

***MSc-thesis Rural Development Sociology***

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# **Bridging differences**

Case studies on social networks and brokerage in potato farming in Peru



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**Sandra Bos**

**MAKS 19**

**Supervisors:**

**Pieter de Vries;** Rural Development Sociology, Wageningen University  
**Conny Almekinders;** Technology and Agrarian Development, Wageningen University



Author: Sandra Bos

Contact: [ardnassob@hotmail.com](mailto:ardnassob@hotmail.com)

Registration number: 790426-105-040

MSc-programme: Management of Agro-ecological Knowledge and Social Change (MAKS), Department of Social Sciences, Wageningen University, The Netherlands

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Supervisors: Dr. Pieter de Vries, Department of Rural Development Sociology  
Dr. Conny Almekinders, Department of Technology and Agrarian Development

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## PREFACE

This thesis is the end-product of the two-year MSc-study 'Management of Agro-ecological Knowledge and Social Change (MAKS)'. Although I see this thesis as an 'end-product', it represents a learning process and a long search through which I finally discovered my field of interest. I began my higher educational career at Larenstein University, where I started the course 'Garden and Landscape Design'. The study at Larenstein did not answer my expectations; the emphasis was too much on the green environment, and too little on people and social aspects related to this environment. After receiving my propaedeutic degree, I therefore switched from Larenstein to STOAS University. At STOAS University I followed the study 'Knowledge Management and Education within the Agricultural Sector'. During this study I was trained to become an agricultural teacher or adviser. In the fourth year of the study I had the opportunity to go to South Africa for an internship. My objective was to learn more about agriculture and rural life in South Africa. The country made a big impression on me. Not only was I amazed by the great differences between rich and poor and black and white, it was also my first encounter with (failed) small-scale development projects in rural areas. As an outsider with an educational background it was strange to see that these projects mainly failed due to classical mistakes such as; lack of participation of the rural communities, the use of technologies unsuitable for the area, a lack of exchange of knowledge and information, and the great distance between the people from the community and the (foreign) experts. As a teacher I was trained to involve students, to make use of methods appropriate for them, and to empathise on the life worlds of the students. For me these educational elements showed great similarities with the development projects I visited. It seemed that the biggest problem was the lack of an integrated social approach for implementing technical projects.

After receiving my BSc-diploma, I knew that I wanted to go beyond being an agricultural teacher in the Netherlands. South Africa had inspired to go abroad, realising that the world is much bigger than the Netherlands. I chose to do the MAKS-programme at Wageningen University, because I was attracted by the focus on integrating technical and social knowledge. From my experiences in South Africa I knew that this integration is an important aspect in the field of agricultural developments.

Within the MAKS-programme I chose 'Rural Development Sociology' as my main course. This direction was a new field of study for me. During the last phase of my study, I finally had the chance to go abroad and learn from farmers' practices. For me, going to Peru was an enormous challenge; going abroad alone, living and working in a different culture, learning a new language, and learning more from potato farmers' practices. I experienced many different situations, which all taught me more about Peru and myself. The comfortable life in Lima with the people from CIP, the tropical life in La Merced where I learned the Spanish language, and the Andean life where I met many different farmers; from small-scale farmers to the biggest potato farmers in Peru. I stayed with farmers with no electricity or bathroom facilities, and I met farmers who paid my very expensive hotel room. Although my experiences were not only positive and pretty, they all represent the complex reality of Peru.

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## ABBREVIATIONS AND GLOSSARY

### ABBREVIATIONS

AOA	Actor Oriented Approach
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (Federal Ministry for Economic Cooperation and Development, Germany)
CGIAR	Consultative Group on International Agricultural Research
CIP	Centro Internacional de la Papa (International Potato Centre)
CONDESAN	Consortium for the sustainable development of the Andean Ecoregion
FAO	Food and Agriculture Organisation of the United Nations
FFS	Farmer Field School(s)
FORTIPAPA	Fortalecimiento de la Investigación y Producción de Semilla de Papa en el Ecuador (Strengthening of Research and Production of Potato Seed in Ecuador)
Ha	Hectare
ICM	Integrated Crop Management
IDMA	Instituto de desarrollo y medio ambiente (Institute of development and environment)
IDESI	Instituto de Desarrollo del Sector Informal (Institute Development of the Informal Sector)
INIA	Instituto Nacional de Investigación Agraria (National Agricultural Research Institute)
INIAP	Instituto de Investigaciones Agropecuarias, Ecuador
INIEA	Instituto Nacional de Investigación y Extensión Agraria (National Agricultural Research and Extension Institute)
IPM	Integrated Pest Management
MPIZ	Max Planck Institute for Plant Breeding, Germany
NARI	National Agricultural Research Institute
NGO	Non Governmental Organisation
PRA	Proyecto de Reducción y Alivio a la Pobreza (Project Poverty Reduction and Alleviation program)
PROINPA	Programa de Investigación de la Papa, Bolivia (potato Research Program)
PRONOMACHCS	Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos (National Program of Watermanagement and Soil Conservation)
PRONSEMPA	Proyecto de Investigación de la Papa, Bolivia (National Potato Seed Project)
PVS	Participatory Variety Selection
SDC	Swiss Development Corporation
SEINPA	Semilla e Investigación en Papa, Peru (Seed and Research on Potatoes)
SENASA	El Servicio Nacional de Sanidad Agraria (National Agricultural Health Service)

UNALM	Universidad Nacional de Agricultura de La Molina
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICA	Universidad Nacional “San Luis Gonzaga” de Ica
USAID	United States Agency for International Development

## GLOSSARY

<i>Agencia Agraria;</i>	Local annex of the regional Ministerio de Agricultura (Ministry of Agriculture)
<i>Almacén;</i>	Storage for potato seed
<i>Arowa;</i>	Potato sac of eleven and a half kilogram
<i>Art de la localit�;</i>	Local art (a dynamic, highly complicated and detailed knowledge system in relation to potato cultivation)
<i>Campos demostrativos;</i>	Demonstration plots for potatoes, generally used by research institutions to demonstrate new techniques or new potato varieties
<i>Capacitacion;</i>	Training or workshop for farmers organised by institutions such as INIEA, SENASA
<i>Casa Agr�cola;</i>	Commercial shop for agricultural products
<i>Chaquitacla (Quecha);</i>	Andean foot plough
<i>Charlas;</i>	Information talk
<i>Chu�o (Quecha);</i>	Dehydrated potato product of bitter potatoes
<i>Comit� de Agropecuarios;</i>	Committee of farmers
<i>Comit� de Semillaristas;</i>	Committee of seed producers
<i>Comit� de Conservacionistas;</i>	Committee of environmental conservationists
<i>Comit� de Productores;</i>	Committee of potato producers
<i>Comerciante;</i>	Merchant working for commercial agricultural companies or shops
<i>Comisionista;</i>	Commission agent who works for wholesalers. These persons search for potato farmers and receive a small commission
<i>Conservacionista;</i>	Conservationist. In the context of this research, a conservationist produces native varieties in order to maintain them from a conservational perspective
<i>Convenio;</i>	Arrangement, engagement
<i>Cuy;</i>	Andean guinea pig
<i>El Ni�o;</i>	Spanish for ‘the Christ Child’, refers to a disruption of the ocean-atmosphere in the Tropical Pacific.
<i>Feria;</i>	Local market, fair
<i>Grupos de peque�os productores;</i>	Groups of small-scale farmers
<i>Hacienda;</i>	Large farm estates
<i>Huano Gallina;</i>	Chicken manure
<i>Ingeniero;</i>	Agricultural engineer
<i>Ingenieros particulares;</i>	Private agricultural engineers who sell their service to farmers

<i>Intermediario;</i>	Potato trader
<i>In Vitro;</i>	Literally: 'In Glass'; an artificial environment for the production of pre-basic seed
<i>Mayorista;</i>	Potato wholesaler
<i>Mestizo;</i>	A term of Spanish origin used to appoint people of mixed European and indigenous Amerindian origin
<i>Minera;</i>	Mining Company
<i>Ministerio de Agricultura;</i>	Ministry of Agriculture
<i>Pallar;</i>	Lima bean, A Peruvian bean specie ( <i>Phaseolus Lunatus</i> ). Locally also called 'chocho'
<i>Papa seca;</i>	Cooked and sun-dried potato product
<i>Polleria;</i>	Chips and chicken restaurant
<i>Rancha;</i>	Late blight
<i>Selva;</i>	Jungle
<i>Semillarista;</i>	Seed producer
<i>Técnico;</i>	Agricultural technician
<i>Tokosh;</i>	Potato porridge, an Andean dish of fermented potatoes

## KEY CONCEPTS

The key concepts used in this research; Diffusion, Release, Certification, Formal system, Informal system, and seed, should be interpreted as follows:

**Diffusion:** In the context of this study, the concept diffusion refers to the circulation or spread of an improved potato variety after the initial introduction. The initial introduction is described as the promotion of a variety. It are mostly public- or private institutions who play an important role in promoting new improved potato varieties. Furthermore, the concept diffusion refers to the social relations and interactions between the actors within a network.

**Release:** The concept release refers to the official variety release of a new potato variety. After a long process of developing, testing, selecting, and evaluating new clones, an ultimate clone is released as approved variety.

**Certification:** The process of inspection by public institutions known as the certification and control over variety release, to ensure that available seed is of a recognised variety with a low incidence of disease (Young, 1990 pp. 5). In Peru, this process of certification and registration of varieties in the National seed law is done by the national institution for certification SENASA.

**Formal seed system:** Also described as formal seed supply system, or formal (seed) sector. These concepts refer to seed production activities by the public sector that is characterised by a vertically organised production and distribution of tested seed and approved varieties, using strict quality control (Douglas, 1980). In Peru, the agricultural research institution INIEA is involved in the production and distribution of approved varieties, whereas SENASA is responsible for the quality control.

**Informal sector:** Can be seen as the total seed production activities of farmers. Breeding, management, replacement and distribution of seed are managed by farmers themselves, without public sector regulation (Thiele, 1998). This system is characterised by farmers who mainly conserve their own seed from season to season using seed selection and storage techniques (Scheidegger *et al.*, 1989).

**Seed:** As potatoes are a vegetatively propagated crop, seed refers to the tubers which the potato plant produces and that are used as seed. It is also possible to use the seed of the potato which develop in the flowering ends of the potato plant. This seed is referred to as *true potato seed*. In the context of this study, only the concept *potato seed* is used, as this is the most common strategy used by farmers to multiply their seed.

## ABSTRACT

This study was conducted between November 2005 and February 2006 in Peru, and is executed in close cooperation with the International Potato Center (CIP). The study addresses one of CIP's field of interests; gaining more insight in the processes that influence diffusion of improved potato varieties in Peru. The Peruvian context provided a unique research location, as it is part of the centre of potato domestication with great genetic and cultural diversity (Brush *et al.*, 1981). CIP has played an important role in the development of many improved potato varieties in Peru, by delivering genetic material to national agricultural research institutions. In order to gain a better understanding of how CIP-related improved potato varieties are diffused among farmers, three case studies were selected. The concept diffusion was interpreted as the circulation of the potato varieties within social networks. In order to study these social networks, the *Actor Oriented Approach* (AOA) was used as theoretical perspective. The AOA is a sociological approach to explain processes of change, and which challenges linear strategies with generalised outcomes. Using the AOA, actors' strategies and social relations are seen as the key factors influencing the adoption of potato varieties. The overall objective of this study was to contribute to an increased understanding of the processes that influence the diffusion of CIP's potato varieties.

The first case study focussed on the diffusion of the potato variety Amarilis in the department Cajamarca. Amarilis is a 'white' potato, mainly used for consumption. The variety was selected because of its Late Blight-resistance, and was officially released in 1993. Amarilis was introduced in Cajamarca because of the high Late Blight-pressure in this department. Due to the uptake of the variety by many institutions, Amarilis was widely spread among farmers throughout Cajamarca. This case study focussed on the involvement of public institution in the formal seed system, and on farmers involved in institutional collaboration for the production of certified seed. The relations between the organised seed producers and the public institutions were defined as an institutionally driven network. The involved farmers are selected, organised and supported by the public institutions. This created dependency of farmers on expert-knowledge and market accessibility. As the result of the institutional selection procedure, mostly successful farmers were included within this network. The vertical structure of this institutionally driven network and political changes within the involved public institutions influenced the functioning of this network. The institutional framework within this network does not permit a lot of room for manoeuvre for the representatives of the public institutions to experiment with alternative strategies. The analysis of the network demonstrated the closed character of the network, which limits the exchange of high-quality seed with the majority of farmers who operate outside of this network. However, within the institutionally driven network, also farmer-to-farmer diffusion took place with farmers operating outside this network. This diffusion was identified as the 'cracks' of the network. These 'cracks' represented unexpected situations where the formal system was linked to the informal system. Both the institutional uptake as the farmer-to-farmer diffusion have led to the wide diffusion of this variety in Cajamarca.

The second case study focused on the diffusion of potato variety UNICA in the coastal department Ica, the Mantaro Valley, and Huasahuasi. UNICA was selected for its virus-resistance and its adaptability to dry and warm climates, which made the variety suitable for potato production in coastal areas. UNICA has been released since 1998, and introduced to farmers on the Coast for the production of potatoes, and to farmers in the central Andes for the multiplication of seed. CIP and the University of Ica had an important role in promoting this variety to farmers. After the introduction, farmers continued to produce the variety that afterwards spread among other farmers. Therefore the drivers within this network were mainly the farmers themselves. This case study focussed on three different types of farmers involved in the production of UNICA; the coastal potato farmers, seed producers from Huasahuasi and the Mantaro Valley farmers, which were defined as network clusters. The connections between the three clusters produced a farmer driven network. The farmers were identified as individual, commercial farmers, occupying the central position within the network. The common interest in commercial potato production, and the presence of connections between the different clusters made this network coherent and efficient. However, due to the dualistic structure of the Peruvian agricultural sector, there was limited exchange with other types of farmers outside this farmer driven network.

The third case study focussed on the introduction of variety Serranita in the department Huánuco. This variety was recently released in Peru (2005), and is appropriate for both the processing industry as well as the consumption market. Within the process of selection and evaluation, public- and private institutions were involved. This case study focussed on a *'private sector driven network'*, consisting of potato farmers and processing companies. This network is established and facilitated by PRA, a private project initiated by USAID with the objective to connect farmers with markets. PRA's strategy is to involve different types of individual farmers to supply processing companies such as Frito-Lay and Laurel. PRA fulfils a central, but independent position in this network, by facilitating the contacts between the processing companies and potato farmers. Two different types of farmers can be identified within this network; the commercial potato farmers, and the small-scale seed producers. The seed producers are involved to supply the potato farmers with seed. The potato farmers produce the potatoes for the processing companies.

The analysis of this network showed that the involved potato farmers maintain weak ties with public institutions and the processing industry. These large, commercial farmers have access to expert-knowledge, which they tend to keep for themselves. This results in a lack of exchange with other types of farmers. The small-scale seed producers operate as a network cluster, due to the isolated location of the community, their strong personal ties and mutual dependency. Intensive support from PRA is needed to connect this community to the potato farmers, and to maintain the high-quality criteria necessary for the seed production. The aim of the project is that eventually the actors will sustain the network themselves when the project will finish. The continuity of this network without facilitation of PRA can be questioned, as it is difficult to bridge groups of actors from divergent social circles (Granovetter, 1983). This case study presents an initiative to bridge different groups of farmers. The involvement of small-scale seed producers – a group that otherwise would have been isolated from

the large processing companies – is an interesting attempt to explore possibilities for bridging dualism among Peruvian potato farmers.

In all the three case studies, the role of brokers was analysed. Brokers were conceptualised as ‘those actors who play a significant role in opening up new sources of economic activity and investment’ (Long, 2001). In the three case studies, different situations were identified where brokers played a role in connecting different networks. This research showed that brokers are active in unexpected situations, which take place within the ‘cracks’ of networks. One example within this research is the farmer-to-farmer diffusion between seed producers from the institutionally driven network, and neighbouring farmers who operate outside of this network. The formal seed producers provided access to expert-knowledge, and new potato varieties were used as payment in kind, which spread the variety among the neighbouring farmers. Broker-functions can also be identified within the institutionally driven networks, as representatives of public institutions fulfil a broker role by connecting organised groups of seed producers to the formal seed market. However, the effectiveness of these institutional brokers can be questioned, as there is little incentive for them to work efficiently due to hierarchical structures, political instability and financial cutbacks within these institutions.

It is not possible to make generalisations about brokers, as their activities take place within a dynamic process of social interactions, which is bound by space and time. Therefore there is no need to create a general theory on brokers. It is important to focus on the structural conditions in which brokers emerge, instead of searching for the social characteristics of brokers.

In this research the diffusion of potato varieties is explained as the result of social relations between actors within social networks. The general conclusion of this research is that the dualistic character of the Peruvian agricultural sector strongly influences the functioning of networks. This results in the existence of few linkages between large commercial farmers and small-scale farmers. The focus of public institutions on larger farmers and organised farmer groups seems to sustain and even encourage dualism among farmers. Therefore it is not realistic to aim at the improvement of livelihood of Peruvian farmers by strengthening the formal system.

No strategy can be recommended as the ideal type of diffusion strategy. All described strategies in this research had their contribution and their limitations with regard to the process of diffusion. More lessons should be learned about ‘cracks’ within networks, as unexpected sites for diffusion. For CIP this would mean that addressing farmers’ needs more efficiently, could be improved by strategically involving different groups of farmers. Connecting these different groups will increase agricultural development among farmers, and accelerate the diffusion of new potato varieties.

## THESIS OUTLINE

Chapter 1 introduces this research by describing the background of this study. It highlights some important features of Peruvian potato farming by addressing its diversified character, describing the potato seed systems, agricultural developments, and the work of CIP. This first chapter ends with the formulation of the problem statement and research objectives.

The second chapter discusses the chosen theory and concepts for this study and the research methodology. The conceptual framework provides the perspective to deal with the problem statement and research objectives, followed by the research questions. Secondly the methodology for conducting research and the research areas are described.

In chapter 3, 4, and 5 the empirical data is presented in relation to the three selected potato varieties. The three empirical chapters describe the circulation of the varieties Amarilis, UNICA and Serranita in Peru. These chapters are structured as follows; firstly the social career of the varieties is described, containing a historical overview, background information and a description of the involved actors in the three different cases. Secondly the gathered field data is described. Field observations and experiences are supported by 'grey boxes' that can be found in all of the three empirical chapters. These grey boxes are used to describe narratives of special cases or give additional information about institutions involved in the research. The last paragraph of each chapter provides the analysis and final conclusions in relation to the three different cases.

In chapter 6 the overall conclusions are drawn by analysing the three empirical chapters according the conceptual framework and answering the research questions.

Finally the lessons and shortcomings are described, followed by the references used for writing this thesis.

## CHAPTER 1. INTRODUCTION TO THE RESEARCH

This ethnographic study relates to processes that influence the adoption of improved potato varieties in Peru. The research is executed in close cooperation with the International Potato Center (CIP), and addresses one of CIP's fields of interest; learning how adoption of CIP's developed potato varieties takes place. There are different ways of conducting a research on this topic. I have chosen to approach the issue topic from an actors' perspective, in which actors' strategies and social relations are seen as the key factors influencing the adoption of potato varieties. Unfortunately, it is impossible to become a potato, which is probably the best way of understanding these processes along the way. What can be done is following the actors along the way. By studying the social relations between the actors I want to explore the networks through which potato varieties circulate, and indicate which actors have an important role in connecting these different groups of people or networks. This research aims to contribute to a better understanding of the discussions around issues of adoption or non-adoption of new technologies such as improved potato varieties.

The theoretical perspective derives from the Actor Oriented Approach developed by Norman Long, and will be used as the foundation for this study. In order to study social networks, social relations and interactions in Peruvian potato farming, it is necessary to include the wider context. As Long explains: *"The significance of interactional networks for making farm decisions will depend on the farmer in question and the particular social context"* (Long, 1989 pp. 227). He argues that we need to consider external, institutional and cultural factors that may shape farmer behaviour and reasoning. Therefore this introductory chapter gives considerable attention to the context in which this research took place.

In this chapter first some important features of Peruvian potato farming are discussed, such as potato cultivation, potato varieties, and some current trends. This is followed by an explanation of the existing seed systems, agricultural developments in Peru, and background information on CIP's activities. This will give more insight in the background of this study. It should be mentioned that this description will not be sufficient to capture the immense diversity that exists in potato farming in Peru, but it will give an understanding of the context in which the topic of this research – the circulation of improved potato varieties – has its origin. This chapter ends with the problem statement and the research objectives of this study.

### 1.1 FEATURES OF PERUVIAN POTATO FARMING

#### ***Genetic and cultural diversity***

Archaeological evidence indicates that potatoes were first cultivated in the central Andes, which covers parts of Peru, Bolivia, Chile, Colombia and Ecuador. Excavations in the Andes show that potatoes have been cultivated since 5.800 BC (Pickersgill and Heiser, 1978 pp. 821). There are even suggestions of an earlier date that goes back to 8.000 - 10.000 BC (Engel, 1970). Although discussion on this

indication exist, genetically the richest gene pool of potatoes, estimated at 3.000 varieties, is found in the Andes, which means that the Andes represents a centre of domestication with great genetic diversity (Brush *et al.*, 1981). The complex and locally variable Andes region has led to this richness in species and its tremendous diversity in varieties. Across even short horizontal distances, differences in altitude and slope can result in a great diversity of soil, drainage, solar exposure, temperature, and evapotranspiration conditions (Brush, 1992 pp. 152). Associated with this genetic diversity and the long history of potato domestication, Peru and other Andean countries have also developed great cultural diversity. Different types of classification, selection, cultivation and processing techniques of potato varieties exist. During my fieldwork I have observed some of these features.

Related to cultivation, I have witnessed different cultivation techniques. For example in some districts of Cajamarca, a northern department of Peru, the fields were cultivated by using a pair of ox to plough the fields. In Huánuco, a department in the centre of Peru, I have visited a community where farmers still use the '*Chaquitacla*', a traditional Andean foot plough which was already used by the Incas. Of course also mechanic cultivation techniques exist, but only in those valleys of the Andes, where mountain hills are not too steep and where farmers have enough economic resources.

Also culinary preference can vary between regions. In northern Peru the market for '*papas blancas*' (usually referred to as improved potato varieties) is much bigger than in the Central and southern part of the Peruvian Andes. As people explained to me: "*People in the North just like white potatoes, and in the South they prefer the dark-skinned potatoes*".

Another interesting phenomena are the different techniques that exist for processing potatoes. For example '*tokosh*', which are potatoes fermented in water for several months and eaten as a porridge. In the higher parts of the Andes, bitter potato species are freeze-dried by freezing and stamping on potatoes to force out the water and make dehydrated '*chuno*', an ancient staple. Another processing technique is '*papa seca*', which is a cooked and sun-dried product made from common varieties.

The examples about cultivation, cultural preference and processing just give a small glance of the cultural features associated with potato production in the Andes. Although the above described examples are limited, they do indicate the great diversity that is typical for Peruvian potato production.

### ***Distinction between potato varieties***

In potato production, basically three main ecological zones can be distinguished in Peru (Highlands, Andean Valleys and the desert Coast), all with different contribution to potato production. In the *Highlands*, potatoes have been traditionally grown for thousands of years. Between 3.500 and 4.200 meters one can find native potato varieties, including over a hundred bitter types with excellent frost and hail tolerance. At lower altitudes, where stronger links with urban markets exist, there is an increasing cultivation of improved varieties and production of potato seed. The *inter-Andean Valley* bottoms between about 2,500 and 3,500 meters are the principal commercial production zones. These zones are the major suppliers of modern 'white' potatoes to urban centres. The third zone is the *desert Coast*, an important area for potato production in the Andean 'off-season' production. These zones permit

intensive coastal agriculture in irrigated valleys through which rivers run from the Andes to the Atlantic Ocean. In this zone large quantities of consumption potatoes are produced for the market in Lima between July and December (Prain and Scheidegger, 1988).

In general, the hundreds of different varieties of potatoes currently cultivated in Peru can be categorised as:

- Improved varieties; produced and distributed by breeding programmes, usually incorporating specific traits (such as resistance to particular diseases);
- Commercial native varieties; not obtained via the formal system, but intended for markets;
- Non-commercial native varieties; grown for local consumption (Thiele, 1998 pp. 87).

The focus of this research is on the circulation of improved varieties. Improved varieties were first released in Peru in the early 1950s, and can now be found in practically every village in the Andes (Brush, 1992). These varieties were specifically bred to have higher yields, more suitable for using chemical fertilizers, and resistant to specific diseases or drought. There exist different opinions on the impact and the diffusion of such varieties. Some argue that it led to increased productivity (Horton, 1984), while others claim a loss of potato diversity (Ochoa, 1975).

Culinary speaking, the improved varieties are perceived as inferior to the native ones. Improved varieties contain more water and are used for frying and soups, whereas native varieties contain more dry matter and are used for special meals and celebrations.

There exists a perception that improved varieties depend on regular renewal of new seed, every two or three years; without this renewal, the varieties lose their resistance or decrease in yield. Seed of native varieties can be kept for many years, by renewing them through rotation between different fields and altitudes (Brush, 1992).

### ***Diversified context***

Much literature exists on the diversity of the cultivation of native varieties. This is for example extensively described by van der Ploeg (1989), who conducted different studies on Peruvian potato cultivation. In one of his studies he described potato cultivation as an *'art de la localité'*; a dynamic, highly complicated and detailed knowledge system. Farmers not only know how to use the locally variable conditions of the Andes to maintain quality, they also use locally defined metaphors, folk taxonomy, and complex, overlapping concepts to identify potato varieties, evaluate and cultivate their potato plots and etcetera. In his article van der Ploeg states that: "*This 'art de la localité' falls outside the scope of scientifically-managed rural development*". In this sense he associates the introduction of improved varieties with the decrease of diversity and the loss of local knowledge.

Although improved varieties are genetically less diverse, the multiplicity of actors involved in the circulation of these varieties, all with their own strategies and perceptions in constantly changing situations, still creates a context that must be considered as highly diversified.

One could argue that improved varieties entail linear, strategic distribution approaches, because of the seemingly homogenous context in which these varieties are being developed, released and diffused.

Although technically this could be true, sociologically a lot of diversity can be discovered, which challenges the linear strategies of formal distribution. Farmers have differential responses to change. Their decisions for using or discarding newly introduced technologies do not only depend on the technology itself; it is determined by their own perceptions, the influence of others, and the constantly changing social context surrounding them.

This research is about diversity and recognising different pathways for diffusion. Learning from different situations, different realities, and different actors will provide more insight in farmers' practices from a sociological perspective and subsequently how this influences adoption of improved potato varieties.

### ***Trends in Peruvian potato farming***

Within Peru, potatoes are the most important crop as it represents 25% of the national agricultural product. In the Highlands of Peru, potatoes are the most important food crop, produced by approximately 600.000 farmers' families (Ministerio de Agricultura, 2000) cultivated on more than 260.000 hectares of land (Ministerio de Agricultura, 2004). Peru can be considered the biggest potato consuming country in Latin America with an average consumption of sixty kilograms per inhabitant on an annual base (FAO-STAT, 2005). Potatoes are grown throughout most of the crop zones in the Andes. They pre-dominate the upper zones between 3.000 and 4.000 meters (Ferroni, 1979) and are mainly produced by small scale farmers. In the 1990s still more than 80% of the potato production was cultivated by farmers having less than one hectare of land (Vilca, 1990 cited in Brown and Scheidegger, 1995). Although potato production in Peru can be characterized by small-scale production, the overall trend since the 1960s is an increase in yield on less area (CIP, 2006). This becomes apparent in figure 1, where the coastal departments show an increased production on less area when compared with the Andean departments. For example the departments of Lima and Ica have the largest average yield, produced on a relatively small area.

<b>Departments</b>	<b>Area (000ha)</b>	<b>Productio n (000t)</b>	<b>Yield (t/ha)</b>
Huánuco	37	479	13
Puno	49	433	9
Junín	23	318	14
La Libertad	20	286	14
Cajamarca	25	254	10
Lima	8	222	27
Cusco	26	188	7
Arequipa	6	156	25
Apurímac	15	141	9
Huancavelica	14	120	9
Ancash	10	89	9
Ayacucho	10	87	9
Pasco	9	83	9
Ica	2	54	30
Amazonas	4	50	13
Piura	1	9	9
Tacna	1	8	9
Moquegua	1	7	13
Lambayeque	1	4	5
Pro.Const.Callao	0	1	27
<b>Total</b>	<b>261</b>	<b>2,988</b>	<b>11</b>

Figure 1. Potato production in Peru, 2004  
Source: Ministry of Agriculture, Peru. In L. Maldonado, 2006.

Although average yield is high in the coastal areas, still the biggest area of potatoes production can be found in the Andes, where the majority of the farmers are devoted to and depending on potato cultivation. More than 90% of the Peruvian potato crop is produced in the central Andes at altitudes above 2,500 meters to a limit of just over 4,000 meters (for bitter potatoes). The other 10% is produced in the coastal valleys west of the Andes, where a smaller area (estimated 5.000 to 10.000 ha) is

devoted to commercial production under irrigation to meet the demand for potatoes in urban markets (Brown and Scheidegger, 1995 pp. 65).

Generally the Andes can be divided into three agro-ecological zones, described by Tapia (1993). The *Green Andes* covers northern Peru and Ecuador, and generally have adequate rainfall and minimal climatic variability. Cajamarca, a northern department of Peru, is located in this zone and is one of the research areas. Research shows that in the *Green Andes* 85% of the production consist of improved varieties (SEINPA, 1994). The *Yellow Andes* covers central Peru and eastern Bolivia, and have a more variable rainfall. The Mantaro valley in the department of Junín, and the department Huánuco are located in this zone. Both regions are included as research areas for this study. The third agro-ecological zone is the *High Climatic Risk Andes*, which covers southern Peru and the Bolivian altiplano. In these regions less improved varieties are cultivated. These regions are therefore not included within this research.

## 1.2 SEED SYSTEMS

An important and regularly repeating concept in this study is 'seed'. Potatoes are a vegetatively propagated crop, and are usually grown by using last year's produced tubers. These tubers are referred to as *potato seed*. It is also possible to use the seed of the potato which develops from the flowers on the potato plant. This seed is referred to as *true potato seed*. In relation to this study, only the concept *potato seed* is used, as it is the most common strategy used for the multiplication of seed.

Farmers renew their seed in order to maintain the production and sanitary quality of their of potato varieties. There are different sources from which farmers can obtain seed; from own harvest, other farmers, local markets, and the formal seed system (Almekinders, 1994 pp. 209 – 210). In Peru, as well as in other Andean countries, there exist different seed systems in which these seed sources are located; the informal system and the formal system. Using Thiele's definition (1998 pp. 84), a seed system can broadly be defined as: "*An interrelated set of components including breeding, management, replacement and distribution of seed*". The 'informal' seed system can be seen as the total seed production activities by farmers themselves, whereas the 'formal' seed system refers to seed production activities by the public and commercial sector (Almekinders, 2000 pp. 1). The seed production activities within the formal system are often regulated by an inspection known as: "*Certification of seed and control over variety release*" (Young, 1990). Within the informal sector, there is no regulation by the public sector.

In many potato producing countries in Europe and North America, the informal system does not really exist, as it is almost totally replaced by the formal system. For example in the Netherlands, more than 90% of the potato area is sown with certified seed, which derives from the formal system. This is in contrast with developing countries, where 95% of the potato seed is produced through an informal system (Horton, 1987). In Peru, more than 90% of the potato producing areas is linked to the informal system (Scheidegger *et al.*, 1989).

Although the given definitions present the formal and informal system as two rather distinctive systems, in practice a clear-cut distinction does not exist as the two can be intertwined. During my fieldwork, I have witnessed examples of situations in which the boundaries between 'formal' and 'informal' were blurred. One example is the involvement of farmers in testing and evaluating new varieties. The breeding and first testing of clones<sup>1</sup> is usually done by institutions in field stations, followed by evaluations done in collaboration with farmers on farmers' fields. The institutions provide the seed, and the farmers manage the fields and receive half of the yield. This kind of farmers' involvement is for example used by CIP and INIEA (national agricultural institute for research and extension) for testing their breeding products.

During the selections, tests and evaluations of clones with farmers it does happen that high-quality material – developed through the formal system but not yet certified – is distributed to others by the involved farmers. This example shows how a first possible spread from the formal system to the informal system can take place. Another example is the support of institutions to groups of farmers by providing them with certified seed. With this support the farmers produce and sell certified seed. It is however not always possible to sell their whole production as certified seed when market demands are low. It does happen that eventually they sell their superfluous seed on local markets for lower prices, sometimes switching the purpose of the tubers from seed to consumption. This case shows that farmers switch easily between the formal and informal system, depending on the support of institutions, market tendencies and their economic possibilities. It seems that in practice people have difficulties with defining the formal and informal system. Till what extent is a system 'formal' or 'informal', and what is the usefulness to speak in such distinct terms? The described examples explain the rather indistinctness of the boundaries between the formal and informal system.

### ***Certification of seed***

Certification of seed only happens within the formal system and works as follows: Seed is produced in various categories; pre-basic seed, basic seed, registered seed and certified seed. It can start with the production of pre-basic seed from In Vitro plants. These mini-tubers are bred by plant breeders in laboratories or green houses and can be categorised as the highest quality-level of improved seed in terms of quality and purity. Pre-basic seed is used to produce basic seed, the highest quality of seed in terms of quality used by seed producers. Basic seed is usually produced at the national research stations (in the case of Peru). Registered seed is an intermediate level of seed, usually produced by specialised institutions or farmers. Registered seed is used to produce certified seed, and usually seed is grown by formal seed producers. Formal producers sell this seed to commercial farmers who produce consumption potatoes (Bentley *et al.*, 2001).

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<sup>1</sup> Advanced clones are new potato material, developed by breeders in laboratories, but not yet registered as new variety. CIP and INIEA are research centres who constantly develop new potato material with better resistance to diseases and pests, or improved yielding characteristics. This material goes through a process of selection, testing and evaluation. First in laboratory and, later on farmers' fields. This process can take between 4 and 8 years, depending on the efficiency of the involved research stations. Eventually the clone will be officially registered and released as variety.

