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Agrarian reform, social movements and Community Based Organization: the emergence of new organizational forms? A case study in Northeast Brazil

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Abstract

There is an on-going debate on the effects of participatory development interventions; some scholars claim that participation is the key driver of change while others show that these interventions are vulnerable to unintended consequences and often only empower the already leading elites.

The Brazilian agrarian reform created a large migration flow into villages inside sugar cane plantations (*engenhos*) that became agrarian reform settlements (*assentamentos*). The main novelties in *assentamentos* are the presence of households with heterogeneous background and free use of land.

The main question is whether the agrarian reform and producers' cooperatives supported the emergence in *assentamentos* of new forms of social organization.

This research argues that that impact of development intervention is not only related to participants but to the entire target social structure. Applying theory of adaptiveness, the main hypothesis is that the capacity of *assentamentos* to respond to the changes promoted by these external interventions depends on the level of overlap between multiple social networks that define the social structure of *assentamentos*.

This research explores qualitatively and quantitatively the network formation of three *assentamentos* in Northeast Brazil. Furthermore it analyzes how one cooperative supporting family farming influences and it is influenced by the social network structure. The agrarian reform and the creation of a producers' cooperative can be considered as participatory interventions, as they were community driven. The unit of analysis is the household. Households are the nodes in the network. Villages are considered as social relational systems. The analysis focuses on the study of multiple networks that connect households in each village.

By analyzing three agrarian reform settlements that were created by three different social movements, the research shows that different households' recruitment strategies and different villages' histories led to different village composition and social processes behind network formation. Family farming plays a crucial role in allowing for the possibility to create new rural villages that differ from previous sugar cane plantation production units. The possibility of family farming to become a relevant livelihood strategy is associated with the features of villages' social networks. The producers' cooperative, supporting the introduction of new labor-intensive crops and guaranteeing a market for some crops, sustains family farming employment network. However the brokering role of the cooperative is hampered by the cooperative political positioning and by the path of specialization towards high value and labor-intensive crops.

Keywords [participation, multiple social networks, adaptiveness, Brazilian agrarian reform, family farming]

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1.1 Introduction

International development projects aim at promoting change in the society where they are operating. By analyzing the discourse of development in the last decades it emerges that what donors refer as development is the adoption of changes in a direction that they consider the most suitable (Mosse 2005).

Participatory development is a crucial element of development discourse since the late 1980s. Authors promoting such approach (Chambers 1983) claim that the creation of institutions that are based on community are key to introduce change. Donors supported the creation of Community Based Organizations (CBOs) to promote innovation adoption.

Several participatory development did not create any change but rather became a new tyranny that only empowers the already leading elites (Cooke B. and Kothari U. 2001). Previous studies showed the vulnerability of CBOs to elites capturing and their risk to introduce no change in the context where they operate (Mansuri and Rao 2004; De Wit and Berner 2009). Organizations such as producers' cooperatives often include people that share similar characteristics and identical social spaces (Arcand and Fafchamps 2012).

The main explanation for this failure is that it is based on a poor understanding of how power and social agency operate. "Behavior and institutions to be analyzed are so constraint by ongoing social relations that construe them as independent is a grievous misunderstanding" (M. Granovetter 1985, 141–142). Francis Cleaver, focusing on the social "embeddedness" of agency and decision making, argues that the main reasons for failure of participatory development is "overoptimistic notion of agency, combined with romantic ideas about groups and institutions" (Hickey S., Mohan G. 2004, 271).

Most of the indicators of development are related to individual features. Instead it is possible to argue that these indicators should also be based on social relations to capture the complexity of the society studied. Analysis based on methodological individualism does not elucidate the dynamics of inequality and exclusion of some groups (Hickey S., Mohan G. 2004).

Network theory developed several methodologies to analyze social relations and how they influence behavior and outcomes. The concept of social structure describes the relational system among actors. Furthermore it portrays the membership in social units or contexts,

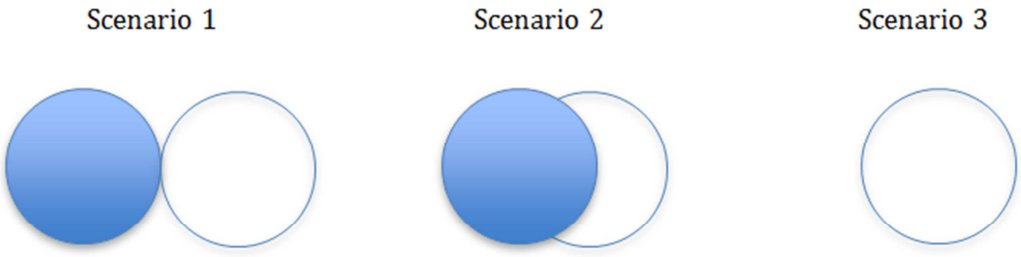
such as schools, villages and neighborhoods (Entwisle et al. 2007). Every actor is embedded in social relations that can be represented as networks. Actors are the nodes of the network. The social relations, such as friendship or kinship, which connect nodes in a network, are defined as edges or ties. Nodes have socio-economic characteristics, such as gender, income, status, that are defined as attributes. Nodes' attributes are important in the study of social networks.

A network is a complex structure that can be analyzed according to several perspectives that describe the network overall characteristics, the position of nodes in the network and the presence of local configurations. This latter concept portrays how attributes and position of nodes influence the presence of ties. There is interdependence between actors network position and agency.

It is possible to refer to development not only in terms of expansion of individual capabilities (Gasper 1997; Sen 1985) but also in terms of emergence of a system which is able to auto-reproduce. Padgett (Padgett and Powell 2012; Padgett and McLean 2006b) focuses on the emergence of organizational novelty and claims that it is crucial to analyze the intertwine between multiple social networks. "With our emphasis on multiple network, however, a central finding about the production of novelty in economic realm will be that other types of social relations – for example, politics, kinship and science – structure the 'topology of the possible' that is, the specific ways and trajectories through which old economic organizational forms can evolve into new ones". (Padgett and Powell 2012, 3–4).

The theory that drives this research refers to social structure ability to adapt to change. The capacity of adaptation depends on how networks overlap (Figure 1.1). A social network structure where different networks do not overlap completely (scenario 2) favors a better adaptation if compared with the total overlap between different social networks (scenario 3) or with the total lack of overlap between different social networks (scenario 1) (Parkinson 2013a; Petersen 2001).

Figure 1.1 Scenarios of networks' overlap



Adapted from Sara Parkinson doctoral dissertation (Parkinson 2013, 59)

Applying this theory to development projects, it is possible to argue that their ability to introduce change depends on contexts' networks. Referring to the case study analyzed, it is possible to argue that the responsiveness of the community to the reform is correlated with how networks overlap. When external interventions operate in contexts where multiple social networks are totally overlapping, (scenario 3) or totally disjoint (scenario 1) they do not promote change. Instead in contexts where multiple social networks do not overlap completely (scenario 2) external interventions can be able to promote change.

This theoretical perspective complements previous researches that mostly aimed at analyzing directly what are the drivers of participation in CBOs or of innovation adoption. Previous studies adopted quantitative models to analyze how social networks affect individual outcomes. Some scholars used dyadic regression models to test if sharing common attributes between actors (homophily effect) influences the probability of co-membership in the same risk-sharing or labor-sharing arrangement or in the same CBO (Arcand and Fafchamps 2012; A. Barr, Dekker, and Fafchamps 2010a). Others used contextual effects models that both aim at describing and assessing how individual level outcome variables are shaped by a combination of individual and contextual variables. The dependent variables usually describe a behavior of the actors. The independent variables include both unit of analysis features and contextual features that are most often operationalized as neighborhood or groups. The analysis of these studies, along with resource limitations, oriented the definition of data collection methodology and the quantitative model adopted for the analysis presented in the dissertation.

This research aim at exploring what are the characteristics of social relational systems that allow for a positive response to external policies. These interventions are the agrarian reform and the creation of a Community Based Organization. They can be considered as participatory development, as they are community driven. These interventions aim at promoting a shift from agricultural production based on plantation system to households as unit of production. The use of the term "family farming" has been chosen to identify a different economic activity from previous sugar cane plantation system. Households are the main production unit of farming activities in the villages.

Villages created by agrarian reform (*Projetos de assentamentos da reforma agraria)* represent an opportunity to create new rural spaces (Bergamasco 1997). They are a novelty in Brazilian rural areas as they create spaces where residency and property coincides (Wanderley 2000). The innovative element of Brazilian agrarian reform is not only access to land but also the mobilization of a large number of people from different parts of the country and with heterogeneous backgrounds.

Family farming can favor the creation of rural spaces with an autonomous social identity. The presence of a complex system of ties inside villages can be interpreted as a proxy of villages' autonomy. The research therefore analyzes intra-village ties to understand if social and economic reproduction functions take place mostly inside villages.

In the context investigated, family-farming employment describes the working relation between small farmers and his fellow villagers, not a contract with a large company. The risk that labor intensive crops' production contributes more to destroy than to build social relations and trust, does not apply to such context where the land dimension is small and where supply is limited to few workers per farmer. The relationship between employer and employee is a face-to-face relation that creates new opportunities for social interaction among villagers. The employer, sharing farming knowledge with his workers, can promote the spread of farming knowledge in the village.

This research focuses on three villages created by agrarian reform in Northeast Brazil. The unit of analysis is the household. Households are the nodes in the network. The analysis focuses on the study of multiple networks that connect households in each village. The key research questions are:

1) How did villages' histories influence social networks?

2) What is the role of family farming in the system of social networks in the villages?
3) How does the cooperative interact with villages' social networks?

The main hypothesis is that the village that responded more positively to external policies (agrarian reform and the creation of a producers' cooperative) is the village where social networks do not completely overlap (scenario 2). To operationalize such hypothesis the analysis is organized in four key arguments.

First, agrarian reform settlements are characterized by the introduction of a new economic activity: family farming. Its different importance across villages is a crucial factor in the transformation of agrarian reform settlements into rural social spaces that are not dependent from towns.

Second, agrarian reform settlements in the same municipality, which were created by different social movements, show substantial network variability. The different histories of villages, namely different households' recruitment strategies and different early organizations of villages, led to different networks' topologies and different tie generator mechanisms.

Third, family farming is an economic activity to create cross-cutting ties among households in the villages studies. Households, having family farming as main livelihood strategy, are more likely to be linked in the frequent contact network. Moreover, family-farming employment creates non-overlapping ties between households. Households that produce more crops need to hire more labor and often they hire households with whom they have no other ties or share few or no common attributes.

Fourth, the producers' cooperative, which is operating in the villages by supporting the introduction of new labor-intensive crops and guaranteeing a market for some crops, sustains family farming employment network. However the brokering role of the cooperative is hampered by the cooperative political positioning and by the continuing path of specialization towards specific high value and labor-intensive crops, without a continued sustaining of credit and technical assistance to support such specialization. These two elements can make the cooperative politically homogenous and tend to exclude smaller farmers. If this trajectory continues, it is very likely that the villages, supported by the cooperative, will move from scenario 2 to scenario 1.

The chapter proceeds as follows. Section 1.2 reviews participatory development critiques. Section 1.3 presents social and economic obstacles to participation in Community Based Organizations. Section 1.4 focuses on some studies that analyzed participatory development interventions. Section 1.5 presents the dissertation theoretical framework and how it differs from other scholars. Section 1.6 provides a chapter-by-chapter outline of the thesis.

1.2 Participatory Development

Participatory development has become a central issue in development discourse since late 1980s. After the failure of structural adjustment programs, a large number of actors have been supporting the creation of rural local organizations, in Sub-Saharan Africa and Latin America. Actors include large scale organizations, such as International Labor Organization (ILO 2002) World Bank (Rondot and Collion 2001) Northern Cooperatives Alliances, national governments and Non-Governmental Organizations (NGOs). The main objectives of rural local organizations are to reduce poverty, to support rural development (Uphoff 1993; North and Cameron 2000), to be "intermediaries between government and its individual citizens" (Esman and Uphoff N. T. 1984, 51) and to solve collective action problems especially in rural areas in poor countries (A. Barr, Dekker, and Fafchamps 2010a).

The connection in development discourse between local development and participation refers to territory, power structures, political dimension and innovation (Elisa Bignante, Dansero, and Scarpocchi 2008). Donors claim that the participation of some households in the organization they supported could be the way by which the innovation they want to promote can be adopted. The main assumption behind such interventions is these participants will adopt the innovation and they will make it spill over to the rest of the community. Also several development governments, in the framework of decentralization, left the local governments to design community-based program to tackle local problems (Alatas et al. 2012, 2).

Development agencies and national governments aim at becoming drivers of innovations that they consider beneficial to empower the target population. In the field of rural development the most common innovations promoted are specialization in cash crops, introduction of new agricultural products and collective commercialization of products. Participatory Rural Appraisal (PRA) (Chambers 1983) and Community Driven Development have become important keywords of the development intervention.

They identified, among others, in households' participation in Community Based Organizations (CBOs), an instrument to spread the innovation they want to promote. The creation of local organizations and the use of participatory approach methodology were conceived as response to the failure of top-down projects and aimed at empowering local people.

These local organizations' pursue a wide range of objectives. Some aim at social inclusion such as "equity in access to opportunities to earn income, to productive inputs and public services" (Mishra S.N. Nharma N., Sharma K. 1984, 89). Others target economic performance improvement increasing production, response to market failures. Some seek out innovation adoption (Bardhan, 2002, in Amhad, Talib, 2010: 3761). Lastly they focus on increasing the trust in economic activities where legal enforcement of contracts is imperfect or missing (Mark Granovetter 1992).

1.3 Barriers to Participation

The major limitations of Community Driven Development approach are an utopist idea of community (Cooke B. and Kothari U. 2001), a conception of empowerment processes strongly related to voluntarism and the de-politicization of role of development agencies, especially Non-Governmental Organizations (Hickey S., Mohan G. 2004).

The main drawback of Rural Participatory Appraisal is the lack of detection of structural problems in the community but rather the identification of immediate needs. Furthermore participatory development intervention become often an effective way to make of market a new way of regulating social interaction and social hierarchies (Cooke B. and Kothari U. 2001).

To understand the problem of development as participation it is necessary to decompose the discourse of development and identify what are the building blocks of the problem: 1) utopic idea of community, 2) obstacles to participation, 3) interdependence among behavior and social influence network dynamics namely innovation diffusion patterns, social autocorrelation and network formation, 4) problems of collective action, 5) normative discourse of development the organization financed by developing agencies becomes itself an actor in the political arena (Escobar 2011; Ferguson 2006; Nelson and Wright 1995; Mosse 2005; Cooke B. and Kothari U. 2001; Hickey S., Mohan G. 2004; Bornstein and Redfield 2011).

The creation of CBOs lies in the utopic conception of positive aspects of cooperation, which is conceived as more likely in contexts characterized by social and spatial proximity, underestimate three important aspects: possible exclusion patterns, the population's needs and expectations, what commercialization of agricultural production means in terms of social structure change.

CBOs often create new dependency patterns pushing towards specialization. Donors' projects often create new needs (Holmén 2010), disruption of existing social norms (Bornstein 2003; Bornstein and Redfield 2011). Smaller producers tend to adopt multiple livelihood strategies and aim not at maximizing production but rather minimizing risks (Brookfield 2001). Specialization and market dependence has often increased rather than decreased inequality and exclusion patterns (F. Ellis 2006; Adato, Michelle, ed. Meinzen-Dick, Ruth Suseela, ed. 2007; DFID Policy Division 2004; Artur, Habinck, and Boon 2002).

Another important negative effect of CBOs is "elites capturing" (Mansuri and Rao 2012; J. P. Platteau and Abraham 2002; Arcand 2008; Cooke B. and Kothari U. 2001): "CBOs reproduce and reinforce relations of domination and subordination between elites and non-elites" (Lund and Saito-Jensen 2013, 105). The strong presence of elites capturing especially in Sub-Saharan Africa (Platteau 2004; Platteau and Abraham 2002; Baland and Platteau 1997; Platteau and Gaspart 2003) made it consider comparable to the dependency pattern created by colonial indirect rule (Elisa Bignante, Dansero, and Scarpocchi 2008).

Next sub-sections describe the main economic and social barriers to participation.

1.3.1 Economic Barriers

The most common objectives promoted by donors, is that by pooling resources and promoting farmers' cooperation it is possible to increase the access to agricultural services and to sell at better prices. However, participating in producers' cooperatives requires a series of assets and skills that are quite complex to achieve.

The main changes that participation in CBOs foresees are specialization in specific cash crops and collective commercialization of products. It is often required to farmers a dramatic shift from sharecropping, dispersed plots, complementary non-farming activities and short migration flows. The shift towards specialization is not a reflection of the change in families' pattern of production but it is either imposed or proposed by external actors and it can be

accepted or rejected by the target population. In contexts characterized by high price volatility, peasants tend to adopt multiple livelihood strategies aiming not at maximizing production but rather minimizing risk (Brookfield, 2001). Furthermore highly risky environment tend to favor organic structure rather than mechanic organizations (Aldrich & Pfeffer, 1976). Specialization also implies the ability to manage savings and to hire the necessary labor that is needed to guarantee the production required. Cash crops tend to be more labor intensive than food crops. Analysts of agrarian change points out how specialization and market dependence has increased rather than decreased inequality and exclusion patterns (DFID Policy Division 2004; F. Ellis 2006; Adato, Michelle, ed. Meinzen-Dick, Ruth Suseela, ed. 2007; Prota and Beresford 2012).

1.3.2 Social Barriers

Agrarian societies have been studied under different perspective both by anthropology, sociology and development microeconomics. Both anthropologists and sociologists focused their analysis on the social structure, that can be defined as "an overall system or pattern of relations" (Nadel 1964, 12), and on social networks: "the interlocking relationships whereby the interactions implicit in one determine those occurring in others" (Nadel 1964, 16).

Anthropologists focused on the exchange aspects of all ties, including the analysis of ties' direction and causal mechanisms, developing what has been defined as "social exchange theory." There is a wide literature on the role of "gift exchange" in defining economic and social ties (Mauss 1925; Malinowski 1922).

Social network analysis instead focused on the description of regular network patterns "to learn how network structures constrain social behavior and social change" (K. S. Cook and Whitmeyer 1992, 114).

Development microeconomics, along with economic sociology, starting from the seminal study of Scott "peasants with a moral economy" (J. C. Scott 1976) and Hyden's work on "economies of affection" (Hyden 2005) analysed how the presence of social networks facilitates coordination problems and economic transactions when markets are missing or incomplete (Ostrom 1990; Narayan and Pritchett 1999; Narayan-Parker 1999) but also constrains business activities and entrepreneurship (Rooks et al. 2009; Kristiansen 2004; Tokuori 2006).

Many studies analyzed how the presence of social network affects mutual insurance mechanisms, collective goods, entrepreneurship, information and innovation diffusion as change agents rely on the opinion leaders or other relevant for mechanisms for the adoption of innovation (E. M. Rogers 1995; T. Conley and Udry 2001; Lyon 2000; Agadjanian 2001; Krishnan and Patnam 2014).

The wider strand of literature in development economics focuses on risk sharing arrangements in agriculture economics (M. Fafchamps 1992; J. Platteau 1997; Townsend 1994), assessing with many case studies, especially in rural areas both in Sub-Saharan Africa, Asia and Latin America, the presence of informal networks of risk mitigation across households. In contexts where contracts enforcement is very low trust relationship are defined on the basis of reputation, sanctions and moral norms previous interaction it is therefore fundamental in the definition of the actor's choice. This explains why in these contexts focus is not on profit maximization but rather on risks minimization. As a result great attention is given to the development of personal relationship and pre-existing connections, such as churches, friendship between agents can be become crucial in the decision to create a new tie. Sharing norms and social and moral pressure are strong incentive for people to cooperate and reciprocate.

There are several studies that explore both functioning and formation patterns highlighting as determinants of risk sharing ties factors such as kinship, ethnicity, physical proximity, age and wealth (Goldstein, De Janvry, and Sadoulet 2002; M. Fafchamps and Lund 2003; De Weerdt and University United Nations 2002; Dekker 2004). The most studied endogenous forms of insurance or cost sharing mechanisms present in rural areas in developing countries are risk-sharing arrangements (De Weerdt and University United Nations 2002; Goldstein, De Janvry, and Sadoulet 2002), funeral groups (Dercon et al. 2006) and sharecropping (Stiglitz 1974).

Some studies shows that cooperatives have a positive impact on social capital focusing especially on trust (Hong and Sporleder 2013; Sabatini, Modena, and Tortia 2013; Becchetti, Castriota, and Conzo 2013). The concept of social capital has been applied to a large number of researches in social sciences. However it does not have a unique definition. There are different views on how to define social capital. “Kind of capital that creates for certain individuals or groups a competitive advantage in pursuing their ends” (Ronald S. Burt 2002,

150). “Social capital comes from the interplay of a range of factors, each of which entails social relations that shape how agents react and these reactions are shaped by existing social capital” (Lyon 2000, 664).

Social capital is associated with positive externalities. It is considered a way to overcome coordination failure, information asymmetries, collective action problem and to provide public goods (Durlauf and Fafchamps 2004). Burt, in his article on the network structure of social capital (R.S. Burt 2000), classifies social structure according to three different models: 1) network models of contagion where physical proximity alone has strong influence on alters probability to adopt innovation, 2) network model of prominence where innovation is based on the imitation of the most prominent group or individual, 3) network model of range. This latter category can be divided in two subcategories: a) closure which competitive advantage is good risks management and that promotes communication and facilitate sanctions, b) brokerage: information access and control are the most important benefit for individual or networks that are positioned in structural holes.

Burt's classification is linked with the “bridging” and “bonding” aspects of social capital, being the first intrinsic features of “social networks which connect an actor to the outside world” and second view that “focuses primarily on the internal characteristics of collective actors”. According to this view the focus is more on a collectivity (which can be an enterprise, village, community and so on), and the social structure of that collectivity which focuses primarily on social capital as resources” (Gerrit Rooks, Adam Szirmai, Adam Szirmai, 2009).

Two are the main aspects of social capital: social networks (Putnam, Leonardi, and Nanetti 1994; Coleman 1998) and social norms and trust (Ostrom 1998). Trust, is considered to be an integral part of social capital. Social capital is considered to have a positive effect on information flow and in reducing transaction costs as it decreases the cost for monitoring and information.

The main sources of trust are considered to be generalized norms of morality and personalized trust. This latter concept describes trust deriving from actors’ embeddedness in social networks. Gambetta (Gambetta 2000, 219) tends to interpret trust more as a rational choice made by the agent to responds to the other’s expectations. Granovetter instead points

out an additional factor to rational choice and he refers that individual's actions are dependent on the level of embeddedness of the relationship (M. Granovetter 1985)

The scholarship on social capital faced the difficulty of how to measure this very broad concept and adopted several proxies. One of the most popular is the presence of civic associations or dense associational life (Narayan and Pritchett 1999; Putnam, Leonardi, and Nanetti 1994). Social capital is considered a way to overcome coordination failure, information asymmetries, collective action problem and to provide public goods (Durlauf and Fafchamps 2004).

The main critiques that can be addressed to this literature refers to the possible negative consequences of very cohesive structures and an issue of causality between civic association and social capital. Negative drawbacks of this are the presence of incentives for people to cheat and the creation of barriers to entrance through the creation of cartels (Gambetta 2000). Cohesive social structures are often defined as "community" with a positive connotation but some authors showed that this often causes the exclusion of certain groups or networks (Rooks et al. 2009). "Loyalties and familial attachments members are discouraged from advancing economically, moving geographically, and engaging in amicable dispute resolution with outsiders"(Woolcock 1998, 171). Furthermore it is possible to argue that the presence of civic associations is already a result of social capital.

It is therefore necessary not only understand the level of connectivity of a network but also to understand what are the local structure inside the network and how much information redundancy is present. It is therefore important to study the process of formation of these networks and what social mechanisms influence the presence of ties in that network.

This research explores the formation of social networks qualitatively analyzing the history of villages' formation and quantitatively using a social network model to identify the structural difference among villages. Furthermore it shows that the village, where there more non-redundant social mechanisms is the village where the cooperative, played a stronger role.

1.3.3 Review of Models to Analyze Participatory Development

Among the several organizations promoted in the framework of participatory development this review focus on rural producers' organizations. There are several different theories that have been adopted to analyze such organizations.

Neo-institutional economics, based on the literature on property rights, define cooperatives as the best ownership structure given some specific sets of market conditions. In the field of agriculture producers' cooperatives can be a possible solution for subcontractors to minimize high transaction costs caused by monopsony, low contract enforcement and asymmetric information (Hansmann 1996). In this strand development economists investigated what is the effect of membership in cooperative on some households' performance indicators (Bernard, Taffesse, and Gabre-Madhin 2008; Bernard et al. 2008). Experimental economics focus on the problem of agency and claim that cooperation emerges from the set of existing social norms where ability to punish plays an important role (Baldassarri and Grossman 2011).

Development studies have investigated the role of social influence on outcomes. More specifically this review focuses on analyses of agrarian societies. The main issues in this stream of literature are 1) group formation (Fafchamps M., La Ferrara E. 2012), 2) drivers of participation and exclusion (Arcand and Fafchamps 2012) (A. Barr, Dekker, and Fafchamps 2010b), 3) effects of network structure in shaping economic and social outcomes (Marcel Fafchamps 2006; Jaimovich 2013; Jaimovich 2011), 4) CBOs as drivers of innovation adoption (Bandiera and Rasul 2006), 5) network variability in a sociological perspective (Entwisle et al. 2007), 6) network architecture with an economic approach (Krishnan and Sciubba 2009).

The next paragraphs describe studies that adopted quantitative models to analyze how social networks influence behavior.

1.3.3.1 Dyadic regression

In development economics, using dyadic regressions, several authors explored the formation of risk sharing mechanisms (Fafchamps M. and Gubert F. 2007) membership and co-membership's determinants of self-help groups (Fafchamps M., La Ferrara E. 2012) am Community Based Organizations (A. Barr, Dekker, and Fafchamps 2010a; Arcand and Fafchamps 2012). The main factors which are considered to facilitate the formation of groups are: ease of information flow, trust, shared social norms, ability to punish (M. Fafchamps 1992), wealth and income members' profile (La Ferrara E. 2002) land ownership and social status (Arcand and Fafchamps 2012).

Two of the most relevant studies that use dyadic regression analysis and focus on agrarian societies are part of a research program called “An experimental analysis of network and group formation for collective action” carried out by Barr, Dekker and Fafchamps in rural Zimbabwe. The overall objective of the project is to understand what are the factors that foster the creation of a group where people trust each other enough to create a collective good, based on voluntary contribution. One study uses behavioral experiment to draw causal inference between imperfect sanctioning enforcement and risk sharing arrangements (A. Barr, Dekker, and Fafchamps 2012). The authors, to minimize possible drawbacks caused by the presence of an artificial decision-making, involved in the experiment only people living in the same village and who are known to be involved in real risk-sharing activities, and allowed face to face interaction during the experiment. Results show that matching on age and gender influence the probability of the creation of risk sharing links while belonging to the same group, such as common church affiliation, influences the presence of social sanctioning. In contrast the other study analyzes CBOs formation in a *de facto* quasi-experiment in rural Zimbabwe (A. Barr, Dekker, and Fafchamps 2010a). The analysis has focused on 15 villages created by the government to resettle people that were displaced during the war. Those villages are not created along the traditional norms of group formation such as lineage or wealth but based on a quasi-random rule; therefore it is possible to disentangle the factors that led to the formation and composition of CBOs. The authors to carry out their analysis used the following data: households survey conducted from 1983 to 2000, detailed retrospective data on CBOs in 2000, genealogical data of 1999 and 2001, lineage data of 2001 and 2009, villages geographical of 1999 and 2009. The main results of this research show that the networks of CBOs co-membership are especially concentrated in poorer villages and there are weak evidence of exclusion of female leaded households and non-Zimbabweans. According to the authors a possible explanation for the former result is that in those locations there is a greater need for organizations aiming at coping with market's imperfection and provision of public goods.

Another important application of dyadic regression is represented by the article on social networks in Ghana (Udry and Conley 2004). The researchers mapped information, financial, labor and land sharing networks and aimed at identifying what are the common attributes that favor the creation of ties among farmers. They showed that membership to the same

church; common family origin and difference in wealth levels and gender are key elements in the definition of information and credit link among people.

1.3.3.2 Contextual effects models

There is wide consensus that social influence plays a crucial role in shaping behavior especially in rural contexts. Literature on contextual, peer and neighborhood effects on individual behavior is present in several fields of social sciences such as psychology, economics and sociology. Different are the dependent variables taken into analysis but a crucial role has innovation adoption (Bandiera and Rasul 2006), (T. G. Conley and Udry 2010), (Banerjee et al. 2012). However the issue is how to operationalize influence namely how to represent group structure and whether considering only relevant peers' behavior or group mean and how to identify relevant peers (Blalock 1984).

Some scholars use synthetic network variables to present network's features and then to insert them into linear-in-means models (Bramoullé, Djebbari, and Fortin 2009) calculating the average mean of the groups or groups in which the individual/organization is located. Other scholars adopt social auto-correlation models (Erbring and Young 1979). Lastly others analyze whole network features assessing on the one hand the presence and relevance of great variability across villages even in small geographical areas (Entwisle et al. 2007) and on the other network architecture effect on social network influence on outcomes (Krishnan and Sciubba 2009).

In the field of innovation adoption, a relevant study for this research question and context of analysis refers to flower seed adoption in central Mozambique (Bandiera and Rasul 2006). Authors' hypothesis is that farmers are more likely to adopt flower seeds when members of their networks have already adopted flower seeds. In order to measure these networks they asked how many people they knew that had already planted them. Farmers' network includes adopters that are members of their extended family or members' of the same church or neighbors. Bandiera and Rasul (2006) state that the adoption decision is function of a vector of individual characteristics and number of adopters in individual's network. However the limitation of this study is that it takes into consideration only the number of adopters but neither their identity nor their position in the network.

The social autocorrelation models or endogenous feedback models foresee reciprocal influence or mutual adjustment of individuals interacting with each other. They consider that behaviors are passively responsive to contextual signals and actively influencing behavior of others sharing the same social space (Erbring and Young 1979). These models are part of non-recursive models that consider behavior as a result of reciprocal causation loop (Erbring, 1976, Leenders, 2002), (Marsden and Friedkin 1993). This literature is strongly influenced by spatial auto-correlation models (Doreian 1981; Anselin 1988).

An application of this technique is the study by Erbring and Young (1976). The authors claim that students' academic results are not only function of their own skills but also of academic results of students with whom they are in contact. Variables describing student abilities are considered exogenous while the contiguity matrix that describes interaction level between all students in the class is considered endogenous. Differently from Bandiera study (Bandiera and Rasul 2006), rather than asking to individuals the numbers of adopters in their networks, they asked with whom in the class they interacted, in order to map the complete social networks among all students in the classes object of the study. This information is introduced in the equation as a contiguity matrix that represents the presence or absence of ties among the group object of analysis. The identification of relevant social network of individuals under analysis allows to limit but not to solve the two main observation problems that arise such as correlated unobservable and simultaneity; without longitudinal data is not possible to solve the reflection problem (Manski 1993).

Another important approach is to analyze villages' networks formation (Krishnan P., Sciubba E., 2009) to study variability of social structure across villages (Entwisle et al. 2007). The former study (Krishnan P., Sciubba E., 2009) is based on a sample of 1,477 households in 15 villages of diverse parts of rural Ethiopia. Network formation theory (Bala and Goyal 2000; Bala and Goyal 2003; Jackson and Wolinsky 1996) is used to represent the choice of farmers to share work with other farmers. The main focus of analysis is homogeneity or heterogeneity of farmers that compose risk sharing arrangements and how these features influence efficiency and stability. The research shows that network overall features such as number of links and architecture are crucial elements to define social networks' influence on outcomes. It presents a model of network formation to predict the network architectures generated by labor-sharing arrangements, which is an informal institution common to many village economies. The latter study (Entwisle et al. 2007) analyzed context and network structures

co-variation in rural villages showing relevant variation in terms of village social structure and mutual influence of network structure and features of villages' context.

Social autocorrelation model

A possible model that could be appropriate for this research, is social auto-correlation model (Marsden and Friedkin 1993; Roger Th.A.J. Leenders 2004). Such model explores how social networks influence behavior. By using such model the social network is included in the model as endogenous variable. For the application to this research's question, two are the possible outcome variables: participation in the cooperative and income from family farming. The model implies households' choices are not only explained by households' history and features but also by the choices of households with whom they are connected through social ties.

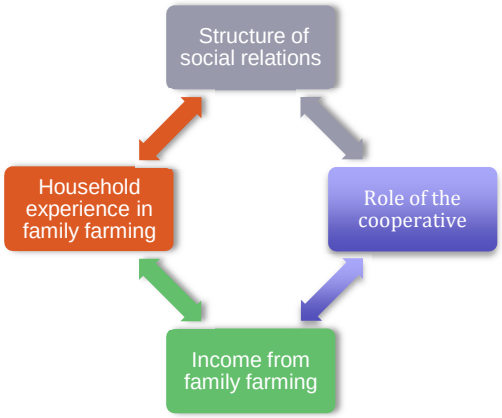
The main limitations to use social auto-correlation model are the limited number of members of the cooperative; the fact that CBOs action goes behind the sole participants and the impossibility to discriminate between selection and influence as drivers of participation, without longitudinal data.

The first limitation to define membership in cooperative, as the dependent variable, is related to the small proportion of members in the whole population and the necessity to collect whole network data. Interviewing all households living in the village means that the proportion between members and non-members will reflect the proportion of members and not members present in the village; as a consequence the analysis for such small number cannot produce statistically significant results. The second is that to have reliable picture of the social network structure of the villages studied it is crucial to map the entire network. Therefore to run an effective social autocorrelation model it would have been necessary to have a large number of villages. Given research resources limitation I focused on a limited number of carefully sampled villages.

Referring to third limitation trying to infer if social influence had a role in shaping households' decision to engage family farming and what has been the cooperative role, it is impossible to disentangle whether homophily is defined by selection (individual attribute reason to be friends) or by contagion (being friends reason to change individual attribute) which is generally referred as the reflection problem. The issue is that structure of social

networks, household experience in family farming and role of the cooperative are not independent but they mutually influenced by each other and co-evolved over time (Figure 1.2).

Figure 1.2 Experience in family farming and role of cooperative



Only collecting more than one observation in different moments, both on ties and attributes, allows disentangling between selection and influence. Cross-sectional data imposes to focus either on node attributes or on ties, as it is not possible to identify direction of causality.

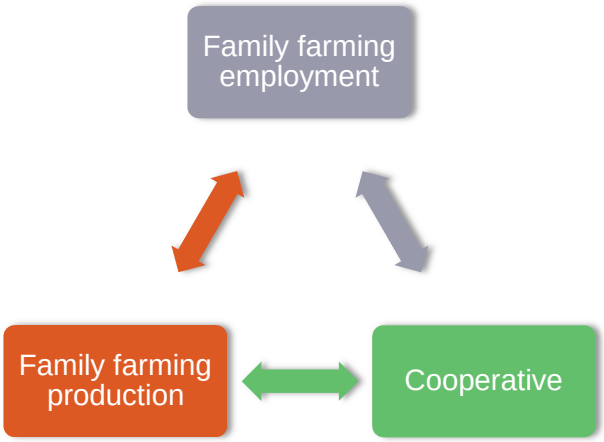
Data have been collected on households' attributes before and after the agrarian reform, namely working experience, access to land and agricultural production. The dataset also contains information on how households arrived to the village and on whether they were engaged in one of the three social movements. These households' attributes from the past refer to propinquity, such as origin or migration waves, or similarity in socio-economic status as such as previous access to land and similar professional experience. Other homophily effects that have been introduced in the model to test whether they influence observed network are geographical propinquity and the co-presence of other networks at the time of survey realization. Villages' histories and households past attributes are considered as generator mechanisms that influence the formation of social networks (Figure 1.3).

Figure 1.3 Villages' histories and villages' social structure

For what concern the role of the cooperative, if on the one hand, the necessity to commercialize products makes households being interested in the cooperative, on the other hand the guarantee of a certain market allows households' to produce more. A larger production increases the necessity of households to have more labor force. There is a strong correlation between income from family farming and number of people hired in the three villages. Furthermore different crops require different amount of labor force.

The cooperative by promoting such crops can be promoting indirectly the creation of new ties in the family farming employment network. If such new ties are not redundant in respect to other ties or they do not overlap completely with other attributes family farming employment can create a bridge across homophilous groups (figure 1.4).

Figure 1.4 Family farming employment and role of cooperative



1.4 Innovative aspects: focus on multiple social networks

The challenges that cooperatives, among other CBOs, face are more than being simple drivers of participation. Cooperatives' challenges relate more to what can be referred as organizational invention (Padgett and McLean 2006a). In order to introduce a new economic pattern, such as family farming, it is not only necessary to make some people participate but rather to use the existing social structure to promote organizational transformation. The issue is not only what makes some participate and others not (also for the issue of impossibility to discriminate between selection and influence) but it is more about what creates the social structure of connections among the households and how the cooperative is able to interact with this system. The question is how the cooperative, with his actions, shapes the network form of households' interaction, both by sustaining a specific activity, such as family farming, by introducing hierarchies, such as coop leaders, and also by operating as an actor in the political arena.

This approach focuses on innovation not in a methodological individualism perspective (Arrow 1994) but rather in terms of emergence of new organizational form (Padgett and Powell 2012). We can refer to development not only in terms of expansion of individual capabilities (Nussbaum 2011) but also in terms of emergence of new organizational forms (Padgett and McLean 2006b). The article on organizational invention defines "social context by multiple-network architectures and actors as clusters of relational ties" (Padgett and McLean 2006a, 1468). The authors argue that "patterns of social embeddedness are important for us not only because of "trust" but also because they regulate the dynamic reproduction of constitutive ties in each domain through the aligning and sequencing of multiple roles" (Padgett and McLean 2006a, 1470). "In other words, both organizations and people are shaped, through network co-evolution, by the history of each flowing through the other" (Padgett and McLean 2006a, 1471).

Drawing from the concept of re-functionality and transposition across domain (Padgett and McLean 2006a), this research aims at understanding whether agrarian-reform settlements are mere repetitions of what happened in the previous *engenhos* or whether they introduce some form of organizational invention.

The main argument is that producers' cooperatives, that are community-based organizations, are *de-facto* mirrors of social networks' structure that they encounter, as they build their

organizational foundations on local knowledge and therefore on local power. The strong risk of these organizations is to simply replicate existing structures and to benefit only one specific group that it is usually also the most central. The main two risks are on the one hand elites capturing, that means that the beneficiaries of the innovations are also the most central in the network, and on the other hand segregation patterns, that means the lack of connections among different groups (McPherson, Smith-Lovin, and Cook 2001).

These risks can be considered as the result of the combination of several phenomena such as homophily, innovation diffusion patterns and peer effects. Homophily, is a widely acknowledged phenomena and it is one of the main drivers of human interaction. It portrays the tendency by which individuals tend to interact with similar others (McPherson, Smith-Lovin, and Cook 2001). Several studies on innovation diffusion, show (Rogers 1995) how social networks are fundamental in allowing innovation to diffuse and how early innovators tend be the most central people in the networks (Jackson and Rogers 2007). Whereas in the framework of the third one, peer effect and contextual models, it is possible to refer that the choice to have family farming as main livelihood strategy is not only explained by their history and skills but also by the choice of households with whom they frequently interact (Marsden and Friedkin 1993). If there are no brokering links across groups and no orthogonal dimension, households will tend to interact only with similar households (homophily) and therefore be influenced in their behavior only by them.

Therefore the main argument is that a development intervention, such as the creation of producers' cooperatives, is likely to trigger change when it is able emphasize the brokering ties in the social networks' structure where they operate. The lack of complete overlap between multiple social networks defines the capacity of to respond to change (Petersen 2001; Parkinson 2013a). The presence of non-overlapping ties, that create bridges between homophilous groups, can limit the negative effects of the above-mentioned phenomena.

This research aims at complementing extant research adopting a different network theory approach namely network theory of organizations. Furthermore it uses a different model to test for the presence of relevant differences in the overlap between multiple social networks. Lastly it considers the political role-played by development agencies and by Community Based Organizations: development intervention is first of all a political

intervention (Olivier de Sardan 2005). These elements imply both a different conceptualization of the research problem and a different model definition and specification.

In development economics, the main references in terms of model specification are the dyadic regression model (Fafchamps M. and Gubert F. 2007) and network formation model (Jackson and Wolinsky 1996). The starting assumption in these studies is that inclusion and exclusion dynamics are essentially based on individual characteristics or synthetic network variables. Starting from this assumption authors tend to use synthetic network variable to present network feature and then to insert them into linear models. They therefore look for individual factors that increase the likelihood of households to participate and/or to adopt the innovation but they do not consider the local structure of interdependencies in which households are embedded. Arcand and Fafchamps focused the analysis of formation and composition of CBOs (Arcand and Fafchamps 2012) and Krishnan and Sciubba instead focuses network architecture of labor-sharing arrangements (Krishnan and Sciubba 2009).

The study carried out by Barr and others (A. Barr, Dekker, and Fafchamps 2010a), despite sharing a series of common research setting and partially research questions, differs from this research for a series of factors. The main objective of Barr's article is to identify what common traits are more likely to influence membership and co-membership in CBOs present in fifteen re-settlements created by Zimbabwean government. Furthermore the authors use a longitudinal dataset on households' affiliations in CBOs and other organizations. They use in fact panel interview to reconstruct the organizations to which the households belonged.

In this research instead a comparative approach is used to disentangle the difference social networks across villages. Furthermore bigger attention is devoted at identifying the social basis of frequent meeting among households, captured by the frequent contact network, using not only survey but also participant observation.

The aim of the analysis developed in this thesis is to describe multiple ties that connect the households (nodes) in the villages, to identify groups and to understand what are the forms of brokerage that connect groups. For each village all the households of permanent residents have been interviewed collecting both attributes and social, economic and kinship ties among them.

The research approach takes into consideration some critiques directed to the shallowest aspects of participatory development conception and rationale: 1) utopic conception of

community considered an ideal social setting (Cooke B. and Kothari U. 2001, 2) idea of development as based on individual motivation (Elisa Bignante, Dansero, and Scarpocchi 2008, 3) non-political representation of development agency positioning (Olivier de Sardan 2005).

In response to the limitations of participatory development assumptions the networks of constituency (kinship) and exchange (agricultural employment and frequent contact) present in the context analyzed have been elicited. This research monitors the voluntarism discourse has been monitored, as the analysis of interdependence among actors' is the main focus. Moreover the political positioning of the Community Based Organization, which is crucial to understand both the access to resources and role in the society, has been analyzed.

