# Social Network Analysis in the Context of Andean Local Groups: The Textile Producers of the Calchaquí Valleys[1]

Laura TEVES

*University of La Plata, Argentina*

Eva FISCHER

*University of Bern, Switzerland*

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### Abstract

The central feature of rural Andean societies is their extensive socio-economic network that links different local communities, which are structured by rules of real and fictitious kinship. At first sight, the norms seem to define strict limits, but considered more closely, they reveal inherent flexibilities and potentialities of frontier crossing. These findings form the point of departure for an analysis of transfer circles via textile production activities and related operations. The different stages of the investigation lead to insights with regard to the extension of individual networks beyond the household domain, individual decision-making under group conditions, and the coherence of a pattern generated by traditional socio-economic ties and currently existing transfer cycles.

Keywords: Ethnography, Network Analysis, Social Anthropology

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# Introduction

The effective application of Social Network Analysis (SNA) within the fields of socioanthropological research which focus on the investigation of social structures created by individuals that are related by traditional locally or regionally practiced lifestyles has been well proved by Thomas Schweizer (1996:111-156, 214-254). Contemporary investigation builds on this solid base and develops more complex questions such as that of lifestyle definitions in an Andean context (Crivos 2006, García and Rolandi 2000; García, Rolandi, López and Valeri 2003; Heras and Foio 2007, Martínez and Pochettino 2004; Raviña, Fernandez and Capparelli 2007). Within this research line that is characterised by statistical methods and the detection of social structures on different levels of society, the refraction of global conditions as experienced within local and regional settings is of special interest. Latin American nations are still in the making and as a consequence, they can currently be viewed as macro-entities with tendencies to integrate, socially and politically, the different marginalized rural groups with which they share the state territory.[2] In the subsequent sections we shall ignore problems of inner conflicts and focus our interest directly on the role of rural local groups as agents within a network of socio-cultural and economic relations, on their structure and their specialisations developed by building on traditional knowledge, on economic and on power relations.

Our contribution has been developed on the basis of Laura Teves' fieldwork data, and our ongoing discussions of the topic over the last two years. First we shall present a brief section explaining the main socio-cultural characteristics of Andean societies' lifestyles that show relevance for the analysis presented in this article. Subsequently we shall pick up only those characteristics that are of special interest and elaborate on the most important details arising from this context for our research. Finally we aim to describe SNA application in the context of Andean local groups and to present the latest findings.

# Andean Local Groups

Andean local groups have at their disposal a respectable list of shared cultural grounds and they make use of traditionally pooled knowledge. In addition to a common geographic range, and a period of macro-history that covers more than 700 years, many of them share a dense socio-economic regional network with stable long-distance ties. Within the Andean cultural horizon, social organization still builds on real and fictitious kinship, which controls the mode of production linked with agricultural activity, especially that of subsistence farming. The transfer of goods and products to locations far from the production zones is realized by using the above mentioned ties. Two examples suffice to emphasize the complexity of this topic. One refers to the trans-local relations established by the travelling doctors of the Kallawaya region during the period from the 1920s to the 1960s (cf. Girault 1984). These medical specialists' paths reached as far as Panama, Buenos Aires and Paris. Some of their routes on the South American continent covered distances of more than 2000 kilometres.

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2  Some authors are of the opinion that distinct social entities or marginalized groups occupy territories that  also are claimed by the Nation States. In this article we clearly take the position of the «distinct social entities or marginalized groups». Within their perspective the Nation State is defined as an invader who is forcing them to share their territory with it. This position is reflected partly in the laws concerning indigenous groups who live within the Argentine territory (e.g. in the Constitución Nacional reformada, art. 75 inc. 17, see also GELIND 2000 and Papazian 2008).

The other is related to the current effects of global conditions and structures and refers to the travelling Ecuadorian Otavalo traders.[3] These people not only market handicraft articles produced by their kinsmen in small local communities across all parts of Latin America including the Galapagos islands, they have also penetrated the European market and can be encountered in the streets and marketplaces of Vienna, Lucerne, Porto and Berlin.

## Material Culture and the Production Processes Used as Markers of Social Relation and Interaction

Our study focuses on material culture and especially on textile production because, in the Andean regions, cloth and weaving occupy a special position. Woven cloth supports and expresses political power, it strengthens economic ties and opens important communication channels to the past and to the ancestors. All these aspects form inherent elements of Andean peasant societies and are closely related to local social organization and economic ties. As a consequence, markers of network sections, of individual and of more extended networks, can be identified within the wide range of activities related with textile production. Fundamental tasks of the textile production process are animal breeding, wool production and wool shearing, the distribution of wool as expressed by the different economic exchange forms, the spinning, the weaving, and the composition of textiles.

Recently completed investigations on rural local groups (Benedetti 2005; Merlino, Sánchez Proaño and Ozcoidi 1988, Rabey 1999, Rist 2006) focus on the topic of natural environment utilisation based on the implementation of a highly differentiated traditional model. The studies also emphasize the role of social organization as the basic condition of a specific mode of production. Typical of Andean economies is the application of strategies developed in the context of limited space within ecological niches and their optimized exploitation. But these forms of acting are also based on transfer activity put into practice by exchange circles and trade, and on the commercialization of raw materials, agricultural products and the intangible commodity manpower (Dollfus 1992:15-17, Murra 1992:122-130, Polanyi 1997:102, 1979:219).

Bearing in mind these parameters, more detailed ethnographic studies[4] need to be established by adopting a micro-perspective and by focussing on the domestic sphere, on the way natural resources are used and on the access to traditional knowledge (Schweizer 1997). The investigation of daily routine activities, which take place within these settings, allows direct access to more complex configurations of knowledge and practice. The inherent tendency of ethnography to spontaneously open up new avenues of investigation makes this

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3  Unpublished data collected by Fischer during the years 1992-2007.

4  „As a method of the proceeding's contextualization, network analysis could dramatically improve qualitative investigation. And vice versa it is impossible to design a network study, or to interpret the results generated by this kind of analysis, without having recently realized a carefully ethnography of the setting by using classical approaches and questions. On the contrary, using exclusively network analysis is a purely formal practice..." (Emmanuel Lazega, 1997:119, original text in Spanish, authors' translation).

 "Como método de contextualización de la conducta, el análisis de redes puede dramáticamente mejorar la investigación cualitativa.  A la inversa, es imposible diseñar un estudio de redes, o interpretar los resultados provistos por este tipo de análisis, sin tener previamente realizado una cuidadosa etnografía del escenario utilizando aproximaciones y cuestiones clásicas. En el sentido contrario, usar exclusivamente el análisis de redes es un ejercicio puramente formal..." (Emmanuel Lazega, 1997:119).

kind of approach our preferred method of data collection. We apply it especially for the research of interaction patterns and of the way in which these are reflected by the practice of everyday life. Thus our studies concentrate on microanalysis of economic activities practised within a clearly defined geographical region. And as a direct consequence, they aim to discover wider economic and socio anthropological contexts via the application of inductive and deductive methods that, at the same time, take the possibility of analysis on a micro and macro level of social life into account.

We do not view rural local groups as isolated socio-economic entities. They all have developed their own relations to national society and their particular arrangements with trans-national movements, migration, and currently arising new consumption-related needs. Many of their members re-evaluate their common autochthonous origins and they use electronic communication, which, besides its value as a means of information exchange, bears the inherent properties of creating communities with extensions into cyberspace (Fernback 1997:46-47, Sassen 1999:54-56, 2001).[5]

On the national stage, the rural local groups represented by their leaders and organizations, are conquering political space and increasingly hold power positions (Posey 1996:54-55, 58-59). For an adequate socio political response that includes all actors who participate in this process, these transformations have to be observed and analyzed accurately, an approach that generates further demand on studies about integration into national societies, and about the adaptive skills of the involved local groups. Currently, the interest in socioanthropological studies concerning ecological strategies focuses on the relevance of the different cultures' adaptive efficiency and its inherent tendency to respond to changes (Abeledo 2007). The research also concentrates on the great variety of individual and collective perspectives, and on their strategies in terms of perceiving, sustaining or exploring new forms of lifestyle adaptations in specific environments. As a consequence, different social lifestyles have become an important category of specialization and take on a clearly positive connotation in various Latin-American Nation States that are in the process of their making and need to create unity (i. e. Bolivia, Argentina, Chile and Ecuador)

Additionally, the dynamics of social transformation processes within nation-state contexts and the influences of globalized production processes (Arzipe 1993:12) lead to other important topics. These include the micro-scale processes involved in the realization of subsistence activities by the application of adapted strategies and the problem of how to promote and maintain traditional knowledge and practices that have emerged over a long period of human adaptation to specific ecosystems. Consequently, this insight into traditional knowledge-based practices, such as, for example, forecasts of imminent harvests, phytomedicine and highly specialized crop management (Caniullan 2006, Cordero 2006, Gómez 2006, Ortiz, 2006, Herrera 2006, Orlove, Chiang and Cane 2000, Posey 1996, Rist 2006) should form an integrated part of all the future efforts aiming at rational and consequently realized sustainable development in rural regional context. Within the scientific sphere of competence, the deepening of our knowledge about these local groups leads to more complex questions and to a macro-analytic research level (see *Table 1* to gain more information about the different levels of analyses and the related hypotheses).

5 Within the last few years distinct Andean local groups have modified their participation in political life on the national level of interaction and have begun to define exactly their ways and forms of representation, which also means strengthening their power position. The activities of these groups in cyberspace do not constitute part of the presented database. Without any doubt this communication platform shows a high relevance for the definition of the communities' current contexts.

