidad de Producción de Semilla de Papa”) as mentioned earlier is the biggest producer of certified potato seed in Bolivia. It produces all the seed categories starting from the Pre-Basic category to the Controlled category (See Chapter 2 -Figure 3). Since its conformation, SEPA was always a mixed semi-private company conformed by three partners: the Swiss Agency for Development and Cooperation (SDC), the Bolivian Institute for Agricultural Technology (IBTA), and the Association for Artisanal Rural Services (ASAR). With the disappearance of the IBTA by the Supreme Decree of Evo Morales’ government in 2008, the management partly was designated to the governance. At the time of the interview (October-2013), SEPA was on a period of constitution, to name the certified seed producers of the country as shareholders in association with the National Government.

Though it is a semi-private company and part of it belongs to the government, SEPA doesn’t receive any financial support, meaning that the salaries for its professional staff and costs of production have to be self-sustained by the companies’ earnings. In the past years, though the government has supported infrastructure projects from SEPA, like greenhouses, and silages, but no direct financial aid was given. SEPA also lost the financial support from the SDC in 2008, and since then it has been an independent company, financially. More details of the destiny of the companies’ earnings (like presence of other major shareholders) weren’t mentioned during the interview.

4.2.1.2 *SEPA: Production of potato seed varieties and categories*

Currently SEPA specializes in the production of 12 different potato varieties, 10 of them being native: Waych’a, Imilla Blanca, Imilla Negra, Pinta Boca, Candelerero, Puca Katawy, Yana Katawy, Amacacho, Canastillo and Yana Imilla; and 2 being improved varieties: Desiree and Romano. There are three different facilities in charge of the production of seed: El Paso (Cochabamba), which mainly produces Desiree and Waych’a varieties; Ayopaya (Ayopaya Province) which produces mainly native varieties, and Carrasco (Carrasco Province) that specializes on improved varieties like Desiree and Romano.

On regular bases El Paso only sells Registered, Certified and Controlled seed categories, and Waych’a and Desiree are its most demanded seed varieties. The most commercial potato seed category sold in El Paso (to produce ware potato) is the Registered category (Figure 3), though the past two years there was an increased demand for Basic 3 and Basic 2 categories of Waych’a. The Basic 1 category is not commercialized, since it is only used for

re-multiplication to produce the Registered 1 and 2 categories. SEPA-Quillacollo produces an estimate of 6000 Kg of Desiree per year, while for Waych'a around 3000 Kg.

4.2.1.3 SEPA: Seed commercialization

SEPA has retail shops at different strategic places around Bolivia, like at Valle Grande, Samaipata, Sucre, Potosi, La Paz, El Alto, Cochabamba- Mercado Campesino, Punata, and Quillacollo. There is no distributor in Tiraque since it is close to Montepunco where SEPA has its silages. In all the distribution centers the seed is sold at the same price; only costs in transportation are different, depending on where the farmers want the seed to be delivered (if they don't have own transportation). There are no special conditions to purchase SEPA seed, meaning that farmers are not meant to be part of associations or be registered seed producers to be able to buy.

To differentiate its products from other seed on the market, SEPA uses special a security lock, donated from the SDC in Bolivia (Figure 25), and imported from Switzerland. The reason for this was the continuous cloning of the paper tags inside the bags from other vendors. Recently it also changed the color (green) of the bag as well. According to Epifania Macías, vendors have been able to clone the bags and tags of the potato seed from SEPA, even making *better-looking* tags, therefore the only trait that differentiates de SEPA seed are the locks, which can't be produced in Bolivia.

SEPA sells in almost all the Departments of Bolivia except for Beni and Pando. The department with most demand of certified potato seed is Santa Cruz, because its warm climatic conditions allow better results with certified seed than with regular seed. There is a decreased incidence of pathogens in regular seed due to the weather, and using certified seed can decrease this.



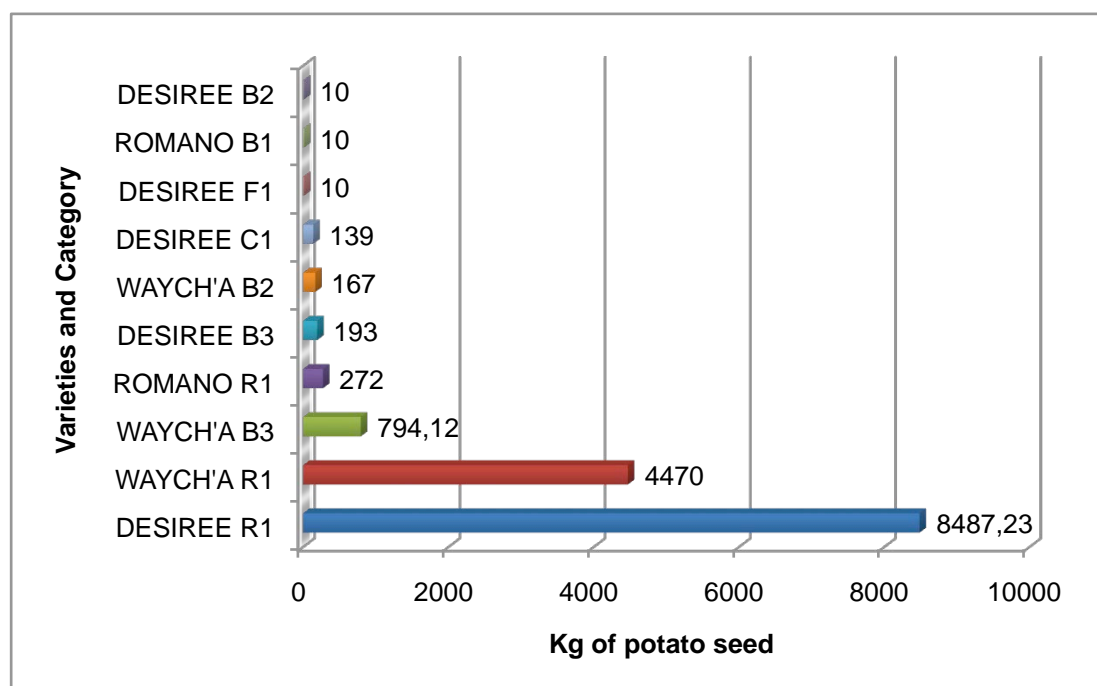
Source: Own photography

Figure 25: SEPA potato seed bags and special security tag

Farmers from Colomi have also purchased seed from SEPA at El Paso, yet they've been isolated cases of one or two farmers. Mostly they go after witnessing favorable results of certified seed on their neighbors' fields. Usually the farmers that come to SEPA always buy in small quantities, buying 5 Kg to 10 Kg at the time. Generally the farmers in the region believe that the seed sold at the El Paso facility has better quality, since the seed is produced there, however that is not true. Until 2005 SEPA had a store open at Colomi, but it closed down. No one in the SEPA knows why, since its administrative staff has always been changing through the years.

During 2012 SEPA from El Paso sold 14552,35 Kg of certified seed only at the Cochabamba Department. Farmers from Cochabamba city had the most demand, particularly of the Desiree (Registered 1 category), and Waych'a (Registered 1 and Basic 3 categories). Only 21 Kg of certified seed were bought from farmers coming from the Colomi area of the Waych'a (Registered 1), Romano (Registered 1) and Desiree (Certified 1) varieties (Figure 26-27).

As prices are concern, SEPA had no price differentiation between the seed categories in the past (only for the Pre-Basic category (220 BOB), however variations have been made during the last two years, charging more for the "elite" categories (Basic category). For the Registered 1 category for example an increase of 5 BOB per bag was established. The reason for it was to raise awareness amongst farmers of the difference of quality between the categories.



* Categories: B=Basic, F=Controlled, R=Registered

Source: Adapted from SEPA stats, 2012

Figure 26: Total Kg of potato seed sold by SEPA per variety and category at the Cochabamba Department during 2012

Seed exports are also a main income for SEPA. Half of the production of seed in the year is destined to meet the national demand, while the other half is exported. During 2012, SEPA exported around a million mini tubers of Pre-Basic seed to Brazil. Chile was also a trading country, yet it was dismissed to meet the growing demand from Brazil, even though SEPA has increased 14 new production greenhouses. Though SEPA produces a large assortment of native potato varieties for the local market, it only produces improved varieties: Cupido (Dutch variety), Atlantic (American variety), Agatha and Asterix for the exports.

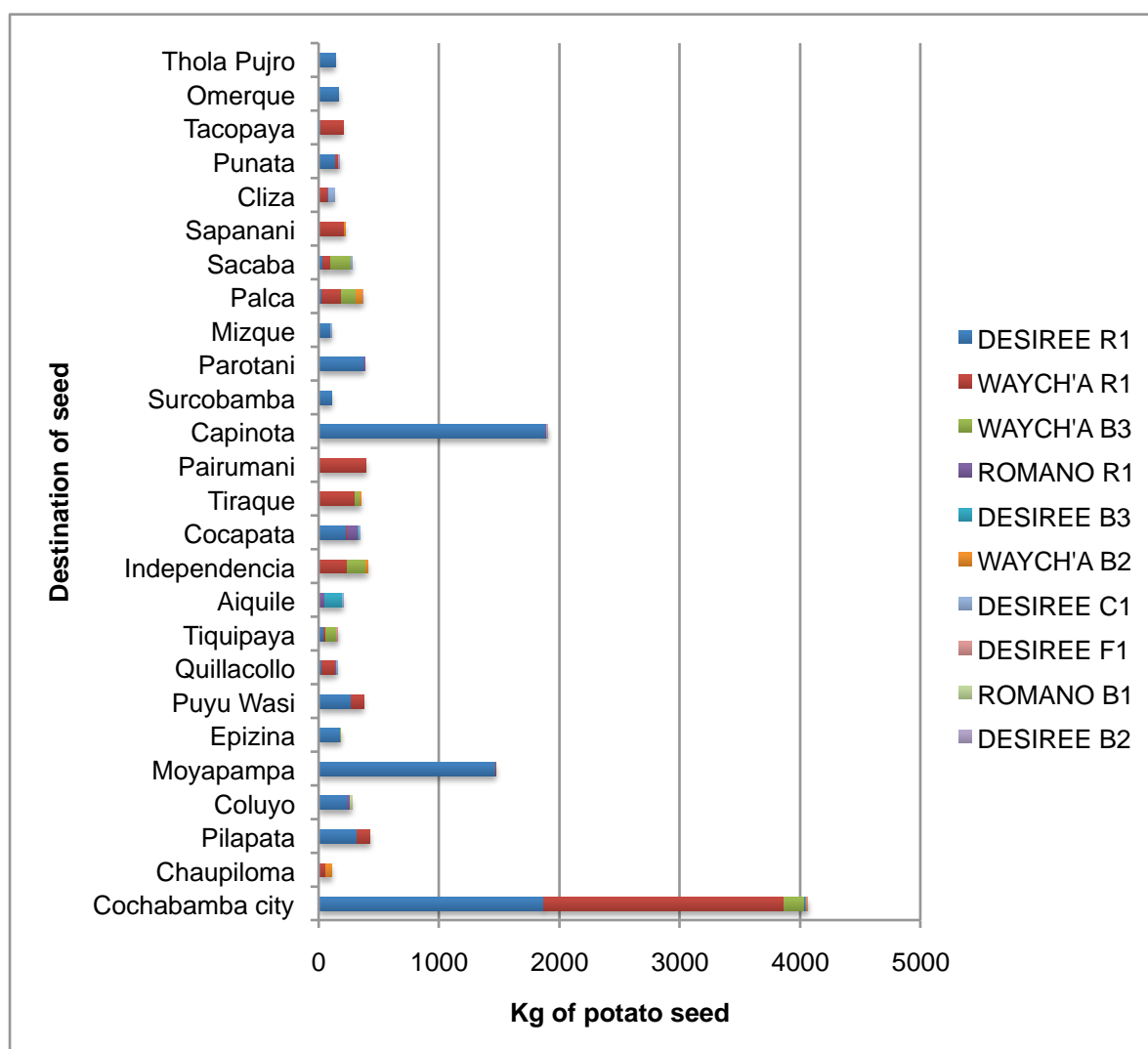
4.2.1.4 SEPA: Other seed producers associations-competitors