This research explores qualitatively and quantitatively the formation of social networks in the three villages analyzed. This choice is driven on the one hand by nature of the data (cross-sectional) and on the other by the decision to adopt a strong network theory approach, that requires modeling the role of social structure. The dependent variable is the network of frequent contact among households in the three villages analyzed. This network is considered to be the result of immigration patterns into the villages and of social and economic activities that were developed since village creation. In coherence with the previous literature the analysis focused on homophily to understand if it played a role in the definition of frequent contact network. Producers' cooperative sustains family farming employment network. However the cooperative political positioning hampers its brokering role in the villages.

1.5 Structure of the thesis: chapter by chapter outline

The thesis, after the first introductory chapter, is composed of five chapters.

Chapter two shows that mixed methods are an appropriate methodological perspective to analyze the interaction between Community Based Organizations and the social structure in which the organization is embedded. Mixed methods is an appropriate methodology for the research questions as qualitative data can confirm, complement and inform quantitative findings (Small 2011) (Mansuri and Rao 2003). Furthermore the use qualitative data to allow for a better understanding of the meaning of social relations in the context analyzed and they provide with possible confirmatory tools for the findings deriving from quantitative analysis (Edwards 2010). Furthermore the chapter presents the sampling strategy and the instrument

(semi-structured interview) adopted to collect qualitative and quantitative data and the quantitative model used to test quantitative hypotheses. The unit of analysis is the household. I used multi-stage sampling and I have collected multiple intra-village ties. Variables used comprise both socio-economic features and network data. In this chapter I have described the reason for the choice of those variables and their meaning in the context analyzed.

Chapter three situates the case study in the macro policy context to then focus on the municipality and in the villages' object of the analysis. It describes the history of agrarian reform, the main features of the previous production system and the position of family farming in Brazilian context. It provides an overview of the history of the sugar cane sector, its crisis and its effects the littoral area of Northeast of Brazil (*zona da mata*), where it represented the first source of employment. It outlines the main features of Brazilian agrarian reform focusing on the crucial role of social movements and the role of encampment in the process of agrarian reform settlements' creation. Such framework is crucial to understand the social structure of sugar cane plantations and the risk to reproduce pre-existing domination patterns in the context analyzed. It allows identifying the different aspect of households' livelihoods that have been influenced by the agrarian reform: access to land and possibility and opportunity to engage in family farming. It highlights the importance of agrarian reform in the municipality object of analysis, and describes the main steps in process of formation of the three villages studied. It illustrates the differences among villages between use of the soil and crops production. The old crops are still those that occupy more soil. New crops have higher value of commercialization but they are more risky crops. New crops need farmers' technical competence, that only very few farmers developed from their previous experience and they have specific harvest seasons and high level of perishability. Therefore they require on the one hand a sure market and on the other hand the ability to mobilize workforce during specific periods of cycle of production. The analysis of the two areas sampled shows that village A is the most productive settlement both in terms of area cultivated and value commercialized. Village A shows a prevalence of new crops towards old crops. Village B instead produces mostly old crops and it does not show relevant differences with neighbors. Village A produces the highest value of soursop and passion fruit. These crops are core products for ASTC. The introduction of soursop and passion fruit induced a new demand of labor in the village that single household alone are not able to provide.

Chapter four illustrates how important differences, in the way in which households have been mobilized, affected village composition and villages' social networks. The combination of narrative of villages' histories and visualization of villages' networks allowed showing substantial variability across villages in households' attributes and social networks' features. The use of ERG models showed that homophily in households' attributes and edge covariance are relevant elements in determining links in frequent contact network. The significant uniform homophily statistic differ across villages. The only parameters that are significant in more than one village portray households' activities in family farming. There are two variables that describe such activity. *Engaged in family farming* is a binary variable that identifies whether the household declared to have family farming as main livelihood strategy at the time of survey. Employment in family farming describes the presence of a working relation between households in the village. Edge covariance in kinship is also extremely important in village A and C where there were no limits in terms of households that could be linked by kinship in the phase of village creation.

Village A is the most complex village in terms of networks and the village with the highest agricultural production. Furthermore there are a wider number of factors contributing to network formation while in the other villages there is a smaller number of factors that are able to explain the contact network. In village A same geographical origin, edge covariance in kinship network and employment in family farming are the most important elements to trigger links.

In village B instead it is more difficult to identify what are the generator mechanisms of frequent contact network. Arriving to the village in the same migration wave is important in defining a link in the frequent contact network.

In village C the major factor that increases the probability of tie in the frequent contact network is the presence of a tie in another network, while few shared attributes have an homophilous effect. Moreover in village C the presence of a large group of old settlers, the lack of previous ties among new settlers and a short period of encampment of new settlers, characterized by episodes of violence, did not favor the creation of ties across groups. Kinship represents the most important driving force of contact network and there is strong overlapping between different ties. This multiplicity can be considered as an anti-risk behavior in response to a long exposure to violence for old settlers and early tensions

between the groups of old and new settlers. I will test if village A is the most similar to scenario 2, as the frequent contact network is predicted by the combination of both family farming employment and kinship network that are not completely overlapping. It is important to point out that a similar quantity of products sold to the cooperative is an element that triggers the connection among households in the frequent contact network both in village B and C.

Chapter five analyzes the role of the cooperative in the three villages analyzed. The analysis of trajectory of ASCT specialization, driven by donors, shows that crucial decisions taken by ASTC reflects only marginally the needs and requests of ASTC members. The debate on crucial role of donors in shaping ASTC decision and the future of the cooperative is central for some of the most productive members. They would like ASTC to gain financial autonomy to increase the bargaining power of ASTC members. However, not all of component of ASTC's board of directors do completely agree on this position and the ambivalent discourse of the cooperative persists. While dependence from external funds provides some members with personal benefits, it strongly hampers the ability of members to take decisions in ASTC. In the framework of coalition theory it is possible to argue that the smaller producers, that are tag along, are important. They allow the cooperative leader not be inconsistent when she justifies her narrative to some donors saying that ASTC supports the more disadvantaged farmers. On the contrary the narrative that is starting to emerge among villagers, especially in village A, is that ASTC only supports the biggest producers.

While ASTC's support to the introduction of new crops has played a role in the emergence of village family farming employment network, its trajectory towards specialization in very costly crops creates on the one hand barriers to entrance in the coop and on the other hand increase dependence towards market.

Despite ASTC ambition and planned strategy, its members are not able to diversify their production including several high value crops but instead they tend to produce high quantity of the same crop. The market represented by municipality schools is important for ASTC. However the political positioning of ASTC members, due to its history, creates barriers to its own access to municipal funds. In village A ASTC members prevalently belong to the blue party and many of the members that withdrew from the coop, are now members of the opposite party. All of these factors can hamper the bridging role of ASTC and expose it to the

strong risk of becoming the mirror of a specific political or economic group. The analysis presented in this chapter is based on the burgeoning materials produced by ASTC (project reports, cooperative power point presentations, cooperative management systems), as well as on my own observations of the cooperative activities, in depth interviews, and on a focus group with a sample of the cooperative's members.

2. Methodology

2.1 Introduction

International and national donors design projects aiming at fostering change in societies they do not belong to. The risk of unintended consequences of participatory development interventions is very high as previous literature shows (Cooke B. and Kothari U. 2001; Lund and Saito-Jensen 2013; J. P. Platteau 2004). Community-Based Organizations often do not introduce any change but simply reproduce existing social structure.

Recent studies highlighted the necessity of better enquiring local contexts and emergence of CBOs (Barr, Dekker, and Fafchamps 2010). The study of participatory development interventions promoted by external donors in developing countries is intertwined in three main literature streams such as participatory development (Cooke B. and Kothari U. 2001; Hickey S., Mohan G. 2004; Mosse 2005) development economics that focus on drivers of participation in Community Based Organizations (Arcand and Fafchamps 2012), social influence and innovation diffusion (Banerjee et al. 2012).

This study, applying the theory of adaptiveness (Parkinson 2013b; Petersen 2001) to participatory development projects, claims that the ability of such interventions to introduce change depends on the contexts' where they operate. Contexts analyzed are three villages created by agrarian reform (*Projetos de assentamentos da reforma agraria*) in the Northeast of Brazil.

The villages can be defined as organizations. The unit of analysis is the household and they are the nodes in the network. A network describes the social relationships (such as friendship) among nodes. Multiple networks that connect households in each village define villages' structure. The research focuses on the study of villages' multiple networks overlap.

The seminal contribution of Padgett and Powell (Padgett and Powell 2012) focus on the problem of emergence of organizational novelty: "our interest is how multiple-network topologies can shape the emergence and evolution of organizational actors over time" (Padgett and Powell 2012, p. 6).

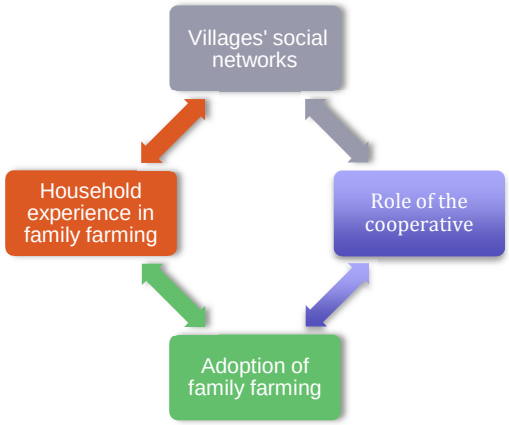
This research shows the different overlap between social networks across villages. It also explores how the response to CBOs is associated to social networks' features. It does not

directly aim at the identification of the factors that favor or hamper the participation of households in the organization, operation that is possible only with longitudinal data.

The challenges of villages' response to CBOs intervention go beyond participation and are more related to what can be referred as organizational invention (Padgett and McLean 2006a). The introduction of family farming, as new important economic activity, is not only the result of people participation in social movements' activities first and then to a producers' cooperative but it is the result of existing social structure transformation.

The main questions are on the one hand how the cooperative's action is shaped by villages' social networks and on the other how the cooperative influences the network form of household interaction by sustaining a specific activity, such as family farming.

Figure 2.1 Experience in family farming and role of cooperative



The research focuses especially on family farming which is an innovation for the context and it can potentially allow for the creation of new ties in the villages. The main object of the research is the social network structure of a sample of three villages where a cooperative operates. The study analyzes social networks' features and on how the cooperative influenced these networks.

Section 2.2 presents mixed methods outlining both strengths and limitations. It provides both a literature review on some relevant studies that used such methodology and it explains why this research qualifies under the definition of mixed methods. Furthermore it explains the main features of the quantitative model adopted to analyze social network (Exponential Random Graph Models). Section 2.3 describes the sampling definition. Section 2.4 outlines the

process of data collection: fieldwork organization and interview delivery. Section 2.5 points out the main data collection limitations.

2.2 Mixed methods: theory and some applications

In development studies, and not only, there is an on-going debate on the selection of research methodologies. Three are the main methodological schools: the main stream quantitative that sustains quantitative approaches (Duflo, Glennerster, and Kremer 2007), a more ethnographic approach (Grillo and Stirrat 1997; Olivier de Sardan 2005; Mosse 2005), (Lewis and Mosse 2006), (Desai and Potter 2006) and a stream that proclaims the advantages of mixed methods and the combination of several research methods (Rao and Woolcock 2004; Bamberger, Rao, and Woolcock 2010; Rao and Ibáñez 2003; Cramer et al. 2013).

Understanding the process of interaction between producers' cooperative and the social structure requires a combination of tools. Qualitative tools allow eliciting the history of the village to understand how villages were created and with which objectives. A combination of qualitative and quantitative tools allows identifying what are the drivers of interaction among households, how groups connect and what is the political positioning of the cooperative.

This section aims at showing that mixed methods are an appropriate methodological perspective to analyze on the interaction between an organization and the social structure in which the organization is embedded. It refers to a consolidated practice of dialogue between quantitative and qualitative methods and data to confirm, complement and inform quantitative findings (Small 2011). There is in development studies, since late Nineties strand of literature that uses mixed methods in monitoring and evaluations', also referred as "participatory econometrics" (Mansuri and Rao 2003) that especially focuses on Community Driven Development initiatives. Well-established institutions such as the Word Bank have as also promoted this scholarship. Social network analysis has long roots in mixed and interdisciplinary research methods (Edwards 2010).

The main common argument of these strands of literature is that qualitative tools allow for a better understanding of the meaning of social relations in the context analyzed and they provide with possible confirmatory tools for the findings deriving from quantitative analysis. However, there is an going debate in literature on opportunities and limitations of mixed methods (Heyvaert et al. 2013).

In the next pages a brief history of mixed methods, outlines what are the features that qualify a study under this category. It will be also described the application of mixed methods in development studies, which is considered to be a good methodology, both by World Bank researchers (Bamberger, Rao, and Woolcock 2010), (Rao and Woolcock 2004) and by an on-going study on fair trade impact financed by UK Department For International Development (DFID). Lastly it will be presented the application of mixed methods in social networks analysis and especially how authors mix the traditions and the two techniques.

The current century is characterized by the presence of several publications that adopted mixed methods approach(Small 2011). In the last fifteen years we observe the birth of a new field with journals and conferences.

There is a debate on what qualifies mixed methods. Is it the choice to combine survey methods with qualitative interviewing? Is it the choice of the sample size? (Small 2011, 58).

Mario Small (Small 2011) argues that the classification of studies should be done on three levels: 1) typology of data, 2) data collection, 3) data analysis. Any study that combines at least two kinds of different data can be considered as based on mixed method.

The combination of different methods has long roots in the history of research methodology in several disciplines of social sciences. In the field of psychology, already in late Fifties, it was argued that confronting measurement obtained with different methods of data collection can improve the validity of results (Campbell and Fiske 1959). In sociology, in the debate on survey methods, Sieber (Sieber 1973) supported the importance and value added represented by integrating fieldwork with survey as the two methods complement each other weaknesses and strengths. Some authors (Brewer and Hunter 1989) even claimed that multi-methods research has produced some of the most important contributions in XX century. In evaluation studies the validity of mixed methods have especially been defended since late Seventies (T. D. Cook and Reichardt 1979).

Motivations of mixed methods

The two main objectives foreseen by researchers when starting multi-method studies are confirmation and complementarity. The first objective aims at testing findings obtained with

other sources. This technique is also referred as triangulation (Jick 1979). The second objective is instead designed to allow different types of data to compensate the weaknesses of the other. This approach has been most widespread since 2000s. There are two main strategies of combining these two methods: a) use qualitative data to interpret quantitative results and b) large sample to test qualitative results.

The combination of qualitative and quantitative can be achieved using a time scale by concurrent or sequential design or instead by using nesting design (Creswell and Clark 2006). In this latter case a wide spread procedure starts from a larger group to focus then on some specific group where more qualitative methods, such as in depth interview, will be adopted.

Main issues in mixed methods research

The main critical issue in mixed methods is commensurability. The two methods combined have diverging epistemological perspectives. On the one hand quantitative research moves from a positivist perspective that claims the existence of an independent social reality to the researcher. On the other hand qualitative research provides more emphasis on subjective interpretation of the researcher (Small 2011).

Another important drawback of such type of research refers to sustained trend of social sciences towards specialization. The risk for mixed methods researchers is to be very vulnerable to critiques. It can happen that the reviewer of the manuscript will dominate the technique applied in the study better than the author (Small 2011, 79). It is therefore fundamental for mixed methods researchers to select the right audience.

Application of mixed methods in development research

In development research and program evaluation it can be provided an added value to combine qualitative and quantitative methods (Rao and Woolcock 2004) as often none of the two techniques alone is able to respond to the research questions of development researches, especially when researchers are not interested in the outcomes but in the way through which outcomes are achieved.

Purely quantitative research face the difficulty to design survey that is able to fully provide definitions that respond to the context. Often development researches surveys do not achieve to successfully integrate what emerges from fieldwork observation into questionnaire

design. Wording of questionnaires, which does not comply with respondents' representation of phenomena inquired, is most likely to foster biases in the measurement.

In addition quantitative methods are able to elucidate correlation between observed outcomes and covariates but they are not able to elucidate on the processes that have driven the formation of such mechanisms. An example (Rao and Woolcock 2004, 167) refers to Community Development Project namely the creation of a village committee. The authors (Rao and Woolcock 2004) claim that a purely quantitative study would not be able to elicits the process of creation, how it interacts with local politics, what are inclusions and exclusions mechanisms and the emergence of leadership.

The main drawbacks of qualitative studies instead are the small number of observations, possibly biased criteria to select key informants to be interviewed, subjectivity in the interpretation of results and impossibility to control for other factors.

In development studies and evaluation researches the first to argue for the necessity of multi-methods was a study on the impact of the creation of an irrigation system in South of India (Epstein 1962). Other scholars instead carried out a very detailed household survey in one single village in India (Epstein 1962; Bliss and Stern 1982) combining qualitative and quantitative methods to investigate the village economy first and second the evolution of poverty and inequality over the last five decades.

The methods of integration of qualitative and quantitative methods can be defined as parallel, sequential and iterative. Parallel is when the two analysis are done separately and then integrated to compare results, sequential and iterative aim at combining the two strategies in all of the phases of the research.

Rao and Woolcock (2004) define as "participatory econometrics", a research design that combines qualitative and quantitative methods in development research. The main qualitative methods adopted are Participatory Rural Appraisal (PRA) (Chambers 1983) (Chambers 1994), focus group and textual analysis.

Participation econometrics face critical issues referred to data collection. Data collection outcome is largely dependent on moderator's ability to animate group discussion. Furthermore it is crucial to achieve a good representativeness of all groups present in the

target population. Finally PRA has been largely criticized because it is not able to elicit structural problems but just problems that are on the surface (Cooke B. and Kothari U. 2001).

Participatory econometrics conceives the research design as based on three steps: qualitative methods to identify the crucial issues; survey design and hypotheses definition driven by qualitative work and eventually by a theoretical model and test of hypotheses with quantitative methods. The analysis of the impact of Jamaica social investment fund (Rao and Ibáñez 2003) in five matched pairs used mixed methods.

The crucial point of (Rao and Woolcock 2004) is that qualitative is essential to understanding the processes object of analysis and to complement quantitative data. The authors identify five ways in which qualitative methods can be useful. It allows generating valuable hypotheses as derived from fieldwork. It helps to understand the direction of causality. It facilitates identification of the nature of bias and measurement error often derived from wording of questions that fail to picture the phenomena that the researchers want to observe. An example of this problem is the use of the word "beating" that for survey respondents failed to portray other forms of domestic violence that the questionnaire wanted to take into consideration (Rao and Woolcock 2004). It enables crosschecking and replication. It informs the context by providing a stronger meaning to quantitative findings.

Ten are the principles that should guide mixed methods evaluations of development projects (Rao and Woolcock 2004, 185). The iterative process should inform the process of survey design. Qualitative questions should be open-ended. Data analysts and people that collected data should be closely working together. The researcher should be driven by quantitative research design but collect data also using qualitative techniques. The sample chosen should be large enough to be representative of the heterogeneities present in the population observed. The fieldwork on research site should be long enough to acquire knowledge on the site itself. Qualitative information should be used to explain quantitative data. Badly trained qualitative researchers can create more damage that not well trained quantitative interviewers. Qualitative work should not be considered as an alternative method to surveys. Identifying the possible externalities to an intervention improve the measurement of outcomes.

An important on-going project that is adopting mixed-methods is the evaluation of the impact of Fair trade certification scheme Fair Trade, Employment and Poverty Reduction

(FTEPR) (Cramer et al. 2013). The sampling methodology selected by FTEPRP research differs from the approach of "Randomized Control Trials" (Duflo, Glennerster, and Kremer 2007), (Banerjee and Duflo 2012). Randomized Control Trials considers development intervention as a treatment and research is conceived as a quasi-experimental design. The promoters of this technique argue that it is possible to assess the effects of the development intervention, by selecting randomly an equal number of treated and non-treated. FTEPRP research instead opted for "contrastive case study that highlights the rationale for purposive selection that generate comparison within as well as between sites" (Cramer et al. 2013, 7).

The choice to use purposive sampling is referred to the objective of research that aims at understanding the process of how, for whom and why certification scheme influence poverty in the contexts analyzed. The researchers do not aim neither to establish a control group neither to isolate an average treatment effect (Ravallion 2007). The research makes a comparison inside two countries where Fair Trade Certification scheme are applied and within countries across commodities.

Use of mixed methods in social network analysis: a long history

In social network analysis (SNA) mixed methods are even more relevant. Social network analysis finds its roots in qualitative research. The study of social networks started in the Forties in anthropological literature (Bott 1955), (Mitchell 1969), (Barnes 1954). Only in the Seventies there was a shift of attention and focus to more quantitative methods to analyze the topologies and structures of networks (White 2008). This trend was strengthened with the development of software for social network analysis that permitted a relevant advancement in quantitative analysis. Additionally SNA is interested not only in the topology of networks but also in the processes that generate these networks and on how these networks are perceived.

"Qualitative approaches offer what quantitative cannot: they can add an awareness of process, change, content and context" (Edwards 2010, 5). Qualitative SNA tend to focus more on personal network than on whole networks (Bott 1955). Qualitative data allows to test for reliability and presence of measurement errors and outline and to elucidate on what is happening in the network what does this topology actually means (Diani and McAdam 2003, chap. 11).

The strategies adopted by researchers to mix qualitative and quantitative data in social

network analysis have been mainly of three types. The first is to combine qualitative methodologies, such as ethnography, with quantitative analysis, using mathematical models. The second is to use multi-stage research process either starting with qualitative enquiry which results will be tested with quantitative methods on a larger scale or instead starting with a large quantitative survey and then focus on smaller sample to study more in depth groups with qualitative analysis. The third type is mixing on the one hand qualitative methods of data collection with mixed-method for data analysis (Edwards 2010).

An example of the first strategy is the ethnographic study carried in high school classes to understand how formal and informal organization of the class influenced student resistance to learning and to teacher authority. McFarland collected data on both friendship ties among students in the class and episodes of students' resistance. He used Poisson multilevel regression to understand how and which elements of classroom features influenced students acts of resistance (D. A. McFarland 2001).

2.3 The research methodology applied in this research

The features of the research questions led to the choice of a mixed methods research methodology. It was used a combination of two qualitative and quantitative methods for complementarity and triangulation purposes and qualitative data as a basis for hypotheses elaboration to be tested with quantitative and qualitative methods.

The combination of the two can allow fighting against what are the main drawbacks of both methods: on the one hand lack of context understanding for quantitative and on the other hand high level of "positionality" (Sultana 2007) or subjectivity of the researcher for qualitative tools.

This research qualifies for the use of mixed methods (Small 2011). Data collection combines semi-structured interviews and qualitative data such as focus groups, field notes and cooperative archival documents. Data analysis comprises mathematical models to test hypotheses and textual analysis of qualitative data.

Quantitative model for social network analysis are based on two important assumptions. The first is that there is high level of interdependence between the different actors and contextual signals influence households behavior (Entwisle et al. 2007), (Erbring and Young 1979). Specifically in this research households are considered to be influenced by other

households, being part of the same settlement, with which they have direct ties. The second is that households' choices are not explained by rational utility model but rather individuals' actions are shaped by other factors such as social norms and intrinsic motivations (Bowles, 2004), (Ostrom 1998).

Qualitative is a way to complement and control for the quantitative and allows having deeper comprehension of the reality as the researcher can go beyond the simple acceptance of what people state during interviews. In a research that aims at collecting households' socio-economic features along with mapping social networks of all households living in the villages object of analysis, it is fundamental to have a clear comprehension of the context relying not only on individuals' responses to interviews but also on observation of households' behavior. In order to have a clearer insight into the social context along with survey questionnaires, participant observation has been adopted.

The researcher needs to gain trust from people being observed in order to be able to collect true information on social ties and household demographic and economic features. Moreover qualitative techniques, such as participant observation are necessary to overcome a lack of common background between observers and observed and to elicit some hidden phenomena.

Qualitative techniques can therefore allow achieving a better understanding of the interviewees and of the context of analysis. Qualitative tools included one focus group, in depth interviews and participant observation that allowed having a clearer picture of cooperative history, village's history, choice to join or not join the cooperative and identification of the main places/institutions of social aggregation in the villages.

2.3.1 Qualitative data collection

Two important features of qualitative research process are: 1) the interest in understanding the meaning of phenomenon, 2) the choice to study people, object of the research, at their location (Creswell and Plano Clark 2007, 29).

Qualitative interviewing allows to elicit the meaning of events and processes in which people have been involved (Rubin and Rubin 2012, 3). The observation of the context analyzed, according to recent literature in anthropology of development, should be carried

out from within: “Arguably the social processes of organizations are better understood from within” (Mosse 2005, 11).

The process of creation of agrarian reform settlements is an important event in the biography of people that took part in it (Severi 2012). They have been involved both as active occupiers or old sugar cane plantations that have experienced the presence of new neighbors and new ruling organizations.

The four main qualitative tools adopted in this research design are the introduction of two qualitative questions in the structured interview, several in-depth interviews with key informants, the conduction of a focus group with a selected sample of cooperative members and the choice to live for some period in one of the villages object of the analysis and to carry period of observation of the cooperative activities.

The interview started by asking people to tell about how their life history led to the agrarian reform settlement. Some of the respondents were already living in the village before the agrarian reform while others decided to join the social movements for very different reasons. The process ended by asking them to point out what was their perception of change having passed through this entire process of village formation and establishment.

The objective of focus groups is to gather a significant sample of people to discuss about a limited number of topics. During the focus group the researcher has the role of the facilitator by supporting the discussion allowing all people to express their ideas. General goal of the focus group is to make people express their minds freely. Participants of the focus group should share some same features, as this would allow them to interact, but also they should have some relevant differences as the questions are designed to make people engaged in a discussion. Focus group aims at eliciting the different interpretation of people of the reality. It is recommendable that the facilitator of the focus group is no group insider as this pushes participants to elicit their concepts and motivations. (Groves 2009).

The focus group used for this research included a sample of eight of members of the cooperative, from different villages, that were chosen to include all the typologies of farmers from the smallest to biggest producers[1]. Cooperative members were asked to discuss about relevant aspect of cooperative life and also reflect on some of the many challenges that the

[1] Focus group questions are presented in appendix 8.2

cooperative have been facing. It is important to point out that, only five members were the most active in the conversation while three remained mostly silent.

2.3.2 Quantitative data analysis: Exponential Random Graph Models

The study of social networks focuses on the characteristics of the networks (descriptives), and on the identification of local configurations that define network formation as well as on the influence of social networks on behavior (social influence).

A network is composed of a set of actors (nodes) that are connected by relations (ties or edges). Two nodes in a network connected by a tie constitute a dyad and three nodes connected by a tie are a triad.

Networks can either portray the ties of single actors (also referred as egos) (egocentric networks)[2] or instead ties among all nodes in a given social space (whole networks)[3]. This research analyzes whole networks and the village represents the network boundary.

Networks can either be directed or undirected. Directed networks show what is the direction of a tie between node *i* and node *j*. The tie is symmetrical (or reciprocated) when both nodes refer to have a relationship with the other. The tie is asymmetrical from node *i* to node *j* when only one nominates the other. In the ''undirected'' network, a tie between i and j is either present or absent.

Networks' descriptives are the overall characteristics of the networks such as size, degree, density, average path length, average degree and number of isolates. Network size is the number of vertices or nodes in the network (*N*). Isolates are nodes with no-connections**.** The degree in an undirected network measures the number of alters with whom ego is connected. The average degree is the mean of the number of ties that each ego has. In a "undirected" network with number of nodes (N), the density ($\frac{L}{\frac{N(N-1)}{2}}$) is defined by the ratio

[2] "An egocentric network consists of an actor, the other actors in its immediate locality or neighborhood, and the relationships among them." (O'Malley and Marsden 2008, 224)

[3] ''Whole network'' studies seek to assemble data on relationships in a theoretical population, that is, on the ties linking all units/actors within some bounded social collective, such as all physicians within a medical practice. In such studies, it is essential that clear boundaries or rules of inclusion for units/actors be specified (Laumann et al. 1983)". (O'Malley and Marsden 2008, 225)

between the observed ties in the network (L) and the number of possible ties. The geodesic distance is the shortest path between two nodes.

The analysis of networks' formation focuses on local network configurations or network structures that are considered as forces behind network formation. Clustering, centralization and homophily are among the most important social forces. Homophily capture the tendency to create ties with others that share similar traits. It is considered to be one the main mechanisms behind network formation (McPherson, Smith-Lovin, and Cook 2001). Clustering or closure is the propensity to form ties with other nodes with which nodes already have ties in common. Centralization (Freeman 1978) is tendency of nodes to form links with other nodes that already have a high number of ties.

ERGMs are a class of statistical models for social network analysis that are designed to enable the recognition of these social processes or forces, which can be considered the structural signature of the network (J. Scott and Carrington 2011). ERG models allow generating networks based on local properties that are specified in the model.

ERGMs, also referred as p* models (Robins et al. 2007) (Anderson, Wasserman, and Crouch 1999)(Frank and Strauss 1986) (Pattison and Wasserman 1999), are designed to observe social networks, which are the dependent variable, at one point in time. They are "tie-based models for understanding how and why social network ties arise" (Lusher, Koskinen, and Robbins 2013, 9). They aim at identifying which forces can explain why we observe the specific network under analysis.

The model is consistent with the main basic social network theory assumptions. Networks are based on local structures and therefore local effects are important to explain the global network structure. The presence of ties in a network is not random but there are social processes or local properties that generate these ties. There are dependencies among ties. They can be specifically modeled by network configurations. Ties are influenced also by actor attributes. Ego's edges are influenced by Ego's own ties, by Alter's ties and also by node-level attributes present in their local neighborhood. "The patterns within networks can be seen as evidence for on-going structural processes. Multiple processes can operate simultaneously. Social processes are structured yet stochastic" (Lusher, Koskinen, and Robbins 2013, 10).

ERGMs are theory driven models, therefore when a researcher decides to use a specific local configuration is implicitly adopting a certain theory.

The frequent contact network, which is the network that I aim at modeling, as any network, can be represented by a random graph. Its main characteristics are being constituted by a set of nodes *n* and dyads *m* and having a specific density (Erdos and Rényi 1959). The presence of ties, also referred as edge or link, in a dyad is represented by $Y_{ij}=1$ and absence in nodes in a dyad is represented by $Y_{ij}=0$. The presence of a tie in the network, in the case analyzed, means that the households (nodes) meet frequently to talk.

ERGMs have similarities with logistic regression models, as they allow estimating the log odds of new a tie occurring in the network for each of the configurations specified in the model, but they go beyond logistic regression as they allow for dependence among observations.

ERGMs model the probability that a random network Y is realized by an observed network y as indicated by the following equation.

$$\Pr(Y = y) = \frac{1}{c} \exp\left(\sum_{k=1}^{K} \theta_k z_k(y)\right)$$

$z_k(y)$ are the model covariates of any K local configuration of the graph that are hypothesized to affect the presence of ties in the network . The most commonly used local configurations are centralization, clustering, homophily, density and in the case of directed graphs also reciprocity and sender and receiver effects. θ_k is a vector of statistical parameters that will be estimated by the model. c is a normalizing constant that allow the probability calculated by the model to sum to 1.

A positive value of the coefficient θ_k signals a positive effect of a specific network statistic in the formation of ties, while the opposite sign means that these configurations tend to hamper the formation of ties. (O'Malley and Marsden 2008, 245).

The main local dependence structures at edge level are Bernoulli graphs, dyadic dependence, and Markov random graphs.

Bernoulli graphs (Erdos and Rényi 1959) assume that edges in a network are independent and that the presence or absence of ties, indicated by a probability α, is fixed for all edges ("homogeneity assumption"): α = where θ is the density or edge parameter.

Dyadic independent models instead are based on the assumption that "a tie from person *i* to person *j* is independent from a tie from person *j* to person *i*. Hence the model is no longer a

model for ties in the network but for pairs of ties in the network, and the pairs of ties are called dyads" (Lusher, Koskinen, and Robbins 2013, 56)

Markov random graphs are based on the assumption that "there is a fixed number of nodes and that edges between disjoint pairs of nodes are independent conditional on the rest of the graph. Two edge indicators {i,j} and {i',k} are conditionally dependent if {i,j} ∩ {i',k}." (T. A. Snijders 2002, 3). The first models of Markov random graphs were developed in the Eighties (Frank and Strauss 1986) proposed as a possible way to model dependence between edges both in directed and undirected graphs.

Estimates in the Bernoulli dependent and dyadic independence assumption are made with Maximum Likelihood Estimation (Lehmann and Casella 1998). Instead, in models that include dependence structures, the coefficients are estimated using Markov Chain Monte Carlo Maximum Likelihood Estimation (MCMCLE).

The simplest ERGMs are defined by specifying the number of edges or the number of isolates in the model.

The outcome variable in ERGMs is the presence of a tie in the network. Network predictors used in ERGMs, also referred as network statistics or local configurations, can be classified into exogenous and endogenous. Using exogenous network configurations, such as homophily and edge covariance, the normal logic of logistic regression holds; instead using endogenous network configuration such as transitivity, centrality and edges, the presence of ties is predicted by the presence of other ties in the network. Because of these dependencies structures ERGMs are different from other regression analysis. ERGMs aim at testing if some structural configurations are prevalent in the network. The interpretation of parameters that describe the presence of some network configuration cannot be the same used for standard logistic regression results. (Robins, Lewis, and Wang 2012)

Density, in ERGMs models, captures the frequency of interaction in the network. It is the effect that incorporates the number of edges or links in a network. The parameter *edges*[4] measures for the overall probability of a link in the network.

[4] Command in statnet package in R : edges. "It adds one network statistic to the model equal to the number of edges in the network." (Morris, Handcock, and Hunter 2008, 3).

Homophily effects capture the tendency to create ties with others that share the same attributes. It is considered to be one the main mechanisms behind network formation (McPherson, Smith-Lovin, and Cook 2001). Homophily effect can either be the result selection (similar actors select similar other with whom to interact) or influence (actors that are connected by ties become similar). With cross-sectional data it is impossible to separate between the two social processes above mentioned (selection and influence). Some scholars describe the process that led to prevalence of ties between nodes that share similar traits as "assortative mixing" (GOODREAU, KITTS, and MORRIS 2009, 111). This effect is captured in ERGMs, among others by *nodematch* and *nodecov*. The uniform homophily statistic (*nodematch*[5]*)* allows testing if the equality (match) in the value of between the two nodes in the dyad increases the probability of a tie in the network. (Morris, Handcock, and Hunter 2008, 5). A positive and high coefficient for this parameter shows sharing the same attribute increases the probability of having a tie. The node covariance parameter (*nodecov*[6]) instead aims at testing whether the covariance between the two nodes in the dyad influence the probability of the presence a tie.

Edge covariate[7] coefficient measures the likelihood of a tie to form in the dependent network given a tie in the covariate network (Morris, Handcock, and Hunter 2008, 6). Edge covariance allows testing for the presence of a joint effect between several networks. This effect is considered important when it is considered that there is no temporal dependence between the networks observed.

Centralization, which is the tendency of nodes to form links with other nodes that already have a high number of ties, is captured in ERGMs by the parameter *alternating k-star* but also by a new parameter *geometrically weighted degree* (Hunter and Handcock 2006).

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[5] Command in statnet package in R: nodematch (attrname, diff = FALSE, keep = NULL)). "It counts the number of edges (i, j) for which attribute (i) = attribute (j), p network statistics are added to the model, where p is the number of unique values of the attrname attribute"(Morris, Handcock, and Hunter 2008, 4)

[6] Command in statnet package in R: nodecov(attrname) "The attrname argument is a character string giving the name of a quantitative (not categorical) attribute in the network's vertex attribute list. This term adds a single network statistic to the model equaling the sum of attrname(i) and attrname(j) for all edges (i; j) in the network." (Morris, Handcock, and Hunter 2008, 4)

[7] Command in statnet package in R: (edgecov (x, attrname = NULL)). "The x argument is a network; the optional argument attrname provides the name of the quantitative edge attribute to use for covariate values (in this case, missing edges in x are assigned a covariate value of zero). This term adds one statistic to the model, equal to the sum of the covariate values for each edge appearing in the network" (Morris, Handcock, and Hunter 2008, 7).

Geometrically weighted degree[8] is a degree distribution term that represents the frequency distribution for nodal degrees where each node counts only once. It helps to model the degree distribution geometrically weighted degree distribution equivalent. A positive coefficient signals the presence of a centralization pattern.

Clustering effect is the propensity to form ties with other nodes with which nodes already have ties in common. This effect in ERGMs is captured by two shared partners statistics Geometrically Weighted Edgewise Shared partners (GWESP) and Geometrically Weighted Dyadic Shared partners[9] (GWDSP) (T. A. B. Snijders et al. 2006) (Hunter 2007). The positive coefficient for the GWESP term is an evidence of transitivity in the undirected network. It represents an alternative term for the alternating k-triangle statistic. It accounts for the number of common neighbors. (O'Malley and Marsden 2008, 252). The GWDSP is very similar to the previous term but it focuses on the number of dyads that the same neighbors whether they are connected by a tie or not (Hunter et al. 2008, 12).

Among the several possible model specifications, I have decided to focus on homophily effects. The analysis of homophily effects is consistent with the literature in development economics where authors' use shared attributes to predict membership in groups or risk sharing (Arcand and Fafchamps 2012).

The use of ERGMs allows increasing the robustness of the results and controlling for other local structures that go beyond the dyadic level, namely the tendency for centralization and clustering. The effect of homophily can be reduced by the tendency to form ties with nodes with which they share common ties, i.e, an indicator of closure ("friends of friends tend to be friends").

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[8] Command in statnet package in R: (gwdegree (decay, fixed = FALSE)). "This term adds one network statistic to the model equal to the weighted degree distribution with weight parameter decay. The optional argument fixed indicates whether the scale parameter lambda is to be fit as a curved exponential-family model (see Hunter and Handcock 2006). The default is FALSE, which means the scale parameter is not fixed" (Morris, Handcock, and Hunter 2008, 6–7).

[9] Command in statnet package in R: (gwesp (alpha, fixed = FALSE)) inputs in the model "a statistic equal to the geometrically weighted edgewise shared partner distribution with weight parameter alpha. The optional argument fixed indicates whether the scale parameter lambda is to be fit as a curved exponential-family model (see Hunter and Handcock 2006). The default is FALSE, which means the scale parameter is not fixed" (Morris, Handcock, and Hunter 2008, 11). GWESP is defined as the number of unordered pairs {i, j} such that yij= 1 and i and j have exactly k common neighbors (Hunter and Handcock, 2004) .

ERGMs not only combines all the properties of the dyadic regression model *à la* Gurbert and Fafschamps (Fafchamps M. and Gubert F. 2007) but also allows identifying what are the forces that generate the network we observe, such as the presence or the absence of transitivity and dyadic dependence which are very frequent phenomena that you cannot control for in dyadic regression.

In dyadic regression models, the presence of dependence in observation is only captured by auto-correlation in the standard errors but such dependencies are not explicitly modeled. It is also possible to specify the model including a series of network configurations that trigger network formation besides homophily such as centralization, clustering, density and edges co-occurrence which are not possible to include in dyadic regressions.

The tendency to create ties with similar others (homophily) is crucial as it is related to the major risk of Community Based Organizations (CBOs) that is to become the mirror of existing social structure.

The main idea is that if there are only few node attributes or edge covariance that make people communicate and homophily is the social process that drives interaction among households, it is very likely that only one group will benefit from CBOs action and the rest will be excluded. The result of these social forces will therefore more likely be no change in the context of intervention or rather an increase of inequality.

Homophily can therefore be one of the reasons of elites capturing of the community-based organizations and the presences of brokering ties across groups hamper such phenomenon. I define groups as those nodes that share the same ties or the same attributes. Namely a clan is a completely connected graph or a clique where the link is defined by kinship. Nodes that have the same geographical origin or work for the same household can compose other types of groups.

The process of ERGMs construction implies six steps. The first is the definition of ties in a network as random variables. The second defines the presence of local social processes that are assumed to generate ties in the network such as homophily, transitivity or others (Robins et al. 2007, 178). The third is the specification of the model with network statistics that describe tie generator mechanisms such as density, triangles or two-star, and three stars. The

fourth is the simplification of parameters due the homogeneity assumption[10]. The fifth is the estimation of model parameters. The sixth is Goodness of Fit Estimation (Hunter, Goodreau, and Handcock 2008).

The estimation of parameters is based on Markov Chain Monte Carlo Maximum Likelihood Estimation (MCMCMLE). The model simulates a range of possible networks distributions starting from some parameters values that are constantly improved by a process of iteration based on the Metropolis-Hastings or Gibbs algorithm (Hunter, Goodreau, and Handcock 2013). The procedure, starting from the set of parameters specified, simulates a distribution of graphs. It then compares the simulated distribution of graphs with the observed graph. The objective of the iteration process is to find the parameter estimate for which the observed graph is central in the distribution. The process of iteration stops when the parameter estimates stabilize (Lusher, Koskinen, and Robbins 2013).

The goodness of fit statistics (GOF) gives a measure, both graphical and statistic, of the similarity of the simulated network to the observed one. If the networks generated by properties specified in the model produced estimates that are around the mean of the observed network we can argue that the observed network is well represented by the model. GOF also allows showing whether the model is able to replicate the graph distribution that were not explicitly model by the parameters specified in the model.

The analysis Markov Chain Monte Carlo (MCMC) diagnostics aims at showing whether the model converged and whether there are degeneracy problems[11]. To inspect model convergence two are the main graphical tools: traceplot and density plot. In traceplots, successive iterations are plotted against their corresponding parameter draws. They allow

[10] "*Homogeneity* assumptions, that is, that all counted instances are equiprobable. This is similar to the assumption in linear regression that a covariate's effect is the same for all observations" (GOODREAU, KITTS, and MORRIS 2009, p. 109).

[11] "Degeneracy is an estimation problem associated with models that fit the data poorly. Essentially, de-generacy results from the specification of a model that is so unlikely to have generated the network, that the ERGM cannot be computed. Degeneracy occurs when the model lumps all or most of its probability mass on just one or a few possible graphs. In most cases of degeneracy, disproportionate probability mass is placed either on the complete (fully connected) or empty (entirely unconnected) networks (Handcock 2003)"(Cranmer and Desmarais 2011, 74).

inspection of the process of iteration and in particular to highlight steps where convergence proved more difficult, which indicates bad mixing.

ERGMs can be estimated both in the software Mpnet (Pattinson et al. 2012) and by the package *statnet* (Handcock et al. 2003) implemented in R software. The analyses presented in chapter four are estimated with *statnet* R package.

2.4 Sampling definition

This section describes the criteria that defined the choice of the sampling strategy adopted. Crucial in the choice of sampling inside villages was a pre-test of methodology that is presented in the paragraphs below.