We have selected to apply SNA, from a wide range of interesting alternatives, for the development of an adequate analytical perspective in the above mentioned contexts of micro-macro relations. This method facilitates insights into the mutual penetration of various domains with different levels of practiced lifestyles within a clearly defined local group (Requena Santos 2003:9). Individual actors and the diversity of their social and economic ties can be explicitly identified and the pattern of these relations can be represented graphically, a procedure which allows a better understanding of the discovered structures. The different rationales and possibilities underpinning the basic processes of decision making and of action can be uncovered and investigated in a more detailed way (Adler Lomnitz 1994; Borgatti, Everett and Freeman 1999, White and Houseman 2002:80). The innovative character of SNA application resides in the possibility to shed light on recently emerging problems in the actually existing communities. The studies of rural Andean local groups, which adopt a network perspective, differ in some characteristics from other studies applying SNA and which generally focus on aspects defined a priori as traditional or genuine of these groups.

As social anthropologists extract primary data directly from an encountered social reality, they all build on a database that has been developed by using ethnography as a method. Within that specific context, in most of the cases, the definition of the sample coincides with the local group's size and the kinship ties cover regional and trans-regional economic relations (cf. Schweizer 1996:219, 225-226, 242). Excellently documented data, such as that concerning the !Kung collected by Polly Wiessner (1977, 1982; cf. Schweizer 1996:71-83, 1997:741; Hage and Harary 1991:123) and the database elaborated by Anita Chan, Richard Madsen and Jonathan Unger (1984) about conflict and change in a south Chinese village from 1950 to 1980 (Schweizer 1996:42-52), also can be used for SNA. In reference to the Andean regions, up to now, no basic survey with the application of SNA has been undertaken in such a way that, as a positive consequence, its data base could be used by other SNA practitioners. As a consequence of the explanations presented up to here, the subsequent paragraphs intend to show clearly the implementation of SNA by taking the case of a local community situated in northeast Argentina.

## The Local Community as Case of Reference: The Analyses of Social Ties Defined by Textile Production-Related Activities and their Corresponding Transfer Network[6]

The community of Molinos is located in the Calchaquí valley complex, a NW Argentine region near the Bolivian border. Its altitude ranges from 2800 meters to 6100 meters above sea level and its inhabitants, who are defined within the national context as members of the Coya[7] group, dedicate their main economic activities to agriculture, animal husbandry and textile production. The households are composed of nuclear families living together

6  SNA enables researchers to analyze the structure of ties between both the members of small groups that form parts of a larger network and entire networks composed of a myriad of members. Network analysts work out only one case or interview one (or few) expert informant(s) to show a general structure or to formulate a hypothesis. But if the research design demands more informants, additional relational data or entire datasets may be added.

7  *Coya* probably derives from the term *Colla* which denotes the Aymara people migrating to Argentine rural regions urban centres from the Andean highlands.

with members of their extended family. In addition to real kinship ties, fictitious kinship is used for the construction of social and economic relations. Travelling is an integral part of the people's lifestyle. Since the 1980s some families have been involved in small-scale enterprises such as herding camelids, especially the half wild vicuña, and textile production. Recently collected ethnographic data (Crivos 2006, Martínez and Pochettino 2004, see also Palma 1973) within the Calchaquí-valleys leads to three central questions, which can be formulated as follows:

1) Do individual networks also indicate more extended affiliations and network spaces that exceed the domain limited by the daily routine work practiced within the domestic unit?

2) Is individual decision-making linked to the group's internal social organization pattern?

3) Do, under conditions of recently shifting structures, the activities of daily practiced routine work still reflect the continuity of the traditional Andean economic system based on the complementarities of ecological micro-zones?

Each one of the questions presented above, and consequently each one of their corresponding answers, is linked to a specific thematic area and perfectly fits the specific intentions of the investigation. They define the basis of primary data collection, of relational data, of the analysis of network properties and of the network description but also lead to insights derived from network properties and to explanations of the studied structures and patterns. In **Table 1** we can see clearly that the methods and the special proceedings of SNA are planned for the whole analytical process. In most of the cases they show a very dense character.

| Objectives | Data Base | Network Description | Results |
|---|---|---|---|
| Definition of ties, subgroups, and networks involved in economic activity | Individual links | Subsistence related exchange activities | Correlations of personal networks formed by the relational attributes |
| Definition of the organizational pattern engendered by textile production | Expert links | Specialized and additional activities related to textile production | Composition of the actors' set defined as the reflection of textile production networks |
| Reconstruction of regional production and transfer circles | Local group links | Transfer of raw materials, goods, information, and manpower | Topology of the transfer network |

*Table 1*: *Research design of the study showing the relation between the distinct levels of investigation and the corresponding hypothesis*

# Collection of Field Data

In the following paragraphs the classification and the organisation and the collected data will be shown. The fieldwork was carried out by conducting a series of semi-structured expert interviews with 15 persons. The informants' key positions referring to the weaving process and the corresponding social network enabled the reconstruction of the different sequences of various economic activities. This data base was used to define the operational sequences of the textile production process, and they were also used as attributes of the actors' relations.[8] In the initial phase we collected narrative and observational data which we used to define the socio-economic spaces where textile-related interaction takes place. From this starting point we began to define the categories, for the description and the identification of the subsistence-related and the textile-related activities (see *Table 2*).[9] We also obtained insights into the basic concepts of textile production activity and its specific organization. Finally, the information gained was used for the reconstruction of a model of the complete production process. For methodological reasons, the actors' cognitions referring to the different activity categories will be ignored because realizing SNA we need relational data and not data that corresponds to characteristics linked to individuals or groups. Within the subsequent stage of research, the same base of primary data was reapplied and information concerning all interactions of "existing and perceivable links" within the domestic domain was gathered and processed (Bernard 1996:10). These relational data lead to a description of activities by both exchange sequences and collective tasks that take place within the activity's domain in Molinos (Lave 1995:30, Teves 2002:146). For the description of the complete textile production activity and its related operations the actors' perspective was adopted. This procedure aimed to analyse the agents' relations that form the pattern of social interaction and of individual networks (Borgatti and Foster 2003:1000, Lazega 1997:120).

| Local Context of Activity | Actor | Actor Attributes | Relation Type | Network Type | Network Extension |
|---|---|---|---|---|---|
| Domestic unit | Expert informant | Gender, age, division of labour by gender | Kin-based. Exchange of manpower | Individual network | Local |
| Local but outside the domestic unit | Communities of practice | Specialization, task | Not kin-based, Exchange of raw materials, technical knowledge and manpower | Specialist network | Regional |
| Outside the location and in specific ecological zones | Location units | Specific ecological zone | Not kin-based. Exchange of raw materials, goods technical knowledge, and manpower | Ecological zone and location micro-circles network | Trans-regional |

*Table 2*: *Complete spectrum of textile production activities in terms of relational data*

8  The textile activity can be described as an operative sequence of tasks which defines the attributes and links between the actors of a network.

9  For an exhaustive definition of subsistence activities within the Andean context see Fischer 2008:46. All textile activity is linked closely to the subsistence sphere and sometimes these two categories synthesize.

## Individual Networks

The details relating to the connections between location and activity are important because they show the different operational sequences of textile production. They are indicated in the first column of the table presented above. The information provided by the second line of *Table 3*, which we would briefly like to exemplify by one case, refers to an actor's specific attributes, activities and ties within and beyond the context of the domestic unit. The expert-informant, a 45-year-old woman (labelled for the analysis with I-SCHG, see *Table 3*), lives within her nuclear family, which forms part of a larger domestic unit in Tomuco, one of the investigated communities located in the Calchaquí valley. She indicated 34 individuals – women, men and children of different age – with whom she holds relations defined by the exchange of goods and manpower like weaving, agricultural activities, gathering wild dye plants, and animal husbandry. The pattern constructed by all these activities comprises dyadic relations and covers 52 transactions. The involved agents reside in various locations scattered at different altitudes over the valley.

Four categories of alters can be distinguished; relatives (the main part), neighbours, friends, and acquaintances or "known people". The ties developed on the basis of textile production. In this analysis we will ignore the commercialization of the textiles, and refer to five transfer modes of manpower, primary material and semi-manufactured products. These cover the fields of trade, which takes place at the local markets where commodities (including manpower) are transferred by using the general equivalent money (cf. Polanyi 1997:102), and they also cover the direct and the indirect, the reciprocal and the unequal exchange of raw materials, goods and manpower. In the subsequent paragraphs we will explain in which way the systematization of the relational data has been realized.

## The Composition of the Corresponding *Adjacency Matrix*[10]

Within the adjacency matrix each pair of nodes and its corresponding tie, which shows reference to an object, transaction or a service, occupies one cell. These directed ties, which are a specified kind of link, indicate the direction of transactions. Some relations show absence of reciprocity.[11] In the presented case, this is equivalent to the synchronic cut provoked by the investigation design, which has placed precisely this restriction on the relational data body. At the moment we only possess information referring to a small part of the complex entity of all possible and/or really existing relations detectable over a long period of time.[12]

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10 „So, the adjacency matrix tells us how many paths of length one there are from each actor to each other actor." (Hanneman and Riddle 2005, chapter 5).

11 „Reciprocity of ties can be a very important property of a social structure because it relates to both the balance and to the degree and form of hierarchy in a network. ,, (Hanneman and Riddle 2005, chapter 5).

12 See footnote 1.

| Informant (I) I-SCHG | Alter (II) | Category / Partial and Total Quantity of Transactions | Attribute of Tie: Kin Tie (1)/ No Kin Tie (0) | Locations: Informant's Location (1) Other Location (0) |
|---|---|---|---|---|
| | II-AG | Exchange /1 Exchange /2 Total: 3 | No kin tie (friends) 0 | Tomuco 1 |
| | II-CH | Trade /1 Total: 1 | No kin tie (acquaintances) 0 | Village of Molinos 0 |
| | II-SC | Exchange /1 Exchange /1 Total: 2 | Kin tie 1 | Las Ramadas Humanao 0 |
| | II-S1 | Exchange /3 Trade /1 Total: 4 | Kin tie 1 | Colomé 0 |

*Table 3*: *Example of stored and systemised relational data of the relations of one individual actor*

## Expert Networks

The information of location and activity as indicated in the intersection of the first column and third line of *Table 2* refers to the local community's groups of textile experts. The corresponding relational data of the textile experts' groups were used to construct the actors' set defined as a community of practice by Julian E. Orr (1996:70) . This set also can be defined as a reflection of the individuals' textile production activities. The actors' relations were constructed by integrating the complete body of available descriptions obtained from the primary data base that is composed of interviews and observations. They all refer to specific functions that make up the textile production process. The links between these actors are indicated by lines and are shown in *Figure 7*. These lines connect the items of each graph. But the relations are not comparable with each other, which means that each network member satisfies the needs of one defined group only. The different groups' members share one class of attributes and they are all connected by the different tasks they are executing.