Usually, public institutions control this process of *certification*. In many developing countries, the role of the public sector includes the production of certified seed, the process of certification and the distribution to farmers (Thiele, 1998 pp. 85). In Peru, the certification is done by the public institution SENASA. This institution, which is part of the Ministry of Agriculture, registers and controls certified seed producers, and controls the process of certification. Furthermore SENASA is also involved in research on the reduction of viruses, pests and diseases. The production and distribution of basic seed is mainly done by INIEA, which also is a department of the Ministry of Agriculture.

Experiences in Bolivia, Ecuador and Peru show that in the past, formal seed production programmes had limited outreach in that they had difficulties in supplying small-scale farmers or in supplying small-scale quantities to farmers (Thiele, 1998 pp. 85). Also remoteness and accessibility of agricultural production areas increased the difficulties for supplying quality seed to farmers (Almekinders, 2000 pp. 9). This has resulted in the supply to practically only large farmers in favoured areas.

The majority of farmers obtain their seed through the informal system. Therefore one could question the relevance of the formal system. There are several reasons that explain this low demand for seed from the formal system. Thiele (1998) discusses some of these reasons, as well as reasons that prove its relevance. One reason for a low seed demand from the formal system are the costs. Most farmers obtain seed from their own harvest; this is cheap, readily available, and the quality is known (Almekinders *et al.*, 1994 pp. 210). Small-scale farmers have limited access to credit for buying seed through the formal system. Making big investments for buying certified seed is therefore too risky. Furthermore, degeneration of seed in the Andes is slow above 2800 meters and very slow above 3500 meters (Scheidegger, 1989). This means that farmers can replace their seed less frequently, which decreases the demand for certified seed. This is contrary to the areas at lower altitude or tropical areas, where it is more difficult to store own seed and where seed degenerates rapidly (Horton, 1987 pp. 142). In these areas the formal system can make a useful contribution. Also in situations where local seed sources are severely affected by for example drought or other natural disasters the formal system is relevant.

The above shows that only a small percentage of seed production in Peru derives through the formal system. Discussions about the relevance and effectiveness of the formal seed system are important to take into account, but these discussions are of less importance within this research. Reason for this is the existing high demand for certified seed through the formal system in the research areas (see chapter 2.3).

### 1.3 INTERNATIONAL POTATO CENTER

The International Potato Center, world-wide known by its Spanish acronym '*Centro Internacional de la Papa*' (CIP), is one of the sixteen international agricultural research centres supported by the 'Consultative Group on International Agricultural Research' (CGIAR). CGIAR is a strategic alliance of more than fifty governments, private foundations, and international and regional organisations supporting those sixteen international agricultural centres ([www.cgiar.org](http://www.cgiar.org)). CIP was formally established in 1971 and funded and accepted into the CGIAR in 1972. CIP receives the majority of their financial support from the CGIAR, who are on their turn financed by the World Bank, the Food and Agriculture Organisation of the United Nations (FAO), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP).

#### ***Mission and research activities***

CIP's mission is to reduce poverty and achieve food security on a sustained basis in developing countries through scientific research and related activities in potato, sweet potato, other root and tuber crops, and in the improved management of natural resources in the Andes and other mountain areas (CIP Annual Report, 2004). Potato production forms the main source of income for many Andean small-scale farmers, and is also the most important staple food. According to CIP's mission, increasing potato production means combating poverty and therefore requires an efficient breeding and distribution strategy. CIP's activities consist of developing, testing and validating a variety of potato cropping technologies such as breeding products (clones), crop management components (seed, pest and disease management technologies), and the collection of potato-, sweet potato-, and Andean root and tuber crops germplasm. An example of one of these activities is the development of disease resistant varieties, in order to reduce losses due to Late Blight disease and Potato Virus Y, which are existing problems in the Andes. From 1977 onwards, one hundred and seven improved varieties have been released in 26 countries worldwide with CIP related material. In Peru, CIP has contributed to the development of twenty-four varieties with different characteristics in resistance, culinary quality, and yield increase (Maldonado *et al.*, 2006 pp. 1). Originally CIP's mandate included potatoes only. In 1985 also sweet potato was added to the research agenda, followed by the inclusion of lesser known Andean root and tuber crops.

#### ***Green Revolution***

CIP found its origin in the age of the *Green Revolution*, a technocratic approach for development, referred to by Richards as "*a postcolonial attempt to bring food security to the countries in the South*" (Richards, 2001 pp. 19). The Green Revolution was an initiative carried out in the light of the Cold War security concerns for the stability of Third World populations in the 1950s. Originally the Green Revolution finds its roots in the Rockefeller Foundation, which dates from 1941 when the geneticist P.C. Mangelsdorf, the pathologist E.C. Stakman, and the soil scientist R. Bradfield developed an agricultural support programme for Mexico by developing fertiliser responsive and broadly adaptable wheat varieties (Perkin, 1997 in: Richards, 2001 pp. 19-20). Their experiences were modelled and introduced

in Asia, Africa and Latin America in the 1960s. This was the beginning of the development of a wide range of improved varieties of several staple crops, which were launched through a network of international research centres that supported national institutions in 'developing' countries. This resulted in the introduction of some successful high-yielding varieties in the late 1960s and early 1970s, which led to some major changes. In some cases these high-yielding varieties 'replaced' low-yielding local varieties and stimulated the use of chemicals to manage pests and diseases, which were the result of the production of the widely adaptable varieties. As an answer to these undesirable side effects, Green Revolution-scientists developed new high-yielding varieties with better resistance to diseases and pests.

### ***Drivers of research priorities***

Since CIP's founding in 1971, variety resistance, mainly to Late Blight and viruses, has been CIP's main contribution to potato breeding. CIP's first improved variety was released in 1979. During the 1980s variety release has been accelerated due to international funding in agricultural research and investments in National Agricultural Research Institutes (NARIs). After the 1980s a funding decreased, which stagnated variety release and declined agricultural research in the NARIs (Walker *et al.*, 1999). CIP's vision is shaped and influenced by global commitments of the international community (CGIAR-network). Therefore priorities have shifted throughout the years. In the early years the focus was more product-oriented; raising agricultural productivity by increasing the production of staple food crops which would combat hunger. CIP was originally concerned with generating widely applicable technologies, which could be, after some adaptations by NARIs, extended to farmers and massively adopted (Thiele *et al.*, 2001). Farmers were not actively involved within this process. Later CIP's priority changed from hunger, to poverty and environment. This change in focus, the influence of donors, and the awareness of the lack of fitting technologies to farmers practice, were drivers for other strategies and activities (Zandstra, 2005)<sup>2</sup>. Through the years CIP developed a more social approach, in order to link the technology to the farmers, which resulted in more room for participatory research. Already from the beginning onwards, CIP used the principle of on-farm research; on-farm trials with farmers' practices as the control, active participation of and evaluations with the farmer. In the 1990s more participatory elements were implemented related to an increased interest in Integrated Pest Management (IPM) and shifts in donors' interest. Examples are Farmer Field Schools in IPM (see paragraph 3.2.3) and the stimulation of participatory elements in special projects with NARIs (for example the SEINPA-project described in paragraph 3.2.2). Since the 1990s also more attention was given to sustainable agriculture due to international concerns about the conservation of natural resources (FAO, 1995). This resulted in the inclusion of conservation activities for potato varieties and other root and tuber crops. An example is the foundation of CONDESAN (Consortium for the Sustainable Development of the Andean Ecoregion) in 1993, which supports a range of research projects that address issues on natural resource management ([www.condesan.org](http://www.condesan.org)). Since 2000, CIP is concerned with the Millennium Development Goals, for which many international donors demand considerable attention.

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<sup>2</sup> Presentation Zandstra: Pathways to Development; a retrospective on research design at CIP's Annual Meeting 2005

### **National partners**

Besides the international concerns, CIP traditionally has the mandate to support the NARIs by helping them generating and transferring improved germplasm, new technologies, information, and to strengthen NARIs' research capabilities for potato and sweet potato (FAO, 1995).

Although CIP has close linkages with the formal system through their partnerships with the NARIs, there are also initiatives to explore linkages with the informal systems and to start collaborations with other partners than just the NARIs. They are changing their strategy by including a wider range of partners – like NGOs, private organisations, universities and farmer groups – to participate in and carry out their research activities.

One of the reasons for this change in strategy was the awareness that different strategies should be used to diffuse new potato varieties. Also more participatory research methods like PVS (Participatory Variety Selection) are being developed, which provides more room for acknowledging and valuing farmers' knowledge and perceptions. Nevertheless CIP is still encountering difficulties due to this change in strategy, as the more participatory methods are in contrast with CIP's traditional approach (informal distribution of varieties requires different ways of operating, which are in contrast with formal release procedures and certification)<sup>3</sup>.

#### 1.4 AGRICULTURAL RESEARCH AND DEVELOPMENTS IN PERU

During the last decades, Peru has undergone many agricultural changes. Before 1972, the agricultural system in Peru was represented by the *'hacienda'*-system. This system, originated during the Spanish colonisation, consisted of large farming estates owned by *'mestizos'* landowners (Long, 1975 pp. 260). Mostly Indian labourers worked on these estates on hired land, and owed a part of the production to the landowners. In the 1960s and early 1970s the hacienda-system was dismantled and land was redistributed as communal holdings to Andean villages.

In the 1970s the military government of General Velasco transformed the hacienda-system on the Coast into cooperative farms run by former hacienda workers. During these transformations, formal seed demand was small because formal seed was qualitative not so good and informal seed qualitative not so bad. All agricultural agencies were placed under the Ministry of Agriculture. Agricultural research was divided in two activities; the National Potato Programme and the National Seed Potato Programme for the multiplication of seed.

In 1981 the government created a separate research- and extension institute; INIPA (*Instituto Nacional de Investigación y Promoción Agropecuaria*).

In the mid 1980s under the regime of President Alan García Pérez, the Ministry of Agriculture induced the cooperatives to buy agricultural inputs on credit from the *Banco Agrario*, which does not exist anymore. Until this moment, many farmers refer to this time as *'the period of many opportunities'*. Agricultural inputs in the form of formal seed were produced at large commercial farms in the Highlands.

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<sup>3</sup>De Haan, Personal communication

Seed was certified by agronomists from the Ministry of Agriculture (SDCCS; Sub-Direction of Seed Certification and Control).

Since the 1990s Peru has gone through a liberalisation process under the direction of President Fujimori, which has caused significant changes in the national agricultural sector. The government started to privatise agriculture, which meant that subsidies and loans for farmers stopped, support for the national research centres decreased, and the seed certification agency was eliminated. Private seed certification committees were set up with USAID funding. The cooperative farms for formal potato seed had to closed down. Also many organised groups of farmers stopped their collaborative activities and started working individually. Members of the cooperative farms at the Coast started to buy informal seed or rented their land to highland farmers who brought their own seed. Since then the seed business in Peru was scattered into many small-scale enterprises.

Since 1987, agricultural research was divided into extension and research, and the national institute for agricultural research (INIA) was founded. During the Fujimori government some INIA stations were closed and budgets were cut; in the late 1990s INIA maintained nine research stations, from which five stations were located in the Andes and has a national potato programme. These measurements had great consequences for agricultural research, as the government only paid for little more than the salaries. The stations were encouraged to produce certified seed. This became the main activity of some stations, as they could earn some extra money with it. The liberalisation in Peru thus resulted in an expansion of seed production activities, but in a reduction of research activities and extension. Nowadays, the extension- and research departments are combined again, which resulted in the founding of INIEA (national institute for agricultural research and extension).

The intended privatisation of INIEA, however, was never totally achieved. INIEA remained a 'semi-public' institution. They have lacked to build trust within the international network and in acquiring international funding. Some argue that the still existing political influence of the Peruvian government seems to result in a lack of consistency in policy, as the institutional structure changes every few years. Also the internal structure might influence the efficiency of the institute; within INIEA there exists the agreement that employees have a fixed contract of employment, which implies that they have a life-long job. Therefore many engineers occupy the same positions for years. This can creates a lack of motivation among the INIEA-staff.

Also the partnership between CIP and INIEA has changed. Traditionally support from CIP was earmarked for NARIs and – in the Peruvian context – went primarily to INIEA. The last decades CIP also collaborates with other national partners such as universities and NGOs, which became just as important as the partnership with INIEA. Furthermore, there have been some financial cut-backs in the support to INIEA. The amount of funding CIP used to received from the international network (World Bank) earmarked for the work with NARIs, has decreased enormously during the last decade. INIEA still receives a guaranteed amount of funding on an annual base, as the Peruvian government – one of CIP's donors – has determined that 50% of the amount of their funding must be spent on collective research activities of CIP and INIEA. The funding is directed by CIP specifically to individual research partners and projects within INIEA.

## 1.5 RESEARCH BACKGROUND

This research is executed in close cooperation with the International Potato Center (CIP). The description of the context, problem statement (paragraph 1.6) and the preparation of this study were a joint effort between myself, Wageningen University and CIP. The research was particularly supported by CIP's BMZ-project 'Genomics and Biodiversity: Providing new opportunities for smallholder potato farmers'. This 3-year project is funded by the German Federal Ministry for Economic Cooperation and Development. CIP is one of the collaborators together with MPIZ (Max Planck Institute for Plant Breeding, Germany), the Foundation PROINPA (Promoción y Investigación de los Productos Andinos, Bolivia), UNC (Universidad Nacional de Colombia, Colombia), INIAP (Instituto de Investigaciones Agropecuarias, Ecuador) and UNALM (Universidad Nacional de Agricultura de La Molina, Perú). The aim of this project is to improve income, food security, human health, and environmental well-being by providing resource-poor farmers with effective technological options for controlling Late Blight<sup>4</sup> disease and Potato Virus Y<sup>5</sup>.

The project's hypothesis is that Andean farmers and communities will benefit from new technologies that combine biodiversity and biotechnology to increase productivity, reduce pesticide use, and reduce imports of chemically-dependent varieties that are un-suited to tropical agro-ecosystems.

The intended outputs of the project are:

- Identify and accelerate delivery of resistant varieties through on-farm, participatory evaluation of advanced lines currently available from breeding programs and establish the economic and health value accruing to farmers who exploit host plant resistance;
- Supply superior hybrids and progenitors of Late Blight and Potato Virus Y resistance, thereby enhancing the effectiveness of variety-oriented national breeding programmes;
- Provide molecular tools and methods to ensure that greater diversity for building durable resistance is available to national programs and;
- Through training and networking, enhance the capacity of national and international research programs to use molecular methods in breeding and assess their impact (CIP Research proposal BMZ, 2003).

More concretely, the project looks for alternatives in developing new clones which are resistant to diseases by making use of wild species that contain new genes for resistance. One component of the project is to have better insight in how new varieties are diffused and reach the farmer. This will be important in developing a better strategy for delivering new resistant clones to farmers. An example of

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<sup>4</sup> Late Blight is one of the most devastating diseases in potatoes and tomatoes. The disease is caused by a fungus-like organism, *Phytophthora infestans*. The spores of the fungus (water mould) overwinter on infected tubers, particularly those that are left in the ground after the previous year's harvest, and are spread rapidly in warm wet conditions. The effects of late blight can destroy entire crops (source: [www.wikipedia.org](http://www.wikipedia.org)).

<sup>5</sup> Potato Virus Y infects potato, as well as other crops of the '*Solanaceous*'-family. The virus is transmitted from infected to healthy plants, and is commonly spread through seed from infected plants. The virus occurs in most potato growing countries worldwide. It is an important virus in having great economic impact; it spreads easily and can decrease yield greatly when the incidence is high and the cultivars sensitive. The virus can be controlled by using healthy seed. Breeders and virologists at CIP are working to incorporate virus resistance into new varieties. Some virus resistance is now available in about a fourth of CIP-bred genotypes.

planned project activities is introducing new varieties by using participatory strategies. New potato varieties will be selected in collaboration with the partners. Final output of the project will be the deployment of strategies to deliver the varieties to the farmers. Therefore this research will have a valuable contribution to the BMZ-project as a first initiative in gaining a better understanding in how improved potato varieties circulate among farmers in Peru. The purpose of the BMZ-project in using this type of information is to identify appropriate strategies for spreading new resistant varieties. The BMZ-project was responsible for the funding of my research activities.

## 1.6 PROBLEM STATEMENT AND OBJECTIVES

CIP has suggested that there is a limited understanding of the processes involved in variety adoption, including formal and informal pathways of diffusion, networks, demands of end-users and interacting knowledge systems. For CIP it is important to know what the impact of their technologies is and how this impact could be achieved more efficiently. What becomes clear from the background is that after formal variety release, there is a lack of understanding of what processes influence the circulation of new released improved potato varieties. Different partnerships have led to the emergence of different diffusion strategies for improved potato varieties. CIP has an interest in gaining a better understanding of how CIP related potato varieties are diffused, in order to better identify appropriate strategies for spreading newly developed potato varieties. This research will focus on different processes of diffusion. However, this research is not an impact study. Whereas an impact study is more concerned with measuring the outcome of an intervention, this study will analyse the processes which can influence the diffusion of improved potato varieties by studying the interactions between the involved actors in potato production.

Therefore the research objective of this study is;

'To contribute to an increased understanding of the processes that influences the diffusion of CIP's potato varieties'.

This is hoped to be achieved by:

- Exploring the networks through which the selected potato varieties circulate, including formal and informal pathways of diffusion;
- Studying the exchange processes (exchange of information, knowledge and products) constituting potato circulation networks;
- Identifying key-actors who play a critical role in connecting different networks.

## CHAPTER 2. CONCEPTUAL FRAMEWORK AND RESEARCH METHODS

After describing the background, problem statement and research objectives, this chapter will explain the theory and concepts used for this research. The research questions derive automatically from this explanation, as they are based on the chosen concepts used in order to address the problem statement. The conceptual framework provides the perspective through which the gathered field data was interpreted and analysed. Subsequently, the research methodology is described, followed by a description of the research areas.

### 2.1 THEORIES, CONCEPTS AND RESEARCH QUESTIONS

In this paragraph the conceptual framework and the research questions will be described. I have chosen for the '*Actor Oriented Approach*' (AOA) as the overall theory for this study. This theory uses a sociological approach to explain processes of change. Processes of change are approached as highly diversified, which challenges linear strategies with generalised outcomes. Most concepts in this study derive from the AOA, with *Social Networks* and *Brokers* as the two main concepts used. In order to learn more about the processes which influence the diffusion of CIP's potato varieties, I have used Granovetter's notion of *network ties* to analyse these two concepts.

#### 2.1.1 ACTOR ORIENTED APPROACH

The founding father of the AOA is Professor Norman Long. Originally he is a Manchester scholar, who are acknowledged for their methodological approach. With this academic background he '*discovered and uncovered*' the actors who formed the focus in his further career (Hebinck *et al.*, 2001), by recognising the ability of individual actors to influence the outcome of interventions, and also how strategies of individuals are influenced by a broader context. The nature of his work criticises the analysis of processes of change, which were characterised in the 1970s and 1980s by being linear, and in which people from the so-called 'third world' were portrayed as being incapable of generating endogenous growth (Hebinck *et al.*, pp. 3). The common belief in that time, that development could be analysed in determined stages, is challenged in Long's work.

An important feature of his work is to study how farmers shape development themselves without interference of institutions. He emphasises that farmers should not be seen as 'passive recipients' of interventions, but as active participants (Long, 2001 pp. 13). Although their resources are often limited, there is always space for manoeuvre to give an own direction to their strategies. With this, Long refers to the concept 'agency' which means the capability of local actors to shape their and others' actions and interpretations. He argues that understanding agrarian change is therefore complex and requires working with the concept of heterogeneity (Long, 2001 pp. 44).

Furthermore, an actor oriented perspective enables us to conceptualise how small-scale interactional settings or locales interlock with wider frameworks, resource fields and networks of relations (Long, 2001 pp. 49). As Collins (1981, in: Knorr-Cetina) explains: *“There is a need to study the micro situations and every day practices in order to understand macro concepts”*. In relation to this study, analysing institutional frameworks and formally constituted groups from a micro-level by focussing on farmers’ practices, will help me to understand the role of institutions in the diffusion of potato varieties.

All this implies that rural development represent complex situations with a multiplicity of different actors, operating on different levels, all with their different realities. An AOA does not take a position that one of these realities prevail over other ones. It analyses the interaction and power struggle between the different actors in order to explain the processes of social change.

This point of view made me choose this theoretical perspective as the basis of this study. Many studies exist in which topics such as diffusion and adoption of new technologies are seen as a linear process, in which the interventions are seen as a solution for the beneficiaries. By using an AOA, all involved actors fulfil a role in explaining a situation: *“Without an analysis of how an individual or a particular group attempt to create space for themselves in order to carry out ‘their project’, and without an attempt to show how these organisational, strategic and interpretative processes can influence the broader context of power and social action”* (Long 1992, pp. 33-34). No; it is about including a wide range of involved actors and analysing how they are connected to and influence each other. This study will go beyond the idea that expert-knowledge and interventions will solve the problem of poverty and food security, and beyond the assumption that situations can be generalised and homogeneous solutions can be created. *“Rather viewing intervention as the implementation of a plan for action, it should be visualized as an ongoing transformational process in which different actor interests and struggles are located”* (Long 1992, pp. 9).

## 2.1.2 SOCIAL NETWORKS

### **Social networks**

One concept used within the AOA and relevant for this study is the concept social networks. The reason for using this concept is to deal with the multiplicity of actors involved in this study. Especially in the case of the circulation of potato varieties, a whole range of different actors are involved in different activities. Communities from the Highlands specialised in seed production, producers of consumption potatoes who are depending on the seed supply from the Highlands, intermediaries and traders who are involved in the buying and selling of potatoes and who might form the linkages between the farmers and the markets, institutions involved in the introduction of new varieties and supporting farmers, the market and processing industry who are important for the sales and etcetera. All these different actors are in one way or another (in) directly connected to a wider geographical potato network, in which different groups of people are most likely isolated from each other. Because it is impossible to include all of the

involved actors, some cases were selected to study social networks in order to understand the mechanisms of the circulation and diffusion of potato varieties.

For approaching the topic of this study – the diffusion of potato varieties – I specifically chose to do a network study. Whereas impact studies – which are more common in relation to the diffusion of technologies or innovations – are more focussing on the achievement of targets and objectives, a network study will give more insight into processes which influence adoption. By using a network theory, diffusion can be defined as the result of social relations and interactions between the actors within a network. It can explain processes on both farmers' level as the institutional level. Understanding macro process (Long, 2001) or large scale patterns (Granovetter, 1973 pp. 1360) can only be done when micro-processes are studied, and small-scale interaction becomes translated. The study of social networks provides fruitful micro-macro bridges (Granovetter, 1973 pp. 1360).

In the below I will give an explanation on social networks, the dimensions of a social network, and how social networks are used to explain social situations.

### ***The dimensions of social networks***

Social networks are used in many economic studies; it are among the most important types of structures in which economic transactions are embedded (Portes, 1995 pp. 8). Social networks are composed of sets of direct and indirect relationships and exchanges (Long, 2001 pp. 242). The nodes in a network may be individuals or organised groups. The individual relationships can be reflected in terms of their normative contents and frequency of interaction which shape specific exchanges. One way of analysing social networks is by looking at the different dimension of a network, which can have consequences for economic behaviour. *Size* and *density* are the most important dimensions. In his article, Portes (1995, pp. 8-12) describes the different dimensions of a social network as follows: "*Size refers to the number of participants in a network and density to the number of ties between them*". Generally one can say that; how larger the size of the network, the less the members are interconnected with each other, which results in a low density. However, in this research *size* as dimension is rather problematic to use, as it is impossible to give complete representations of the networks involved in this study; only parts or clusters of networks are included in this study. According to Portes (1995, pp. 9): "*Within relatively large and dense networks, reciprocity and normative expectations are more likely to occur*". Another dimension of social networks is the relative *centrality* of members. Power tends to be correlated with this dimension. This can be explained as follows: Within a network with high centrality and weak social control (weak ties), one person has a strong position within this network. This central person is able to control flows of information among other network members. Within dense networks, the centrality is much lower as there are less central positions. These types of networks are more effective in creating common expectations, and monitoring individual compliance is much greater.

Figure 2 visualises the concepts density and centrality. Centrality within a network is also related to the concept brokers. This will be explained in further detail in paragraph 2.1.3.

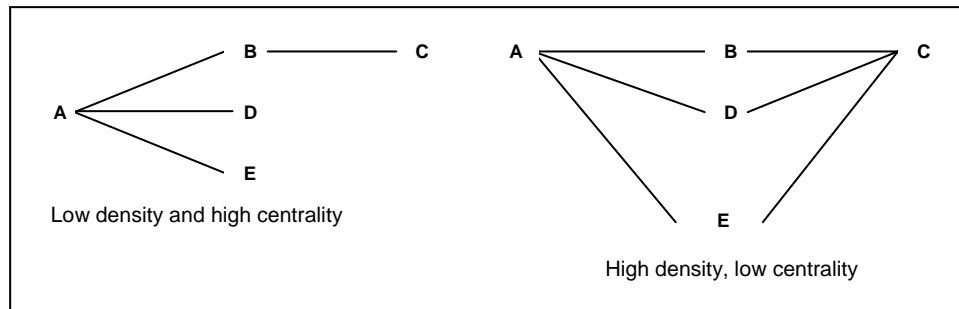


Figure 2. Density and centrality in social networks (source; Porter 1995)

### **Clustering and multiplexity**

Two other aspects of networks are clustering and multiplexity. Clusters – sometimes also called cliques – refer to the degree to which subgroups of a network have greater density than the network as a whole. Clusters are formed in these situations to defend common interests or aggressively pursue greater control over resources within a network. Multiplexity is the degree to which relations between participants include overlapping institutional spheres, for example in situations where clusters are overlaid by multiple ties such as family ties, work ties, religious ties and recreational ties (Portes, 1995 pp. 10).

### **Network ties**

In relations to the above, Long also speaks about: “*The existence of a relatively dense social network which can hinder the absorption of new information and the quick adaptation to changed circumstances*” (Long, 1984 pp. 23). With this Long refers to Granovetter’s theory on network ties (Granovetter, 1973). This theory is about social relations and networks, and how different types of relations can influence information flows within or between networks. According to Granovetter (1983), a person’s social relations can be characterised as *strong ties* or *weak ties*. Strong ties can be considered as a network of close friends and family. Friends and family are more likely to be socially involved with one another than a person’s acquaintances. A network of acquaintances can be considered as weak ties. The *strength* of a tie can be defined as follows: “*The strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterise the tie*” (Granovetter, 1973 pp. 1361). He explains that: “*The set of people made up of any individual and his or her acquaintances comprises a low density network*” (Granovetter 1983, pp. 201-202), whereas the set of people made up of a person’s close friends or close family members, will be a dense network. As explained in the first section, density refers to the number of ties between the people within a network. This means that there exist less linkages or personal relation between a person’s acquaintances, and more linkages and personal relations between a person’s close friends or family members. Furthermore, Granovetter explains, just like Long that a great number of acquaintances (weak ties) could provide more and new information, whereas a person with few weak

ties has a bigger chance to be excluded from distant information. He or she has to rely on information received through his close friends and family network, or through regional news. As a result of this, this person does not have access to the newest information or is always lacking behind. Granovetter (1993, pp. 202) gives the example of job seeking activities, which might put a person with few weak ties in a disadvantage position in the labour market, where knowing about appropriate job openings on the right time is crucial. Networks with few or without weak ties will always be disadvantaged, as Granovetter puts it as follow: *“New ideas will spread slowly, scientific efforts will be difficult to access, and subgroups separated by race ethnicity, geography, or other characteristics will have difficulty reaching a ‘modus vivendi’ (a way of living)”*.

In line with the above, it might seem like strong ties are not useful or irrelevant in obtaining new opportunities, information, etcetera, which is not true. Also strong ties have their advantages. This is explained by Pool (1980, pp. 5), who argues that it depends on the situation of the individual whether weak ties or strong ties are useful. Pool gives the example of a poor peasant who has a very insecure prospective if his harvest will fail. In this case the peasant has to depend on a few strongly protective individuals and cannot permit himself to maintain his loose network of acquaintances. If he would have been part of a low-density network, this would not help him in this uncertain situation. A person with resources on which he can fall back, can become dependent on any given other individual and can explore more freely alternative options. Although weak ties are important, they are less relevant when a person lives in insecurity or has a lack of resources. It is also true that strong ties are *not* irrelevant in information flows. Credibility and influence are greater through strong ties (Weimann, 1980 pp. 12). Weimann suggest the following division between strong en weak ties: *“Weak ties provide the bridge over which innovations cross the boundaries of social groups, however, the decision making is influenced mainly by the strong ties network in each group”* (Weimann, 1980 pp. 21). In other words; if one wants to make use of the information, strong ties have to be activated where trust and support are important. In this sense one could claim that both weak ties and strong ties have their functions and are important.

### ***The purpose of network studies***

Network studies can be used for different purposes. In literature these types of studies are used in relation to economic activity, mobilisation of resources, migration, market studies, and etcetera. An example of a study on social networks is Long’s work on economic careers. He was particularly interested in the question: *“How social networks give direction to economic careers”*, by analysing the history of one highland Peruvian family (Long, 1979). In his analysis, Long takes the region and its resources into account to study a family enterprise. The family enterprise could be seen as a close network, organised in terms of a division in labour between household members and extended family. In addition, for the provision of information and other resources, the entrepreneur relied on an extern network of social relations.

Another field of interest for using a network analysis are studies of migration processes (Narotzky, 1995 pp. 80). An example is a study about migrants from Huasicancha in the Central Andes to Lima and

Huancayo (Smith, 1989 pp. 77-117). Smith describes a dense network of credit and partnerships between residents in Huasicancha and the migrants in Lima and Huancayo who were integrated in 'confederations of households'. This network affected its members' decisions to migrate temporarily to provide labour for fruit enterprises in Lima, or to stay and take care of the farming and herding ventures of ex-residents in Huasicancha. In this case, a dense network appeared as fluid inter-household linkages bridging space and geared towards making a living.

In relation to this study, where the research is concerned with the diffusion of (new) improved potato varieties, a study on social networks is used to provide insight in the underlying processes of diffusion. One can argue that having access to information about release and availability, or information about marketing and maintenance, is very important. In order to take advantage of a new potato variety, one must produce and sell it on the right time and in the right place. Therefore it seems relevant to analyse the social relations (network ties) within networks related to receiving new information on improved potato varieties. Analysing network ties makes it possible to focus on the accessibility of information provided by institutions involved in producing, promoting and releasing new potato varieties, the access to seed (where and from who do farmers obtain seed), and the accessibility to market information (prices, market tendencies, etcetera). I will not only focus on the use of weak ties in relation to information, but also the functions of both weak and strong ties in different networks will be studied. Besides the focus on network dimensions and network ties, it is also relevant to study the exchange processes between networks or clusters within networks. An exchange process refers to negotiations, information sharing, and how exchange of products (seed/ potatoes), money or gifts take place. Exchange can be studied according to the social relations (how are relations constructed and maintained) and reciprocity (the giving and returning of help, in which the equivalence of value and time are important variables) (Narotsky, 1997 pp. 45, 75).

On the basis of the above described concepts and considerations, the first research question is as follows:

**What are the networks through which CIP potato varieties circulate?**

### 2.1.3 THE ROLE OF BROKERS IN SOCIAL NETWORKS

In paragraph 2.1.2 the concepts *strong ties* and *weak ties* were explained. Knowing that groups of people with few weak ties might be excluded or isolated from certain type of information or exchange processes, casts a different light on the seemingly logic routes followed during the circulation of potato varieties. By using Granovetter's theory on network ties, the reasons why certain groups of people are connected to certain networks can be explained through the number of weak ties they possess (the more weak ties a cluster has, the more likely they have access to new information). The reason why groups of people (clusters) or networks are involved within the process of circulation depends on the linkages (weak ties) between them. It is among those weak ties between networks where brokers are active, especially when networks or clusters are significant different from each other. Brokers are actors

who can establish linkages between networks, and make the inclusion of isolated groups possible. Studying the role of brokers can therefore contribute to an improved insight in how different networks or clusters within networks are connected, and will explain more about why potato varieties follow certain routes.

### **Characteristics of brokers**

Granovetter (1973) defines brokers as: *“Those persons in a network with weak ties, and who have contacts within at least 2 different networks or clusters within networks. Some weak ties in a social network function to link two or more relatively*

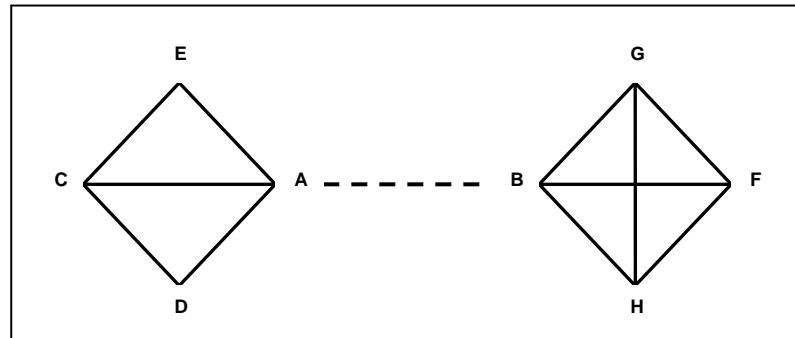


Figure 3. Bridges between networks

*dense clusters in a network or between networks”*. Granovetter calls these relationships ‘local bridges’ while other scholars (Boissevain 1974, Allen and Cohen, 1969) suggest the term ‘broker’ or ‘gatekeeper’ for the persons occupying such a position. Figure 3 represents a part of a network where the linkage between two clusters is portrayed. Because there is no other connection between the two clusters as through the bridge between person A and person B, one of these persons holds a central position within the network. This person is responsible for the flows of information between the two clusters and can be defined as broker.

Within a social network, brokers hold the central strong position (see paragraph 2.1.2, centrality of networks). Brokers are important for the flow of information since they command access to socially distant relationships and resources, and hence often play a significant role in opening up new sources of economic activity and investment (Long, 2001 pp. 151) by connecting different networks or sectors in networks which otherwise would have been isolated from each other (Milardo, 1988 pp. 17). Not all weak ties can be characterised as brokers. Brokers have the quality to connect individuals who are significantly different from one another. This requires a cognitive flexibility, as the connections between the individuals or groups of people will lead to complex situations. The absence of flexibility may prevent or block renewal. According to Granovetter (1983 pp. 205) brokers must have the competences to: *“Assess needs, motives, and actions of a great variety of different people simultaneously”*.