2.4.1 Pre-test of sampling

The sampling and research methodology has been tested with a pilot study of three weeks in Central Mozambique, namely in the district of Caia. Object of analysis were six rural producers' organizations operating in 5 villages of Caia municipality. This pilot study has been extremely important as it pointed out the main risks and constraints of primary data collection: sampling strategy and formulation of questions. The methodological choices applied in this research were directly guided by these research results. In the pilot study the choice of interviewing 47 households (25 members and 22 non-members) distributed among five different villages did not allowed for a comprehensive representation of the social structure analyzed. Most of the rural association members represented the core, while non-members represented the periphery. To solve this issue it was decided to change sampling strategy by reducing the number of villages studied and by interviewing all households living in those villages. The pilot study highlighted also the difficulty of using name-generator techniques (Marsden 1990) to elicit social ties among households and to recognize the households nominated by the interviewee. To prevent such problems names and nicknames of all households living in the village were asked to local officer before starting the interviews in order to construct a complete roster of names. In this way it was possible to know in advance the name of respondent and some of the households' features before starting the interview.

2.4.2 Criteria to define sampling strategy

The main sampling strategies are on the one hand probability sampling and on the other purposive sampling.

Probability sampling is mainly used in quantitative studies where the most relevant criteria is to guarantee that every observation has equal probability to be chosen. The main rules to select the sample studied is random sampling, cluster sampling, stratified sampling and sampling using a combination of the previous quantitative techniques.

Purposive sampling is preferred by qualitative studies where the choice of population should allow for the possibility to answer to the research question. The main purposive sampling procedures are: 1) representativeness or comparability, 2) special or unique cases and 3) sequential sampling. A further possibility is to use multi purposive techniques (Plano Clark and Creswell 2008, 204–206).

Mixed methods sampling are composed by techniques that combine the two strategies. Among the several types of combination the one adopted is the one considered the most suitable to respond the research question: mixed multi-stage sampling (Teddlie and Yu 2007). The choice of the sample of villages object was based on dependent variable logic both on economic and social dimensions. The initial idea was to choose four settlements that were scoring the highest and lowest value for each variable. The initial criteria proposed for economic variable was per household value of products sold to the cooperative, while for social dimension were considered a range of options. The fictional name that I will use to refer to the cooperative is Alagoas Sem Terra Cooperative (ASTC). The definition of the first criterion was easily adopted as ASTC has this information available while the second was much more complex due to limited data availability before survey and difficulty in selecting the most appropriate variable.

The social dimension criteria included several options: 1) the former working experience of settlers, 2) the religion's prevalence, 3) the old and new settlers, 4) level of violence in the settlement in the period of settlement head election, 5) prevalence of political party and level of political activity, 6) social movement recruiting households, 7) distance from the road, 8) settlement spatial organization. The first two weeks of fieldwork were devoted to define what would be the most effective variable to define sample criteria.

The two criteria to discriminate among these variables were the estimated impact on settlements' social structure and the availability and reliability of data. For most variables it was not possible to have information before going to the settlement. The existing data available at village level, mainly collected by local health officers responsible for village medical assistance, only offered very limited information such as number of households per age class and other similar information. Regarding information on political participation, due to the electoral campaign period, it was only possible to gather information through direct observation that was not feasible due to spatial dispersion of settlements.

2.4.3 Sampling description

Besides theoretical criteria that oriented the sampling definition criteria, two criteria were used to discriminate among the 18 *assentamentos* in the municipality object of analysis. The three villages chosen were selected as different social movements have led their creation. To select among the villages whose process of creation was led by Movimento Sem Terra, the criteria was to select one village that could be comparable in participation in cooperative actives with the only village that was not created by a social movement but by a private association (village A). Village B was therefore selected because it had the highest percentage of households' members in the village after village A. In case two villages had the same features I have chosen the village that had the smaller number of households living in the village.

Different social movement mobilizing households impacted several dimension of villages' composition and organization. The three organizations recruiting households in the three villages differed: 1) in recruiting techniques, 2) in the way they set the rules to define households who can have access to land after a period of occupation, 3) in the spatial organization of the settlement, 4) in the way they choose the political representation of settlers and in the ability to negotiate with local and national authorities.

For what concerns the recruiting techniques while MST and CPT were driven by the speed of recruitment, the private association followed a longer path, which led household to engage in fights for the land. In the rule to choose who can have access to land after a period of occupation, the most important difference was the definition of a maximum number of households linked by sibling ties, which could live in the same village. MST defined this criterion, as they wanted to prevent the creation of new landlords that have a large number of

plots, which would then recreate the problem of latifundia. Settlements' spatial organization also differed across different social movements. The two main typologies were either centralized (*agrovila*), or dispersed (*casa no lote*). *Agrovila* is the most common in the municipality studied and it has been strongly supported by MST. It is a centralized settlement where all houses are built in the same area called *agrovila* and plots can be up to one-hour walk from settlements' residences. Agrovila share some similarities with the ancient *arruado* as houses are very close to each other. In several villages, despite many settlers asked to have their house on the plot, MST refused to grant this right and it allowed only old-settlers (*moradores*) to build their house on the area where they were already living before the agrarian reform. *Casa no lote*, strongly supported by cooperative, is characterized by a dispersed location as houses were built in each household plot. In the municipality studied there is the only settlement that adopted such organization and it is part of the sample. Furthermore in settlers' political representation mechanisms while MST and CPT are organized at national level and negotiated directly with INCRA, the private association instead was negotiating with INCRA and local mayor but had no representation at national level.

Village A has 102 households living constantly in village, two out of village for health reason and six households that have abandoned their plot. The village is organized as *casa no lote* and it located 23 km away from the main road.

Village B has 38 fixed residents households and 4 households that come just from time to time to take care of their plots. The village is organized as *agrovila* and it is 5 km away from the main road.

Village C has 40 fixed residents households but it was not possible to interview 3 of them. The village is organized in two *agrovilas* and some houses on the plot. It is 18 km away from the main road.

2.5 Data collection

The research is based mainly on primary data collected during household survey carried out during three months of fieldwork, from July to October 2012 in three villages, created by agrarian reform, in a municipality in the North of Alagoas state, in the Northeast region of Brazil. Complementary sources are cooperative archival sources, one focus group and some in-depth interviews with key informants, as well as few secondary data. Cooperative archival

data include cooperative digital management system, cooperative internal documents such as general assembly presentations, projects descriptions and reports and cooperative statute. Qualitative data comprise one focus group with a sample of cooperative members, two anonymous self-administered questionnaires, related to decision taking mechanism in cooperative, some key informants' in depth interviews to collect villages' history and participant observation of cooperative activities' field notes. Secondary data include a previous bachelor thesis on the cooperative and the studies that aimed at assessing the situation of the agrarian reform settlements in the municipality analyzed, in order the design the plan to support their recovery (COATES 2007).

The unit of analysis is the household. This choice is consistent with studies, that dealt with the same topic, carried out in agrarian societies of developing and emerging countries (Entwisle et al. 2007), (Krishnan and Sciubba 2009), (Banerjee et al. 2012), (Jaimovich 2011). In such contexts the household is considered to be the unit of production and the fundamental social unit. Members of the households are all of the people that live in the same dwelling.

Notwithstanding its widespread use, considering the household as a unit of analysis is a simplification of reality. Inside the households there are different livelihood strategies that allow for household subsistence and therefore different members of the households interact in different social spaces. Furthermore in a study that focuses on the analysis of social networks different members of the family can have different ties. As heads of the households I consider the father and the mother of most of the children living in the household. In this survey have been considered the ties developed by the heads of the households. Despite the limitation described, the advantage of adopting household as unit of analysis is that it allows collecting ties among all households that live in the village.

In order situate this case study in its historical background it was reviewed literature that analyzed issues at the macro-policy level such as sugar cane industry, the agrarian reform and the role of social movements and the emergence of family farming sector (chapter three).

2.5.1 Socio-economic variables

Two types of variables that define households' features have been collected: socio-economic status, and network data.

Socio-economic status variables

There were four main goals of socio-economic variables' collection. First, understanding village composition in terms of migration waves, origin of settlers and other possible information that could shed light on the presence of pre-existing ties before encampment among households. Second, describing previous and current livelihood strategies. Third, having a better understanding of households' engagement in family farming activities. Fourth, drawing a general profile of socio-economic status of households.

Variables that describe village composition include migration origin, migration wave and number of years in the village, presence in the village before the agrarian reform and the name of the person or organization that told the household about the possibility of going to the village (contact to get in the village). The creation of the villages is the results of the stratification of different migration waves that I have categorized in two broader groups: old settlers and new settlers. Old settlers are households that were already living in the village before the agrarian reform mobilization. New settlers include household mobilized by the agrarian reform either because they were engaged in a social movement or association fighting for the access to land or because they were contacted by some of the old settlers. New settlers are then divided into: first comers, first comers' dependents, old settler's dependents, second comers and third comers.

Variables describing previous and current livelihood strategies consist of professional backgrounds. They have been categorized in five categories of contractual agreements: 1) autonomous, 2) employee, 3) mixed, 4) retired and 5) unemployed. The first category comprises activities that have an entrepreneurial component being either in agricultural sector or petty trade activities. The second correspond to wage work of several types and the third is a combination of first and second category.

Variables describing households' engagement in family farming activities include: dimension of plot, monthly income and expenses, importance of family farming as income generation activity such as previous job, present job, access to land before coming to settlement, number of plots, type of agricultural production before coming to the village and at the time of interview, animals' possess, percentage of the plot that is used for agricultural production, products and place of commercialization, advices for agricultural activities, use of tractor and property of tractor used, total average monthly income, households hired for

agricultural activities and households for which they work in their plot. The question related to advices in family farming was conceived as a name generator technique but it was not possible to collect the information in this format because most of the people, in spite of the indications, named people that mostly are beside village boundaries. Rather than using this as network data I considered that asking for advice is a proxy for relevance of family farming.

Variables that describe more general households' demographic and economic characteristics comprise number of schooling years, assets such as type of access to water and means of transportation. Further data collected include number of times that households go outside the village and popularity of the households. The variable "popularity" can be considered as a proxy for leadership as households are asked to nominate people that they consider to be the most well known and the ones that represent a reference in the village. Past studies referred to the importance of leaders to make an innovative behavior spread (Nypan 1970), (Inguaggiato, Navarra, and Vailati 2013). Controlling for the effect of node attribute on popularity means understanding whether households tend to form ties with peers or rather with others that are more popular than them.

2.5.2 Network data

Rural villages, that are often referred with the word "community", can be represented as multiple networks of interdependences that determine power-dependence relations (Emerson 1962). In the villages studied I have mapped multiple social networks that connect all households inside the village and affiliations in different groups active in the village and outside it. *"By social networks we refer to the patterns of interaction and exchange among people, arising through human social processes; and by multiple social networks, we mean that there may be several different types of social networks simultaneously present among those individuals"* (Robins and Pattison 2006, 3).

The choice to focus on kinship, frequent contact and labor exchange (agricultural employment) and associated life, namely church, political party and local associations, is related on one hand to literature presenting similar analyses (T. Conley and Udry 2001; Arcand and Fafchamps 2012) and on the other to the meaning that such ties have in the context of analysis. I consider kinship and family farming employment as constitutive ties.

Such networks could be the result of strategically built ties to create patronage systems. Frequent contact network is considered a behavioral tie that is influenced by other two ties.

Family is a crucial institution in small-scale societies and it is often the way to articulate many dimensions of life not only social but also political and economic. Kinship network connection, which relates with the other dimensions of social and economic life, is of primary importance in understanding the social structure. Furthermore the lack of connection between families and the seek for benefits only within its group members is one of the first cause of phenomena that are referred to as "amoral familism" (Banfield 1967). Kinship ties collected during survey include the following relationships: marriage, brother/sister, mother/father and cousin.

Labor force supply is one of the most crucial elements in agricultural economics; the ability to produce more crops is strictly connected to the ability to mobilize more labor force (Seavoy 2000). Some authors refer that wealth in peasant economies can be measured in terms of the number of people that households are able to mobilize (Guyer and Belinga 1995). Family employment is a hierarchical relationship rather than an equal (unranked) one. In order to clearly disentangle the direction between employer and employee it has been asked either if the household employed someone or if it was employed by someone else or both. Because the answers to the two questions were different, I have treated the two networks as separate.

Family farming employment includes the following possibilities: employing just people inside the household itself, hiring people from other households with whom they are connected through kinship ties (i.e. they are part of the extended family), hiring people that live in the same village with no kinship connection, hiring people that come from other villages, hiring people that are no fixed residents but that decide to transfer to the village for some time. It was not considered for data analysis workers members of the households and people that are non-fixed residents in the village. These non-fixed residents are not registered by local health officer and not considered as part of the village by fellow villagers[12].

[12] They are referred by households interviewed as "the land tenant of", "he is just an old man, living drunken that has not fixed residency, living some day in some place and some day in some other".

Frequent contact portrays the frequent interaction among households. To describe these ties during the interview I asked respondents to nominate people that they meet on a regular basis by going to visit them at their houses. Visiting someone's house in the context of analysis can be interpreted as recognizing importance to this household. I argue that there is deeper meaning to this type of declared relationship than simple companionship. The reason why I have decided to focus on such network is because it can represent an opportunity for social contagion among households. Investigating the social forces behind network formation is important in a context where village creation was not driven by kinship or other more usual patterns. It was instead the encampment process and the activities of villages' early organization that played a crucial role in the process of socialization among villagers. "Social networks shape and are shaped by participation in social movements" (Porta and Diani 2006).

Two recent articles on social network dynamics in settlements created by agrarian reform in Zimbabwe (Abigail Barr 2004), (Dekker 2004) focused their attention on homophily patterns and the role of CBOs beside using a different quantitative approach. In such contexts it is important to understand what social process allows "households to become from strangers to neighbors" (Abigail Barr 2004, 1753).

2.5.3 Fieldwork organization

I have spent three months of fieldwork (from July to October 2012) in a municipality in North of the state of Alagoas in the Northeast of Brazil. All interviews have been conducted in Portuguese, which has been the main working language except for few exceptions of important conversations with the Italian nun, main responsible for the cooperative and for the Italian voluntaries supporting the work of the cooperative. The support of an interpreter was never needed as Portuguese is the only language used in the context analyzed. The access to list of village inhabitants as well as information on households was given by local health officer (*agente de saude*). During the first interviews in the village, especially in village A, the local health officer accompanied me. The interview has been tested with some people working at the cooperative.

The period spent in Brazil was organized in two main periods. During the first period of two weeks, I made participant observation of the cooperatives' activities and some in depth interviews with cooperative's key figures to understand the history of the cooperative. I also aimed at placing the role of the cooperative in the municipality, by identifying retailers that

buy farmers' production, its market and cooperative main competitors. In this period I also made exploratory questions and observations to identify: the main activities that compose livelihood strategies (family farming, state employee, tourism, seasonal worker in plantation, sugar cane cutter with regular contract), the main elements that determine the level of people wealth and entrepreneurship (type of housing features, electronic devices ect..) and the most important social and economic ties that connect families in villages object of analysis. Furthermore I aimed at eliciting the main organizations in the area which provide the occasion for social gathering and therefore potential brokers (Ronald S Burt 2005) such as social movements, local churches, schools, political parties, local markets and occupation [13].

During the second period, I was conducting interviews in the three villages object of analysis. The main points of the interview, described more in detail in the next section, are: a) socio-economic features of households and b) social networks among all households in three villages, c) identification of places outside villages where people go most often and number of times they go outside villages per household interviewed. Very few interviews were recorded due to the sensitivity of the electoral campaign period.

2.5.4 Interview description

To collect data, I have carried out 177 face-to-face semi-structured interviews. The main differences between questionnaires and semi-structured interviews refer to the level of standardization of questions' wording and answers (Creswell 2003). In the interview there were a fixed number of questions that households were asked to answer but the ordering and wording of questions was extremely similar[14] but not identical.

I have developed a coding scheme that allowed me to classify answers according to specific categories but I left people free to answer especially on questions that induce social

[13] School was also considered by some informants as an important place for interaction but it has not been considered as only including part of the family and usually not households' minds.

[14] During the interviews I have proceeded as follows: I had on my laptop two files open, one with the list of questions in Word and one with an Excel table where in every column there was the name of the information collected. The presence of these two files was conceived as a way to guarantee that all the information was asked and the wording would stay the most similar possible.

desirability bias[15]. Households' interviews were distributed as follows among villages: 102 in village A, 38 in village B and 37 in village C. These numbers represent all households permanently living in village A and B and 95% of those living in village C. The interview was carried out in the house where the household resides. They were conducted either at the presence of both households' heads or of one of the two, most of the times only the woman.

The choice to perform all of the interviews at households' house is based on the consideration that it allows gaining more insight about the reality of households' features and because it allows for better interaction between the researcher and the respondent. These two dimensions can make easier for the respondents to answer questions sensitive in nature and therefore increase the reliability of data collected. In village A and B some of the interviews have been delivered with the presence of the "agente de saude".

Table 2.1 Interviewees' composition by gender

	Interviewed male	Interviewed female	Interviewed both
Village A	22%	62%	17%
Village B	39%	39%	21%
Village C	30%	70%	0%

Accessibility and approachability matters explain the prevalence of female interviewed (Table 2.1). First, men tend to be out of the households until late afternoon, and second women accepted more easily to be interviewed by another woman. In village C the higher prevalence of female households' heads interviewed is related first to a shorter period of time with respect to the other villages and second to main employment of households. In village C, a higher number of households that are employed as sugar cane cutters. This implies more established working hours than family farmers and therefore smaller probability to meet such households.

The reason why in village B there is a more even division of interview between male and female respondents is related to an higher percentage of households that are only composed by one male.

[15] The interview guide is presented in Appendix 8.1

Interview organization

The interview was conceived to be composed of five main parts. The first aimed at drawing the trajectory of the household to reach the village and its previous occupation. The second investigated the current household's condition including number of household components, economic condition of the household measured both in terms of assets (household appliances) and average monthly income, agricultural production for subsistence and for commercialization and place of commercialization. The third enquired on household mobility outside the village and availability of means of transportation. The fourth aimed at mapping intra-village ties among households in the three villages. The fifth registered the perception of change of the household from their previous to their current condition.

The interview started by introducing myself, making a disclaimer about the objective of the research and making clear that data will be used anonymously or in an aggregated form. I made clear from the beginning that I would ask people names as I was interested in how people interact in the village but I explicated that all of these names will become numbers in the elaboration. In order to guarantee the protection of respondents' identity, I also have decided not mention neither the municipality name nor the names of the agrarian reform settlements studied but only the Brazilian state where I conducted this research.

I also made clear that the research investigated the role of the cooperative but that I had no ties with the institution. To clarify on this point some of the households even asked me who financed the research and I specified that this research was part of university graduate program and that the funds came from a research institution specialized in development cooperation.

After this short disclaimer, I started the process that I have been repeated 177 times. Except for the first two questions and the last question, which I will briefly detail in the next paragraphs, the order of questions was not always strictly observed. As already mentioned, I had a laptop with me and I recorded the answer to the questions in pre-composed Excel table where all of the categories under analysis have been recorded. This allowed me to check at the end the interview that I had collected all the planned information.

The two major households worries were related to three questions related to income, agricultural activity and source of information about news in the municipality. They feared that declaring a high income they would lose the social benefit that most of the households

receive, namely the state conditional cash transfer called Bolsa Familia. Furthermore they were afraid that INCRA, (Instituto Nacional de Colonização e Reforma Agrária, National Institute for Colonization and Agrarian Reform) noticing their weak or absent agricultural activity, would take some action against them. Some of the respondents asked me directly if I was related to INCRA or if I was working for a local political candidate. These were, in that period, the two most frequent visits that people received. The strategy to ask questions has therefore been targeted to allow reducing such problems.

However it is important to acknowledge that many households had been already interviewed more than once. Many of them recognized questions that had already been asked during the questionnaire carried out by the National Statistical Institute (IBGE).

The interview started by asking the household head to introduce him/herself telling their name and nickname ("alcunha") by which the two households' heads are generally referred to in the village. This clarification has been important as it allowed me to understand the answer to name generators questions. In all of the villages most of the people are just referred by their nickname and most of the villagers do not know the complete name of villagers. I have also asked the respondent to tell me about his/her place of birth, places where she has lived and last place where he has been living.

This first point of the interview is extremely important as it allow me to create a common ground and also to allow them to talk briefly about their story. They told about how they arrived at the village, where they were coming from and what was their previous occupation before living in the village. This more open-ended introduction eventually would make them feel at their ease.

The interview continued by collecting information on household composition: male and female head names and number of children or other people that were living in the same household and their occupation. Regarding the occupation I asked them to specify whether any of the members of the households was working outside the village.

It was then asked about household mobility outside the village and availability of means of transportation. The ability to travel and commute influences both the facility to commercialize products and to work outside the village. Those faculties are also a proxy of prestige and wealth.

The last two questions of the interview referred to household income and perception of change. In the question related to income, people were asked to indicate the average monthly income. I was aware that, when households have family farming as main livelihood strategy, income varies greatly across months. In this case I asked them to estimate how much they earn in total per year from selling their products and to divide it by the number of months. The difficulty to calculate the accurate value and a certain resistance in some cases to declare their income drove me to the decision to ask them to approximate the value of their income to a proportion of minimum salaries. Households have mostly indicated how many salaries they earned.

The last question, related to change, aimed at understanding the perception of change of households in the three villages. Two are the possible typologies of change. The first affected people that were already living in the village and is caused by the mobilization created by social movements, which introduced people in the village. Second affected people that arrived within the framework of the mobilization activated by the social movements by changing their new living space. I asked them in what measure they felt their situation changed from their previous condition and in which terms.

Network data collection

In order to construct the roster of households for the three villages, the main source was local village's households' record books of health service officers (*agentes de saude*). Local health service officers are in charge by the municipality to provide basic health assistance on a weekly basis to all villages' households. They are therefore the most reliable source of information to have a clear image of who are the households that are permanently living in the villages. Households that have their name registered at INCRA (Instituto Nacional Colonização e Reforma Agraria), because they were assigned a plot, do not constitute a complete record of households living in the village. There are cases where more than one household live in one plot and some households that have more than one plot.

Most of network data was collected through name generator techniques. Households were asked to nominate other people belonging to households living in the village. There was no limit of the number of households that they could nominate. It was not repeated in every name generator question they should indicate only households inside the village but there

was a disclaimer at the beginning of the interview that I was interested in interactions inside the village.

The two network data that were not collected during face-to-face interviews are geographical proximity and kinship. Geographical proximity, available only for village A and village B, was constructed by using a combination of official villages' maps, when available and accessible, and completed or substituted by participatory village map drawn by the interviewed and key informants. Kinship was collected both asking key informant and households to tell to whom they are related by kinship ties in the village. The reason for such choice was the difficulty to keep track of all kinship ties at the beginning of the village survey as I had no information about them and names of people are extremely similar. There were therefore three steps for kinship network collection: information from health service official for each household to nominate their relatives inside the village, households were asked to nominate their kin during interview, lastly when interviews were over, I have cross-checked the reliability of network data collected by asking the respondents or their relative to confirm if data collected were correct. This procedure allowed me to improve the reliability of the data. In village A and B, where I stayed longer, data is considered to be robust. In village C, where I stayed less, there might be minor inconsistencies. It is important to point out that the level of information disclosure varied from household to household.

The name generator questions inserted in the interview were the following:

1. Who told you about the possibility of having access to land in the settlement?
2. During last year have you called someone to work on your plot? If yes can you name the main workers that you contracted? (Hires)
3. During the last year have you worked on the plot of some villages' holders? If yes can you name the main people that called you? (Work for).
4. How do you get to know about the news of Maragogi? Is there somebody that you like to talk with to get this information?
5. Are there some people that you frequently meet to talk? Who are they? Can I know their names?
6. If you need help to solve some issue related to your plot, whom do you ask to?

Beside one-mode network that describe behavioral and social ties between households of the same village also households' participation in villages' events have been mapped. These

two-mode networks are weighted on the base of number of meetings per year of each event. The main dimensions covered are: religious services, places of commercialization of agricultural products (namely local weekly markets and cooperative), football team, associations related to land issues and participation in political parades. Variables related to households' participation in events was not used as network data but rather as node attribute. The questions asked where the following.

7. Do you participate in the activities of some church? Which? How many times per week do you attend to?
8. Beside the church have you already participated in the activities of some group (association, trade union, cooperative)? In which way and with which frequency?
9. How did you get to know about these groups? Did someone invite you or how did you get to know?

The participation in political parades was not directly asked to every household during face-to-face interviews, due to the sensitivity of the survey period that coincided with the electoral campaign. This information was therefore based on a mixture between conversations with key informants, participation in some political parades and symbols of parties present on houses' walls.

The answers to the question related to access to news could not be used because of heterogeneity of answers. Only a minority of households indicated the name of one or more households in the village while the majority told the name of the household together with other source of information such as radio, telephone or newspaper. Some respondents also declared that they perceived the question as too intrusive and preferred not answer. This is most probably related to the period of survey. For most people news from town probably sounded like news about politics. Having said that, it is quite obvious that they did not want me to know how they got informed about such news. I did not clarify what news I meant because I wanted them to elicit how they gathered the relevant news from the outside world beyond village boundaries. Being the nearest town their administrative and political reference I aimed at understanding how they get informed about novelties that were happening there that could interest them, being the specific interest varying across households.

The answer to the question related to advice in family farming could not be used either because only an extremely small proportion of households referred to others living in the village or because people referred to people that institutionally should be in charge of the issue but in reality were not. For example they would refer that, to have advice to solve issues related to family farming, they should refer to the technician; but finally when I asked when they last talked to him they referred that the agricultural technician used to be there but now is no longer present.

The situation was similar as regards the question related to the person they refer to when there are difficulties in the settlement. Most households nominated the president as the person in charge but when they were asked to specify whether this person was of some help they responded negatively. Therefore I did not consider such answer as a real tie but simply as an indication of the presence of offices in the village.

The answer to the question on the contacts to get to the village was not conceived as being limited to villages' boundaries but it was as a strategy to elicit the different ways in which people got access to the village and also the different migration waves that composed the village. As it will be detailed in the next section I consider crucial to understand how people got to know about the village and the presence of previous ties before having access to the village.

2.6 Main data collection limitations

Carrying out household surveys in rural areas foresees a series of challenges related on the one hand to difficulty of sampling and on the other hand to variables collected with the interview.

The first difficulty is related multi-activity (*multiatividade*) of most households in rural areas of Brazil (Sérgio Schneider 2003; Wanderley 2000; Neves 1997). Households tend to diversify their livelihoods, combining different strategies such as wage salary either permanent or seasonal, both in agricultural and non-agricultural sector, public service, small petty trade and agricultural production. These features of livelihoods' organization have two main effects: first they hamper the level of precision of income declaration and second they increase the difficulty in defining complete list of households' residents in the area object of analysis. Households often have difficulties in quantifying their income from family farming,

which is affected by seasonal variability. Furthermore often households commute from urban to rural areas in daily or seasonal basis.

It was possible to have a complete list of villages' inhabitants using the local official officers' households' list. Local officers are the most reliable sources of information as they are responsible for weekly support to households in health matters. However the income declaration is certainly subjective and it can lack precision. Asked about monthly expenses as a confirmatory practice, often households declared more than they earn. This is consistent with the widespread practice of putting up several debts.

The second limitation in data collection is related to interviewer's features and to the research period. As already mentioned, interviewees were mostly but not totally females, even when the household was not female headed, due to accessibility and approachability matters. Primarily it was easier to find women at home as many men are at home only after sunset when it was not feasible for me to conduct interviews. The second is that women more easily accepted to be interviewed by another female, men sometimes showed more distrust than women. The division of labor inside the households and the management of income implied that, in several cases, female head of the household were not aware of the total amount of family revenues'.

The third limitation is that very few interviews were recorded due to the sensitivity of the electoral campaign period.

The fourth limitation is related to interviewees' representation of myself because of perceived proximity with the cooperative.

The fifth is the unequal treatment of different villages as did I not spend the same amount of time in the three villages. In village A and B I had the opportunity to spend more time. In village A I lived in the village for three weeks while in the second I mostly commuted from the main municipality to the village. In third village I also commuted but I have been there less frequently. The three villages differ in accessibility. Village B is very easily reached by any weather condition because it is only 5 km away from the paved road. Village A and C instead are more difficult to reach because they are much further and only connected by unpaved roads. Moreover in village A I was hosted in some of the wealthiest and widely known families.

The sixth limitation is that I was the only interviewer carrying out all 177 households interviews.

3. Agrarian reform and the role of social movements

3.1 Introduction

Agrarian reform is a controversial agenda in Brazilian politics. There are opposing views on the effects of agrarian reform measures implemented so far. Some emphasize the positive effects of land distribution while others stress the minor changes in land tenure inequality and the low productivity of expropriated areas and interpret it as a missed opportunity to include the rural poor (A. Pereira 2003) .

Agrarian reform is so important in Brazil due to high inequality in land distribution, which is considered one of the reasons for structural poverty and misery. Furthermore agrarian reform has been present in the political agenda since the Sixties. In addition social movements, among which Movimento Sem Terra (MST), played a major role in the implementation of agrarian reform.

The social movements mobilized thousands of households to occupy unproductive land. The process of land occupation was a fundamental push towards Brazilian government for the expropriation of unproductive land (Sigaud 2004). Social movements promoted a collective utopia of land (Wolford 2010), a new migration flow towards rural areas and a path of careers in political office for several of their activists.

Brazil is one of the most unequal countries in the world in terms of land tenure. This situation is the result of both labor's organization based on slavery and an inheritance system that prevented non-whites and non-Catholics to have access to land. Such systems of unequal opportunity to access to land were reinforced with the Land Law of 1850. The agrarian question has its origins mainly on labor relations based on slavery. Yet after the abolition of slavery, the land tenantry system was a way to coerce labor force and to keep the labor market deliberately imperfect (Martins 2003, 147).

In the Northeast the prevalence of sugar cane plantations created a hierarchical system based on structural inequality and patronage for almost five centuries. Some authors claim that this system created the "deepest wounds" as the structure of captivity of the sugar cane labor force and political patronage persisted over centuries (Rogers 2010).

Movimento Sem Terra and the other social movements used the concept of redistribution of land as a powerful message of change with a dual purpose. Promoting a sense of union

among very different households by creating a discourse of "imagined community" as response to proletarianization of rural workers and their descendants (Wolford 2003). Having access to land implies controlling the means of production, as Marxist theories argue. According to social movements' ideology fighting for access to land means fighting to diminish class inequalities in rural areas and fighting for a more communitarian and collective conception of labor organization (Wolford 2010).

In the Northeast Brazil, in the early Eighties, MST faced serious difficulties in recruiting sugar cane plantation workers. Only when there were no other working opportunities available and rural workers lacked paternalistic protection from landlords, they decided to engage in asocial movements' fight for land (Wolford 2004). In order to understand what led the possible social conditions that enabled MST to mobilize both urban and rural workers it is important to understand the significance of sugar cane in the littoral area of Northeast of Brazil and how the crisis of sugar cane was reflected in a crisis of labor relations.

This chapter argues that agrarian reform settlements represent an opportunity to create new rural spaces (Bergamasco 1997). Those new villages present positive features as agrarian reform settlers have higher heterogeneous composition in terms of profession, higher political representation and more freedom in the use of time than average rural inhabitants of "assentados" (Leite S., Helena B., Medeiros L., Palmeira M., Cintrao R. 2004) but also face the serious risk to reproduce the domination structure present in previous "engenhos".

The chapter proceeds as follows. After the introduction, section 3.2 provides a brief overview of the sugar cane role in the Northeast of Brazil. Section 3.3 provides an overview of sugar cane crisis and its effects. Section 3.4 outlines the main features of Brazilian agrarian reform focusing on the crucial role of social movements and the role of encampment in the process of agrarian reform settlements' creation. Section 3.5 focuses on the importance of agrarian reform in the municipality object of analysis, highlighting the main steps that led to settlements creation and the general situation of settlements in the municipality. Section 3.6 presents the history of villages object of analysis. Section 3.7 closes the chapter with some concluding remarks.

3.2 Sugar cane role in the Northeast of Brazil

In the region referred to as “mata do Nordeste”, corresponding to the littoral area, the landscape and economy have been dominated by sugar cane monoculture since XVI century (Freyre 2004). Such region has the most favorable geographical and climate conditions for the production of such crops (Targino 2003).

Production of sugar cane has been always organized in large plantations around of the factory responsible for the processing of sugar cane. This unit of prodution was in early days referred as “engenho” or “bangue” and later with the modern techniques, “usina”. Around the “engenho” an entire economic, social and political system was developed including: “casa grande”, the big house where the landlord (“senhor do engenho”) resided, “fazendas” (literally farms) that were the productive units of sugar cane and where the sugar cane cutters resided (Freyre 1964). Landlords managed both industrial transformation and agricultural production. Most of the families controlling land and financial capital of sugar cane were descents oligarchs from the colonial period (Manuel Correia de Andrade 2000).

Sugar cane industries are agro-businesses that can be considered a synthesis between agriculture and industry. Their organization of labor, specialization of tasks and separation of work from food basic needs makes it closer to factory rather than to a farm (Mintz 1990).

The sugar cane industry, represented the first source of employment in the whole “zona da mata” before agrarian reform.It still represents a very important occupation. The main activities are planting and harvesting, work in the fields, and then transformation into sugar in the mill. The most labor-intensive activity is planting and harvesting. People in charge of planting and harvesting compose the majority of the labor force in sugar cane plantations. They are referred as “cortadores de cana” (sugar cane cutters) and more generally rural workers (“trabalhador rural”). However, the latter term refers more generally to all low skilled workers involved in large plantations not only of sugar cane but also of coffee. “Sugar cane cutters were day laborers that did not possess land nor any productive assets and they had to sell their work to eat. They were workers that lived in factory constituted by the field” (Mintz 1990, XVIII).

The development and growth of sugar cane industry has been strongly related to the employment of forced labor. Sugar cane production for its cycle of production needs to ensure a large number of workers both for crops preparation but especially during harvest period.

This period lasts several months and should be developed in harmony with the functioning of the mill that extracts juice and then transform it into sugar. Furthermore the cane collected has to be processed within a limited number of hours otherwise its concentration in sugar decreases.

Despite the relevant improvement in labor law to protect rural workers' right, institutions such as "salary for production" did not make sugar cane cutters' working condition improve consistently (Antunes 2013). Even today, especially migrant workers face extremely hard working conditions. Workers have to collect approximately 6 to 10 tons of sugar cane per day and very little health protection is guaranteed (de Menezes, da Silva, and Cover 2012).

Alagoas is the fifth producer of sugar cane in Brazil and first producer in Northeast region (IBGE 2009). Today in Alagoas the first main products are sugar cane and coconut, being the latter currently declining in terms of importance. An emerging sector is tourism that has been fostered also by a national program called Programa de Mobilização para o Desenvolvimento dos Arranjos e Territórios Produtivos Locais do Estado de Alagoas (PAPL). This program created by Alagoas government in 2004 together with SEBRAE and private and public companies, aimed at promoting collective actions that can trigger local development processes (Barreto, Oliveira, and Sicsú 2007). Tourism sector, despite its importance, is mainly limited to the littoral area and it is not able to satisfy the supply of labor in the municipality.

The sugar cane industry and its crisis are fundamental elements for the comprehension of previous social structure but also to understand the lack of power that made the actions of social movements possible.

3.3 Crisis of sugar cane sector: land conflicts and labor relations

The emergence of land conflicts in Brazil is deeply rooted in the changes in tenant relations among sugar cane cutters and sugar cane industry unit of production responsible, called as "senhores do engenho", and later referred as landlords.

Sugar cane plantations have a long history in Brazil; the first sugar cane crops were taken from India to Brazil in 1532. It is possible to consider the unit of production of sugar cane plantations called "engenho" or "usina" as a closed environment. The equilibrium between labor force and landlord was guaranteed through the patron client relationship between the

sugar cane cutter and the landlord. The landlord or *senhor do engenho* was the only ruling authority and reference point for sugar cane labor force until the military regime.

Engenhos and *fazendas* are composed of two elements: sugar cane fields and a small inhabited area where there are several small houses organized in "lines of rooms in long block buildings (called an *arruado*)" (T. D. Rogers 2010). *Engenhos* and fazendas had a local shop (called *barracão*) were households could buy several products that were necessary to complete the family diet and the households' basic needs. House tenants (*moradores*), that were more stable workers, used to have small plots but they were prohibited to produce crops that would last for more than one harvest such as fruits or other permanent crops. After sugar cane crisis the population residing *engenhos* and *fazendas* decreased substantially.

The main transformations in labor organization have been driven by two main factors: quest for modernization of agricultural production (Scandizzo 1979) and state intervention.

In 1875 emperor Pedro II promoted a change in spatial and labor organization of sugar cane industry from "engenho" to "usina" and a substitution of several tasks from labor force to machineries.

In 1888, with Aurea law, slavery became illegal. It was a transformation from slavery to captivity (Rogers 2010). The most wide-spread form of dependency between employee and landlord was land tenancy (Eisenberg 1974, 183). This form of land tenure arrangement refers to plantation employees living in the "engenho" or "fazenda" called "moradores".

The main elements that determined captivity, after the abolition of slavery, were debts, housing and legal protection from landlord. *Moradores* had the "privilege" to have housing and to farm small plot where they could grow staple crops, such as manioc and banana and were paid upon the completion of workload defined by the landlord.

The condition of "moradores" were comparable to sharecroppers or land tenants (Keen and Haynes 2008, 133). "Moradores" bought most of necessary products including food and medicines, from the local shop running inside the "engenho" which was managed by someone close to the landlord. The reason for workers to buy there and not in other shop beside physical proximity is the possibility to buy products on credit thanks to landlord intermediation (Scheper-Hughes 1993). Very often workers did not receive a pay that would

allow them to satisfy their family needs. The only place where they could ask loan was the local shop present in most of *engenhos*. This reinforced the dependency with the landlord.

In 1950 landlord and land tenant relationships were altered due to landlord's decisions to eliminate tenants' plots. This alteration of terms was done to increase the sugar cane production. The event caused a lack drop in tenant commitment towards their landlord (Rogers 2010). In 1955 Peasants' Leagues (Ligas Camponesas) were created and in the 1950s and1960s, especially in the Northeast region, there were the first rural workers' uprisings.

In 1963, the Rural Workers Statute, a law passed by National Congress, extended labor legislation to rural Brazil during military regime, introducing for the first time legal rights for sugar cane cutters. This regulation also implied the definition of court intervention in case of worker and landlord disputes.

Landlords had to register ("fichar") their workers and guarantee them labor rights including monthly salary and holidays. This practice, however, was considered very costly for many small landlords, who preferred to reduce the number of sugar cane cutters living in the "engenho". They sent away many former sugar cane cutters residing in the boundaries of the plantation, which were referred as "moradores". It therefore created internal migration across different "engenhos" and important migration flows to the nearby towns.

The number of households living in the "engenho" decreased and sugar cane cutters started to diversify their work. Registered workers ("fichados") were those that managed to preserve their bonds with the landlord ("senhor do engenho"), had a small plot of land to plant, had housing and gained labor rights and including holidays and retirement. Illegal workers ("clandestinos") had no housing guarantee, had to commute from near towns or other "engenhos". Those workers enjoyed potentially more freedom but also faced more vulnerability. It is therefore understandable why many of the old "moradores" would have preferred to stay with the old landlords and not be involved in the agrarian reform. Before the sugar cane crisis they enjoyed both labor rights protection from the state and paternalistic protection from the landlord.

In 1964 Land Statute ("Estatuto da Terra") was issued. Article 94 provides legal basis for agrarian reform that took its first steps during the military regime, which started the same year. During the military regime, the main objective of the government was not to expand access to land for new settlers but rather to control and limit the processes of land

appropriation that it could have enacted. Farmers, who had been expelled from the land where they worked, started to occupy unproductive land. Therefore a law aimed at controlling this flux of illegal occupiers had a conservative role rather than an expansive role (Martins 2003).

In 1975 Brazilian government introduced Proalcool program in order to promote the increase of sugar cane for ethanol production, an alternative energy source (De Carvalho C.P. 2009). This gave an important push for landlords to increase their production. This expansion resulted in increased demand of migrant workers to satisfy the high demand of labor for sugar cane mills during the harvest and degradation of working conditions (de Menezes, da Silva, and Cover 2012).

In the late 1980's two negative events affected the sugar cane industry: the fall of international price of sugar and the end of government subsidies to sugar and alcohol prices (Wolford 2006). This economic conjuncture led to a sugar cane crisis and several companies, unable to cope with the new economic situation, declared bankruptcy and closed their firms (Targino 2003). Because of these changes thousands of people lost their jobs. In states such as Alagoas and Pernambuco, where sugar cane sector represented the primary source of employment, this crisis created massive unemployment.

The large number of unemployed people represented one of the target groups to be mobilized by MST for unproductive land occupation. Households, who were mobilized by social movements, occupied several sugar cane factories that went bankrupted during sugar crisis of the early 1990s

3.4 Agrarian reform and social movements

The main legislative foundations for agricultural reform are twofold: the Land statute, Law 4, 504 of 1964 and the 1988 Brazilian constitution art. 184. The former states "Agrarian Reform is considered to be the conjunction of measures that look to promote better distribution of land, through modifications to the regime of its possession and use, with the purpose of meeting the principles of social justice and increasing productivity" (Gaspar 2009). The latter allows Brazilian government to "expropriate for the purpose of agrarian reform, rural property that is not performing its social function" (Article 184). Since 1964, several

governments from the military regime to the present day took action to allow households access to land.

The implementation of Land statute drove the creation of two organs: Instituto Brasileiro de Reforma Agrária (Brazilian Institute of Agrarian Reform) (IBRA) and Instituto Nacional de Desenvolvimento Agrícola (National Institute for Agricultural Development) (INDA). The previous was in charge of supervising all the process of agrarian reform, while the latter to coordinate the colonization process. These two institutions received a great deal pressure during military regime from the landlords. In 1970 they were merged into a single new entity called INCRA, Instituto Nacional de Colonização e Reforma Agrária (National Institute for Colonization and Agrarian Reform).

In the late 1960s and early 1970s studies of INCRA and IBRA revealed the presence of large portion of land property that were not productive, while small properties played a major role in the production of food crops. In that period two projects have been implemented to control the process of colonization of unproductive land: Programa de Integração Nacional (National Integration Programme) (PIN), and in the Northeast region and PROTERRA that allowed landowner to give INCRA part of their lands receiving compensation in cash. There was a very strong resistance from landlords against agrarian reform implementation (Gaspar 2009).

In 1985 the first land reform decree was signed during president Sarney's time in office. The Fernando Henrique Cardoso administration (1998 – 2002) was the first to scale up the implementation of a market-led agrarian reform (D'incao 1991). Among the program financed by World Bank the program referred as "Cedula da Terra" is important to mention (J. M. M. Pereira 2012). It was conceived as pilot test and it represented a benchmark for the future agrarian reform.

Social movements' actions played a fundamental role in accelerating the process of expropriation of unproductive land that is part of the agrarian reform.