Each of the identified networks is composed of a minimum of three actor categories: of experts like weavers, spinners, and composers; of entrepreneurs like coordinators of cooperatives, cultural promoters, municipal agents, landowners and company bosses that offer work; and the providers of raw materials like caravan owners, ambulant traders, carriers and breeders (see *Table 4*). An important actors' reference is the mention of space where the different textile-related activities are realized. In the following paragraphs we shall especially refer to this kind of link.

| Sociometric Notation | | Tie Properties | Activity |
|---|---|---|---|
| **Assigned Number of Actor** | **Anonym or Name Acronym** | | |
| 1 | TG | 1 | Weaver |
| 5 | AG | 1 | Spinner, weaver |
| 9 | Ach | 3 | Carpenter |
| 15 | Afa | 1 | Knitter of pullovers (cooperative-based) |
| 16 | Aro | 1 | Designer (cooperative-based) |
| 22 | Boli | 2 | Trader of dyestuff |
| 26 | Cata | 2 | Intermediary of wool and hides |
| 29 | Yapu | 1 | Assembler |
| 30 | Trader1-LCCH | 2 | Trader of threads |
| 33 | Trader1-SR | 2 | Wool buyer |
| 36 | Trader2-SR | 2 | Collector and seller of dye plants |
| 38 | Trader3-SR | 2 | Wool buyer |
| 40 | Breeder1-SR | 2 | Wool buyer (llama and sheep wool) |
| 41 | Breeders1-JG | 2 | Producer of llama wool |
| 45 | DiFaLo | 2 | Spinner, assembler |
| 47 | EG | 1 | Weaver |
| 48 | Guay | 1 | Weaver, farmer |
| 52 | Farmer (landowner) | 2 | Landowner |
| 57 | Choco | 3 | Carpenter |
| 67 | GeGó | 1 | Weaver |
| 69 | GraBa | 2 | Organizer of cultural events |
| 70 | GTR | 1-3 | Weaver, shepherd |
| 78 | Ha.Gu | 3 | Attendant of donkey caravans |
| 79 | Blacksmith-MF | 3 | Blacksmith producing weaving combs |
| 81 | Ha.LCCH | 3 | Industrial dyestuff |
| 84 | JuQui | 3 | Farmer, breeder (cooperative-based) |
| 88 | MeBull | 2 | Organizer of commercial events (handicraft markets) |
| 94 | Meló | 2 | Coordinator (cooperative-based) |
| 99 | Organiser (local handicraft market) | 2 | Public administrator |
| 103 | BertoFa | 2 | Local functionary |
| 109 | SR | 3 | Nomad herder |
| 111 | Sr. Fa | 3 | Breeder, wool producer |
| 115 | Sr. Ló | 1-3 | Breeder, weaver |
| 123 | Sr. Torteros-SCHG | 3 | Producer of spinning-whirls |
| 134 | Sr. Employer 1-EG | 2 | Employer, contracts workers |
| 137 | Sra. Gó | 3 | Buyer of industrial dyes |
| 147 | Sra. Ló | 1-3 | Breeder, spinner |
| 151 | Sr2-SR | 3 | Exchange unit of goods and food |
| 156 | VL | 2 | Intermediary |
| 158 | Yuyero1-JG | 3 | Collector and seller of dye plants |

***Table 4****: Stored data used for the comparison of different individual networks. The table has been developed with regard to the specific tasks processed by the actors and to the links established within the textile production network*

## Social Relations in Space: The Different Involved Regional Communities

The data referring to the contexts of location and activity is indicated in the fourth line, first column of *Table 2*. It permits the examination of social ties within the regional geographical space and it covers the third hypothesis initially presented. The 15 expert-informants involved in the data collection listed their co-operators' names without any repetition The 175 mentioned persons live in different locations; in high desert valleys, communities and dispersed settlements within the province or neighbour provinces and in more distant places of NW Argentina. They are all linked by different transfer categories such as the exchange of raw materials, the provision of technical skills, work contracts, and the commercialization of goods and commodities in the local and regional markets. By interconnecting all strategically important locations, their network covers the entire Department of Molinos (see *Table 5*). The information provided in *Table 5* is more specified in *Table 6* which contains more particular aspects about the trails and routes related to these roads.

Within the system of three routes running along the valley and the mountain slopes of the Calchaquí valley from north to south and from east to west, 38 locations make up 68 pairs composed of different road sections (see *Table 6*). This system does not only cover the Department of Molinos, it also reaches towns like Antofagasta and Santa Maria in the province Catamarca, and the provinces Córdoba and Buenos Aires. In the north the circulation reaches the capital Salta and far into Bolivian territory. The next step after the initial investigation phase of data collection and storage, and the composition of adjacency matrices, is the computer-based analysis using UCINET 6.0.[13]

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13 UCINET is a computer package that allows statistical modelling of network data. For basic information see Hanneman and Riddle (2005), for more complex problems try the second part of Wassermann and Faust (1994).

| Encoded Location | Pairs of Locations Forming a Trail | Elements of the Transfer Circle | |
|---|---|---|---|
| | | **Goods and Products Related Directly with the Textile Production Process** | **Activities, Goods and Products Related Indirectly with the Textile Production Process** |
| L1 | Tomuco-Molinos | Thread and yarn<br>Textiles | Land cultivation<br>Animal husbandry<br>Fertilizer |
| L2 | Molinos-Pueblo | Thread and yarn<br>Textiles<br>Tools for weaving and spinning | Tourism<br>Provisions<br>Commercialization |
| L3 | Santa María - Catamarca | Thread, yarn | Hides |
| L5 | Tacuil - Molinos | Nuts and other parts of the walnut-tree for dyeing<br>Tools for weaving and spinning<br>Ropes | Animal husbandry<br>Maize seeds |
| L7 | Salta - Capital | Industrial dyestuff | Craftwork<br>Commercialization |
| L8 | Compuel - Salta | Sheep fleece<br>Thread and yarn (llama, sheep fibres) | Medicine plants |
| L9 | Colomé - Salta | Thread and yarn | Land cultivation<br>Animal husbandry |
| L10 | Humanao - Molinos | Textiles | Land cultivation |
| L11 | Entre Ríos - Molinos | Thread and yarn<br>Weaving combs<br>Textiles | Land cultivation<br>Animal husbandry (half-wild vicuñas)<br>Commercialization |
| L12 | Santa Rosa - Molinos | Textiles | |
| L13 | Barranca - Molinos | Fibres | Animal husbandry |
| L14 | Hualfin - Molinos | Tools for weaving and spinning<br>Fibres | Animal husbandry |
| L15 | Luracatao - Molinos | Thread and yarn<br>Fibres | Animal husbandry |
| L23 | Buenos Aires - Capital | Dyes<br>Looms | Commercialization |
| L24 | Mayuco - Tacuil | Fibres | Animal husbandry |
| L26 | La Esquina - Molinos | Textiles | |
| L27 | Antofagasta de la Sierra - Catamarca | Fibres | Animal husbandry |
| L29 | Cafayate - Salta | Tools for weaving and spinning | Commercialization |
| L31 | Córdoba | Textiles | Commercialization |
| L33 | Huerta Grande - Salta | Textiles | Land cultivation |
| L34 | Cabrería - Luracatao | Fibres | Animal husbandry |
| L35 | Alumbre - Luracatao | Fibres | Animal husbandry |
| L36 | Compuel - Salta | Fibres<br>Thread and yarn (llama and sheep wool)<br>Furriers | Animal husbandry (sheep, llamas, goats)<br>Pharmaceutical plants |

***Table 5****: Arrangement of data applied for the calculation of the level of connectedness between the textile production network and the transfer circles of goods and commodities within the different eco-geographical zones*

| | |
|---|---|
| 1. Alumbre/Luracatao - Entre Ríos | 2. Luracatao - Tomuco |
| 3. Amaicha - Tacuil | 4. Molinos - Amaicha |
| 5. Banda Grand – Entre Ríos | 6. Molinos - Banda Grande |
| 7. Banda Grande – Salta | 8. Molinos - Buenos Aires |
| 9. Banda Grande - Molinos | 10. Molinos - Córdoba |
| 11. Barranca/Tacuil - Molinos | 12. Molinos - El Colte |
| 13. Bolivia - Molinos | 14. Molinos - Huerta Grande |
| 15. Bolivia - Tomuco | 16. Molinos - Humanao |
| 17. Brealito - Tomuco | 18. Molinos - Luracatao |
| 19. Buenos Aires - Entre Ríos | 20. Molinos - Salta |
| 21. Cabrería - Entre Ríos | 22. Molinos - Santa Rosa |
| 23. Cachi Adentro - Tomuco | 24. Molinos - Tomuco |
| 25. Cafayate - Molinos | 26. Patos - Molinos |
| 27. Cafayate - Tomuco | 28. Patos - Tomuco |
| 29. Catamarca - Molinos | 30. Salta – Tomuco |
| 31. Colomé - Molinos | 32. Salta - Entre Ríos |
| 33. Colomé - Tomuco | 34. Salta - Luracatao |
| 35. Compuel - Tomuco | 36. Salta - Molinos |
| 37. El Puente - Banda Grande | 38. Santa María /Catamarca - Entre Ríos |
| 39. El Puente - El Churcal | 40. Santa Rosa - Entre Ríos |
| 41. El Puente - Entre Ríos | 42. SantaMaría /Catamarca - Tomuco |
| 43. El Refugio /Luracatao - Entre Ríos | 44. Seclantás Adentro - Tomuco |
| 45. Entre Ríos – Molinos | 46. Tacuil - Entre Ríos |
| 47. Entre Ríos - Buenos Aires | 48. Tacuil - Molinos |
| 49. Entre Ríos - Cachi | 50. Tacuil - Tomuco |
| 51. Entre Ríos - Luracatao | 52. Tacuil -Patos |
| 53. Entre Ríos - Salta | 54. Tomuco - Amaicha |
| 55. Entre Ríos - Tomuco | 56. Tomuco - Entre Ríos |
| 57. Hualfín – Tomuco | 58. Tomuco - La Esquina |
| 59. Hualfin - Molinos | 60. Tomuco - Luracatao |
| 61. La Puerta /Luracatao – Entre Ríos | 62. Tomuco - Molinos |
| 63. Luracatao - Entre Ríos | 64. Tomuco - Salta |
| 65. Luracatao - Molinos | 66. Tomuco - Santa Rosa |
| 67. Luracatao - Seclantás | 68. Tomuco - Tiopampa |