SEPA is the largest potato seed producer and distributor in Bolivia, however there are other farmers' associations that also occupy a small part of the market. Around 20 potato seed producers associations exist nation-wide. Associations like ARADO from Tiraque or APROSEPA from La Paz, produce small amounts of specific varieties. ARADO for example produces only Desiree, while APROSEPA only Waych'a. A catalog from the INIAF of all the different seed producers associations can be found in the Annexes.

Though the Bolivian Specific Norms for Potato Seed Certification establish that no potato seed can be sold without the proper registration and certification, the seed producers associations are having a complicated time to sell the seed, since there is no reinforcement of this law whatsoever in Bolivia (PNS 1999). During the year 2012 many small farmers' associations had to throw away their seed (around 2000 bags of 50 Kg each), since there was a nation-wide overproduction, also many associations had to close down because they could not maintain the business with such a variable market. SEPA had also problems to sell seed, however during 2013 the sales went better. Sometimes seed producer associations ask SEPA if *they* can purchase their seed, but that is not possible since SEPA has high quality standards and cannot sell a seed that has not been produced under their own technical supervision. The only way SEPA helps these associations is by giving them tips of potential buyers in the region. Today there are no seed producers associations At Colomi, mainly because its lowlands have high incidence of white worm (*Premnotypes vorax*).

There have been cases where the producer associations have had in stock more seed for certain categories than SEPA. According to Epifania Macías that cannot be possible, comparing their production rates with the ones of SEPA. The possible explanation for the problem is that the producers associations could have been using the same type of seed category every year without lowering the category. For example a year they start multiplying the Basic 3 category, and the next year they keep the same multiplied seed at Basic 3, when it should have been lowered to the Registered 1 category. This is due to the lack of control from the INIAF (the governmental institution in charge of the seed certification process). Ac-

According to Mrs. Macías, INIAF has no sufficient technical staff to keep a proper record of all the seed producers' association's activities, having only 4 people in charge of the entire Cochabamba Department. SEPA always tries to collaborate with the INIAF by giving information of which their clients are, and what seed category they have purchased, due to the high rate of cloned seed tags. Another actors in the chain involved in the cloning of tags are the market intermediaries. They are the ones managing the greatest capitals and quantities of potato seed in the region, mainly at the markets in Quillacollo and Cochabamba. They have very extensive commercialization channels, which sometimes cover all the country. There have been cases where the intermediaries hire farmers, providing seed, fertilizers and agro-chemicals, paying them way less for the final production, affecting the farmers' economies.



* Only locations with 100+ Kg of seed purchased are represented.

Source: Adapted from SEPA stats, 2012

Figure 27: Destination, varieties and categories of potato seed sold by SEPA-EI Paso at the Cochabamba Department during 2012

4.2.1.5 SEPA: What about the loss of diversity?

According to Mrs. Macías the systems is not to be blamed for the loss of diversity, but the market demand. Farmers would always be inclined to the varieties that have higher demand, and sometimes those varieties are the improved. Evo Morales' government however has been promoting food sovereignty and cultural identity since 2008, and it has been helping to raise the demand of native potato varieties. During 2009 the government created a project to produce native varieties to be distributed around the country. SEPA was in charge to produce Pre Basic seed of native varieties, even the ones who were not registered at the time. Around 8000, 50 Kg bags were purchased by the government and distributed around. Since then, there hasn't been any other intervention. The problem is that neither SEPA nor INIAF were able to give a proper follow-up to the project beneficiaries once the project ended.

4.2.1.6 SEPA: Financial aid for farmers

SEPA has no current an aid program for farmers. In the past they've tried to grant credits, but they have always failed. Farmers never paid back the grant because of problems with the seed, or low production rates due to arduous climatic conditions. According to Mrs. Macías, every single time they have granted credits, the farmers had problems with the seed, or *inferred* that they had, proving a lack of seriousness in some cases. Apparently some farmers believe that buying certified seed, will solve *all* of their problems and neglect the other agricultural practices, which are basically the other *half* of factors that affect the production rate. Due to these problems, summing the fact that SEPA has to sustain itself without the help of other institutions, grants have been stopped by SEPA.

4.2.2 INIAF (Instituto Nacional de Innovación Agropecuaria y Forestal)

INIAF, as mentioned early in the State of Research, is the governmental institution in charge of the seed registration and certification processes in Bolivia. Yuri Antezana has been working in INIAF since it was established. Before the creation of the INIAF he also worked at the National Seed Program (Programa Nacional de Semillas-PNS) at the Regional Seed Offices (Oficinas Regionales de Semillas – ORS), with a 7-year long experience combined in both organizations. This gave a unique opportunity to understand the process of change of the PNS to the INIAF between the years, and how this affected the formal potato seed system in Bolivia.

4.2.2.1 INIAF: establishment, structure and relationship with the former PNS

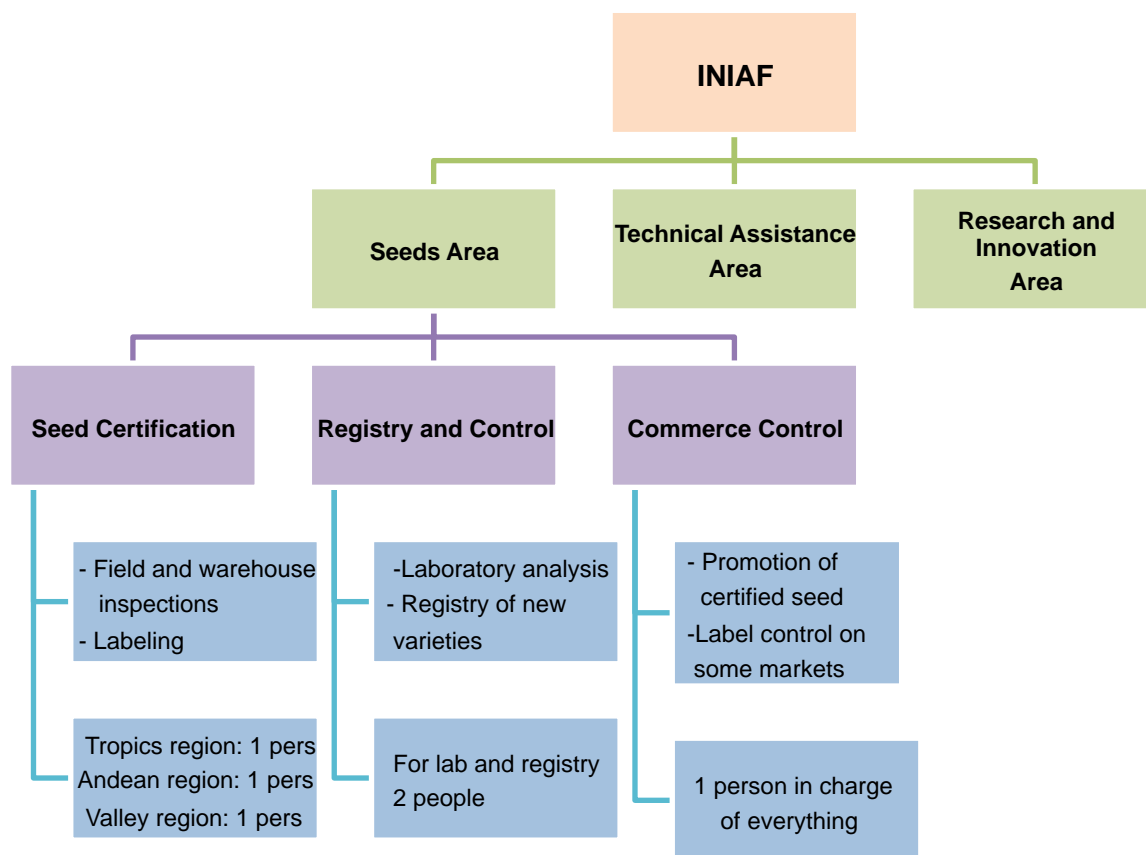
Since the beginning of Evo Morales' government, a series of increased national policies to promote research and innovation were made. A governmental structure was established to continue and promote the work done by the National Seed Program (PNS), a program with over 20 years of experience on seed certification and supervision in Bolivia. The PNS was one of the most successful programs of the Ministry of Agriculture; therefore it was not dissolved, but transferred to create the Seeds Area within the INIAF, one of the 3 main areas that form the INIAF (Research and Innovation Area and Technical Assistance Area). The area of Seeds is one of the most consolidated of the INIAF, since it brought the experience of the previous PNS into the area, as well as most of its staff.