"Land occupation and creation of encampment, have become in Brazil, in the last twenty years, the appropriate way to claim for the implementation of agrarian reform. Movement of Rural Workers without land (MST), trade unions' movement and many other organizations in rural world used it. Brazilian state legitimated movements (this is the way these organizations auto-denominate themselves and they are denominate) to dispossess occupied farms (fazendas) and redistribute land among those that are in encampment" (Sigaud 2004, 225)

Created in 1984, MST is the most well-known social movement both in Brazil and internationally. It was a group being part of Comissão Pastoral da Terra that decided to create a new autonomous organization. It is considered by some authors among the most dynamic, organized and effective social movements in Brazil (Wolford 2010). The other organization of agricultural workers called National Confederation of Agricultural Workers (Confederação Nacional dos Trabalhadores na Agricultura, CONTAG) did not represent landless workers (Pereira 2003).

The MST, according to its leaders, built his roots both in popular religiosity and theology of liberation (Stédile and Fernandes 1999). Stédile, one of MST leaders, declares that the movement started in the South of Brazil as a response to what is referred as "painful modernization" of Brazilian agriculture.

The mechanization of production forced tenants to abandon the land they had been working on, leaving these peasants with no employment options. They could neither go to towns, where they would be destined for unemployment, nor gain access to new land. Organizing occupation to force the government to expropriate the unproductive land was therefore considered as a possible strategy to give again access to land to people that had been expulsed from their previous land.

1980-1990 was the decade of rural movements where the motto was "occupy, resist and produce". 1995–1999 was the first "wave" of MST-led occupations. Table 3.1 illustrates the number of families settled per period.

Table 3.1 Families settled by period

Period	Government	Families settled per year
1964- 1984	Military Regime	3689
1985-1989	José Sarney	16737
1990-1992	Fernando Collor de Mello	14172
1993-1994	Itamar Franco	7183
1995-2002	Fernando Henrique Cardoso	48923
2003-2009	Luis Inácio Lula da Silva	7564

Source: Adapted from (L. S. de Medeiros 2013, 6)

MST was born in the South of Brazil; in the state of Rio Grande do Sul, where the economic and social conditions and people social representation of land are extremely

different from the Northeast region. In the South MST followers were fighting for the land, as this was their main source of livelihood.

In the Northeast, where the sugar cane sector is the main employer in rural areas, the economic foundations of the movement were weaker. There was no pre-existing request for land from rural workers, "posseiros" and "arrendatarios", but it was the presence of the social movements that make these requests emerge (Sigaud 2004).

Before the sugar cane crisis MST faced difficulties in recruiting households among sugar cane cutters and rural workers in general. The two main forms of resistance towards households' engagement in social movements are related to spatial imaginaries. MST activists used imaginaries on the use of land that were totally different from those of sugar cane cutters.

For sugar cane cutters occupying land, even if unproductive, means invading someone else's property. Furthermore differently from what happens in the south of Brazil, where land is conceived as the most important productive resource, land is not conceived as a way to create livelihood strategies. People contacted by MST's activists would have better preferred to fixed wage salary and "full paternalistic protection on the plantation rather than a piece of land" (Wolford 2004, 147)

It is possible to observe two waves of adhesion into social movements. The former were the most vulnerable workers of sugar cane plantations ("clandestinos"), while the latter where sugar cane cutter residents that were left without job and therefore had no other working opportunities.

To understand what are the forces that, in Northeast region, led to the process of mobilization of thousands of households to occupy the land, it is fundamental to point out what are the motivations behind households' engagement in the social movements and discourse of social movements.

MST discourse had his foundations on the main concepts proposed by theology of liberation and Freire teachings (Freire 2000). MST declared that they aimed to free sugar cane workers from the captivity of their employment. MST activists ("militantes") went often to the peripheries of the towns to "rescue peasants' sons": most probably the ones that have been expulsed by landlords from the 1950s on.

MST declared mission was to fight against land concentration, which is considered to be one of the main causes of Brazilian socio-economic inequality. By forcing the government through means of occupation to expropriate unproductive land they argue that is possible to have more equal distribution of land (Johnson 2004).

Many households instead considered the fight for land as an opportunity for livelihood strategies among others (Sigaud 2004). During the interviews this was the most frequently self-reported reason to join social movements. For rural workers they aimed at having access to a comfortable house where they can rest after a whole life of struggle and continuous migration across different plantations (R. M. Medeiros and Ribeiro 2011, 9). For people living in the slums of towns and for recent unemployed workers they looked for a safer place to live, for a new livelihood and hopefully to have some benefits from the state. Only some people declared that their main interest was to have some land to crop.

In Northeast Brazil many sugar cane cutters decided to join social movements because there were no other working opportunities. In addition joining social movements provided them with a new political representation towards local government and INCRA officials in substitution to the protection they received from distillery or mill landlords.

> *" Having access to land made a difference in the settlers' lives, but that difference was situated within an understanding of land as providing independence from outsiders (including the MST) and a paternalistic interpretation of political rights. Because the government was the ultimate overseer of the settlements, the settlers now turned to local and state officials rather than the distillery or mill owners when they needed assistance." (Wolford 2004, 150)*

An evidence lack of strong association between engaging in social movements and the vocation to become small holders' farmers is the return to sugar production in settlements' plots after that sugar cane prices' rose again in 2000 and 2001. Many agrarian reform settlers, mostly the ones that were sugar cane cutters before, after a renewal of importance of the sugar cane sector, came back to their previous occupation either as labor force employed by renewed "usinas" or production suppliers of sugar cane (Wolford 2004).

Martins (Martins 2003, 151) argues that since the 1950s, the strong pushes for modernization in the sugar cane sector, broke the strong patronage bonds between rural workers and landlords. Rural workers started becoming a relevant "clientele", especially for the three main organizations, which according to the author, were disputing such clientele: the Catholic Church, communist party and peasants 'unions ("Ligas Camponesas").

Martins also claim that the weak attention family farming and the weak of production agrarian reform settlements might also be related to the internal debate inside Brazilian left. There were two opposite positions: one sustaining the "trabalhista option" while the others the agrarian option. This issue is also related to negative conception among many exponents of left wing of the lack of modernity of family farming. "Some of the exponents of the first position claimed that the agrarian reform could include direct distribution to the beneficiaries and support the start of urban economic activities"(Martins 2003, 144) .

The main actors involved in the creation of "assentamentos" are social movements, INCRA federal institute, the owners of sugar cane industries and households involved in the agrarian reform. Social movements mobilized households to occupy land to be expropriated. INCRA federal institute was responsible for management of land expropriated by agrarian reform. The owners of enterprises were expropriated. Households involved in the agrarian reform were mostly social movements followers, but also people that were already living in the former "engenho". They took part only residually in social movements' activities but that gained access to land.

There is a loop of dependency among the three actors involved in the process of implementation of agrarian reform: INCRA, social movements and households that take part in the occupations. Social movements are necessary to make the Brazilian state implement what is present in the constitution: "expropriate unproductive land for social purpose". Social movements need to mobilize a certain number of households in order to make their demonstrations effective. Social movements need to make the state give benefits to occupiers in order to be able to attract more households to occupy (Sigaud 2004).

Social movements emphasized the possibility for agrarian reform settlers to have access to state benefits in order to persuade households to take part in the occupations (Sigaud 2004). The process of encampment constitutes the main part of the fight for land. For households involved in the fight for land, the process becomes self-reinforcing according the success that this struggle produces. In addition recruiters encouraged households to participate in the fight by saying that if the protest would be successful they would receive free housing from the government.

Luiz Inácio Lula da Silva won the elections in 2002 and became president on January 1, 2003. He made of the continuation of agrarian reform a major point in his electoral campaign.

> "For us in PT the agrarian reform is as necessary as the air we breathe, because it is not only a matter of fixing people in the countryside, but also of solving the problems of unemployment, life quality of urban population, of one of our major problems which is infant mortality. (...) Independently from the will of the largest land owners [latifundiarios], we want to clearly state that we will implement an agrarian reform in Brazil." (Campello 2013, 8)

There has been a significant discrepancy between promises and implementation (G. Ondetti 2008.) Some scholars claim that Lula did not introduce policies that actually triggered structural change for marginalized fringes of society (Bianchi and Braga 2005) (Panizza 2005) (Webber and Carr 2012) (Navarro 1997). Other claimed that Lula blocked the agrarian reform (Fernándes 2005). In 2004 MST declared red April ("*abril vermelho*") and made 80 protest demonstrations to protest against lack of implementation of agrarian reform.

Critical opinions claim that agrarian reform can be considered only a social program, mimicking the landlord benevolent behavior towards the most marginalized part of population. The main reason lies in the greater attention towards housing founding rather than technical assistance and agricultural training facilities and credit. For this reason some argue that agrarian reform share some common traits with the program "Bolsa Familia", that is considered to be one of the important basis for Lula government popularity. It is the major conditional cash transfer program in Latin America. It was, firstly conceived as emergency policy, and kept growing in scale over years. In the next section I will show how the actual administration of the agrarian reform changed after the start of Lula legislation.

Another necessary aspect to mention is the deficiency in technical assistance to promote agricultural production, referred by previous studies on agrarian reform settlements in Maragogi (Leite S., Helena B., Medeiros L., Palmeira M., Cintrao R. 2004) and confirmed by fieldwork.

3.4.1 Recruitment and political training of settlers: the process of encampment

The creation agrarian reform settlements in Brazil can be classified in two waves: 1990s and early 2000s. The first wave was during the Cardoso government while the second during Lula government.

The comparison between first and second wave of settlement creation is a central element in settlers' narrative on the agrarian reform. During the second wave, rules governing the process of encampment changed. The main change was the impossibility to build the

encampment on the land that protesters want the government to expropriate. As a result people fighting to have access to land have to create their encampment on the streets and not on the land.

Most of the settlements present in the municipality studied were created during this first wave, however village C that was created during the second wave.

The process of settlements creation described in the following paragraph describes the seven main phases that are constant across the entire Brazil.

The first phase was the identification by social movement or other organization of an unproductive land to be occupied. Usually people entered in the abandoned "*fazenda*" during night or at sunrise, they constructed their tents made of black plastic ("lona preta") and put the flag of the social movement that was leading encampment, as a symbol of their occupation (Sigaud 2004).

Second is the recruitment of households either by social movements or by other associations of households that will occupy land to make pressure on INCRA for expropriation.

Third is the period of encampment that can vary in length, being on average in Maragogi municipality from one to two years, but which is much longer in other areas of the state.

Fourth is the check of land eligibility to be expropriated and the division of land into parcels.

Fifth is selection of households that, after the period of encampment, can have access to land and the assignment to each households of a piece of land ("parcela" or "lote" in Portuguese), later referred as plot.

Sixth is the attribution of land to the households selected and the delivery of basic staff comprising: "cesta basica" (foodstuff baskets) to support settlers basic food needs, "fundo fomento" to start the first plantations, credit for housing, a specific credit to make investment to agricultural production for agrarian reform settlements called Programa Nacional Agricultura Familiar (PRONAF A) and the construction of the main infrastructure such as electricity and water.

Seventh, yet to occur, in the entire state of Alagoas, would be to turn the village into an autonomous entity from the state ("emancipação do assentamento" which turns)

The role that local politics plays is crucial to agrarian reform settlers. Many households were strangers before the process of encampment and the participation to political parades and other activities organized by social movements have been one important way by which households got to know each other.

Additionally politics plays a role in terms of resource dependency. Settlers' plots will eventually become their property when settlements will complete the process of "emancipation" (*emancipação*), foreseen by the government, but before that can happen, the land cannot legally be sold but only passed to other households. The land is property of the state and most of their service provision depends on the state. Social movements have been negotiating with the local administration to have access to resources both at community and individual level.

Lastly, as pointed out earlier, especially rural workers , but also other settlers, expect from the state the same political protection and service provisions that they used to ask to the landlord.

3.4.2 Agrarian reform settlements: new "engenhos" or new rural spaces?

The change from landlord responsibility over workers to state responsibility over villagers can be considered as a form of "re-functionality"(Padgett and McLean 2006a). The word responsibility, for many old settlers, is translated into respondents' words as "captivity". The word captive is often repeated during people narratives in the interviews, conducted for this research, and it is an important point in the work of Rogers (T. D. Rogers 2010).

The possibility to have access to land for many of the old settlers ("moradores do engenho") that were sugar cane cutters is considered mostly it as a new form of captivity from state towards them rather a resource that can be used according to their needs. In the municipality object of analysis as they were not able to reimburse the credit received during the period of settlement creation to start agricultural activities, they owe debts to the banks and cannot have access to other funds directly designed for agrarian reform settlers nor seek loans from other banks. The land cannot be legally sold and settlers are indebted to the state. Some of those interviewed said that the state is just another "boss" that substitutes the landlord. It is therefore possible to claim an overlap between state's social policy and landlords' paternalism.

Many of the people interviewed, referred that social movements' activists, when the first state funds arrived, advised settlers to take up the maximum value of possible project funding. Furthermore in most cases state agricultural technicians allowed no choice to settlers in the definition of their project. Probably also as consequence of such behaviors, none of the households in any of the settlements in the municipality has paid back their debts towards the state. The rule is that until everyone in the village had paid back the debt it will not be cancelled and households cannot have access to other funds to invest in agricultural production.

Several ex-sugar cutters, interviewed during fieldwork, expressed the feeling of no change happening. It can be explained by an alteration only in name but not in structure of captivity. The two main mechanisms of captivity used towards the sugar cane labor force, namely housing guarantee and debts, persisted over time. Nevertheless the way in which groups emerged is innovative. Villages' creation process was not just lead by kinship or political patronage but there were several factors contributing to the definition of villages' social composition.

However, the process that leads to the creation of agrarian reform settlements can be considered a laboratory for new type of social interactions, new forms of labor organization and eventually negotiations of new social hierarchies.

"Encampment period is perceived as a provisional moment marked by disarticulation and de-structuration of ways of life, by suffering but also by the re-organization of sociability forms inherited by communitarian life and by the re-definition of dreams and aspirations." (Severi 2012, 68)

"Encampment" and "landless" became new political categories. Encampment, during the last decade, has been the main tool forcing governments to implement agrarian reform expropriating unproductive land (De Medeiros 2013). Landless ("sem terra") has become a social category and MST has been able to make of it a political force (Rosa 2012). "Sem terra" is the name that indicates people that are involved in social movements and that take part in the occupation, beside their real land tenure condition.

The term "sem terra", as outlined in the previous paragraphs, comprises very diverse categories of households from sugar cane cutters to farmers and from small petty traders to urban unemployed (Sigaud, Ernandez, and Rosa 2010; Rosa 2012; Severi 2012). In some

settlements the presence of relevant differences across settlers both in motivations and professional experiences also caused conflicts (R. M. Medeiros and Ribeiro 2011, 8).

The settlers' life encountered relevant modifications, first in terms of more freedom over their work time and secondly in terms of land property (Bergamasco 1997). Vergara-Camus (Vergara-Camus 2009, 179) points out also that the MST demonstrates in order to obtain services from the state. The author also stresses that the strength of those communities lies on their "relative autonomy" (Vergara-Camus 2009).

3.4.3 Family farming: the emergence of new rural social actor

In Brazil for a long time family farming has not been considered a relevant economic activity. This is related on the one hand to the structure of land distribution, on the other to the condition of overall dependence of rural areas towards urban areas. 76% of rural properties are organized in large estates (*latifundios*) (IBGE 2009).

In most Brazilian rural areas therefore households' residence and property of land have been largely separated. The creation of agrarian reform settlements introduced a novelty by creating spaces where the two dimensions are combined. Moreover, people used to reside in the rural areas but everything that was needed for their social and economic reproduction, such as medical services; markets and banks, was located in town. Rural space was therefore not conceived as an autonomous social space but rather as periphery or appendix of the urban space.

Wanderley (Wanderley 2000, 36) classifies in six different typologies of Brazilian rural areas: 1) rural space as a product of consumption of urban population, 2) loss of vitality of rural areas characterized by monoculture because of the strong decrease of rural population, 3) family farming characterized by an intense social life, 4) the devastating effects of rural exodus on areas characterized by family farming, 5) the construction of new social spaces: social life in *agrovilas*, 6) the settlements of agrarian reform ("assentamentos da reforma agraria").

In the 1990s two important transformations occurred in Brazilian rural space: the recognition of family farming as a social actor and the request for land by social movements (Wanderley 2000). From mid-1990s family farming has become an important issue in Brazilian debate both among social scientists and policy makers (Sérgio Schneider 2003). It

was registered a rapid increase of agrarian reform settlements (Guanziroli and de CS Cardim 2000).

In 1996 was created the first national fund devoted to support family farming: PRONAF (Programa de Fortalecimento da Agricultura Familiar). In 2000 INCRA and FAO together made an assessment to evaluate the state of family farming in Brazil (Guanziroli 2001). One of the main findings was that family farming is more efficient and productive than large-scale estate farmers. The relevance of family farming in Brazilian policy debate is shown by a recently approved legislative project (52/11 PT-PR) that establishes the creation of National Certification for family farming. This new entity will aim at identifying products made by this segment of rural economics.

There are four main characteristics that, according to Brazilian scholars and policy makers, qualify a smallholder producer as engaged in family farming (Guanziroli and de CS Cardim 2000) and therefore eligible to have access to rural credit provided by PRONAF funds. The first is the dimension of the property that should be less than four fiscal modules (*modulo fiscal*) (Brasil 1993). *Modulo fiscal* is an agrarian unit of measure defined by municipality to define rural properties (Law nº 6.746, 10/12/1979). The second is the primacy of family farming activities as a main source of income. The third is related to use of labor force in the production. Family members should constitute the majority of the labor force; being admitted only two permanent employees and only on temporary basis as additional employees. The fourth is family leadership in businesses: the head of family itself is the one who must define production activities.

Another fundamental feature of family farming is the presence of production strategies that combine both intensive and extensive production techniques and non-farming income. This concept is referred as "multi-atividades" (Sergio Schneider 2010; Neves 1997) and generally referred to as multi-livelihood strategy in literature on agrarian societies (Frank Ellis 2000). Households tend to minimize risks rather than maximize production. Frequently family farmers combine both family labor force and permanent or temporary contracted workers. The two main conditions that favor external labor force adoption are the lack of internal labor force when family members do not participate in production activities because they are too old or too young or migrated, and family specialization in the production of high labor intensive crops (Sérgio Schneider 2003).

The concept of family farming activity (Brasil 2006) describes family farming production unit as the estate that is directly and personally exploited by the farmer and his family, guaranteeing the family with subsistence, economic and social progress; its maximum area is fixed according to the region and the type of production and the predominant use of internal labor force (TINOCO 2008). The first definition of Familiar Property is contained in the Land Statute (Estatuto da Terra, Law n. 4.504 30 November 1964, art. 4). The last census in 2010 included under the category "family farmer" also settlers without title, as opposed to the previous census in 1995 ("assentado sem titulação"). This was in addition to "occupier" ("ocupante") that was the only category of families involved in agrarian reform previously considered.

Family farming contributes approximately to 38% of the total value of agricultural production. Production of vegetables represented 72% of family farming production, in major proportion with temporary crops (42%) and minor with permanent crops (19%). Family farming also plays a fundamental role in the absorption of workforce. It employs 74,4% of labor force employed in agricultural enterprises (SOUZA et al. 2011).

3.4 The importance of agrarian reform in the municipality studied

Agrarian reform is particularly important in the municipality studied for the number of mobilized households and the intervention of local mayor. The municipality studied has the highest number of new settlements created by agrarian reform: 18 settlements, while the national mean is 3.4 per municipality. In the period 1996-2000 it was registered an increase of population in the municipality of approximately 7% and in terms of Alagoas state of approximately 2% (Prefeitura 2011).

In the first phase of the agrarian reform, in 1997, the municipality mayor, who held the role created a specific commission for agrarian reform to better manage agrarian reform and involve civil society. Among the commission's participants there was a catholic congregation operating in the municipality since the 1970s, which nominated a nun to be a member of the commission. She had the idea to support the new people, mobilized through social movements, by implementing projects to support family farming.

In 2001 the first project aimed to provide training, credit, technology and commercialization of products. In 2003 a producers' cooperative was created. It involved

several households in the various settlements present in the municipality. Furthermore the local *prefeito* supported the creation of local market place (*feira livre*) for agrarian reform village settlers.

In the municipality the main social movements that have been active in the agrarian reform were Movimento Sem Terra (MST) and (Comissão Pastoral da Terra – CPT). Since 2000 MST, due to political internal division, was dissolved and two new social movements were created: Movimento de Libertação dos Sem Terra (MSTL) e Movimento Terra Trabalho e Liberdade (MTL).

3.4.1 Creation of settlements in the municipality (1997 – 2006)

Rural areas in municipalities are categorized in three typologies of population units: *fazendas* or *engenhos,* which are areas of property of sugar cane factories where sugar cane workers (*moradores*) are living; *sitios* that are small properties that belong to some owner and *povoados* that are villages in the rural area.

From 1997 to 2012 in the municipality 18 different settlements have been created by agrarian reform. "Assentamentos" in the municipality were created in two phases that are characterized by differences in political representation both in national and local government. The first 14 settlements were created between 1997 and 2002 during Henrique Cardoso and Brazilian Social Democracy Party (*Partido da Social Democracia Brasileira*, PSDB), municipal administration.

The other four settlements were instead created between 2003 and 2006 during Lula government and a local administration that included Labor Party (*Partido Trabalhista,* PT) in the coalition. These settlements have in total 1431 households and they represent 36.4% of the total rural population.

In the first phase INCRA verified whether areas occupied by social movements were actually not productive ("vistoria") and concluded an agreement with the previous owner of the land ("desapropriação").

In the municipality studied all the 18 "assentamentos" created were, before the agrarian reform, *fazendas* or *engenhos* of the same sugar cane industry, which had its headquarters in the neighboring state of Pernambuco. The sugarcane company, which had four productive units in Alagoas, had debts with Bank of Brazil ("Banco do Brasil") and therefore it was forced

to give several productive units to the bank to have access to new loans (Sigaud 2004, 161). The presence of distillery owners' debt in respect to the Bank of Brazil allowed for a smooth transition to land expropriation. The sugar cane company abandoned the land. In several *engenhos* and there were registered cases where old settlers, ex plantation employees, helped the new settlers. There were very few episodes of violence during the period of occupation. Only two "*engenhos*" suffered from the threats of previous owners that did not want to surrender such properties.

Instead in other parts of Alagoas, such in the region of *Sertão* in the center of the state, people fighting for the land had to face strong resistance from landlords. Many people I interviewed that at first attempted to get the land in these areas. They referred to have suffered several episodes of violence both by the police and landlords' militia. They were"cleared out" (*despejo*) on average every 6 months and had being living under threat of landlords' militia.

After the period of encampment was over, INCRA mapped the land, defined the areas to be preserved as forest and divided the productive land in plots ("*lotes"*). The social movement determined who could stay and who had to leave In cases with a higher number of occupiers, in relation to settlement capacity.

Agrarian reform settlements can include the following typologies of households: farmers without land, small holders (*posseiro*), waged workers (*assalariado*) or land tenants (*arrendatario*) and farmers which property does not go beyond one modulo fiscal in the municipality (Art. 5)[16].

Eight are the categories of households that cannot benefit from agrarian reform: 1) public officers that occupy civil, military or administrative positions at municipal, state or federal level; 2) farmers that have as total household income more than three minimum salaries from non-agricultural activities; 3) individuals that own, share or co-participate in commercial or industrial activity; 4) previous beneficiaries of land regularization executed directly or indirectly by INCRA or of agrarian reform settlements or other rural settlement under public

[16] The legal basis for the definition of beneficiaries of agrarian reform is the "NORMA DE EXECUÇÃO Nº 45, DE 25 DE AGOSTO DE 2005, DOU 166, de 29/8/2005, seção 1, p. 122 – B.S. 35, de 29/8/2005".

supervision (Lei nº 8.629/93) including also spouse except for cases permitted by law, 5) farmers, which have properties, that larger than one modulo rural in the municipality; 6) people affected by physical or mental disabilities, which impede agricultural work; 7) foreigners that have not been naturalized into Brazilian citizens; 8) people that have declared condemned with final tribunal sentence except when the person is part of program of ex-prisoners recuperation (Art 6).

It emerged from interviews that INCRA and social movement had in village B different criteria to decide who was entitled to become a settler. Beside formal rules defined by INCRA regulation on eligibility, successful behaviors promoted by the two sides tended to differ. Social movement leaders tend to prefer people that were very active in political demonstration participation such as marches and strikes while INCRA preferred people that showed ability as farmers and started to plant crops. The only commonly agreed rule was the order of arrival. The difference in criteria between the two organizations is important as it created on the one hand the some confusion in what matters the most being a good farmer or a good protester and on the other it did not supported the creation of cohesion among settlers.

In the municipality object of analysis, episodes of violence, including murders, took place during the phase in which the first funds to support village creation started to arrive from the government. It was a fight for access to resources and for leadership in the settlements. Every settlement has the legal form of an association with a president and other officers such treasurer and members of fiscal council. There were murders of presidents and other people related to settlement hierarchy occurring in more than one of the settlements, including village C (where one murder occurred).

The main three reasons for conflict were the definition of redistribution of funds for settlers, election of president of the association, divergence of interests between old and new settlers. Management of the funds devoted to housing construction and agricultural project implementation were sources of many episodes of corruption and personal use of collective funds. The settlements' presidents in that phase were particularly relevant as they were responsible for the management of the water system and relative funds and they were the intermediaries between settlement's inhabitants and external institutions providing funds.

The presence of social movements and other organizations that mobilized households completely changed the hierarchies, spatial organization, and division of labor and control of violence in the village. In some villages the old elites did not welcome the new village organization, which overthrew their leadership positions. I define as old elites as individuals who previously held land rights over areas as "arrendatarios" and other individuals that had very small properties ("pequenos posseiros"). For them the arrival of such a large number of mobilized households was perceived as an intrusion in their economic activities. MST and other social movements created a new form of village organization by promoting a series of collective activities.

3.4.2 The second wave of settlements creation (2002 - 2006)

The main social movement-mobilizing household during the first wave was MST, except for one village, village A, where settlers organized in one association from the South of Alagoas negotiating directly with INCRA. In the second wave the main organizations MTL, MSTL and Comissão Pastoral da Terra, mobilized most of the families living in settlements.

The changes of political administration at national and local levels were reflected in differences in the rules governing the creation of settlements and access to funds. The delivery of funds for the construction of houses was in goods rather than in money. Households had the possibility to negotiate the definition of the project to be implemented in their plot. Houses built by INCRA for agrarian reform settlers were of bigger dimension than the ones built during the first wave of settlements' creation. They could no longer establish encampment on the land to be expropriated but "sem terra" were obliged to live along the streets near the area where they are claiming access to land. This had an impact on the difficulties faced by settlers as they could not plant the essential food crops and they were living in a situation of greater vulnerability. Fifth the time elapsed between villages' creation, access to land and credit reception became longer.

All of the households that have been registered in INCRA records to be part of "Projeto de Assentamento" were eligible to receive the settlement credit ("credito de implantação") which was composed by the following three components: 1) credit for food (Credito de alimentação) that is directed to support households food necessities before the crops planted have grown, 2) "Credito fomento" to support the purchase of equipment to carry out agricultural production and 3) housing credit devoted to support the building of settlers' houses.

The negative aspect that many of the interviewed discussed was the timing for the definition of the plots and the access to the agricultural founds was longer than in the previous waves of settlement creation.

" I have arrived in January, I encamped, in 1999, one year after, INCRA already told us that the land was our, we could stay. In 1999, some things already started: delimiting plots, building some houses, money for electricity system and some technicians to support family farming. Three years afterwards they created another agrarian reform settlement in our municipality. Lula became president in that period. Between settlement creation and now I think that already ten years have passed. They do not have their plot yet. Beside they have houses, electric energy, they already received the funds for houses twice, until last year plots had not been delimited yet and they did not know where their land was. (ID 3 village A)

Settlers, in the second wave of settlements' creation had to wait longer to have their plots identified and to get access to funds for family farming investments. This implied that the agrarian reform slowed down.

The protagonists of the occupation in the settlements studied argue that the main reason was a lack of counterpart of MST to fight against. Since 2002 the ruling party both at national and local level has been a left wing coalition, the same coalition that used to support Movimento Sem Terra.

Instead an interpretation reported by a MST representative, is related to the agenda of PT government supporting, as an economic strategy, the creation of agro-business rather than family farming.

Lastly others claim that the main reason is the lack of interest of national government in agrarian reform due to low visibility at national and international level. In the 1990s there was a big debate and expropriating the land was a possible driver of votes' collection. In contrast, after 2000s, the agrarian reform became a minor issue, also because of the weak success of settlement productivity,

It is possible to argue that the occupations, having become the main political instruments to put into operation the agrarian reform, were also the reason to stop the agrarian reform. Frequent use of violence depicted the MST as a destroying force rather a propelling one.

"Usually people say that after Lula government the social movements stopped. The reason is that now formally social movements are not against the government. Now that the government is partly in favor of social movements, we have disadvantages, because we went to quarrel against the government. I consider both Lula and Dilma governments good. However for the people of agrarian reform, if we make an analysis

they took landlords debts and they passed an eraser on it. Why are they making this to us? During Lula government how many fazendas have been expropriated? Now the government does not have the strength to fight, even if the people are against it. All of that was conquered with the use of strength. Everything is in favor of the government, for this reason they do not have strength anymore. Which is the social movement that is active here (in this municipality)? The social movement does not have interest in the settlements anymore. They cannot fight against themselves." (Former MST activist)

3.4.3 The settlements today

Settlements, distributed in the rural area of the municipality, have a number of plots and therefore a number of households ranging from 38 to 241, for a total of 1431 plots that have been granted access to land to 1431 households registered at INCRA. The total number of households living in each settlement does not reflect perfectly the number of plots registered at INCRA. Two are the main reasons: 1) sometimes more than one household live on the same plot; there are households not registered as often they came to live in their siblings' plots and 2) some households have more than one plot. There are also few cases of some individuals, usually male adults, which have no permanent residence.

Not all households that were recruited and took part in the occupation stayed until the division of land into plots. Many of them went away before that and were substituted with families living in the neighboring areas being mainly sugar cane cutters. Since the creation of settlement other families also decided leave the villages: some straight after the end of fund distribution by the state, and others after some years of life in the settlement. As the land is property of the state and cannot be sold, all of the land transactions happen in the informality: there is no public notice of vacant plots and the insertion of a new family is always mediated by acquaintance, kinship or friendship network. Owning plot or having legally recognized access to the use of plot ("reconhecido gozo do direito de posse") are the conditions to be members of the ASTC (art. 4). It is important to point out that being ASTC member is not a necessary condition to sell products to it.

Settlements now include four main typology of households: farmers that had no access to land, farmers that were working in family plots, urban workers, sugar cane cutters coming from different areas of Alagoas and old settlers of failed sugar cane industry which land was expropriated by the state. It is important to point out that until the process of agrarian reform will been completed, village settlers have no land property title. The plot and the house in which they live is still property of the state.

There are two main conditions for households to acquire property: the first is absence households' debts towards agrarian reform entities and the second is the completion of all village features required to become an autonomous entity ("emancipação do assentamento").

Table 3.2 below illustrates the list of settlements that have been created in the municipality, the names of settlements in which ASTC operates, the total number of registered plots per village, the number of ASTC members' in each settlement and the average income derived from participation in ASTC activity per household and the name of the social movement that promoted settlement creation.

These elements led the sample selection. This table also acknowledges also how the number of settlements' creation decreased after the Lula administration. There are only four settlements out of eighteen that were created after 2003.

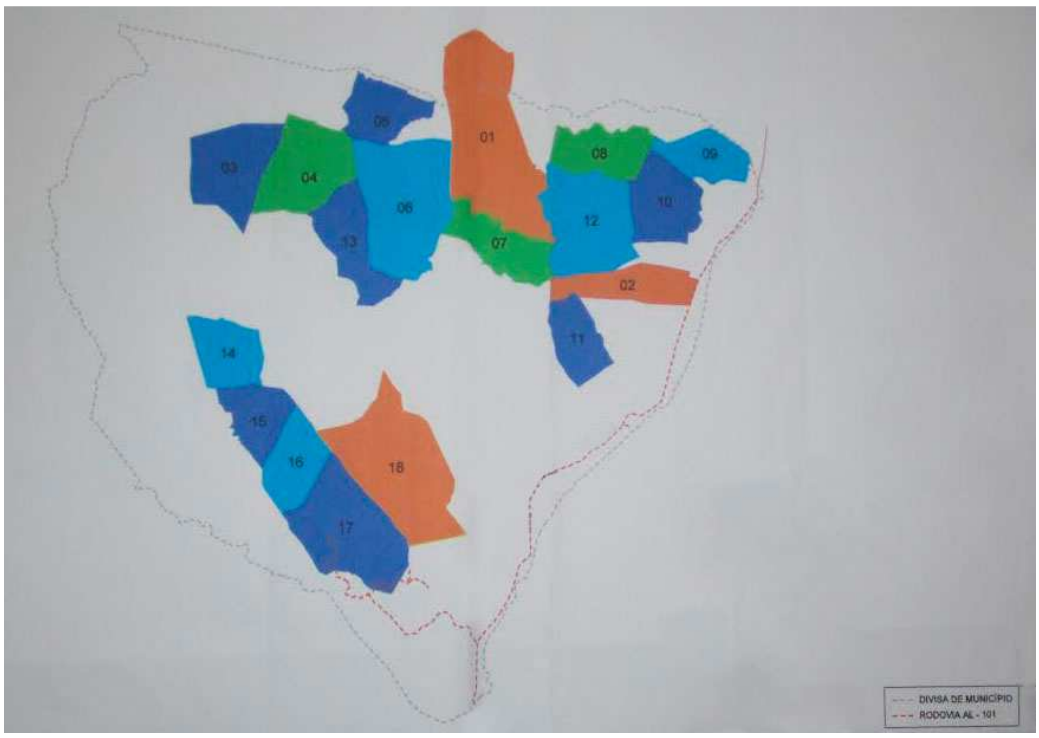
Table 3.2 Municipality agrarian reform settlements' features

Settlement name	Number on Municipality Map	Creation year	Settlement area (ha)	# registered plots	# ASTC members	% ASTC members	Average Sold to ASTC (R$)	Name of social movement	Distance from the road (km)
Village A	3	1998	690	100	26	28	10478	Geremia Association	23
Village B	8	1997	445	38	9	23	119	MST	5
Village C	14	2005	453	42	2	4	1337	CPT	16
Settlement D	18	2006	1254	109	0	0	0	MLST	6
Settlement E	4	1997	791	84	5	5	437		22
Settlement F	12	1997	963	120	4	3	2324	MST	6
Settlement G	10	1997	505	68	4	5	2829	MST	3
Settlement H	9	1997	409	40	1	2	0	MST	3
Settlement I	15	1998	406	46	0	0	0	MST	17
Settlement L	13	1997	505	58	7	12	5303	MST	18
Settlement M	6	1997	1086	117	5	4	1319	MST	16
Settlement N	7	1998	400	51	7	13	39	MST	9
Settlement O	11	1998	495	42	1	2	0		5
Settlement P	1	2004	1651	241	1	0	0	MLST	15
Settlement Q	17	1997	863	116	0	0	0	MST	16
Settlement R	5	1997	461	58	0	0	0	MST	19
Settlement S	2	2006	467	52	0	0	0	MLST	0
Settlement T	16	1997	461	49	0	0	0	MST	15

Source: INCRA data and survey elaboration

Figure 3.1 illustrates the geographical location of settlements in the municipality.

Figure 3.1 Municipality settlements' map



3.5 Villages' histories

In the next pages I will present the history and composition of each of the three villages' object of analysis. The history of each village will be divided in the phases of village creation described in section 3.4.1 of the chapter.

3.5.1 History of village A

Organization in charge of village creation

Village A is the only settlement in the municipality where a social movement has not mobilized most of settlers but instead a private association was the organization that led to the village's creation. This association was located in the South of Alagoas that is considered to be one of the very few areas of Alagoas where family farming is a relevant economic activity. There was also a group led by an MST representative. The two leaders of the groups were Geremias and Severino[17].

[17] Fictional names.

Among the settlers arrived during first migration wave most of them were directly or indirectly recruited by Geremias' association while Severino recruited only a small percentage (Table 3.3).

Table 3.3 Village A first settlers' groups

	Percentage (%)	Absolute value
Geremias' association	69	29
Severino's group	10	4
Geremias' associations' acquaintances	7	3
Substitutes from neighboring villages	7	3
First settlers' acquaintances	7	3
Total number of first comers	100	42

Geremias had an agreement with INCRA and he chose village A, among the three different options proposed, because it responded to the features that he considered essential not being too close to town and having good land.

> "INCRA had three settlements: village D near to Maragogi, settlement E neighboring with village A. Village D was too close to town, village E did not convince him and therefore he selected village A (Id 34 village A).

In the first week of January 1998 approximately eight buses of new people arrived in village A. At that time only twelve households were there: the family of "barraqueiro", the only local shop tenant, and eleven ex-workers of just bankrupted sugar cane factory ("moradores").

Households' recruitment

Geremias was well known in Penedo and he recruited several families talking on radio and visiting directly families' houses. In total he recruited a group composed by more than 100 households in the towns and rural villages neighboring Penedo and he organized them into one association. His promise to associates was to get access to land near the sea.

Most of the association's members had meeting for almost two years before going to Maragogi municipality. These households therefore had the time to get to know each other and to withdraw from the program if they were not convinced. There was also longer time for Geremias to select the families that were interested to join the occupation because they wanted to make a living from family farming. Many of the members of Geremias' association were people that already had some experience in family farming. A few of them were working

for a company that was producing rice, others were working for a cooperative that produced both fruits and sugar cane, part of them were working on the land of their parents and others were sugar cane cutters that used agricultural production as complementary income.

However, it is important to point out that none of them had experience with production of crops that represented the core business of ASTC. Few of them already knew passion fruit but the vast majority was producing "culturas de grão" such as beans and cassava. Such productions constitute the main staple crops and they are temporary crops, therefore permitted to be plant by land tenants. In village A they are not profitable, due to the poverty of the soil, damaged by over four centuries of monoculture in sugar cane plantations,.

The group headed by Severino, which was an MST activist, instead was less homogenous in terms of households' professions some were already working in family farming while many were sugar cane cutters. Severino as most MST activists had precise guidelines from MST to recruit as many families as possible and therefore there was not much time to make a real selection of people.

Table 3.4 illustrates the previous profession of those people that arrived in village A because the two leaders of mobilization Geremias and Severino recruited them directly or indirectly. I define this group of households as "first settlers" as they were the first to arrive in the village. The table aims to show that people recruited by two leaders of village occupation had distinct features in terms of previous working experience. The table portrays only the households that have been present in the village since the period of occupation until the period of survey delivery. The two groups leaded Severino and Geremias were much larger at that time but many of the households left the village.

The categories of occupation listed in table 3.4 represent the most widespread typologies of jobs among villagers. The category mixed livelihood describes households that combine more than one of above listed professions as income generating strategy. The category "other" represents those professions that are residuals to the categories indicated in the table 3.4.

Table 3.4 Village A first settlers groups' features

	Geremias' association	Geremias association' s acquaintances	Substitutes from neighboring villages	Severino's group	First settlers' acquaintances
Sugar cane cutter	17%	33%	100%	75%	33%
Official sugar cane plantation	0%	0%	0%	0%	0%
Agricultural production	59%	67%	0%	25%	67%
Urban jobs	7%	0%	0%	0%	0%
Municipal job and other	3%	0%	0%	0%	0%
Mixed livelihoods	10%	0%	0%	0%	0%
Other	3%	0%	0%	0%	0%
Total in absolute value	29	4	3	3	3

The encampment

Beside previous agreements between INCRA and Geremias, households had to live in tents ("abaixo da lona") for one year before the land was finally dispossessed.

During this first period of encampment many of the first settlers went away as they were disappointed by settlement conditions. There was no electricity, no water nor sanitation. People were living out what they were able to grow and what they received as food supply ("cesta basica") by the municipality. Some of the key informants referred that at that time village A was known in the whole municipality for the high level poverty that was there but at the same for a better organization than other settlements.

Households that abandoned the settlements were substituted by others living in the neighboring "engenhos" increasing therefore the level of heterogeneity among settlers' professional experience.

All of the interviewed described the period of encampment as a period of great difficulty ("sofremos muito") but also of great solidarity among families. It was not a period of danger; no violence, no stealing nor quarreling among households took place during the first period of encampment. Tents proximity was defined by kinship and geographical origin, therefore even households with very small kids were not afraid.

Selection of people that can have access to land

During the first period of encampment, the two leaders of associations Geremias and Severino did not get along well and there was not enough space in the village for both of them.

In the fight between the two leaders, Severino lost. Geremias became the first president of the village association. Many of households that were linked to him went to neighboring settlements and only a very small group of households of Severino followers remained.

INCRA for every "Projecto de Assentamento" measured the land and divided it into plots that were assigned to households, which took part in the occupation. The number was fixed and thus the social movement leading the occupation and INCRA had to decide who could have access to land and who could not.

The first important act of Geremias as president of the settlement was to declare the settlement communitarian. As a result he could keep in the settlement all households that took part in the occupation and not only the number of households that corresponds to the number of plots defined by INCRA.

> "This farm (fazenda) could not host all of the families. It was dramatic to decide who could stay and who could not. You got nothing in life just a tent ("casinha de lona"). You received "cesta basica": it was rice, pasta and beans. Therefore it was difficult when INCRA said that not all of the families could stay. We all passed through the same suffering. It was in such a way that Geremias, the president of the settlement, got the idea of a communitarian settlement. This was not like the other settlements were people went or stayed according to what INCRA decides." (id 3 village A)

In INCRA reports, village A is not divided in different plots ("lotes") each one with one owner. There are a certain number of families registered at INCRA and there is an informal division of land and informal map that explicit how the land is divided but this is not officially registered in INCRA offices.

Leadership in the village

Many of the interviewed referred positive experience of the period when Geremias was president.

> " Geremias wanted to gather people together. He always wanted to be the leader. His words were law; he created groups, organized collective activities such as vegetable gardens. He got speech and he made that people created union. The following presidents were ashamed to follow people. Geremia did not have education but he had speech. He had discourse to gather resources. He had a loyal team. He worked a lot and his wife too. His wife was very strong" (id 57 village A)

> "Geremias was a dictator but he had a clear idea of what he wanted from village A. He had very hard law. He was able to negotiate directly with the municipality. When Geremias arrived there was already the team of

Severino. Severino was friendly but he had no ideas. His socialization ("convivência") was only political." (id 34 village A)

"We are in a place where everything is missing. When there is leadership, a group that is taking charge of things. I miss that period. Geremias was worried to bring the political candidates to listen to the necessities of the people, to have a political support, to solve some issue. Today there are only spiteful people that buy votes for example by offering a pump to push water to your house, money or a job for your children. Health services are precarious. For example I have already problems with the group of ASTC members. There are individuals that sell people's souls. It is only necessary to have a better speech and you win. ASTC is playing a role but it is limited to agricultural production. For other issues such as education and health services ASTC has nothing to do. Politics have direct influence on people. There is big dependency in respect to politicians. Everything today comes from politicians." (ID 3 village A)

Geremias negotiated for technical assistance and facilities directly with municipality mayor and INCRA federal institute responsible for management of settlements. Besides these positive comments from many of the settlers, not all of the households accepted the forms of Geremias' actions. He was imposing a specific way to manage the village that left no space for discussion: his decision was the one to be followed. Many of the households that did not like his style of action were some of the old settlers. In 2002 he left the settlement and he moved to a neighboring state, where he would became eventually again president of a settlement.