*Table 6: Stored data of location pairs, which refer to the different road sections that build the transfer circle of raw materials, manpower, textiles and textile-related products and goods*

## Applied Analytical Strategies

The selection of SNA models perfectly fits the objectives formulated in *Table 1* (see *Table 1*, column 1) and defined for the presented study. Three analytical entities, each of them corresponding to one of the three central problems initially formulated on page 5, guide the procedures of basic evaluation (see *Table 7*). They also provide a conceptual, formalized and operative framework for the procedure of proving the formulated hypothesis (see also *Table 1* which indicates the research design).

| Operative Concepts | SNA Model | Operations Provided by UCINET 6.0 |
| --- | --- | --- |
| Ego-network: dependent and independent variables, ties Statistical correlation of the observed and the structural network | Matrix correlations | QAP-CORRELATION |
| Density: size, links, pairs, components | Density | DENSITY MEASUREMENT |
| Connectedness: paths, cut points, distance, range | Cohesion | COHESION - REACHABILITY calculation |

*Table 7*: *Operative concepts, SNA models and the adequate operational tool provided by UCINET 6.0*

## Individual Networks

The subsequent sections deal with the first hypothesis, which refers to individual network extensions inside and exceeding the domestic unit's domain and to their intersections. This research question will be proved by applying a QAP-correlation that enables a comparison of networks and the expression of their integration level. In the presented context the transaction network, the kinship network and the location network will be compared. These three classes of data are crucial for the exploration of the correlation›s range within the different interaction types.The relational data obtained from a single informant's questionnaire enabled the construction of three personal networks, which build on exchange relations as dependent variable and on kinship relations and locations as independent variables. The variables are defined by methodological decisions. In the presented case these decisions base on the interest in economic relationships.

The calculation with UCINET 6.0 is based on three matrixes formed by arranged and selected pairs in accordance with the variables. Two of the model matrixes lead to the construction of networks that can be used for correlations with only one matrix defined as observation matrix. The results of comparing the two matrices are expressed as a QAP-correlation[14] which permits users to interpret the index developed by Pearsons. Its significant value is <0.05 and there will be no correlation of networks when this value is higher (see the visualized individual networks in *Figure 1* and *Figure 2*).[15]

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14  QAP means the mathematical operation of Quadratic Assignment Procedure (http://genome.jouy. inra.fr/doc/bioinfo/statistiques/R-2.6.0/library/sna/html/qaptest.html). This procedure is mainly used to test network association. One network is the observed network and the other is the reference network or standard network.

15  For further explanations of Pearson's relationship to this value see http://www.analytictech.com/ ucinet/.
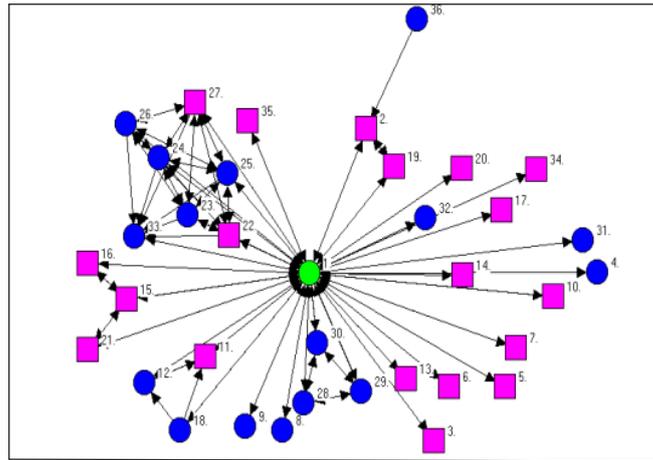
*Figure 1: Complete number of an individual's transactions within the informant pattern: circulation of products, goods and manpower in the context of textile production and other daily routine activities*[16]
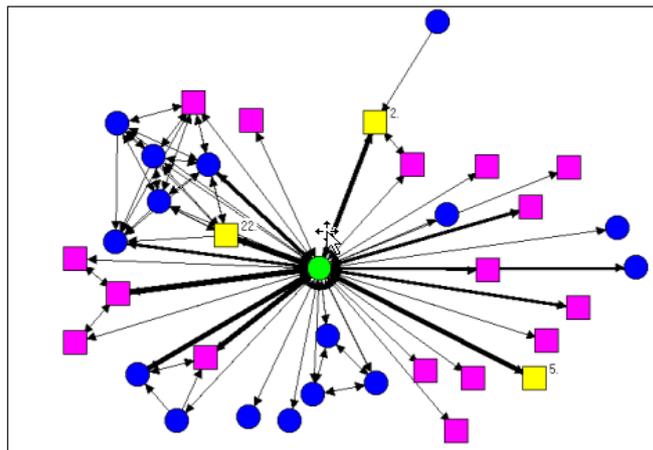


*Figure 2: Exchange frequency within the context of an individual's daily routine economic activities*

16  Key to figures (*Figure 1* and *Figure 2*):
 Green item = Central actor of an individual network
Blue item = Actor linked only by agricultural activity, animal husbandry and services
Pink square = Actor linked only by textile production activity
Yellow square = Actor linked by textile production activity (like the gathering of wild plants), agriculture-related activities and animal husbandry-related activities
Thicker line indicates greater frequency of interaction
*Figure 3*: Light blue item = Reciprocally related kin alter
Light red item = No kin alter
*Figure 4*: Light blue item = Alter living in ego's location
Light red item= Alter living in a different location to ego, which forms part of the locations spread over the valley

In the presented case, the correlation value indicates that Pearson's correlation between the observed matrix "transaction" and the matrix "location" takes the value 0.534, which is 10 times higher than 0.05. In the case of the example using the observed matrix "transaction" and the structural matrix "kinship", Pearson's index takes the value 0.511. As a consequence, we conclude that no relation exists between the ego's transaction network and his kinship- and local networks (see the visualized individual networks in *Figure 3* and *Figure 4*).
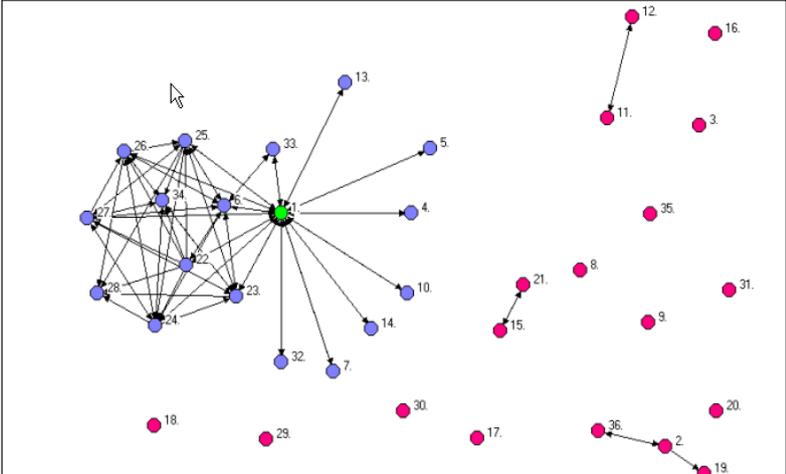


*Figure 3: Transactions between an individual's relatives and persons without kin ties*
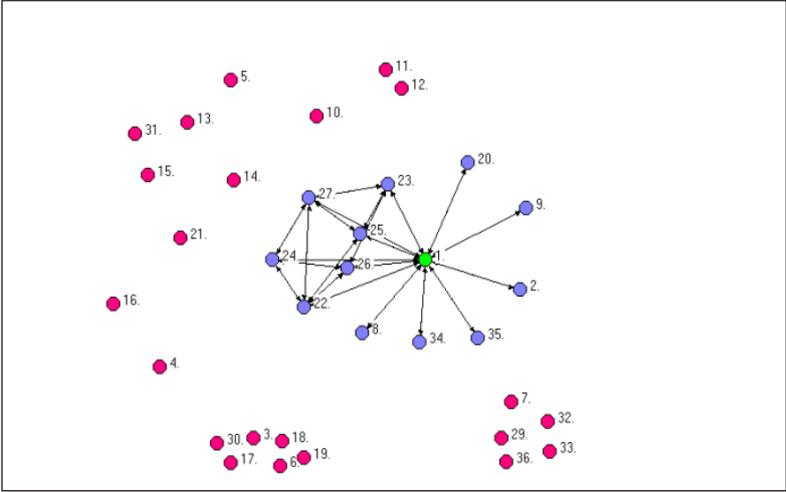


*Figure 4: Transactions linking individuals by location of their residence and by other locations within the region*

16

## Local Networks

The second question presented on page 5, and as an SNA hypothesis in *Table 1*, referring to the linkage of individual decision-making to the local group's internal social organization pattern, was tested by the application of a density analysis. This procedure permits the construction of any actor's individual network within the local network and it calculates the measurement for each ego-network. It also incorporates, taking reference to individuals or groups, data of directed relations within and outside the networks and calculates 14 characteristic dimensions of the ego-networks. The actor x actor matrix, or *15 x *157 matrix, is based on the total available information and represents the relationships between all actors. It refers to the ties of 15 persons within the different sections of textile production activity. It also introduces 157 alters who share 202 relations. These results are demonstrated in the corresponding digraph or graph, the visualization of network structures, that show clearly the existence of oriented and of dichotomous links. These kinds of links refer to all individuals taken into account.