In Long’s work on economic brokerages in the case of Peru (1975), brokers are described as those individuals and social categories who play a major part in connecting local production systems with the wider socio-economic framework and who control the crucial sets of relationships involved. The social characteristics of brokers rely on type of markets and type of region. He describes different brokerage roles varying from large producers, middlemen, to traders, merchants, transporters, landowners and etcetera. Each of these occupational categories requires slightly different types of local and external

networks for the operation of their business. Long's examples are related to brokers involved in market activities. Of course there are many more examples to present. Granovetter (1973) describes for example the usefulness of weak ties and role of brokers in relation to seeking employment or housing. To arrive at a more complete understanding on how contacts between networks are established or how networks are being separated, the role of brokers must be elaborated by analysing how and on what criteria relationships are built up and maintained. This entails an understanding of the social and economical characteristics of the local and external contexts in which brokers operate, and of the range and types of resources available to them. Also the characteristics of the broker are important variables for understanding how relations are built and how contact between networks are established. According to Hannerz (1980) loyalty, ability to deliver and objectives of the actual holder of resources in releasing them could be some of the variables to conceptualise the role of brokers.

For the purpose of this research, I want to focus on brokers as those actors who have a crucial role in connecting different networks or groups of people within a network. This could provide improved insight in the diffusion processes of the selected potato varieties.

On the basis of the above described concepts and considerations, the second research question is as follows:

**What role do brokers play in connecting different networks or clusters within networks?**

#### 2.1.4 BROKERS AT THE INTERFACE

In the previous paragraphs the concepts 'social networks' and 'brokers' were described. By using the concept social network, the involved groups of actors are approach as networks or clusters within a network with divergent interests, values and life worlds. The social relations and interactions between the actors determine the circulation of the potato varieties, and therefore will give more insight in processes that influence diffusion. Subsequently, the role of brokers is described. They have the cognitive flexibility to assess needs, motives, and actions of a great variety of different people simultaneously (Granovetter, 1983 pp. 205), and are capable to connect different groups of people who otherwise would have been isolated from each other (Milardo, 1988 pp. 17). The above shows that the interaction between the different groups of people can result in multiple responses by the different actors. The situations where actors or groups of actors with different interest and values meet, can be indicated as **interface** encounters.

Interfaces are characterised by discontinuities in interests, values and power, and their dynamic entail negotiation, accommodation and the struggle over definitions (Long and Villarreal, 1993 in: Hebinck *et al.*, 2001 pp. 5). This concept is extensively described by Long (1989). He explains that: "*In the field of rural development, interfaces often occur where government or other outside bodies intervene in order to implement a particular development policy or to assert politico-administrative control over an agrarian population and its resources*" (Long, 1989 pp. 221). According to Long, the concept interface can be used to emphasis how discrepancies of social interest, cultural interpretation, knowledge and power are

mediated and perpetuated or transformed at critical points of linkage or confrontation. Discrepancies can arise in different situations. Long gives the following examples: *“The struggles between peasants and non-peasants interests and life worlds in a village; the intersection of political grouping, differing ideologies or authority levels in a bureaucracy; or in a broader arena, they may involve the interplay of different ‘worlds of knowledge’, such as those of the farmer, extensionist, and agricultural scientist”* (Long, 1989 pp. 222). Interface analysis focuses on the linkages and networks that develop between individuals or parties. The concept of interface becomes relevant as a way of exploring and understanding issues of social heterogeneity, cultural diversity and the conflicts inherent to processes involving external interventions. This concept seems relevant for this study as interfaces typically occur at points where different life worlds or social fields intersect. These points can be seen as sites for conflict and negotiation. According to Long, *“negotiations at the interface are sometimes carried out by individuals who represent particular constituencies, groups or organisation. Their position is inevitably ambivalent since they must respond to the demands and expectations of two groups. Those who become skilled in managing such ambivalent position can act as brokers or intermediaries”* (Long, 2001 pp. 69). Within this research, situations where actors with different life worlds intersect can be recognised. It will be interesting to analyse how these encounters result in certain actions, behaviour or events. Also the role of possible brokers can be studied at these sites, as brokers operate exactly at the interface. Generally, they belong to a group or organisation themselves. It will be interesting to see how they maintain relations within and between different groups, manage critical situations, and establish relations between separate groups or networks.

#### 2.1.5 RESEARCH QUESTIONS

Based on the research background, problem statement (chapter 1) and the concepts framework, I have formulated the following central research questions and sub-questions:

##### **Which processes influence the diffusion of CIP’s potato varieties?**

1. What are the networks through which CIP’s potato varieties circulate?
  - Which actors are involved within the circulation of the selected potato varieties?
  - What role do the different actors have?
  - Which actors are excluded or choose to remain outside the system?
  - What are the perceptions and interests of the different actors?
  - How do exchange processes between actors take place?
    - What information and knowledge do actors use?
    - How do negotiations take place?
    - How do actors exchange products?
  - What limitations, uncertainties and other constraints can influence exchange processes?
  - How are contacts between actors established, constructed and maintained?
    - How do weak and strong ties influence information flows?

2. What role do brokers play in connecting different networks or clusters within networks?
  - Which actors can be considered as brokers?
  - What social characteristics do brokers have?
  - How do brokers' life-worlds look like?
    - How do brokers act and interact with different groups of people?
    - What are the life histories of brokers?
  - How do brokers establish and maintain relations within different networks?
  - How can these relations be characterised?
  - How do brokers translate and spread information within different networks?
  - What are the interests of brokers in the different networks?

## 2.2 METHODOLOGY

For this research I have used 'case-study' as my main research methodology. Case-study refers to the documentation of some particular phenomenon or set of events which has been assembled with the explicit end in view of drawing theoretical conclusions from it (Mitchell, 1983 pp. 191). A case study is a detailed examination of an event which the analyst believes exhibits the operation of some identified general theoretical principles (Mitchell, 1983 pp. 192). For this study three cases have been selected in order to gain more insight in the processes that influence the diffusion of improved potato varieties. These cases represent three different situations, with the aim to analyse the same phenomenon; what processes influence the diffusion of potato varieties. The three cases will be compared and analysed according to the social network theory, as described in paragraph 2.1.

In this research, three of CIP's improved potato varieties were selected as the three case studies. All three varieties were initially developed with CIP-related material and all have variable characteristics, year of release, and actors involved. Subsequently, centres of production (areas with a large production of one of the three potato varieties) were selected in order to delineate the research.

This research relies on 'snowball techniques' as a way to make a sample selection and to select the research units. In the following paragraphs the three varieties will be introduced, followed by a description of the data collection techniques and research areas.

### 2.2.1 THREE IMPROVED POTATO VARIETIES

Researchers from CIP's division 'Germplasm Enhancement and Crop Improvement' indicated that it would be interesting to study three different potato varieties, all with different characteristic, release dates, and different actors involved in the process of selection and evaluation. The following three varieties were selected for this research; Amarilis, UNICA and Serranita. In the below, the three varieties will be introduced briefly. A more profound explanation can be found in the empirical chapters 3, 4 and 5.

*Amarilis* is the 'oldest' variety in this research and is particularly popular in the North of Peru. This potato is mostly used for consumption. During the process of selection and evaluation mainly public institutions were involved.

*UNICA* was released more recently. This variety is particularly appropriate for the processing of French fries. *UNICA* is mainly produced on the Coast. Within the process of selection and evaluation; CIP, a University and farmers' associations were involved.

*Serranita* is the youngest of the three varieties and was released during my fieldwork in Peru. It is unknown how successful this variety will diffuse in Peru. Expectations are promising, because this variety is appropriate for both the processing industry and the consumption market. Within the process of selection and evaluation, both public and private institutions were involved.

### 2.2.2 SAMPLE SELECTION

For selecting the informants for this research, I used the snowball sampling technique. Snowball sampling is very useful in studying social networks, where the object is to find out who people know and how they know each other (Bernard, 1995 pp. 97). By using this sampling method, it became possible to identify one or more key-informants and through them other interesting actors for my research. Snowball sampling is very useful in studies of social networks, where the object is to find out who people know and how they know each other (Bernard, 1995 pp. 97).

Main criteria for selecting key-informants were that they had to be involved in activities directly related to one of the three varieties. I started selecting key-informants who were identified by researchers from CIP as knowledgeable actors. These actors were involved in the selection and promotion of one of the three selected potato varieties. After contacting these key-informants, it became possible to identify institutions and farmers who were involved in activities related to the production of one of the three varieties. By using the snowball sampling technique, all informants were related to each other in one way or another.

### 2.2.3 RESEARCH UNITS

The research units in this research are; those people involved in the circulation of the selected potato varieties. Learning more about the interactions and exchanges between them is essential in order to understand the processes that influence the diffusion of the varieties. The research units include the following groups of people:

- Individual or organised farmers involved in the production of seed, referred to in this research as '*semillaristas*' or seed producers;
- Farmers involved in the production of consumption potatoes, referred to in this research as potato farmers or potato producers;
- National institutions involved in the release, promotion, production and certification of the varieties;

- Local governments involved in giving agricultural support to potato farmers;
- Private and non-governmental organisations involved in giving agricultural support to potato farmers;
- Potato breeders from CIP and INIEA involved in the breeding, selection, and introduction of the selected potato varieties.

#### 2.2.4 DATA COLLECTION TECHNIQUES

##### ***Participatory observation and informal interviews***

In order to prepare the research and to get familiar with the context, I did several participatory observations. Within CIP I engaged in the Annual Meeting and several workshops. This gave me more insight in their organisational structure and on how CIP operates at different levels. Especially the Annual Meeting was very valuable to understand how CIP defines its strategy at the global level. The workshop organised by CIP gave me the opportunity to be introduced to some collaborative national partners, who later functioned as key-informants in my research. During the workshop I also learned more about the collaboration between CIP and its partners and the differences between them. I also observed many activities related to potato cultivation during my fieldwork in Peru. These observations improved my understanding about the daily work of Peruvian potato farmers, since I was not familiar with this. When possible I participated in the farmers' field activities. During the sowing season I helped preparing the field and planted potato seed and during the harvesting season I harvested potatoes with the farmers. For me these were important events. Not only did I learn more about the practical side potato cultivation, I also learned about the (social) organisation of such activities (organising transport, organising labourers, division of labour, etcetera). Whenever I interviewed the farmers, I always asked whether it was possible to visit their fields. This gave me a better understanding of the informant (size and conditions of the fields, means of transport, organisation of the work) and potato cultivation in general (observing various potato varieties during different growing stages in different areas).

In all of the research areas, I have visited markets. At these markets I observed a wide range of activities; the offering and buying of products, the coming and going of different people (costumers, farmers, wholesalers, salesman, truckers), market traditions and the differences between markets.

During all of the observations I have informally interviewed actors. These informal interviews improved my understanding of the context in which this research was carried out.

##### ***Semi-structured interviewing***

For data-gathering I mainly used semi-structured interviews. For making these semi-structured interviews I developed an interview guide. This guide contained a list of questions and topics that were asked to every key-informant involved in the research. According to Southwold, the advantage of using such technique is that: *“The informant can express himself in his own terms; the interviewer can follow up any leads that arise during the interview; the data from the interviews is comparable because the*

*same topics have been covered with each informant*" (Southwold, 2002 pp. 7-11). Using semi-structured interviews helped me to ask questions with moderate skills of the Spanish language and it enabled me to gather a lot of data within considerably short periods of time. The general topics used in the semi-structured interviews for farmers were:

*Questions for both seed producers and potato producers:*

- General information; name, residence;
- Characteristics of the farmer; educational level, occupation, principal cultivars, quantity of produced potatoes, hectares of land, etcetera;
- History with the variety; first experience with variety, access to variety, reasons for producing variety, management of difficulties, etcetera;
- Production of the variety; quantity, utilisation of harvest, management, marketing, seed provision, etcetera;
- Obtaining information; used media for information provision, institutional support, experimenting with new varieties, advantages and disadvantages of variety, etcetera;

*Additional questions only for seed producers:*

- Quality of seed; seed category, produced quantity, sold quantity, selection of varieties, access to quality seed, etcetera;
- Seed provision; seed providers, quantity, collaboration with providers, etcetera;
- Seed sale; seed buyers, quantity, collaborations with clients, information provision to clients, etcetera;

*General topics used for interviewing officials of institutions:*

- General information; activities of the institute, activities related to potatoes, objectives;
- Support; number and type of farmers they support, activities, methodology;
- Collaboration; other institutes, collective activities;
- History with variety;
- Diffusion; achievements, difficulties;
- Opinion on; diffusion, collaborations, variety;

## 2.3 RESEARCH AREAS

For this research, four departments were selected because of their high production of improved potato varieties, in particular the selected varieties. I have visited the departments of Cajamarca, Huánuco and Junín which all are located in the Andean region. In these mountainous regions, I mainly visited areas between 2.800 – 3.600 meters. In these areas the growing conditions for potatoes are optimal (Brush *et al.*, 1981 pp. 74). On the Coast, I have visited the department of Ica, where potato farming is highly commercialised. In these areas, modern agricultural techniques as commercial fertilisers, insecticides, and improved, high-yielding varieties were used. The majority of the involved farmers in this research

produced primarily improved varieties. Figure 4 shows a map of Peru with the four research areas, corresponding with the selected potato varieties.

Within the four departments, I have selected specific research locations. This was done in collaboration with the involved key-informants in this research. In order to identify and explore networks, the specific research locations were selected in areas where the involved key-informants were working.

The selected research areas all have great geographical differences; Cajamarca in the North, Huánuco and Junín in the centre and Ica on the Coast of Peru. In the next paragraphs the four departments and the specific research locations will be described in detail.



Figure 4. Map research locations and selected potato varieties  
Source: [www.lib.utexas.edu/maps/americas/peru\\_pol91.jpg](http://www.lib.utexas.edu/maps/americas/peru_pol91.jpg)

### 2.3.1 CAJAMARCA

Within the department of Cajamarca, the research focussed on the circulation of the potato variety Amarilis. Cajamarca has a surface of 33.248 km<sup>2</sup> and a population of 1.498.161 inhabitants. The capital of the department Cajamarca is the city of Cajamarca, which and is located on an altitude of 2.750 meters. In Cajamarca 25.000 ha of potatoes are produced on an annual base (Ministerio de Agricultura, 2004). Potatoes are the second most important crop, covering 35% of the areas allocated to agriculture. Research by CIP (2002) shows that potatoes are cultivated by 59% of the people involved in farming. The most important improved varieties in the department of Cajamarca are Amarilis, Yungay, Canchan and Perricholi. The most important native varieties are; Colorada, Huagalina and Huamachuquina. In Cajamarca 84.4% of the cultivated potatoes are improved varieties and 13.8% are native varieties. This department was selected because the extensive production of Amarilis.

Cajamarca can be divided into a northern region and southern region. In the North, the provinces Cutervo, Chota, Bambamarca and Santa Cruz are located, where a total area of 6.700 ha of potatoes is cultivated. Especially in the provinces Chota and Cutervo, potato production is very important. Potatoes are the most important cultivated crop in comparison to other crops. Chota and Cutervo are the main suppliers for the potato market of Chiclayo, a big city in the northern part of Peru. Generally the sowing season takes place between October and March, although sowing can be done throughout the whole year. During my fieldwork I have visited the provinces Chota and Cutervo.

The southern region consists of the provinces Cajamarca, Celendín, San Marcos, Cajabamba, San Miguel and San Pablo, where a total area of 9.500 ha of potatoes is cultivated. Within this region the the most important potato production provinces are Cajamarca, Celedín and Cajabamba. In these provinces the sowing season is between August and November, although this can vary per locality. In this region the province of Cajamarca was selected as a research location.

Through CIP I got in contact with an engineer working for INIEA Baños del Inca, a district of Cajamarca close to the capital of the department. Together with this INIEA-engineer, I selected certain districts and communities with a high production of Amarilis. This resulted in the selection of the following research locations:

- In the province Cajamarca; the districts La Encañada, Purhuay and Baños del Inca
- In the province of Chota; the district Chucmar
- In the province of Cutervo; the district Cutervo



Figure 5. Map provinces of Cajamarca

### 2.3.2 HUÁNUCO

In the department of Huánuco research focussed on the circulation of the potato variety Serranita. Huánuco is located in the central eastern part of Peru, and has a population of 709.000 inhabitants. The capital of the department is Huánuco, which is located on an altitude of 1.896 meters. As figure 1 shows, Huánuco is one of the largest potato producing departments in Peru, with an average of 35.000 ha of potato area cultivated on an annual base. Potatoes are the most important crop in terms of cultivated surface, covering 27% of the area allocated to agricultural production. Approximately 46.000 farm families in Huánuco are involved in potato cultivation. In the western part of the department (the Andean provinces Huamalies, Dos de Mayo, Lauricocha, Yarowilca, Huacaybamba and Marañón), an area of approximately 18.200 ha (53%) is cultivated with potatoes in (CIP, 2002). The majority of the produced potatoes in these regions are used for auto-consumption. Only a small part (around 9%), is sold to supply eastern provinces. The western provinces have only one campaign<sup>6</sup> per year, with the sowing season between August and December.

In the eastern Andean provinces (Ambo, Huánuco, Pachitea), 16.000 ha (47%) are allocated to potato production. Generally these provinces have a wet, moderate climate, which permits year-round potato cultivation. In contrast with the western provinces, around 55% of the potato production is for commercial purposes. A relatively big part of potato production in Huánuco consists of native varieties, although this varies per province. Research by CIP (2002) has shown that in the provinces of Ambo and Huánuco between 50% and 60% of the production consist of native varieties, whereas in the province of Pachitea only 15% of the produced potatoes are native varieties.

<sup>6</sup> The concept 'campaign' refers to one crop-cycle of the potato

The most popular (and produced) improved potato varieties in Huánuco are Canchan, Yuncay and Amarilis (CIP, 2002). Huayro and la Amarilla are the most produced commercial native varieties. Huánuco is located central in Peru, which makes it an important supplier of the Lima wholesale market. They supply 15% of the consumption potatoes for this market and are the principal supplier of la Amarilla.

Huánuco is not only characterised by its high potato production, there is also a lot of research activity in this department. Many improved potato varieties were first tested, evaluated and released in Huánuco. For example the first selections and evaluations of the variety Amarilis were done in Huánuco. Reason for this research focus on Huánuco is the relatively high humidity, which makes it an ideal location to test on resistance to '*rancha*' (late blight). The eastern part of Huánuco borders the jungle, which causes this high humidity even on high altitudes.

Through CIP I got in contact with the director of private project PRA Huánuco. In collaboration with the director I have selected the following research locations:

- In the province of Huánuco the district Churubamba and Pillao
- In the province of Pachitea the district Molino



Figure 6. Map provinces of Huánuco

### 2.3.3 JUNÍN AND COASTAL AREAS

In relation to the variety UNICA I have visited the departments Junín and Ica. UNICA is mainly produced in the coastal areas as a consumption potato. These areas are the main suppliers of the Lima market during the Andean 'of-season' (those periods with limited potato production in the Andes). For the provision of seed, the coastal areas are depending on seed produced in the Andes. Therefore both Ica and Junín were included in the research.

The department of Junín has a surface of 44.409 km<sup>2</sup>. Approximately an area of 23.000 ha (in 2004, see figure 1) is allocated to potato cultivation. The capital of the department is Huancayo, which is located in the Mantaro valley, one of the largest Highland valleys in Peru. Huancayo accommodates the headquarters of the national potato programme (INIEA), the experimental station of CIP, and an agricultural University. The Mantaro valley is located 200 km from Lima and is just like Huánuco one of the main suppliers of potatoes for the Lima wholesale market. A good road and railroad system connect this region to Lima.

Almost all of the research locations in Junín were located in the Mantaro valley. The Mantaro valley can be divided into three production zones. The low zone (between 3.200 and 3.450 meters) is a relatively flat area along the Mantaro River. Between 3.450 and 3.950 meters there is an intermediate zone with

sloping mountainous hillsides. The high zone is located above 3.950 meters and has steeper mountainsides.

In these three zones, different potato producing techniques are used. In the low zone commercial potato farming is practiced. Because of the flat character and the slope mountainsides more mechanised cultivation techniques (tractors) are used. The low zone has a moderate, dry climate, with a raining season between October and April and with frost periods in May, June and July. The growing season is during the raining season and starts in November. In the low zone the potato fields near the Mantaro River are irrigated. In the higher parts the cultivation depends on rainfall.

The higher zones (intermediate and high zones) deal with frost and hail risks, whereas the lower zones have more problems with diseases and pests. In the low zone both large commercial farmers and small-scale subsistence farmers operate. In the higher zones less commercial farmers and more small-scale farmers are active. The commercial potato producers supply Lima's and other distant markets. The small-scale, subsistence-oriented farmers supply the local and regional markets.

In Junín I got into contact with INIEA Santa Anna. In collaboration with INIEA I have selected a number of UNICA producers from the Mantaro valley. Together with an engineer of INIEA I have visited the following research locations:

- In the province Huancayo, the districts Sicaya and San Pedro de Saño
- In the province Chupaca, the districts Chupaca
- In the province Jauja, the districts Yauyas
- In the province Tarma, the district Huasahuasi



Figure 7. Map provinces of Junín

In the coastal region I have selected the department of Ica to study the circulation of the variety UNICA. In this region around 2.000 ha (2004, see figure 1) are allocated to the production of potato. In contrast with the Andean departments, coastal regions can only produce potatoes during the cool winter months. Although potato production is only possible in the winter season (between May and November), coastal potato producers are important suppliers for the Lima market. Coastal production is particular important when potatoes from the Andes are less available (Brown and Scheidegger, 1995 p. 65). Although the area allocated to potato production in Ica is limited, the average yield per hectare is very high (30 tons per hectare (t/ha)) when compared to the Andean departments (Junín: 14t/ha, Huánuco: 13t/ha and Cajamarca: 10t/ha). Potato production was introduced to the coastal regions during the 1950s and 1960s. Since then, the irrigated river valleys became important potato production areas. In the coastal areas mainly high-yielding, improved varieties for the processing industry are produced. In general, coastal producers prefer seed from the Andes, because of its high quality. Important areas for the provision of seed are Huasahuasi, Jauja and Huancayo.

In collaboration with a CIP breeder, I have established contacts in the department of Ica. I have visited farmers in the provinces of Ica and Nazca.



Figure 8. Map provinces of Ica

### CHAPTER 3. AMARILIS; 'THE POTATO THAT CHANGED FARMERS' LIFE'

This chapter addresses the diffusion and circulation of potato variety Amarilis in the department Cajamarca. Amarilis is released since 1993, and widely diffused in this northern department of Peru. The title of this chapter refers to a quote of an INIEA-engineer working for INIEA Baños del Inca in Cajamarca. An impact-study conducted by this engineer on Amarilis showed a wide adoption of this variety among farmers. This variety was produced by the majority of farmers in Cajamarca and sold on practically every market in this department. According to this engineer, the variety had a great impact in the department, and considerably increased the standard of living among Amarilis potato farmers. This chapter will not address the impact of the variety of Cajamarca, but is more concerned with the social processes among the actors involved in the production of Amarilis. By studying the social relations between these actors, more can be learned about the collaborations between institutions and farmers.

In November and December 2005 I have visited different provinces in the department Cajamarca to study the circulation of the potato variety Amarilis. Researchers from CIP provided me with a list of key-informants that were involved in activities related to this variety. After contacting these key-informants, field visits to areas important for the production of Amarilis were organised in collaboration with the public institutions INIEA Baños del Inca, SENASA Baños del Inca and Chota, and the municipality of Baños del Inca. Together with the key-informants – engineers (*ingenieros*) and technicians (*técnicos*) of these institutions – I have visited a number of farmers who were known by, or involved in activities of one of the above-mentioned institutions. For this research twenty-five different cases of farmers are selected to learn more about the circulation of the variety Amarilis. Additionally, engineers from other institutes and organisations (CARE, PRONOMACHS, and the regional Ministry of Agriculture) were interviewed about their activities related to Amarilis, in order to understand the context and to unravel the history of this variety.



Figure 9. Geographical map research locations Cajamarca

In the following paragraphs, first the characteristics about the potato variety Amarilis are described (paragraph 3.1) followed by an historical overview of developments related to Amarilis (paragraph 3.2). Next the field data is presented (paragraph 3.3). In the last paragraph, the analysis and conclusions will be drawn.

### 3.1 THE VARIETY AMARILIS

Amarilis was official released in 1993 by INIEA, and in 2000 it was officially registered by SENASA. The initial clones were developed by CIP breeders. Already in 1986 researchers from INIEA Huánuco started with the selection and evaluation procedure, involving farmers from Huánuco and Cajamarca (INIA, 1993). Amarilis was one of the first important varieties resistant to '*rancha*' (late blight), and therefore very popular



Figure 10. Variety Amarilis on a market

among farmers. Another advantage was that Amarilis had a relatively short cultivation period (from sowing to harvesting 120 days in areas with an altitude of 2700 till 3200 m.), which makes it possible to have two campaigns in one year. Eventually the clone was selected and approved as variety for these two characteristics (resistance and earliness). Initially, Amarilis was recommended for the central and northern Andes (Huánuco, Junín, Cerro de Pasco, Huaraz and Cajamarca), due to the high '*rancha*' pressure in these zones. Although its characteristics were very promising in the beginning, after some years undesirable factors became apparent, such as rapid greening<sup>7</sup> and degeneration<sup>8</sup>.

Amarilis has a white cream skin and yellow coloured flesh. After release Amarilis became particular popular in northern Peru, because of the preference for white potatoes in this region. This might be explained by the disappearance of native varieties in northern Peru. The majority of potato production consists of improved varieties, which results in smaller supply and demand for native varieties. This variety is mainly used for consumption as it is sold on daily markets for example in the city of Cajamarca. Because of the popularity and high production of Amarilis in Cajamarca, this department is chosen as research area.

<sup>7</sup> After harvesting, the tubers turn green rapidly after been exposed to sunlight. This has consequences for the taste, as it turns bitter. As a result, only short transportation distances and durations are possible to ensure fast selling.

<sup>8</sup> Farmers in Cajamarca explained that Amarilis' resistance to '*rancha*' diminished through the years, a phenomenon they explained as something which gradually happens to improved varieties; "they loose their power". According to scientists, degeneration of '*rancha*' resistance is the result of insufficient knowledge of farmers to manage the disease well. Furthermore, the level of resistance in potato varieties is only intermediate, and access to resistant varieties by farmers is often limited and the use of fungicides too costly (source; [www.cipotato.org](http://www.cipotato.org)).

## 3.2 THE SOCIAL CAREER OF AMARILIS

In the previous paragraph, the main characteristics of the variety Amarilis were explained. In this paragraph, issues related to the diffusion of this variety are discussed. In the context of this research the concept diffusion refers to the different channels through which the variety is spread. As already mentioned in section 1.2, a new improved variety finds its origin in the so-called formal sector, but it can spread as well through formal as informal channels. This paragraph will explain more about the different pathways of diffusion which I came across during this research. The variety Amarilis was released since 1993, whereas the selection and testing happened between 1986 and 1993. This means that before release, after release, and till today, the variety went through a lot of different hands, and was spread through many different channels. This has determined the routes the variety has followed. Describing the past and current developments, will help us to understand the context in which farmers learned about the existence of this variety and reasons why they start using it.

### 3.2.1 BREEDING AND RELEASE OF AMARILIS

The history started in 1985 with the crossbreeding of the clone Amarilis within CIP's late blight programme. This clone was selected for its late blight resistance. The common strategy of CIP is to pre-select almost finished clones and provide this material to the national potato programme (INIEA). Researchers from INIEA do the following up by further testing the clones. In the case of Amarilis, pre-selections were done in Huánuco by CIP because of the high '*rancha*' pressure of in this department. In that time CIP had an alliance with INIEA and farmers for selecting the clones. According to a CIP breeder, this selection went very well, unlike the testing done by the national potato programme itself. From the perspective of the CIP breeder, there was no interaction between CIP and the national programme. The local and regional trials organised by INIEA were inefficient because of a lack of money and tools. He explained that the involved farmers within the alliance with CIP and INIEA, already started producing the clone and spreading it to other farmers far before the release of the variety was realized, which represent a form of informal diffusion.

The release took a long time (from 1986 till 1993), basically because three different trials were done by INIEA on three different locations; Huánuco, Huancayo, and Cajamarca. Because every experimental station of INIEA had put a lot of effort in the selection, there was an argument on where it should be released as they were all claiming that their station worked on the selection the most. Therefore the formal system was far behind the actual diffusion. In this sense, an official release of a new variety is important for the provision of seed, but it does not always have to be the driver of diffusion. In the end the official release is important, because the national programme start producing formal seed. This is important to provide farmers with quality seed and to keep the variety in good condition.

In the period before and short after release, three ways of diffusion could be identified:

- INIEA by selecting clones before release & by producing seed after release;
- Alliance between CIP, INIEA, and farmers by testing clones;
- Followed by informal diffusion of clones through the involved farmers;

After formal variety release (1993) the variety Amarilis has been introduced in Cajamarca in different ways. First of all, it started with formal seed production by INIEA Baños del Inca. Through the years, several institutions and organisations started to use the newly introduced variety within their programmes to support farmers. These different institutions or organisation will be described in the next paragraphs.

### 3.2.2 INIEA BAÑOS DEL INCA

Before the formal variety release of Amarilis, INIEA Baños del Inca was involved, as one of the three experimental stations of INIEA, in the selection and evaluation of clones of Amarilis. More detailed information about INIEA is presented in box 1.

Selections were particularly carried out in districts of the provinces Cajamarca, Chota and Cutervo with the involvement of farmers. The selections implied an evaluation of the tuber shape, quality of the skin and flesh, the yield, resistance to '*rancha*', and earliness. CIP did not have a role in this process. The only form of information exchange between INIEA and CIP was during the annual meetings and with the final official release.

#### Box 1. INIEA Baños del Inca

INIEA Baños del Inca is one of the five agricultural research stations in the Highlands with a national potato programme. These research stations focuses on agricultural research on the one hand, and agricultural extension on the other hand. The agricultural research units consist of different departments: cultivation, cattle breeding, forestry and genetic resources. The cultivation programme for each of these research centres is focusing on improving the quality, yield and the productivity of the crops that are important or typical for the region in which the research centre is located. In the case of INIEA Baños del Inca the research department has the following programmes; legumes, fruits, Andean crops (cereals, tubers and roots), maize, and potatoes. The agricultural extension units of INIEA are responsible for training activities and the diffusion of technologies by spreading information. Every station has its own strategy. Baños del Inca uses different mediums in relation to potato production, pest management and quality improvement, such as radio programmes, spreading information bulletins, offering trainings, organising 'farming days' ('*día del campo*'). INIEA Baños del Inca are active in the departments Piura, Amazonas, Cajamarca, Lambayeque, La Libertad, Ancash and San Martín. The research station has annexes on four different locations for the implementation of their developed technologies, and for the production and distribution of seed in the different departments. In general, the potato programme is responsible for developing, selecting and releasing new potato varieties, and for the production and diffusion of quality seed (pre-basic and basic seed). INIEA Baños del Inca can be considered as the largest producer of high-quality seed in Cajamarca. INIEA owns different experimental farms ('*campos experimental*') for the production of pre-basic seed. For example in the community of Polloquito in the district of La Encañada INIEA has four hectares where they produce pre-basic seed. This seed is sold the next year as basic seed for approximately

three soles per kg (in 2005, which is about \$ 0,95). On the research station itself (Baños del Inca), the seed is sold generally to large seed producers, committees of seed producers (*'comités de semillaristas'*), public and private institutions, and NGOs. In general 60% is sold to public institutions (PRONOMACHCS, Ministry of Agriculture, etcetera), 30% to *'semillaristas'*, and 10% to NGOs<sup>9</sup>. One of INIEA's objectives is to improve the formal seed system in Cajamarca, which they try to accomplish by forming groups of formal seed producers (*'comités de semillaristas'*). In general, these committees buy their seed from INIEA and receive technical assistance. In return they pay 5% of their production.

An engineer from INIEA Baños del Inca explained that after formal variety release of Amarilis, several activities initiated by INIEA took place. These activities are explained in the following sections:

- Promotion by SEINPA;
- Technical support for farmers, organised by the extension department of INIEA;
- Organisation of local markets.

### **SEINPA-project**

SEINPA was a national seed project to improve seed production and potato research from 1983 till 1994. This project was supported by INIA<sup>10</sup>, CIP, and SDC (Swiss Development Corporation) who financed the project. The objective of SEINPA was to develop and validate a strategy for the production, multiplication and distribution of high-quality seed. Similar projects were also organised in Ecuador (FORTIPAPA) and Bolivia (PROINPA and PROSEMPA). All projects worked with small-scale farmers to promote the wider use of quality seed or new varieties, by encouraging farmers to associate (Thiele, 1998 pp. 92).

Interesting about the SEINPA-project was that it tried to create better linkages between the formal and informal system. In the first period of the project (from 1983 till 1989) an 'injection'-strategy was used to link the two systems, by using existing mechanisms of the informal system for the efficient diffusion of quality seed. During the second period (from 1989 till 1994) the project changed its strategy in a 'reform'-strategy, with the underlying notion prevailed that the quality of local seed was nearly always poor or uncertain (Thiele, 1998 pp. 93). In this second period the variety Amarilis was introduced. The following activities were implemented in order to create linkages with the informal system; the organisation of groups of small-scale farmers who use basic seed to produce high-quality seed, collective planning, purchase of inputs and selling, and the coordination of the purchase of basic seed and sales among groups of local producers. Specialised seed plots with basic seed and improved management practices, and the use of protected seed beds were introduced.

The results of the project in the period 1988-1994 was the selection, organisation and training of nearly 1600 small-scale seed growers in 126 entrepreneurial groups who produced an estimated 3600 tons of

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<sup>9</sup> Personal communication technician experimental farms INIEA

<sup>10</sup> During the period 1983 till 1994 INIEA (Instituto Nacional de Investigación y Extensión Agraria) was still called INIA, which is the abbreviation of '*Instituto Nacional de Investigación Agraria*'.

seed in 1994.<sup>11</sup> The SEINPA project was executed in the provinces Cajamarca, Chota and Cutervo in the department Cajamarca. Especially in Chota and Cutervo the project was successful in forming '*comités de semillaristas*', more than in the province of Cajamarca. An extensionist of INIEA explained to me that "*in Chota and Cutervo farmers are fully dependent on the production of potatoes, whereas in Cajamarca farmers do not rely on potatoes only*".

The use of the reform-strategy by SEINPA by organising entrepreneurial groups was taken up by other projects after this period. Many of these groups still exist as I have encountered them in the field. How these groups operate will be discussed in the next paragraph (4.3).