During the establishment of the Seeds Area, INIAF decided to adopt the Norms and Regulations developed by the PNS in the past years (see State of Research for additional information): the General Norm for Seeds of Agricultural species (Norma General de Semillas de Especies Agrícolas RM 121-2001), the Specific Norms for potato seed certification (Normas Específicas para la certificación de semilla de papa N° 101-1999) and the Norm for National Registry of Varieties (Norma sobre el Registro Nacional de Variedades RM 0.45 -2005).

All documents can be found on Internet, and are available for public viewing, however they still have the logo of the PNS, and no connection with the INIAF is given, confusing people in search for information. The process to update their web page has been slow due to high bureaucracy since INIAF is a public institution.

Given that the World Bank has decided to invest on innovation projects in Bolivia, INIAF is receiving extra financial support from the National Government. This has allowed the strengthening of all the different areas of INIAF, specially the Seeds Area giving the possibility to hire more staff; increasing from 2 people responsible for the Seed Area to 7 at the Quillacollo offices in Cochabamba. However, the amount of people is still not enough, particularly for the certification of potato seed.

The Seeds Area has 3 divisions: Seed Certification, Registry and Control, and Commerce Control. As seen on Figure 28, each division has specific tasks and staff in charge, and in the case of Seed Certification, 1 person in charge of every region of the country: Andean, Valleys and the Tropics. Since the amount of workers are not enough to supply the seed certification process in the area, sometimes personnel from the other divisions aid during the field inspections. The most demanding job for the division are the potato field inspections, since it is imperative to do them at a specific time of the year (January, February, March, April), which coincides with the heaviest rainy season of the year (January, February and March). Excessive rain in many cases affects the access roads to the fields complicating the work of the inspectors.



Source: Antezana 2013, personal communication

Figure 28: Divisions, activities and number of workers within the Seeds Area at INIAF-Quillacollo Cochabamba Department

Complicating the situation even more, inspectors have very specific activities that have to be met on weekly bases, and when they can't access a field once, then the whole year planning is affected. During the time for field inspections SEPA helps INIAF to identify the farmers' fields by providing the information about their clients. Producers in small rural areas are notified with two-weeks notice through a radio transmission of the inspections.

4.2.2.2 Additional information on the Seed certification process

INIAF's main requisite to certify a farmer in the Registry. The farmer National Registry gathers the personal data from the farmers, or farmers association, the species, varieties and categories of seed to be produced, the location of the field and the area. Following the Registry, the farmer has to go the offices of INIAF to register the seed fields destined for the production. The main requisite is to bring the label that comes inside the SEPA potato seed bags, and the security lock (Figure 25). The costs for the services of certification charged by INIAF vary per Department and type of culture (potato, corn, wheat etc.). In Cochabamba, for

example, INIAF charges in function of area planted (296 BOB per ha), while in La Paz they charge per labeled potato bag (carga) and in Santa Cruz per ton of certified seed (since in Santa Cruz they work more with soy). Every INIAF office adjusts to the reality of every Department and type of culture. In Cochabamba they only charge the farmers once during the entire process, while in La Paz they charge for the first inspection, second inspection and labeling. According to Yuri Antezana, the price for inspection is accessible for small producers, since most of them have fields no bigger than 2000 m² to 3000 m²; therefore affordability is not a valid argument to not certify. In the case of seed producing companies like SEPA, which plant around 280 ha to 300 ha per year of certified seed, the payment is done in quotas, since they can't afford to pay all the value at once.

There have been cases where institutions and organizations (also PROINPA), that forget about the seed certification process during the projects with the farmers. Meaning that they deliver the certified seed to the farmers, but they don't register them, nor inscribe the seed fields. On the other hand there are farmers and farmers associations that inscribe the seed fields every year with no exceptions, some even for the last 20 years.

During the field inspections, the staff of INIAF visits farmers, carrying a "Form of Seed Inspection", which has to be filled as the field is analyzed, and signed, by the farmer and the inspector. The form is the only prove that the seed fields have been inspected. There is no difference between the inspection procedures for all the categories, from the Basic to the Controlled, except for the percentage of tolerance of atypical plants. For Basic seed the level of tolerance is 3% while for the Controlled and Registered is 5%. When the inspection is done the farmers are informed if their seed fields have been approved or rejected, and in the case that they are rejected the inspector explains the reasons for the decision and how they can improve it. With decent weather conditions, it can take up to 8 to inspect a field of 3000 m² to 5000 m².

During the months of September or October the warehouse inspections are done. Usually farmers notify INIAF when they are ready to transport their seed to the different markets in the area and the inspector meets them to do the evaluation. INIAF also tracks the producers' situation and arranges the inspections as well. Traits like: grade of variety mixture (different mixed varieties in the carga), plagues, diseases, and seed sizes are evaluated. When the evaluation is passed the cargas are properly labeled and ready for commercialization. Currently INIAF-Quillacollo is certifying around 3500 tons of potato seed. Cochabamba is the main producer of certified potato seed in Bolivia, while Santa Cruz is the main user. Around 85% of the total potato seed used at Santa Cruz comes from certified sources, while at the Andean region only 5% is certified.

4.2.2.3 Control of forged labels of certified potato seed

There have been cases where vendors forge the INIAF labels (see Figure 3) in the same way like the SEPA labels. During 2012 FAO bought seed with forged labels, causing considerable problems in their projects. INIAF wants to upgrade the labels, so that they have holograms and bar codes, to reduce the forging, however if enforced could lead to an increase of prices of the certification services for farmers. The creation of the Commerce Control division at INIAF has the objective to stop or at least decimate the forging problem, making regular controls on the labels in seed producing companies. The Commerce Control division is the newest of the three divisions at the INIAF-Quillacollo Seed Area (Figure 28).

The situation is far different in Santa Cruz, since there are control points on the roadways that verify the origin and destiny of the seed being transported, in difference with the Andean region, where potato is a staple food, commercialized and produced in traditional matter. Though the informal seed system is necessary, it is also vulnerable. According to Yuri An-tezana, in local markets like Lopez Mendoza and El Puente, where seed exchange is very common, there has been inputs of potato seed coming from the west (Santa Cruz) with bacterial wilt, spreading the disease on new areas.

The main problem is that the current General Norm for Seeds of Agricultural species (Norma General de Semillas de Especies Agrícolas RM 121-2001) is that it was elaborated with focus on the Santa Cruz context, where there are large volumes of grain being produced. For the case of potato the Norm wasn't adjusted, nor it is realistic.

4.2.2.4 INIAF and the certified potato seed commercialization

Though INIAF doesn't sell certified potato seed, it does play an important role in the promotion of certified seed in the country. INIAF gives assistance to farmers to apply for public contests to sell potato seed to large institutions like FAO, the Fondo Indígena, and the Government. The government and non-profit institutions are the ones who buy the most certified potato seed in Bolivia. Unfortunately, due to recent problems in label forging, the institutions have raised the number of requirements for the seed producers to meet, like bill reports, quality certificates and registry at the Unique Registry of State Suppliers (Registro Único de Proveedores del Estado-RUPE). INIAF also organizes a yearly national fair of potato seed producers, and elaborates/distributes pamphlets with the contacts of the seed producers associations that work with them (see Annex 9).

5 Overall discussion

The Municipality of Colomi is the best example of how traditional potato production systems work in many areas of Bolivia. During this study the effects of the potato seed value chain and national policies in the diversity and availability of potato seed were analyzed. All the different actors involved in the areas' potato seed value chain were analyzed, as well as the policies and legal framework surrounding them, in order to identify the problems and threats affecting the farmers' productivity as well as their accessibility to diverse and good quality potato seed.

5.1 Comparison between the farmers' communities located at the Highlands and Lowlands

Potato producers in Colomi though living on the same area, are spread in two main eco-regions, causing many differences in their production activities, particularly in the aspect of potato seed. Table 4 compares the two eco-regions the in matters of potato seed production, potato seed sources, potato seed selling, seed replacement, crop rotation, accessibility, and potato varieties; based on the interviews with farmers of 8 communities in the study area, spread in the Highlands and Lowlands of the Municipality of Colomi. Aspects with no clear differences between eco regions are examined later on this chapter.

Table 4: Comparison of potato production aspects in two different eco-regions found at the study area

Aspects	Highlands (3800m-4000m)	Lowlands (3200m-3400m)
Potato seed production	Potato seed production represents an important part on the farmers' activities and income.	Potato seed production is not a significant activity. More focus on ware potato production.
	Have "Phurumas" or virgin soils and therefore less probability for plague and disease infestations.	"Worn out soils". High probability of infestation of plagues, and diseases.
Potato seed sources	The majority of farmers obtain seed from their own production, or they purchase it in local markets.	Farmers buy seed from the local markets a small minority produces own seed.
Potato seed selling	Farmers sell potato seed often at the Colomi Fair, and have a reputation for being seed producers.	Farmers only sell seed when they have remaining quantities, after planting their own fields.

Seed replacement (seed refreshment)	Farmers replace the seed they work with every 3 to 5 years.	Farmers replace the seed they work with every year or 2 years.
Crop rotation	Crops rotations are used more often, periods of rest of soils can take up to 10 years	More intensive production, crop rotations are not used. Periods of rest are sometimes inexistent.
Accessibility	Gravel roads to communities in bad conditions, and during rainy season can become inaccessible.	Gravel roads are in good condition, water canalization and maintenance is evident.
Varieties	Native varieties are preferred due to greater tolerance to arduous climatic conditions like hail and frosts. Yet also produce improved varieties for the market.	Native and Improved varieties are produced, however improved varieties are produced more often.

Source: Own source

The differences between the communities found at the two eco-regions at the study area, confirm the potential of the communities located at the highlands to become certified seed producers and confirmed their eligibility for PROINPA and Bioversity Internationals' project (PROINPA Report LoA 2014,12). Better access roads, though are needed to improve the accessibility to the area for potential customers. According to Audi et al. (2010) markets with good road networks, as well as vendors with high number of trading assets supply relatively higher amounts of seed for the market.