After Geremias a series of presidents followed in the village. Another president took over just for few months to substitute Geremias that left the village. After him office of representation passed from the new settlers that had become the majority of households to the old setters for a period of four years.

The period between 2002 and 2006 was crucial for the definition of village equilibrium. It was an important of fragmentation as it coincided with the change of political party at municipal level. The new president of the village, the former "barraqueiro", tried to get a political office at municipal level without success.

Many of the people interviewed looked with great disillusion at the lack of representation as deputy in municipal assembly of their village president. Many people worked for the president electoral campaign withot success. Some of the people did not felt represented in the municipality and wanted a more close connection with the ruling party. Some of households decided to start to vote for the party that was in charge while others continued to vote for the party that supported village creation.

" Village A is isolated, therefore it is difficult because we have no representation at municipal level because we are not part of the movement. The advantage for the settlements that are connected with the social movements is that they can negotiate actions through the movement and not directly with the municipality" (id 86 village A)

The new president from 2006 to 2010 was again a new comer and a reference for the MLST. In the village, he was supporting the party of municipality local administration.

Since 2010 the new president is a member of ASTC and also member of the group of Geremias. However, his action is not considered to be very effective by many households in the village. When I asked about meetings and activities in the village most of the people said that not much has being done recently there were just some courses and very seldom meetings of village association.

Village composition today

In terms of settlers' origin, they can be grouped in four main areas: 1) the village itself (old settlers), 2) neighboring "fazendas" and "sitios" 3) Agreste alagoano namely Penedo, San Sebastiao and others, where Geremias association was based, 4) Junqueiro where Severino group was recruited.

Geremias contacted thirty-two settlers of the households currently living in the village. Among them twenty-seven households, have been members his private association for two years. Geremias' association main goal was to put together people that shared the same idea of getting access to land that would be expropriated in the framework of the agrarian reform. Most of those households (twenty-two) were from the town of Penedo, where the association was based and some from neighboring towns (one from San Sebastiao and four from Pindorama). The remaining five households were living in "engenhos" that surrounds settlements and they were invited by the settlement president to substitute people that desisted from occupation and encampment, as the conditions were considered too extreme.

The group of first settlers was able to mobilize six new households since 1998, year of occupation. Many of the first settlers' dependents (in total twenty-two households) remained in the village and as soon as some households were leaving the village they have been substituted in most of the cases by relatives and some of the cases friends that were invited to settle in the village. Also some of the "antigos moradores" mobilized mostly their relatives to

come to settle in the village. Among the 107 families that have registered their plot, in 1999, only 47 remained the same until today.

Role of ASTC in the village

In 2012 households from village A represent the majority of ASTC members among all settlements. They contribute the most to ASTC agricultural production (65.6%).

In 1997 and 1998 there was a "municipal commission for agrarian reform", the charismatic leader of the ASTC was part of this commission and present agronomist of the ASTC was at the time the municipal secretary of agriculture. In village A where there was no social movement everything was negotiated directly with INCRA and the mayor ("prefeito"), certainly the presence of an agreement between the secretary of agriculture and the nun to support the settlers played a major role in facilitating the delivery of agricultural services for the village. An ex-activist of MST, currently involved in local politics, recalls that at the time, in 1998, village A had a technician from the municipality to give training to farmers differently from what happened in the other villages where technicians were only related to INCRA funded projects.

3.5.2 History of village B

Organization in charge of village creation

38 permanent settlers compose village B. Most of them arrived during the first wave of migration and mostly they were contacted by Movimento Sem Terra activists. Table 3.5 illustrates the composition of first settlers in terms of organizations mobilizing households.

Table 3.5 Village B first settlers' groups

	Percentage	Absolute value
MST committee	4	1
First comers	4	1
MST activist	39	9
INCRA	9	2
Atalaia team	17	4
MST activist 2	17	4
Other	9	2
Total	100	23

MST organized all of the phases of village creation: recruitment, period of encampment, selection of people that could have access to land and the early phases of the village creation, negotiation of access funds and resources and distribution of them. The national committee of MST had a common policy for all the settlements in the state managed these negotiations. The selection of households that could stay after the encampment period had been the responsibility of INCRA and MST activists and national committee.

At the time of village B occupation, late 1990s, MST was in its golden period both in terms occupation and land expropriations but also in terms of international media coverage of their struggle for land. MST had a strong political organization in all Brazil and in every state there were state representatives and a large number of activists that constituted the base of the movement ("militantes".) It was therefore a very strong political engine able to mobilize thousands of people, with political connections at all levels.

Village B is in a favorable position for MST leaders and activists in organizing logistics for marches, roadblock and demonstration both at municipal level but especially in the capital of the state and in other parts of the country. The village is close to the road being separated from paved main road linking Alagoas with Pernambuco only by 5 km not paved road. Moreover most of neighboring villages are other settlements of agrarian reform. Settlement F was the headquarters of MST leaders. This geographical proximity along with common history between the different settlements of agrarian reform made village B and its neighbor's very connected. Villages F, G and H were all productive units of the same sugar cane company. There are both kinship ties across households of these settlements and common participation to events such as religious functions and health services.

Households' recruitment

MST activists (*militantes*) had only a very short time to recruit as many people to occupy the land. These "militantes" went to be peripheries of towns and in rural areas to recruit people for the occupation. In village B two were the main "militantes" that gathered people. They did not enquire on the households' capacity to family farm or interest in land but rather tried to convince them to join the movement with promises of a better future in the rural areas. The national discourse of social movements was that agrarian reform should have supported sons and nephews of agricultural producers that had lost access to land.

In the early phases of the social movements' action there was a period of political training of occupiers, later the the social movements leaders aimed to mobilize large number of people (Sobral 2006). Afterwards, at the national level, there was shift towards acceleration of recruitment. Recruiting a critical mass was necessary for social movement to make their voice heard by the government. MST involved very several types of people with very different professional background being both farmers with no access to land ("arrendatario"), unemployed people in urban areas and unemployed looking for a new job opportunity. Therefore many of households recruited had no concrete experience in family farming (Table 3.6).

Besides, people recruited from further away from the place of encampment also sugar cane workers living nearby the settlements were involved. Normally those households did not take part in the process of occupation, but rather they were called to substitute household that withdrew during the period of encampment.

The history of migration of several families living in Porto Calvo and in the neighboring areas to the settlements started with these promises.

"The government will give you money, will give you housing and you will get a lot of advantages. When you will get to settlement the coordinator will give all of the necessary papers." (Id 118 village B)

"Village B was the last to be invaded. They had to live in tents. My motivation to get involved in the movement was that I did not want to pay house rent anymore. Golias called my husband to come to the village. Golias was not a leader. Part of people that were in excess had to go a neighboring settlement." (id 106 village B)

"In settlement F there was many people living there. The people who stayed were the ones that wanted to have. They would become rich they would become like the owners of sugar cane plantations ("fazendeiros"). The people from the social movements said that government would give money. These people from the social movements received money to gather people to go and occupy the land. Their promise was to have a better life" (id 132 village B)

" Alberto called me to come and squat. He was one leader and now he is living in village F. There were more than 100 people occupying the land. Some stayed and others had to leave" (Id 104 village B)

"In Porto Calvo there was a lot of movement. Id 106 contacted me and I arrived when I was fired by the enterprise I was working in." (Id 118 village B)

Table 3.6 Village B first settlers groups' features

	MST committee	MST activist 1	MST activist's affiliates	INCRA group	Atalaia group	MST activist 2	Other
Sugar cane cutter	0%	44%	100%	50%	0%	0%	100%
Official sugar cane plantation	0%	0%	0%	0%	0%	0%	0%
Agricultural production	0%	22%	0%	0%	50%	75%	0%
Urban jobs	0%	11%	0%	0%	50%	0%	0%
Municipal job+ other	0%	11%	0%	0%	0%	0%	0%
Mix livelihoods	0%	11%	0%	50%	0%	25%	0%
Other	100%	0%	0%	0%	0%	0%	0%
Total in absolute value	1	1	9	2	4	4	2

Encampment period

Households occupying village B had to live one year in tents before INCRA started the process of land expropriation ("*Desapropriação*"). During the encampment period people suffered more than in other places as there was no infrastructure where people could find shelter.

"When I arrived there was nothing planted" (id 131 village B).

Furthermore due to the frequent actions of protest carried out by settlers by means of strikes or others, there were some episodes when police entered the settlement and took some occupiers t to jail.

"It was dangerous because of the police, some people were arrested. I was afraid by police and not by settlers" (id 104 village B).

Selection of people that could stay after occupation

The next crucial moments were first the definition of plots division, the selection to households, among those who took part in the occupation, that could finally have access to land and second the definition of village organization either in "agrovila" or in the plot "casa no lote".

The complexity of the first process was related to the co-coexistence of different selection rules between INCRA and MST. While the former wanted to give primacy to people that showed their ability as farmers by planting crops, the latter instead favored people that were very active in the strikes promoted by MST.

"There was INCRA and there was the movement. There was strong competition among them. There were people that stayed with the movement and people that worked the land." (id 118 village B).

The only commonly agreed rule was to give primacy to the first occupiers. As a result households' members of this group do not report any difficulty in having access to land.

"The division of plots was easy. Various people wanted the house in the plot but it was not possible. (Id 107 village B)

"INCRA divided the land. For the first it was easy to get access to land. In this first group there were people I knew" (id 115 village B)

The second instead was strictly related to the general policy of MST that favored the creation of "agrovila" instead of "casa no lote". Many households asked to have their house built in their plot, but the settlement's first president did not support the request from the villagers. He followed strictly what was required by the general guidelines of MST. At the end of the process the only people that managed to have their house built in their plot were: the first president, MST activist and the old settlers.

"The plots are not same; there are plots that are useless. House in the plot, INCRA did not want that. Just very few people could have it: old settlers and few others [..] They asked to stay in the plot but it was not possible. We had a conflict with the first president that wanted that we stayed in "agrovila". The leaders of the movement at national level decided where we had stay." Id 134 village B

Leadership in the village

In terms of presidents village B has been relatively stable. There were four names that alternated over the period of existence of the village. MST selected the first president (id 132). He was coming from Maceio and he had no connection with other groups present in the village. The other presidents instead are part of the two larger kinship groups present in the villages. Id 118 and id 138 were the two main leaders of the village having been both in power for two legislations being Id 118 still in his second one. Id 118 is ASTC member, is the one organizing prayers' meeting for the Catholics and he participates to the blue political parades. id 138 instead participates to the orange political parades, he is part of the evangelical church and he does participate in the cooperatives' activities. The other president was a relative of Id 118 that had office for only one mandate.

Village composition today

In this village many of the households had no connections before and got to know each other during the period of encampment.

The first wave of settlers in village B consists of five "moradores do engenho" all ex-employees and tenant of the cane sugar industry and twenty-three households that arrived in 1997 to occupy. The second wave consist by eight households that have been invited by the first settlers to substitute people that decide to go away from the settlement and two first settlers' descendants.

Households permanently living in the village, that are the object of this research, can be classified in five main groups according to their origin. First the group of five old settlers that were living village B before the agrarian reform. Second a group of eleven households mainly coming from Porto Calvo being mainly recruited by an MST activist; among them only four mainly living in the upper road already know each other before coming. Third among the first settlers a group of seven households that came from another encampment in Atalaia that finally was not expropriated by the state, among them only two of them knew each other before encampment. Four a group of two households that were workers for the sugar cane factory in the closest town San Jose da Coroa Grande - Pernambuco. Fifth a group from Maceio composed by four households including both old settlers and new settlers.

It is important to point out that the MST activist decided to settle in the village where he was coordinating the encampment. The twenty-three first settlers have then invited relatives to substitute the previous settlers that moved out. The households arriving from Atalaia already had a very difficult story of occupation before getting to the village. They had to occupy for a long period before being able to get access to the land.

Role of ASTC in the village

Village B was the first settlement, after the failure in settlement G, to receive support from the congregation of which the nun was part. The nun in first period of activities in the settlements put great attention to this settlement and first ASTC president was residing in village B. The main drivers of action of nun and her congregation were the hope for change that this new organization could bring. She therefore started to support the projects with

several means both by participating in social movements meeting and also participating actively to settlements' life.

Differently from what happened in village A where the nun had a direct role in the process, in village B because of the central presence of the social movement that were controlling the whole process of negotiation to access to funds the role of the nun was smaller than in village A. The first project and ASTC afterwards allowed participants in the project and then cooperative members to have access to micro-credit to create small irrigation systems, to start small breeding activities and also prepare reservoirs for the production of fish.

All of these investments had poor results as the number of members and crops sold to the cooperative decreased over time. Despite ASTC strong presence with activities and credit to farmers, agricultural production devoted to ASTC was extremely low. More generally family farming was more a complementary rather than a main income generating activity. It is important to point out that the distance from the road was low. It was only 5 km away from the main street. The other issue was related to ASTC specialization on some specific cash crops namely fruits that require more investment and more labor force. It made it more difficult to sell their products to ASTC.

3.5.3 History of village C

Organization in charge of village creation

Village C creation was related to the action of Comissão Pastoral da Terra (CPT). Comissão Pastoral da Terra is one of the oldest social movement in Brazil. It is different from MST as it is church based and it declares to use no violent means for its form of protest. CPT was born in 1975 in the conference of Brazilian bishops, during the dictatorship, as a response to the dramatic situation of small holders ("posseiros"), rural workers ("peões") and migrant workers in Amazonia region. CPT is a Christian ecumenical institution including several Christian confessions manly Catholic and Evangelical. Despite CPT first focus on Amazonia, it soon began to expand its action to the entire country supporting all workers that were fighting serious issue such as resistance against dam's constructions and later supporting the cause of "Sem terra".

The main objectives of the organization are supporting family farming; fight against slave labor and the main target are rural workers. CPT has a journal and publishes annual reports on the situation of land conflict in Brazil.

Recruitment

The land in village C was not expropriated after a period of occupation but purchased by INCRA and it was created in the second phase of agrarian reform.

This implied the absence of a real period of encampment and lack of necessity to mobilize a large number of families to the area but instead that social movements could bring people already knowing that the land would be available.

The number of households that can have access to land for each settlement is limited as it depends on the dimension of the village area. INCRA had to assign land to the households that were already residing in the village: the former workers of sugar cane plantation. Furthermore CPT recruited people that had already been part of the movement for a long period and therefore deserved to finally have their "promised land" after years of struggle. In this village there is prevalence of old settlers and their family to new settlers (Table 3.7).

Table 3.7 Village C households' distribution in migration waves

Migration waves	Percentage	Absolute value
Old settlers	41	15
First comers	32	12
Old settlers dependents	8	3
First comers dependents	5	2
Second comers	8	3
Third comers	0	0
Mix marriages between different migration waves	5	2
Total	100	37

In the group of new comers there were people that had a long history of occupation, always in a situation of danger. Namely a group composed by five households had to encamp for seven years before being able to finally reach a destination where they could live. They passed through several places such as Flor do Bosque, São Sebastião, Rio Bonito and Joaquim

Gomes before reaching village C (Table 3.8). In this village among old settlers there was a very cohesive clan that had several members across neighboring settlements and "povoados".

For the new settlers, there was no specific selection rule to recruit people in terms of professional experience and none of the interviewed refers to have been involved in association, meeting or training before occupation (Table 3.9). It is important to point out though that churches, especially evangelical ones, are an important point of reference for CPT recruitment. Many of households, even if currently they do not attend church as their congregation is not present in the village, they used attend church in their town of origin.

Table 3.8 Village C first settlers' groups

	Percentage	Absolute value
CPT activists' affiliat	33	4
CPT activist 1	17	2
CPT activist 2	33	4
Other 1	8	1
Other 2	8	1
Total	100	12

Table 3.9 Village C first settlers groups' features

	CPT activists' affiliates	CPT activist 1	CPT activist 2	Other 1	Other 2
Sugar cane cutter	25	100	75	0	100
Official in sugar cane plantation	25	0	0	0	0
Agricultural production	0	0	25	0	0
Urban jobs	1	0	0	100	0
Municipal job plus other	0	0	0	0	0
Mixed livelihoods	0	0	0	0	0
Other	0	0	0	0	0
Total in absolute value	4	2	4	1	1

Encampment period

Village C faced more difficulties than the other villages studied not having access to infrastructure and credit for longer periods. It was created during the second phase of agrarian reform and this aspect has effects both on village composition but also on rules for

village creation. Since 2005 neither the houses building neither credit for family farming have been completed yet.

The total number of settlers according to the number of plots, defined by INCRA, is 48. Until now though only 42 are registered, as six still have not received their house. Houses building have being divided in three phases. The first two have been completed. They have built respectively 11 houses and 24. The third that foresees the building of 13 houses has not started yet. Access to the credit has also been postponed until the process of registration of all households is concluded.

One of the settlers referred that, in seven years of settlement presence, they did not received credit to start projects in family farming. The only funds that they have received so far are a very small first financing to buy the first essential staple crop (500 reais), a small credit to start first plantations of crops (1250 reais) and a bigger credit received in materials to build their house.

Leadership in the village

Most of the presidents of village C were women. The first president of the village had been appointed from the CPT. She was selected because of her ability of leadership demonstrated in the village where she was previously occupying. She had the longest experience in the fight for land but she was quite isolated in terms of contacts with the old settlers and with other new settlers. Her office was extremely short being only less than two months. During her interview, she referred that her dramatic short experience of presidency that was characterized by several episodes of physical threats with shotgun from other settlers. She told that one female, of the largest clan in the village being part of the group of the old settlers, was strongly against her presidency. The first president referred that this person interpreted agrarian reform as an opportunity to have a small land property ("sitio") for her extended clan: she therefore acted against anyone that could be an obstacle to her project. She co-opted some of the old settlers that represented her militia.

After the first president other three women followed her in the leadership being all of them living in the village before the agrarian reform except for one. All of the presidents were not able to conclude their office. The current president which family is ASTC member is the first one to be in charge for a longer period.

There are a large number of ties going beyond the boundaries of the village A. This is a signal of the lack of complex system of ties inside the village. The main important necessities of rural households (such as buy everyday staple food and basic things (credit to get food), get access to mechanical devices for land work (such as tractor and access to means of transportation to go the market places to sell their products) are satisfied outside the village. Instead in village A and B most of services are performed by people living in the village. Many of the interviewed refer households from neighboring areas as people contacted to access to important devices such as tractor, to get transport to town to sell products.

Village composition today

Most of the new arrived settlers did not know each other. Beside the old settlers living in the village before the CPT had access to land, the others have more than ten different geographical origins. Among the new settlers kinship ties linked only a very small group but the vast majority had no connection before. For new settlers the lack previous ties with the lack of a period of common encampment certainly did not favor the creation of ties across different groups.

The geographical location of the village is also relevant as it is mainly surrounded by *engenhos* rather than by assentamentos. This is very important as it influences both the opportunities of work and the models of behavior. The main occupation in the neighboring areas is to work for the sugar cane industry.

Role of the ASTC

For what concerns the role of the cooperative, differently from what happened with the other two villages and more in general in the villages where the ASTC operates, households have not been contacted directly by the nun. It was instead a relative of an ASTC member in village A, living in the neighboring area that invited some households in village C to join ASTC. The cooperative analyzed their request and considered them eligible.

ASTC plays a small role in terms of membership, having only two members, but they are active producers. One of two members is among the middle producers among all of ASTC members.

Summary of the differences among the three villages

The main differences, observed among the three villages, can be classified in three categories: recruitment pattern, early organization of the village, geographical location and village spatial organization.

In village A recruitment and early organization of village was leaded by a private association and there was a larger number of households with experience in family farming. During the first period of village constitution there was common activities organized among villagers such as the creation of common plot to be devoted to the production of vegetables. Village A was the furthest from the main road and households were scattered in the village being every house being built on the households' plot.

In village B recruitment and early organization was leaded by MST, a lower number of settlers had previous experience from family farming, the organization of communal activity mostly related to strikes and protests and competition among households to decide who could stay and who should live and the third by proximity to main road, therefore easier accessibility to other working opportunities beside family farming and proximity to other settlement also created by MST.

In village C Comissão Pastoral da Terra organized recruitment but differently from other villages there was already a large a large number of settlers before the period of encampment. The number of people with experience in family farming is smaller than in the other villages. The organization of activities in the period of encampment was not very relevant and there was high instability in village leadership. In terms of distance from the main road was similar to the distance of village A. The spatial organization of settlements is a mixture between house in the plot and *agrovila*.

3.6 Current situation of villages

3.6.1 Agricultural production and family farming: diversity across villages

The objectives of this section are first to show the presence of relevant variability across villages both in the use of soil and typologies of crops produced and second to outline the prevalence of new crops towards old crops where the cooperative, referred as ASTC, is more active. ASTC offers to his members a sure market destination for high labor-intensive cash crops.

Family farmers' choice of crops and quantity depends on capital assets such as soil features, plot's dimension and access to irrigation. Furthermore, a crucial role in this choice is played by the capacity of farmers to interpret and respond to agro-ecology that is referred as farmer technical competence. Such competence is the result both of previous farmers' experience but also the farmers' ability to get access to information from other farmers (peers) and by the ability and accessibility of technicians to make the knowledge about crops production features and challenges accessible. Moreover, the decision of products' quantity is related to costs of production, value of products in the commercialization and certainty of commercialization of crops produced.

Given the same soil features and plot's dimension the choice of farmers' to specialize on certain products is highly influenced both by presence of people that already knew some of the new crops and by the role of social networks in making the information available to the rest of settlers. Important implications of the typology of products commercialized are on the one hand the average income that farmers can derive from family farming and on the other hand the necessity of labor force to produce the crops selected. Both factors influence farmers' decision to diversify their range of activities besides farming.

In the context analyzed the availability of labor force plays a great role due to low level of mechanization and high need of labor force for fruit trees maintenance and harvest.

The three main market destinations of farmers' products are: local markets (*feira livre*), intermediaries (*atravesadores*) and ASTC. The decision on which market to commercialize is related to the typology of products, the quantity produced and accessibility of markets. Some products can be produced in small quantity but constantly while other have few but big harvests. Accessibility of villages can be measured in terms of distance between villages and the local market. It varies across settlements being village B the closest while village A is the furthest (23 km).

Local markets offer better prices than intermediaries but they are able to absorb only small quantity of products. Intermediaries have the advantage to collect the products directly at farmers' place but pay a lower price. ASTC function is similar to intermediaries as they collect crops directly at farmers' house and it is able to take up large quantities of crops. ASTC price is slightly higher than that of the intermediary but it is smaller than local market price.

The analyses presented in this section are based on secondary data collected in the study commissioned by INCRA that aimed at assessing the situation of the agrarian reform settlements in the municipality analyzed, in order the design the plan to support their recovery (COATES 2007). COATES, a cooperative of agricultural technicians operating in Alagoas and Pernambuco, collected data, between 2006 and 2007, using Rapid Participatory Appraisal methods and households questionnaires. Object of analysis were all settlements created between 1996 and 1997 in the eleven settlements. It was not involved in the study the analysis of settlements that were created after 1997. This implies that village C and other seven villages are not included in the study.

Data relative to costs presented refer instead to COATES data collection in the same settlements but in 2010. The duration of the cycle of production used to calculate the cost of production for every crop analyzed are taken both from Brazilian Enterprise for Agricultural Research[18]

2007 survey on eleven settlements (COATES 2007), in spite of the difference between the time of the survey and time of secondary data analyzed, are considered crucial as they allow for a detailed picture of agricultural production in the different villages and production and market features of different crops. Furthermore the cultivated area can be considered a good proxy for fruit trees. Soursop, citrus, acerola are perennial crops; banana productive has a production cycle is of 25 years. The fruit trees present could be increased but trees present in 2007 are certainly present also in the period of 2012 survey.

This section will be organized in three parts. Section 3.6.1.1 presents the differences in soil's use and production of crops across all eleven agrarian reform settlements in the municipality object of analysis. Section 3.6.1.2 focuses on a group of the most widespread crops to illustrate the differences of price of commercialization, total production costs, and importance of labor force use across products. Section 3.6.1.3 compares two areas of agrarian reform settlements where the cooperative is active (that include the villages object of the dissertation) but with different number of members to show the differences in use of the soil, different quantity and typology of crops produced and different commercialization destination according to different crops.

[18] http://sistemasdeproducao.cnptia.embrapa.br

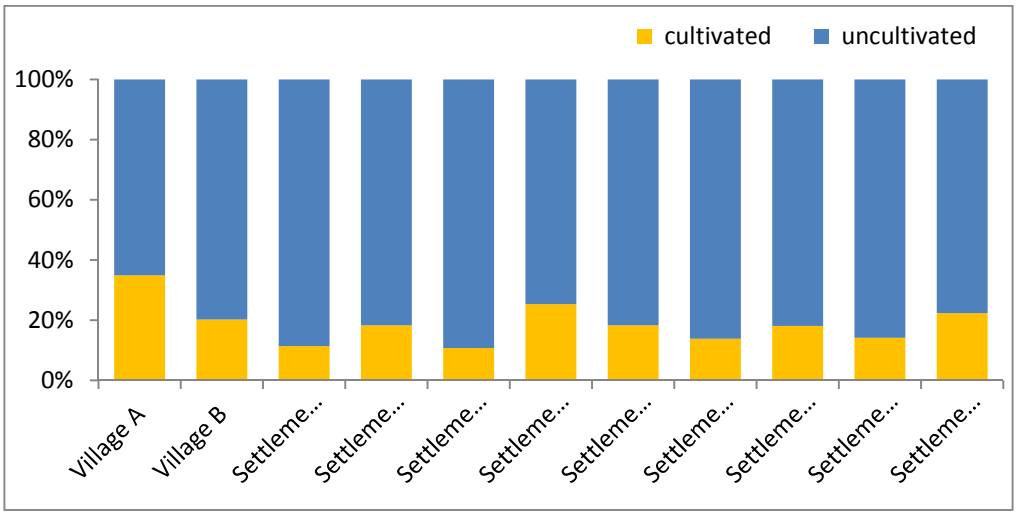
3.6.1.1 Soil use and crops

All agrarian reform settlements analyzed were productive units of sugar cane or coconut plantations. They have impoverished soils because of decades of monoculture. A recent study shows that all settlements present the same soil quality (Embrapa Solos 2012). However this section shows that settlements differ significantly in soil occupation (Figure 1) and crops grown (Figure 3).

The "percentage of soil used" is intended to measure the percentage of settlers' plots used for cultivation. The settlements' soil use is divided in three separate areas: family plots of approximately 5 hectares, an area for the preservation of the forests (*reserva florestal*) of approximately 20% of the total, and a communitarian area. On the total the area for settlers' plots is therefore approximately 70%.

Across the eleven villages studied there are relevant differences in the percentage of soil cultivation. Village A is the one that uses the largest percentage of soil that represent most of the cultivable soil among all villages (Figure 3.2). The remaining settlements instead used only a small percentage of the soil available, ranging from 20% to 30%. This implies that many of settlers use only a small portion of their plot.

Figure 3.2 Percentage of soil used: a comparison across villages



Crops' features

Crops produced in the area are classified as temporary and permanent crops according to the duration of their cycle of production. Temporary crops have a production cycle shorter than one year and permanent crops longer than one year (IBGE 2012).

Before the agrarian reform, because of the typology of land tenure conditions, people living in the sugar cane and coconut plantations (*moradores*) were allowed to produce only temporary crops while perennial crops were forbidden. The only exception is represented by banana that is a fruit tree but with a much shorter cycle of production than the others (Furlaneto et al. 2007).

The results of COATES's study show the presences of fifty-eight crops produced in the eleven settlements analyzed. Many of these crops are varieties of the same product while others share very similar features, both in terms of botanical species production cycle, price of commercialization and costs of production. For the analysis presented in this section, crops have been aggregated in twenty-eight broader classes of products.

Figure 3.3 illustrates the classes of products that, in the eleven settlements studied, occupy more soil. Crops, that were already present before the agrarian reform, are the ones that occupy more soil. The first by area occupied is coconut trees which were already present in many areas before agrarian reform settlements and that had been sponsored by the first state projects after village constitution occupy the largest area. The second is cassava (*mandioca*), which is both a food and cash crop. Third is cultivation of pasture; fourth is banana, fifth is sugarcane and only the sixth, passion fruit, is a new crop for the area.

The total value of products commercialized is quite different from the use of soil (Figure 3.4). It is important to point out that the value presented is only referred to the product commercialized while there is a part of production that is devoted to consumption, being mostly composed by cassava.

Figure 3.3 Area of production (ha) for different typologies of crops

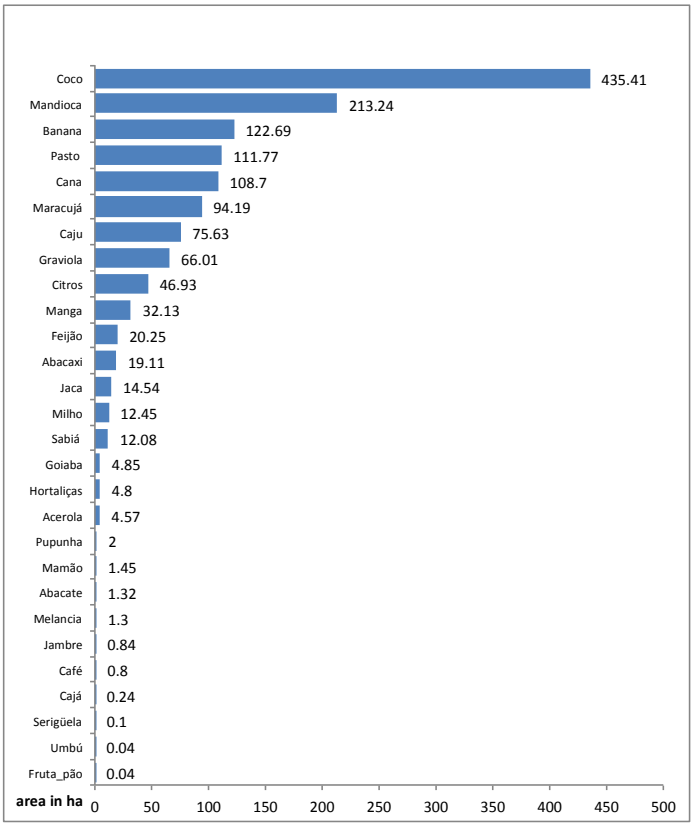
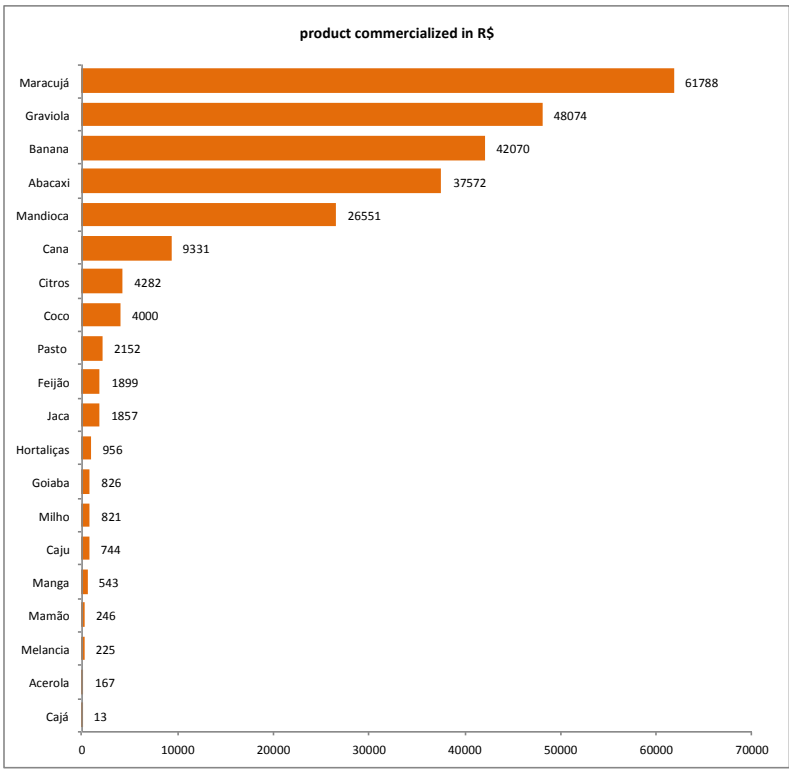


Figure 3.4 Products by value commercialized (in R$)



3.6.1.2 Focus on most widespread crops

Two are the criteria that drove the selection of crops on which I focus the analysis. First, I included the two crops that constitute the main staple crops and cash crops (cassava and banana) and the two monocultures practiced in the area before the agrarian reform and still present in the municipality today (sugar cane and coconut). Second I selected crops that have been supported first by an Italian development project and then by ASTC both with technical assistance, credit and support to commercialization (table 3.10).

From 2004 to 2008 farmers' members of ASTC could commercialize all of their products including cassava, vegetables and all fruits in the weekly market organized by ASTC referred as *feirinha*. Instead from 2008 ASTC started to purchase only some specific fruits such as soursop, which is the first by production of cooperative members', passion fruit and acerola. Citrus and pineapples produced by coop members that, before commercialized them at *feirinha*, organized by the cooperative every Saturday, stopped to find a market destination related to the cooperative (Table 3.10).

Further to the classification in temporary and permanent crops (IBGE 2012), I have divided crops in old and new. Old crops are those that were already known in the municipality while new crops are those that represent a novelty for the context.

Table 3.11 presents the area in hectares destined to the eight crops that I have sampled. Old crops are present in all of eleven settlements but there is variability in the presence of the new crops across villages. While pineapple and citrus are present in ten settlements, soursop only in nine villages and acerola and passion fruit only in eight. Most of the areas of the villages that are cultivated with soursop and fruit passion are in village A (Table 3.11).

The percentage of used soil assigned to old and new crops differ greatly across village (Figure 3.5). Village A has the highest production of new crops among villages (70%). The rest of villages instead range from 10% to 20% of new crops.

Figure 3.6 presents the different price of products commercialized across different channels. Soursop's price per ton is the highest among all products (1100 R$). The second is banana (660 R$). The third is acerola (500 R$). The fourth are pineapple, citrus and passion fruit (450 R.) The most valuable for commercialization are new crops except for banana.

However new crops require higher investment in fertilizers, soil preparation and pesticides and they tend to require a larger amount of workforce as illustrated in table 3.12.

Table 3.10 Typologies of crops' produced

Name of the crop in Portuguese	Name of the crop in English	Type of products	Typology	Initial support by ASTC	Currently commercialized by ASTC
Banana	Banana	old	permanent	x	
Cana	Sugar cane	old	temporary		
Coco	Coconut	old	permanent		
Mandioca	Cassava	old	temporary	x	
Abacaxi	Pineapple	new	temporary	x	x
Acerola	Acerola	new	permanent		x
Citros	Citrus	new	permanent	x	
Graviola	Soursop	new	permanent	x	x
Maracuja	Passion fruit	new	permanent	x	x

Figure 3.5 Extension of area in hectares by category of products

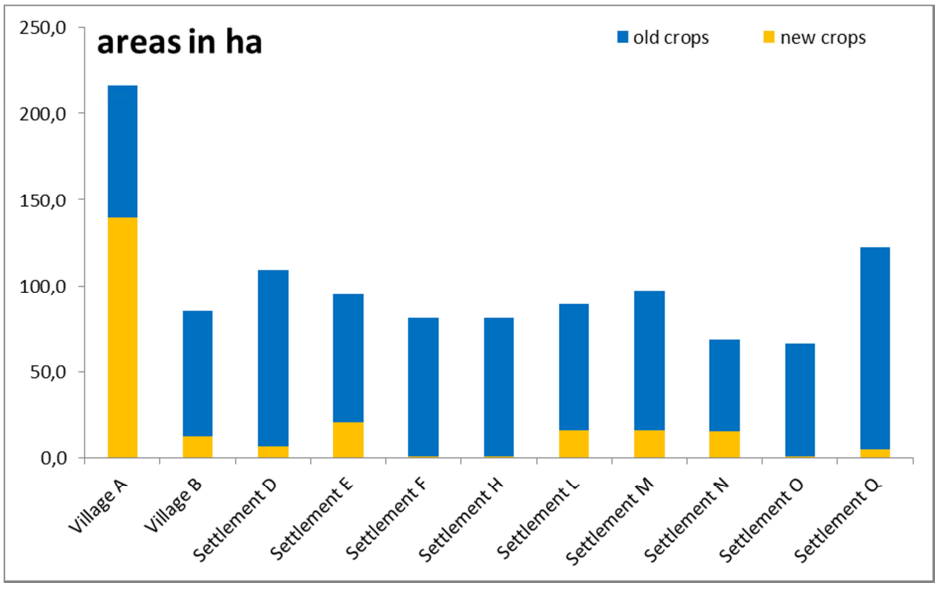


Figure 3.6 Prices of crops in R$ per ton

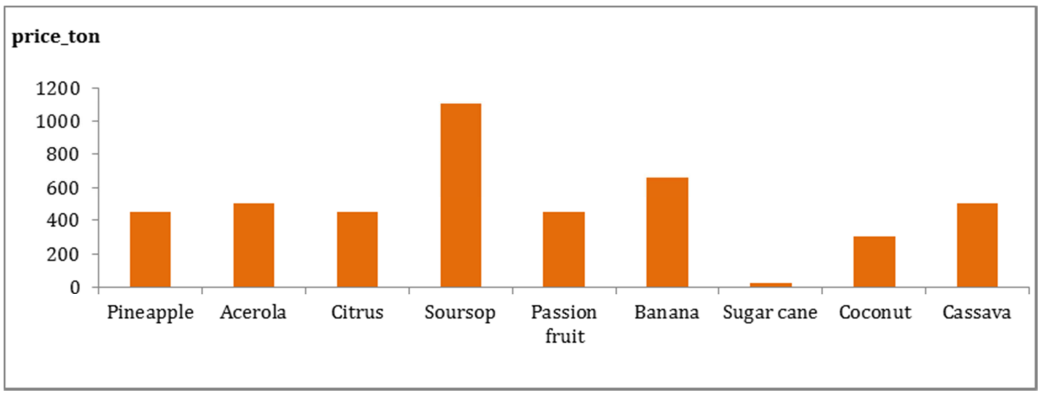


Table 3.11 Area of crops produced by village (ha)

	Pineapple	Acerola	Citrus	Soursop	Passion fruit	Banana	Sugar cane	Coconut	Cassava	Total
Village A	7	1	20	46	67	4	19	44	9	217
Village B	2	1	4	0	6	16	2	38	17	85
Settlement D	1	2	1	2	2	10	7	65	21	109
Settlement E	0	0	9	7	5	7	7	33	27	95
Settlement F	0	0	1	0	0	10	3	55	12	81
Settlement H	0	0	1	0	0	10	3	55	12	81
Settlement L	4	0	4	7	0	4	12	27	31	89
Settlement M	6	0	3	0	7	14	10	29	29	97
Settlement N	0	1	4	2	9	6	6	25	17	68
Settlement O	0	0	0	0	0	8	12	30	15	66
Settlement Q	0	0	2	2	0	33	26	34	24	122
Total	19	5	47	66	94	123	109	435	213	

Analysis of crops' production costs

The total cost of crop production takes into consideration several values including cash rent equivalent, machinery depreciation, machinery investment, storage costs, interest rates on operation and land taxes. However I have decided to focus only on costs that are only related to the crop production and I do not consider the other costs (Michieli and Michieli 2002).

Crop production cycle and therefore crops include two main phases: implantation and maintenance of crops. The impact of the cost of implantation on the total cost of crops' production depends on the duration of the lifespan of crop. The three main categories in which the cost of production can be categorized into are materials (such as pesticides, fertilizers, seeds and plant), the cost of use of machinery (including oil) and workforce. Data used for the imputation of costs are referred to farmers' use of everything that is needed according to the good practices of agrarian management. Data refers to the cost per hectare.

Table 3.12 illustrates the difference between costs of production of the different crops. The total cost of production has been calculated using the following formula: Cost of implantation + (Cost maintenance * years of duration of production cycle). The annual total cost of production divided by the number of years of duration of production cycle.

New crops have on average a higher cost of production. The most costly crop to produce is fruit passion. It has very high costs of implantation and very short period of production cycle (Table 3.12).

Soursop has a high necessity of labor force and a longer period of investment recuperation but it has high price of commercialization and high weight of every fruit (de Araújo et al.). Every fruit can weight from 0,4 to 10 kg being on average 2,5 kg (Gomes Estrela de Freitas 2012).

The reason why soursop requires an additional amount of labor force for production is the necessity of bagging of all fruits present in each trees to prevent from fruit borers (Gomes Estrela de Freitas 2012). Bagging practice is fundamental as it prevents from serious losses of fruits. It is estimated that 100% of fruits that were not bagged are attacked by borers (Leite et al. 2012).

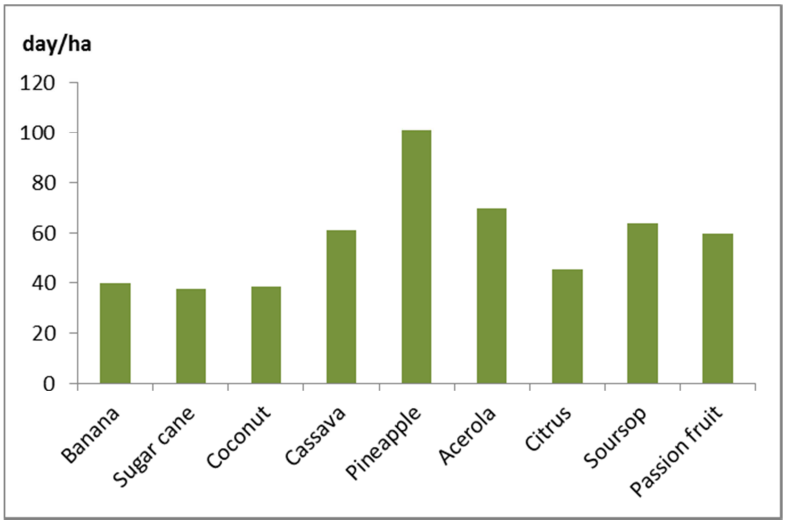
The costs table prepared by COATES used for imputing costs presented in table 3.12 did not include as days of work the time needed for bagging. In order to take into consideration such element I have added in the calculation the equivalent for the days needed for the harvest as every fruit of the tree needs to be bagged in a specific moment of maturation of the crop in order to prevent from fruit deterioration. Another additional cost, which is not considered in the calculation, refers to cost for buying the paper used to wrap every fruit.