### **Training activities**

In the period 1995, 1996, 1999 and 2001 80% of the training activities of INIEA focused on potatoes, especially on the variety Amarilis. The activities included technical information on varieties and agricultural management (technical training/ information related to sowing, cultivation and harvest). During this period, INIEA offered trainings in nine different provinces within the departments Cajamarca (Cajamarca, Chota, Cutervo, Cajamamba, San Marcos, Celedín), Libertad (Huamacucho), Piura (Auabaca), and Lambayeque (Incahuasi). These training activities were intended for potato farmers who produced consumption potatoes.

In 1999 INIEA provided assistance particularly for '*semillaristas*' (seed producers) for a period of two years. They supported individual farmers to organise themselves in groups. Thirty-five groups (*comités de productores*) were formed, who received support during sowing season, management of the fields, and commercialisation. In 2005 still twenty groups were active; other groups were forced to stop because of unfavourable market conditions.

Currently, training activities within INIEA are limited. Reason for this is that farmers are changing their production; less focus on only one crop. In relation to potatoes, market conditions are less promising and the cultivation of potato is rather expensive in comparison with other crops. Therefore INIEA changed its strategy within the extension department; trainings are more demand driven. At the moment there is more interest in trainings on *cuyes* (Andean guinea pig).

Although these supporting activities of INIEA to farmers does not necessary explains more about the diffusion of Amarilis, it contributed to the provision of information among farmers.

### **Organisation of '*ferias*'**

In 2001, 2002 and 2003, INIEA organised '*ferias*' (local markets) in Baños del Inca. The objective was to stimulate commercialisation and to sell seed. Engineers from INIEA have indicated that these events were very important for the exchange of information, introduction of new varieties, and commerce, especially because *ferias* are well visited events for farmers. The *ferias* were organised to stimulate contacts between '*semillaristas*' and potato farmers.

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<sup>11</sup> Described information about SEIPNA project derives from; G. Thiele (1998) *Informal potato seed systems in the Andes: Why are they important and what should we do with them?*

Generally speaking, INIEA's main and most consistent activity in relation to the spread of Amaranis, is the production and the sale of quality seed. As described in the above sections, in the last 10 years several activities were initiated, which took place for a number of years and then stopped. Projects and activities of national institutions often depend on (external) funding, which was the case with the SEINPA-project. Also changes in policy can cause a change in direction. In the 1990s there was more money available for offering technical support<sup>12</sup>. Nowadays engineers are limited in their resources. During the fieldwork it became clear that for example within their research activities (doing experiments on farmers' fields with new clones) less regions could be included because of a lack of money for transportation. Remote areas were therefore marginalised.

### 3.2.3 INVOLVEMENT OF CARE PERU

One important organisation in relation to the spread of Amaranis in Cajamarca was CARE Peru. CARE started working in Peru since 1970, initially to help respond to an earthquake emergency. Since then, CARE's work in Peru includes activities in food security, agricultural and community development, small economic activity development, education and health (CARE, 2006). CARE has worked in several projects focussing on potato farmers with partners like CIP, PRONAMACHCS, and Yanacocha Mining Company. The different projects will be explained in more detail in the following sections.

#### ***The MIPANDES-programme***

From 1993 till 1997 CARE-Peru initiated a three-year IPM<sup>13</sup>-programme called MIPANDES. The project was financed by USAID and technically supported by CIP, which provided IPM-training materials for the potato pest problems (Andean weevil and the tuber moth) in Cajamarca, as well as in the departments Puno, Ancash, and La Libertad. For the last 15 years CARE has collaborated with CIP. Back then this was the first initiative for CIP to work with a NGO.

In Cajamarca, forty-seven farmers groups were formed (*Grupos de pequeños productores*), of which thirty-eight groups participated in the whole project (CODESAN, 1999). The overall objective of this project was to provide food security and increase income for small-scale farmers. They had chosen for potatoes as one of the crops to work with. In that time Amaranis was recently released, thus they used this variety because of its market opportunities.

Basically the projects activities can be summarised as follows:

- Groups were formed and profitable crops were identification to use for the project;
- Preparation and implementation of several growing seasons with the selected crops;
- Technical support of a CARE-extensionist during the growing seasons (technical training and information);
- CIP was involved for the technical support concerning pest management;
- Improvement of irrigation systems and storages.

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<sup>12</sup> Personal communication extensionists of INIEA Baños del Inca and INIEA Santa Ana (Huancayo).

<sup>13</sup> IPM; Integrated Pest Management

### ***The ALTURA-project***

The ALTURA-project is a further expansion of CARE's work on IMP. Together with PRONAMACHCS<sup>14</sup> they continued IPM-activities. PRONAMACHCS is a large government soil conservation project that also included IPM activities (Ortiz et al. 2005). The ALTURA-project aimed to implement IPM on 7500 farms in eleven departments in Peru (Horizon Solutions Site, 2003), and took ten years (from 1992 till 2002). The goal of the project was to improve the soil and to limit the effects of frost. One of the projects' activities was the introduction of high-quality seed among the involved farmers. CARE financed the project and supported the project staff. One of PRONAMACHCS's activities in relation to the diffusion of potatoes, is the distributed of certified seed to the groups of farmers. In the case of Cajamarca they used Amarilis seed. They supported groups of seed producers to produce and sell certified seed. Seed was sold to other farmers through PRONAMACHCS. According to a CARE-engineer, this project used the same strategy as the MIPANDES-programme; organising groups of farmers. Not only the strategy was similar, even the same groups of farmers were involved. They changed the names from '*grupos de pequeños productores*' to '*comités de conservacionistas*'. In 2002 the project stopped, and nowadays PRONAMACHCS has decreased its activities in relation to buying and selling of high-quality seed.

### ***The Prosay-project***

The Prosay-project was a partnership between CARE and the Yanacocha Mining Company, which gave rise to the Yanacocha Food Security Project (Prosay). This project focused on themes as health and education, productive development, school nutrition, highway construction and rehabilitation, environmental clean-up, and rotating funds. The Yanacocha Mining Company ('*Minera Yanacocha*') operates in the department of Cajamarca, and cause a lot of environmental damage. Therefore, social projects such as Prosay are implemented to challenge the negative site effects. The project took place from 1996 till 1998. CARE was one of the financing parties of the project. In relation to potato farming, the project had activities such as funding agricultural inputs (potato seed, fertilizers and pesticides), provision of credit, and agricultural support to small producer groups. The agricultural support included the introduction of quality inputs (seed, fertilizers and pesticides), technical assistance and training programmes on pest control and marketing. A total of 13 groups have participated in the programmes. During the first year of the project, seed of four different crops were distributed (potato, wheat, barley and '*chocho*' (Lima bean). Later, the project concentrated only on potato seed. The mining company built seven storages in order to lower potato seed lost. The costs of these activities were financed by Yanacocha, CARE and the involved groups of farmers themselves (A. Pascó-Font, et. al 2001). Also within this project the focus was on farmers groups. CARE only participated in the first part of this project. They withdrew from the project to avoid being used by the mining company to justify their mining-activities.

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<sup>14</sup> Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos

### ***Farmer Field Schools programme***

After the IPM activities (MIPANDES), CIP continued working with CARE. In 1998 they launched a pilot Farmer Field School (FFS) programme for potato farmers in the department of Cajamarca (Godtland *et al.*, 2004). As part of a joint effort between CARE Peru and CIP, eight FFS were initiated in 1998. In 1999, thirteen schools were operating; this number rose to twenty in 2000, and fell back to sixteen in 2001. Specifically, the FFS were initiated to improve the situation of farmers, by introducing '*rancha*' resistant potato cultivars and knowledge of IPM and ICM. At the same time CIP, as a research centre, was interested in evaluating promising clones together with farmers. CARE was responsible for the implementation, organisation and facilitation of the FFS, while CIP led the development of the training curriculum, the delivery of clones and cultivars, and the monitoring of data generated by the participatory research (Thiele *et al.*, 2001, Nelson *et al.*, 2001). During the first part of the FFS-project, Amarilis was used in experiments to investigate and evaluate the impact of '*rancha*' on promising clones. The clones were compared with Amarilis, which was then perceived as one of the most '*rancha*'-resistant potato varieties.

#### 3.2.4 INSTITUTIONAL SIMILARITIES

After the release of Amarilis in Cajamarca, several institutions have used the variety within their projects or programmes (for example in IPM-activities). In the above sections, I have described some of these initiatives. By analysing the described initiatives, similar elements can be recognised.

#### ***Focus on organising groups***

Almost all projects focused on forming and organising groups. As already mentioned (see explanation ALTURA-project), the used strategy in most of these projects was similar. As a result of this, the same types of farmers were involved in the projects. This also became clear during the fieldwork, when farmers explained that they had participated in several projects of different institutions. It seems that institutions are doing the 'same thing'; selecting groups of farmers according to similar criteria, and supporting these groups to become certified seed producers.

#### ***Consequences of institutional support***

Within the described projects Amarilis was used as promising new variety due to its high '*rancha*'-resistance. In the 1990s an increased support for farmers in producing certified seed led to an imbalance between supply and demand. Figure 11 shows how this occurred in three provinces in Cajamarca during the period 1994 till 2004. After 2000, the area of certified seed and the number of certified farmers decreased rapidly.

An official from SENASA explained that from the beginning of 2000 onwards, institutional- and NGO support changed dramatically. There was less money available within institutions<sup>15</sup>, which caused the

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<sup>15</sup> Personal communication PRONOMACHCS- and CARE-engineers

drop. In the late 1990s the production of certified seed lost its economic advantages for many farmers, due to this decrease of institutional support.

An extensionist from INIEA explained to me; *“haven’t you noticed that every institution is doing about the same thing, and that there is no collaboration between them?”* According to him, this represents the way of working of institutions in Cajamarca; *“disorder”*<sup>16</sup>. Additionally, the great emphasis of institutions in supporting farmers by introducing the new variety Amarilis looked very promising, but still a minority

of farmers was reached through these projects. A CARE-engineer gave the following example of the ALTURA-project; *“it looks like many farmers are reached by the project if you look at the number of addressed communities. Almost all districts were addressed. But if you look at the number of farmers, only 5% till 10% of the farmers participated in these projects.”* He explained that a lot of farmers have distrust in organisations or institutions. Especially in the Prosay-project, farmers had a lot of distrust in the mining company, because the mining company is causing a lot of environmental damage and pollution in the region.

### 3.3 LEARNING FROM THE FIELD

In the previous paragraph, a genealogy of developments concerning Amarilis was described. This genealogy is based on projects which have been implemented through the years. CARE had a great share in organising several of these projects together with their partners. One described similarity within these different initiatives was the focus on organising farmers groups. During fieldwork, I have visited several of these farmers’ groups in collaboration with representatives of INIEA Baños del Inca, SENASA, and the municipality of Baños del Inca. In the next paragraphs five different situations are described which explain more about the institutional collaborations.

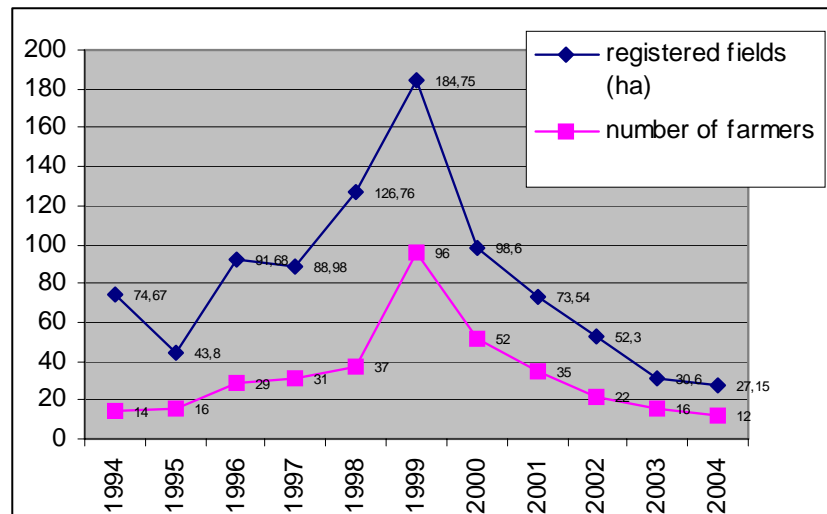


Figure 11. Developments in the production of certified seed in the provinces Cajamarca, Celendin and San Miguel in the department Cajamarca  
Source: R. Llique, SENASA Cajamarca, 2005

<sup>16</sup> Personal communication extensionist INIEA Baños del Inca, 2005

### 3.3.1 FIELD VISIT TO LA ENCAÑADA

In November 2005, I went on field visit to the district La Encañada in the province of Cajamarca. I had the opportunity to accompany an INIEA-engineer to some of the farmers with whom he collaborated. For me this was an interesting event, because it was my first day of visiting and interviewing farmers. We had agreed that he would help me with conducting interviews with farmers, because my Spanish was limited at that time. For me this was an opportunity to explore the network of farmers around this engineer. Our first visit was to a farmer who was perceived as a very innovative farmer. This farmer was selected because of his large production of Amarilis, and his institutional collaborations.

Several engineers from INIEA and CIP had told me to visit this farmer; he was labelled by INIEA and CIP as a successful farmer because he was actively involved in testing and producing new clones and varieties. A brief description about this farmer and his history with the variety Amarilis can be found in box 2.

#### Box 2. The innovative farmer

Seed producer Amando lives in the community of Sierra Morena, within the district of La Encañada. The INIEA-engineer explained that Amando is a relatively big farmer with his eighteen hectares. According to the engineer, in Cajamarca large farmers own more than ten hectares, medium-size farmers own between five and ten hectares, and small-scale farmers own less than five hectares.

Amando produced the variety Amarilis through PRONOMACHCS. In 1993 PRONOMACHCS started growing Amarilis (ALTURA-project) in La Encañada with groups of farmers. Amando formed a '*comité de semillaristas*', which enabled them to receive new seed and support through PRONOMACHCS and CARE. This was Amando's first encounter with Amarilis. Currently, he sells his Amarilis production as seed to PRONOMACHCS, '*Agencia Agraria*', and to other farmers in the region. The rest of his production he sells as consumption potatoes on the market in Baños del Inca to recover back some of his investments. He always buys new seed from INIEA Baños del Inca because they sell clean, certified seed, and he receives useful information about new varieties. Besides producing Amarilis, he also produces other improved varieties, such as Serranita which is a new variety in Peru. Together with a group of farmers, he had participated in a CIP-experiment to test a number of clones. They had selected Serranita as very promising, and started to produce this clone themselves. Now, Amando is grateful that this variety was officially released in 2005 on the Peruvian market. As he is one of the first farmers who produced Serranita seed, he foresees great opportunities now the demand for Serranita seed is growing.

Farmer Amando was lucky to have the opportunity to participate in several projects. With the support of PRONOMACHCS he formed a '*comité*'. CARE, PRONOMACHCS, and '*Agencia Agraria*' were his main clients for buying seed in the case of Amarilis. He is regularly invited to participate in workshops organised by PRONOMACHS and INIEA, and he participated in a CIP-experiment. He told me an

enthusiastic story about how he met engineers from different institutes during his participation in the several activities. Especially during the CIP-experiment on clones, he got in touch with researcher from all over the world, which made a big impression on him. This story shows that Amando is receiving a lot of institutional support. During my visit I got the impression that his participation in these different activities contributed to his popularity within institutions. Both Amando and the institutions benefit from this situation. It enabled Amando to work pro-actively in relation to the market demand for Serranita which provided him better financial prospects. On the other hand, it provided institutions like INIEA and CIP an (successful) example of how varieties could diffuse among farmers like Amando, which indirectly legitimised their strategy.

We continued our trip by visiting three other farmers. Two farmers were members of an organised group of 40 farmers (*'convenio'*) supported by INIEA in the community of Santa Margarita. The other farmer was member of a *'comité'* of thirty-four farmers in the community of Polloc. These three farmers were much smaller than Amando, having about five hectares of land. The farmers explained to me that potato farming is an expensive business. In comparison with other crops, potatoes need a lot of external input like fertilizers and pesticides. They only produce small amounts of potatoes, half a hectare every year. During the interviews these farmers explained that for them it is not possible to rely only on their potato production, whereas yields regularly fail. Therefore they divided the risk by also cultivating other crops like beans, maize, and wheat, which are as important for them. The collaboration with INIEA had advantages for them, because they receive technical support during the growing season starts and for renewing their seed. In general they renew their seed approximately every two or three years. In between they use their own harvest as seed source. Beside the production of Amarilis, the two farmers from Santa Margarita also produce several clones in collaboration with INIEA. INIEA uses this strategy to evaluate clones on farmers' fields. The farmers lend a piece of their land and manage the crop. In return they receive half of the production and technical support. Participating in this type of experiments can have advantages for farmers, as the example in box 2 describes.

### ***The individual small-scale farmer***

After talking with the above mentioned farmers, I got the impression that INIEA plays an important role in supporting and informing farmers, especially with the introduction of new varieties such as Amarilis. All these farmers mentioned that they received information about Amarilis from INIEA. The explanation given by the farmers were quite similar. This is probably a logical result, whereas the INIEA-engineer introduced me to the farmers he knew. On the way back of this field visit I learned that the described situation of these farmers is not a common one. Along the road, we met a potato farmer who showed me a different situation. This farmer made his living from only two hectares of land, from which half a hectare was allocated to potato production. During the last three years, only his last potato harvest had succeeded; the other two harvests failed because of frost. In contrast with the other farmers, he did not receive any support of institutions or organisations. The farmer had produced Amarilis during the last four years (since 2001). He had first heard of this variety through his neighbours and through brokers active on the market in Cajamarca. He once bought Amarilis for own consumption, and after that he

decided to buy seed to produce Amarilis himself. Nowadays he sells his yield individually on the market in Cajamarca. For information on new varieties, he depends on advice through market brokers and neighbouring farmers.

The difference between this farmer and the farmers collaborating with INIEA lies especially in the availability of information. For the individual farmer, the market and his neighbours are an important source of information. Probably for the other farmers this information source also exists, but there is a certain dependency on expert-knowledge, as they are engaged in activities steered by INIEA. This dependency on expert-knowledge became apparent when one of the farmers told me that he was producing a clone. When I asked him *'which clone'*, he had to ask the engineer from INIEA who responded; *'you are producing various clones'*. Another farmer also explained to me that it is only because of the support of INIEA they produce potatoes; otherwise they probably would not have the opportunity to produce potatoes because of a lack of economic resources.

### **Hierarchical differences**

During the interviews I was amazed about the interaction between the engineer and the farmers. I had asked the engineer to help me conducting the interviews. He interpreted this as him conducting the interviews solo. The interviews got the character of a cross-examination. Several times the engineer did not let the farmer finish his sentence, or he gave suggestive answers to the questions. On the other hand, the farmers also had a certain attitude towards the engineer. When they talked to the engineer they only used his official title *'ingeniero'*<sup>17</sup>, and mostly gave desirable answers to the questions. Later I learned that this type of relations between engineers and farmers is not an exception. During several field visits with engineers in Cajamarca, I experienced these situations more often; a hierarchical and formal relation between engineer and farmers.

### 3.3.2 FIELD VISIT TO PURHUAY

A second field visit was made to the community Purhuay in collaboration with an engineer of SENASA, who introduced me to a *'comité de semillaristas'*. Purhuay is a famous seed producing area, located in the district Cajamarca in the province of Cajamarca. At our way to Purhuay the engineer explained to me more about the work of SENASA. A description of this can found in Box 3.

#### Box 3. SENASA

SENASA (El Servicio Nacional de Sanidad Agraria) is a national agricultural health service which exists since 1992. Just like INIEA, SENASA is a decentralized public institution of Ministry of Agriculture in Peru. SENASA is concerned with inspections and certification in plant- and animal health. Their main

<sup>17</sup> In this context, *'ingeniero'* refers to an academic degree in Agronomic Science. Rural people often refer to *'ingenieros'* as part of an educated class from a higher hierarchical level. *'Técnicos'* refers to a lower hierarchical level and can be seen as those people who carry out the practical work in the fields under supervision of engineers.

activities are registration and regulation of plagues, seed and livestock, but they are also concerned with issues related to animal medicines, animal fodder, and the control of agricultural import- and export products. Seed regulation includes certification of seed (the assurance that the seed is in fact the stated variety) and the certification of the quality (Bentley, *et al.*, 2001). SENASA was created to regulate the general Seed Law which was developed in 1992. The former seed registration system was very weak; there was corruption on seed registration which resulted in the circulation of bad quality seed. This seed ended up in the Highlands where in some regions for the first time disease occurred<sup>18</sup>.

SENASA receives financial support from the World Bank, which means they have more money available in comparison with other agricultural public institutions, such as INIEA.

SENASA's most important activity in relation to this study is the registration of new potato varieties and the certification and control of seed producers. If farmers want to apply for a certification, several controls have to be carried out by SENASA before they can be registered as formal seed producer. Two controls are carried out during the growing season to check the conditions of the soil and plants. After harvesting another control is done on the seed. The quality and sanity of the seed is controlled both in the storage as in the laboratory of SENASA. The storage itself has to meet certain conditions; a certain degree of light diffusion, 30 till 40% humidity, sufficient ventilation, and sufficient distance between the tubers. Besides the registration and certification activities, SENASA also has a programme in relation to potatoes. This integrated potato management programme (*'programa manejo integrado del cultivo de la papa'*) has special attention for virus diseases and bacterial wilt. Activities in this programme consist of training (*capacitaciones*) for farmers focussing on management and prevention of plant diseases. These *'capacitaciones'* are organised both in the office as in the field. In general all interesting farmers can participate. Beside the *'capacitaciones'* SENASA also does exploratory research on plaques and diseases, by visiting farmers' fields randomly.

Along the road we passed several *almacéns*, which are storages for potato seed. The engineer explained that every formal seed producer needs to have a storage, which is controlled by SENASA. Applying for certification is a complex process which requires technical skills. Building an official storages is also quite expensive for most farmers. Therefore many *'comités de semillaristas'* build and finance the storage collectively, with support of institutions. These collective actions are not always sustainable, as the engineer showed me during this field visit. We passed several unused storages which were originally built with the support of some projects described in paragraph 3.2 (e.g. Prosay-project). We saw for example a storage built by Minera Yanacocha; empty and locked. This storage was no longer used by the supported *'comité'* because they had not continued after the project had finished.

In Purhuay I met one member of a *'comité de semillaristas'*. This *'comité'* existed since 1998 and had twelve members. Every three years they renewed seed by buying basic seed from INIEA. This is necessary for them to keep their inscription as certified seed producers. Similar as farmer Amando from La Encañada, this farmer also had heard about Amarilis through the projects of PRONOMACHCS. He

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<sup>18</sup> Personal communication CIP-researcher

decided to continue producing Amarilis because of its commercial potential, especially because PRONOMACHCS was a guaranteed buyer. Unfortunately PRONOMACHCS decreased their activities on potatoes from 2000 onwards. Therefore the 'comite' lost their most important client. Two other important buyers were a regional NGO and 'Minera Yanacocha'. However, the NGO only had bought seed once in 2002 and the mining company only once in 2004. The farmer explained that these institutions were his most important buyers because they buy large amounts of seed and pay premium prices. These institutions know the 'comité' through agricultural radio programmes and through promotion by INIEA.

### ***Farmer's perception on institutional support***

Although this farmer had different connections with institutions and received technical support from INIEA, he was not very positive about these collaborations. He told that he perceives the support as useful, but that the social relations with representatives of these institutions are sometimes problematic. Mostly he had no problems working with the 'técnicos'. Working with the engineers was different, as he explained; *"I do not like to work with those 'ingenieros'...they never have time to really talk with me. No, with the 'técnicos' I have a much better relation"*.

He also explained that institutions failed to help farmers with the marketing of their seed production. Although institutions try to stimulate farmers to become formal seed producers, the majority of the 'comités' I visited in Cajamarca had problems with finding buyers for certified seed. Institutions and NGOs form the most important group of buyers, but there is no guarantee for the farmers that they regularly buy seed. Due to political changes or financial cuts they lack consistency. Farmers explained that they could make a good profit by selling certified seed (twice as much as informal seed), only if there would be a market. It seems that there exists an imbalance between the production and sale of certified seed. The seed system is not self-regulated because too few potato farmers are interested in buying expensive certified seed.

We also met some farmers in Purhuay, who were unknown by the SENASA-engineer. All the farmers I had met till now were very positive about the variety Amarilis. One of them, Rodriguez, had a different opinion. Rodriguez is a potato farmer. He owns a quarter of a hectare for potato production. At the time of the interview (November 2005) he only produced two types of improved potatoes; Canchan and Liberteña. He explained to us that he only had produced Amarilis for one year. He had heard very promising stories about Amarilis, and in 2000 he bought seed to produce Amarilis himself. He explained that he decided to try it once because of the recommendations of a cousin. His cousin was 'semillarista' and produced Amarilis. He recommended this variety because its high-yielding. However, Rodriguez faced problems after harvesting due to 'greening'. For Rodriguez the risks were too high to produce Amarilis again. He is not able to make investments; therefore he hardly tries new varieties.

The experience of this farmer with Amarilis was in contrast with the stories from the farmers I had visited. I realised that visits with institutions give a limited representation of the situation, as I only heard

the 'success' stories about promising farmers who produce this variety. It seems that *'semillaristas'* and potato farmers are facing different kind of problems and use different strategies. Rodriguez for example always exchanges one or two *'arowas'* of seed (bags of potatoes of eleven-and-a-half kg) with his neighbouring farmers during the harvest. He uses his own harvest and the exchanged bags of seed to renew his seed. For Rodriguez this type of exchange is also a strategy to exchange information and to receive new varieties. This requires close relations with neighbouring farmers. Rodriguez explained to me that contact with neighbouring farmers was more important than the contacts with institutions. Although he perceived the information provided by institutions as valuable, the contact is less often and intense.

### ***Distrust towards institutions***

The last farmer I met in Purhuay was a young farmer. Initially, this farmer was not willing to collaborate with an interview. The SENASA-engineer explained to him in better Spanish what the purpose of my research was and assured him that the research was only used for personal purposes. The young farmer finally agreed to participate, but during the interview he barely dared to speak. It seemed that he tried to give the 'right' answer, although the questions were not about right or wrong, but only about what varieties he produced and why he had chosen for them. His answers were very short and the engineer helped him answering the questions on a polite way. After the interview the farmer asked us again what I was going to do with the data. The engineer reassured him again that under no condition the research was going to be used against him. The farmer looked relieved and explained to us that in his community they had been the victim of some misleading propaganda and research of officials making false promises in order to recruit votes during election time. The engineer explained to me that it did happen that they promised a motorcycle or some cattle. Eventually the deceived members of the community lost all their confidence in public institutions.

These negative experiences can have great influence on farmers' perceptions. It seems that personal relations and trust are of great importance in collaborations with farmers. Farmers who distrust institutions are probably not willing to collaborate in organised groups supported by institutions such as INIEA. This also means that they will not benefit from the advantages these collaboration bring. Negative perceptions of farmers can block the exchange of information and products through institutions. Eventually this could have influence on the diffusion of potato varieties.

### 3.3.3 FIELD VISIT WITH 'TÉCNICOS'

In collaboration with the Municipality of Baños del Inca, farmers in the district of Baños del Inca were visited. A description of the municipality can be found in box 4.

#### Box 4. Municipalidad Baños del Inca

Through CIP-researchers contacts were established with the '*Municipalidad Baños del Inca*'. Since some years CIP has a partnership with the municipality through one of its directors. This director previous worked within CARE for a period of fifteen years, where he worked on the dissemination of new varieties. During this period he already maintained a close relation with CIP.

The current partnership with CIP and the municipality consist of financial support for research – for example on '*rancha*' – and testing the cost benefit of participative methods for IPM.

The municipality supports farmers in forestry, agriculture and soil conservation. They provide technical support to farmers and are concerned with the multiplication of seed. They have an alliance with both SENASA (for the quality control) and '*semillaristas*' for the multiplication. They work with hundred-and-twenty families in ten different communities in the district Baños del Inca. The criteria used by the municipality to select farmers and communities, as explained by one of the '*técnicos*', are; control of the soil quality and the selection of 'responsible' farmers. In general they use the following strategy to support farmers: first they select farmers and organise the groups. They contact the authorities of the communities and organise several meetings in which interested families receive information. Eventually they organise the groups and plan the activities. When the planting season starts those groups receive technical support twice a month in controlling diseases, managing the fields, and evaluating the plants. When there is a demand, the municipality organises an extra meeting after harvest on storage of the seed and marketing.

The activities related to the multiplication of seed are done with the variety Amarilis as well as other improved varieties. Recently (2005) they have started with the multiplication of Serranita. Much of their strategy is comparably with that of INIEA.

In collaboration with two '*técnicos*' I have visit the communities Ligliconga and Luichuprucro in the district of Baños del Inca, which are both specialised seed producing areas. Although the municipality has a similar strategy as INIEA to work with organised groups for the multiplication of seed, this field visit went totally different than the more formal organised visits with INIEA and SENASA.

#### ***The importance of friendship-based relations***

On our way to the communities I had a special seat in front of the car next to the driver. The other two '*técnicos*' where sitting in the back. First I addressed the '*técnicos*' as '*ingenieros*', but they immediately explained that they were just simple technicians. Although I could call them by name, they kept on addressing me on a formal way. During the trip I noticed that contact between them and farmers was

different than I was used from the field visits with the engineers. Passing farmers were greeted along the way by making jokes and shouting each others names. They also gave as many farmers as possible a ride, because they knew that there was hardly any public transport in this area. These small examples explained more about the differences between 'técnicos' and 'ingenieros'. It seems that technicians have a closer relation with farmers, due to their practical experiences. One of the 'técnicos' explained for example that he was farmer himself. Together with his father he owns two hectares of land in La Encañada where they produce seed. Furthermore, he had years of experience working with farmers; he had worked for twelve years as 'técnico' for PRONOMACHCS, and since two years he worked for the municipality.

It seems that the relations between technicians and farmers are more friendship-based and less formal. Throughout my research I learned that these are the type of relations farmers appreciate. I have noticed that often there is a big gap between researchers or engineers and farmers, and that it is difficult to understand each others life-worlds. The following two examples represent this gap:

*Before I actually went to Cajamarca to do my research, I consulted several researchers within CIP to prepare myself for the research. Because I did not have any experience doing field research, I asked people for some advice about interviewing farmers. One researcher told me that I could buy some candies to give to the interviewed farmers. During a field visit in Cajamarca, one of the interviewed farmers asked me if I had brought my candies. I apologised and told him that I did not bring anything. He laughed at me and explained to me that he ones received a bag of candies after helping a researcher. This polite gesture had the opposite effect; the farmer felt not being taken serious by the researcher.*

*The second example took place in Ica, the department I went to in relation with my research on the variety UNICA (chapter 4). I spent a full day with a student to visit some farmers. This student was a farmer himself and told me that several times he had helped engineers from institutions with their research or experiment. He explained that some of these field visits were problematic because the researchers did not want to get dirty hands. He even experienced once that a female researcher wore high-heeled shoes. Although it is not their profession to work on the fields, farmers do appreciate it when researchers are more involved or interested in their work.*

### **Farmers' strategies and utilisation of potato production**

In the community of Ligliconga I met farmer Marcos and Daniel. They were both member of the 'comité de conservacionistas de suelas', an organised group supported by PRONOMACHS for protecting the fields from erosion. Marcos had participated in a farmer field school in 2000. These FFS were organised by CARE as part of their activities on IPM. As preparation of the FFS, CARE donated the involved farmers a certain amount of Amarilis seed. His first harvest of Amarilis brought him good results; he had a relatively higher yield in comparison with his other varieties, and Amarilis was very resistant to 'rancho'. Therefore Marcos decided to continue producing Amarilis. Nowadays he produces four

different varieties, Amarilis, Liberteña, INIA 305 (a nameless variety developed by INIEA) and Peruanita, with Amarilis as his main variety. He uses his production for different purposes; he sells 40% of his production, 40% is used for own consumption, and 15% he uses as seed source, and 5% is used for *'papa seca'*<sup>19</sup>. Marcos has different strategies for selling the 40% of his production: 60% of his production he sells on the market of Cajamarca or Baños del Inca. This is the most used strategy for small-scale potato farmers, because it is possible to sell small quantities on these markets. 20% is sold to *'intermediarios'*, who travel around during harvesting time to search for farmers who want to sell their potatoes. The last 20% he exchanges with other farmers in his community for renewing seed. He explains that the community of Ligliconga produces good quality seed. therefore he has is no real need to obtain seed through other channels or localities.

Farmer Daniel explained that he received Amarilis for the first time through local seed sources of neighbouring farmers. Daniel is member of a group of five farmers from his community. The group exists of small-scale farmers, having one or two hectares. They gather once a week to exchange information, and exchanged labour during intensive periods (sowing- and harvesting season), and collectively organise the sell of the potato production. They also bought Amarilis collectively 2000, by selling a part of the production of variety Yungay to other farmers from the community. Using this strategy makes it easier to sell their potatoes for a good price.

The stories of Marcos and Daniel explain more about farmers' strategies without institutions interference. These farmers have different destinations for selling their harvest to spread risks carefully. Within the community there exist farmer driven collaborations to better anticipate on the market.). Marcos and Daniel were not part of an institutional collaboration, and maintain their own network for selling potatoes and obtaining Amarilis seed (*'mayoristas'*, *'intermediaries'*, other farmers). But still, the initial encounter with Amarilis was through the FFS-project with CARE.

### ***Radio as important information source***

Both Marcos and Daniel mentioned the radio as an important source of information. They listen to the radio every day. It seems that the radio is a useful medium to spread information. During my stay in Cajamarca it was very common to see farmers 'accompanied' by their portable radio. Every farmer has one, hanging around their neck on a long cord. An extensionist from INIEA explained that the radio is the most used medium by farmers for obtaining information. Institutions use the radio for propaganda and to make announcements for meetings or workshop for farmers. An extensionist from CARE explained that radios are very important for farmers, especially in remote areas. They do everything by feet and work long days in the field with nobody around. Often the radio is their only company.