5.2 Identified threats that affect farmers' access to good quality potato seed

According to the results of this study, farmers at the study area are exposed to threats that affect their access to good quality potato seed. The "tired seed" phenomenon, or the accumulative effect of plagues, diseases and virus in seed used for several planting seasons is a very common problem. Farmers are forced to renew their stocks of seed more often to obtain the same results in a period of time, forcing them in some cases to buy seed every season. Not only this can affect the income of the farmers, but also it increases their vulnerability when there is seed scarcity. Seed scarcity forces them to purchase bad quality seed on their local markets, due to the lack of offer. This problem is quite common at the Lowlands of Colomi, were farmers renew their seed every year. Diseases like the bacterial wilt and potato blight are common in the area, as well as problems with Nematodes in the soil and white worms in the seed (Terrazas et al. 2003). This can be due to a decrease of the periods of

rest of the soil (3 years minimum: as suggested by the PROINPA experts) and lack of crop rotations.

Another threat that has been developing on the new generations of farmers is migration. In communities like Khocha-Khochá and Linde (all located at the Highlands) more young farmers prefer to leave their fields, and work instead in the cities as construction workers or transporters. Some farmers, mainly at the Highlands have come to realize that it is *easier* or far more rentable to work in other areas; earning more money for half the work they would do in farming. This is understandable; since the working conditions at the Highland areas are physically very demanding, adding the arduous climatic conditions and lack of accessibility. Javier Enzinas, a member of one of the 5 families living at Khocha-Khochá clearly explained his vision of moving away, the only reason he has decided to stay a few more years it was because he got involved in the current PROINPA project. According to Yuri Antezana, there are far less number of seed producers now in Bolivia than there was 7 years ago.

The “divided farmer” phenomenon is quite common in the area. It refers to farmers that own fields in other regions besides Colomi, and “divide” their agricultural practices without spending full time on each of the parcels planted. Some farmers own land at the tropical Chapare region and have coca plantations, which in comparison with potato, are far more rentable, causing the farmers to neglect their potato fields at Colomi.

During this master study potato variety identification was done only by varietal identity and not by morphological characterization, therefore there can be discrepancies since some varieties in the sampled communities could have been known by two different names, or having several varieties with one name alone (Lipper et al. 2010). The knowledge and ability to identify these differences has been lost through the generations, in the study area, and more potato morphological characterizations are still necessary in order to identify newer varieties at the area of study (Gonzales 2013, personal communication).

5.3 Supply versus demand of potato seed varieties

Comparing the potato seed varieties mentioned during the farmers interviews, with the demand of seed varieties on the farmers preferences survey, no differences were found. This means that the main varieties offered by the interviewed farmers (Pinta Boca, Waych’a, Holandesa, Doble H, Toralapa, Puca Ñawi, Q’oyllu, and Imilla Blanca), were also the main varieties demanded during the additional survey for the farmers’ preferences. This shows that farmers have a great knowledge of the market movements in the area, and can somewhat infer which varieties will have a greater demand during the next planting season. Based on the market observations and farmers interviews during this study, it can be inferred that the varieties demanded by the farmers during the current season, were the ones who had the

best prices in the market during the previous season. The market demand of varieties affects directly on the farmers preference of variety to plant, as well as defines which varieties the farmers will consume in their households, since they destine part of their current production (of any available variety) to household consumption.

Seed exchange as defined for this master study, is the occasion were farmers give their potato seed to neighbors, friends, or relatives in order to receive different varieties of potato seed. Based on the results of the farmers interviews during the study, it can be inferred that seed exchange is not an aspect linked to the eco-region were farmers live. The types of social relations like: farming associations, kinship and friendship, which exist within a community, affect seed exchange, making it a proper indicator for social relationships. As explained by Sperling et al. (2008), informal exchanges of seed are government by a set of cultural norms that are determined and known only by the participants of the exchange.

5.4 Pros and cons of the informal potato seed market

The Colomi Fair is a 100% informal market for potato seed distribution. There are no registered seed producers or associations that produce potato seed certified by the INIAF. Though the Colomi Fair presents one of the most diverse offers of potato seed in the region according to Alekinders et al. (2010), and partially confirmed during this study, it does present weaknesses that could affect the farmers' productivity. As mentioned by almost all farmers' interviewed in the area of study, there has been several problems when purchasing seed at this fair. A great majority prefers not to buy seed there due to great presence of diseases and plagues with the seed. Farmers presented a very defined rule to not buy seed coming from the same place they've been planting in the past seasons, so therefore most prefer to go to other fairs in Tiraque, Quillacollo and Cochabamba to get better results.

The "mixed cargass" phenomenon as explained in this master study, is a method of deceive by the market vendors in order to sell ware and seed potato at a higher price. It consists on placing small, sick or rotten potatoes at the bottom of the potato bag then covering the upper visible part with good-looking high quality potatoes. The mixed cargass also present varietal mixes, meaning that potatoes of several varieties are mixed on a same bag to *fill it up*, usually left-over potatoes from the field are used for this. A great number of farmers, mainly in the Lowlands have been victims of this activity. Nagarajan et al. (2010) found a similar situation with millet at informal market in Tamil Nadu, India, where it was not possible for any enforcement agency to distinguish between seed and grain sales among vendors.

There are farmers at the Colomi fair, like the farmers from Cotani (Highlands of Colomi), that imply to sell certified seed from SEPA, though during the market observations no labels from the INIAF were presented with the potato bags being sold. The seed presented good charac-

teristics, but there was no possible way to confirm the statements of the vendors. As confirmed by INIAF's Yuri Antezana, there are no registered potato seed producers in Colomi; however there has been a small amount of farmers from Colomi who have bought SEPA seed during 2012 (SEPA stats 2012). The possible explanation for the lack of labels in the Cotani seed is that the farmers haven't registered as seed producers nor have registered their seed fields at the INIAF, making them unable to qualify for seed certification and labeling; yet this is just a supposition and further inquiries are required. Farmers often do not submit their seed for certification, either because they don't wish to go through the time-consuming process or because they have own quality control processes (Nagarajan et al. 2010).

The Colomi fair has no defined organized and permanent stations for its vendors. It is a fair done in the streets, with minimum infrastructure available. This lack of organization affects the potato seed customers, which have to ask randomly to any vendor if they are offering seed. Since there is no differentiation between the bags with ware potato and potato seed, the customers have to base their choice using visual selection and past experiences. Of the three informal markets analyzed during this study only the market at El Puente had a specially assigned area for potato seed. Dalton et al. (2010) confirmed the different characteristics of seed markets with the product markets; seed characteristics are difficult to identify at the time of purchase unless the products are labeled properly.

The Colomi Fair has a diverse supply of potato seed varieties, however this supply is directly affected by the individual production cycles of the potato varieties being offered. This means that potato varieties are planted at specific times during the year, having certain differences with each other. Therefore, farmers will harvest the same variety at the same or close time in the year, as well as selling it in the fair. The Waych'a variety had the most constant supply at the Colomi Fair, being offered every Fair day during 6 weeks of market observations.

5.5 The formal seed sector: strengths and weaknesses

The Bolivian formal seed sector has existed in Bolivia for the past 25 years, starting with the National Seed Program (Programa Nacional de Semillas- PNS). The PNS left a legacy of Norms and National Policies to regulate the production and commercialization of seed in Bolivia. Though these norms, and specially the General Norm for Seeds of Agricultural species (Norma General de Semillas de Especies Agrícolas RM 121-2001) are the pillars for the current system for certified potato seed production and commercialization; they are also its main weakness. According to Yuri Antezana (former staff member of the PNS and head of the Seed Area at INIAF) the Norms were elaborated with focus on the Santa Cruz context, where there are large volumes of grain being produced and certified seed is used on regular bases.

This means that the current Norms are not adjusted to the reality of potato seed production in Bolivia, given that they do not take into account the high grade of diversity of potato existing in the region, nor the importance of the informal potato seed system and markets. There have been many difficulties to enforce the Normative because it is simply not realistic. Seed certification, though it can increase the gains from trade, it also generates barriers of exchange (Dalton et al. 2010). In order for the situation to change, and to improve the results of INIAF's Seed Area, it is imperative to readjust the current Norms to the different realities of the regions and type of crops.

On recent years, and with some funding from the World Bank, INIAF has been trying to hire more qualified staff to meet the demands of the certification process. Nevertheless it is still not enough to cover all the activities mentioned in the Norms (field inspections, warehouse inspections, laboratory analysis, varietal registry, and commerce control) (Antezana 2013, personal communication).

Though the use of certified potato seed is supported by the National Norms, it is not enforced on regular bases, affecting the demand of certified potato seed. Several farmers associations during 2011 had to throw away their seed, and stop their production because of low demand. The demand of certified seed has high variability of in the Andean Region of Bolivia, and it is directly related to the productivity of every season. The higher the productivity during the season the less demand for the next season. This is the reason why certified seed producers are always searching to win public bids to sell seed to institutions like FAO or the Government. SEPA, being a consolidated company has been having problems as well to sell certified seed, and that is one of the main reasons why it destined half of its seed production in the year to exports (Macías 2013, personal communication).

Based on the data gathered during the interviews and the analysis of the formal seed sector with the key informant interviews, it can be inferred that it can be a complicated process for a regular small-scale farmer to enter the seed certification process. As Javier Fernandez (farmer and transported from Tablas Monte-Colomi) implied:

"The only way for a small scale farmer to afford certified potato seed from SEPA is through institutional aid".

(Fernandez 2013, personal communication)

Farmers who can't afford to buy seed from SEPA nor pay for the certification process have no chance to enter the formal seed system. This means that they need to apply for aid *twice*, once for acquiring the seed and plant it and later to sell the seed to institutions, in the case that the certified potato seed demand goes suddenly down.

A great problem in Bolivia, and at the study area is the lack of sustainability of aid projects. During 2009 the Bolivian government bought and donated 8000 bags of certified potato seed

to the farmers, yet there is no knowledge of the current situation of the farmers, not the situation with the seed. Projects have only helped the farmers to acquire the seed and produce it, yet they have forgotten to help the farmers to register as official seed producers, nor pass the seed certification process that grants the label for official commercialization, and eventually receive assistance from the INIAF to promote the seed and secure markets.