The different crops also vary in perishability and seasonality. Crops such as pineapple, cassava and banana can be planted during several time of the year and therefore can be harvested in different moments with a smaller need of work force. Instead fruits such as acerola, soursop and passion fruit have to be harvested all together, requiring a large labor force for short period of time. These fruits also have very high perishability: they should be transformed into pulp or sold in a very short time after being harvested. Figure 3.7 shows that the crop that requires the higher number of days of work is pineapple.

Table 3.12 Total cost of production and incidence of labor force per hectare

Name of crops	Duration of cycle of production in years	Cost of implantation		Cost of maintenance		Annual cost of production		Total annual cost of production	Incidence of labor force
		Other costs	Workforce	Other costs	Workforce	Other costs	Workforce		
Banana	25	3909	830	1131	790	1287	823	2111	39%
Sugar cane	1,2	2420	880	221	110	2238	843	3081	27%
Coconut	50	1215	825	683	765	707	782	1489	52%
Cassava	1,5	1753	1220	473	1220	1642	2033	3675	55%
Pineapple	4.5	3691	2530	3691	1870	4511	2432	6943	35%
Acerola	20	2934	1440	869	1390	1016	1462	2478	59%
Citrus	100	1400	1030	716	905	730	915	1645	56%
Soursop	50	1463	1010	882	850	911	870	1781	49%
Passion fruit	3	9081	1195	7248	1195	10275	1593	11868	13%

Figure 3.7 Amount of days of work per one hectare



Comparison between the two areas where the cooperative is most active

Villages' areas sampling criteria

The three criteria used to select the other villages on which to make a more detailed analysis of crops' production and commercialization were: presence in the survey, geographical proximity, similar dimension in hectares, presence of the cooperative. Figure 3.8 represents all the settlements present in the municipality. Village A is number 03, village B is 08 and village C is 14. Figure 3.9 illustrates the different dimensions of settlements. The settlements colored in green are neighbors of village B, neighbors of village A are ones colored in orange while blue are the settlements that I do not consider in the analysis. Figure 3.9 illustrates the percentage of ASTC by village.

Figure 3.8 Settlements' dimension in hectares

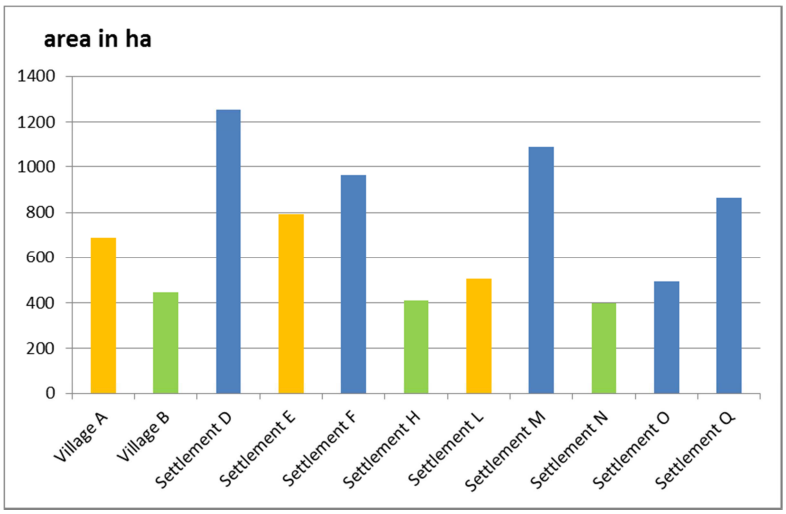
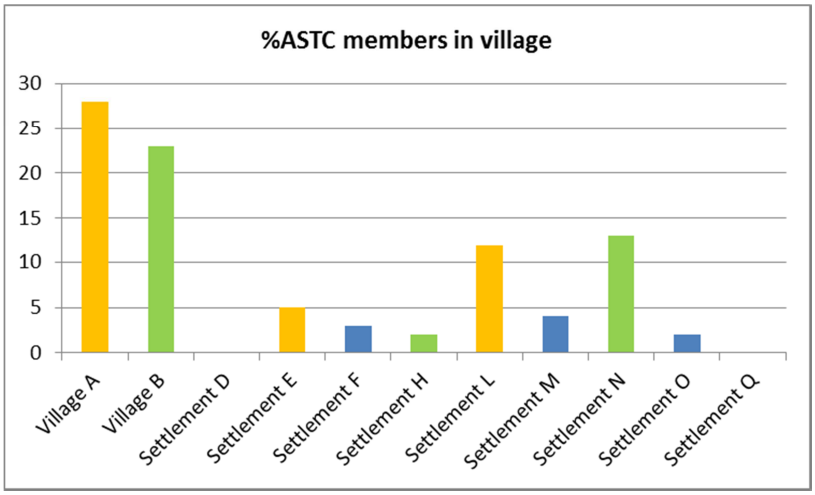


Figure 3.9 Distribution of settlements' cooperative members



3.6.1.3 Comparison of agricultural production between the two areas

The following paragraphs present a comparison of crops' areas and crops' values of commercialization between the two areas where the ASTC is more active. The following graphs shows that besides a similar presence of ASTC in terms of members the level of productivity is very different. Furthermore in village B the main crops are the old crops and there is not much difference between village B and the rest of neighboring settlements.

Figure 3.10 illustrates the difference in area destined to the various crops between village A and its neighbors. Village A has the largest production of all new crops while the production of cassava is higher in village L.

Figure 3.11 instead shows the comparison in terms of value of crops' commercialization is new crops towards old crops is very different being banana the only products that has a similar value to pineapple.

Figure 3.12 shows that, differently from the previous geographical area, there is no relevant difference between village B and its neighbors. The only crop where village B has destined a larger geographical area is banana.

In term of value commercialized instead the highest value is that of cassava and passion fruit (Figure 3.13).

Figure 3.10 Villages of area A: crops' area of production in hectare

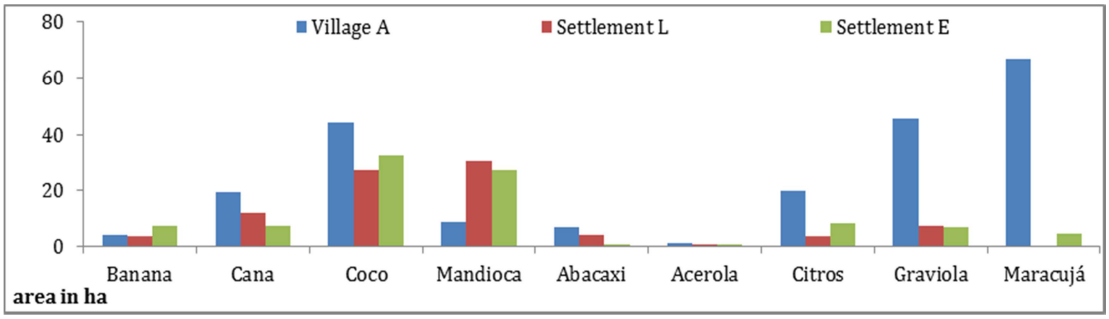


Figure 3.11 Villages of area A: total value of commercialization in reais (R$)

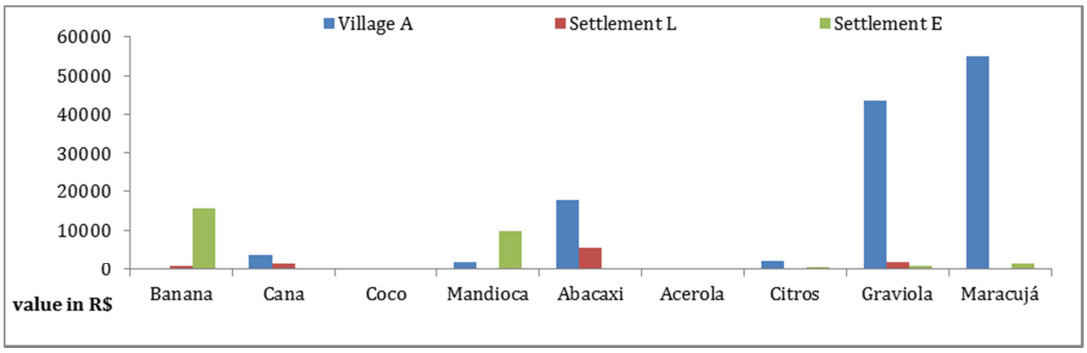


Figure 3.12 Villages of B area: crops' area of production in hectare

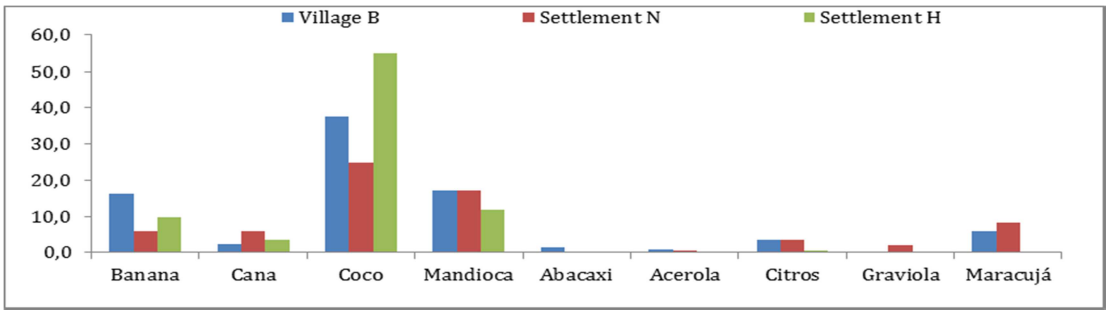


Figure 3.13 Villages of B area: total value of commercialization in reais (R$)

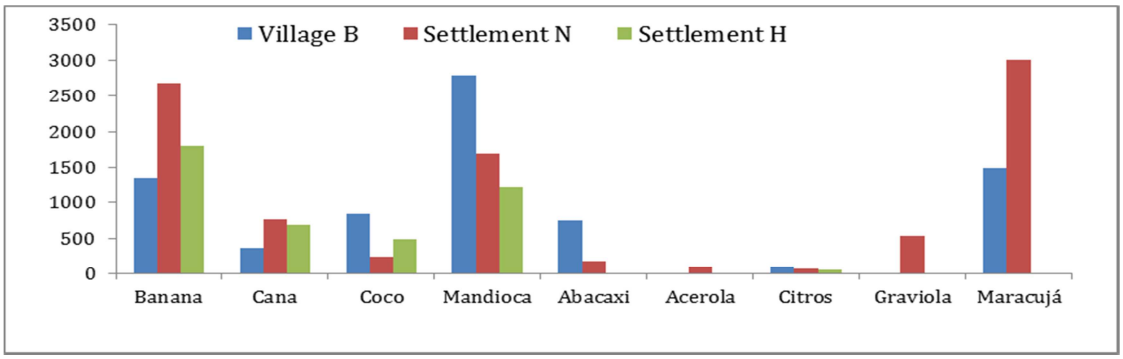


Table 3.13 illustrates the different market destinations of the different crops in the six villages analyzed. Sugarcane, pineapple and banana have only one possible market, the other products' have different market destinations. This table also shows that ASTC is an important market destination of soursop and passion fruit. Table 3.14 illustrates how the price of crops varies across different market destinations.

Table 3.13 Crops markets' destination

	ASTC	Intermediary	Market
Acerola	33%	0%	67%
Banana	0%	0%	100%
Cassava	2%	30%	69%
Citrus	67%	0%	33%
Coconut	25%	31%	44%
Passion fruit	90%	0%	10%
Pineapple	0%	0%	100%
Soursop	92%	0%	8%
Sugarcane	0%	100%	0%

Table 3.14 Crops' prices (R$)

	ASTC	Intermediary	Market
Banana			862
Sugar cane		22	
Coconut	500	271	250
Cassava	500	123	808
Pineapple			433
Acerola	600		500
Citrus	500		435
Soursop	1000		1025
Passion fruit	450		750

3.6.2 Current employment situation in villages

In the settlements object of analysis, working opportunities first of all depend upon accessibility, given the very bad conditions of the roads, especially during the winter season. There is relevant variability in terms of settlements distance from the main road (Table 3.15). This plays a crucial role in defining the level of mobility that households can sustain.

Table 3.15 Households' mobility and distance from the main road

	Village A	Village B	Village C
Average number of times outside the village per year	54	106	61
Distance from the main road (km)	23	5	19

In settlements that are nearer to road, such as village B, households tend to have higher level of mobility that allows them to be engaged also in urban activities, namely related to tourism sector and construction industry. In more remote locations, such as those of village A and C, being impossible to commute every day from the settlement to urban area, households decide either to stay in the village working in family farming or in nearby sugar cane plantation or to leave the village for temporary cyclical migration periods. Many of the households for several consecutive years go to work from six to ten months in labor-intensive plantations.

Households, engaged in family farming, either work for themselves or work for other households living in the village. Households employed in the nearby sugar cane industry, can be distinguished between "fichados" (legally registered) and "clandestinos" (informal workers). The first category commutes every day with sugar cane industry bus to the nearby sugar cane plantation. Many of these households beside their work in the plantation also work their plot, especially in the period that is not devoted to harvest of sugar cane, when they have minor workload in the plantation. The second category instead works in sugar cane industry just occasionally upon the necessity of bigger workload in the period of harvest. It is important to point out that those just represent a minor part of the households.

People, that decide to migrate to work far from the village, mostly work in agro-industries. Only in very few cases they are employed in the service sector in Brazilian capitals in the center-south of the country. The male head of the households or one of the male sons mostly composes this migrant labor force. This implies that I was able to interview the female head of the household that continues to reside with the children in the village. Working for some seasons in sugar cane or other labor-intensive agro-business is, especially for young men, a strategy to create some savings to be able to start a new family and then come back to the village. However there is a small group of households in village A that made of this cyclical migration a more stable livelihood strategy.

3.7 Concluding remarks

This chapter outlined the history of sugar plantations and its fundamental role in Northeast of Brazil in shaping labor organization, social meaning of land and patronage bonds between landlords and sugar cane workers. It then presented how social movements' action mobilized this social context and how they built up households engagement, leading to the formation of these new rural entities: "agrarian reform settlements". It also showed the elements of transformation that this policy allowed for.

In addition it stressed the vulnerability of the agrarian reform settlements to the risk of creating no change but reproducing re-functionality of the pre-existent dependency structures. Very important in this respect, is the role that politics played in the creation of those settlements and the motivations that moved households to join the struggle for land. Fourth it specified the role of family farming. Fifth it focused on the municipality object of analysis, describing the history of village formation of the three settlements surveyed and on a sample of agrarian reform settlement.

Social movements conceived the struggle for land as a combat against exclusion from many services such as education, health and housing (Severi 2012). However, it is possible to argue that it was a fight to place include farming in the Brazilian agricultural policy agenda. Adopting family farming as main livelihood strategy for agrarian reform settlers meant investing resources and being able to manage savings. These skills, for people that have no prior experience in family farming, are hard to achieve with no training and credit. The investment, provided by Brazilian government in technical assistance and extension services, in the area object of the analysis, did not used sufficient means to fill the gap of training and management skills that sugar cane cutters faced when approached family farming. I argue therefore the decision of households to work in family farming is also related to positive contagion among households with different professional backgrounds.

In the section on family farming production in the villages, I have illustrated the differences among villages between use of the soil and crops production. The old crops are still those that occupy more soil.

The analysis of the most widespread crops shows that new crops have higher value of commercialization but they are more risky crops. They need farmer technical competence that only very few farmers developed from their previous experience and they have specific

harvest seasons and high level of perishability. Therefore they require on the one hand a sure market and the other the ability to mobilize workforce during specific periods of cycle of production.

The analysis of the two areas sampled shows that village A is the most productive settlement both in terms of area cultivated and value commercialized. Village A shows a prevalence of new crops towards old crops. Village B instead produces mostly old crops and it does not show relevant differences with neighbors.

Village A produces the highest value of soursop and passion fruit. These crops constitute the core products for ASTC. Soursop requires a high quantity of labor force because of the process of bagging and the necessity to harvest all of the products in a very short time. Passion fruit requires very high initial investment (9000 reais per hectare) and it has a very short production cycle. Both need to be processed or sold shortly after harvest. The introduction of soursop and passion fruit induced a new demand of labor in the village. In the peaks of production cycle, it is necessary for farmers to have a higher number of workers that the household itself is not able to provide.

The next chapter illustrates how important differences in the way in which households have been mobilized affected villages' composition and villages' social networks.

4. Formation of the villages and features of the social networks

4.1 Introduction

Two of the most important aspects of Brazilian agrarian reform are the mobilization of a large number of people and the creation of agrarian-reform-settlements (Wolford 2003).

This research argues that the most innovative element of agrarian reform is not access to land per *se* but rather the possibility of the creation a more heterogeneous social space of professions and a new freedom in the use of time. As referred in chapter three, in the Northeast region of Brazil, there was not a pre-existing request of land by rural workers. Nevertheless in the early Nineties, economic and political conditions (especially sugar cane crisis) allowed social movements to mobilize a large number of people to occupy unproductive properties, pushing the government to expropriate the land (Sigaud 2004) .

Family farming could become a way to promote bridges among households that otherwise will not be connected. In the *assentamentos* there is the opportunity to recreate new organizational forms based not anymore on a single landlord dependency but on a more plural system.

The term family farming has been chosen to identify a different economic activity from previous plantation agricultural system. Households are the main production unit of farming activities in the villages. Family farming employment describes the working activities that one household carries for another household to support farming activity.

The Brazilian state played a weak role in supporting family farming as a livelihood strategy. Therefore the decision of settlers to invest in family farming is the combination of settlers' past experience, the ability to manage savings and of social influence among settlers.

The theory that drives this research refers to social structure ability to adapt to change (Parkinson 2013b; Petersen 2001). The multiple networks that connect households' define the social structure of *assentamentos*. Applying this theory to *assentamentos'* response to agrarian reform and to the activities of a producers' cooperative, the main argument is that the capacity of *assentamentos* to adapt to change, depends on the overlap between multiple social networks. For simplicity I will refer to *assentamentos* as villages in the text.

Information has been collected on three networks: frequent contact network, kinship and family farming employment. Frequent contact network, which describes frequent meetings of

households in the village, is considered an approximation of how people interact in each of the three villages.

The first hypothesis is that different histories of villages' formation led to differences in ties' generator mechanisms. Analyzing villages with different histories of creation, but of the same municipality and included in the same macro phenomena of agrarian reform, the analysis carried out with Exponential Random Graphs (Robins et al. 2007) aims at eliciting the presence of differences in the most significant social processes that generate frequent network formation. ERGMs allows testing if the presence of a link in the frequent contact network is influenced by the tendency of nodes to associate with others that have the same attributes (homophily).

The second hypothesis is that the family-farming engagement has a role in fostering network formation and it is not non-redundant to other ties' generator mechanisms. Main reasons why family farming has a bridging role is related both social and economic aspects. Households, having family farming as main livelihood strategy, are more likely to form ties in the frequent contact network. Family-farming employment creates non-overlapping ties between households. Households that produce more crops need to hire more labor and they tend to hire households with whom they have no other ties or share few or no common attributes. The presence of a tie in the frequent contact network is influenced by the presence of a tie in the other two networks collected (family farming employment and kinship).

To test such hypotheses a combination of both quantitative and qualitative analysis will be adopted. The description of villages' histories allows showing how actions taken by different organizations (described in chapter 3), which mobilized people, varied in the crucial moments of village creation, namely households' recruitment and villages' early organization.

The chapter is organized in seven sections. After this introduction, section 4.2 provides a brief description of the research question explaining why social network structure plays such a crucial role. Section 4.3 explains data transformation before the analysis. Section 4.4 presents the hypotheses. Section 4.5 describes the model specification to test the hypotheses. Section 4.6 presents the results that allow inferring how different histories of villages contributed in creating different social mechanisms behind network formation. Section 4.7 draws some concluding remarks.

4.2 Villages' formation and the importance of social networks

Projetos de Assentamentos, are new villages that emerge from expropriated unproductive farms of sugar cane plantations. Starting from the desegregation of an highly hierarchical society of sugar cane plantation (*engenho*/ *fazenda*) there is the opportunity to recreate new organizational forms based not anymore on a single landlord dependency but on a more plural system where family farming employment could become the new form of patronage.

The major changes for villagers in *assentamentos* are access to means of production, a new freedom in the use of time and of land (Manuel Correa de Andrade 2001), lack of highly strong controlling systems, possibility to stay for long period in the same place, which was never possible for people that lived in *engenho* as workers without contract (*clandestinos*) and the possibility to confront with people with different biographical histories.

Assentamentos can be considered quasi-natural experiments in terms of village composition and network formation as they include both old and new settlers; moreover family farming supported by a producers' cooperative is an innovation for the context.

The presence of relevant number of new villagers, which did not arrive through the usual pattern such as kinship or work opportunity, raises the question of how new and old villagers connect and what make households communicate.

The co-presence in the same village of old and new settlers does implies neither interaction nor peaceful co-existence, especially because the two groups have very different features. The creation of *assentamentos* creation in the framework of the agrarian reform does not mean that their main economic activity is family farming. As a result to understand if these villages differ in their organization of labor from previous sugar cane plantations it is crucial to focus the analysis on social networks for two main reasons.

Households, that were living in the villages before agrarian reform, and households, which were mobilized by social movements, differ in three main dimensions: previous professional experience (Table 4.1) level of education (Table 4.2), and kinship system.

Table 4.1 Employment status: old settlers and first comers before agrarian reform

	Village A		Village B		Village C	
	Old settlers (%)	First comers (%)	Old settlers (%)	First comers (%)	Old settlers (%)	First comers (%)
Autonomous	8	43	0	30	0	8
Employee	75	48	80	57	93	92
Mixed	8	7	20	13	0	0
Retied	0	0	0	0	0	0
Unemployed	8	2	0	0	7	0
Absolute value	12	42	5	23	15	12

Old settlers, that in the sample analyzed, were mostly working in sugar cane industry as waged workers and mostly had a low level of education. Both during the interviews carried out in this research and in the life histories collected by other researchers (Severi 2012), it appears clearly that continuing migration and need to work to get money for the family are two very important factors that prevented children from regular attendance to school.

Table 4.2 Years of school attendance: old settlers versus first comers

	Village A		Village B		Village C	
	Old settlers (%)	First comers (%)	Old settlers (%)	First comers (%)	Old settlers (%)	First comers (%)
0	33	21	60	17	13	17
1-3	33	45	40	22	60	33
3-5	25	19	0	13	13	42
>5	8	14	0	48	13	8

Rural workers employed in sugar cane sector and households with tradition in family farming have different kinship systems. The former tend to have more fluid kinship systems having higher mobility patterns and high level of financial instability. Kinship ties, namely marital unions, very seldom formalized into marriage contracts, have shorter duration and very rarely children, in adult age, stay with the household. Most commonly, they start early the work life as waged labor force and are often employed as migrant labor force either in sugar cane or other high labor intensive agro-industries. Instead, households that have a longer family farming tradition tend have smaller mobility patterns and larger families and longer marital relationships. The contamination between the two systems of kinship is certainly an interesting laboratory that the agrarian reform can allow for.

It was not possible for Brazilian government to provide settlers with a significant and extensive over time technical assistance to promote family farming, given the mobilization of a large number of people and the creation of a large number of settlements in a short period

of time. There were in fact specific funds and projects designed by National Institute for Colonization and Agrarian Reform (INCRA) but their action was short and, not tailored to villagers' needs. According to key informants, the selection of projects to be implemented was decided at village level, sometimes even at municipal level, not taking into consideration skills, aspirations and specific characteristics of single farmers' plots. The presence of a short and not very personalized technical assistance for farmers was therefore not able to compensate for the different level of settlers' experience in family farming and different level of previous capital assets that could allow households to invest in family farming. The decision of settlers to invest in family farming is the result of the combination between past settlers' experience in family farming, the ability to manage savings and social influence among settlers, higher when there is non-redundant interaction between households..

4.3 Methods

4.3.1 Data

Data were collected with household survey conducted in the municipality studied, in three agrarian reform settlements selected out of the 18 existing in the municipality (INCRA 2012a), (INCRA 2012b). The methodology for data collection is described in chapter two.

The criteria to select villages, more extensively described in chapter two, were: 1) difference in villages' history namely social movement recruiting households to occupy the land, 2) percentage of households' members of the cooperative and 3) household average income from sell of products to cooperative. The aim of this sampling strategy is that different village creation rules led to different households' features and network formation patterns. This sampling strategy that combines features of both purposive and probabilistic sampling is called mixed-multi stage sampling (Teddlie and Yu 2007) (Table 4.3).

For each village households' heads of permanent residents have been interviewed collecting both attributes and social, economic and kinship ties among them. The number of households per village is respectively 102 in village A, 38 in village B and 37 in village C. They represent all households permanently living in village A and B and 95% of those living in village C. The total number of household living in each settlement does not reflect the number plots registered at INCRA: more than one household live on one plot and some households has more than one.

Table 4.3 Villages' main features

Settlement name	Year of creation	Settlement area (ha)	# Plots	Total population	% Coop members	Income from coop (R$)	Members contribution to total coop production (%)	Name of social movement
Village A	1998	690	100	437	28	10478	66.0	Private association
Village B	1997	445	38	285	24	119	0.6	MST
Village C	2005	453	42	279	5	1337	0.3	Commissão Pastoral da Terra

Network data transformation

Frequent contact network and family farming employment were collected as directed networks (O'Malley and Marsden 2008). It is in fact possible that if A nominates B the opposite will not occur. Kinship and spatial contiguity are instead by definition undirected. For none of the networks studied it was decided to consider direction of ties but rather to symmetrize all of them because the most crucial aspect of the analysis is the presence or absence of a tie and not presence or lack of reciprocity. Analyzing the case of each network it be will provided an explanation of why it was followed such transformation strategy.

Family farming employment networks include two types of ties that in principle are the transpose one of the other: households that hire ("hire") and households being hired ("work for"). However, it was decided to keep the two network separated as they are considered to be more informative being separated rather than being joined. The "work for" network in fact by placing at the center of the network households that hire more households provide an interesting picture of households' leadership in the village. The "hire network" instead does not allow giving relevant insights on village distribution of power but it is important to confront it with the other. It is important to show that, only in village A, there is just one single household that hire and is hired by another. This information shows that hiring or working for others refer to two different statuses rather than to a form of exchange. Households that hire are households that produce more or focus on more labor intensive crops, while households that work for others are people that work as employee for others either as main livelihood strategy or complementary income. In family farming employment network direction was not considered to be very informative. In fact the presence of an unreciprocated tie might not be connected to lack of transitivity but rather to a cognitive bias. Namely if employee would tend to remember all of their employers because of substantive value of this

tie, employer could only remember the last people he employed and therefore the last ties he had. A possible comparison with a similar case refers to student-professor relationship: professors might remember the last students that graduated with him or her while students are more likely to remember a higher number of professors that taught them.

Frequent contact network describes behavioral ties that have some common elements with friendship. This network is not referred as friendship because of the ambiguity of the term and cross-cultural variability of the meaning. The choice not to consider the presence of mutuality but the mere presence or absence of ties, on the one hand is prone to criticism as it creates a loss of information, on the other hand it reflects the absence of a theory that is able to consistently explain the presence of such important asymmetries in villages. The reason for such asymmetry can also be simple cognitive bias. It is important to notice that in village B where there is the highest asymmetry beside a small group that is closely connected, the networks tend to be quite sparse. Furthermore considering only mutual ties as in some analysis on friendship networks (Hunter, Goodreau, and Handcock 2008) would have meant modeling an extremely sparse network. Such choice is consistent with the literature. A recent similar study also did not consider direction of ties. This study explored network variability across villages only focusing on the presence or absence of a link among households in the networks observed (Entwisle et al. 2007).

In the analysis the most relevant aspect to be captured is the presence of frequent meetings among households as they describe the pattern of interaction in the village. It is possible to argue that the influence that one household exerts on the other is higher when both households in the dyad declare the presence of a tie. This aspect would have been relevant if this network would be an input for auto-correlation models that aim at explaining households' behavior by social influence. In this case the outcome variable is the presence of the presence of ties, this can be considered not to be a crucial aspect. Lastly, using a simple analysis based on color-coding of nodes on attributes, it was not possible to identify a specific pattern that differentiates mutual dyads from the rest.

In the models presented later in the chapter all of networks will be considered as undirected. The symmetrization of ties has been based on weak rule therefore it was added a tie when at least one of the two nominates the other (Table 4.4).

Table 4.4 Network data as collected

	Village A		Village B		Village C	
	Mutual	Asymmetric	Mutual	Asymmetric	Mutual	Asymmetric
Kinship	253	0	26	0	13	17
Contact	34	139	4	76	12	55
Work for	1	71	0	17	0	14
Hire	1	65	0	19	0	11

4.3.2 Hypotheses

Chapter three has illustrated the histories of the three villages and how they differ in the crucial moments namely households' recruitment, early organization of the settlement and leadership in the village.

The villages can be defined as organizations. The unit of analysis is the household and they are the nodes in the network. A network describes the social relationships (such as friendship) among nodes. Multiple networks that connect households in each village define villages' structure. Nodes have socio-economic characteristics, such as gender, income, status, that are defined as attributes.

Social movements had different strategies to recruit households. As a result, at the time of creation, some villages were composed by a larger number of experienced farmers than others. Recruitment patterns and early villages' organization influenced network variability across villages in terms of: 1) kinship networks' overall features, 2) tie generator mechanisms in frequent contact network, 3) overlapping among tie's generator mechanisms in frequent contact network, 4) presence of marriages between households of different geographical origins.

The use ERGMs aims first at identifying what are the node attributes that create homophily effects in the frequent contact network and whether the presence of ties in the other two networks collected has an effect on the presence of tie in the observed network, second at showing which node attributes creating homophily effect are non-redundant by inserting all of the variables together, third at testing for homophily effects controlling for closure and transitivity.

Section 4.6 of this chapter tests whether differences in villages' histories and network topologies are reflected in different social processes and local structures that trigger frequent

contact network formation. Specifically it aims at identifying what are the common attributes or common edges that increase the probability of a link in the frequent contact network. It was decided to focus on this specific network because it can be considered as a behavioral network that is result of constitutive social networks such as kinship and agricultural employment.

4.3.3 Selection of predictors for model specification

The hypotheses on the presence of structural differences between frequent contact network in the three villages are tested with exponential-family random graph model (ERGMs) (Robins et al. 2007), described in chapter two. ERGMs generate networks that match the observed network with respect to local the configurations, also referred as local forces, network statistics or effects, (D. McFarland et al. 2010) that are specified in the model.

The outcome variable is the presence of a tie in the frequent contact network.

The predictors are five "network statistics" or "network configurations" that describe social mechanisms that are likely to increase the probability of a tie in the network. First, edges, which is the most basic term embedded in the model, and that accounts the overall tendency to create or refrain from building ties that is the intercept of the model. Second, homophily, which is the prevalence of ties between nodes that share similar characteristics. Third, edge covariance that describes the effect of the presence of a tie in another network on the network observed. Fourth, clustering, which is prevalence of ties between nodes that already share ties in common. Fifth, centralization, which that is tendency of nodes to form links with nodes that have high number of ties.

The outcome variable in ERGMs is the presence of a tie in the network. Network predictors used in ERGMs, also referred as network statistics or local configurations, can be classified into exogenous and endogenous. Using exogenous network configuration such as homophily edge covariance the normal logic of logistic regression holds. Instead using endogenous network configuration such as transitivity, centrality and edges, the presence of ties is predicted by the presence of other ties in the network. Because of these dependencies structures ERGMs are different from other regression analysis. ERGMs aim at testing if some structural configurations are prevalent in the network. The interpretation of parameters that

describe the presence of some network configuration cannot be the same used for standard logistic regression results. (Robins, Lewis, and Wang 2012)

After identified what are node attributes and network co-occurrence have an effect on tie formation, the model controls for effects that go beyond dyadic level. The model is specified with three structural terms: geometrically weighted degree that is one degree distribution effect, geometrically weighted edge wise shared partners and dyad wise shared partners that are shared partner distribution effect that capture the presence of closure.

Among all characteristics that describe households the model tests the ones that are considered most likely to create homophilous effects. In the literature nodes' attributes that are likely to create homophily effects are similar livelihood strategy, participation to the same events, common background and similar status. (A. Barr, Dekker, and Fafchamps 2010a; Arcand and Fafchamps 2012).

In this study the nodes' attributes which can create homophily effects are classified in six typologies: 1) settlers' attributes from the past, 2) villages' formation attributes, 3) social activities in the village, 4) economic activities in the village, 5) hierarchy indicators, 6) activities outside the village and 7) covariate networks.

Settlers' attributes from the past comprise the origin of settlers, i.e. the place where the household lived immediately before the agrarian reform, and previous employment sector before agrarian reform.

Villages' formation attributes describe migration wave in which the household has arrived and permit the classification of households according to the person or organization (contact) that informed about the possibility to have access to the land. The village composition observed in 2012 is the result of the combination of several migration waves of households that arrived in the villages, as described in chapter 3.

Social activities in the village comprise participation in the same religious congregations, membership in village football team and membership in village association. For what concern religious congregation in village A there are two evangelical and one catholic congregations, and in villages B and C one catholic and one evangelical congregation.

Economic activities in the village comprises a dichotomous variable that describe family farming as main livelihood strategy, household participation in cooperative activities in terms

of production sold to the cooperative during the year previous to survey and of average amount of products sold to the cooperative since households' membership in the cooperative and current sector of employment.

Hierarchy indicators comprise a variable that indicates the number of households hired for agricultural activities, a variable number of households for which they work for and an indicator variable that shows whether a member of the household had an office in the village since village creation.

Activities outside the village comprise participation in political parades and production sold in the same market.

Covariate networks are kinship and agricultural employment. The hypothesis that I would like to test is whether the presence of a tie in these other two network has an effect on the presence of a tie in the frequent contact network which is the outcome variable.

4.4 Villages' histories and early organizations' effects on networks' features

Movimento Sem Terra, Comissão Pastoral da Terra and Geremias' association differ in criteria to recruit and mobilize households, in the rule to define households who can have access to land after a period of occupation, in the organization of activities in the period of encampment, in the spatial organization of the settlement and in political representation of settlers and ability to negotiate with local and national authorities and in the way in which access to land was negotiated (expropriation versus acquisition).

The argument is that the above mentioned differences in villages' local histories, more extensively described in chapter three, influenced four dimensions: first the number of households with previous experience with family farming (Table 4.5), second percentage of old and new settlers (Table 4.6), third the overall features of kinship networks (Table 4.7) and fourth number of marriages between villagers of different geographical origins (Table 4.8).

Marriage between settlers with different geographical origins define weddings between two individuals that are either children of first settlers with different geographical origins or children of first settlers and old settler; or between two individuals that came separately from different locations to join village encampment, either alone or with their parents, and got married in the village.

Table 4.5 Households' livelihood strategies by village

	Village A – before (%)	Village A – at survey (%)	Village B – before (%)	Village B - at survey (%)	Village C – before (%)	Village C - at survey (%)
Sugar cane	32	7	37	0	68	11
Official of sugar cane	3	0	3	0	3	0
Third sector	32	1	16	8	14	0
Agriculture	8	49	21	45	5	24
Municipality and others	2	9	8	11	3	3
Mixed livelihoods	6	25	13	32	0	41
Other	17	9	5	5	8	22

Table 4.6 Comparison between old and new settlers

Migration wave	Village A (%)	Village B (%)	Village C (%)
Old settlers	12	13	41
New settlers	88	87	59

Table 4.7 Kinship network overall features

	Village A	Village B	Village C
Density	0.047	0.024	0.045
Isolates	12%	50%	19%
Average degree[19]	4.71	1.36	1.62

Table 4.8 Marriage between settlers with different geographical origins

	Villag A	Village B	Village C
Number of marriages between people with different origin	12	1	2
Percentage of marriages between people with different origin	12%	3%	5%

[19] The degree in an undirected network measures the number of alters with whom ego is connected. The average degree is the mean of the number of ties that each ego has.

The next paragraphs briefly summarize the histories of the three villages. A sequence of social networks visualization, produced with the software UCINET (Borgatti, S.P., Everett, M.G. and Freeman, L.C 2002), shows differences in kinship networks' topology among the three villages and different number of marriages between people of different geographical origin of settlers. Households represent nodes and they are color coded according to the different origins of settlers. The kinship network in village A is polycentric while village B and C have sparser network.

Village A

In village A the charismatic leader of a private association (Geremias), that led the process of encampment and expropriation of the land, recruited a large portion of households that live in the village. Most of these households were members of an association that was based in the south of Alagoas. The association allowed more time for households' recruitment process. The result of this recruitment pattern is shown by a higher number of households that already had with experience in family farming (32%) and by the presence of households that already knew each other before encampment for almost two years.

At the moment of settlement establishment Geremias, who became the first president of the settlement, declared the settlement collective. This allowed him to prevent to send away households that were exceeding the number of plots indicated by INCRA. There were no rules limiting the number of households connected by kinship and there is in fact low percentage of isolates in kinship network (12%).

During the period of encampment and early period of settlement composition several collective activities were organized in the village. This latter element probably favored the creation of more marriages among different groups both among old settlers and new settlers and also among new settlers of different origins. There are in fact in the village 12 marriages across different groups (where geographical origin defines groups).

In terms of settlers' origin four are the main geographical areas: 1) the village itself (old settlers) colored in blue, 2) neighboring "fazendas" and "sitios" colored in light blue, light green and pink, 3) Agreste alagoano where Geremias' association was based colored in red, grey and purple, 4) Junqueiro where Severino group was mostly recruited colored in black.

The remaining geographical origins codified as other were colored in dark green. Mixed marriages across origins are colored in yellow.

Figure 4.1 illustrates the network of kinship colored by origin. It is important to notice two large components: one clan and one polycentric structure. The former is composed by an old settler (id. 72) that contacted several of his relatives to live in the village and latter is composed by a combination of old and new settlers.

Figure 4.1 Village A kinship network: nodes colored by origin

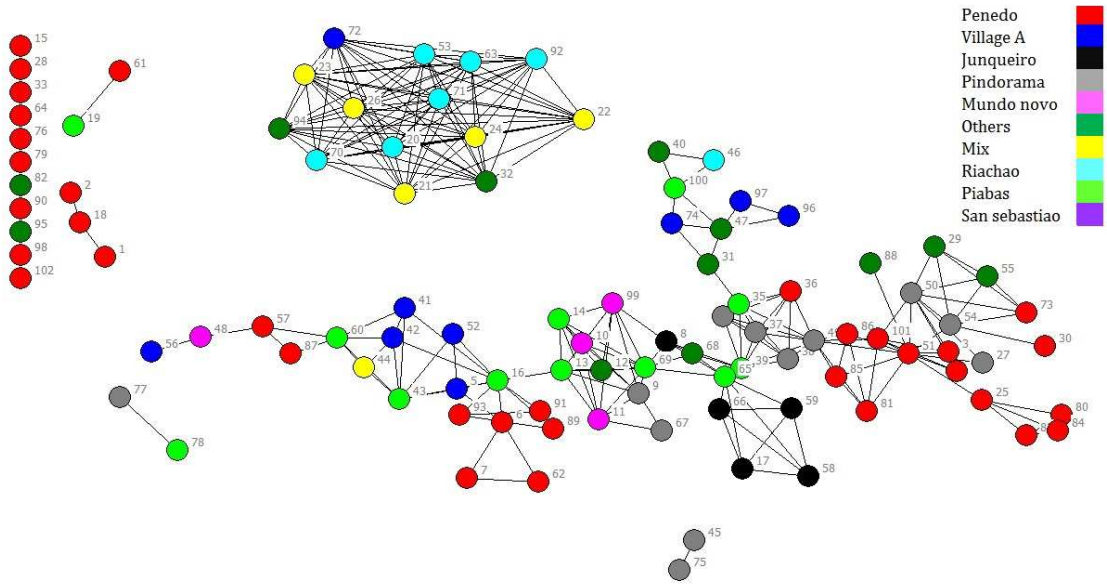
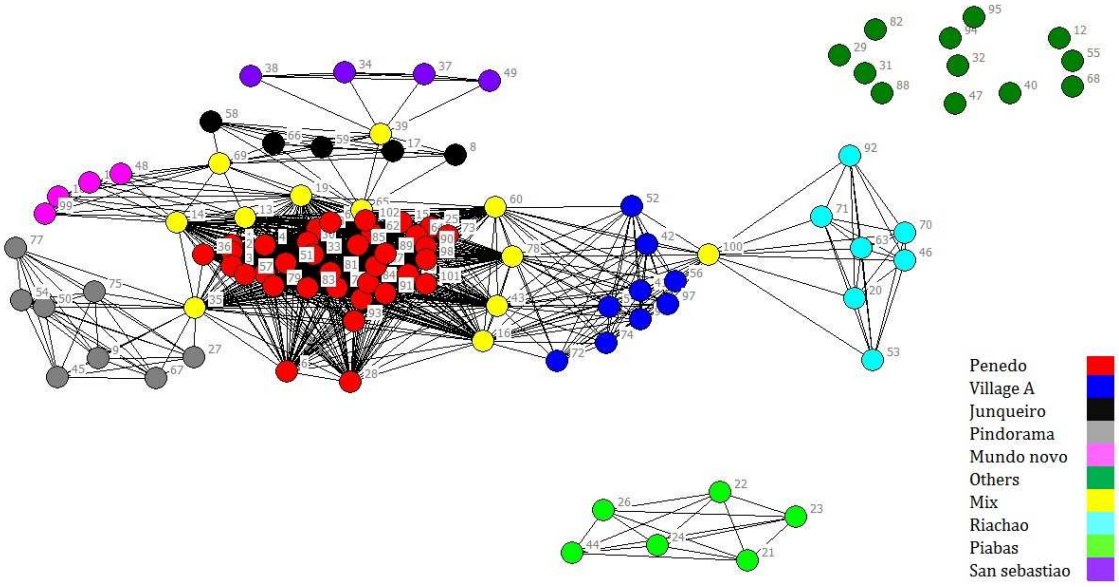


Figure 4.2, is the network representation of an affiliation matrix, where the rows represent the household and the columns geographical origin of husband and wife. The graph shows that in total, in this village there are twelve marriages between people of different geographical origin, among which four of them are marriages between old settlers and new settlers. The twelve marriages are the twelve nodes colored in yellow that connect the different groups defined by common origin.

Figure 4.2 Village A network representation of settlers' origin



Village B

Village B was created by Movimento Sem Terra that defined a maximum number of households linked by kinship that could live in the same village. The observed kinship network is quite sparse, being only 50% of households connected by kinship ties. Only a very small number of households already knew each other before the process of encampment. MST activists calling people to occupy had in fact short time gather people and therefore collected households with very different work experience. Mostly they were employed in the sugarcane sector (37%) and only 21% were already living of family farming.

Most of the people got to know each other during the period of encampment. Many households have been literally socialized by politics: most of activities promoted by MST were especially participation to demonstrations, occupation and other forms of protest to make pressure on the government to expropriate the land. Furthermore at the moment of land division in plots when MST indicated households that could have access to land, participation in political parades was an important criterion.