The application of a density calculation to an ego network via UCINET 6.0 permits an exploration of these structures by considering dyads (two linked actors) and triads (three actors linked by specific relationships), single actors and the complete network. Taking this as a point of departure, it will be possible to work out the attributes linked to each structure and its interaction with others. In this way, the size of the different nodes of the network and the quantity of their potential and existing relations, directly linked or not, with an individual, can be calculated. At the same time and for this particular set of actors, the personal relations embedded in the complete network can be clearly distinguished. Through the measurement of density, it expresses the proportion of really existing links within a personal network with respect to all possible relations within the complete network.

The table presented below (see Table 8) refers to a pattern formed by 15 individuals and 202 alters, of whom 157 were named once and 30 named repeatedly. This means that there exists a minimum quantity of alters shared by the informants. The size of this pattern is defined by all actors or an ego's alters, to whom ego is directly linked. The ties refer to the total number of relations within the individual network but without those integrating ego. The pairs refer to the total number of alter-pairs in ego's network including the potential links.

| Type of Member | | Between Groups of Informants | | | Between the Members of the Complete Network | | |
|---|---|---|---|---|---|---|---|
| Ego | Alter | Size | Ties | Pairs | Size | Ties | Pairs |
| LCCH | 31 | **8** | 30 | 56 | 26 | 324 | 650 |
| JG | 28 | 7 | 32 | 42 | **63** | 1058 | 3906 |
| ML | **20** | **10** | **54** | **90** | 41 | 894 | 1640 |
| SCHG | 18 | 6 | 20 | 30 | 3 | 6 | 6 |
| VL | 18 | 5 | 12 | 20 | **55** | 1324 | 2970 |
| SR | 17 | 6 | 22 | 30 | 35 | 528 | 1190 |
| MF | 15 | 5 | 14 | 20 | 46 | 1114 | 2070 |
| RV | 13 | **9** | 42 | 72 | 30 | 870 | 870 |
| LZ | 10 | 6 | 22 | 30 | 32 | 876 | 992 |
| GTR | 9 | **9** | 40 | 72 | 8 | 56 | 56 |
| MCI | 6 | 6 | 26 | 30 | 17 | 272 | 272 |
| FV | **6** | **8** | 40 | 56 | **77** | **2012** | **5852** |
| AG | 4 | 3 | 6 | 6 | 40 | 596 | 1560 |
| MAR | 4 | 0 | 0 | 0 | 9 | 72 | 72 |
| ETG | 3 | 0 | 0 | 0 | 9 | 72 | 72 |

*Table 8*: *Measurement of density for each individual network*

The table shows for instance that informant FV[17] has a personal network of 6, which means that he named six alters who form part of his personal network. The lowest number of FV's relations are those acknowledged by himself. Within the informants' group considered for the presented case, his network extends to 8 persons and to 40 links established between these actors. Viewing the node of FV in the context of the complete set, his personal network extends to a size of 77 persons including 5852 pairs of alters in their particular individual networks. This means that FV is known by a major part of the persons involved in the textile production process. The case of informant FV shows clearly that the apparently existing opacity of some persons takes a different dimension when they are analyzed within the context of all relations of a network.

In most of the cases, the quality of personal network density[18] ranges from 50% to 100% of the expected links out of the totally possible links in the textile producers' complete network. Within each ego-network a homogenous composition of the relations between textile experts, traders and suppliers of raw materials can be observed. At the same time, these ties are not redundant but almost exclusive to each informant's network. This means that textile production activity develops in small groups with members who only pertain to one group and who choose each other for interactions and for group formation.

## Regional Networks

The third question presented on page 5, and as an SNA hypothesis in *Table 1*, line 3, initially refers to the conditions of recently shifting structures and to their influence on the activities of daily practiced routine work, as well as on the continuity reflected up to now by the traditional Andean economic system based on the complementarities of ecological micro-zones. This hypothesis was tested by an analysis of connectedness.[19]

In the presented case, the nodes taken in the complete network as an equivalent to persons (= of ego and alters) have been changed to nodes representing locations and, at the same time, the local and regional spaces of resource concentration. Simultaneously, the relations between nodes refer to paths and roads between the circulation centres of products and goods (see *Table 9* and *10*). In the tables presented below we can clearly note the data order in reference to the ties and the geographical space. *Table 9* indicates the evidence of a link between two localities and *Table 10* the number of stages between the different localities. The application of UCINET 6.0 generated the value of cohesion 0.313, which is based on the calculation of distance, ranging between 0 to 1. A higher value indicates higher cohesion density.

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17 The abbreviations of the informants' names are used both for making the informants identity anonymous and for finding, if necessary, the corresponding primary data in the documentation of the field work.

18 Generally we distinguish between the density of ties among actors and the density of ties among events (Wassermann and Faust 1994:314). Density is defined in terms of the number of friendship ties existing in networks consisting of the respondent and his three best friends.

19 The concept of connectivity reflects important aspects of social organization. Tree-shaped figures point to the disappearance of some nodes or links, which are disconnected from the network structure. The value of connectedness provides a parameter for the measurement of social cohesion.

|     | Alu | Ama | Ca | ER | LP | Lur | Mol | Pat | Ref | Sal | Sec | Tac |
|-----|-----|-----|----|----|----|-----|-----|-----|-----|-----|-----|-----|
| Alu |     |     |    |    |    | 1   |     |     |     |     |     |     |
| Ama |     |     |    |    |    |     |     |     |     |     |     | 1   |
| Ca  |     |     |    |    |    |     |     |     | 1   |     |     |     |
| ER  | 1   |     | 1  |    | 1  | 1   | 1   |     | 1   | 1   |     |     |
| LP  |     |     | 1  |    |    |     |     |     |     |     |     |     |
| Lur |     |     |    | 1  | 1  |     |     |     |     |     | 1   |     |
| Mol |     |     |    |    |    |     |     |     |     |     |     |     |
| Pat |     |     |    |    |    |     |     |     |     |     |     |     |
| Ref |     |     |    | 1  |    |     |     |     |     |     |     |     |
| Sal |     |     |    |    |    | 1   |     |     |     |     |     |     |
| Sec |     |     |    |    |    |     |     |     |     |     |     |     |
| Tac |     |     |    |    |    |     |     | 1   |     |     |     |     |
| Tom |     | 1   |    |    |    | 1   | 1   |     |     |     |     |     |

*Table 9: Corresponding adjacency matrix of the distinct localities*

On the basis of the first adjacency matrix and by using the algorithm of reachability[20], the calculation of coverage has been developed. In this way a matrix of coverage or of direction can be constructed, which evaluates each pair of nodes and which, for each one of them, calculates the value of their shortest connecting path. Subsequently the algorithm tests the existence of paths and the exact dimensions of the connecting links (see *Table 10*).

|     | Alu | Ama | Ca | ER | LP | Lur | Mol | Pat | Ref | Sal | Sec | Tac | Tom |
|-----|-----|-----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| Alu | 0   | 4   | 3  | 2  | 2  | 1   | 3   | 6   | 3   | 3   | 2   | 5   | 3   |
| Ama |     | 0   |    |    |    |     | 2   | 2   |     |     |     | 1   |     |
| Ca  | 3   | 4   | 0  | 2  | 3  | 3   | 3   | 6   | 1   | 3   | 4   | 5   | 3   |
| ER  | 1   | 2   | 1  | 0  | 1  | 1   | 1   | 4   | 1   | 1   | 2   | 3   | 1   |
| LP  | 4   | 5   | 1  | 3  | 0  | 4   | 4   | 7   | 2   | 4   | 5   | 6   | 4   |
| Lur | 2   | 3   | 2  | 1  | 1  | 0   | 2   | 5   | 2   | 2   | 1   | 4   | 2   |
| Mol |     |     |    |    |    |     | 0   |     |     |     |     |     |     |
| Pat |     |     |    |    |    |     |     | 0   |     |     |     |     |     |
| Ref | 2   | 3   | 2  | 1  | 2  | 2   | 2   | 5   | 0   | 2   | 3   | 4   | 2   |
| Sal | 3   | 4   | 3  | 2  | 2  | 1   | 3   | 6   | 3   | 0   | 2   | 5   | 3   |
| Sec |     |     |    |    |    |     |     | 0   |     |     | 0   |     |     |
| Tac |     |     |    |    |    |     |     | 1   |     |     |     | 0   |     |
| Tom | 3   | 1   | 3  | 2  | 2  | 1   | 1   | 3   | 3   | 3   | 2   | 2   | 0   |

*Table 10: Adjacency matrix of distance. The numbers indicate the quantity of relations or stages, which make up the distance between two locations. The encircled numbers refer to a high quantity of sections. We count five sections from La Puerta (LP) to Amaicha (Ama), seven from La Puerta (LP) to Patos (Pat) and six from Salta (Sal) to Patos (Pat)*

20  Network analysts use different kinds of algorithms to calculate the distinct characters of network's ties. Consequently the algorithm of reachability is applied to calculate the distance of two elements of a relationship.

The most interesting result of this part of the study refers to three categories of movements within the Calchaquí valley. The relevance of the three movement types described below is based on the displacement of persons in relation to the activity and within this zone. SNA enables an exact mapping of these movements and of the relationships within this social and geographical frame.