INIAF's vision is not to concentrate 100% on maintaining ware and seed potato diversity, but to improve the farmers' chances to get a better income by producing certified improved varieties that have a greater demand than native potatoes in Bolivia. There are some indicators of the reduced offer of improved varieties in Bolivia, like the increased presence of contraband potatoes from Peru. It is illegal to import potato to Bolivia, however if the potatoes are peeled, cut and frozen for French fries production, or potato chips they have zero importation taxes. That is the reason why during 2011 there was a total estimated import of 7000 tons of pre-cut potatoes in Bolivia to supply the demand of restaurants (COMTRADE 2014). Unfortunately, INIAF has tried to find native varieties with industrial potential, yet it has been unsuccessful. PROINPA, with its PAPA NATIVA project, tried to commercialize bagged fried potato chips made with native varieties; the project is still running, but it hasn't grown or expanded in the following years.

Several studies suggest that trade-offs exist between the conservation of plant genetic resources and market integration or other factor like globalization (Lipper et al. 2010). Demand is an important factor to maintain the production of native varieties around the region. If the demand of native varieties decreases they will eventually disappear, as it happened in Ecuador, where only 5% of the total commercialized varieties are native (Monteros et al. 2012).

6 Conclusions and Recommendations

6.1 Conclusions of the master study

This master study was carried out in the framework of Bioversity International's project: "*Improving the availability and the use of diverse seed and other planting materials to reduce vulnerability and improve food security for smallholders in vulnerable ecosystems*" in Bolivia in close collaboration with the project partner PROINPA. For potato seed, the Municipality of Colomi located in the Department of Cochabamba, province of Chapare was selected as the study area. In order to create a proper baseline of information to conduct the project it was imperative to identify the main constraints of the potato seed system, as well as mapping, and understanding the key factors that affect the farmer's production, acquisition and distribution of potato seed in the area of study. Two main objectives were defined to contribute to the

project during this master study 1) Provide full baseline information about the potato seed system in the municipality of Colomi through a complete Potato Seed Value Chain Analysis in the region and 2) Elaborate a thorough analysis of the legal context or policies, which affect the seed value chain in Bolivia, to provide a detailed description of their effects in the seed value chain.

The different eco-regions existing in the Municipality of Colomi: the Highlands (3800msl-4000msl) and the Lowlands (3200msl-3400msl), define important aspects that affect the potato seed production, trade, sources, diversity and renewal. Farmers' having their production sites at the Highlands have greater potential to become certified seed producers, due to the presence of "Phurumas" or virgin soils in the area, which have reduced plague and disease infestations and are subject to longer resting periods. A greater tradition for own potato seed production and greater use of native varieties are also important traits that differ producers from the Highlands with the producers at the Lowlands.

The main threats for a future and sustainable certified seed production at the communities involved in PROINPA and Bioversity Internationals' project are young farmers migration, lack of accessible roads to the production sites, and the possible unstable demand of certified potato seed in the region. The volumes of production of the current season will, directly affect the demand of seed for the next planting season, meaning that the seed producers markets are in the hands of external factors that cannot be controlled.

Farmers involved in the project that have their crop fields on other locations are a set back for the projects' development, since they are not able to participate in all the projects' activities. Absences during the certification and farming practices can harm the agility of the process, and have negative consequences for the entire farmer association in the future.

The Colomi fair is the main entry and exist way for potato seed in the region, and it is characterized for being solely an informal local market. Farmers from the Lowlands and Highlands of the Candelaria district have numerous problems during potato seed acquisition. Seed bags or "cargas" (150 Kg- 170 Kg bag) offered at the local Market can present varietal mixes, presence of diseases and plagues, as well mixes of good and bad quality seed, and potato seed sizes. There are no registered farmers' associations that produce certified potato seed in Colomi. In spite of the problems arising at the informal market of Colomi, there is still a high offer of different potato seed varieties.

The continuous presence of bad quality seed at the Colomi Fair has forced farmers to prefer other markets in the Tiraque, Quillacollo and the Cochabamba regions. Giving the limitations, farmers are still able to find the seed they are looking for, sometimes even by using seed exchange.

The potato seed producers at the area of study have a great knowledge and understanding of the potato market movement at the area, being able to infer which varieties of potato are having the highest demand during the next season.

The current General Norm for Seeds and Agricultural Species (Norma General de Semillas de Especies Agrícolas RM 121-2001) and the Specific Norms for Potato Seed Certification (Normas Específicas para la certificación de semilla de papa N° 101-1999) are outdated Norms that are not adjusted to the reality of potato seed production in Bolivia, given that they do not take into account the high grade of diversity of potato existing in the region, and the importance of the informal potato seed system and markets.

In spite of the advantages that the National Norms for certified potato seed production and commercialization, give to the registered seed producers, it is still not possible for small-scale farmers to afford SEPA seed; unless they manage to organize and convince their own communities or farmer syndicates to apply for aid to afford certified seed. Organizations, institutions and the government have tried to make SEPA seeds more accessible for the farmers; yet proper follow-ups to ensure the sustainability of the seed producers haven't been made.

The lack of affordable and more effective alternatives for the certified potato labeling done by INIAF that reduce the grade of forging, is a latent threat for the markets of legal certified potato seed producers, therefore new alternatives need to be established in order to strengthen the labeling methods.

Potato seed diversity is not a 100% priority for governmental institutions like the INIAF in Bolivia, and particularly not for the Seeds Area. INIAF's focus is to provide farmers with more opportunities to receive higher incomes for their production by planting certified improved varieties, which have higher selling prices in the market.

In order to secure diverse and good quality potato seed sources for the study region, it is imperative to find a balance between the formal and informal seed systems. Focus on native varieties preservation only, cannot be sustainable without a proper legal framework to support it, and a secured demand in the market.

6.2 Recommendations for PROINPA and Bioversity Internationals' project

Based on the given results of the study, the following recommendations for the general project were elaborated in order to mitigate the different weaknesses identified, ensuring better lasting results for the future seed producers in Colomi:

- Seek and secure future seed buyers in the Candelaria District by providing information about the seed offered by the farmers' involved in the project, as well as the benefits of buying certified potato seed.
- Secure the fulfillment of all the requirements, and activities within the seed certification process established by the INIAF in order to secure the final label for commercialization.
- Perform follow-ups of the farmers' situation after the commercialization of the produced certified seed in order to secure their involvement for the next planting season.
- Assure the seed fields registration for the next planting season, as well as the proper use of certified seed to create at least two stable seasons of seed production.
- Elaboration of a special "PROINPA" label that comes with the potato seed produced by the communities involved in the project, in order to be differentiated amongst the other potato seed offered at the Colomi Fair.

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8 Annex

8.1 Annex 1 Master Thesis project Definition

Student's name	Ana Gabriela Escobar
Working Title of the Thesis	Seed Value Chain analysis for potato (<i>Solanum tuberosum</i>) seed market in the municipality of Colomi Cochabamba-Bolivia.
Background ¹ and state of knowledge	<p>This Master Thesis would be a contribution to BioversityInternational's project Improving the availability and use of diverse seed and other planting materials to reduce vulnerability and improve food security for smallholders in vulnerable ecosystems. The project is carried out in 5 countries (Bolivia, Nepal, Uganda, Burkina Faso and Uzbekistan) in collaboration with national and local organizations and funded by SDC (Swiss Development and Co-operation Agency). In Bolivia, the project is conducted in Cochabamba, in association with PROINPA (Fundación para la Promoción e Investigación de Productos Andinos).</p> <p>This project seeks to 1) reinforce seed production and diffusion mechanisms and 2) improve the availability of adapted and adaptive crop varieties of selected crops for farmers in vulnerable farmers. In general, the project aims to help seed actors move away from a linear approach to technology development and transfer to a much more inclusive method, by involving a diversity of actors in the supply chain, strengthening linkages between them, and reinforcing the role of small holders as seed suppliers. The outputs of this project are: 1) enhanced capacity and diversification of seed suppliers and other stakeholders to provide local crop genetic diversity planting materials in large enough quantities to minimize risk for smallholders in vulnerable ecosystems, 2) smallholder farmers are recognized not only as recipients of technology and seeds, but are also providers of diversity and seeds, 3) crop varieties with variation in functional traits in respect of abiotic and biotic stress in crop varieties exist in the farmers' production system, 4) tested technical schemes that use crop genetic diversity to reduce vulnerability (in terms of the probability of future crop or ecosystem services losses) developed, and 5) recommendations, and corresponding actions, developed on how local, national and international institutions and strategies on plant genetic resources should address seed systems in their agendas.</p>
Objective of the thesis	<p>The overall goal of this master thesis is to contribute to the projects' output 1; enhancing the capacity and diversification of seed suppliers, promoting local crop genetic diversity in proper quantities reducing the risks for farmers; and output 5: providing recommendations for seed systems to local, national and international institutions.</p> <p>The objective of the thesis investigation is to conduct a complete Seed Value Chain Analysis of potato (<i>Solanum tuberosum</i>) in the Municipality of Colomi located in the Department of Cochabamba-Bolivia in order to identify and describe the actors involved inside the seed value chain, from plant variety developers to consumers, as well as the relationships between them, the constraints they face and the factors that affect the demand and supply of seed. It will also analyze the legal context or policies, which affect the seed value chain in Bolivia, providing a detailed description of their effects in the value chain; serving as a key tool for identifying possible problems inside the system, and helping in future policy measures to improve diversification and availability, reducing the risks for farmers.</p> <p>The thesis' outputs are:</p> <p>Output 1. Develop a complete Seed Value Chain analysis for potato and arracacha which includes:</p> <p>a) A Seed Market Map which:</p> <ol style="list-style-type: none"> 1) Identifies all actors involved inside the chain by using quantitative and qualitative research methods, 2) Classifies the actors into different categories according to their role inside de value chain (e.g. extension services, enablers etc.). <p>b) Recognition of the different interactions within the Seed Market Map.</p> <p>c) Identification of issues like: constraints actors face; the elements that create disincentives for the development of a seed value chain, factors that limit the market of seed of adaptive and adapted varieties etc.</p> <p>d) Recommendations on how to improve the seed value chains of these two crops.</p>

¹ If necessary include a description of the project in which the thesis is embedded in an annex