### ***The use of institutional connections***

In the afternoon we finally arrived in Luichupucro. In this community I had the opportunity to meet the *'comité de semillaristas'*. This group existed since 1996 and had seven members. In total they had one

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<sup>19</sup> *'Papa seca'* is a dried potato product; see chapter 1.1, section 3

hectare of land which they managed collectively, with Amarilis and INIA 305 as their main varieties. As formal seed producers they initially had bought basic seed from INIEA. Besides those two varieties, they also produced a various clones since the last two years (2004 –2005). They have an institutional collaboration with CIP and the municipality, and receive technical support from the ‘*técnicos*’ during the growing season. The first few years of their existence they were also supported by PRONOMACHCS. Currently, PRONOMACHCS and CIP are their two main buyers, the former in relation to their production of Amarilis and the latter for the clones. Additionally they sell small amounts of seed to other farmers and on the market to have some extra reserves in case they cannot sell their production to the institutions.

The experiences of this ‘*comité*’ from Luichipucro show similarities with the story of farmer Amando (paragraph 4.2.1). They also were involved in different institutional collaboration. Farmers choose for these kind of institutional collaborations to earn a little bit more as institutions are willing to pay a good price. However, they farmers from this ‘*comité*’ also maintain their own network and use different channels to sell their production, in order to spread risks.

#### 3.3.4 FIELDVISIT TO CHOTA AND CUTERVO

The last field visit coordinated in collaboration with institutions was to Chota and Cutervo, two provinces of Cajamarca which are centres of potato production. These provinces rely more on the production of potatoes than the province Cajamarca, as potatoes are the main crop cultivated there. I had organised these field visits very carefully. Most engineers had advised me not to go alone whereas transport facilities in these provinces were limited, and because it might be too difficult for a foreign woman to travel alone. Through CIP I found an independent engineer who was willing to help me. He had a lot of experience working as a facilitator in several of the projects described in paragraph 4.2 (SEINPA, Altura-project, FFS). He offered me to help me with my interviews in return for paying his expenses. This sounded like a very reasonable offer, and we agreed to go to Chota and Cutervo for five days. Two field visits were organised in Chota and Cutervo in collaboration with SENASA in Chota.

##### ***The specialised formal seed producer***

In Chota we visited the community of Chucmar in the district of Tacabamba. Chucmar is well-known for their seed production. Within the community of Chucmar there are several formal ‘*semillaristas*’. The first visit was to farmer Genebrardo, a successful formal seed producer. He has close relations with INIEA Lima. During the interview he explained that he specifically works with INIEA Lima because he had more confidence in this research stations. According to him, they sell better quality seed than INIEA Baños del Inca. He buys in-vitro plants (pre-basic seed) from INIEA, which is rather exceptional for a farmer. He has his own greenhouse, and therefore can produce basic seed. He produced Amarilis since 1992 when it was still a clone. He participated in the SEINPA project which provided him Amarilis clones. With the support of this project he started a ‘*comité*’ with eight other farmers. Since 2003 he also produces new potato variety Serranita, which he also started to produce as a clone provided by INIEA.

To buy his seed, he goes to Lima where he also regularly follows workshops. This distinguishes him from other farmers. Although he has no specific educational background, he operates like an agricultural specialist by growing in-vitro plants and making regular trips to Lima. Within the community he has the reputation being a successful '*semillarista*'. This became apparent during the conversation Genebrardo had with the two engineers who accompanied me. They saw him as an progressive farmer and during the conversation there were no hierarchical differences from both sides.

### ***Access to quality seed through farmer diffusion***

His good reputation also became apparent when we talked with his neighbour Norbl. This farmer had less area and produces three different varieties; Amarilis, Yungay and Serranita. This farmer had obtained Amarilis for the first time through Genebrardo. Recently, he also produced the new variety Serranita. He had obtained one sac of Serranita in 2004 as payment for his labour. The interview with Norbl went totally different than with Genebrardo. During the conversation he repeated many times that he did not receive any support from institutions. All the support went to the more successful farmers, like his neighbour Genebrardo. He explained that "*a poor farmer like him*", is not in the position to receive any support. According to him, farmers need to have a certain income to make investments and to participate in workshops. All workshops and trainings are organised by institutions in Chota and are not for free. He cannot invest in new seed, external input, and spending days in Chota paying for workshops. The engineer from SENASA reacted a bit annoyed afterwards, and explained to me that some farmers always complain about their situation, especially in the presence of representatives of institutions. But he also admitted that participating in trainings is not for free, and that its true that small-scale farmers living in remote areas, do not attend those trainings. In general, institutional support goes to organised, responsible farmers, who have a certain size of area at altitudes above 3000m. According to this engineer this is a logical strategy, otherwise effort and money from institutions is wasted. In contrast with his critics on the institutions, Norbl idealised his relation with Genebrardo who he sees as an expert: "*At least they help us*". He explained that when he has difficulties with plagues or diseases, he always consulted his neighbour. Through his neighbour, Norbl also has access to new varieties. According to him, institutions should increase the access to good quality seed to other farmers than only '*semillaristas*'.

### ***Small distances, big differences***

Although Genebrardo and Norbl live next to each other, they are both different farmers. Norbl sells about 80% of his production of Amarilis to '*intermediarios*', who pass the community two times a week. For him this is a costume and a safe way of selling his potatoes, as he has a long-term relationship with these '*intermediarios*', built on trust that comes from working together for many years.

Genebrardo is a successful, progressive farmer, who operates mainly in the formal sector. His main buyers are public institutions and NGOs which all come to his field to buy seed. On the other hand, he also sells small amounts to his neighbouring farmers, which becomes clear from the story of Norbl. This means that although Genebrardo operated mainly in the formal sector, he still maintained some connections within the informal sector. Norbl on the other hand, operates mainly in the informal sector

with *'intermediarios'* as his main buyers. However, he maintains connections with the formal system through his relationship with Genebrardo. It seems that Norbl takes advantage from the connections his neighbour has with institutions: Exchange of knowledge and diffusion of new varieties does exist between the farmers who both operate in different networks.

### ***Focus on institutions***

The next day a field visit to interview farmers from Cutervo. However, this day went different than I had expected. The SENASA-engineer had contacted his colleague in Cutervo to organise this day in Cutervo for us. I was exciting to go there as many engineers had explained that Cutervo is an important potato producing area. When we arrived at the SENASA-office in Cutervo, the local SENASA-engineer had organised a full schedule of meetings with officials of different agricultural institutions. After these meetings a big lunch was organised in a famous restaurant with traditional food. After the lunch, there was no time left to actually interview farmers. Most interesting about this lunch was the payment. When we were about to leave, nobody took care of the note, from which I drew the conclusion that I had to pay for the whole lunch. This explained more about the financial position of public institutions and their officials. I also had the impression that my relation with CIP resulted in this formally arranged situation and financial expectations. The focus of this day was mainly on the institutions themselves.

### 3.3.5 THE ENTREPRENEURIAL SEED PRODUCER

One of the few meetings I did individually in Cajamarca, was the visit to Ingeniera Erminia. Erminia is one of the few individual large female seed producers in Cajamarca. A description of the career of this woman can be found in box 5.

#### Box 5. The entrepreneurial seed producer

Ingeniera Erminia is a formal seed producer. She lives in the community of Chilacat in the district Namora, located in the province of La Encañada. She lives together with her elderly mother on the family farm. Erminia started her career as agricultural engineer working for INIEA. First, she worked for INIEA Huánuco experimental station. During the 1980s and 1990s she was actively involved in the pre-selection of Amarilis and Canchan<sup>20</sup> in Huánuco in collaboration with CIP. Later she conducted research on *'rancho'* in Cajamarca. During those years she built up a close relation with CIP. According to CIP-researchers, Erminia was very devoted to her work, and innovative in developing new techniques and experiments. During her career in Huánuco for example, she developed a successful fertilising technique *'Huano Gallina'* which is useful in low production zones. In general these zones are more susceptible for diseases due to climatologic conditions. This technique could considerable decrease costs for fertilisers. In the beginning of the 1990, she started working for INIEA Baños del Inca in Cajamarca. In Cajamarca she combined her work as engineer with informal seed production on a local level. She also shared her expert-knowledge within her own community, by

<sup>20</sup> Canchan is a high-yielding, *'rancho'*-resistant variety, released in 1990

applying her developed technique '*Huano Gallina*'. Introducing this new technique resulted in the improvement of potato farming in Chilacat. Erminia explained that before 1993 there was hardly any potato production in Chilacat because the community is located in a lower area where conditions are unfavourable for producing potatoes. Nowadays all farmers in the community are producing potatoes. Erminia expanded her seed producing activities after she stopped working for INIEA due to personal conflicts. As people explained to me, her success led to tensions under colleagues. After a political change a new director took control, rumours were spread and she got fired. Eventually in 2000 Erminia became formal seed producer.

Erminia is a different type of '*semillarista*' than I met during my fieldwork in Cajamarca. She has an academic background and years of experience working within INIEA. This position gave her access to knowledge, new information and seed.

She started to produce variety Amarilis since 1998. Of course she already knew the variety as she had worked extensively with Amarilis during her career at INIEA. In 1998 she had the opportunity to buy high quality seed from INIEA to start producing certified seed. She explained that during this period the prices for basic seed were lower. Figure 12 shows her formal seed production of the variety Amarilis.

She first made investments in buying basic seed from INIEA during the first three years. This seed was used for multiplication. From 2000 onwards she started to sell seed as official formal seed producer, registered by SENASA.

Through the years she expanded in area and quantity. Figure 12 also shows that the quantity of produced seed decreases through the years. In 2004 only 20% of the total production could be sold as seed, in comparison with 30% till almost 50% in 2002. This was the result of the decrease of quality.

Formal seed production Amarilis	Purchase basic seed INIA	Quantity planted seed	Hectares	Total production	Produced quantity seed	Quality seed
1998	800kg 1.000kg					
1999	1.000kg					
2000	1.000kg		2,0 ha 2,0 ha		45.000kg 20.000kg	Registered Certified
2001		6.000kg	3,5 ha		85.000kg	Registered
2002		7.000kg 7.000kg 1.500kg	2,0ha 2,0ha 0,8ha	40.000kg 60.000kg 25.500kg	18.000kg 20.000kg 12.000kg	Registered Certified Registered
2003		12.000kg 8.000kg 6.000kg	4,0ha 2,5ha 1,5ha		20.000kg 18.000kg	Registered Registered Registered
2004		35.000kg	16ha	80.000kg	16.000kg	Certified

Figure 12. Seed production of formal seed producer

Initially she had selected Amarilis for its resistance to '*rancha*' and its earliness. However, she explained that Amarilis is becoming more sensitive for '*rancha*' since the last few years. Also market accessibility and low prices makes the variety less attractive.

She has different kinds of clients who buy seed from her; farmers from her region, CARE, a NGO's from Piura (a coastal city in the North of Peru), PRONOMACHCS, municipalities, and Minera Yanacocha. For example in the case of PRONOMACHCS, she only sells small quantities. The local farmers are her principal buyers. She explains that both types of clients are important. Although farmers are her main buyers, she can only sell for low prices (0,40sl per kg); otherwise farmers would not buy her seed. On

the other hand, institutions like PRONOMACHCS buy small quantities, but pay a good price (1,00sl per kg). She explains that she does not have to promote her seed to farmers from her locality, as they can observe the quality of her production and the conditions of her fields themselves. For her regional clients, for example the NGO from Piura, she has to promote her seed by sending proposals and information.

Erminia still maintains contact with CIP. Information provided by CIP is important sources for her. On the other hand, information provided by INIEA (what varieties are sold, what quality, which prices) is important to anticipate in buying seed. This type of information differs from the information sources the other farmers involved in this study used. As she explained, she does not have to depend on expert-knowledge. According to her, radio programmes from the institutions are an important source for farmers, as this is more accessible for the majority of farmers. Also '*charlas*' is another important medium. '*Charlas*' can be seen as conversations or small lectures for farmers. In these '*charlas*' technicians or engineers from institutions provide information, give promotion or council.

Since 2002 Erminia also produces Serranita. She explained that only she and farmers who participated in the experiments of INEA and CIP had access to this variety. She started to produce Serranita at the time it was still a clone. She found the sprouts of this clone which were thrown away. She took some waste material from INIEA and started to multiply them at her farm in Chilacat. During her last campaign (2004) she already had produced 30.000kg Serranita. From the total production, 90% can be used as seed, while it is new material. She already sells small amounts to local farmers. At this moment she is waiting for a market for Serranita to start selling high quality seed.

Erminia works individually and has a different background as most seed producers I met in Cajamarca. Therefore it seems difficult to place her under one of the two described networks. She is a formal seed producer and therefore falls under the formal system. She partly operates in this institutionally driven network as she was member of this network herself which also provided her the contacts with different institutions. She was forced to change her position from an 'expert' to a seed producer. She is still an expert, as she has introduced a valuable technique within her community and sells a newly introduced variety which is only accessible for insiders. She also uses a slightly different strategy than which is generally used by the institutions. Because she has started her seed company individually without any support from institutions, she developed her own strategy. She has the same type of clients as the institutionally supported '*comités de semillaristas*'. But it seems that she is less dependent on only this group. Her principal buyers are local farmers. Although she sells her seed for lower prices, she acknowledges this group as the most important clients to focus on. This creates better links with the majority of potato farmers who operate in the informal system.

### 3.5 ANALYSIS AND CONCLUSIONS

In this chapter I have described different actors who were involved in activities related to the production of the variety Amarilis. In the first part of this chapter I described the social career of Amarilis, by giving a detailed description of strategies and activities of the involved institutional actors. In the second part of this chapter (paragraph 3.3) I have described my field experiences. These experiences explain more about the social relations between the involved institutions and farmers, exchange processes and strategies they used. Also experiences of farmers with no institutional collaborations were described. The aim of this last paragraph is to structure the described information of the previous paragraphs, and to analyse the most important findings followed by the conclusions.

#### ***The variety and its users***

Variety Amarilis can be found on practically every market in Cajamarca. It is the most popular in this department and can be found on practically every market. The majority of potato farmers produce this variety. During fieldwork, the following types of farmers could be identified; organised seed producers, potato producers, and the entrepreneurial seed producer.

The organised seed producers are supported by formal institutions, and are located in areas optimal for seed production. The farmers involved in this research were collaborating with institutions such as PRONOMACHCS, INIEA, the Municipality, CARE, and etcetera. These farmers were selected and organised by these institutions as formal seed producers. Due to the institutional selection criteria, it is unlikely that individual, remote farmers are selected to participate in these institutional collaborations. The farmers obtain their seed through INIEA. During production, they are controlled on quality and sanity by SENASA. Their main clients are institutional buyers. These institutional collaborations are defined as an institutionally driven network.

During fieldwork I also met potato farmers who were not involved in institutional collaborations. They operate mainly through the informal system. These farmers make use of different strategies than the formal seed producers. They have other channels for obtaining seed and to sell their production.

'*Intermediarios*', neighbouring farmers, and market places, were important seed- and information sources for these farmers. Although most potato farmers I met worked individually, also farmer-driven collaboration could be recognised, where small-scale farmers organised themselves in groups (see paragraph 3.3.3) in order to better anticipate on the market.

It seems that the potato farmers maintain little relations with the organised seed producers. Both potato farmers and organised seed producers operate in different networks, with the use of different seed sources, information sources and buyers.

The third type of farmer is the entrepreneurial seed producer as described in paragraph 3.3.5. This producer worked individually as a formal seed producer, and is registered and controlled by SENASA. Although she operates through the formal system, she is not depending on an institutional collaboration and fully embedded in the institutionally driven network. She has developed her own network of clients,

both local farmers as institutional buyers. Her independent position creates room for manoeuvre to operate in both the formal and the informal system.

**Role of institutions**

Due to the institutional uptake of Amarilis after its release (1993), the variety got widely spread in Cajamarca. Amarilis was used in many different projects (improving formal seed production, Farmer Field schools, IPM, etcetera). Many of these projects (see paragraph 3.2) used similar strategies. Due to these similarities, the variety did spread widely, but only among certain types of farmers. They all focused on organising groups of seed producers to stimulate the production of formal seed. This has created a formal market system in which the institutions provide and buy the seed, and the organised groups of farmers are responsible for the supply of formal seed. One example is the alliance between INIEA, PRONOMACHCS and SENASA; INIEA sells quality seed, PRONOMACHCS support organised seed producers to buy and produce certified seed. SENASA is responsible for the certification process and controlling the seed producers. Subsequently, PRONOMACHCS buys seed from organised seed producers, to use it for their project activities and for selling it to potato farmers. Mainly public institutions and NGOs are buyers of certified seed. Therefore the majority of farmers, who operate outside the institutionally driven network, are not directly addressed through these projects.

**Individual actors**

Within the institutionally driven network, the focus was on producing high-quality seed and improving the formal system. Few linkages could be discovered between the organised seed producers and potato farmers outside this institutionally driven network, as the institutional structure of the network is not allows informal diffusion. However, during fieldwork it became apparent that within these institutionally driven network, also farmer-to-farmer diffusion took place. The example of Genebrardo and Norbl (paragraph 4.3.4) showed how farmers, who are member of such network, exchanged or sold new varieties to neighbouring farmers. Figure 13 represents the connections between the members of the network, and the fluid character of the exchanges with farmers outside the network.

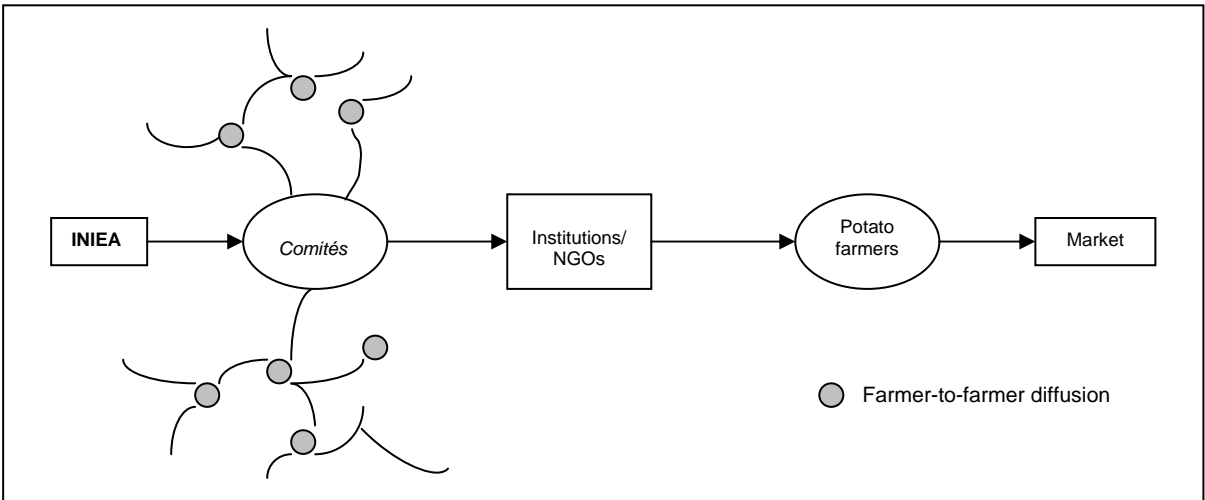


Figure 13. Vertical structure of the institutionally driven network, and farmer-to-farmer diffusion

Despite the vertical structure of the network, formal seed producers do not limit themselves to work only in the formal system. The part of their productions which cannot be sold within the formal system is used for other purposes within the informal system (selling to/ exchanging with neighbouring farmers, selling on local markets).

### ***Social relations within the network***

Within the institutionally driven network, the social relations between the farmers and institutions are less personal and infrequent. These relations can be characterised as weak ties (Granovetter, 1973). The advantage of weak ties is that it provides access to new knowledge and information. The involved farmers can profit from these relations, as it can open up new economic resources. This can be explained by the example of farmer Amando (paragraph 3.3.1, box 2). Due to his involvement in an institutionally driven network, this farmer participated in several experiments on new clones. This gave him the opportunity to work pro-actively on the market.

Although the social relations within the institutionally driven network are defined as weak ties, they are also hierarchical oriented. Due to the hierarchical structure of the network, representatives of the institutions are seen as the experts, and the farmers are dependent on expert-knowledge. Despite the advantages for farmers to have access to expert-knowledge and new varieties, it does create a certain dependency.

### ***Information flows***

As explained above, weak ties in institutionally driven networks can provide access to new information or varieties. However, during fieldwork many farmers explained to me that they first had heard about variety Amarilis through neighbouring farmers or family members. Exchanging experiences and observing and learning from each other, finally results in making the decisions to start producing Amarilis, or to participate in an institutional collaboration. This means that both weak relations, as strong personal relations contribute to farmers' decisions and strategies.

## **CONCLUSIONS**

Based on my analysis I discovered that diffusion is a multi-faceted and multi-dimensional process. Diffusion requires multiple strategies and takes place on different moments. Therefore the concept diffusion needs to be reconstructed. In stead of a linear process, diffusion should be seen as the result of interactions between actors within different networks. Both formal and informal ways of diffusion contribute to a wide spread of newly introduced varieties in Cajamarca. By using diffusion strategies as a linear approach, only a small part of the great diversity among farmers will be addressed.

It seems that the formal seed sector in Cajamarca is maintained through a network of institutions and organisations. The main buyers on the formal seed market are institutions and NGOs. A small percentage of commercial farmers also have a share on this market, but the big majority of farmers

have other channels for buying seed. Therefore the formal seed system is not self-regulated. Formal seed producers are depending on institutional buyers. During the fieldwork it became apparent that the institutional clients are not guaranteed buyers, although they pay premium prices. The farmers who participate in these institutional collaborations are depending on external input (quality seed, fertilisers, specialised techniques). The institutional 'experts' occupy the central position within these collaborations. This creates a certain dependency on institutions in relation to knowledge and market accessibility.

Organised groups of seed producers within the institutionally driven network are mainly linked to institutional actors. Only few linkages exist with potato farmers. However, farmer-to-farmer diffusion takes place within all networks, both within the institutionally driven network as well as in the informal network. These interactions between farmers are the result of farmer driven initiatives. These initiatives are important for linking the institutionally driven network and the informal network. In these linkages lie big opportunities for more successful diffusion of potato varieties. However, this opportunity is currently not utilised by the institutions, mainly because strengthening these linkages is not part of their institutional strategy.

## CHAPTER 4. UNICA; 'THE POTATO VARIETY THAT SPREAD ITSELF'

The title of this chapter derives from a quote of a CIP-engineer who had been actively involved in the evaluation and promotion of the variety UNICA on the Coast. In the case of UNICA, the variety was not promoted by the national research centres (INIEA). Therefore this engineer believed that the spread of UNICA, without the interference of the public institutions, was the result of the quality of the variety itself.

UNICA has been released in 1998, and is mainly produced on the Coast of Peru. Potato production on the Coast has led to the emergence of seed production in the Andes. In order to study the circulation of this variety, both areas are included in this case study.

Therefore, research locations were selected in the departments Junín and Ica (see figure 14). Seed producers and potato farmers were interviewed to study the circulation of this variety. In contrast with the research of the variety Amarilis (chapter 4), farmers were visited individually. Farmers involved in the production of the variety UNICA were mostly commercial farmers. This gave me the opportunity to explore a network of large, commercial farmers who operate individually. Twelve different farmers, both in the Andes and on the Coast, were selected to learn more about the circulation of this variety.

In the following paragraphs the characteristics and the social career of the variety UNICA will be described, followed by my field experiences. The field experiences will explain more about the type of farmers involved in the production of UNICA. The last paragraph will describe the analysis and conclusions.



Figure 14. Geographical map research locations Junín and Coastal areas

### 4.1 THE VARIETY UNICA

UNICA is a red skinned potato variety with white flesh. The variety was released in 1998 and officially registered by SENASA in 2004. One of UNICA's most important characteristics is its tolerance to drought and heat, which makes it an appropriate variety for the coastal areas. One of the big advantages of UNICA is that it has a very short cultivation period (90 days), which permits more campaigns in one year. UNICA can be seen as a processing variety, and is mainly used to supply the fast growing market of 'pollerias' (chips and chicken restaurants). UNICA is selected and evaluated by twenty different localities during a period of seven years (Gutiérrez *et al.*, 2005). During this period CIP,

the University of Ica<sup>21</sup>, a technical institute from Nazca<sup>22</sup>, and a farmers' association from Nazca<sup>23</sup> took actively part in these research activities. CIP was responsible for providing genetic material to the University of Ica, and was involved in the promotion and evaluation of the variety on different locations. The University was responsible for selecting this variety in collaboration with the farmers' association. The technical institute was involved in supporting farmers who wanted to become formal potato producers (registered in the National Register of SENASA). In relation to the selection of UNICA, this institute had a supporting role by financing the farmers' association.



Figure 15. Variety UNICA on a market in Huancayo

The initial clone was selected for its resistance to potato virus Y, potato virus X, and potato leaf roll virus<sup>24</sup>, Root Knot Nematode<sup>25</sup>, and its adaptability to dry and warm climates. Especially its virus-resistance and tolerance to heat were important reasons for CIP to select this variety, because it could have considerable impact on the Coast. UNICA's tolerance to heat is for example under the circumstances of the phenomena '*El Niño*'<sup>26</sup>. In contrast with the traditional improved varieties (Tomas, Perricholi, Canchan) produced on the Coast, UNICA can cope with increased temperatures under these circumstances.

#### 4.2 THE SOCIAL CAREER OF UNICA

The first evaluations of UNICA were done at the experimental stations of CIP, followed by evaluations on several locations on the Peruvian Coast (Virú, Ravine, Canete, Ica, Nasca, Majes, Tacna). The final selection of the variety was done in Ica and Nazca in collaboration with farmers and the University. UNICA was released by the University of Ica in 1998. In 2005 the variety was officially registered by SENASA. The selection of UNICA was realised without the involvement of INIEA because of a limited interest. Normally INIEA is responsible for gathering the selection data of new clones in order to register it within SENASA. In the case of UNICA, the University of Ica and CIP played the most important role in

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<sup>21</sup> Universidad Nacional 'San Luis Gonzaga' de Ica

<sup>22</sup> Instituto tecnológico Nazca

<sup>23</sup> La asociación de productores de agropecuarios' de Nazca

<sup>24</sup> potato virus Y (PVY), potato virus X (PVX), and potato leaf roll virus (PLRV) are the three most common potato viruses and are responsible for significant crop losses ([www.cipotato.org](http://www.cipotato.org))

<sup>25</sup> Root Knot Nematode (RKN) is a plant-parasite. They exist in soil in areas with hot climates or short winters. Root-knot nematode larva infects plant roots causing the development of root-knot galls that drain the plant's photosynthate and nutrients. (source [wikipedia.org/wiki/Root-knot\\_nematode](http://wikipedia.org/wiki/Root-knot_nematode))

<sup>26</sup> Phenomena '*El Niño*'; The term El Niño (Spanish for "the Christ Child") was originally used by fishermen along the Coasts of Ecuador and Peru to refer to a warm ocean current that typically appears around Christmastime and lasts for several months. El Niño is a disruption of the ocean-atmosphere system in the Tropical Pacific having important consequences for weather and climate around the globe (source <http://www.elnino.noaa.gov>).

selecting the clone. CIP took over the role as the responsible party for gathering the selection data, in order to officially register the variety.

The University of Ica was responsible for the final selections of the variety. The University and CIP have a partnership which already exists that goes back more than twenty years. Initially the University had approached CIP for testing and evaluating CIP-material as part of their educational curricula. During this partnership several clones were tested on drought- and heat tolerance. For the University, these tests were important teaching activities, projects for thesis-students and agricultural projects for farmers. As part of thesis-projects of students from the University, clones were tested and evaluated in collaboration with coastal farmers. In the case of UNICA, the clone was selected with farmers' association from Nazca. The involved farmers were automatically the first producers of the new clone.

After the release in 1998, the variety was promoted by CIP to farmers in the Andes to initiate the seed production. The multiplication of UNICA seed was coordinated by CIP. First seed was produced from in-vitro plants at the experimental stations of CIP. After this multiplication, seed was given to some farmers in Andahuaylas, where it was produced and distributed to farmers in Huasahuasi. These two places became important areas for the seed production for the coastal farmers from Ica and Nazca. As part of the promotion, UNICA was also introduced to some farmers in the Mantaro Valley by a CIP-engineer. Seed was given to a successful farmer, which resulted in a spread among Mantaro Valley farmers.

After the introduction in the Andes, the interest and demand for UNICA grew among farmers. The farmers involved in the multiplication activities started selling seed to neighbouring farmers. This became particularly apparent during field visits to Huasahuasi (paragraph 4.3.3). Eventually, INIEA also started to multiply UNICA for the sale of certified seed. Although they had not been involved in the selection and promotion of this variety, growing demand for UNICA among farmers made INIEA decide to start multiply UNICA themselves from 2000 onwards.

The most important market for UNICA is the processing industry. As already mentioned (paragraph 4.1) UNICA is used as processing variety for '*pollerías*'. The processing companies who supply to '*pollerías*' are constantly searching for appropriate potato varieties with a low percentage of discard. UNICA has a relatively large tuber size, and therefore only 15% till 20% of the tuber is lost after processing. After release, UNICA was offered on the Lima wholesale market. The variety was soon discovered by the processing companies because of its large tuber size. In this case the variety promoted itself on the market due to its characteristics<sup>27</sup>.

#### 4.3 LEARNING FROM THE FIELD

Different research locations were selected in collaboration with CIP and INIEA. One CIP-engineer, who had been actively involved in the selection of UNICA, had provided me a list with several coastal areas

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<sup>27</sup> Gutiérrez, electronic mail communication

where the variety UNICA was produced. Through an INIEA-engineer, several farmers in the Mantaro Valley were contacted. In the following paragraphs four different situations of UNICA-producers are described. The first paragraph describes farmers from the Mantaro Valley farmers who are involved in commercial potato farming and produce for the Lima wholesale market. The second and third paragraphs explain more about UNICA seed producers in Jauja and Huasahuasi, both well-known seed producing area. The fourth paragraph explains more about the coastal potato farmers from the department Ica.

#### 4.3.1 THE MANTARO VALLEY FARMERS

My field visits in the Mantaro valley were coordinated in collaboration with INIEA Santa Anna (headquarters of the national potato programme). Because of the recent involvement (2000) of INIEA in the multiplication and sale of certified UNICA seed, they could provide me a list of UNICA-producers in the Mantaro Valley. Five different farmers from the districts Sicaya, Chupaca, and San Pedro de Saño were interviewed. These farmers can be seen as large, commercial farmers, having between twenty till fifty hectares of land. All five farmers had potato fields both in higher and low zones of the Mantaro Valley. The fields in the higher zones were used for the production of seed (both for selling and as seed source for their fields in the lower zones). The fields in the low zones were used for the production of potatoes. The farmers had indicated that they had received UNICA seed for the first time through seed producers from Jauja. Some of the farmers mentioned that these seed producers belong to their circle of friends. They all had connections with INIEA. Regularly they renew their seed with high-quality seed from INIEA, to maintain a high productivity. For selling their production, they are connected to the Lima wholesale market, mostly through *'intermediarios'* from Lima. The farmers were the only UNICA-producers in there region. In the next sections, the narratives of two of the interviewed farmers are described.

##### ***The commercial UNICA-producer***

In Chupaca I met farmer Juan. Together with his son he runs a big farm with more than thirty hectares. They produce potatoes, carrots, flowers, unions, and beans. About eighteen hectares are allocated to the production of potato varieties Canchan, Perricholi, and UNICA. When I arrived, a big group of women who worked for them were just selecting a big mound of harvested UNICA. The father and son had about fifteen employees working for them.

They were the only farmers from this who produce the variety UNICA. Juan explained that: *"Other farmers from this region do not know UNICA because it is no a regular produced variety"*. Juan produced UNICA since 2002. He had heard about the variety through a friend from Jauja. This friend had produced twenty-five tons per hectare, which is a lot for the Andean region. Therefore they decided to also start producing this variety. He sells his production directly to *'intermediarios'* from Lima. Every year he buys basic seed from INIEA in order to maintain a high production. He produces an average of 30.000 kg UNICA per hectare, which he can sell for approximately one sole per kg (which is about \$ 0,30). He explained that this is not always the case. Last year (2004) he only could sell his potato

production for 0,15 soles. Juan explained that he obtains information about new varieties from INIEA, because he buys his seed there. More detailed information about production, cultivation, and experiences with varieties, he exchanged with his friends. Most of his friends are private agricultural engineers. He also explained that most of his children had studied at the University of Huancayo. Furthermore, the wife of his son was agricultural engineer working for INIEA.

### ***Dualism among farmers***

After the interview with farmer Juan, I walked through the fields back to the main road, where I passed a neighbouring farmer who was working on his fields. The conversation with this farmer showed me a different reality of the Mantaro Valley. This farmer only had two hectares of land, on which he cultivated the potato varieties Perricholi and Yungay. He sells his production directly on the market on Huancayo. He mentioned that he knew his neighbour (farmer Juan) well. He sometimes visited him to ask him advice about farm practices. However, from this conversation it became clear that this farmer never had heard about the variety UNICA, nor did not know that his neighbour produced this variety.

The narrative of farmer Juan and his neighbour explains more about the contrasting situation in the Mantaro Valley. Farmers like Juan, are more commercial farmers and operate on the Lima wholesale market. These farmers only try new varieties when they know it has commercial value. His neighbour belongs to a group of small-scale farmers. This neighbour only produced two of the most common potato varieties in the Mantaro Valley, with a guaranteed market for these varieties at the local and regional level. However, he does not have any connection with the Lima market. He sees farmer Juan as the successful farmer, who he ask for advice. The situations suggest that the commercial large farmer has a more central position; he obtains information either from INIEA or from his network of educated farmers. The small-scale farmer clearly does not operate within the same circles, and has limited access to expert-knowledge.

### ***Large farmer with institutional partners***

In the district of San Pedro de Saño, in the province of Huancayo, I met farmer Theodori. Theodori has more than fifty hectares of land. He practiced different branches in agriculture; he had fields in different areas allocated to grassland, forestry and agriculture and cattle breeding. Potato production is his most important activity. Approximately eighteen hectares were allocated to potato production, and his main varieties were Canchan and UNICA. He could realise two campaigns in a year; from August till January a small campaign, and from October till April a big campaign. During the sowing and harvesting seasons he has approximately nine people per hectare working for him. He explained that he ha potato fields in different regions for the production of seed, consumption potatoes, and '*papa seca*'. In San Pedro de Saño he produced consumption potatoes and '*papa seca*', and in the higher zones (3650 meters) he produced UNICA- and Canchan-seed. For the processing of '*papa seca*' he used the variety Yungay. During the Andean 'off-season' he hires fields on different locations on the Coast, to produce consumption potatoes. He uses this diversified strategy to spread risks. He started to produce UNICA in

2001. He explained that he had received clones through CIP. He decided to start producing this variety because of its earliness, and the growing demand from the processing industry.