1) The mountain trail, which designates the trails formed by caravan routes. These are used for the transport of raw materials and other exchange and trade objects. The two most frequently used tracks lead to Luracatao and to Tacuil y Compuel. Longer trails crossing mountain peaks up to 6000 meters above sea level connect 12 locations over distances of hundreds of kilometres. Their most important points were identified as those which, once removed from the network, provoke its disintegration. The involved locations coincide with the sites that dispose of the highest quantity of natural resources (see *Figure 5* and *Figure 6*).

2) The valley trail, which is used for the circulation of products and manpower between the community of Molinos and 13 other communities situated along the valley. It coincides with labour contracts for textile production completed between different experts.

3) The market trail, which refers to paths leading out of the valley and crossing the mountain slopes to the ten major province centres where products originating from different regions are commercialized. This network integrates all the other routes and forms a macro-unit of regions reaching into other provinces of northern Argentina and to trans-national locations in Chile and Bolivia.
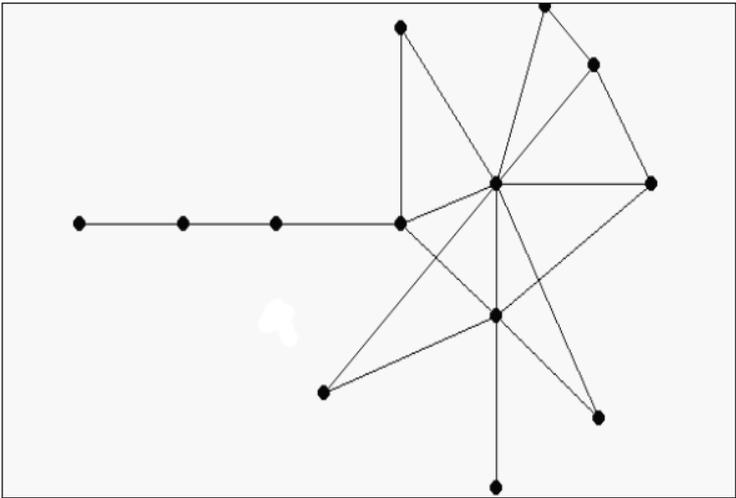


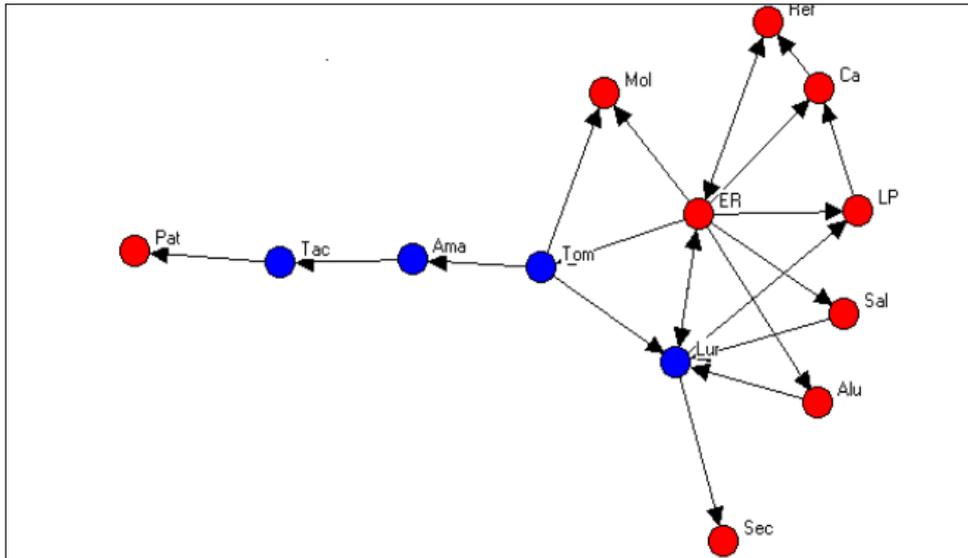*Figure 5*: *The mountain trail composed of locations and the distance between them*

*Figure 6*: The mountain trail network with its cut points (blue)

## Conclusions

The subsequent sections present the study's results and retain the order of the investigative questions as introduced in the initial section. The first problem refers to network extensions exceeding the individual networks. The analysis of exchange interactions within the subsistence sphere revealed that the relations practiced in the context of daily routine work and of the domestic unit are composed of both kin and no-kin relations. A larger number of no-kin relations are used more frequently than kin relations. Although in Andean societies subsistence production is linked closely to kinship ties and to exchange activity within the domestic unit, the wide range and the ecological diversity of locations that are linked to an individual and its household via exchange activity can be traced within the different individual transaction networks.

The applied ethnographic approach, realized by long term ethnography, participant observation, structured interviews and expert interviews (see Schweizer 1996, Teves 2002, Wiesner 1977), to subsistence activity required the redefinition of the notions "expert" and "domestic unit" as analytical entities. Inevitably the results also lead to basic discussions of the topics "culture" and "ethnic group", which should be reconsidered carefully. The coverage of relations exceeds autonomous and auto-referential spheres of classical functionalist analysis and results in a notion of social networks that challenges these configurations by considering the specific value of the economic dimension playing a part in the relations of individuals who are living within the studied communities.

Within the rural communities of NW Argentina, expert identification coincides with persons who show organizational and economic skills. Regardless of ethnic, territorial, social or institutional limits they develop capacities of creating and sustaining relations. These persons can be exactly identified, an important factor for SNA practitioners. The daily routine activity linked closely to the domestic units is the key for the observation and the description of individual and collective social interaction. The activities establish important contexts for the definition of constitutional, motivational and normative aspects

of relations. They also lead to an adequate application of ethnographic information used to treat questions of resource exploitation, production and commercialization.

With respect to the second question initially mentioned, which refers to individual decision making and its linkage to a group's internal organization pattern, the importance of the actors' attributes and of their relations as indicated by the characteristics of an activity network should be emphasized. Within the complete network, relevant actors are identified by a higher quantity of directed ties, which becomes clearly visible in the associated graph (see *Figure 7*).
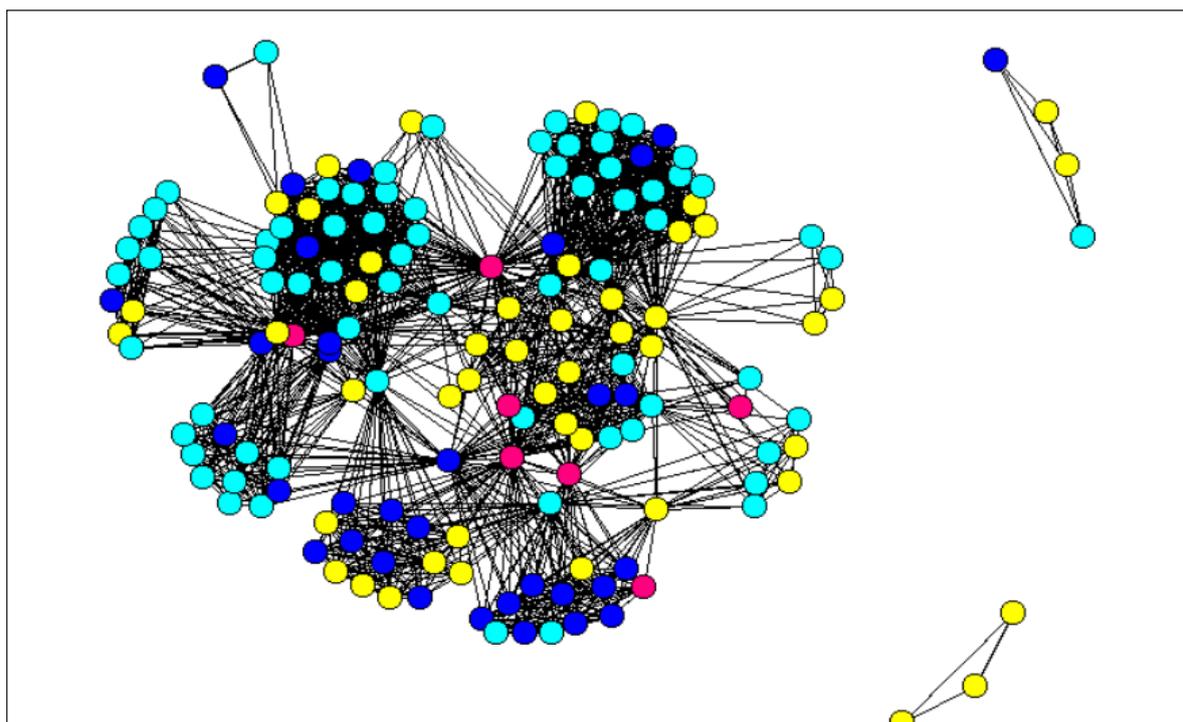


*Figure 7: Visualization of the complete network showing all integrated actors differentiated by their particular roles*

The most important actors are not those anticipated by social theory via specific expected attitudes according to a public image drawn of the people living in rural areas and defined as members of the Coya group. The combination of both methods, of ethnography for the collection of field data and of SNA for the analysis of the corresponding relational data, provide important tools to discover the limits and the structure of a social entity, which can be defined as the sum of all interactions taking place in different contexts. But social anthropological studies centring in activity and relation analysis also use models to define a specific activity as one section of a series of various stages. The dynamics of its different actions in reference to personal decision making are related to the election of specialists out of a wide range of alternatives and of tie combinations, which generally show an ontological character.

In the Molino communities the key factor for the construction of social relations is linked with the individuals' strategy of acting in every-day-context by using the complex and integrative structure of rural ethnic environment, like the domestic unit, the farms and

cooperatives, which in turn is linked directly to local lifestyle. It also becomes obvious that this lifestyle influences the variability of individual strategies. This conclusion is at odds with the concept of homogeneity guiding the different governmental and non-governmental projects. While putting into practice their concepts of sustainable development (cf. Altieri 2000:1-3, 7, 9-10), most of them culminate by imposing opinionated and idealized transfers to these communities.