	<p>Output 2: Collect and analyze information about how national and institutional policies and national laws (seed laws, subsidies, credits, crop insurance schemes) influence:</p> <p>a) Varieties/seed/genetic diversity available for farmers; b) Farmers' choices on what to acquire and from whom c) Exchange of knowledge and genetic materials among actors in the seed value chain</p>
Expected outputs ²	<ul style="list-style-type: none"> • Master thesis publication • Inventory of seed producers, sellers and consumers in the municipality of Colomi-Cochabamba. • Seed Market Map model with the different interactions of actors involved. • Summarized report of main problems inside the value chain. • Inventory of main institutions/policies, which affect in some way or another the seed market in Bolivia and farmers' choices about what to plant. • (Possible brochures on Seed Market information addressed to farmers and researchers) • (Possible publication in collaboration with PROINPA/Bioversity)
Research topic, research questions or hypotheses	<p>Research Questions:</p> <ul style="list-style-type: none"> • Who are the main actors involved in the potato market in Cochabamba? • Which are the causes for seed scarcity for farmers in the Municipality of Colomi? • What are the reasons influencing the farmers' preferences for seed purchasing? • Do the seed developers in Bolivia have sufficient access to technologies? • What role does the private sector have on the seed market in Bolivia? • What role do farmers' associations have in seed production and marketing in Bolivia? • How do the national and institutional policies and national laws influence the availability and accessibility of seed varieties to farmers?
Methods	<ul style="list-style-type: none"> • Literature and secondary data review on seed value chain in Bolivia. • Background research on legal framework on seed market in general, and in particular in Bolivia. • Survey using semi-structured interviews, and focus group discussions with actors involved in the seed value chain • Interviews with representatives of different national institutions about national and institutional policies, laws and practices that affect seed production and distribution. • Questionnaires to get quantitative data about the actors involved in the seed value chain. • Workshops with farmers and other seed value chain actors to report, discuss and refine with them the research findings <p>The methodology and a detailed research protocol will be developed during the months of May and June 2013 in collaboration with the experts of BioversityInternational and PROINPA. The student will be provided with feedback from researchers in PROINPA at the present time to avoid repetition of analysis, and to broaden other aspects of the investigation. The feedback will be done by conference calls and mails.</p>
Principal adviser ³	Dr. Alessandra Giuliani, HAFL
Main adviser at other institution ⁴	Dr. Isabel Lopez (BioversityInternational, Rome) Dr. Ximena Cadima, PROINPA, Cochabamba, Bolivia
Additional advisers (including affiliation)	Dr. Prof. Urs Scheidegger, HAFL
Place(s) of research	The field of work of the master student will be carried out in Cochabamba, Bolivia in collaboration PROINPA. Student's fieldwork period: beginning of July 2013-October 2013.
Language of thesis ⁵	English (the work and other documents will be in Spanish, but the final thesis will be in English)
Comments	The title of the master thesis is provisional and will be edited in collaboration with the involved partners once the fieldwork is completed.
Dates (month/year)	Start: April 2013 End: July 2014

² Break down the objective into several partial objectives or expected results or expected outputs

³ This must be an HAFL professor or a senior scientist employed by HAFL

⁴ If the thesis is conducted in close collaboration with another institution (please provide contact details)

⁵ Accepted options include English, German, French, Italian, and Spanish

8.2 Annex 2 Survey for farmers at sampled communities

Nombre: _____ Número de miembros de familia: _____

Edad: _____ Género: M F Comunidad: _____

1. ¿Tú compras semilla de papa? o ¿es propia? o ¿ambas?

a. Es propia	
b. La compro	
c. Es propia y también la compro	

Si la respuesta es **a** por favor continúe a la pregunta # 9

2. Cuando no utilizas semilla propia, ¿de dónde o de quién consigues semilla mayoritariamente?
¿Y otra fuente?

Fuente 1	Respuesta:
Fuente 2	Respuesta:
1. Compañía que vende semillas: (Ponga el nombre y ubicación)	
2. Organizaciones no gubernamentales/fundaciones	
3. Gobierno (INIAF)	
4. Feria Local (Nombre/día de feria)	
5. Asociación de Productores de semilla (APROS)	
6. De la comunidad (vecino, pariente etc.)	
7. De otra comunidad	
8. Asociación de agricultores	
9. Otro (Especifique)	

3. (Para la Fuente 1), ¿Por qué la utilizas?

4. (Para la Fuente 2), ¿Por qué la utilizas?

5. ¿Cuáles son los problemas que tienes para comprar o conseguir semilla? (1-2 problemas)

6. ¿Cómo debe ser la semilla de papa para que tú decidas comprarla?

7. En este año, ¿qué variedades de semilla de papa has buscado al comprar?

8. ¿Si tuvieses la posibilidad de comprar semilla de papa certificada en un almacén en Pico Central o en Linde lo harías?

9. ¿Has recibido alguna ayuda para conseguir o comprar semilla de papa?

a.	si	
b.	no	

Si su respuesta es fue **b** por favor continúe a la pregunta # 10

9a. Si la respuesta fue SI, ¿de quién?

Respuesta:
<ol style="list-style-type: none"> 1. Compañía que vende semillas: (Ponga el nombre y ubicación) 2. Organizaciones no gubernamentales/fundaciones 3. Gobierno (INIAP) 4. Mercado/Feria Local (Ponga el nombre de su proveedor en la Feria si lo sabe) 5. Asociación de Productores de semilla (APROS) 6. La comunidad 7. Asociación de agricultores 8. Fuera del país (De qué país) 9. Otro (Especifique)

10. ¿Vendes semilla de papa?

a.	si	
b.	no	

Si su respuesta fue **b** por favor siga a la pregunta #12

10a. Si vendes, ¿qué variedades comercializas y a quién las vendes?

10b. ¿Si quisieras vender más semilla de papa, qué necesitarías?

11. ¿A cuánto te cobran por carga de semilla para transportarla a la feria?

12. ¿Cuántas cargas produces por carga sembrada al año? ¿Cuánto de eso guardas para semilla?

13. ¿Qué variedades de papa tienes para consumo propio?

14. ¿Intercambias o regalas semilla de papa?

a. si	
b. no	

11a. Si intercambias, ¿qué variedades de semilla intercambias y con quién?

8.3 Annex 3 Survey for farmers preferences

Nombre: _____ Número de miembros de familia: _____

Edad: _____ Género: M F Comunidad: _____

Objetivo: determinar las preferencias de variedades de papa de los agricultores y qué determina estas preferencias en la elección de semilla

1) ¿De qué variedades de papa compras semilla?

2) ¿Cómo sabes que la semilla es Buena o mala, para comprarla o no comprarla?

(Lista sugerida para complementar las respuestas encontradas):

- Sus ojos
- Tamaño
- Forma
- Si es o no certificada
- Donde ha sido producida
- Otros _____

3) Están produciendo semilla de papa (variedades: Waycha, Imilla Blanca, Pinta Boca, Yana Imilla y Canastillo) en Pico Central y Linde. ¿Comprarias esta semilla? SI NO ¿Por qué?

8.4 Annex 4 List of farmers interviewed per sampled community

Farmers at the Highlands (3800msl- 4000msl)

Name	Community	Date	Gender	Family mem	Age
María Torres	Linde	29/07/13	f	4	30
Remigia Peña	Linde	29/07/13	f	4	61
Clemente Torres	Linde	29/07/13	m	1	51
Teodora Torres	Linde	29/07/13	f	3	28
Albina Torres	Linde	29/08/13	f	4	21
Emeteria Arias Villca	Linde	29/08/13	f	8	17
Emilio Rojas	Linde	29/08/13	m	5	53
Cristobal Arias	Linde	29/08/13	m	10	23
Alexander Colque	Linde	29/08/13	m	7	28
Renato Choque	Linde	29/08/13	m	6	27
Eliseo Nicolas	Linde	29/08/13	m	3	62
Hermógenes Solis	Linde	29/08/13	m	7	45
Pascual Peña	Linde	29/08/13	m	3	71
Rufino Castellón	Linde	29/08/13	m	8	59
Alfredo Rojas Espinoza	Linde	29/08/13	m	5	16
Indalicio Montaña	Linde	29/08/13	m	5	52
Domingo Peña	Linde	29/08/13	m	9	58
Dario Tuaca	Linde	29/08/13	m	6	38
Iber Mamani	Linde	29/08/13	m	5	16
Dalicio Cosio	Linde	29/08/13	m	5	59
Filiaco Quiroz	Pico Central	13/08/13	m	2	30
Humberto Arroyo	Pico Central	13/08/13	m	9	23
Felix Zambrano	Pico Central	24/07/13	m	8	57
Ruben Arroyo	Pico Central	24/07/13	m	4	22
Alvaro Montaña	Pico Central	24/07/13	m	8	34
Juvenal Arroyo	Pico Central	24/07/13	m	9	37
Teodoro Arroyo	Pico Central	24/07/13	m	2	67
Albina Pozos	Pico Central	24/07/13	f	3	23
Zenon Montaña	Pico Central	24/07/13	m	10	52

Guillermo López	Pico Central	24/07/13	m	10	35
Abdón Choque	Pico Central	13/08/13	m	5	24
Emilio López	Pico Central	13/08/13	m	5	34
Victor Arroyo	Pico Central	24/07/13	m	1	78
Severino Quiroz	Khochá-Khochá	31/07/13	m	4	70
Javier Enzinas	Khochá-Khochá	08/08/13	m	4	23
Freddy Quiroz	Khochá-Khochá	31/07/13	m	4	
Martina Quiroz	Khochá-Khochá	31/07/13	f	4	
Polinaria Quiroz	Khochá-Khochá	31/07/13	f	4	65

Farmers at the Lowlands (3200msl- 3400msl)

Name	Community	Date	Gender	Family	
				m	Age
Fructoso Vargas Aviles	Chimpa Rancho	14/08/13	m	8	36
Pastor Caberos	Chimpa Rancho	08/08/13	m	4	41
Marcelino Jeimes	Chimpa Rancho	14/08/13	m	1	45
Gonzalo García	Chimpa Rancho	14/08/13	m	6	33
Angel Vargas Fuentes	Chimpa Rancho	21/08/13	m	5	48
Fernando Rojas	Alto San Isidro	14/08/13	m	2	22
René Rojas	Alto San Isidro	14/08/13	m	6	37
Hector Flores	Alto San Isidro	14/08/13	m	3	21
Anita Ledezma	Alto San Isidro	14/08/13	f	8	30
Marcelino Cavallo	Alto San Isidro	21/08/13	m	9	54
Gerardo Cavallio	Alto San Isidro	21/08/13	m	6	32
Ma Magdalena Villarroel	Balcón	30/07/13	f	6	45
Fortunato López	Balcón	30/07/13	m	4	25
Joaquín López	Balcón	29/07/13	m	4	42
Cintia Torres	Balcón	30/07/13	f	3	21
Emilio Maldonado	Kanco	09/08/13	m	5	62
Zenon Villarroel	Kanco	14/08/13	m	6	38
Venita Gonzáles	Kanco	28/08/13	f	6	49
Luis Hidalgo	Kanco	28/08/13	m	8	33

Francisco Arispe	Kanco	04/09/13	m	6	72
Florentino Arispe	Kanco	12/09/13	m	6	55
Luis Gonzales	Kanco	12/09/13	m	7	33
Reinaldo Fernandez	Kanco	12/09/13	m	7	49
Segundina Vargas	Jatun Rumi	04/09/13	f	6	27
Saturnina Rodriguez	Jatun Rumi	29/08/13	f	1	70
Eloina Iporani	Jatun Rumi	29/08/13	f	4	26
Jacinta Jaimis	Jatun Rumi	29/08/13	f	8	36

8.5 Annex 5 Calculation of frequencies of farmers seed sources

The following tables show the amount of mentions per seed sources and the frequency calculated for it.