Figure 4.3 shows that households permanently living in the village can be classified in four main groups according to their origin. Five old settlers that were living village B before the agrarian reform are colored in light green. The eleven households mainly coming from Porto Calvo being mainly recruited by an MST activist are colored in red. Seven households, which came from another encampment in Atalaia region, are colored in blue. Two households

that were workers for the sugar cane factory in the closest town are colored in black. Four households coming from Maceio are colored in dark green. Households that have other geographical origin are colored in pink. The only household which marriage is classified as mixed across origin is colored in yellow.

Figure 4.3 Village B kinship network: nodes colored by origin

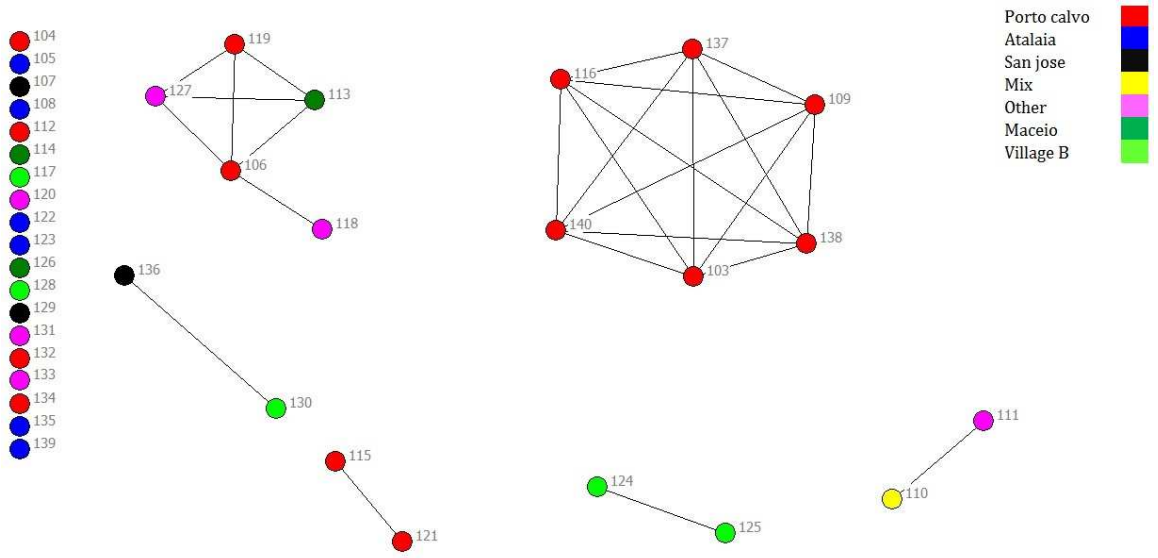
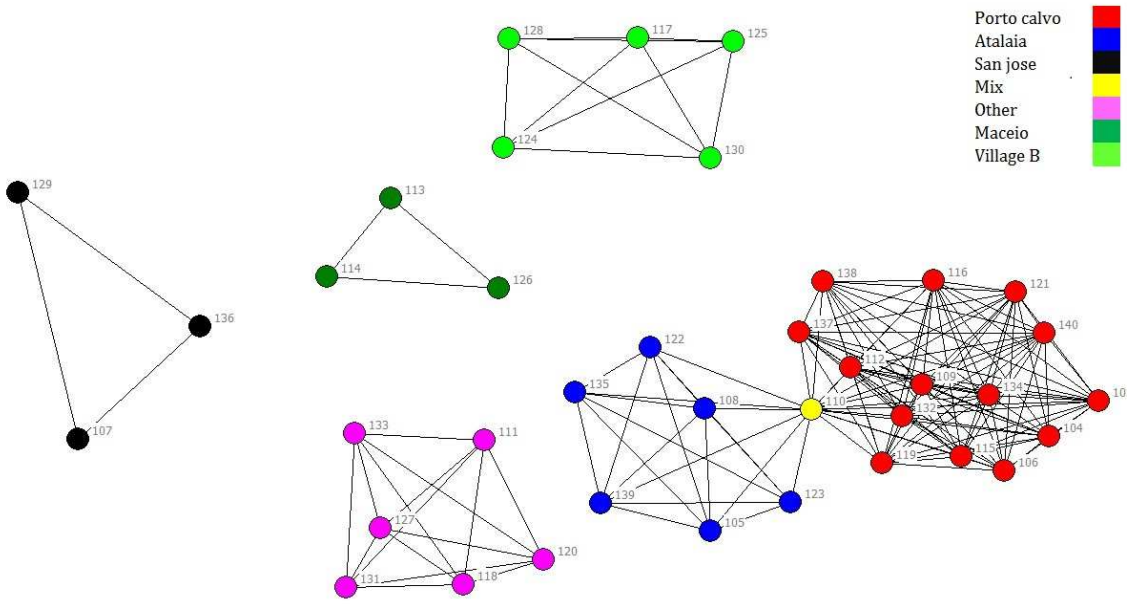


Figure 4.4, the network representation of an affiliation matrix defined by villagers' geographical origin, shows that in this village there is only one marriage between two people from the same migration wave but from different origin, namely one person recruited by MST activist coming from Porto Calvo and another that was part of Atalaia group. Instead there are no marriages between old settlers and new settlers.

Figure 4.4 Network representation of settlers' origin



Village C

Comissão Pastoral da Terra created village C, differently from the previous two settlements, the land has not been expropriated after a process of occupation but instead it has been bought by INCRA.

There are a larger number of households that were already living in the village (27%) or in the immediate neighboring area that arrived there as soon as they received information by their relatives that it was possible to get access to the land.

Most of the new settlers did not shared a common history of occupation but rather INCRA with the intermediation of Comissão Pastoral da Terra called households that already had experience of struggle in different settlements across the state of Alagoas. A small group of three households have already been occupying in other settlements for over six years.

This situation is represented by figure 4.5 that shows the presence of a larger group mostly composed by old settlers colored in red and few new settlers connected by kinship ties. The presence of different colors, representing different origins, of nodes being part of the larger clan is due to the fact old settlers called their relatives to join them in the village.

The main geographical origin of households living in the village are: 1) the village itself (old settlers) colored in red, 2) neighboring "fazendas" colored in pink, 3) Maceio colored in

dark green, 4) Porto Calvo colored in light grey, 5) Messias colored in black, 6) Porto Pedras colored in light green, 7) Jacuipe colored in light blue. Households that have other origins are colored in dark blue and marriages mixed across origins are colored in yellow.

Figure 4.5 Village C kinship network: nodes colored by origin

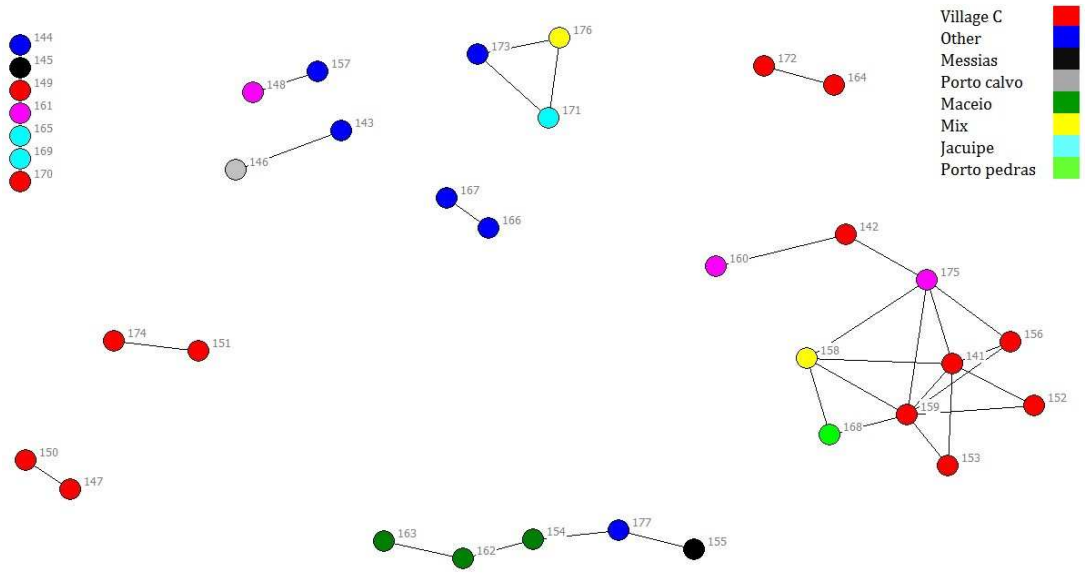
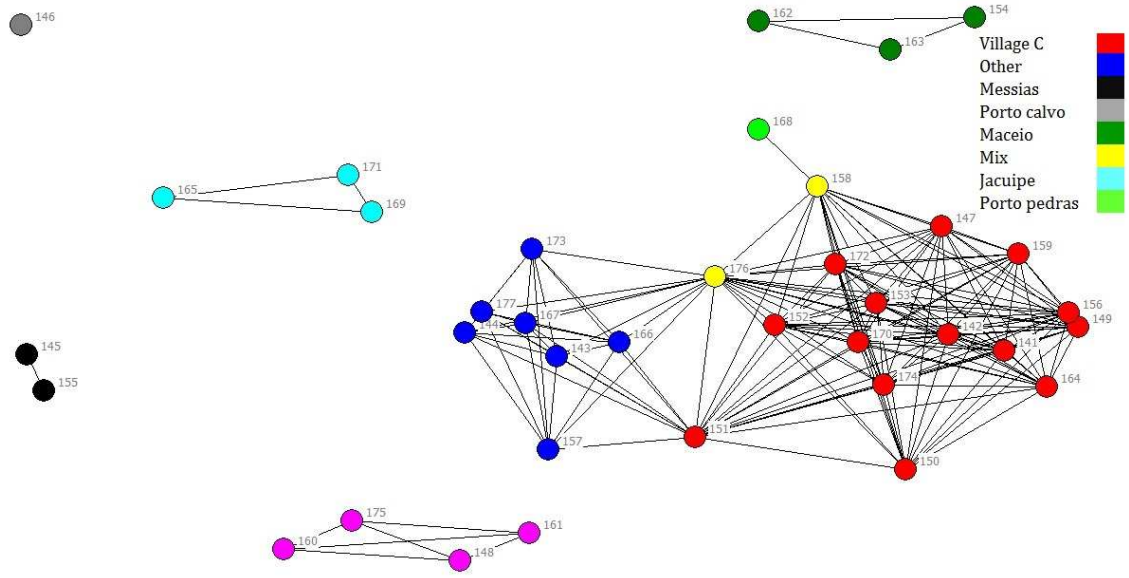


Figure 4.6 is the network representation of the affiliation matrix defined by villagers' geographical origin. It shows that there are only two mixed marriages: one between one of the coordinators of the villages in its early phases of creation and the daughter from one family part of the largest clan of old settlers and one between the children of old settler and new settler are neighbors.

The first marriage we can consider that as a form of co-optation. This marriage was in fact between the first coordinator of the village appointed by CPT and the daughter of one of the families of the larger clan.

Figure 4.6 Network representation of settlers' origin



4.4.1 Why more mixed marriages across origin in village A?

In village A there is, among villages studied, the highest number of marriages across origin, being in total 12. By analyzing the geographical location of these couples, in relation to their families of origin, it is possible to observe that most of them are neighbors. These marriages therefore can be considered as the result of what anthropologists call *casamentos em casa* (Nogueira 2013) or marriages between neighbors.

"*Casamentos em casa*" join relatives and neighbors in a sort of "extended family", where those that connected by kinship among them, confirm their belonging to the family and to the family's land, and people from outside are integrated, reaching the point where it is impossible to think about a real division between relatives and not relatives, between those of the family and those from outside. The matrimonial practice is an important and ancient strategy of reproduction in peasant families, preserving the direct relation with the perpetration of group domination (land inheritance) over the land, the major heritage for these families (Bourdieu, 2004; Garcia Júnior, 1983; Godoi, 1998, 1999; Moura, 1978; Woortmann, E.,1995; Woortmann, K., 2009). According to Bourdieu (2004), peasants' marriages have as primary function to guarantee the continuity of a family, without compromising the integrity of its heritage. In this sense, a reproduction/ conservation of the

integrity of peasant heritage which is destined to "preserve the kin unity and the circuits of reciprocity that in her and for her are active, as well as the moral conception of relationship with the land (Woortmann, E.,1995, p. 225)" (Nogueira 2013, 253).

Couples married across different origins are in fact mostly the children of old settlers ("moradores do engenho") that married with new settlers. It can be argued that is not by chance the fact that many of these marriages involve old settlers as they were often *moradores*, a high position in the sugar cane plantation very hierarchical society (Sigaud 2008). The access to a small piece of land by the *senhor do engenho* represented a privilege in respect to the rest of people living in the *fazenda*. Until the 1962 in fact sugar cane workers had no labor right: there was no minimum salary and the payment was the result of the negotiation with the landlord. The possibility to use such piece of land represents in fact a very precious resource and an important element of distinction from the other households living in the *fazendas* (Guilhoto et al. 2007, 210).

Many of these marriages joined physically contiguous plots that sum up to a larger portion of land. Most probably the main motivation is therefore to increase family land property. However the question is why this strategy was implemented mostly in village A and not in the other villages. The argument proposed is that more mixed marriages are the result of the combination of three main factors: more work opportunities inside the village, co-presence in the same living space between old and new settlers, more remote location of village A in respect to the other two villages.

In village A many young people, specifically the children of old settlers and new settlers, did not leave the village permanently. The presence of large family farmers represents in fact a work opportunity mainly for young male adults. Several young men engage in what is referred as "pre-marriage migration" but then they come back home to create new households. "Pre-marriage migration" has both a practical and symbolic meaning as it allows on the one hand to build some savings to start their adult life and on the other it is a rite that establishes the transition from boy to man (Guilhoto et al. 2007, 219). In the early phases of household creation several young males are involved temporary activities both in family farming employment working for some of the large producers in the village or in sugar cane plantation as causal labor force only in the peaks of the season (*clandestinos*).

Furthermore in village there is no physical division between old and new settlers as in village B. In village B, where the settlement creation process was driven by MST, the old settlers were the only that could have their house on the plot, while this was not possible for new settlers, apart from two exceptions. A side effect of this is a physical segregation between the two groups: old settlers in the plot and new settlers in the *agrovila*. Instead in village A, where no social movement led the settlement creation, Geremias' leadership prevented INCRA from sending away exceeding families and allowed all households to build their house on their plot. In addition the activities developed in early years of village creation favored more cohesion between old and new settlers. While in village B the main activities were participation to political parades instead in village A several activities inside the village were organized.

In village A the physical distance from the main road limits the mobility of villagers given the difficulties of access to the village. This imply that for young people, after they finish the school, the main space of social interaction is the village and this is where they are most likely to find their spouse. It is interesting, however, to make a comparison between village A and C in respect to villagers' marriage behavior as they share similar distance from the road but where there are differences in the marriage behavior. In village B very few young people stay in the village in adult age. In contrast in village C there are more young adults but they tend not marry people living in the village but people that have different geographical origin

4.5 Different ties' generator mechanisms of frequent contact network

The three frequent contact networks have a small number of isolates[20] and similar average degree[21] (Table 4.9) but they present different local structures (Figures 4.8, 4.9, 4.10).

Table 4.9 Frequent contact network overall features

	Village A	Village B	Village C
Density	0.034	0.114	0.101
Isolates	2%	5%	0%
Average degree	3.39	4.21	3.6

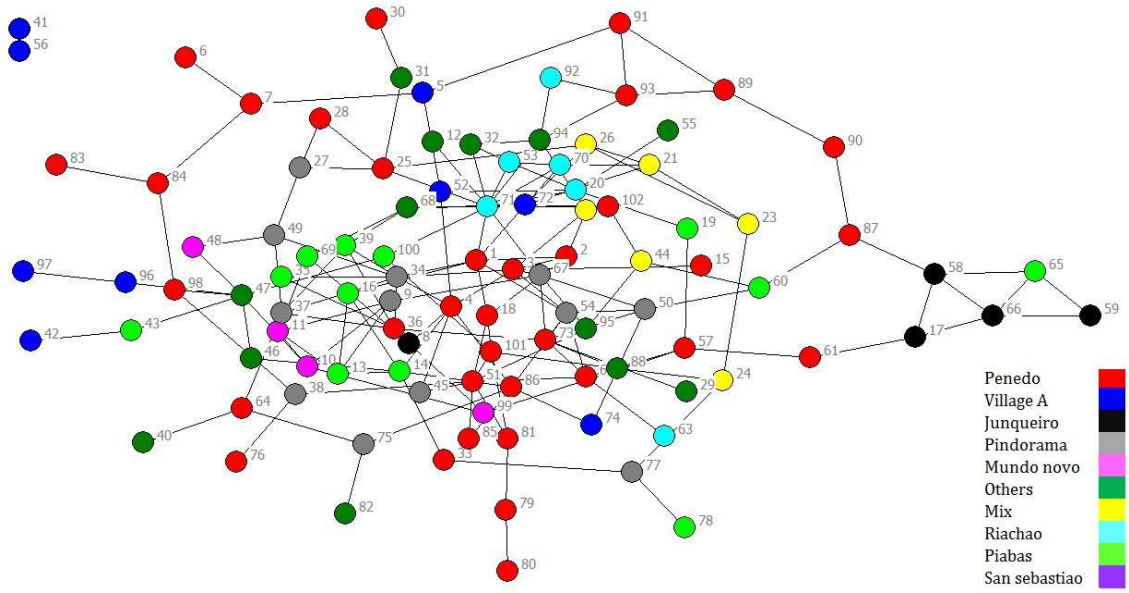
[20] Isolates are nodes with no-connections.

[21] The degree, in an undirected network, measures the number of alters with whom ego is connected. The average degree is the mean of the number of ties that each ego has.

The nodes (Figure 4.7, 4.8 and 4.9) are colored with the attributes that are more important in determining the link between households in the frequent contact network.

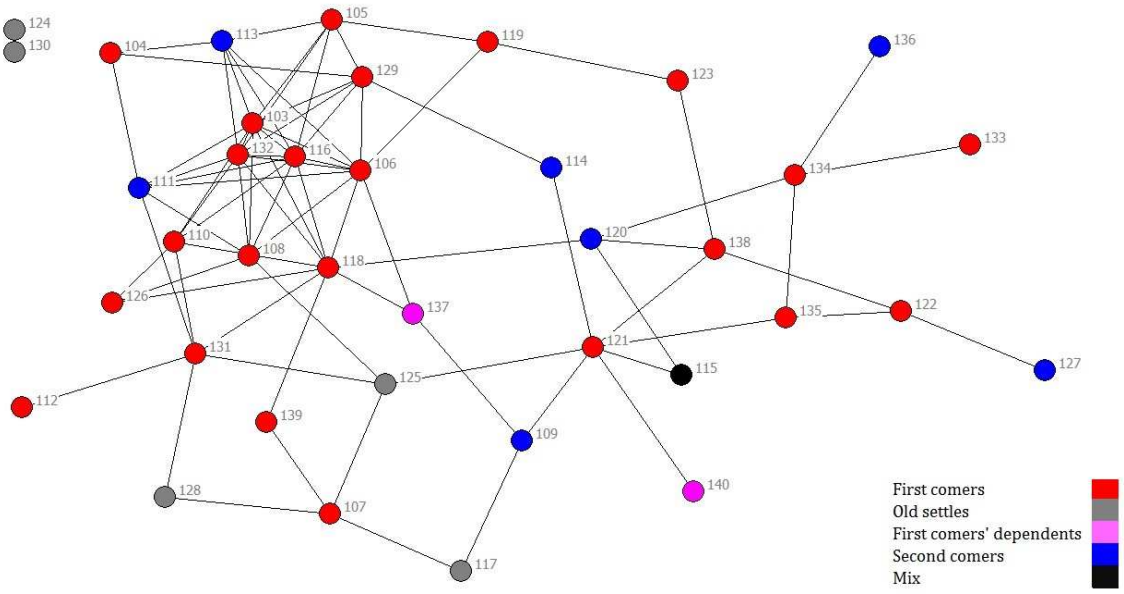
The network of village A is the most interconnected being difficult to separate single cliques, except at the periphery of the network (Figure 4.8). In village B and C instead it is easier to identify cliques. This means that in village A, besides being homophily on origin an important effect, this does not create segregation.

Figure 4.7 Village A contact network colored by origin



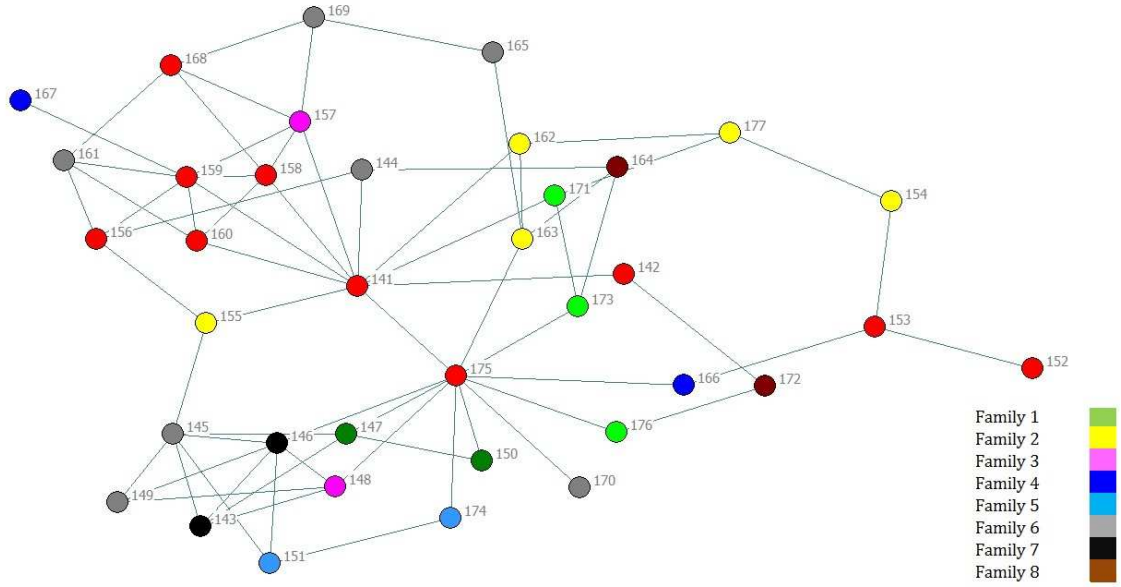
In village B there is a dense group where all households are connected to each other while the rest of households are only connected by a smaller number of ties (Figure 4.8). Households, that arrived together at very beginning of encampment process and that are currently living in the same road, compose the mostly densely connected group.

Figure 4.8 Village B contact network colored by wave



In village C the contact network is sparser and there are few brokering nodes between the more dense groups that can be identified in the network (Figure 4.9).

Figure 4.9 Village C contact network colored by kinship



4.5.1 Model specification

The overall hypothesis that is tested in this sub-section is that the three observed frequent contact networks of the three villages are based on different social processes are the result of different villages' histories.

Two main important elements differentiate villages' histories. The role of kinship, as in village B, MST defined a specific number of households that could be linked by kinship in the same settlement, and while in the two other villages there were not such limitations. The presence of different shared attributes that are ties-generator mechanisms and that are derived from different recruitment patterns.

The main possible reasons for establishing contacts that are considered in this analysis are the following: kinship, geographical origin, being arrived during the same migration wave, attending the same church, and going to the same political parade. In villages B and C, villagers had no time to get to know each other before occupation as MST and CPT were extremely fast in the process of mobilizing people; by contrast, the association organizing people in village A allowed for better knowledge of people before occupation.

For each village, I estimate a model that analyzes the effects of particular network configurations on the presence of ties in the frequent contact network among households:

$$logit\ \Pr\ (X_{ij} = 1|\theta) = \log\ Pr\ (X_{ij} = 1|\theta) = log\ Pr \frac{Pr\ (X_{ij} = 1|\theta)}{Pr\ (X_{ij} = 0|\theta)}$$

$$= \theta_1 z_{1ij} + \theta_2 z_{2ij} + \theta_3 z_{3ij} + \varepsilon_{ij}$$

The dependent variable is the probability of a new tie occurring in the network. The predictors are three vectors of network configurations z_n: sociability (*edges*[22]), uniform homophily (*nodematch*[23]), and edge covariance (*edgecov*[24]). In ERGMs the coefficients represent the effect of each network configuration on the log odds of a new tie occurring[25].

[22] *edges* command in Rstatnet

[23] *nodematch* command in Rstatnet

[24] *edgecov* command in Rstatnet

[25] In order to estimate the effect of the network statistic specified in the model on the odds of a new tie occurring it is necessary to take the exponent of the coefficient of the parameter.

Three steps have been followed in order to identify the presence of different tie generator mechanisms namely homophily on node attributes and edge covariates. Moreover this procedure allows to identify is family farming is a tie generator mechanism. Each model is estimated separately for each village.

Several bivariate models that have as predictors in the model (network configurations) are *edges* plus the effects described above. The aim of this model specification is to understand what network configurations have an effect when inputted alone and to identify the direction and size of each effect singularly.

Multivariate full models with all the network statistics whose effects have been tested in single bivariate models. The hypothesis is that some network statistics are redundant with respect to others. This model allows identifying the most important network configurations. The full model estimates' results show that the most important network configurations are edge covariance on kinship and homophily on origin and migration wave.

A stepwise procedure has been followed to test if the development of family farming activities in the villages created new network configurations that in turn generated new ties that are non-redundant to the preexisting ones. The first model includes one history-related network configuration (wave homophily and origin homophily) and kinship edge covariance. The second model includes also the predictor edge covariance on family farming employment to the model. The third model includes as predictors in addition engagement in family farming homophily effect. Lastly, the fourth and fifth model include additional structural effects such as geometrically weighted degree, geometrically weighted edgewise shared partners, geometrically weighted dyadwise shared partners to increase the fit of the model and to control respectively for tendency towards centralization and clustering effect.

4.5.2 Bivariate models results

Table 4.10 reports the results from the bivariate models and shows the coefficients, standard errors, and levels of significance of all network statistics specified in the model. For significant parameters the odds ratio have been included in order to make clearer which parameter has the strongest effect.

The table 4.10 does not show the effect of edges for each of the bivariate models, as they are all significant and negative. The negative sign of the edges parameter means that there is

an overall tendency to refrain from building ties. The frequent contact networks of the three villages have in fact a low density. The decision to show only homophily effects' and edge covariance effects' estimates allows visualizing the comparison among the different villages.

The similarities that households can share have been classified in six typologies of characteristics: 1) settlers' attributes from the past, 2) villages' formation attributes, 3) social activities in the village, 4) hierarchy indicators, 5) activities outside the village and 6) covariate networks.

Table 4.10 confirms that sharing common geographical origin is a tie generator mechanism in village A, where many households had the opportunity to get to know each other before taking part in the mobilization, while this is not the case in village B and C where fewer people knew each other before coming to the village. In village B households that arrived during the same migration wave are more likely to be in connected in the frequent contact network. In village C instead there are no network statistics that describe settlers' attributes from the past nor villages' formation attributes that have an homophily effect in the observed network. As illustrated in chapter three, in village C there was not a specific rule based on households collected attributes that has driven the process of village creation. As results settlers were very heterogeneous in their characteristics at the moment of settlement creation.

The comparison of the total number of significant parameters across villages shows that village A has a larger number of network statistics that are significant: in total ten homophily effects and three edge covariance effects. Village B and village C have a smaller number of parameters that are significant being respectively seven and nine. In village C three out of nine parameters are edge covariates. In village C households are more likely to have frequent contact when they have another type of relation than when they share similar characteristics (homophily).

The results of the model show the presence of several differences across villages in significant networks configuration. In village A there is plurality of significant network configurations that refer to all of the categories of attributes referred. In contrast in the other two villages these homophily effects are not significant. In village B and C significant homophily effects refer to participation in social and economic activities in the village.

In village A the significance of variables referring to settlers' attributes from the past can be interpreted as a confirmation of qualitative analysis of the village's history. The parameter shows that many households already knew each other before getting to the village. The statistics "contact to get to the village" and "previous employment before" are positive and significant. Especially members of Geremias' association have been meeting for almost two years before reaching the village. Furthermore in village A also common attendance in the same village church has an effect is a tie generator mechanism. This network statistic measures the number of times that households attend the church activities per year. In village A there are two evangelical congregations and one catholic congregation. Evangelical church 1 is the oldest congregation that started its activities when the settlement was created. It is located in the main square of the villages where also the Catholic Church is located. It is a larger church in terms of members. Instead evangelical church 2 is a smaller congregation where many of the affiliates are also connected by kinship ties. It is also the only church that has not a building in cement but that it is a hut.

In village B there are few significant effects and most of refer to migration patterns in the village while no households' characteristics from the past are significant. Participation to strikes and protest acts represented during village creation process an important factor of socialization between households. Both participation to the same political parade and village president are significant homophily effects. The other significant homophily effects describe activities inside the village, which are a female association and having sold the same value to the cooperative. These activities however are related, as many of the members of the female association are also cooperative's members.

In village C the two only positive and significant homophily effects describe common activities inside the village namely participation in village football team and in the catholic congregation. All other significant homophily effects have negative signs meaning that sharing those characteristics hampers the creation of new ties. Furthermore sharing other common ties is an important mechanism that predicts the probability of a tie in frequent meeting network.

In both village B and C the predictors that describe households' engagement in cooperatives' activities (value sold to coop in 2011 and average production sold to the cooperative 2007-2012) are significant parameters. However, the negative sign of the

coefficients indicate that this is probably an indicator of hierarchy rather an indicator of equality. The majority of villagers do not belong to the cooperative therefore this negative sign is mostly capturing how the non-participation to the cooperative influence the probability of a tie.

The only effect that is significant in all three villages is being e*ngaged in family farming in 2012*. This network statistic portrays the higher probability of households to be frequently meeting when they share family farming as livelihood. However while in village A and B family farming has positive coefficient, in village C the coefficient is negative. In village C the coefficient of the parameter of edge covariance in family farming has a positive sign; it can be interpreted as the presence of more interaction related to a hierarchical process such as working for another households (work for network), rather than a interaction between peers.

Table.4.10 Bivariate village models estimated coefficient of frequent contact network

	Village A				Village B				Village C			
	Estimate	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**
Actor dyadic effects (Homohily)												
settlers' attributes from the past												
employment sector before agrarian reform	0.56	0.16	***	1.76	0.33	0.27			-0.04	0.26		
geographical origin	1.03	0.16	***	2.79	0.22	0.28			0.09	0.34		
village formation attributes												
contact to get in the village	0.49	0.17	**	1.62	-0.29	0.37			0.31	0.31		1.36
migration wave	0.41	0.17	*	1.51	0.72	0.24	**	2.05	-0.09	0.30		
social activities in the village												
catholic church	0.39	0.17	*	1.48	-0.40	0.24	.		0.55	0.26	*	1.74
evangelical church 1	0.40	0.19	*	1.49	-0.04	0.30			-0.03	0.30		
evangelical church 2	0.64	0.27	*	1.90								
footbal team member	0.10	0.16			-0.03	0.24			0.53	0.26	*	1.69
membership in village association	0.01	0.16			-0.61	0.25	*	0.54	0.25	0.35		
economic activities in the village												
engaged in family farming	0.35	0.16	*	1.41	0.55	0.24	*	1.73	-0.66	0.26	*	0.52
employment at survey time	0.34	0.16	*	1.40	0.06	0.26			-0.33	0.31		
value sold to coop in 2011	-0.14	0.15			-0.81	0.32	*	0.44	-0.69	0.35	*	0.50
average production sold to coop '07-'12	-0.29	0.16	.		-0.53	0.24	*	0.59	-0.69	0.35	*	0.50
hierarchy indicators												
village president (node covariance)	0.69	0.25	**	2.00	0.83	0.23	***	2.29	0.33	0.25		
number of households for which they work	0.04	0.16			0.08	0.55			-0.60	0.26	*	0.55
number of workers hired	0.06	0.16			0.23	0.24			-0.26	0.26		
activities outside the village												
production sold in the same local market	0.04	0.20			-0.19	0.24			0.12	0.26		
political parade participation	0.30	0.16	.		-0.50	0.25	*	0.61				
Coviarate networks (edge covariance)												
edge covariance hire network	2.48	0.29	***	11.93	-0.09	0.76			1.68	0.64	**	5.37
edge covariance in kinship network	3.05	0.17	***	21.03	0.89	0.48	.		1.95	0.40	***	7.04
edge covariance in work for network	2.17	0.39	***	8.76	0.90	0.58			3.26	0.61	***	26.10

Coefficients significance codes: p value<0.001 '***' p value =0.001 '**' p value =0.01 '*' p value = 0.05 '.'

4.5.3 Full model results

The second step of the analysis is specifying the model with all network statistics that have been tested singularly in the bivariates models in table 4.11.

A correlation analysis on the variables describing homophilous traits (Appendix 4.1) has been performed to control for possible multicollinearity. The two pairs of variables with a correlation higher than 0.6 with each other in the three villages are: 1) *employment sector at survey time* and *engaged in family farming*, 2) *average production sold to coop 2007-2012* and *value sold to coop in 2011*.

A sensitivity analysis on the effect of omitting highly correlated variables (reported in Appendix 4.1) led to a finer selection of the network statistics: in village A and C *employment sector at survey time* and *average production sold to the cooperative in the period 2007-2012* have been removed. In village B three variables (namely *employment sector at survey time*, *average production sold to the cooperative in the period 2007-2012* and *production sold to the cooperative in 2011*) have been omitted in the full model.

Furthermore in all three models the variables *number of workers hired* and *number of households for which they work* were omitted in the full model because these two aspects are already captured by the edge covariate terms describing family farming employment network. By introducing both terms in the model it is possible that this could introduce multicollinearity problems.

Table 4.11 shows the full model estimates and standard errors for the network statistics and the odds ratio only for the parameters that are significant. As expected, in the three villages, the number of significant network statistics decreases significantly from the bivariate model presented in table 4.11. In village A and B it decreases by more than 50% passing respectively from 13 to 7 and from 7 to 3 significant effects, while in village C it decreases from 9 to 4 significant effects. This result confirms the redundancy of some network statistic which effect is already captured by others.

In village B and A, the estimate of nodecov "village office" was significant in the bivariate model and keeps its significance also in the full. Furthermore the value of the estimate does not change significantly. The positive sign indicates that the probability of a tie is higher when both households had an office or when at least one of the two had an office in the village. Given the very few number of households that had an office in the village (in total maximum

4), the probability of a tie between two households is higher when at least one of the two has or had an office in the village.

Table 4.11 shows that in village A there are more network statistics with positive and significant coefficients, seven in total. This implies that, in this village, there are more shared households attributes' that generate ties in the observed network. In village A the traits that result significant that have significant homophily effects are the following: attending the same village church, having the same geographical origin, having had the same previous employment before moving to the village. Furthermore the presence kinship and family farming employment ties increase the probability of tie formation in the observed network.

Most homophily statistics relating to attendance of religious functions lose their significance in the full model in village A, with the exception of evangelical church 2, which keeps its significance. As described earlier evangelical church 2 is a very specific congregation, which is smaller and has both a specific geographic and group focus. The fact that keeps its significance can be interpreted as the fact that sharing such characteristic is a mechanism to create ties which effect cannot be described by others.

Migration wave network statistic loses significance, probably because its effect is partially captured by migration origin. Several people that shared common migration origin also arrived in the village during the same period.

In village A differently from B and C the effect of family farming engagement is not significant in the full model. The possible reason for this is that being engaged in family farming is partly captured by other parameters that are proxies for the importance of family farming, such as the employment sector before agrarian reform, as most households that were farmers before are still farmers, and by the edge covariance in the two parameters, that describe the family farming employment network.

In village B model has the lowest number of significant effects, with only three network statistics showing significant and positive estimates: engaged in family farming, migration wave and village president. It is important to observed they are only homophily effects while there are no edge covariance effects that are significant in the full model.

In village C four network statistics result significant: two homophily effects (football, engaged in family farming) and two edge covariance effects (kinship and work for network). Engaged in family farming homophily effect, as in the bivariate model is negative.

Table 4.11 Estimated coefficients of village frequent contact network full model

	Village A				Village B				Village C			
	Estimate	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**
edges	-5.20	0.47	*	0.01	-2.48	0.48	*	0.08	-2.69	0.65	***	0.07
Actor dyadic effects												
settlers' attributes from the past												
employment sector before agrarian reform	0.42	0.18	*	1.52	0.37	0.29			0.35	0.33		
geographical origin	0.52	0.20	**	1.68	0.22	0.33			-0.19	0.45		
village formation attributes												
contact to get in the village	0.07	0.20			-0.86	0.45	.		0.49	0.38		
migration wave	0.25	0.21			0.74	0.26	**	2.09	-0.25	0.40		
social activities in the village												
catholic church	0.24	0.20			-0.18	0.28			0.49	0.31		
evangelical church 1	0.32	0.21			-0.38	0.33			0.18	0.36		
evangelical church 2	0.63	0.29	*	1.87								
footbal team member	0.00	0.17			0.14	0.26			0.65	0.29	*	1.92
village association	-0.18	0.18			-0.24	0.28			0.21	0.40		
economic activities in the village												
engaged in family farming	0.29	0.17	.		0.58	0.25	*	1.79	-0.83	0.30	**	0.44
employment sector at survey time*												
value sold to coop in 2011	0.01	0.19			-0.20	0.39			-0.76	0.45	.	
average production sold to coop 2007-2012*												
hierarchy indicators												
village president (node covariance)	0.68	0.29	*	1.97	0.63	0.27	*	1.87	0.36	0.30		
number of households for which they work *												
number of workers hired*												
activities outside the village												
production sold in the same local market	-0.14	0.23			-0.18	0.25			0.36	0.30		
political parade participation	0.11	0.17			-0.19	0.27						
Coviarate networks												
edge covariance in hire network	1.45	0.38	*	4.28	-0.31	0.80			1.30	0.77	.	
edge covariance in kinship network	2.81	0.19	*	16.61	0.92	0.54	.		1.71	0.48	***	5.52
edge covariance in work for network	1.78	0.39	*	5.95	0.90	0.66			3.15	0.68	***	23.27

Coefficients significance codes: p value<0.001 '***' p value =0.001 '**' p value =0.01 '*' p value = 0.05 '.'

The goodness of fit of the model shows a good level of convergence for village A (Figure 4.10) and C (Figure 4.12) and an acceptable level of convergence for village B (Figure 4.12). This result is important as it shows that the difficulty of modeling village B network cannot be explained by the relative lack of power or size effect. Village B and C have the same dimension but village C specification shows a much better level of convergence.

Figure 4.10 Goodness of Fit of village A full model

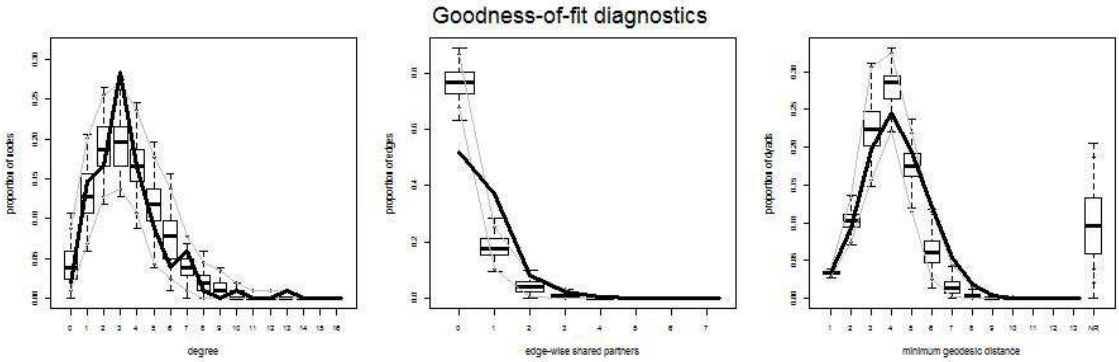


Figure 4.11 Goodness of Fit of village B full model

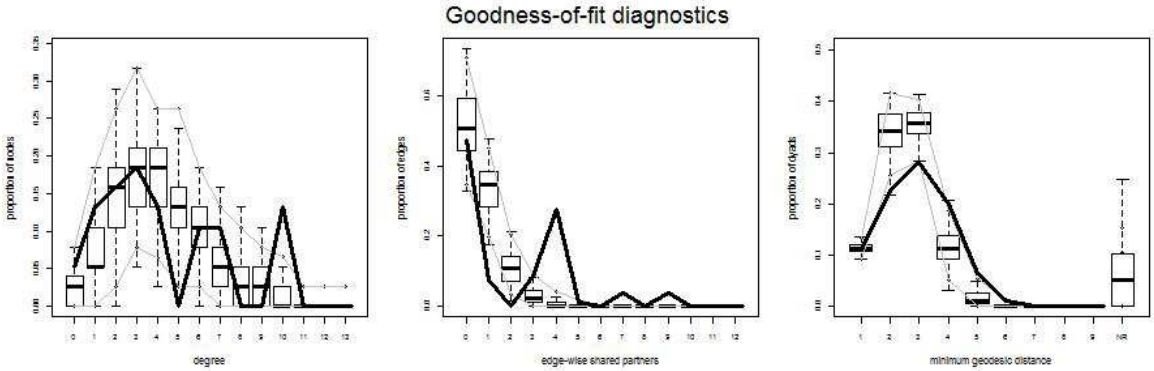
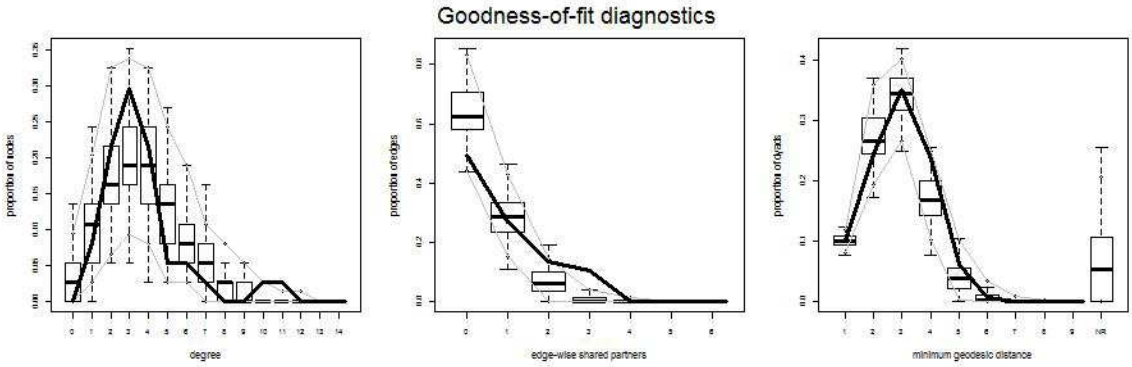


Figure 4.12 Goodness of Fit of village C full model



4.6 Family farming as social mechanism to generate ties

Engagement in family farming is a reason for proximity in the frequent contact network across the three villages. However, the importance that this activity has for villagers varies greatly across villages. Village A is the most successful settlement in terms of agricultural production, not only because many of the settlers had already experience in family farming (Table 4.12) but also because of the co-evolution of intertwined social ties that allow for the

creation of ties across households that better allow to adopt family farming as main livelihood strategy.