He has both institutional clients as farmers who buy his seed. He sells to some NGOs and PRONOMACHCS. He was brought in contact with these institutions through INIEA. The farmers who buy his seed are mostly potato farmers from the Coast (Huaral, Barranca, Nazca), who visit him around harvest time. Additionally, he sometimes also sells to 'comisionistas' from Huancayo. These are commission agents who work for 'mayoristas' in Huancayo. They search for seed producers who want to sell a part of their production. These persons receive a small commission (about 0,04 soles per kg). He makes use of different seed sources. Every year he buys a small quantity of basis seed from INIEA. He also makes use of his own seed sources from his fields located in the higher zones of the Mantaro Valley. In cases of shortage, he buys seed from other seed producers in the region.

Although buys and produces certified seed himself, he explained that the majority of farmers in the region are not interested in buying seed from INIEA. According to him, the organisation of the formal seed system has caused a lot of problems in the past. He gave the example that uncertified seed was sold and distributed through the formal seed system. This resulted in distrust among farmers.

#### ***Lack of information exchange among farmers***

According to Theodori, there is a lack of information exchange between farmers in the Mantaro Valley. He thinks that the great difference between farmers restricts the exchange information and knowledge among farmers. In the past there used to be different kind of collaborations between farmers. However, the increased commercialisation and mechanisation of agriculture decreased the need to collaborate. He explained that he had organised a 'learning-group' with four – similar type of – farmers. They regularly organise meetings to talk about production, pest management, and potato prices. Theodosi also visits workshops organised by INIEA. He explains that these workshops are open for all farmers, but only a minority of farmers, mostly only large, commercial farmers, visits these workshops. He indicates that many farmers are not well informed about new potato varieties. He gives the example of the variety UNICA. The majority of the farmers from this region do not know this variety. He knew about this variety due to his contacts with CIP.

The narratives of farmer Juan and Theodori shows that variety UNICA is produced by large, commercial farmers from the Mantaro Valley. Both Juan and Theodori have a network of educated friends or farmers around them for exchanging information. They are also connected to INIEA and other institutions. Although these connections gave them access to certified seed and new varieties, the farmers mentioned that they were not depending on this access. One farmer explained it as follows; *"We already have the knowledge ...I am educated myself so I do not really need the support of institutions"*.

#### 4.3.2 THE SEED PRODUCERS FROM JAUJA

Some of the interviewed farmers from the Mantaro Valley had indicated that they obtained UNICA for the first time through seed producers from Jauja. This paragraph describes my field visit to Jauja (see figure 14), where I interviewed two different types of seed producers; a commercial seed producer and two members of a *'comité de agropequarios'*, an organised group of seed producers. These cases represent two different strategies of UNICA seed producers.

##### ***The commercial seed producer***

In Jauja I met Rosales, the largest seed producer of the Mantaro region. This seed producer has more than hundred hectares allocated to potato production. The meeting with Mr. Rosales already gave me an impression of what type of farmer he was, as he arrived in his big pick-up. A description of Rosales can be found in box 6.

##### Box 6. The commercial seed producer

Rosales is the largest seed producer of the region. Besides his seed production, he also produces twenty hectares of quinoa, owns a citrus plantations in the Selva, and a transport company. He uses his hundred hectares for both the production of seed and potatoes. He owns about thirty hectares near to Concepcion (see figure 14). The other eighty hectares he hires in the high zones of Jauja for seed production, and in Barranca on the Coast for potato production.

He produces four different potato varieties; sixty ha Canchan, twenty-five ha Perricholi, eight ha UNICA, and eight ha Yungay. He had chosen these varieties for their commercial potential. He started to produce UNICA four years ago. He thinks that this variety will gradually take over the position of Canchan and Perricholi. He had buys seed from the *'comité de agropequarios'* in Jauja. Furthermore, he received seed through the University of Huancayo. He explained that he has an agreement with the University through the contacts of his sons who are students on this University. He collaborates with the *comité'* because they formally produce high-quality seed. For him it is important to use certified seed, in order to produce a high yield. He sells his seed production to farmers from the Coast (Barranca), Huánuco, and Huancayo. He also sells small quantities to *'intermediarios'* and to PRONOMACHCS. He explained that he is not very fond of selling to PRONOMACHCS because they pay two or three months after delivering. For selling his seed he organises an annual *'día del campo'* for farmers from the Coast. A group of approximately twenty farmers visit this day to buy seed. He sells his coastal production of potatoes directly to *'mayoristas'* from the Lima wholesale market. He keeps up to date about new information about varieties through his contacts with the *'comité'*, the University and his friend who works for INIEA.

This case represents the strategy of a large commercial seed producer. He maintains the quality of his seed by buying registered seed from the formal *'comité'* in Jauja. He is able to spread risks by rotating

his fields in the higher zones of the Mantaro Valley, and by hiring fields on the Coast for the production of consumption potatoes.

### ***The 'Comité de Agropequarios'***

The second farmer I met in Jauja was farmer Leoncio. He was very enthusiastic to help me with an interview, and showed me his fields in the high zones of Jauja with his tractor. Leoncio is member of the '*comité de agropequarios*' in Jauja, a group of twenty-five organised seed producers. The '*comité*' exists since 1989. Leoncio explained that there used to be about eight-hundred '*comités*' in Junín, but since the process of liberalisation (chapter 3.1), introduced by the Fujimori government from 1990 onwards there is hardly anything left of these farmers' networks, as the access to credits disappeared. Farmers started to work individually after the commercialisation of the agricultural market (lower market prices), which led to increased competition among farmers. This group was one of the only two '*comités*' in the department Junín who had survived these agricultural developments. Collaborating in a '*comité*' brought Leoncio several advantages. They collectively buy high-quality seed and high-input products (fertilisers, pesticides, and etcetera) in large quantities, which is much cheaper. They also produce seed for processing companies and sell collectively to farmers from the Coast. Every week all members come together on Sundays to discuss about their farm practices and collective activities. They regularly invite a weather expert to discuss about water management, which is an important issue in the high zones of Jauja. Leoncio explained that "*they are stronger together and have easier access to information, support, and markets*". They actively exchange information between all the members of the '*comité*', and some members are agricultural engineers themselves. Besides the weather expert they also receive information SENASA, INIEA, and a private institute about new varieties, soil- and water management, etcetera.

The '*comité*' is involved in several experiments with INIEA and CIP. Some members produce clones with CIP. Leoncio showed me three test-plots where he was doing experiments on IPM in collaboration with INIEA. He is very positive about the relation the '*comité*' has with INIEA and CIP, as they receive new seed for the experiments and can learn more about new techniques. Although the '*comité*' buys and sells collectively, each member has its own fields and produces different varieties. Leoncio for example has about thirty-five hectares of its own, where he produces the varieties Canchan, Perricholi, Revolucion and Tumi. One of the varieties they produce collectively with the '*comité*' is the processing variety Capiro. This variety already exists for many years and was initially released in Colombia. They are collaborating with an NGO for the production of this variety. This NGO arranged contracts with the snack-industry. The '*comité*' produces Capiro seed, which is sold to coastal potato farmers, who on their turn sell their potato production to the snack-industry. This agreement with this NGO provides them guaranteed buyers for seed. They have one harvest a year due to the lack of water in the higher parts of the Mantaro Valley.

### ***The usefulness of educated friends***

Leoncio introduced me to farmer Hugo, another member of the '*comité*'. This farmer had about twenty hectares of land for the production of Capiro, UNICA, Perricholi and Serranita. He produced UNICA

since seven years. He has fields in both the higher zones for the production of seed, as in the lower zones for commercial seed- and potato production. Hugo has a background as agricultural engineer. He had received UNICA for the first time through one of his friends who used to work within CIP. This friend gave him a bag with clones as a gift in return for a favour. Therefore he was already producing UNICA before it was released in 1998. He uses his UNICA-production as seed source, to sell to farmers from the Concepcion and the Coast, and to *'intermediarios'* from Lima. All his clients come to his fields to buy seed. Hugo is the only farmer in the region who produces Serranita. He received Serranita seed through one of the trails of INIEA for testing the clone. He explained that he does not sell his production of Serranita yet. *"Here in the Mantaro Valley, people do not know the variety, so I use it for seed multiplication and own consumption"*. He used to try clones and new varieties regularly, but the last few years he had not tried any. He explained that unfortunately he did not have friends within CIP anymore.

4.3.3 THE SEED PRODUCERS FROM HUASAHUASI

Another well-known seed producing area is the district of Huasahuasi in the province of Tarma. Through another student from the University of Huancayo I came in contact with a farmers' family in Huasahuasi. In the Mantaro valley many farmers had told me that Huasahuasi is just like Jauja a specialised seed production area. Huasahuasi is located on the borders of the Andes and the Selva. This region has an intermediate humid climate, and therefore has many problems with *'rancho'*. The reason why this area is well-known for the production of seed is not so much because of its good quality, but due to characteristics of the soil. One farmer explained that *"seed from Huasahuasi flourish in almost every type of soil"*. The mountainsides in the province of Huasahuasi are different than the sloping landscape of the Mantaro Valley. The potato fields are small pieces of scattered land along steep sides. The big difference with the Mantaro Valley lies in the fact that there is no possibility to mechanise and intensify agriculture in Huasahuasi because of the landscape.

During my visit to Huasahuasi, I learned more about the family business of Lorenzo, an informal seed producer. In Huasahuasi I interviewed two different types of farmers; Lorenzo as informal producer and his brother in law, who is one of the few formal producers in the province of Huasahuasi. Also two *'intermediarios'* from Huasahuasi were interviewed. A description of farmer Lorenzo can be found in box 7.

<p>Box 7. The informal seed producer</p> <p>Farmer Lorenzo is a seed producer from Huasahuasi. Both he and his wife come from real potato farmers' families. He lives in the village of Huasahuasi and has his fields in different districts of Huasahuasi. A few years ago he had the possibility to build a house in the village, and they moved from a small community to Huasahuasi. According to Lorenzo almost all people in Huasahuasi are in one way or another involved in potato production. Just like him, there are many seed producers, but also transport companies, bag-manufacturing companies, <i>'intermediarios'</i>, agricultural shop keepers,</p>
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farm labourers, and many migrants who come to work temporarily during harvesting season. In the harvesting season, Lorenzo has about 10 people working for him from different departments. He explained that people from Huánuco and Huancavelica come to Huasahuasi to find a job. Lorenzo's house is a typical potato farmers' house; a big garage and potato storage on the ground floor, and the living area on the first and second floor. About 50% of the seed producers in the village have their own loading truck, because of the distant fields. Farmers with no truck can rent it from other farmer during harvesting time for 2,50 soles per hundred kg of potatoes (one bag). Lorenzo has about ten hectares of land allocated to potato production; six hectares are his own property and four hectares are hired. Most farmers in Huasahuasi have an average of ten hectares for the production of potatoes. He produces five ha Canchan, four ha Perricholi, one ha Yungay, and half a hectare of UNICA. He produces UNICA for three years now. He had bought seed for the first time from a friend in Huasahuasi. He used to have three hectares of UNICA, but since last year he reduced the area. He explained that last year the majority of farmers started to produce UNICA, which caused a dramatic drop in price. He only could sell one kg for 0,10 soles. This year about 20% of the farmers still produce UNICA, and he hopes the demand for UNICA will increase. He uses his half hectare of UNICA as seed source for the next campaign. Lorenzo explained that it is difficult to make strategic decision in Huasahuasi, because many farmers are producing the same varieties which regularly cause overproduction and low market prices. Most farmers work individually. Lorenzo only exchanges information with his relatives. His whole family is involved in potato production. During family affairs they discuss issues regarding potato farming. He buys seed from other farmers from Huasahuasi to renew every year. Generally he buys seed from the same farmers from who he knows they sell fresh and disease-free seed. Lorenzo explained that there were problems with seed producers in Huasahuasi who sell a miscellany of seed. During my field visits in Ica this problem also became apparent, as farmers were facing problems with unclean and mixed seed bought from Huasahuasi. According to Lorenzo these problems were mostly caused by *'intermediarios'* who tried to sell low-quality seed in the name of 'Huasahuasi seed'. Lorenzo sells his seed directly to farmers from the Coast (Chibote, Ica, Nazca) who come to Huasahuasi to sell seed. His potato production he sells to *'intermediarios'*. When Lorenzo has the economic possibility, he also hires fields on the Coast to produce consumption potatoes. In these occasions they take their own truck and seed to Chimbote and hire a tractor to cultivate the land. A family member takes care of the fields during the growing season.

### ***Role of institutions***

The majority of farmers in Huasahuasi are informal seed producers. According to Lorenzo there were no institutional activities in Huasahuasi. He mentioned that he had heard about some trails of INIEA on *'rancho'*, but that only a minority of farmers was involved in these activities. The only type of institutional support he could remember was during the agricultural reform, about twenty years ago when *'banco agraria'* still provided credits.

In Huasahuasi there is only one formal seed producer, Teodosio. He is Lorenzo's brother in law. This farmer does maintain relations with institutions, owns a commercial agricultural shop, and is agricultural teacher at the University of Lima (UNALM). Since three years he has an agreement with the University to produce formally. The University provided him pre-basic seed for multiplication, and Teodosio can keep half of the production. He has twelve hectares for the formal production of Amarilis, UNICA, Yungay and Canchan. Furthermore he has eighteen hectares for the production of 'unregistered' Canchan. For this production he buys seed from farmers in Huasahuasi. Every year he hires six hectares of land on the Coast (in Huaral, see figure 14) for the production of consumption potatoes. Recently he started to produce Amarilis on the Coast, as he foresees great opportunity for an upcoming market for this variety on the Coast.

Teodosio has clients from the Coast, Arequipa, and from PRONOMACHCS. Farmers from Huasahuasi are not interested in his certified seed because it is too expensive. According to him the other farmers do not see the use to produce formal seed, because there are few institutions operating in Huasahuasi to inform farmers about the advantages. During my stay in Huasahuasi I heard about one workshop organised by SENASA to inform farmers about formal seed production. However, this workshop was organised in the middle of the day during harvesting season. Because all farmers were working in the fields, this workshop did not have a big impact.

### ***Trading potatoes, a women affair***

In Huasahuasi I learned more about potato trading activities. Huasahuasi has a long tradition as seed producing area, and there exist a well organised network among farmers for the selling of consumption potatoes and seed. Seed is mostly sold directly to potato farmers from the Coast or Huánuco. Most farmers have built up a network of regular clients. From the conversations with Lorenzo and Teodosio it became clear that farmers in Huasahuasi have to keep up a good reputation, especially in relation to the circulation of bad quality- and mixed seed. Therefore farmers prefer to buy it directly to farmers. Only when it is not always possible to sell the total yield, they sell to seed-'*intermediarios*' from coastal regions who come to Huasahuasi to search for farmers who want to sell.

The sell of the potato production is mostly done to another type of '*intermediarios*'. In Huasahuasi there are about eight '*intermediarios*' who are specialised trading consumption potatoes. In most cases these '*intermediarios*' are farmers from Huasahuasi. I have spoken to three women from Huasahuasi who were involved in these trading activities. One of them explained that she started to work as an '*intermediario*' some years ago after having the economic possibility to make investments in potatoes. She has daily contact per telephone with '*mayoristas*' from the Lima wholesale market about market prices. Next, she visits the potato storages of farmers to offer a price per kg. In most cases it are farmers wives who manage the sale of potatoes to the '*intermediarios*', as men are mostly working in the fields. The woman explained that most '*intermediarios*' have invested in a large truck to pick up large quantities of potatoes. They have direct contact with truck drivers who daily drive up and down to Lima. From this story I can conclude that women in Huasahuasi are actively involved in the potato.

#### 4.3.4 THE COASTAL POTATO FARMERS

The previous paragraphs showed that farmers from the Mantaro region and Huasahuasi are the seed suppliers for coastal farmers. I have visited the province of Ica and Nazca in the coastal department Ica to learn more about the production of UNICA by coastal producers. In this paragraph the experiences of two different potato farmers are described; an individual farmer from Ica, and a '*comerciante*' from Nazca. Contacts with these farmers were established through the University of Ica and CIP.

##### ***Potato production in Ica and Nazca***

Along the river valleys in coastal areas, conditions are favourable for potato production during the winter season (from April till September). However, potato farming is not accessible to all coastal farmers as it is an expensive business. Especially the costs for irrigation and seed require a big investment. During my stay in Ica and Nazca it became clear that there is little institutional support in relation to potato production. According to the interviewed farmers, public institutions in Ica and Nazca are not interested in potato farming because only a selected group of farmers is actually involved in these activities. There is more interest in production of cotton, fruits, and peppers. There used to be several farmers' cooperatives, from which only few survived the liberalisations. Nowadays there is hardly any type of organisation among farmers, and most farmers work individually. Many coastal potato farmers produce for the processing market and are contracted by processing companies. In general, only the medium-size and large farmers have the opportunity to invest in potato production. An engineer from the University of Ica explained that; *"the small ones do not have the economic possibility, neither do they have the knowledge or access to information to specialise in potato production"*.

Box 8 gives describes potato farmer Julio from Nazca, who is involved in potato production and commercial potato selling.

##### **Box 8. The '*comerciante*'**

Through the CIP-engineer contacts were established with farmer Julio. I had made an appointment with Julio early in the morning to visit some of his fields. Because of the early appointment, the farmer Julio had booked a hotel room for me in Nazca the day before my visit. Next morning he picked me up with a big pick up to visit his cotton fields. Julio is one of the biggest farmers in the province of Nazca. He has about eighty hectares of land. He produces cotton, onion, Lima bean (*'pallar'*), pepper, and potatoes. Julio has about seventy persons working for him and has his own groundwater irrigation system. During the winter seasons he produces four different potato varieties; eighteen hectares Canchan, five hectares Yungay, three hectare UNICA and three hectare Perricholi. He explained that these are the most common produced varieties on the Coast, because of their tolerance to heat. Canchan in his most important variety because of its high production (forty-five tons per hectare) and its commercial potential. He is one of the four potato farmers in Nazca who produces UNICA. He had heard about this variety for the first time through the experiments of the CIP-engineer, who is his friend. After observing these experiments, Julio decided to start producing UNICA. According to Julio

observing other farmers' fields is the most important source of obtaining information of new varieties or techniques for coastal farmers. He explained that besides observations, also sharing experiences with his friends who are involved in potato farming are important sources of information. He obtains specialised information on seed, pest management, and external input, through private companies, such as Bayer. According to Julio, these companies replace the role of public institutions. Another important information source are Andean farmers who hire fields on the Coast for commercial potato production. These farmers bring new varieties from the Andes and try it on the Coast. Coastal farmers learn from these experiences and get to know new potato varieties.

In 2004 he bought UNICA seed for the first time in Andahuallas, after a friend had recommended a location where he could buy good quality seed. Generally he buys seed in Andahuallas or Huancayo because of the good quality. Mostly he goes to these places to see the seed production himself.

According to him this is the most secure way to buy seed. Once in a while he also buys from '*intermediarios*', but only from those ones he personally knows and trust. He explained that many farmers from the Coast buy from '*intermediarios*', but not always with success (low quality).

The average yield of Julio's UNICA production is about thirty-five ton per hectare. The total production of UNICA is solely for selling. He sells his production to '*mayoristas*' from Lima and Truchillo. He explained that '*mayoristas*' from the North export processing potatoes to Ecuador, and sometimes offer better prices. Julio has close contacts with '*mayoristas*' in Lima because he is involved in commercial potato trading himself. Besides his farming activities, he works as a '*comerciante*' in potatoes and onions. Around harvesting season he regularly travels along the Coast to search for farmers who want to sell. He has regular sellers in Huaral and Barranca from who he buys Canchan and Perricholi. Before buying the potatoes, he first contacts '*mayoristas*' in Lima to arrange a price. Mostly he hires a truck for one day and travels to Barranca and sells in Lima on the same day. He knows which farmers along the Coast want to sell, as it are always the same groups of farmers who are involved in potatoes farming. Through the years he personally got to know most farmers. He explained that he especially goes to Barranca because there is more commercial potato production than in Nazca.

Julio is a successful farmer who runs a big farm business, and had the opportunity to pay my expensive hotel room. This narrative shows that only a few potato farmers were involved in the production of UNICA (four farmers in Nazca). It seems that the exchange of information and experiences among farmers is an important information source. These farmers are strongly depending on seed supply from the Andes. Buying seed can be a risky business, due to the circulation of bad quality seed. Some coastal farmers organise themselves in small groups to travel to the Andes, and to buy collectively. More about collaborations between farmers is explained in the next section.

#### **Potato farmer from Ica**

In Ica I have visit farmer Marino. He has about forty hectares of land allocated to the production of maize and cotton. In the winter season he produces about eight hectares of potatoes. He cultivates four

hectares Canchan, three hectares Perricholi, and since last year also two hectares UNICA. He confirmed that coastal farmers merely work individual. He usually buys seed from *'intermediarios'* who sell seed from Huancayo, Huasahuasi and Tarma, while other farmers go to these places themselves to buy seed. Marino explains that not every farmer is in the position to travel to the Andes to buy seed individually. Therefore small groups of farmers organise themselves and travel to the Andes to buy seed collectively. Marino exchanges information with other potato farmers from his region, especially on topics as water management and potato production. Observing other farmers' fields is another important information source for Marino. Marino explained that he decided to start producing UNICA last year (2004) after he had seen it on his neighbours' field. Due to the climatologic conditions on the coast, coastal farmers cannot keep their seed for next season. Therefore Marino sells his complete production after harvesting to *'comerciantes'*, persons like Julio.

### ***Information sources***

For potato farmers in Nazca there were three important information sources in; farmers from the Andes, the CIP-engineer, and private engineers.

Many coastal potato farmers learn from the experiences of Andean farmers who hire fields on the Coast. This already became clear from the story of Teodosio in paragraph 4.3.3. He was experimenting with the variety Amarilis on the Coast, with good results. This might result in the introduction of the variety on the Coast.

Also the CIP-engineer was a valuable information source for coastal farmers like Julio. Through his experiments with UNICA, Julio was inspired to start producing this variety. According to Julio, the CIP-engineer was very passionate in testing new varieties on the Coast. He explained that most potato farmers from Nazca know about these experiments and think he is *"loco de papas"*, which is a positive way to explain that he is crazy about his work on potatoes.

A third information source is the *'ingenieros particulares'* (private engineers) who sell counsel to farmers, or *'ingenieros'* from private companies as Bayer who travel around to sell products. They provide information on the management of plagues and diseases, water management, seed, etcetera. The presence of *'ingenieros particulares'* on the Coast emerge during the agricultural reforms in the beginning of the 1990s. According to Bentley *et al.* (2001) new forms of extension services emerged (NGOs, private extensionists) as the result of the financial cuts in the public-sector extension service due to privatisation of the agricultural sector. The interviewed farmers acknowledged this information source as important, because there is a lack of knowledge on good water management and the production of potatoes. However this information source is not accessible for all farmers, neither is it perceived as a reliable source. The private engineers are very expensive for small-scale farmers, and most farmers do not perceive private engineers as trustworthily. In most occasions these engineers work in collaboration with *'casas agricolas'*, which could result in a great emphasis on selling products instead of giving good advice.

#### 4.5 ANALYSIS AND CONCLUSIONS

In the first part of this chapter (paragraph 4.1 and 4.2) I have described the social career of UNICA. This gave more insight in how the variety was developed, selected, and released. In the second part (paragraph 4.3 and 4.4) the experiences of farmers from four different locations involved in the production of UNICA were described. These experiences explained more about what type of farmers produce UNICA, and how the variety circulates among these farmers. In this last paragraph, this information will be analysed, followed by the conclusions.

##### ***The variety and its users:***

UNICA is a processing variety especially appropriate for the Coast due to its virus-resistance and its tolerance to heat. CIP and the University of Ica have introduced this variety on several locations on the Coast and in the central Andes, which led to the diffusion among seed producers and potato producers. The involved farmers were mostly successful, large farmers; as the CIP-engineer explained to me; “*we searched for the leaders for multiplying UNICA seed*”.

The UNICA producers are connected as follows: The first group of farmers are the coastal potato farmers. These farmers are particularly involved in the production of potatoes to supply the Lima wholesale market during the Andean ‘off-season’. For the provision of seed, these farmers are depending seed supply from the Andes. This have led to the formation of the second group of farmers; the seed producers. Especially seed producers from the higher zones of the Mantaro Valley and Huasahuasi are important seed suppliers for the Coast. Eventually, the emergence of seed production of UNICA in the Andes resulted in a third group of farmers; the Mantaro Valley farmers who produce both consumption potatoes as seed.

Although the variety was initially selected as consumption and processing variety, there exist no consumer market for UNICA. The interviewed farmers mentioned that the variety has low culinary quality. The most important users of this variety are ‘*pollerias*’, which is a growing market in Peru. During the time of my fieldwork (December 2005), UNICA was only available on the wholesale market in Lima. Most of the interviewed UNICA farmers had connections with this market.

##### ***The geographical network***

The seed flows of UNICA can be characterised by direct lines between the Andes and the Coast. Initially, only direct flows between seed producing areas (Jauja and Huasahuasi) and the Coast existed. As explained before, due to the growing demand for UNICA, also commercial potato producers from the Mantaro Valley have discovered the variety. This have led to the emerge an increased exchange among farmers in the Mantaro Valley, and direct potato flows from the Mantaro Valley to the Lima wholesale market. Seed producers do not only supply coastal farmers, but also commercial potato farmers from the Valley. This means that the production area of the variety is expanding. Figure 16 represents the current exchanges of seed and potatoes between the Andes and the Coast. In this figure you can see that the commercial, large farmers from the Valley are involved in both seed production

and potato production. Most of these farmers have fields on different locations (higher zones for the production of seed, in the Valley-bottom for the production of consumption potatoes, and on the Coast for potato production in the 'off-season'). It seems that the Mantaro Valley farmers take the most advantage of the situation. However, potato production of UNICA in the Mantaro Valley does not necessarily have to result in competition, as the growing seasons in the Andes and Coast do not overlap.

The exchange of UNICA in Huasahuasi took place differently. Huasahuasi is primarily a seed-producing area. In the case of the production of UNICA, seed is directly sold to potato farmers from the Coast. Furthermore, for maintaining a good quality seed, farmers exchange seed among each other. This has led to a wide diffusion of UNICA in Huasahuasi.

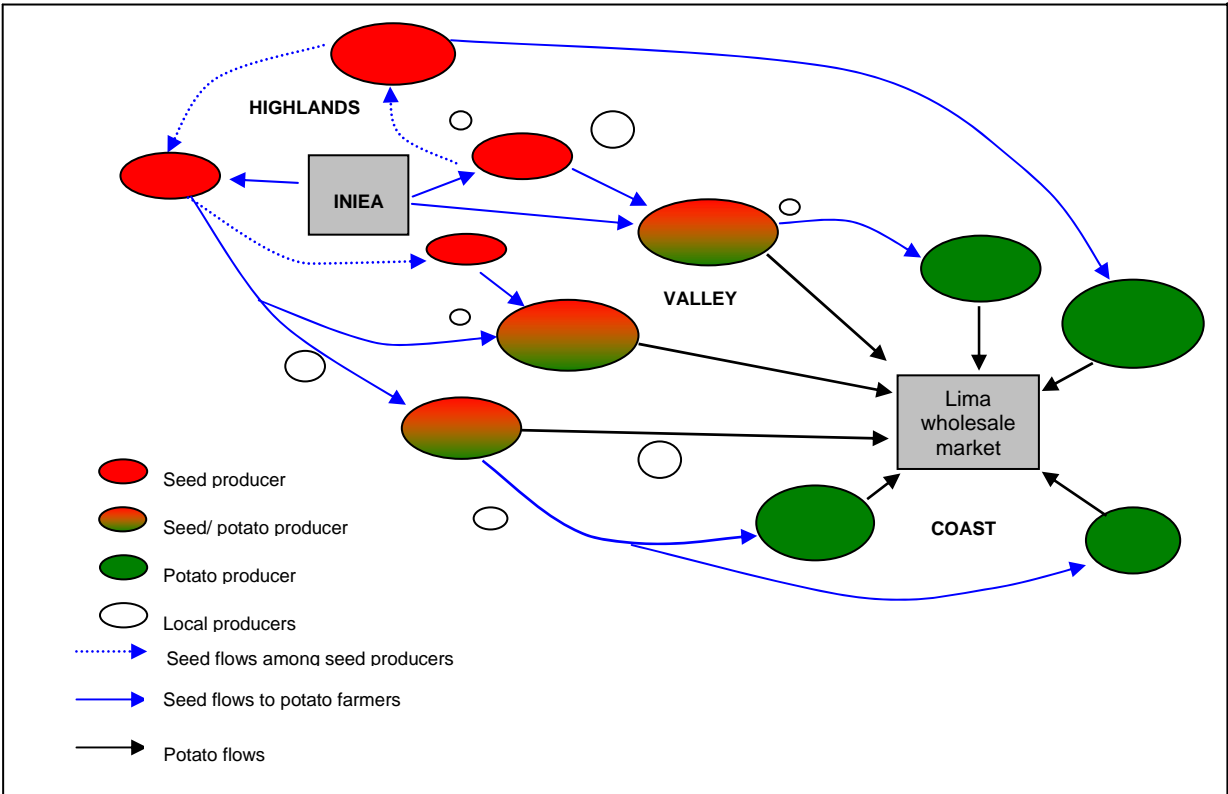


Figure 16. UNICA-producers and the connection with Lima

**The role of institutions**

In the case of UNICA, it was interesting to see that without institutional uptake by INIEA, the variety got spread among farmers. The variety was introduced and promoted by CIP and the University. The University was responsible for the final selections and release of UNICA on the Coast, especially in Ica and Nazca. CIP had an important role in promoting and register this variety. Although CIP has no mandate in spreading new varieties, in this case their role was essential for introducing the variety.

**The social network**

The connections between the farmers described in this chapter, can be described as a farmer driven network. Although the process of diffusion was initiated by CIP and the University, there is no institutional interference to stimulate the exchange between the farmers in this network. Therefore the

farmers themselves maintain the central position within this network. I can identify three different clusters within the network; the cluster Mantaro Valley farmers, the cluster farmers from Huasahuasi, and the cluster coastal farmers.

The cluster of Mantaro Valley farmers exist of an elite group of farmers. The farmers within this cluster are large farmers. They have an educational background, or educated friends. It seems that these farmers maintain personal relations with each other, as they operate in the same high-status group. However, this group of farmers does not represent all Mantaro Valley farmers. As explained in chapter 2.3.3, there also exist a large group of small-scale farmers. Both groups produce different varieties and supply a different market. During the field visits in the Mantaro Valley it became clear that there is little interaction between these two groups. Information about UNICA was not accessible for the small-scale farmers, as the UNICA-producers operate in a closed network.

Within the cluster of Huasahuasi farmers, differences between farmers are smaller. The fact that UNICA got spread massively among farmers proves that there exist more social involvement and interaction among these farmers.

The cluster of coastal farmers consists of individual farmers. However, differences between these farmers are not that big as in the Mantaro Valley. These farmers all have the economic possibility to invest in potatoes. The similarity between these farmers is their dependency on seed supply from the Sierra. Personal contact and exchange of information is very important for the coastal farmers, due to this dependency and distrust towards Andean farmers. Their dependency on seed consolidates the 'farmer driven network'.

### ***Information flows***

Besides the flows of seed between the Andes and Coast, also flows of information could be identified. Andean farmers are also information sources by the coastal farmers. Many Andean farmers hire potato fields on the Coast during the Andean 'off-season'. They bring their own seed and experiences. This gives coastal farmers access to new information.

## **CONCLUSIONS**

The majority of UNICA producers are large commercial farmers, and it seems that this variety circulates within a closed network of these farmers. Initially, the variety was introduced to some successful, individual farmers. Although UNICA got spread among farmers, it remains circulating in a closed network. Therefore no diffusion takes place among other types of farmers.

Within the cluster of Huasahuasi seed producers, diffusion took place rapidly. Differences between farmers in Huasahuasi are less great, as in the case of the Mantaro Valley. Although the farmers operate individually, they are more socially involved through family ties and dependency on each other for renewal. The closed character of this cluster seems to accelerate diffusion.

The case of UNICA shows that diffusion of a new variety could take place without institutional involvement of public institutions (INIEA). However, the process of diffusion needs to be initiated. In this case the active involvement of a CIP-engineer was very important for the initial introduction.

## CHAPTER 5. SERRANITA; 'A GIFT FROM HEAVEN'

With this headline two news channels (newspaper El Comercio and Radio channel RPP noticias) gave national publicity to the newly released potato variety Serranita in 2005. The variety was described as the promise for Peruvian farmers, because of its good processing quality, resistance to 'rancho'; and promising market possibilities.

This chapter describes the currently released variety Serranita, of which the process of diffusion was still taking place during the study. In order to study the introduction and diffusion of this variety, I have visited the department of Huánuco (figure 17). Many improved potato varieties have been evaluated and selected in this department because of the high 'rancho'-pressure in this area. This chapter describes the context in which Serranita was introduced to farmers by Proyecto PRA<sup>28</sup>. During my fieldwork in Huánuco I mainly focussed on farmers who collaborated with PRA. Because of the relatively short history of Serranita (Serranita was released in 2005), this chapter is considerably shorter than the chapters on Amarilis and UNICA. However, it does give insight in a different diffusion strategy as the result of the involvement of different actors.

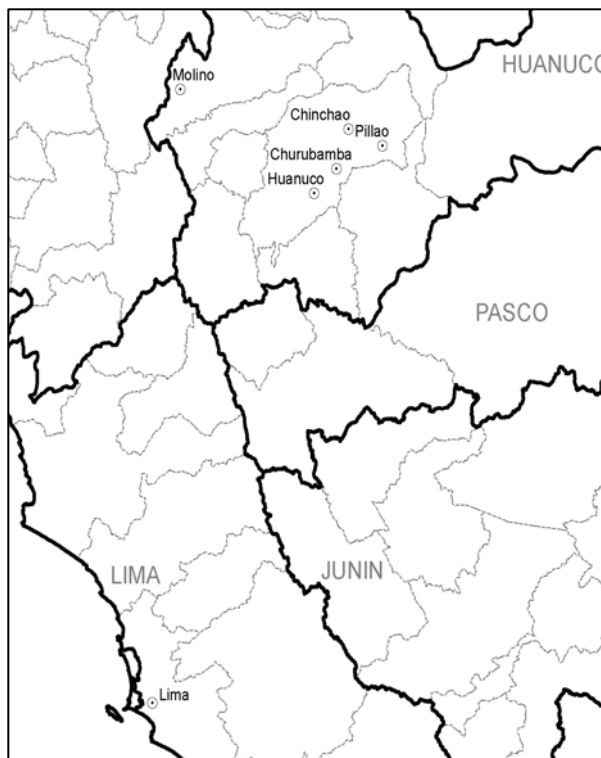


Figure 17. Geographical map research locations Huánuco

The first part of this chapter (paragraph 5.1 and 5.2) will discuss the characteristics and the social career of Serranita. The second part (paragraph 5.3 and 5.4) describes the field visits to three different locations in Huánuco. The field visits were organised in collaboration with the director of PRA. The research locations can be found in figure 17. The last paragraph presents the analysis and conclusions (paragraph 5.5).