Linde

Sources	No. of Mentions	% of 20 farmers
Own source	7	35%
Colomi Fair	5	25%
Cotani	4	20%
Tiraque Fair	4	20%
SEPA	3	15%
Tiraque (S)	1	5%
Quillacollo (S)	1	5%
Sapanani	1	5%
Palca	1	5%
Aguas Calientes	1	5%
Cochabamba MC	1	5%
Calayosia	1	5%

Pico Central

Sources	No. of Mentions	% of 13 farmers
Colomi Fair	6	46%
Own source	6	46%
SEPA	1	8%
Neighbors	1	8%
Colomi Fair	6	46%
Own source	6	46%
SEPA	1	8%
Neighbors	1	8%

Chimpa Rancho

Sources	No. of Mentions	% of 5 farmers
Colomi Fair	4	80%
Chimpa Rancho	1	20%
Quillacollo	1	20%
Tiraque Fair	1	20%

Alto San Isidro

Sources	No. of Mentions	% of 6 farmers
Quillacollo	5	100%
Tiraque Fair	4	80%
Colomi Fair	3	60%
Pisli	1	20%

Balcón

Sources	No. of Mentions	% of 4 farmers
Own source	2	50%
Tiraque Fair	1	25%
Colomi Fair	1	25%
Cotani	1	25%

Kanko

Sources	No. of Mentions	% of 8 farmers
Colomi Fair	4	50%
Tiraque Fair	3	38%
Cochabamba MC	2	25%
Chapare	1	13%
Cogosinola	1	13%
Cochabamba PT	1	13%
Morochata	1	13%
Pico Central	1	13%
Cotani	1	13%

Jatun Rumi

Sources	No. of Mentions	% of 8 farmers
Colomi Fair	3	75%
Quillacollo	2	50%
Cochabamba PT	1	25%
Tiraque Fair	1	25%

8.6 Annex 6 Calculation of frequencies of potato seed varieties at Colomi fair

The following table shows the amount of mentions per potato seed variety in relation to the amount of vendors interviewed per fair day, and the respective frequency.

No. Vendors	Date	Varieties	Frequency
8	week 1 25-31 jul	Pinta Boca	25%
		Q'oyllu	25%
		Rosita	13%
		Waych'a	13%
		Holandesa	13%
		Doble H	13%
16	week 2 1-7aug	Waych'a	38%
		Pinta Boca	13%
		Doble H	13%
		Peruana	6%
		Holandesa	6%
		Robusta	6%
		Bola Q'oyllu	6%
		Rosita	6%
		Q'oyllu	6%
12	week 3 8-15aug	Puca ñawi	33%
		Waych'a	25%
		Robusta	17%
		Tanta Imilia	8%
		Chola	8%
		Isaño	8%
8	week 4 16-21aug	Waych'a	75%
		Qorizongo	13%
		Doble H	13%
5	week 5 22-29aug	Waych'a	80%
		Puca ñawi	20%
5	week 6 9-15sep	Waych'a	40%
		Doble H	20%
		Pinta Boca	20%
		Candelerero	20%

8.7 Annex 7 Base questionnaires for semi-structured interviews with key informants

8.7.1 SEPA

Nombre: Ing. Epifania Macías

Cargo: Responsable de producción de semilla Pre Básica

Fecha : 8/10/2013

¿Qué hacen en SEPA?

¿Cómo podría categorizarse SEPA, como una institución pública o privada?

¿Cuál es el rol de SEPA en la certificación de semilla de papa?

¿Cómo manejan sus canales de distribución? ¿Qué hay de Quillacollo y Cochabamba?

¿En qué zonas de Bolivia venden más semilla certificada? ¿Y Colomi?

¿En cuanto al financiamiento aquí en SEPA? Qué es lo que le sostiene a SEPA, es la venta de semilla o también tienen respaldo del gobierno.

¿Qué categorías de semilla de papa se producen más en SEPA? ¿Qué hay de las variedades?

¿Cuál es la diferencia de precios entre las diferentes categorías de semilla de papa, especialmente en relación a la semilla fiscalizada?

En la Normativa Específica para la Certificación de Semilla de Papa se estipula que está “completamente prohibida la comercialización, distribución y/o donación de semillas sin etiqueta oficial del INIAF (Oficina Regional de Semillas)”; sin embargo en el sistema tradicional de comercio de semilla (que ocupa el 95-98% del mercado de papa) esto no se cumple; ¿cuál es su opinión al respecto? ¿Sabe de alguna medida futura que busque de algún modo legalizar este sistema tradicional?

Cuántas asociaciones productoras de papa existen?

¿Tú sabes si el gobierno o alguien quiera legalizar un poco este sistema de venta de semilla?, porque no existen ningún seguimiento.

Existiría la posibilidad de hacer algún tipo de diferenciación de la semilla que ha sido multiplicada en los mercados, por ejemplo una etiqueta etc?

Y estas son asociaciones de agricultores? ¿O solo son los intermediarios?

¿Se podría decir que este sistema promueve la pérdida de variedades nativas? Ya que por el momento solo están registradas 27 variedades de papa, de las miles de variedades que existen en Bolivia.

Cuánto cuesta registrar estas variedades nativas, osea cuál es el proceso?

¿Tienen pensado registrar nuevas variedades de papa en el futuro?

¿Realizan algún seguimiento de los clientes que compran semilla certificada?

¿Lo informan al INIAF? ¿Qué hay de algún convenio?

¿Cualquier persona puede comprar semilla de papa certificada?

¿Desde hace cuándo implementaron el candado y bolsa verde para la semilla de SE-PA? ¿Cuál fue la razón de realizar esto?

¿Tienen programas de apoyo para agricultores que no tienen el dinero suficiente para comprar o algún bono de respaldo para los agricultores sin muchos recursos?

¿El gobierno les ha comprado semilla para donarla a los agricultores? ¿Y qué pasó con esa semilla?

¿Cómo está su situación este año en venta de Pre Básica?

¿Todavía tienen invernaderos con sistema aeropónico?

¿Tienes alguna lista de asociaciones de productores o personas naturales que te compren semilla en el área de Colomi?

8.7.2 INIAF

Nombre: Ing Yuri Antezana

Cargo: Encargado del área de semillas

Fecha: 14/10/2013

¿Cúéntame cual es tú función en el INIAF?

Y cómo así cerraron las Oficinas Regionales de Semillas?

He estado analizando algunos documentos del gobierno acerca del registro de semillas y todo lo relacionado, pero hay unos documentos antiguos del Programa Nacional de Semillas que todavía son usados, y no hay seguimientos del INIAF, a qué se debe esto?

¿Cuál es el procedimiento de la certificación de semilla de papa? Me han contado que son dos técnicos supuestamente?

Ustedes tienen algún manual para la certificación de papa?

¿Cuántas inspecciones mas o menos logran realizar en un día?

Cuánto tiempo dura todo este proceso de certificación? Osea hasta decir usted ya está certificado, cuál es el lapso de tiempo?

¿Ha habido casos en el que la gente falsifica la etiqueta?

¿Hay alguna diferencia en cuánto al trámite entre las categorías de papa?

¿Ustedes no comercializan semilla?

En la Normativa Específica para la Certificación de Semilla de Papa se estipula que está completamente prohibida la comercialización, distribución y/o donación de semillas sin etiqueta oficial de la Oficina Regional de Semillas; sin embargo en el sistema tradicional (que ocupa el 95-95% del mercado de papa) esto no se cumple; ¿cuál es su opinión al respecto?

¿Considera usted que este sistema más bien promueve el intercambio informal más que regularlo?

¿Existe la posibilidad de introducir un modelo de regulación más permisivo que más bien fomente la diversidad local de semilla de papa?

¿Existe algún método de regulación de comercialización de semilla de papa además de las etiquetas?