Finally, and taking into consideration the third question presented in the initial section, we refer to the results concerning the continuity of the traditional economic system based on the complementarities of Andean ecological micro-zones. Three roads of circulation can be distinguished and the related activities develop on local and regional scale. Within this perspective the condition for network cohesion is given by the ties with and by the integration of nodes, which indicate the characteristic environments of the valley and the highland. The corresponding relational data indicating the different activities leads to a wider context than that initially established by ethnography and applied in micro-scale observations of the domestic domain. By doing so, the topological character of this analysis with its ontological projection of social and geographical space will be introduced to the complete study.

The network of subsistence activity, which forms the basic condition of textile production, only works when its social ties reach to all Andean ecological zones. At least three forms of transaction are related closely to the different types of spaces, the local, the regional and the trans-regional (see page 24 and *Figure 8*).

1) The traditional mode, realized on the local level and documented by numerous ethno-historical and archaeological studies (cf. Murra 1992:130-136), is characterized by the exchange of products, goods and raw materials by means of donkey caravans.
2) The service on landowners' estates or the exchange of manpower, money, and goods outside the local community, but within the region.
3) The commercialization of goods and products in the national and the international markets.

The road network, which interconnects different locations within a territory of hundreds of square kilometres, indicates the complementary relation of the circulating goods with participation of high- and low altitude zones. The SNA graphs obtained not only correspond perfectly to political and geological maps, they also indicate the different centres of connectedness within the road system of exchange. The elimination of these centres from the circulation network would imply a disconnection of the relations established between the different ecological zones used for the provision with products, for the production and the transfer of goods. In summary, the results of the different stages of the presented study clearly show that SNA is an adequate diagnostic instrument for the investigation and for the definition of socio-ecologically determined interaction within micro- and macro-regions.
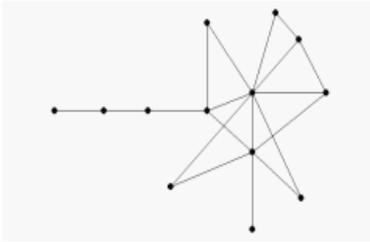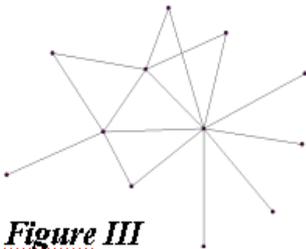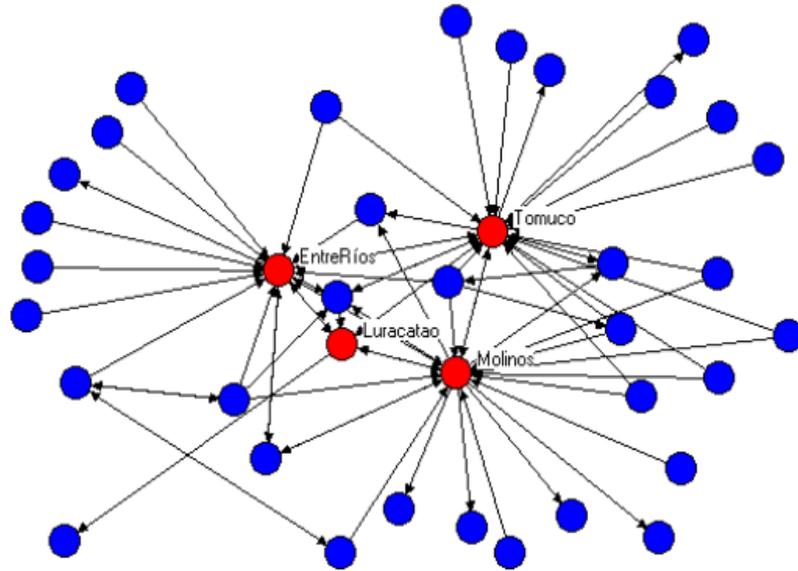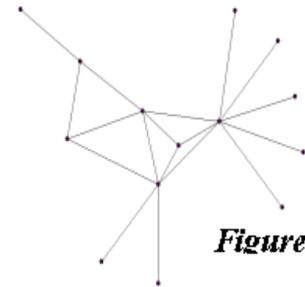
*Figure 8: The complete network of locations, trails and roads that make up the transfer circle of textiles, of other products and goods, and of manpower. Each one of the three small integrated figures indicates a specific trail. **Figure I** refers to the mountain trail, **Figure II** indicates the valley trail and **Figure III** the trail of trade*

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# References

Abeledo, Sebastián (2007). *Los Pastores de la Altura. Una mirada evolutiva de la vida en al puna de Atacama.* Unpublished MA Thesis, University of Buenos Aires, Argentina.

Adler Lomnitz, Larissa (1994). *Redes sociales, cultura y poder: Ensayos de antropología Latinoamericana*. Colección Las Ciencias Sociales. México: FLACSO.Arizpe, Lourdes (1993). "La antropología en los noventa". *Balance de la Antropología en América Latina y el Caribe*. Instituto de Investigaciones Antropológicas. Centro Regional de Investigaciones Multidisciplinarias, México: Universidad Nacional Autónoma 11-17.

Altieri, Miguel A. (2000). "Enhancing the Productivity and Multifunctionality of Traditional Farming in Latin America". *International Journal of Sustainable Development* (Wolverton Mills) 7:1-12.

Benedetti, Alejandro (2005). "Incorporación de nuevas tierras durante el período de conformación del agro moderno en la Argentina: El territorio de los andes primeras décadas del siglo XX". *Mundo Agrario* (Universidad Nacional de La Plata, La Plata, Argentina) 6 (11), http://www.mundoagrario. unlp.edu.ar/mundo_agrario/numeros/numero11/atdocument.2006-06-23. 0405504676/view, last visit 12th of October 2008, at 15:16).

Bernard, H. Russell (1996). "Qualitative Data, Quantitative Analysis". *CAM, The Cultural Anthropology Methods Journal* 8 (1): 9-11.

Borgatti, Steve P.; Martin G. Everett and Linton C. Freeman (1999). *UCINET 6.0 Version 1.00.* Natick: Analytic Technologies.

Borgatti, Steve P. and Pacey C. Foster (2003). "The Network Paradigm in Organizational Research: A Review and Typology". *Journal of Management* 29(6): 991–1013.

Caniullan, Victor (2006). «El saber mapuche y la intra, interculturalidad». En: Freddy Delgado B. y César Escóbar (eds.) *Diálogo intercultural e intercientífico para el fortalecimiento de las ciencias de los pueblos indígenas originarios.* La Paz: Plural, 209-216.

Chan, Anita; Richard Madsen and Jonathan Unger (1984). *Chen Village. The Recent History of a Peasant Community in Mao's China*. Berkeley: University Press.

Cordero, Hugo (2006). "Cosmovisón andina: construyendo el pachakuti educativo". En: Freddy Delgado B. y César Escóbar (eds.) *Diálogo intercultural e intercientífico para el fortalecimiento de las ciencias de los pueblos indígenas originarios.* La Paz: Plural, 259-266.

Crivos, Marta (2006). "El estudio de la narrativa de casos: una propuesta para el abordaje etnografico de las alternativas médicas", in: Anatilde Idoyaga Molina. (ed.), *Los caminos terapéuticos y los rostros de la diversidad. La seleccion y combinaicon de medicinas en Argentina*. Buenos Aires: Espacio Editorial páginas?Dollfus, Olivier (1992). "Los Andes como memoria", in: Pierre Morlon (ed.), *Comprendre l'agriculture paysanne dans les Andes Centrales – Perou-Bolivie*. Paris: INRA, 11-29.

Fernback, J. (1997). "The Individual within the Collective: Virtual Ideology and the Realization of Collective Principles», in: S. G. Jones (ed.), *Virtual Culture*, London, New Delhi: SAGE, 36-54.

Fischer, Eva (2008). *Urdiendo el tejido social. Sociedad y producción textil en los Andes bolivianos*. Vienna: LIT-Verlag.

García, Silvia and Diana Rolandi (2000). «La Preservación del recurso silvestre en relatos contemporáneos de la Puna argentina». *Actas del XI Conferencia Internacional de Historia Oral* (Istanbul, Turkey), 1: 267-270.

García, Silvia; Diana Rolandi, Mariana López and Paula Valeri (2003). "Para el gasto". Vigencia de redes de intercambio en un área rural del Noroeste argentino. Paper presented at the Roundtable *Mesa Hispano-Americana para el Análisis de Redes Sociales*, 12th of february of 2003, http:// revistaredes.rediris.es/webredes/textos/mesa.htm, last visit 3rd of August 2008, at 11:26).

GELIND. 2000. *El espíritu de la ley y la construcción jurídica del sujeto "pueblos indígenas"*. Congreso Argentino de Antropología Social. UNMdP Mar del Plata.

Gómez, Felipe (2006). «La ciencia maya y el diálogo intera e interciltural». En: Freddy Delgado B. y César Escóbar (eds.) *Diálogo intercultural e intercientífico para el fortalecimiento de las ciencias de los pueblos indígenas originarios.* La Paz: Plural, 235-248.

Girault, Louis (1984). *Kallawaya. Guérriseurs itinérants des Andes*. Paris: L'Orstom.

Hage, Per and Frank Harary (1991). *Exchange in Oceania. A Graph Theoretic Analysis*. Oxford, New York: Clarendon Press.

Hanneman Robert and Mark Riddle (2005). Introduction to Social Network Methods. http://faculty.ucr.edu/~hanneman/nettext/index.html, last visit 24th of June 2008, at 20:36.

Heras, Ana Inés and Socorro Foio (2007). «Inclusion and Exclusion as Semantic Fields: Agents´ Perspectives Through Inter Disciplinary Analysis». Unpublished paper presented at *The Second International Conference on Multicultural Discourses*, Institute of Discourse and Cultural Studies, Zhejiang University, Hangzhou, China 13th-15th of April 2007.*http://www.humiliationstudies.org/documents/HangzhouDiscourses2007ProgrammeAbstracts.pdf*, last visit 4th of June 2008, at 23:58.