<sup>28</sup> PRA ('Proyecto de Reducción y Alivio a la Pobreza') is a private project initiated and financed by USAID, and supported by the NGO IDESI ('Instituto de desarrollo del sector informal de Huánuco').

## 5.1 THE VARIETY SERRANITA

Serranita is the youngest of the three selected potato varieties for this study. Just like the variety Amarilis, Serranita was initially developed within the late blight resistance programme of CIP.

After ten years of testing and evaluating the clone, Serranita was officially released as a variety in 2005.

Serranita is especially appropriate for the processing industry to make chips and French fries, a growing market in Peru. Potatoes suitable for the processing

industry need to have certain characteristics, such as; low sugar level, a high dry matter level, the right colour and shape. Serranita owns these characteristics. Furthermore the variety is resistant to 'rancho' and potato cyst nematodes<sup>29</sup>, which reduces the production costs, because fewer pesticides need to be used during the production process. Serranita has a cultivation period of four till five months. The tuber has a purple coloured skin (see figure 18) and white flesh. This typical colour of the skin shows similarities with certain native varieties. Besides being suitable for frying, Serranita also has high culinary qualities because of its floury texture and good flavour which makes the variety also appropriate for consumption. The variety was evaluated over a period of ten years by different institutions at different locations. These evaluations have shown that Serranita is a high-yielding variety (30 – 40 t/ha) and can be adapted widely<sup>30</sup>.



Figure 18. Variety Serranita on a farmer's field in Cajamarca

## 5.2 THE SOCIAL CAREER OF SERRANITA

The selection and evaluation of Serranita was the result of joint research activities by INIEA, PRA and CIP. PRA (in collaboration with CIP) was responsible for the evaluations on different locations in Huánuco. INIEA was responsible for the evaluations in the departments Junín, Huancavelica, Cajamarca, Ayacucho and Cuzco. Also CIP held pre-selections on different locations in Peru. In total, thirty-eight experiments were executed in which clones were selected, comparative research took place, technologies were tested, and the economic benefit and quality of the variety were validated.

In Cajamarca I have analysed initiatives of how Serranita was introduced to farmers by INIEA and the Municipality of Baños del Inca. The narratives of farmer Amando (chapter 3.3.1.), farmer Genebrardo (chapter 3.3.4) and farmer Erminia (chapter 3.3.5) further explain how this introduction took place. The farmers involved in the initiatives of INIEA were selected through a similar strategy as was applied in the case of the variety Amarilis. Most farmers in Cajamarca who were involved in institutional collaborations knew the new variety Serranita. Farmers referred to the variety as 'Clone 12' (the name of the clone before it was officially released as variety Serranita) or 'Aceituna' (which means 'olive' in

<sup>29</sup> Potato cyst nematodes (PCN) '*Globodera pallida* and *G. rostochiensis*', is a serious soil pest of potatoes in the Andean region. It causes deformed tubers and wilting of the above-ground plant parts, and can reduce the yield by about 30% ([www.cipotato.org](http://www.cipotato.org)).

<sup>30</sup> Described information derives from an information bulletin from INIEA (INIEA, 2005)

Spanish) referring to the dark skin of the variety. In Huánuco the variety was better known as '*Huánuqueñita*', which can be translated as 'the little one from Huánuco'. From this I concluded that farmers give locally adaptable names to new clones. The involvement of different institutions, working on different locations caused some difficulties in selecting a name for the variety. With the locally adaptable names, the origin of the variety was claimed by several of the involved institutions. Because they could not agree on using one of the existing names, they thought of a new name; Serranita.

In Huánuco the variety was introduced to farmers through PRA in 2004. One of the project's activities was to promote varieties (suitable for processing) to potato processing companies such as Frito Lay and Laurel<sup>31</sup>. In Peru, potato-processing companies require a regular, reliable supply of high-quality, uniformly-sized potatoes (Butler *et al.*, 2004). These are increasingly obtained from large-scale producers through contract-agreements, to the detriment of small- and medium-scale potato farmers (Bernet *et al.*, 2002). To encourage that also small- en medium scale farmers can benefit from the increasing demand for processing potatoes, PRA facilitates the contacts between these farmers and the processing companies.

Since its release, the number of farmers who produce Serranita in collaboration with PRA gradually increases. These developments are carefully monitored by the processing companies. Recently (2006), Serranita is also introduced on the Coast near to Lima where initial tests had good results<sup>32</sup>. The production of Serranita on the Coast will accelerate the demand for seed from the Andes. According to the director of PRA Serranita could become one of the most important varieties of Peru, due to the wide introduction on different locations in Peru by different institutions, and the growing demand of the processing industry. He thinks that the quality of Serranita can easily compete with Canchan, which is the most produced potato in Peru (CIP, 2004). In paragraph 5.3 I will explain more about the work of PRA and the farmers involved in this project.

### 5.3 LEARNING FROM THE FIELD

In collaboration with PRA, I have visited three different locations. In the province of Huánuco I have visited the communities Chogobamba and Pillao in the district of Churubamba, and in the province of Pachitea I have visited the district Molino. Chogobamba is known as a seed producing area, whereas Pillao and Molino are two potato producing areas. In these three areas PRA is working together with farmers in the production of potatoes and artichoke. PRA's strategy is to take market demands as the starting-point for developing activities with farmers. A more profound description of PRA and their strategy can be found in box 9. My field experiences (paragraph 5.3.1 and 5.3.2) will explain more about the different types of farmers who were involved in the activities of PRA.

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<sup>31</sup> Frito Lay and Laurel are large international 'snack-companies' which process chips for national and international markets.

<sup>32</sup> Mendoza, electronic mail communication

#### Box 9. Ingeniero Mendoza and Proyecto PRA

PRA is a demand driven and private sector led project, and is active on eleven locations in Peru. The objective of PRA is to contribute to the reduction of poverty through the mobilisation of private enterprise activity and investment in key economic corridors, defined as poor areas exhibiting economic growth potential (USAID, 2005). PRA is initiated and financed by USAID, which means that the project is result-oriented and has to deal with a tight budget and targets. In Huánuco the project is organised in collaboration with the NGO IDESI<sup>33</sup>. The strategy of PRA is to connect local producers and entrepreneurs to different kinds of markets (regional, coastal, national and international), and to create local employment. PRA's projects focuses on working with local products. PRA's principal export products are coffee, flowers and plants, trout and gold jewellery (Chemonics, 2005). PRA Huánuco is working on the marketing of potatoes, artichoke, Hydrangea, maize and Gladiolus. Through CIP-breeders I came into contact with engineer Mendoza who is the director of PRA. Mendoza has been head of INIEA Huánuco for many years (between 1975 and 1999). He is involved in PRA since 2002, and recently he became director of this project. Mendoza has a close relationship with CIP. For more than twenty years he has been involved in the evaluation of twenty-thousand CIP clones (CIP, 2004). The change from INIEA to PRA allowed him to work more according to his own vision on the role of agricultural research in supporting farmers. According to Mendoza agricultural research must go hand in hand with the market demand. Therefore production must be planned according to the market demands. He thinks that supporting farmers is only possible when projects include different types of farmers (both small-scale and large farmers) and access to markets is created. Mendoza is very enthusiastic about this integrated PRA strategy. In an interview (Portal Regional Agrario Huanuco) he mentioned that one of the problems in Peruvian potato farming is the lack of planning, which results in low market prices due to overproduction. He is convinced that the strategy of PRA combats this problem. In general PRA arranges contracts for the processing of agricultural products with companies both inside and outside of Peru. At the time of my visit (February 2006) PRA was promoting artichoke and the potato variety Serranita in Huánuco. Depending on the demand of the companies they can coordinate the production together with the farmers. In the case of Serranita, PRA is promoting the variety to potato processing companies such as Frito Lay and Laurel. PRA arranges contracts between these companies and the potato producers. Agreements are made on the price, quality and quantity of production, which creates a guaranteed market for the potato farmers. For the delivery of seed, PRA has involved seed producers who supply the potato producers with Serranita seed. This triangular relationship between the processing companies, potato producers and seed producers forms the bases for an integrated strategy that can react quickly on market demands. Additionally PRA promotes artichoke in Huánuco that offers an alternative to potato production. This helps farmers to spread risks in periods when potatoes are overproduced. This

<sup>33</sup> IDESI; '*Instituto de Desarrollo del Sector Informal*' (Institute Development of the Informal Sector) is an NGO that provides micro-credits to small producers and entrepreneurs in different sectors. They collaborate with PRA by facilitating contacts between rural producers and new markets.

integrated, planned production strategy creates more stable market prices and less risk for the farmers. Because the processing companies are mainly interested in the production of large quantities of processing potatoes, also medium-size and large farmers are involved in the project. The small-scale farmers focus on the provision of seed. According to Mendoza this has several advantages, especially for introducing a new variety. Although small-scale farmers do not produce in large quantities, he believes that the process of diffusion among this group of farmers evolves faster than among larger farmers. For this reason PRA includes different groups of farmers; on the one hand for the production of large quantities, and on the other hand to stimulate fast diffusion.

Mendoza explained that he has developed this vision through the years. When he was working for INIEA, he used to work according to a different strategy. INIEA's activities mainly focus on the participation of medium-size and large farmers. According to Mendoza these groups of farmers work individually and have no need to exchange seed or share experiences and information with other farmers. Among small-scale farmers this need is much more urgent which accelerates the process of diffusion.

During this research (February 2006) PRA was working with fifty producers. Already there is a small group of farmers who have established their own contacts and contracts with the processing companies without the facilitation of PRA, which is the eventual aim of the project. Mendoza thinks it will be necessary to continue the Serranita-related projects activities for one campaign more, to facilitate the contacts between farmers, the market and the processing companies. The project will probably continue until July 2007. After this date USAID will stop financing the project and expects that the Peruvian government or other donors will take up and continue the project. The current government of Peru might be interesting in developing more activities with PRA in the future, because of an increase focus on international exportation.

### 5.3.1 THE SEED PRODUCERS FROM CHOGOBAMBA

My first field visit in Huánuco was to the community Chogobamba, which is a seed producing area. Due to the favourable soil conditions, potato seed from Chogobamba is of very good quality. Within the community, farmers use limited external input due to the lack of economic resources. PRA has contracted a small group of farmers from the community as seed producers for the production of Serranita seed. This seed is used by potato farmers in other regions who are contracted by the potato-processing companies. The aim of PRA is to connect the small-scale seed producers from Chogobamba to this network of larger potato producers and the processing industry.

Chogobamba is a small community located in a remote part of the district Churubamba. I went to this community in coordination with Mendoza, as the possibilities for having transportation to this area were limited. The village has one small shop and collective storage facilities that are open before and after the farmers are working on the fields. The area is not connected to the power net, and there is one public toilet in the centre of the village, owned by a farmer family. The majority of the community

members are farmers and the most important language is Quechua. Mendoza showed me around the village and introduced me to Andrea, the first person in Chogobamba who produced Serranita. Two years ago, Mendoza had given her two tubers of Serranita to try the variety. Mendoza had great confidence that his strategy was a good way to test the potato in Chogobamba. He had expected that if she would have good results, she would share her experiences with her family and the rumour would spread around the community. As expected, after harvesting the potato Andrea's brothers and other farmers approached Mendoza if he could provide some more Serranita seed. This was the start of the production of Serranita in Chogobamba. At the time of my visit (February 2006), five farmers were producing small quantities of Serranita in collaboration with PRA. Currently (December 2006) already more than twenty farmers from this region are involved in the production of Serranita, both informally as in collaboration with PRA<sup>34</sup>.

### ***Role of PRA***

After the try-out with Andrea, Mendoza approached 5 farmers to produce Serranita seed. He explained that he had involved only a small group of farmers in order to keep the seed production of Serranita orderly and planned. Mendoza approached Andrea's family because they were interested in working with him and because he is closely related to them. He is for example the godfather of Andrea's child and he regularly visits the community in his free time. The first time Mendoza delivered the seed as a loan. One part of the produced seed was used to provide potato producers from other regions with seed; the other part was kept as seed source for next season. The role of PRA was coordinating and they controlled the quantity and quality of the seed production. Besides that PRA facilitated the contacts between the five seed producers from Chogobamba and the potato farmers from other regions. The objective of PRA is that contacts between seed producers and potato producers will be maintained by the farmers themselves after the project ends.

I have spoken to four Serranita-producers in Chogobamba. They told me that Serranita was already very popular within the community, as most farmers from the community were also interested in producing Serranita. The variety could only be provided through Mendoza, since he introduced the variety last year (2005) and the involved farmers were about to harvest the first campaign. This caused some tensions between Mendoza and some other farmers from the community as he insisted on working only with a small, selected group of farmers. According to Mendoza the principle of planned production in relation to market demand would not work if he would provide Serranita seed to all farmers in Chogobamba.

### ***Social relations among farmers***

All of the interviewed farmers mentioned that they mainly work individually. However during my stay I could observe that there was some kind of organisation among the farmers. Every morning and afternoon before and after working in the fields, the farmers from the village gathered in the centre to talk about the work. Also going to the market was organised collectively. Because most farmers sold

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<sup>34</sup> Mendoza, electronic mail communication

their harvest directly to the market in Huánuco, they collectively organised transportation to visit the market. There is even a type of collaboration with neighbouring communities for the storage of crops and for organising visits to the market. These examples show that although the farmers consider themselves as individuals, there are close-knit relations between them.

### ***The use of 'ferias'***

Besides the weekly visits to the market in Huánuco for selling their products to market salesmen, a group of farmers from Chogobamba also visit a weekly ecological fair (*feria ecológica*) in Huánuco organised by IDMA<sup>35</sup> and PRA. IDMA is a private organisation that is involved in sustainable agricultural development activities (IDMA, 2001). The fair was initially organised to support biological farmers, to promote biological products, and to accelerate the establishment of new contacts between farmers. Now more than hundred-and-twenty biological farmers from different districts from the province of Huánuco are participating in this weekly fair. Most farmers are small-scale producers specialised in local products. They can sell in small quantities (something which is more difficult on normal markets) and promote their products. On this fair one can find a wide range of indigenous products, such as native potato varieties and other root and tuber crops, flowers, different kind of indigenous fruits, jams and honeys, etcetera. A group of farmers from Chogobamba also participates in this fair with their biological potatoes. For these farmers this fair is also an opportunity to visit the PRA-office or to meet with Mendoza on the market. On the day of the fair, it is a coming and going of farmers in the office of PRA.

During a conversation with a farmer it became clear that – besides selling agricultural products – markets are also important opportunities for establishing contacts and exchanging information. I met farmer Victoriano in the office of PRA. Victoriano is from Quisqui, a district in the province of Huánuco. He had already worked with Mendoza for more than twelve years. He described himself as *'conservacionista'*, as he produces more than three-hundred-and-forty different native potato species on only two hectares. On the one hand he produces native varieties from a conservational perspective, and on the other hand, it is his principle crop for selling. Besides his production of native varieties, he has about one-and-a-half hectares for the production of seed of the varieties Serranita, Tomasa, Canchan and Capiro. Serranita and Capiro were introduced to Victoriano through Mendoza. From the beginning onwards he had been involved in the evaluations of Serranita. Victoriano also worked in collaboration with INIEA on experiments with new varieties. He explained that both PRA and INIEA are important information sources for him, as they had introduced new improved potato varieties to him. He also mentioned that market places and fairs are important to him, because there he obtains new information, seed and new native varieties. On fairs and markets he can meet farmers from different provinces and departments. Especially for his conservation activities these contacts are very important. He explained that it was on a *'feria'*, where he first met Mendoza.

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<sup>35</sup> IDMA; Instituto de Desarrollo y Medio Ambiente

### ***Diffusion among farmers***

From the narratives of the farmers from Chogobamba it became clear that varieties are introduced in the community in two ways. Farmers mentioned that they learn about new varieties through Mendoza and through neighbouring farmers. The contact with Mendoza was especially important for having access to new varieties and new markets. Besides this type of introducing new varieties, the farmers rely on exchanging and selling seed to other farmers from the region. This became clear when I met a farmer from the nearby community Pacshaj. When I passed his fields, he was just eating with his whole family. They offered me something to eat and I realised that they were eating Serranita. This farmer had received seed from Mendoza two years ago. Just like the farmers from Chogobamba, he also explained that many farmers from his community were searching for Serranita seed, as they all knew about the variety. It seemed that the news had spread rapidly, and the farmer expected that during the next growing season more farmers from nearby communities would produce Serranita; a good example of farmer-to-farmer diffusion.

Another type of seed exchange between farmers is the phenomena that seed is used as an instrument of payment in kind. Farmer Victoriano from Quisqui for example explained that he uses 20% of his production of Serranita to pay other farmers' labour. The other 80% of the production he keeps as seed-source for the next campaign. For him this was a useful way to effectively use (payment for labour) the part of his Serranita production he could not directly sell on the market.

### **5.3.2 THE POTATO PRODUCERS FROM PILLAO AND MOLINO**

In coordination with PRA I also visited the district of Pillao in the province Huánuco and the district of Molino in the province Pachitea (see figure 17). PRA works in these districts with potato farmers who are contracted by the processing companies Frito Lay and Laurel for the production of Capiro (processing variety) and Serranita. I have visited six farmers who were involved in collaborations with PRA. All of the farmers used Serranita seed provided by PRA, of which some seed derived from Chogobamba. The visited farmers were much bigger than the farmers from Chogobamba. Four of the interviewed farmers from Pillao owned at least ten hectares per person, and the two farmers from Molino each owned about twenty hectares. According to Mendoza the farmers from Pillao can be seen as medium-size farmers and the farmers from Molino as large farmers. During these visits the differences between the farmers involved in the collaboration with PRA became clear. One narrative by a farmer from Pillao represents the situation of the medium-size farmers in Pillao (Box 10).

#### **Box 10. The medium-size farmer**

Jorge is a young farmer who already works for more than ten years with Mendoza. Of his land, around ten hectares are allocated for the production of potatoes. At the moment he produces two hectares of Canchan, seven hectares of Capiro, half a hectare of Serranita and half a hectare of Yungay. Once in a while he produces the varieties Amarilis and Amarilla, depending on the market as he would explain later. During the time of my visit it was harvesting season, and he had about twenty-

five persons per hectare working for him. When I met him, he was just driving a group of labourers to his fields for harvesting. Through Mendoza, Jorge had been involved in the evaluations and introduction of the variety Amarilis. Because of his participation in the introduction he became one of the first seed producers of Amarilis. This had brought him big successes. Ten years ago he was merely a small-scale farmer, but through his successes, he became one of the larger farmers in the region, which enabled him to build a new big house for his family. Since the beginning of 2006 he is also producing Serranita in collaboration with Mendoza. He is very positive about this variety, as it is high-yielding and has good resistance to 'rancho'. He explained that he only has to apply fungicides four times during the growing season. This is a considerable decrease in costs when compared with the fifteen applications during one Capiro campaign. Jorge is contracted by the company Frito Lay to produce Serranita and Capiro. PRA is coordinating these contacts with Frito Lay. Together with four other farmers Jorge has formed a group of agro-industrial producers. He explained that they receive technical assistance and information about market prices through PRA. Additionally, engineers from Frito Lay control the potato fields during the growing season. Jorge received 350 kg of Serranita seed from PRA, from which he will produce 6.000 kg Serranita. Jorge could sell part of his production to Frito Lay. The remaining part will be used as seed for the next season. Every two years he renews his seed from other localities. Jorge had a well considered way of operating his business. He did not exchange any of his Serranita production with other farmers, because he expected an upcoming market for this variety. He did not want to sell any of his Serranita seed because he believes he can make a lot of money next year. Just like the majority of farmers in his district, Jorge still produces Amarilis, but only once in a while because farmers are facing problems with this variety. Due to overproduction and low market prices to variety is not very profitable anymore. Also the quality of Amarilis seed has decreased. Therefore farmers need to renew their seed at least every two years. Because of these disadvantages Jorge carefully watches the market developments, and decided to focus on other, more marketable, varieties.

### ***Institutional support to larger farmers***

The described narrative in box 10 illustrates that the interviewed farmers from Pillao were considerably larger than the farmers from Chogobamba. Two of them passed me along the road with a truck full of employees working for them. All four farmers had connections with several institutions and they were all collaborating with PRA in the production of Serranita or Capiro. Two of them had worked with Mendoza when he still worked for INIA on the introduction of Amarilis. One of the farmers used to have a close relation with the '*Ministerio de Agricultura*', and another farmer was involved in several experiments on UNICA and Serranita in collaboration with INIEA Santa Anna (Huancayo). The situation of these farmers shows similarities with the situation of the Amarilis producers from Cajamarca who were involved in institutional collaborations (chapter 4). The larger, more successful farmers are more often approached by institutions for the introduction of new varieties than small-scale remote farmers.

Three of the interviewed farmers had initially received Serranita seed through PRA. However, one of the farmers mentioned that he had received the variety through other farmers. This means that farmer-to-farmer diffusion also takes place among the larger farmers.

### **Contact with farmers**

During the field visits with Mendoza and other engineers from PRA I could notice that the contact with farmers had an informal, open character. Mendoza believes that personal contact with farmers is very important in order to maintain a good relationship. This became especially clear during one of my field visits to Pillao. During the morning, three farmers in a row invited us into their homes to have breakfast. According to Mendoza, we could not refuse any of the offered three meals, although we did not feel hungry anymore after the first breakfast. Mendoza explained that he already had refused a meal the last time when he visited one of the farmers, because of a lack of time. If he would refuse again, this could influence the relationship between the farmer and himself. The example of Mendoza being the godfather of Andrea's child (paragraph 5.3.1, section 3) also shows the close personal relations Mendoza has with the farmers he works with.

### **The large farmers from Molino**

In Molino Mendoza introduced me to two farmers; Juel and Maralino. Molino is located in the province of Pachitea. Juel and Maralino have been contracted by different processing companies for the production of Capiro and Serranita. In contrast with the Serranita production of half a hectare by farmers from Pillao, Juel was already producing eight hectares of Serranita and Maralino five hectares. Last year (2005) Juel sold 9.000 kg of Serranita to Laurel. For the production of Capiro, Juel has been contracted by the processing company 'Snack America Latina'. This company also provides the seed for production of the potato. Through their contracts with these big processing companies, the two farmers were making a lot of money. Additionally, Juel also owns a '*casa agricola*' which gives him easy and cheap access to all kinds of external inputs. Since two years they both produce Serranita in collaboration with PRA. Mendoza explained that these farmers are important for the production of large quantities. They are the only two farmers in this region who produce this variety. The majorities of farmers from Molino produces Amarilis and Canchan, and have not yet heard about the new variety Serranita. This is partly due to a lack of exchange of information with other farmers.

## **5.4 ANALYSIS AND CONCLUSIONS**

In this chapter I have described different actors involved in activities related to the production of Serranita. First I have described the characteristics and the social career of the variety. This gave more insight in the different actors involved in the selection and introduction of Serranita. Because Serranita was recently released, the variety has a rather 'short' social career. In paragraph 6.3 I have described my field experiences with farmers who can be considered as the first producers of Serranita. This gave me more insight in what type of farmers are producing Serranita, and how they came in touch with this

newly introduced variety. In this last paragraph, I will analyse the described information, followed by the conclusions.

### ***The variety and its users***

Some important characteristics of the variety Serranita, such as its resistance to '*rancha*', its wide adaptability and its processing quality, have created great opportunities for its diffusion. Although the process of diffusion was in its initial phase during the time of this research (2006), Serranita's characteristics determined possible production areas (resistance to '*rancha*' and wide adaptability), and its connection to the potato processing companies. From the side of the potato processing companies there is a growing demand for Serranita. However, this market is only accessible for a small group of farmers because quality and quantity regulations are very strict. Only farmers who are approached by either the processing companies (usually large commercial farmers) or project PRA can become the suppliers of this market.

I also noticed that farmers used Serranita as a consumption potato. Serranita's likeness with native varieties, its good culinary qualities – according to the majority of interviewed farmers – and the absence of a consumption market for Serranita, made farmers use the variety as consumption potato. This shows the potential for the emergence of a local and regional consumption market for Serranita. In some cases the variety was even used as 'payment in kind'. Labourers were paid with Serranita seed for their work.

### ***The role of institutions***

In the introduction of the variety, three different institutions were involved; CIP, INIEA and PRA. CIP was responsible for the provision and testing of the initial clones, and carried out several experiments in collaboration with their partners. The aim of these experiments was to select, test and evaluate the initial clones and can be seen as a first introduction and promotion of the variety.

Secondly, clones were provided to INIEA by CIP. INIEA became an active actor in the research activities related to the selection and evaluation of the clone/ variety in different departments. From my experiences in Cajamarca I can conclude that a similar strategy was used for the experiments on Serranita as in the case of Amarilis, which means that mainly more successful farmers and organised groups of farmers were involved in these experiments.

Later in the evaluation process, PRA Huánuco took part in the research activities. Their activities focussed on testing Serranita for its processing qualities. Therefore PRA had an important contribution in promoting the variety within the processing companies. PRA's strategy is to involve individual farmers, instead of forming organised groups as was done by public institutions. On the one hand this leads to the inclusion of commercial, more individualistic farmers who are able to produce high quality and quantity of potatoes in order to satisfy the demands of the processing companies. On the other hand, the strategy of PRA does not exclude possibilities to involve small-scale farmers with fewer economic resources. However, this strategy requires a lot of planning, organisation and communication with the involved farmers.

Figure 19 represents how PRA's strategy functions.

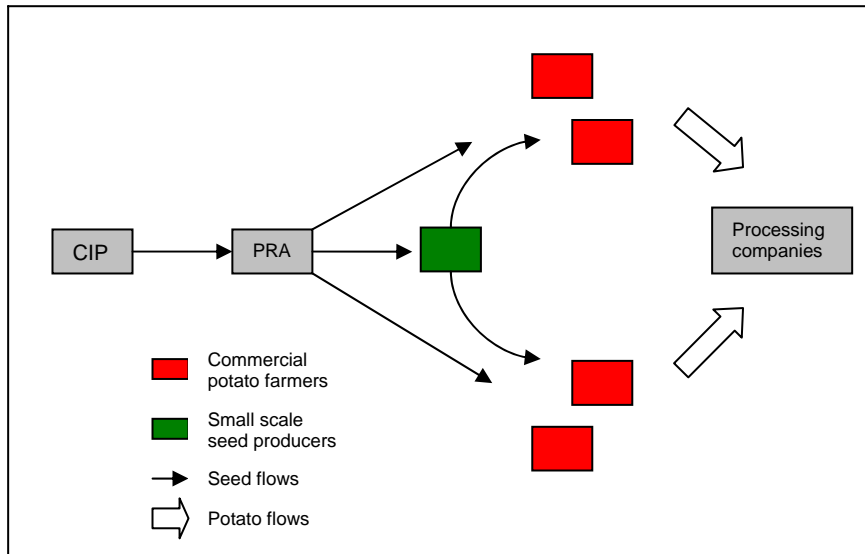


Figure 19. Seed and potato flows within the private sector driven network

### ***The individual actors***

The steering force behind PRA's strategy is Mendoza, the director of the project. Because of his years of practical experience with farmers, Mendoza discovered that the inclusion of small-scale farmers from 'traditional' communities accelerates the diffusion process of new potato varieties. His vision is that small-scale farmers exchange more information and seed with each other and neighbouring communities than the bigger commercial farmers. In remote areas there is also a higher need of collaboration among farmers, for example for organising transport to markets.

Mendoza can be seen as a broker because he includes remote small-scale potato producers and tries to connect them to commercial potato farmers. However, the question is how long-lasting these connections are, and if they will maintain after the project ends.

### ***The social network***

Because the process of diffusion took place during the time of my research, the interviewed farmers can be seen as the first producers of Serranita. In relation to the production of Serranita, PRA has formed a network around its activities which consists of seed producers, commercial potato farmers and processing companies. PRA has a facilitating role in this network by connecting these different actors. PRA obtains a central position in this network as they connect actors who otherwise would have been isolated from each other. This counts especially for the involved small-scale seed producers. The chance that small-scale seed producers would have been approached by either the processing companies or the commercial potato farmers is rather small. The aim of the project is that the mutual relationships between the actors become more solid after the project will finish. This is already happening on a small scale with some potato farmers. They individually maintain relations with the processing companies without the support of PRA. These relations are consolidated with contracts from the processing companies.

### ***Information flows***

Two different types of information flows can be identified; exchange of information between farmers and the exchange of information between farmers and institutions.

The three visited research areas gave me valuable information about the exchange of information among farmers. Within the community of Chogobamba, Serranita was introduced to a small group of farmers. During my visit it became clear that almost all farmers knew about Serranita, which meant that information about new varieties spreads rapidly. In the two other research areas this was less clear. One of the interviewed farmers from Pillao mentioned that he would not sell or exchange his Serranita seed to increase his own chances on the market next year. This example shows how larger, commercial farmers tend to keep new information for themselves.

Exchange among larger farmers also takes place, whereas one of the interviewed farmers mentioned that he had received Serranita from a neighbouring farmer. However, this exchange was the result of the willingness of an individual actor, and does not emerge from a collective need (as in the case of small-scale farmers).

The larger farmers from Pillao and Molino all had connections with institutions or processing companies besides their contact with PRA. It seems that larger farmers maintain more connections with institutions than small-scale farmers. The connection between the small-scale farmers from Chogobamba and PRA can be seen as rather exceptional. These farmers do not have connections with institutions other than PRA. Because of the personal efforts of the director of PRA, contacts with this community were established. It cost considerable time to build up a trust relation with farmers from a small-scale, tradition community. The director explained that many farmers from Chogobamba are still sceptical towards working with PRA.

It seems that different relationships and interests result in different information flows. This requires a cognitive flexibility from PRA as facilitator.

### **CONCLUSIONS**

The diffusion of Serranita can be seen as the result of two complementing factors; the characteristics of the variety and the involvement of both public and private actors. Serranita's characteristics created interest of farmers, possibilities for wide adaptation, and the interest of the processing industry. The involvement of both private (PRA) and public (INIEA) institutions resulted in a wide introduction of Serranita and the application of different diffusion strategies. Through these different diffusion strategies, different types of farmers were reached. Therefore I conclude that both the quality of the variety, as well as the joint research endeavour resulted in the wide introduction and acceptance of Serranita among farmers.

The connection between farmers, processing companies and project PRA can be defined as a private sector driven network. The potato processing companies determined the demand within this network. The relations between the actors within this network are infrequent and impersonal. The central position of PRA in this network is crucial for maintaining the network and keeping the actors together.

The involved farmers within the private sector driven network also maintain their own network. The network in which the small-scale farmers operate can be identified as a closed network with a high degree of personal involvement, where information spreads rapidly. Additionally, the larger farmers operate more individually and receive information from their institutional partners. It seems there is less interaction with other farmers as the commercial interests are stronger. Therefore the exchange of information among farmers seemed to decrease when the involvement of larger farmers increased. The involvement of a wide range of diverse farmers within a project can overcome the circulation of information within closed networks. PRA created bridges between these networks, which might accelerate the exchange of information and subsequently the diffusion of the new variety Serranita.

The case of project PRA in Huánuco showed that there is also room for the inclusion of small-scale farmers within a private sector driven network, although it is on a small scale. The involvement of different type of farmers requires a social vision and creativity from the side of the facilitator. Strengthening of the relations between the involved actors is an important factor for consolidating this diversified network.

## CHAPTER 6. CONCLUSIONS

In the introduction of this research I have explained the rich history of potato farming in Peru with its great genetic and cultural diversity. This has resulted in more than three-thousand potato species, local preferences, different markets and traditions. Since the 1950s, improved potato varieties have been introduced in Peru. Nowadays these varieties can be found in practically every community in the Andes. In general, improved varieties are introduced through the so-called 'formal system', because different public research institutions are involved in the development, testing and evaluation of new potato varieties. The formal system is characterised by a vertically organised production and distribution of tested seed and approved varieties, using strict quality control (Douglas, 1980). CIP has played an important role in the development of many improved potato varieties in Peru, by delivering genetic material to national agricultural research institutions. Initially CIP merely focussed on the development of new potato varieties, but through the years, they also became more concerned and interested in the social issues surrounding potato farming. This interest resulted in an increased focus on widely applicable technologies, more room for environmental developments, participatory research and sustainable agriculture. This change in mandate has not only resulted in broader research activities; CIP has also established new partnerships that went beyond their initial mandate to work primarily with national research institutions. This resulted in newly established relations with private partners, Universities, and NGOs. As the involvement of different actors and strategies has increased, also the diffusion process became more complex. This formed the starting point and objective for this research; 'To contribute to an increased understanding of the processes that influence the diffusion of CIP's potato varieties' (chapter 1.6).

Furthermore, my aim was to address this research objective from a sociological perspective, which provides new perspectives for analysing CIP's research activities. This research started with the perspective that diffusion of improved potato varieties is not merely the result of planned intervention, but can also be seen as the outcome of interactions and exchanges between actors involved in the introduction and diffusion of new potato varieties. Based on the research background and the conceptual framework, the following research questions were formulated:

### **'Which processes influence the diffusion of CIP's potato varieties?'**

1. What are the networks through which CIP potato varieties circulate?
2. What role do brokers play in connecting different networks or clusters within networks?

In this concluding chapter, my main findings will be discussed and analysed according to the conceptual framework. Paragraph 6.1 focuses on the networks through which CIP's potato varieties circulate. Paragraph 6.2 discusses the role of brokers in these networks. Eventually the central research question will be addressed in the conclusions of this chapter (paragraph 6.3).