8.7.3 Vendors and Transporters at Markets

Cuestionario para Ferias en Colomi (entrevista semi-estructurada)

Nombre:

Origen:

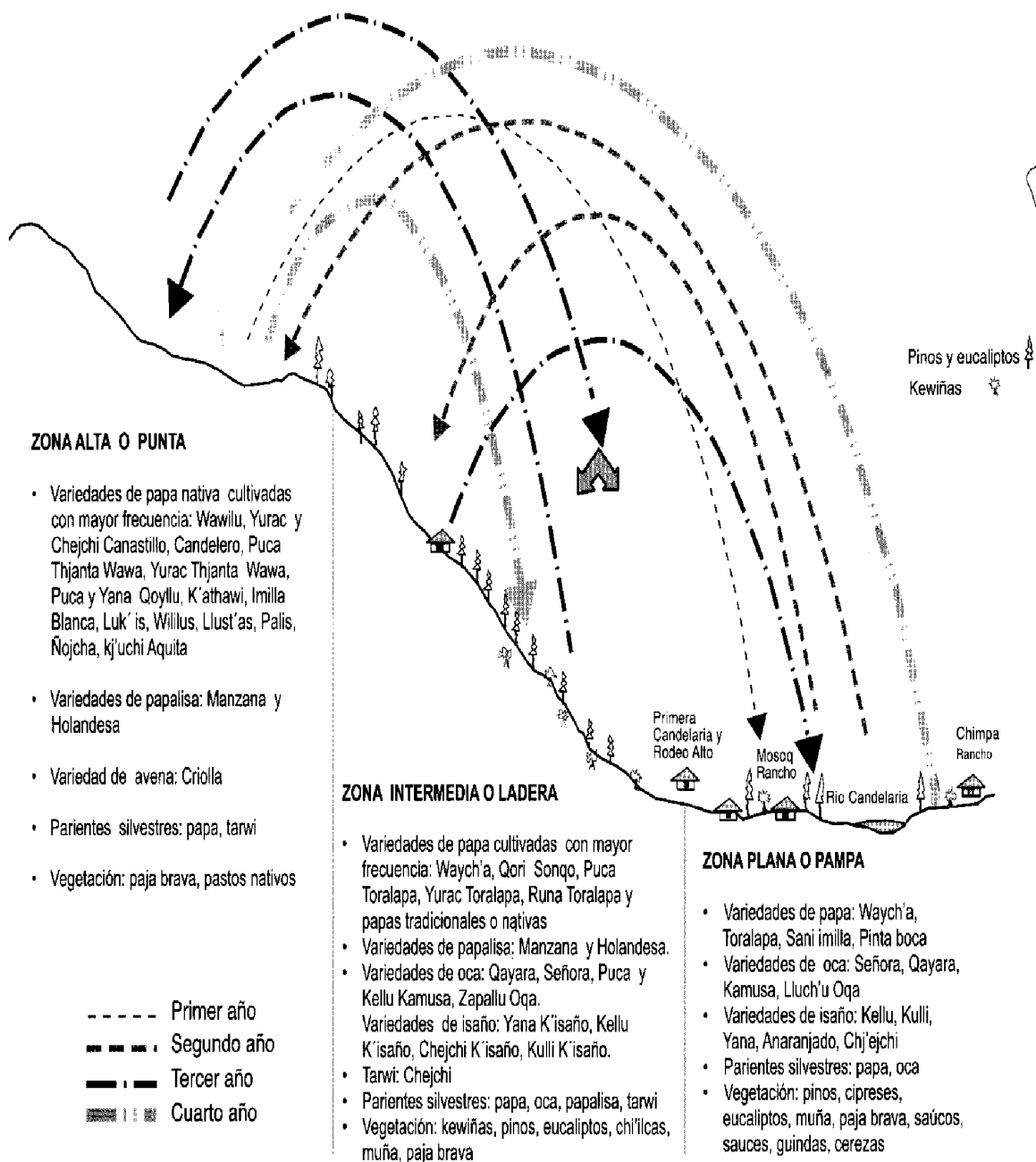
Preguntas Generales:

1. ¿Qué variedades de semilla de papa tienes? ¿Cuánto cuestan? ¿Están certificadas?
2. ¿De dónde has traído la semilla que vendes aquí? ¿Por qué?
3. ¿Si yo quisiera otras variedades me las puedes conseguir?

Preguntas Específicas (Cuestionario extendido)

4. ¿Qué variedades de semilla de papa vendes más? ¿Por qué?
5. ¿En qué meses del año se vende semilla de papa en esta feria?
6. ¿A quién usualmente vendes tus semillas de papa?
7. ¿Los agricultores te hacen pedidos de semilla? (por año)
8. ¿Cómo tiene que ser la papa para vender como semilla (selección/calidad)?
9. ¿Cuánto pagas por carga para transportarla hasta la feria?


8.8 Annex 8 Seed Flows at the Candelaria District at different eco-regions



8.9 Annex 9 INIAF: Brochures of certified potato seed producers, seed categories and process of certification




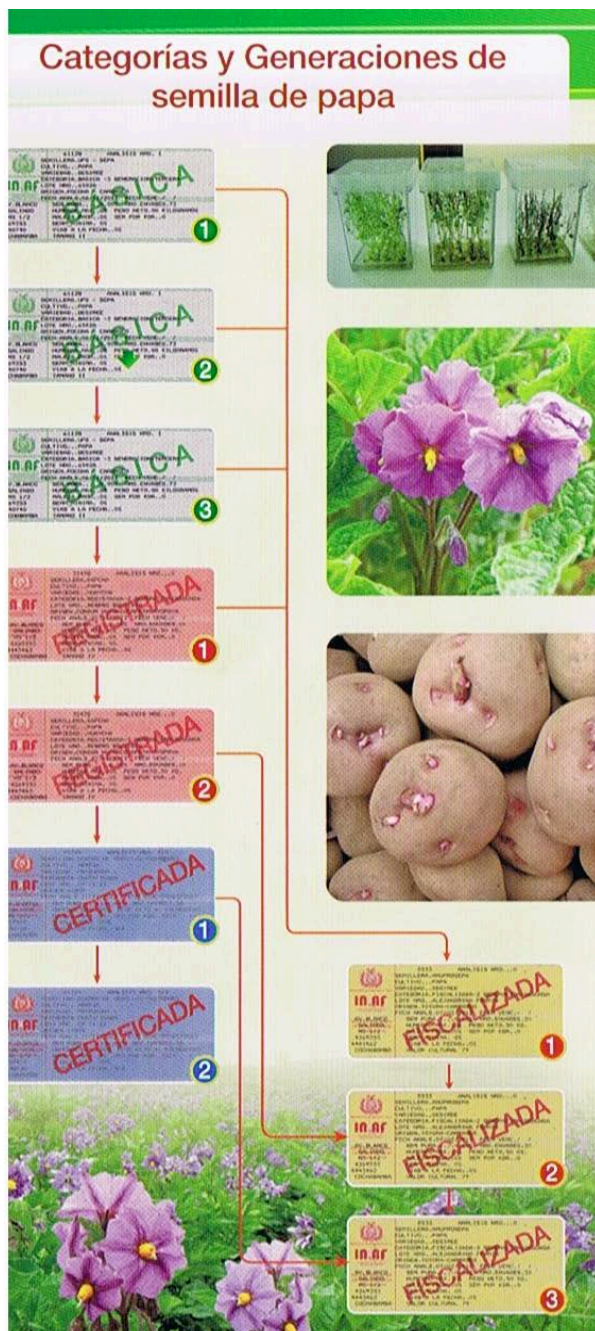
PAPA		INIAF	
VARIEDAD	EMPRESA	CONTACTO	TELEFONO
HUAYCHA	APROSEPA	JUAN CARLOS MARCANI, SILVANO FERNANDEZ	72247141-76987304-68549665
HUAYCHA	A.P.S. SUMAJ POQOY	FILIBERTO QUINTANA	77414179-72739458
HUAYCHA	ASEP	VICENTE MAMANI	72736509
HUAYCHA-NATIVAS	SUMAJ TARPUY	ELEUTERIO MAMANI	72736509-71410854
HUAYCHA	SUMAJ MUJU	SERAFIN FERNANDEZ	72780441-72291740
HUAYCHA-DESIREE	TUNARI	PEDRO RÍOS	4391755-77975192
HUAYCHA	ASPAN	FLORENCIO QUISPE	76996549
HUAYCHA	ORPACA	VICTOR QUISPE-TORIBIO CALISAYA	72933508- 71751764
HUAYCHA	APROASAM	GABINO CHOQUE	4378406-76901749-72758983
HUAYCHA	APROSER	JOSE LUIS ALARCON	71455747-73754803
HUAYCHA	ASOFLOR	ROBERTO CUELLO	4910004
HUAYCHA	ASPCHA	ELEUTERIO BAUTISTA	77957931
HUAYCHA	APROSEMILLA	CRISTOBAL MAMANI	76911872-73752440
HUAYCHA	ASPROSEP-CANTON PALCA	CONSTANTINO SOLIZ	76423742-72276968
HUAYCHA	MOSOJ TARPUY	FREDY ESPINOZA	71497588-78335349-76442506
HUAYCHA, DESIREE, ROMANO	SEPA	JHONNY TERAN	4319943
HUAYCHA	ASEPA	FACUNDO TINTA ROCHA	75489694
DESIREE	ARAPI	NICANOR QUISPE	76953499-4733666-4733555



ESTADO PLURINACIONAL DE BOLIVIA

INSTITUTO NACIONAL DE INNOVACIÓN AGROPECUARIA Y FORESTAL COCHABAMBA

CATEGORÍAS DE SEMILLAS



CERTIFICACIÓN DE SEMILLAS

La Certificación es el proceso de supervisión y verificación de la calidad de la semilla en campo y laboratorio. Se aplica a semillas de los cultivos que cuentan con Normas Específicas de Certificación.

SEMILLERISTA

1.- Inscripción de las parcelas semilleras

El semillerista inscribe sus parcelas adjuntado las etiquetas de la semilla que ha utilizado en la siembra. Debe estar inscrito como productor semillerista y la variedad a certificar debe estar inscrita en el Registro Nacional de Variedades.

2. Programar inspecciones

Se coordina las inspecciones de las parcelas con los semilleristas, de acuerdo a lo establecido en las Normas Específica de cada cultivo.

3. Inspección de parcelas

Se realiza la inspección de parcelas acompañados del productor, verificando el cumplimiento a las normas de certificación de semillas, observando el estado general de la parcela, estado fitosanitario, mezcla varietal y manejo del cultivo. Se debe realizar al menos una inspección de campo.

APROBACIÓN DEL CAMPO SEMILLERO

NO

SE RECHAZA EL CAMPO SEMILLERO

SI

Es semilla de Papa

4. Selección de semilla

Una vez cosechada la semilla, el semillerista selecciona la semilla de acuerdo a los tamaños (II, III y IV) establecidos en la norma.

5. Inspección en almacén

Una vez seleccionada la semilla por parte del productor, el INIAF realizará la inspección en almacén, verificando el cumplimiento de la norma establecida para este cultivo.

Es semilla Botánica

4. Acondicionamiento de semillas

Una vez cosechada la semilla, el semillerista deberá beneficiar y acondicionar la semilla, la cual estará lista para su correspondiente muestreo.

5. Análisis de la semilla en laboratorio

Una vez beneficiada y embolsada la semilla, se tomará la muestra para su correspondiente análisis de la calidad en laboratorio (Determinación del porcentaje de Humedad, Pureza y Germinación).

APROBACIÓN DEL LOTE SEMILLERO

NO

SE RECHAZA EL LOTE SEMILLERO

SI

6. Etiquetado de la semilla