Herrera, Alejandro (2006). «Globalización desarrollo y el pueblo mapuche en Chile». En: Freddy Delgado B. y César Escóbar (eds.) *Diálogo intercultural e intercientífico para el fortalecimiento de las ciencias de los pueblos indígenas originarios.* La Paz: Plural, 217-234.

Lave, Jean (1995). *Cognition in Practice*. Cambridge: Cambridge University Press.

Lazega, Emmanuel (1997). "Network Analysis and Qualitative Research: A Method of Contextualization", in: Gale Miller and Robert Dingwall (eds.), *Analysing Institutions and Organizations.* Context and Method in Qualitative Research. London: Sage, 119-137.

Martínez, María Rosa and María Lelia Pochettino (2004). "Microambientes y Recursos Vegetales Terapéuticos. Conocimiento Local en Molinos, Salta, Argentina". *Revista Zonas Áridas* (Lima, Perú), 8: 18-31.

Merlino, Rodolfo; Mario Sánchez Proaño and Margarita Ozcoidi (1988). "Persistencia y transformación del modo de vida andino en el extremo sur de los Andes Centrales", in: Shozo Masuda (ed.) *Recursos Naturales Andinos*. Tokio: University of Tokio, 301-338.

Murra, John M. (1992). "El control vertical de un máximo de pisos ecológicos y el modelo en archipielago", in: Pierre Morlon (ed.), *Comprendre l'agriculture paysanne dans les Andes Centrales – Perou-Bolivie*. Paris: INRA, 122-136.

Orr, Julian E. (1996). Talking about machines: An Ethnography of a Modern Job. Cornell: Cornell University Press.

Ortiz, Ariel (2006). «Reflexiones sobre la ciencia maya y el diálogo intercientífico». En: Freddy Delgado B. y César Escóbar (eds.) *Diálogo intercultural e intercientífico para el fortalecimiento de las ciencias de los pueblos indígenas originarios.* La Paz: Plural, 249-255.

Orlove, Benjamin S.; John C. H. Chiang y Mark A. Cane (2000). "Forecasting Andean Rainfall and Crop Yield from the Influence of El Niño on the Pleiades Visibility". *Nature* 403: 68- 71.

Palma, Néstor H. (1973). «La población actual», in: Eduardo Cigliano (ed.) *Tastil una ciudad Preincaica en Argentina*. Buenos Aires: Cabargon.

Papazian, Alexis (2008). "El Espíritu de la Ley en la conformación de la Corporación Interestadual Pulmarí". 3ras Jornadas de Historia de la Patagonia Bariloche, 6-8 de noviembre de 2008, Mesa E.3: Políticas indígenas en Patagonia: una historia de dos siglos. http://www.hechohistorico.com.ar/Trabajos/Jornadas%20de%20Bariloche%20-%202008/Papazian.pdf.

Pearson›s relationship: http://www.analytictech.com/ucinet/, last visit 12th of September 2008, at 11:34.

Polanyi, Karl (1979). *Ökonomie und Gesellschaft*. Frankfurt am Main: Suhrkamp.
(1997). *The Great Transformation*. Frankfurt am Main: Suhrkamp.

Posey, Darrell A. (1996). "Conclusions", in: International Union for Conservation of Nature and Resources (ed.), *Traditional Resource Rights: International Instruments for Protection and Compensation for Indigenous People and Local Communities*. Gland, Cambridge: AGL Partenaires, 53-60.

QAP: http://genome.jouy.inra.fr/doc/bioinfo/statistiques/R-2.6.0/library/sna/html/qaptest.html, last visit 5th of June 2008, at 22:14.

Rabey, Mario (1999). «Construcción de conocimientos y cuidado de la biodiversidad: El caso de los pastores altoandinos», in: Silvia Diana. Matteucci, Otto Sobrig, Gonzalo Hallfter and Jorge Morello (eds.), *Biodiversidad y Uso de la Tierra: Conceptos y Ejemplos de Latinoamérica*. Buenos Aires: *EUDEBA*, 85-105.

Raviña, María Gabriela; Ana María Fernández and Aylén Capparelli (2007). «La relación de las tarabitas, horquetas o ganchos de atalaje con el tráfico de bienes en momentos tardíos prehispánicos». *Estudios Atacameños:Arqueología y Antropología Surandinas*, 33: 87-104.

Requena Santos, Félix (2003). *Análisis de redes sociales. Orígenes, teorías y aplicaciones*. Colección Monográfica 198. Madrid: Centro de Investigaciones Sociológicas.

Rist, Stephan (2006). «Diálogo intra e intercientífico entre comunidades ontológicas: «Caminos para recuperar las dimensiones espirituales de las ciencias naturales y sociales». En: Freddy Delgado B. y César Escóbar (eds.) *Diálogo intercultural e intercientífico para el fortalecimiento de las ciencias de los pueblos indígenas originarios*. La Paz: Plural, 87-100.

Sassen, Saskia (1999). "Digital Networks and Power", in: Michael Featherstone and S. Lash (eds.), *Spaces of Culture*. London, New Delhi: SAGE, 49-63.

Schweizer, Thomas (1996). *Muster sozialer Ordnung. Netzwerkanalyse als Fundament der Sozialethnologie*. Berlin: Dietrich Reimer.

(1997)."Embeddedness of Ethnographic Cases. A Social Networks Perspective". *Current Anthropology* 38 (5):739-760.

Serdült, Uwe and Volker Täube (Eds.), (2008). *Application of Social Network Analysis ASNA 2005. Conference Contributions, Zurich, October 20-21, 2005*. Berlin: Wissenschaftlicher Verlag Berlin.

Teves, Laura (2002). "Trazas de paisajes en Molinos, un pueblo del valle Calchaquí, Salta, Argentina", in: Philippe Denis and James Worthington (eds.), *The Power of Oral History: Memory, Healing and Development*. Pietermaritzburg (South Africa): University of Natal, 145-155.

Wassermann, Stanley and Faust, Katherine (1994). *Social Network Analysis – Methods and Applications*, Cambridge: Cambridge University Press.

White, Douglas R. and Michael Houseman (2002). "The Navigability of Strong Ties: Small Worlds, Tie Strength and Network Topology". *Complexity* 8 (1):72-81.

Wiessner, Polly (1977). Hxaro: *A Regional System of Reciprocity for Reducing Risk Among the !Kung San*. Ann Arbor: University Microfilms.

1982. "Risk, Reciprocity and Social Influences on !Kung San Economies", in: Eleonor Leacock and R. B. Lee (eds.), *Politics and History in Band Society*. Cambridge: Cambridge University Press.

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### Analyse de Réseau Sociale dans le Contexte des Groupes Locaux Andins

Une caractéristique essentielle des sociétés Andines est leur immense réseau socio-économique. Ceci interconnecte divers sociétés locales qui disposent des structures internes formées par règles de parenté réale o fictive. En premier lieu, ces normes semblent à définir des limites exactes. Mais depuis d'une étude plus profonde il se montre leur flexibilité inhérente et leur potentialité pour transcender des limites geo-politiques et sociales. Cette affirmation forme le point de départ pour l'analyse présentée des cycles de transfert par l'étude des activitées constitutives du processus de la production textile et de ses opérations connectées. Les étapes différents mènent la connaissance de l'extension des réseaux individuels qui dépassent le domaine de l'unité domestique, de la prise de décision individuelle dans le contexte du groupe local et de la cohérence entre le structure traditionnel d'interaction et les cycles actuels des activitées de transfert.

## Soziale Netzwerkanalyse im Kontext andiner Lokalgruppen

Eines der Hauptmerkmale andiner Gesellschaften ist ihr ausgedehntes sozio-ökonomisches Netzwerk. Dieses verbindet unterschiedliche Lokalgesellschaften, deren innere Struktur durch reale und fiktive Verwandtschaft bestimmt wird. Zunächst scheinen die Normen exakte Grenzen zu definieren. Nach genauerem Studium zeigen sich allerdings deren inhärente Flexibilität und ihre Potentiale zur Überwindung geo-politischer und sozialer Grenzen. Dies bildet den Ausgangspunkt für die vorliegende Analyse von Transferzyklen durch Studium der konstituierenden Aktivitäten des textilen Produktionsprozesses und ihrer spezifischen Operationen. Die unterschiedlichen Etappen führen zu Erkenntnissen über die Ausdehnung von individuellen Netzwerken jenseits der Bereiche einzelner Haushaltsgemeinschaften, über individuelle Entscheidungsfindung im Kontext der Lokalgruppe und über die Kohärenz von traditionellen Interaktionsmustern und aktuellen Transferzyklen.

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*Laura Teves MA., PhD. candidate, lecturer and investigator at the Faculty of Natural Science and Museum of the National University of La Plata, Laboratory of Applied Ethnography. Intensive field studies in the Calchaquí valleys in NW Argentine on regional economic activities, various studies with SNA application. Currently: participation in the project "Anthropological characterisation of lifestyles. Theoretical and empirical implications and strategies of ethnographic investigation". Research interest: ethnography, socio-economic organization and sustainable development. Address: National University of La Plata Paseo del Bosque S/N. 1900 La Plata - Argentina. Email: lteves@fcnym.unlp.edu.ar, laurateves@netverk.com.ar.*

*Eva Fischer PhD., social and cultural anthropologist, extensive fieldwork in Bolivia, associated expert at the Institute of Social Anthropology, University of Berne, Switzerland. Currently: SNF research project "Young People in Andean Local Groups: Shifting Identities and Societies in Transition". Research interest: social anthropological theory, peasant societies, young people in rural societies. Address: Länggass Strasse 49a, 3000 Bern 9 – Switzerland. Email:eva.fischer@anthro.unibe.ch.*