## 6.1 VARIETIES AND THEIR NETWORKS

This paragraph will address the first research question; ‘What are the networks through which CIP’s potato varieties circulate?’ In chapter 3, 4 and 5 I have described the three different potato varieties that were studied during my fieldwork. In figure 20 I have compared these three varieties according to the analytical themes used in the empirical chapters.

Analytical themes	Amarilis	UNICA	Serranita
<b><i>The variety and its users:</i></b>	Consumption potato, initially with great resistance to late blight  Produced by all farmers  End-users: consumers	Consumption and processing potato with low perceived culinary quality, but with great possibilities for the processing industry  Produced by large commercial farmers and large seed producers  End-users: French fries restaurants ( <i>'pollerías'</i> )	Processing potato with high perceived culinary qualities and great possibilities for the processing industry  Produced by large commercial farmers and different type of seed producers  End-users: Chips factories (Frito-Lay, Laurel)
<b><i>The geographical network:</i></b>	First introduction in different departments, especially in Huánuco and Cajamarca  Wide adoption of variety in Cajamarca due to the uptake by different institutions  Great acceptance on local and regional markets	First introduction to coastal farmers and well-known seed producing areas in central Andes  Upcoming production of variety in Central Andes among commercial farmers  Strong connection with Lima market	First introduction takes place in different departments due to the involvement of INIEA  Recent introduction of the variety on the Coast  Strong connections with the Lima market and processing industry
<b><i>The role of institutions:</i></b>	Uptake of variety by different public institutions and NGOs like CARE.  Focus on organised group of farmers with the aim of improving the formal sector	Involvement of the University of Ica and CIP for the selection and promotion of the variety  Focus on coastal potato producers and large seed producers from central Andes	Both the involvement of public institutions and private companies  Focus on commercial potato producers and different types of seed producers
<b><i>The individual actors and critical events:</i></b>	Uptake by different institutions	Promotion by CIP to farmers	Promotion by PRA to the processing industry
<b><i>Information flows:</i></b>	High input of information from the institution	Information circulation among farmers	Facilitation of information flows by PRA
<b><i>The social network:</i></b>	Institutionally driven network	Farmer driven network	Private sector driven network

Figure 20. Analysis of the three case studies

During this research, three separate networks were studied in which the three selected potato varieties circulated. It should be mentioned that these are not the only existing networks through which the potato varieties circulate. The varieties also circulate within other existing networks. The three studied networks were established as the result of the involved actors, their strategies and the type of relationships they maintained. In order to explain these different networks, I will analyse them one by one according to the concepts described in chapter 2.

### ***The institutionally driven network***

In chapter 3 I have described the collaboration between farmers and institutions involved in formal seed production of Amarilis in Cajamarca. I have defined these collaborations as an '*institutionally driven network*'. The farmers involved in this network were selected by public institutions such as PRONOMACHCS and INIEA, according to fixed selection criteria. The institutions not only had a role in establishing these networks, they also actively took part as an actor in buying and selling certified seed. The aim of the networks was to strengthen formal seed production (formal seed system) by organising groups of formal seed producers and multiplying certified seed.

In order to understand the structure of this network, Long has suggested to analyse the dimensions within such a network (see chapter 2.1.2). Looking at the network as a whole, the density within this network is low. Density refers to the number and type of social relations between the involved actors in a network (Portes, 1995). This means that the members of this network – organised groups of formal seed producers (networks clusters), INIEA and buyers of certified seed – have few interpersonal relationships. However, within these networks the organised groups of formal seed producers have stronger personal relations and can therefore be defined as cliques or clusters within the network. Clusters were defined by Portes (1995) as subgroups within a network which have greater density than the network as a whole. These farmers do not only form a cluster within the institutionally driven network, also in their social environment they operate as a separated group defending their common interests. They receive institutional support, buy and sell seed collectively, and collaborate with different actors (NGOs, public institution) than other farmers in their social environment.

According to Granovetter's theory, a network that is characterised by such social relations can be defined as a network with weak ties. This type of network should accelerate the flows of information on new varieties, new techniques and new ideas. In practice it seemed that the farmers involved in the institutionally driven network were taking advantage of these weak ties. They have access to new information and have the possibility to work pro-actively with regard to market demands (see the example of farmer Amando, chapter 3.3.1).

However, there were issues at stake which influenced the exchange within this network that could not be fully explained by Granovetter's theory. First of all, this research showed that the relations between farmers and institutions can be characterised as 'hierarchical, power relations'. This is the result of the central position occupied by the institutions. Figure 21 represents the position of the members in the network and how they exchange seed and potatoes. The institutions that occupy a central position are in red. The arrows represent the seed and potato flows between the members.

Although seed producers and potato farmers are connected through institutional actors (such as PRONOMACHCS and NGOs), there is no direct, personal contact between them. Somehow the focus of institutions on organised groups of seed producers and the criteria of the certification process blocks/restricts the direct exchange of information between the seed producers and other groups of farmers.

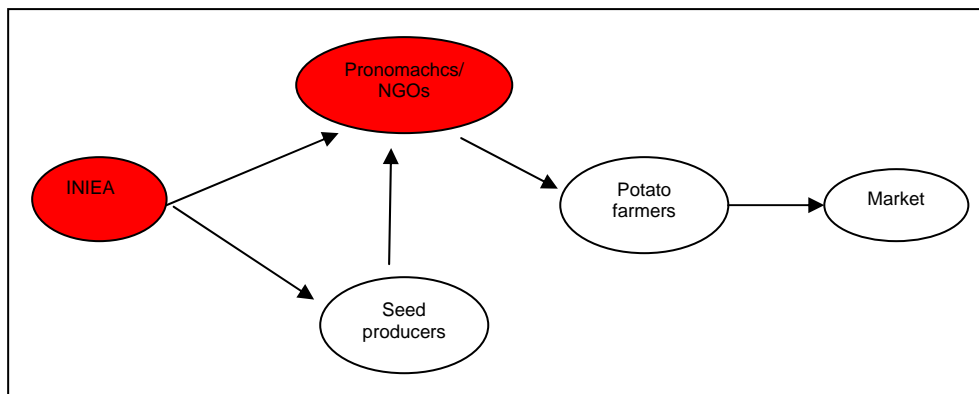


Figure 21. Central position of institutions in the institutionally driven network

The second issue at stake is institutional dependency. The institutionally driven network creates a certain dependency of seed producers on their institutional buyers and expert-knowledge. However, the involved farmers do take advantage of participating in this network, as they receive technical support and institutions pay a premium price for the seed. The demand for seed depends on the continuity of the activities of these institutional actors. The research has shown that when institutional support decreases, formal seed demands fluctuate (chapter 3.2.4, figure 9). Due to the lack of connections with the largest group of potential seed buyers – potato farmers who operate outside this institutionally driven network and cannot pay premium prices – one could question the efficiency of this network. However, some farmer-to-farmer diffusion took place between farmers involved in these institutional collaborations and the farmers operating outside of the network. Farmer-to-farmer diffusion in Cajamarca might be the result of smaller differences between farmers in comparison to the farmers from the Mantaro Valley, (chapter 4), where no farmer-to-farmer diffusion took place. Also the absence of a nearby market such as the Lima wholesale market might result in this less dualistic character of the Cajamarca context.

Despite of the weak character of the social relations between the network members, the network as a whole operates as a closed system (due to the lack of connections with potato farmers). According to Granovetter's theory, a closed network mostly consists of strong ties. Therefore the weak social relations and the closeness of the network are rather striking. A closed network mostly consists of close friends and family members who are socially related to one another. This is not the case within the institutionally driven network. The concepts for analysing networks do not fully explain the closeness of the Cajamarca institutionally driven network. Therefore I suggest to also include the notion of *'institutional incorporation'*, described by van der Ploeg (1990). According to van der Ploeg (1990, pp. 50) incorporation can be defined as: *"The degree to which farming becomes dependent on markets for supplies"*. Another concept used in his work is the *'institutionalisation of agricultural practice'*, which he defines as: *"The degree to which tasks carried out by farmers are externally prescribed and sanctioned, i.e., the degree to which they are influenced by their technical environment, which has influence on the acquisition and processing of information, the making of investment decisions, and on development of craftsmanship"* (1990, pp. 50).

In his study on potato production in the Peruvian Highlands, van der Ploeg used this notion to explain the dependency of farmers on markets and credits. In the case of the institutionally driven network, farmers have been incorporated in the institutionally driven formal seed market. Although this incorporation creates a certain dependency of farmers on external inputs (seed, support, etcetera), the economic advantages for farmers are strong enough to participate in these networks.

### ***The farmer driven network***

In chapter 4 I have described different types of farmers involved in the production of the potato variety UNICA; the coastal potato farmers, seed producers from Huasahuasi and Mantaro Valley farmers. These three groups of farmers operate as network clusters, embedded in their specific localities. The connections between these farmers create a *'farmer driven network'*. A number of the seed producers within this network are involved in institutional collaborations, similar as described in the previous case. However, this network cannot be defined as an institutionally driven network, as there are some crucial differences. First of all, the farmers involved in this network mainly worked individually, and can be characterised as commercial large farmers. Secondly, in this case the farmers themselves occupy the central position in the network. Although institutions are involved, their role seems less significant and less central. The initial institutional uptake was done by CIP and the University of Ica. They had an important contribution in introducing the variety to potato producers on the Coast and seed producers in the central Andes. After the introduction, farmers continued producing the variety, and soon it got spread among other farmers. Therefore the drivers within this network were the farmers themselves.

According to the concepts for analysing social networks, this network can be characterised as a low density network. This extensive, regional network – covering several departments – consists of weak ties. This became clear during fieldwork; farmers from the different clusters were connected to each other for selling of seed. These relations can be defined as a network of acquaintances, as there are few personal linkages and infrequent contact. The network reflects an overall common orientation and interest; commercialisation of UNICA by supplying the Lima wholesale market.

The three clusters within the network have a more closed character. The steering force of the connections between these clusters is the market demand for the variety UNICA. Figure 22 represents the connections between the three clusters and the Lima market. The coastal farmers have the most direct connection with this market as they are main suppliers of potatoes. The Mantaro Valley farmers have connections with the Lima market (for selling their potato production), with the coastal farmers (for seed supply), and with other farmers within the cluster for seed exchange. The Huasahuasi farmers have a strong connection with the coastal farmers (as they are specialised in seed production), and with other farmers within the cluster for seed exchange.

The social relations between the farmers within these clusters include overlapping spheres. This is defined by Portes (1995) as the multiplexity of a network cluster. This means that the farmers within the

clusters – beside their shared interest in UNICA – have some other overlapping interests which connect them as a group.

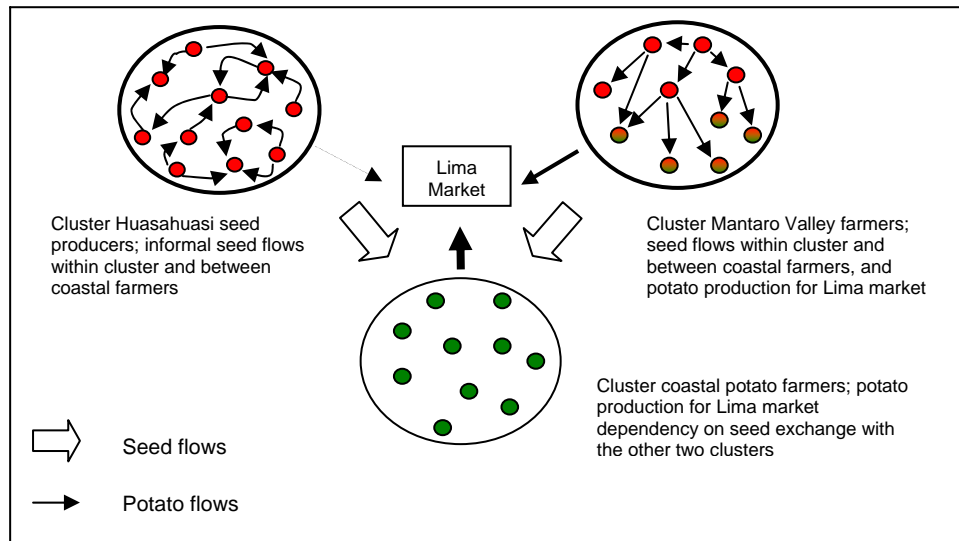


Figure 22. Exchanges within the farmer driven network

This was most clear in the case of the Mantaro Valley farmers. They are all large, commercial farmers who have connections with the Lima market. Furthermore, they are part of the high-class farmers' society with an education background, or educated children and friends.

The farmers within the Huasahuasi cluster are all seed producers. Between these farmers many family ties exist, because of the long tradition of seed producing families. This is represented by the example of farmer Lorenzo and his wife (chapter 4.3.3, box 7), who both come from real potato farming families. The farmers in the coastal cluster are connected to each other through their involvement in potato farming. Only those farmers with enough economic resources have the possibility to produce potatoes. Therefore this group of farmers forms a select cluster. Although these farmers work individually, they do exchange information. This is the result of their dependency (and also distrust) on seed producers from other regions. Characteristics of this cluster are personal contact, exchanging experiences, and making use of each other's networks of acquaintances.

In contrast with previously described institutionally driven network, the concepts used by Granovetter for analysing farmer driven networks seem more relevant. Power relations are less present in this network. In the UNICA case, the concept of institutional incorporation cannot be applied. It seems that the centrality of farmers within a network is closely related to issues of dependency.

### ***The private sector driven network***

In chapter 5 I have described the activities of private project PRA in relation to the promotion of potato variety Serranita. The project's strategy was to involve different types of individual farmers to produce Serranita to supply processing companies such as Frito-Lay and Laurel. I have defined the connections between the different actors as a '*private sector driven network*'. Although this network is also institutionally driven (with PRA as an institutions), the main drivers within this network are the

processing companies which create the market demand for the involved actors. Furthermore, the role of PRA appeared to be essential for maintaining this network by facilitating the contacts between the involved actors. Despite the existence of eleven PRA-projects in Peru, their strategy cannot be seen as a uniform one. The director and the engineers working within this project have created a unique strategy, adapted to the social context. In the case of PRA Huánuco, the director created some room for manoeuvre within PRA's institutional framework to work according to his own vision and beliefs. During fieldwork I learned that other PRA-projects use different strategies and involve different types of farmers.

Within this private sector driven network, three different groups can be identified; seed producers, potato producers, and the processing companies, which form a commodity chain. The demand from the processing companies is very concrete, as they order a fixed amount of potatoes. Although PRA plays an active and important role in this network, they are merely the facilitator. The connections between the members of this network are visualised in figure 23.

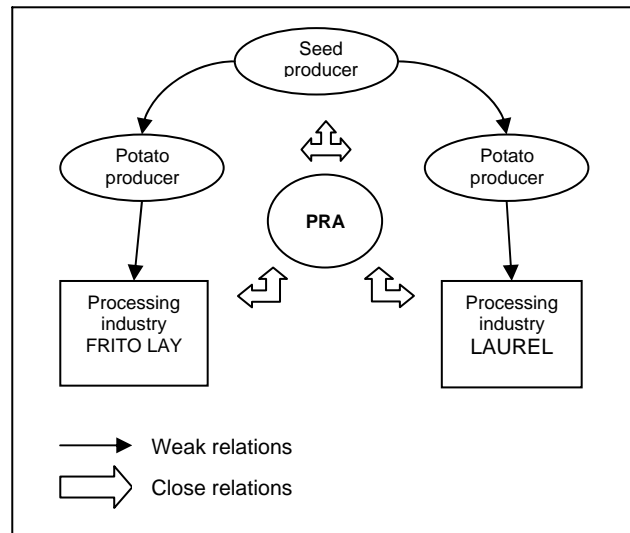


Figure 23. Social relations within the private sector driven network

This network can be defined as a low density network. The impersonal social relations between the members are facilitated by an independent actor (PRA). Therefore these relations can be characterised as weak ties.

The potato farmers involved in this network operate individually, and can be characterised as large, commercial farmers. These farmers maintain weak ties with institutions and the processing companies. Although they have access to expert-knowledge, they tend to keep this information for themselves. Therefore, there is little exchange of information with other types of farmers.

The second group of farmers involved in this network are the small-scale seed producers from Chogobamba. These farmers operate in a cluster, due to the isolated location of the community, their personal relations, family ties and mutual dependency. These farmers are connected to the large potato farmers through PRA. However, intensive support and facilitation from PRA is needed to maintain these connections and to maintain the high-quality criteria for the seed production.

As the network is constructed and maintained due to the efforts of PRA, the question arises; if this network will sustain after the project has finished. According to Granovetter's theory it is difficult to bridge groups with divergent social circles (Granovetter, 1983 pp. 208), which is applicable in the case of the commercial potato producers versus the small-scale seed producers. This would mean that it will be difficult to sustain the connections between the different members of this network without the

facilitation of PRA. Furthermore, Granovetter explains that it is far more likely that weak ties can be bridged and will result in new collaborations and advantages. Therefore the commercial potato farmers can probably maintain relations with the processing companies, as the small-scale farmers can.

It seems that the strategy of the project (planned production for processing companies) and the vision of the director (including different types of farmers for quantitative potato production and rapid diffusion) are contradictory. On the one hand, the PRA director argues that the inclusion of densely-knit communities will accelerate the diffusion of a new variety. On the other hand, the project does not provide the access to the variety (only on a small scale). This became clear during the field visit to Chogobamba. All farmers knew about the variety Serranita and tried to obtain seed, whereas only a small number of farmers were actually involved by PRA for the production of seed. This caused some tensions within the community and towards the PRA-project.

### **Conclusions**

The institutionally driven network, through which the potato variety Amarilis circulates, focuses on formal seed production. The institutional structure of the network (connections between different institutions and NGOs) can be seen as successful, as the variety was introduced on many different locations in Cajamarca. This accelerated the spread of the variety. However, when the network is analysed more in detail, it shows an increased dependency of farmers on expert-knowledge and market accessibility, delivered by the institutions. As the result of selection criteria and the inclusion of more successful farmers in experiments and diffusion activities, the network has a rather closed character, despite the many weak ties. The conceptual framework does not give satisfactory answers as market dependencies and power relations are not fully addressed by Granovetter's theory on network ties. Furthermore the vertical structure of this institutionally driven network and political instability (within the involved public institutions) influences the functioning of this network. The institutional framework within this network does not permit a lot of room for manoeuvre for the representatives of the public institutions to experiment with alternative strategies.

The farmer driven network, through which UNICA circulates, consists of commercial large farmers. This network contains both weak and strong ties. The common interest and the presence of connections between the different clusters make this network coherent and efficient. However, the structure of the Peruvian agricultural sector limits the opportunities for exchanges with other types of farmers. The research has shown the existence of a strong dualism<sup>36</sup> among farmers, especially in the Mantaro region. This dualism has resulted in two different realities; large commercial farmers who have strong connections to the Lima market, and small-scale farmers producing different types of potato varieties that supply local and region markets. It seems there is no exchange between the two different types of farmers in the farmer driven network. Therefore the network is open for farmers belonging to this first group, but does not allow exchange with the latter.

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<sup>36</sup> Dualism refers to the contrasting situations within the Peruvian agricultural sector. Differences in ethnicity, between rich and poor, traditional and commercial, small-scale and large farmers, and etcetera, are some of the examples which have created this dualism.

The private sector driven network, through which the Serranita circulates, consists of processing companies, potato farmers and seed producers. The network is established by the PRA-project with the objective to connect farmers to the processing industry. The demand of the processing companies permits exact planning of the potato production. This makes the network very efficient. The involvement of small-scale seed producers – a group which had otherwise been isolated from the large processing companies – is an interesting attempt to explore possibilities for bridging dualism among Peruvian potato farmers. However, to sustain such a network, either the facilitation of an independent partner with a social vision is needed, or the social relations between the members need to become more personal. The advantage of the network's structure is the independent role of PRA. This allows room for experimenting and testing new strategies which however largely depends on the creativity of the actors involved in the project.

## 6.2 CONNECTING NETWORKS

This paragraph will address the second research question; 'What role do brokers play in connecting different networks or clusters within networks?' Firstly, it is important to identify actors within the networks who could have such a role. According to Long (2001), such actors often play a significant role in opening up new sources of economic activity and investment. Granovetter has mentioned that brokers are those actors with weak ties who link two or more clusters or networks. In most occasions these persons hold a central position in social networks. This role is described by Allen and Cohen (1969) as 'gatekeeper', which can be interpreted as; permitting or blocking access to a network.

During fieldwork I could recognise different kinds of situations where possible brokers played a role in connecting different clusters or networks. The following roles of brokers can be identified:

### ***Institutional brokers***

In the case of the institutionally driven network, described in chapter 3, the central position within the network was held by the public institutions. Through institutional collaborations, clusters of farmers within these networks were connected to the formal seed market. This brought the involved farmers new economic possibilities. Therefore it seems that the public institutions fulfil brokerage functions through the actions of their employees. However the effectiveness of these institutional brokers can be questioned, as there is little incentive for them to operate efficiently due to hierarchical structures, political instability and financial cutbacks. Although the institutional brokers create linkages between the members of the networks, these linkages do not reach groups of farmers who are considerable different than the involved groups of farmers. Therefore no unexpected and innovative sources (information, economical resources, social relations, and etcetera) are opened. It might happen that institutional brokers start functioning in an informal way, sometimes by leaving the institution. The following example of brokerage (entrepreneurial seed producer) describes such a situation.

### ***Entrepreneurial seed producer***

The entrepreneurial seed producer Roncal (chapter 3.3.5, box 5) was identified as broker. She had operated within the institutionally driven network as representative of INIEA. After ending her employment at INIEA, she started working as a formal, entrepreneurial seed producer. Her position is independent and she actively established a network of buyers around her. She can be considered as a broker, because she acknowledges informal potato farmers as her most important group of clients. This group of clients does not pay premium prices, but her approach accelerates the diffusion of high-quality seed in the informal system. Her vision is to improve potato farming in Cajamarca, by producing quality-seed. In this sense she accomplishes her vision by connecting the formal and informal system as agricultural entrepreneur. Furthermore, her social involvement in her community and sharing of knowledge and techniques has resulted in the growth of potato production. Due to her more independent position outside of the public institutions, she has more room to work according to her own vision, which could lead to more surprising developments and could open up new economical resources.

### ***Director of private project PRA***

In chapter 5 I have described project PRA. The aim of this project is to link farmers with markets. This project creates a broker function by facilitating contacts between farmers and the processing companies. The director of the project can be seen as a broker here, because he also includes small-scale farmers from remote areas. His capability to collaborate and communicate with different types of actors from different social circles makes him a broker. He has created room for manoeuvre to work according to his own vision, by ending his career within INIEA.

### ***Farmers within seed producers committees***

At the farmer level I could also identify a potential broker; farmer Genebrardo, the formal seed producer from Chota (chapter 3.3.4). He worked intensively with INIEA and his most important clients for registered seed are public institutions and NGOs. He was also one of the first farmers in his region who produced Serranita. During the field visit it became clear that this farmer was an important information source for neighbouring farmers. Not only did he share information with his neighbours, operating outside of the institutionally driven network, he also exchanged new varieties by using Serranita as payment for labour. Although this farmer was probably unaware of his position, through him his neighbours had access to new varieties and high-quality seed. This resulted in the diffusion of the new variety Serranita among farmers. During fieldwork I found out that many seed producers in comparable situations were not willing to share seed with neighbouring farmers (chapter 5.3.2, box 10). The example of farmer Genebrardo shows how different groups of farmers can be bridged by the unexpected actions of individual actors that operate in both the institutionally driven network and the informal network of farmers. These situations can be defined as 'cracks' within a network. These 'cracks' are visualised in figure 13 (chapter 3.5) and are essential for the diffusion of new potato varieties. However, 'cracks' cannot be planned, as they are the result of the social relations between farmers, which are fluent and change over time.

### ***CIP's role in promoting varieties***

In the case of UNICA, CIP-engineers played an important role in promoting this variety. The CIP-engineer involved in this study had an important contribution in introducing the variety to farmers on different locations on the Coast and in the central Andes. This CIP-engineer was a farmer himself, who experimented on his farm and was actively involved in exchanging information with other farmers. He strongly believed in the quality of potatoes: *"If a variety is good, it will spread by itself... It does not depend on the people involved"*, he explained. He did not notice his own bias, because due to his efforts, the variety was successfully introduced and spread among other farmers. Especially in the case of Huasahuasi, the introduction of UNICA to merely two farmers was enough to spread the variety among the majority of farmers in a period of only three years.

### ***Local market places as a tool for establishing new relations***

Market places and local fairs can be seen as sites where new bridges are created. The example of the initiative of IDMA (chapter 5.3.1) represents such a situation. IDMA organises a weekly fair in Huánuco to support biological farmers, promote biological products, and to accelerate the establishment of new contacts between farmers. Although this example is not studied in detail during fieldwork, fairs like these are important meeting points for farmers. The organisation of fairs is already emphasised by other researchers (Tapia, 1993 in: Boef *et al.*, 1993) as a useful approach to stimulate exchange between farmers and for integrating the formal and informal seed system.

### ***Conclusions***

The above examples represent a variety of cases in which individuals, institutions, or initiatives have a broker function. In some cases these actors were aware of their broker function (director of PRA), whereas in other cases they were not (farmer Genebrardo from Chota). Brokers cannot only be recognised according to their central position within networks, also the social characteristics of brokers explain more about the ability of such persons to fulfil this role. Brokers must be able to assess needs, motives, and actions of a great variety of different people simultaneously (Granovetter, 1983 pp. 205). According to Hannerz (1980), loyalty, ability to deliver, the objectives of the actual holder of resources in releasing them, could be variables conceptualising the role of brokers. Hannerz argued for a further analysis of the social characteristics of brokers for a better conceptualisation. In the above described examples, some additional social characteristics of brokers can be identified:

- Independency and flexibility to create room for manoeuvre;
- Experiences with, or the ability to assess needs of socially divergent groups of actors;
- Willingness and courage to involve outsiders.

Although these social characteristics are important, I will not further analyse them. It is not possible to make generalisations about brokers, as their activities take place within a dynamic process of social interactions, which is bound by space and time. The awareness of the existence of these bridging functions is important. Bridges create pathways for innovation and the diffusion of new information and resources; in this case new potato varieties. These pathways cannot be planned on forehand. Therefore

there is no need to create a general theory on brokers. It is important to focus on the structural conditions in which brokers emerge, instead of searching for the social characteristics of them.

### 6.3 CONCLUSIONS

The overall research question of this study was: **“Which processes influence the diffusion of CIP’s potato varieties?”** Based on this study, different processes that influenced the diffusion of CIP’s potato varieties can be identified. First of all, I want to conclude by saying that the diffusion of CIP’s potato varieties is influenced by many factors, which are difficult to grasp in only this study with three fairly distinct cases: Potato farming in Peru is characterised by great geographical differences, differences in ethnicity, institutional contexts and etcetera. Therefore no standard format can exist for the diffusion of new varieties; every situation is heterogeneous and embedded in its locality.

In this research, diffusion is explained as the result of the circulation of potato varieties in different social networks (paragraph 6.1). Secondly, the role of brokers seemed essential in connecting different groups of people, which resulted in the diffusion of potato varieties among divergent groups of actors (paragraph 6.2). Furthermore, some processes were identified which went beyond the theoretical explanations of Granovetter’s theory on network ties. Also power relations and the dualistic character of the Peruvian context can be seen as processes which influence the diffusion of CIP’s potato varieties.

According to Granovetter’s theory, the diffusion of potato varieties is the result of social relations between actors in social networks. Despite the existence of different networks through which CIP’s potato varieties circulate, the general tendency shows a division among Peruvian farmers. Because of the dualistic character of the Peruvian context, there exist few linkages between large commercial farmers and small-scale farmers. Public institutions have the tendency to work with a homogenous group of more successful farmers. It seems that the diversified context is not taken into account by the institutions. Using Granovetter’s theory, this would mean that the majority of the potato farmers (80% of the potato farmers who own less than one hectare) are not addressed, as there is little exchange between these two types of farmers; they are to a large extent part of different networks. Expert-knowledge and new varieties are limitedly accessible for – and circulates within – only a small group of farmers. This is confirmed by Prain and Scheidegger (1988), who found that diffusion of potato seed from large to small farmers did not take place in Peru, due to the poor linkages between these groups resulted by social differences, and ethnic and geographic boundaries. This reduces the impact of breeding programmes (Janssen, 1989). Due to the big differences between the two groups of farmers, and the small number of weak ties small-scale farmers have with the farmers who have more direct access to expert-knowledge and new varieties, these farmers will always face difficulties in having access to information sources and a disadvantage position in the potato market. Therefore the focus of public institutions on institutionally driven networks will sustain and even encourage this dualistic character within Peruvian potato farming.

For CIP this would mean that in order to address farmers' needs more efficiently, strategically involvement of different types of farmers could lead to more linkages between these two separate groups. Connecting these two groups will accelerate agricultural development among the small-scale producers, and it will lead to more rapid diffusion of new potato varieties.

However, no blue-print approach can be recommended as the ideal diffusion strategy. All of the described strategies in this research had their contribution and limitations with regard to the process of diffusion. They cannot be used as blueprint strategies followed by adaptive approaches, because they are embedded in their locality.

The role of institutions in the institutionally driven network has proven its contribution as the variety Amarelis was widely introduced. On the other hand, this network is characterised by vertical structures which might decelerate the diffusion of varieties as circulation of information and varieties remains within the institutionally driven networks. However, farmer-to-farmer diffusion always took place (chapter 3.5), even within formal diffusion strategies. I have defined this farmer-to-farmer diffusion within formal diffusion strategies as 'cracks' within networks (see paragraph 6.2). These cracks can be considered as interesting situation to gain a better understanding on the processes of diffusion.

Diffusion of the variety UNICA within the farmer driven network took place among commercial, independent farmers. In this case, personal and direct contacts between farmers have proved to be efficient in the diffusion of potato varieties. In spite of this successful farmer-to-farmer diffusion strategy, circulation remained within a network of similar types of farmers, and no bridges were made with other groups of farmers.

The private sector driven network seemed most useful in exploring opportunities for connecting divergent groups of farmers. Initiatives like PRA are interesting approaches for declining the differences between large commercial farmers and small-scale farmers. However, analysing the role of PRA Huánuco showed that this strategy not only depends on the project itself, but also on the role of the director who fulfilled a broker function. Therefore it is problematic to generalise this strategy, as it is only applicable within its specific social context.

The distinction between the formal- and informal system is worthy to mention. This issue is part of an ongoing discussion which has been the topic of several researches (Almekinders *et al.*, 1994 and Thiele, 1998). These researches have addressed the usefulness of the integration of the formal- and informal system. Within the current situation, approaching the formal- and informal system as two separate systems, influences the diffusion of new potato varieties and even encourages the dualistic character of Peruvian farming. The formal system is responsible for the initial introduction of new improved potato varieties, whereas the informal system is needed to spread new varieties among the majority of farmers. Although these two systems are seen as separate systems, in practice they are intertwined as the 'cracks' in networks explain.

The research has described examples of public institutions within the formal system which introduced activities in order to establish more integration of the formal and informal system (chapter 3.2.2). This integration could strengthen the formal system, as their market increases and subsequently,

marginalised, small-scale farmers have more access to the high quality seed. However, these initiatives are on a temporary basis. The formal seed system in Peru is related to policy and political changes. During fieldwork it became clear that political changes (privatisation of the agricultural sector and financial cutbacks) decreased the possibilities to stimulate such integration. Institutional mandates and strategies within public institutions are conflicting. Awareness of this conflicting situation is important for CIP to focus on, as they operate through the formal system. More lessons should be learned from already existing research on this topic, and more could be learned from the 'cracks' within networks, as unexpected sites for diffusion.

CIP's strategy to work with trustworthy and promising individual actors within institutions is a strategy that can be encourage according to the theoretical notion of brokers. However, the institutional structures which might limit the flexibility of these brokers should be taken into account. Therefore partnerships should not be seen as fixed strategies. Although I have identified different broker roles in this research, I would recommend further research on other broker situations, such as the role of 'potato traders'. Further research could provide more insight in the contribution of this group of brokers to the diffusion of new improved potato varieties and information among farmers.

The title of this study: '**Bridging differences**' refers to the diversified social context in which Peruvian potato farming takes place. The research has shown that this diversified context has a dualistic character. The differences between farmers are big, and are maintained through the strategy of many public institutions. According to the theoretical perspective of this research, these differences can be decreased by creating bridges between the separate groups of farmers. This would give the majority of farmers – small-scale, marginalised farmers – access to new information, new varieties and institutional support. However, creating these bridges is not something which can be strategically planned. This research has described and analysed the promising role of brokers in creating bridges between these different networks.

The photos on the front-page are selected to give an impression of the diversified Peruvian context; the steep mountainsides of Chogobamba which are cultivated by hand, the irrigated river valleys on the desert Coast, the cultivation of fields by ox in Cajamarca, and the selection of potatoes by women in the Mantaro Valley.

The titles of the three empirical chapters (chapter 3, 4, and 5) refer to the commitment of actors to the three selected potato varieties. Although this research attributes diffusion of potato varieties to the social relations and interactions between actors, the titles refer to the strong believe actors have in the power of the potato itself. Their confidence in these varieties must also be interpreted as important and essential drivers for diffusion.

## LESSONS

During the fieldwork, the time schedule and the selection of research areas were experienced as a limitation. The relatively short research period did not give me the possibility to observe whole growing seasons in different areas. Therefore I could not study the potato season on the Coast (the potato season is between May and September, while my fieldwork was conducted between November and February). Furthermore, many research locations were selected in order to collect large quantities of information. I have visited different locations in four different departments. Although this provided me with diversified information and gave me the opportunity to explore the country, the time to study the social context of the involved actors was limited. This limited me in studying the social relations between the actors in detail.

Another limitation was the experienced language barrier. Deliberately I had chosen to conduct my research in a country where I could learn a new language. I have spent the first three months of my stay in Peru on learning the language. Especially during the first month of my actual fieldwork I faced difficulties in planning research activities and interviewing farmers. I received a lot of help from the key-informants in this research, in organising fieldtrips and conducting interviews. This support might have resulted in biased information and desirable answers from farmers, as the key-informants were representatives from the involved institutions. However, without their support, many field visits would not have been possible.

During the fieldwork I experienced the difficulties of having no background in natural sciences. Therefore it took me considerable time to get used to the technical jargon and understanding potato farming practices. However, as a person with no background knowledge, I approached this research from a different theoretical perspective as generally used within CIP-related research. I hope that this different perspective will provide new insights for conducting research.

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