In order to have a more complete picture of how family farming varies in importance across villages, it is necessary to take into consideration a series of variables that include not only the number of households that declare to be family farmers and family farming income distribution across villages (Figure 4.13) but also to consider how many households there are in each class of family farming income over total income (Table 4.12) and difference in typologies of crops produced, as described in chapter three. While in village A there is a high percentage of production that is composed by products that were not present before the agrarian reform, in the other villages the "old crops" represent still the prevalence of the production (Figure 4.14).

Figure 4.13 Extension of area in hectares by category of products

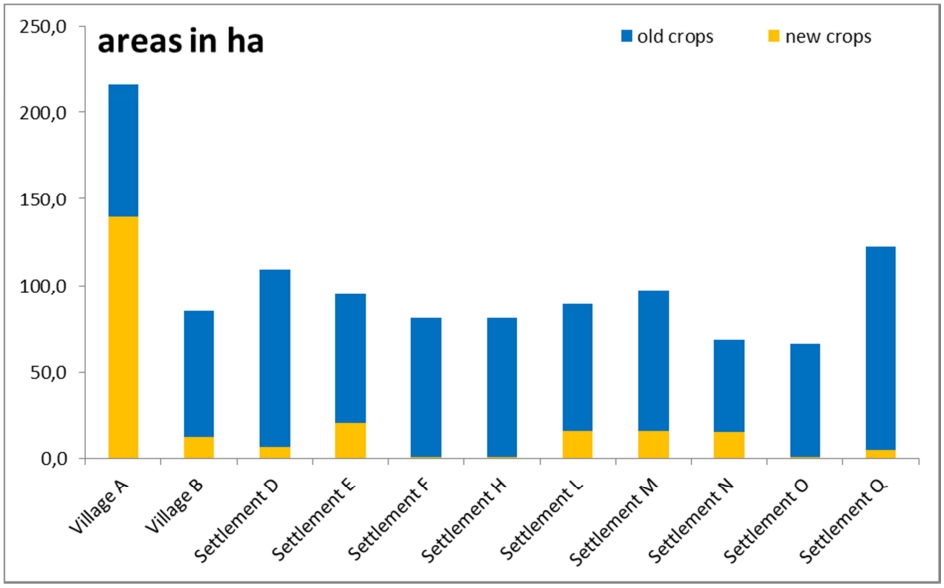


Table 4.12 Households' engagement in family farming in the three villages

	Village A	Village B	Village C
Family farming as main livelihood strategy before agrarian reform	32%	21%	5%
Family farming as main livelihood strategy in family farming after agrarian reform	49%	45%	24%

Figure 4.15 illustrates the difference in the distribution of income from family farming in the three villages. While the median value does not differ significantly it is possible to observe that the range is very different across villages. In village A in fact values go up until 2000 reais (approximately 630 euro) corresponding to more than two Brazilian minimum salaries. However, family farming income could be a biased variable: on the one hand because of the difficulty for households to calculate net monthly income from family farming, and on the other hand because households could refrain to declare high income because they may fear to lose their social benefit from the state (*Bolsa familia*).

Figure 4.14 Family farming income distribution in the three villages

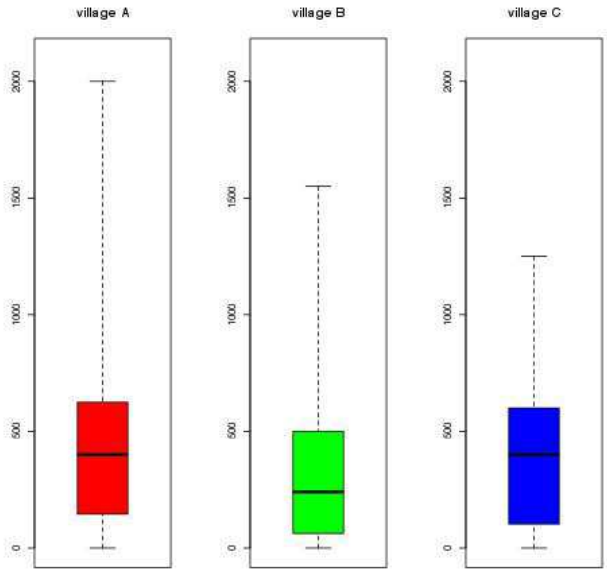


Table 4.13 presents a comparison of the percentage of households per class of weight of family farming on total income. Table 4.15 illustrates households' average income from family farming for each category of weight of income from family farming over total income. They show that village A is the village where family farming plays a more important role in terms of income generating activity. Even if in terms of net income of pure family farmers the average is the same (Table 4.14).

Table 4.13 Percentage of households by category of income

Family farming income over total income	Village A	Village B	Village C
0	18	21	24
0.1. ≤ x ≤0.5	31	37	49
0.5≤ x ≤0.9	7	8	19
1	43	34	8

Table 4.14 Average family farming income (R$) by category

Family farming income over total income	Village A	Village B	Village C
01. ≤ x ≤0.5	407.8	276.1	289.4
0.5≤ x ≤0.9	578.2	380.0	651.4
1	706.8	711.2	683.3

The pictures below (Figure 4.15, 4.16 and 4.17) represent the three frequent contact network color coded as follows: dark green dots represent households that were living from family farming before coming to the settlement and continue to be farmers; light green dots represent households that started to live from family farming when they arrived to the settlements, purple dots represent sugar cane cutter that did not change their livelihood after the agrarian reform, and grey dots stand for households that are not represented by the previous cases.

Figure 4.15 Village A frequent contact network

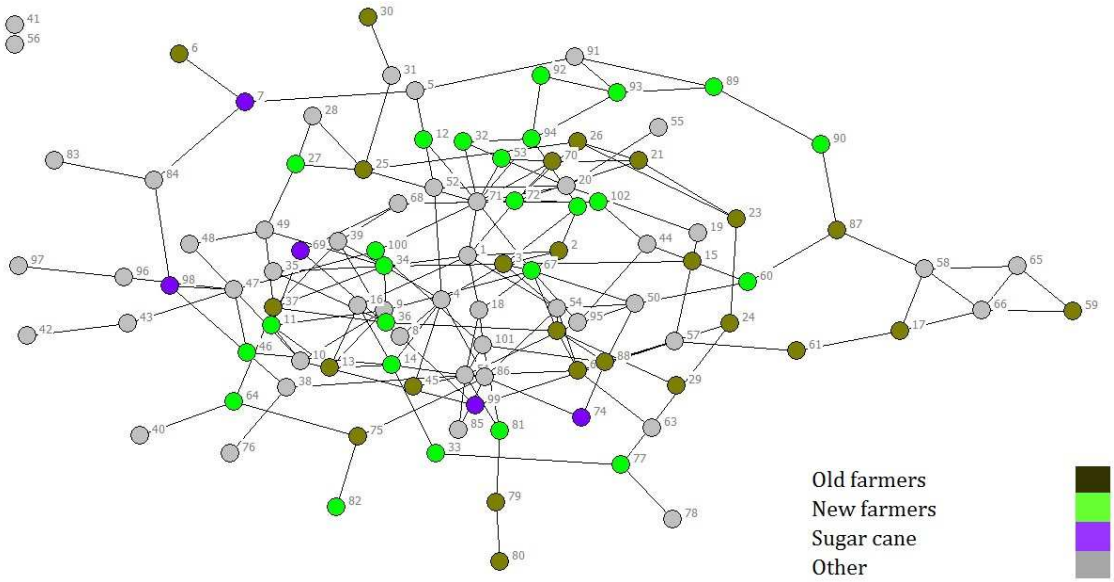


Figure.4.16 Village B frequent contact network

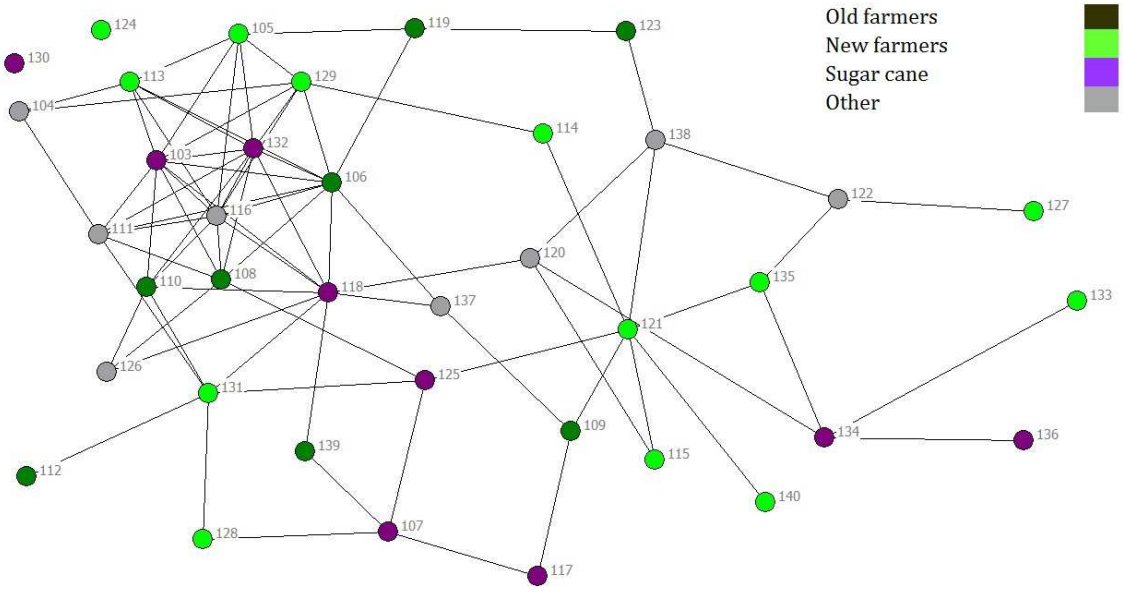
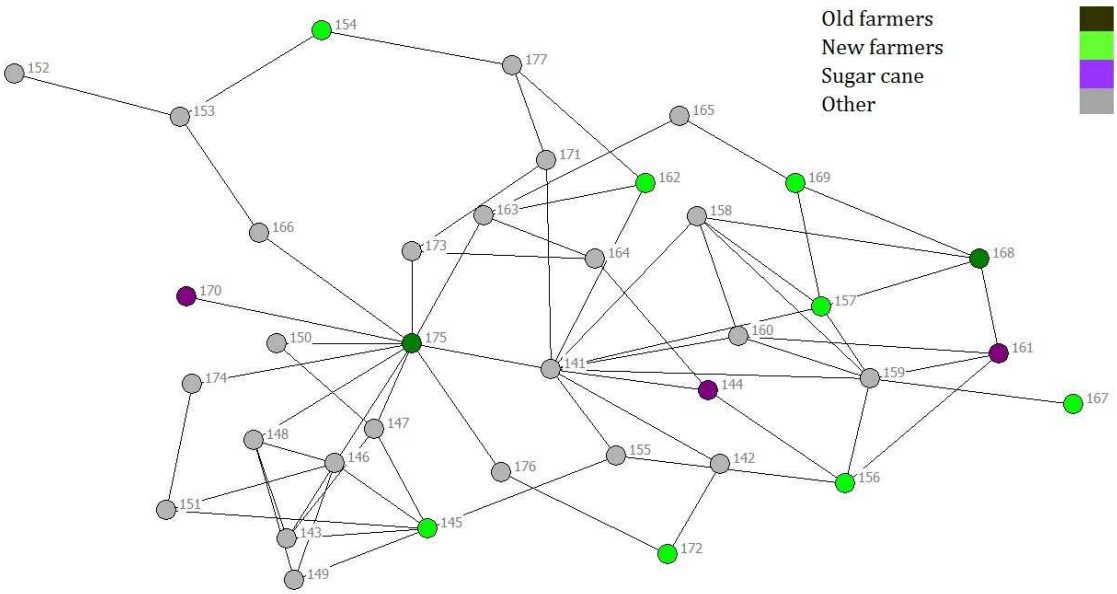


Figure 4.17 Village C frequent contact network



The three networks of the three villages show how households, that declared to be engaged in family farming as main income generating activity, tend be close to each other in the frequent contact network. However, the position in the network of households that have as main livelihood strategy family farming differs across villages, while in village A family farmers are mostly at the center of the network, in villages B and C they are at the periphery.

4.6.1 Family farming employment as cross-cutting tie

This subsection shows first by network visualization and second by applying ERGMs that family-farming employment is a form of brokerage.

Figure 4.18, 4.19 and 4.20 show the different brokering force of family farming employment in connecting different groups defined by kinship. Nodes are colored by origin, kinship ties are red and family farming employment ties are green. The brokering connection is present in the three villages however the number of brokering ties varies across villages.

In village A the presence of family farming ties totally changes that network structure of the village (Figure 4.18). There is a shift from a situation of potential clash between two cohesive unconnected blocks to an integrated system. If we look only at kinship ties we see two distinct and isolated groups being one large endogamous cohesive clan and the other a

more polycentric structure where households of different origins are tied together by marriage.

Family farming employment ties keep together the two groups in a quite articulate way. The presence of multiple ties between the two groups makes the whole structure less vulnerable to possible tie removal that can separate the two groups. Most of the households are in fact integrated in the system and there are only three households that are left aside. In village A family employment network includes 77% of the households. On a more general scale this also means that many households are able to find their source of employment in the same village where they reside.

Table 4.15 Family farming employment network in the three villages

	Village A	Village B	Village C
Isolates	33%	50%	54%
Density	0.014	0.024	0.021
Average degree	1.41	0.89	0.76

Figure 4.18 Village A kinship and family farming employment ties

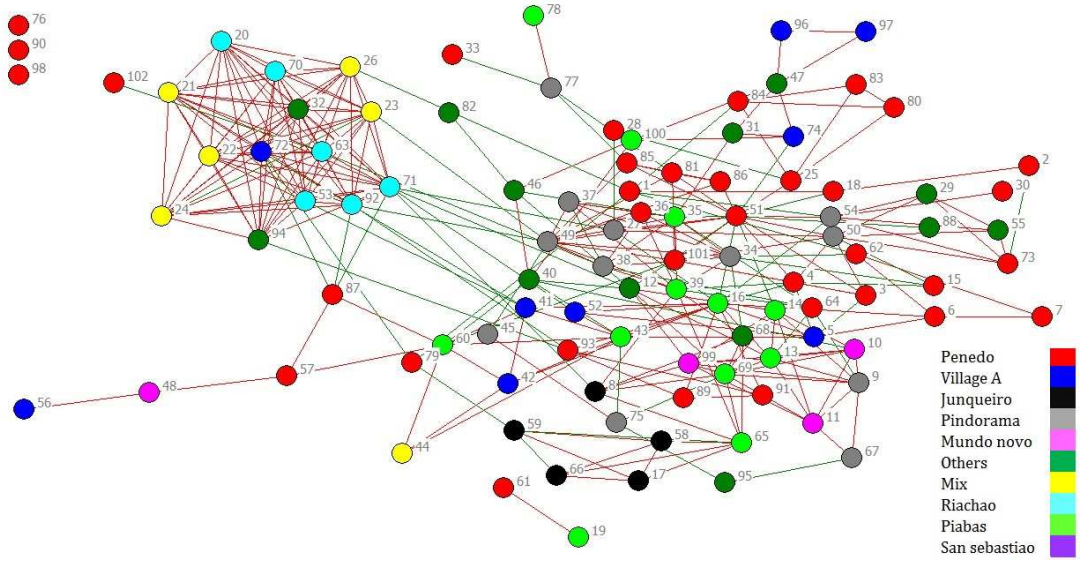
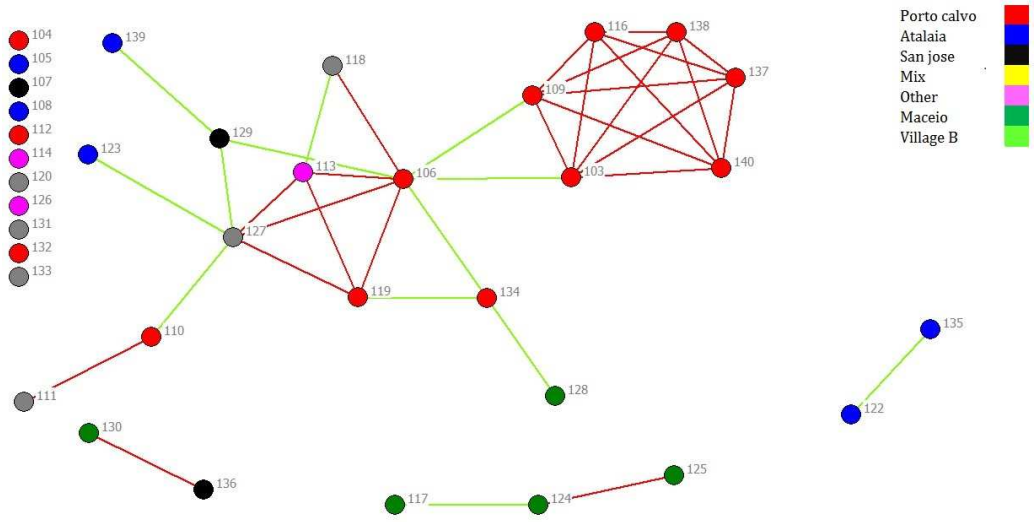


Figure 4.19 instead illustrates that in village B the situation is different; despite the brokering role of family farming employment between the two main groups, many families

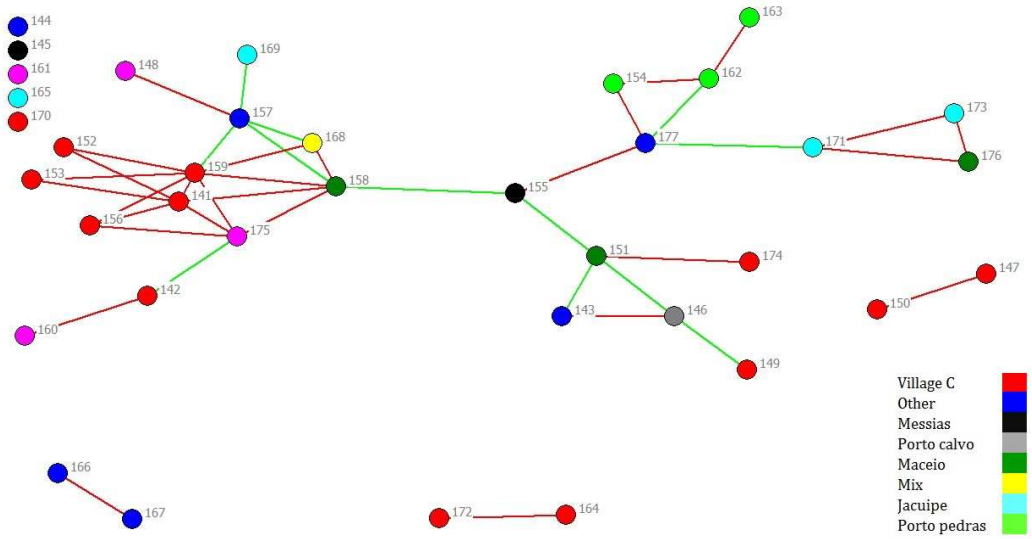
are left aside with the percentage of isolates being 50%. In village B there are 45% of the households that declare to make their living mostly out family farming but when it comes to income from family farming the values are mostly below one minimum salary (Table 4.14). This data show that family-farming production is mainly for subsistence and not on a scale that creates the necessity to hire somebody even occasionally to work on his or her plot. There is in fact a quite strong correlation (0.44) between income from family farming and number of households employed in family farming.

Figure 4.19 Village B kinship and family farming employment ties



In village C the brokering role of family farming employment is important but vulnerable (Figure 4.20). There are only three ties that connect the main clan mostly composed by old settlers and their relatives and some of new settlers. The role of family farming is certainly the lowest among the three villages: only 22% of households make their living out of family farming and most of households (57%) live out of a mixture between sugar cane employment and other activities.

Figure 4.20 Village C kinship and family farming employment ties



4.6.2 The role of cross-cutting ties in favoring adaptiveness

To test if cross-cutting family employment network played a role in favoring village adaptiveness to family farming it would have been necessary to have the three networks collected and households' engagement in family farming at two time points, namely at the time of village creation and at the time of the survey.

Attributes that describe households' engagement in family farming at the time of survey comprise the following variables: 1) number of families that declare to be engaged in family farming, 2) importance of family farming over the total income, 3) average income from family farming, 4) typologies of crops produced, and 5) number of people hired.

The only attribute that describes villagers' engagement in family farming at the time of creation of the village is a binary variable that indicates whether the household declared to have already been engaged in family farming before coming to the village.

In all the three villages there is an increase of the number of households that declare to be engaged in family farming from the time of village creation to present: these changed respectively for village A, B and C from 33 to 51, from 8 to 17 and from 2 to 9. Despite this increase in the total number, the values are different when it comes the number of households

that derive more than half of their salary from family farming in the three villages: in village A 50%, in village B 42% and in village C only the 27%.

In order to understand how higher and non-redundant connectivity of village A allows for better adaptiveness to family farming, the optimum would be to test with a social autocorrelation model the importance of social influence in determining the choice of households to engage in family farming as main livelihood strategy (representing more than 50% of the total income). However this relies on longitudinal data both on attribute and ties that are not available.

Given the absence of such information, some of the collected homophilous traits, namely common origin and common migration wave, can be considered as proxies of previous ties created at the moment of village creation. New ties instead are considered to be those related to family farming employment, new marriages and common participation to village events that provide villagers with the possibility to create new ties.

Family farming employment as a crosscutting tie is very important in allowing for better village adaptiveness, as it allows for a better diffusion of family farming by creating ties between households that would otherwise not be connected. The main argument is that in villages, where there are more non-redundant social mechanisms that allow for ties' formation, there are more opportunities for building new ties. In village A, the number of family farmers would not have increased over time if, at the time of village creation, the households with experience in family farming would not have got in contact with other households that did not share the same characteristics. Furthermore it is possible to consider this process as self-sustaining, as more households live from family farming, more households would be hired and therefore more opportunities of contagion will arise, if sharing engagement in family farming is a tie generator mechanism.

Exponential Random Graph Models aim at testing the following three hypotheses. First, in the three villages, the frequent contact network, that portrays interaction among villagers, have different number of ties' generator mechanisms that are positive and significant. Second, the role of family-farming employment as cross-cutting ties varies across villages, as illustrated in figure 4.19, 4.20 and 4.21. Third, households that both declared to be engaged in family farming tend to be connected in the frequent contact network.

In village A the frequent contact network is the result of a combination of both edge covariance effects and homophily effects, while in village C the main tie generator mechanism is edge covariance as there are very few significant homophily effects, that are positive and significant; instead in village B there are very few significant effects.

The more general argument is that village A is the more responsive/adaptive to the innovation introduced as there is no complete overlap between different networks, village C is instead characterized by redundancy/multiplicity in fact the probability of creating a tie between households is mostly explained by the presence of other ties and lastly in village B there are few effects that are able to explain the presence of ties between people in the network.

In village A there are more opportunities for households to create connections between households. ERGMs results show that in village A there is wider number of homophily and edge covariance effects contributing to network formation instead in the other villages, only households that share a very specific and low number of characteristics are likely to meet.

4.6.3 Presence of a gender bias in frequent contact network

Frequent contact network, having interviewed mostly women especially in village A and C (being respectively 62% and 70%), mostly portrays frequent meetings between women. There is therefore a gender bias[26]. An important question is whether family farming employment as cross-cutting network refers more to gender integration rather than to social integration. In order to understand the gender division of labor in family employment it is necessary to take into account four factors: first livelihoods' strategies composition, second the typology of crops production, third whether the household is female leaded and fourth the household's wealth. The reasons why the household could be female headed are either because the man has temporally migrated to work or whether he has permanently left the household because of death or separation from the spouse. Literature on gender division of labor in family farming is unanimous in stating that the contribution of female in family

[26] One possible evidence is the fact that only in village B, where the village association is composed by women co-membership proved to be significant, while instead in village C and A, where the local association are mostly composed by males, co-membership in local association are not significant. Furthermore prevalently male events such as co-attendance in market are not significant.

farming is underestimated and it is often invisible (SILVA and SCHNEIDER 2010; Cordeiro and Scott 2007; de Melo 2002; Galizoni and Ribeiro 2014).

"The recognition of female work in farming does not imply important changes in the relationships between men and women. This is because symbolically and in practice men work produces products and goods that are exchangeable and that can be socialized, instead female work for being fragmented and discontinuous – and therefore more intense – produces less products for unity worked (Ribeiro, 1993). In this way the qualification of work is not built by the efforts required but instead by the final product. The value of work is qualified later depending on whether they were performed by men or women, as indicated in Paulilo (1987). In this way female work in farming is recognized and considered important, but when confronted with masculine temporary work sugar cane region of Sao Paolo state, it is considered "lighter" because performed in better condition than the latter. (…) When the man does not migrate or, in the stream of family cycle, stopped migrating, her work is revalued in the composition of family work and several times, in these situations masculine and feminine work are considered as complementary but coordinated by the man." (Galizoni and Ribeiro 2014, 8)

Recent studies also acknowledge that, both the increasing importance of *pluriatividade,* i.e. the fact that households work both outside and inside of the family enterprise and combine both farming and non-farming activities (Kageyama 1998; Nogueira 2013) and the crucial role of migration in livelihood composition (Guilhoto et al. 2007, chap. 12), increased significantly the role of female in family farming related activities (Medeiros and Ribeiro 2011). Female, even when males migrate, tend to remain at home as they have to take care of the house, the plot and the children (R. M. Medeiros and Ribeiro 2011, 9).

Also in sugar cane plantation according to the different times of the year workers engage in several activities further than sugar cane planting and harvesting such as small trading, farming and livestock breeding (Sigaud 2008, 79). Female workforce contributes both to the cultivation of crops that are mainly related to subsistence but also they play a role in the production of labor-intensive fruits. In this case study several of the households interviewed referred to contact females to work in their plot for soursop bagging process.

The fact that the women specifically engage in activities that take place inside the household or in the plot just outside (Galizoni and Ribeiro 2014) is also related to the amount of agricultural work load that the household has and on the ability of the household to hire

others to work on their plot. Women in fact very often intervene in periods of high request of labor (R. M. Medeiros and Ribeiro 2011, 6).

It is possible to state that if on the one hand the non-involvement of female in farming heavy activities, is a way to protect women from physically heavy duties; on the other it prevents the social recognition of the crucial role of female work that very often significantly contribute to family farming activities.

In order to have a clearer picture of whether family farming employment network portrays mainly a male network it is necessary to do a specific ethnography on the villages studied that focuses on gender division of labor. Only after such data collection it would be possible to describe how households are organized and what are the characteristics of labor relations in family farming. It would be therefore necessary to codify several households typologies according to the factors above mentioned namely composition of livelihood strategies, presence of migrant workforce, level of wealth, typologies of crops produces and enquire both with observation and in depth interview on farming labor organization inside the household.

4.6.4 Family farming as non-redundant tie generator mechanism: results of stepwise models

The figure 4.19, 4.20 and 4.21 showed that family-farming employment ties are not overlapping with kinship ties.

This sub-section tests the hypothesis that family-farming employment is non-redundant to the main ties formation mechanisms, namely homophilous traits and kinship network. In order to do so a stepwise approach has been followed.

The estimates of homophilous traits and other edge covariance effect, which do not decrease significantly, show that the family farming employment edge covariance and homophily effect of family farming are not redundant.

The first model is specified with the most important homophilous effect and kinship network edge covariance. The homophily effects in each village model were chosen because they are proxies of each village history. In village A the model is specified with geographical

origin and in village B the model is specified with migration wave homophily effect. For comparability matters, in village C, the same model specification has been used for village B. It is important to point out however that in village C model all homophilous traits' estimates lose their significance when they are added to kinship edge covariance.

The second model for each village adds family farming employment as edge covariance.

The third model for each village model adds homophilous traits effect of engagement in family farming.

The fourth model, after having imputed homophilous traits, the structural terms geometrically weighted edge-wise shared partners and geometrically weighted degree distribution, controls respectively for transitivity and centrality effects, to test if the homophily parameters decrease their significance.

The fifth model adds an additional structural term namely, geometrically weighted dyad-wise shared partners was added to test whether it improves the fit of the model.

The results of village A's model (Table 4.16) show that all of the effects specified are non-overlapping and except for edges they are all positive. Adding to the model edge covariance in kinship network and homophilous traits in family farming, the estimates do not change their value significantly and their sign does not change.

Only one parameter, *nodematch on family farming,* loses significance when controlling for transitivity (geometrically weighted degree distribution and the geometrically weighted edge wise shared partners parameters). Such phenomenon is consistent with literature. Homophily is likely to decrease in the coefficient when a particular share of homophily is due to the force of transitive closure rather than to homophily. This can indicate that A and B have homophilous ties not as a result of homophily but because of triadic closure effects. In other words, first there are homophilous ties with A, and the homophilous tie A has also an homophilous tie with B, and because of closure/transitivity, there is another homophilous tie, that is B, but not so much because was homophilous for B in that case, but because A's first choice was homophilous. The fact that only one parameter (node match family farming) loses significance can be interpreted as a sign that triadic closure is not so strong to capture the other homophily effects, namely geographical origin and the other edge covariance effects.

Table 4.16 Estimated coefficients of village A frequent contact network models

	Model 1				Model 2				Model 3				Model 4				Model 5			
parameter	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**
edges	-4.00	0.11	***	0.02	-4.09	0.12	***	0.02	-4.27	0.15	***	0.01	-4.96	0.23	***	0.01	-5.49	0.41	***	0.00
geographical origin	0.64	0.18	***	1.89	0.62	0.18	***	1.85	0.63	0.18	***	1.87	0.54	0.17	**	1.72	0.56	0.18	**	1.74
edge covariance in kinship network	2.92	0.18	***	18.61	2.93	0.18	***	18.68	2.92	0.18	***	18.49	2.51	0.18	***	12.36	2.56	0.18	***	12.87
edge covariance in family farming employment network					2.26	0.34	***	9.62	2.28	0.34	***	9.82	2.28	0.33	***	9.74	2.21	0.34	***	9.10
engaged in family farming									0.34	0.17	*	1.40	0.32	0.17	.	1.38	0.32	0.16	*	1.38
Geometrically weighted edgewise shared partners													0.76	0.13	***	2.13	0.76	0.13	***	2.14
Geometrically weighted degree													1.28	0.49	**	3.61	1.76	0.61	**	5.82
Geometrically weighted dyadiwise shared partners																	0.06	0.04		1.06

Coefficients significance codes: p value<0.001 '***' p value =0.001 '**' p value =0.01 '*' p value = 0.05 '.'

The goodness of fit plots (Figure 4.21) is not different from plot of the full model (Figure 4.10). This shows that reducing the model to a small number of parameters it is able to capture the main social process that describe the process of network. The fit of the model increases slightly only when adding the structural terms formation (Figure 4.22 and 4.23).

The Markov Chain Monte Carlo (MCMC) diagnostics (in appendix 8.6.1) also confirm a good level of model convergence for the model with structural terms.

Figure 4.21 Goodness of fit plots of village A stepwise model 4

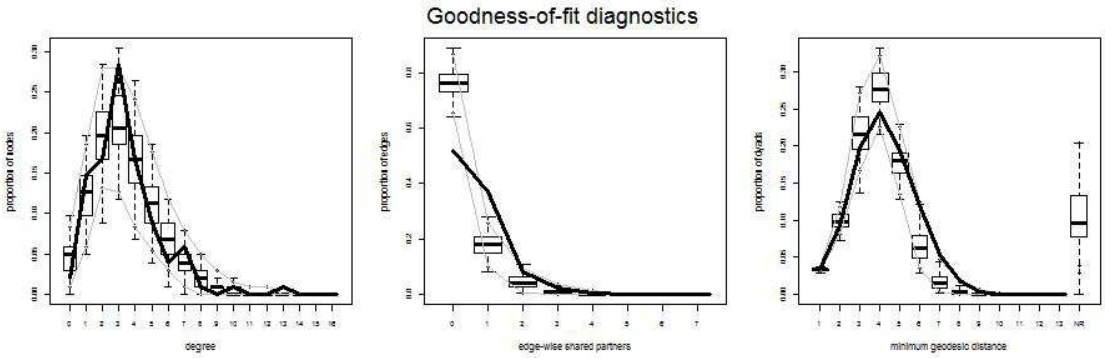


Figure 4.22 Goodness of fit plots of village A stepwise model 4

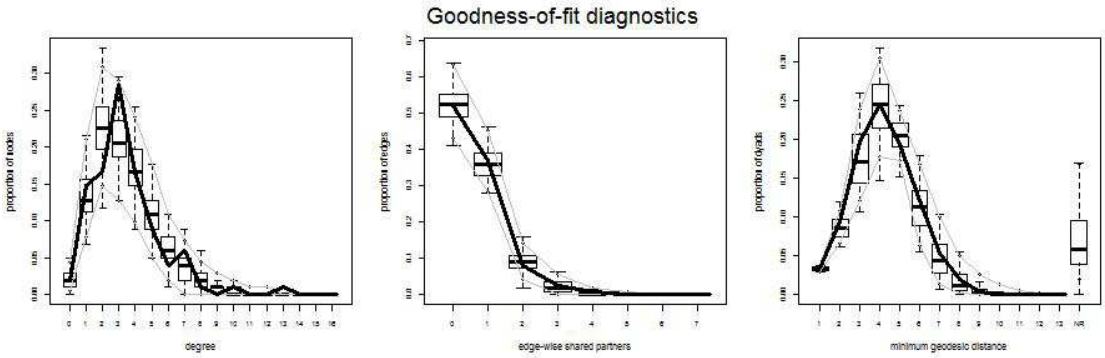


Figure 4.23 Goodness of fit plots of village A stepwise model 5

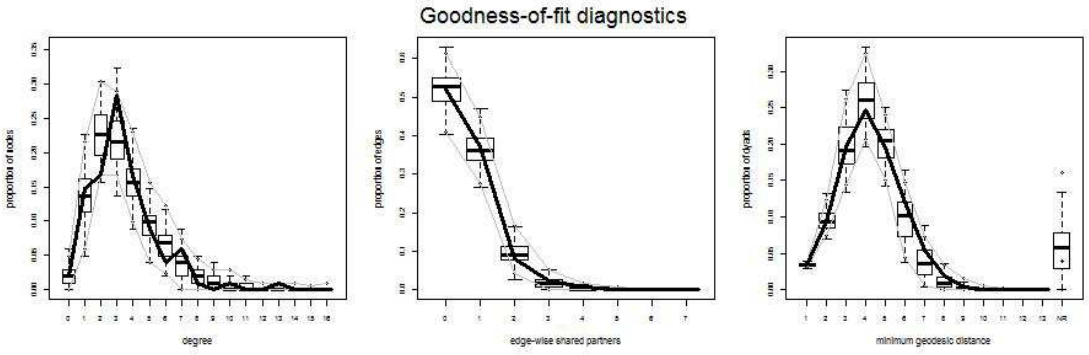


Table 4.18 illustrates the estimates of village B four models. Kinship edge covariance parameter loses its significance by adding family farming employment network edge covariance. This result can be explained by the presence of only four dyads linked both by kinship and frequent contact network, and only two dyads connected both by family farming employment and frequent contact network and it can indicate some overlap between kinship edge covariance and family farming employment network.

The positive and significant coefficient of family farming homophily effect shows that sharing a common, i.e. being engaged in family farming activity is a non-redundant tie generator mechanism.

In this reduced model for village B, controlling for transitive closure (geometrically weighted edge wise shared partners) none of the two homophilous traits loose its significance and the estimates coefficients show only minor changes. Instead the geometrically weighted degree parameter is negative and significant.

Model 5, is presented for the purpose of comparing it with the other two villages. However clustering, represented by the alternating terms, as already shown by model 4is not significant and by adding an additional alternating term makes the model degenerate (Figure 4.26).

Table 4.17 Estimated coefficients of village B frequent contact network models

	Model 1				Model 2				Model 3				Model 4				Model 5			
parameter	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**	**Estimate**	**S.E.**		**odds**
edges	-24.55	0.18	***	0.00	-24.77	0.18	***	0.00	-27.96	0.24	***	0.00	-2.67	0.35	***	0.07	-0.34	30.40		
migration wave	0.74	0.24	**	2.10	0.75	0.24	**	2.11	0.75	0.24	**	2.12	0.57	0.21	**	1.77	0.53	0.17	**	1.70
edge covariance in kinship network	0.99	0.49	*	2.69	0.89	0.50	.		0.86	0.50	.		0.82	0.47	.		1.02	0.52	*	2.79
edge covariance in family farming employment network					0.74	0.60			0.87	0.61			0.80	0.61			0.63	0.64		
engaged in family farming									0.58	0.25	*	1.78	0.56	0.24	*	1.75	0.36	0.17	*	1.44
Geometrically weighted edge wise shared partners													0.20	0.16			-1.17	0.68	.	
Geometrically weighted degree													-1.25	0.60	*	0.29	-2.36	19.21		
Geometrically weighted dyadiwise shared partners																	0.20	23.66		

Coefficients significance codes: p value<0.001 '***' p value =0.001 '**' p value =0.01 '*' p value = 0.05

Goodness of Fit plots (Figure 4.24) shows some difficulties of ERGMs to predict some specific values in the degree distribution such as proportion of nodes with degree 5 and degree 10 as well as the proportion of edges that have 4 edge-wise shared partners. This issue is most

probability related to the difficulty of modeling the presence of an almost "caveman structure" (a very cohesive clique where everybody is connected with everybody) surrounded by a sparser network. Even adding the degree distribution term (geometrically weighted degree), the fit of the model does not increase.

The Markov Chain Monte Carlo (MCMC) diagnostics (in appendix 8.6.3) show instead an acceptable level of model convergence for the model 4.

Figure 4.24 Goodness of fit plots of village B stepwise model 3

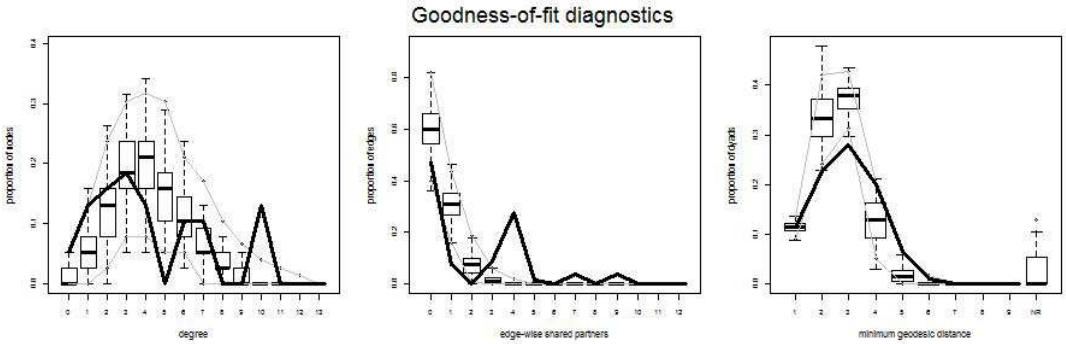


Figure 4.25 Goodness of fit plots of village B stepwise model 4

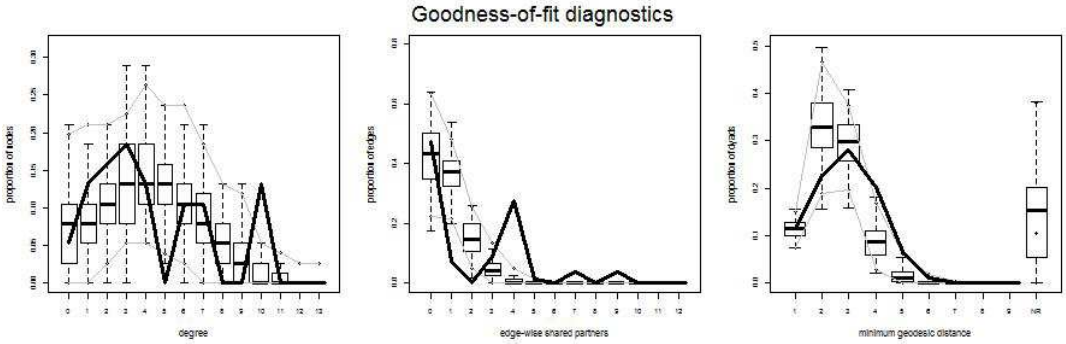


Figure 4.26 Goodness of fit plots of village B stepwise model 5

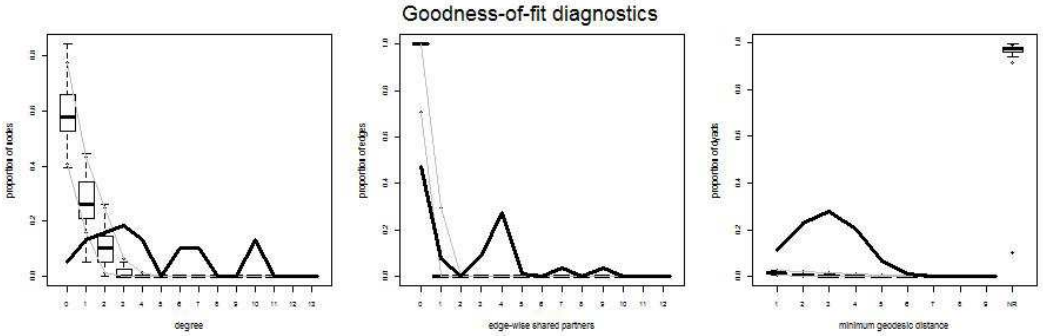


Table 4.19 illustrates the estimates of the four models of village C. Differently from the previous two villages' homophilous traits, referring to process of creation of the village, inserted in the model are not all significant. In this village, in fact, only football team homophily effect is not redundant to kinship network. By adding family farming employment edge covariance and homophilous traits in family farming the estimate of kinship edge covariance estimates do not decrease significantly. However in this village the estimates of uniform homophily in family farming parameter is negative and significant. This result indicates that the likelihood of adding a tie between any given i and j is reduced by the equality of the *engaged in family farming* parameter. . The positive sign of *family farming edge covariance* seems to suggest the presence of relations between farmers that act as employers and their employee.

Controlling for transitive closure family farming estimates do not lose its significance and the estimate's coefficients show only minor and not significant changes. Both the goodness of fit plots (Figure 4.27) and the Markov Chain Monte Carlo (MCMC) diagnostics (Appendix 8.6.3) show an acceptable level of model convergence.

Table 4.18 Estimated coefficients of village C frequent contact network models

	Model 1				Model 2				Model 3				Model 4				Model 5			
parameter	Estimate	S.E.		odds	Estimate	S.E.		odds	Estimate	S.E.		odds	Estimate	S.E.		odds	Estimate	S.E.		odds
edges	-23.07	0.16	***	0.00	-24.66	0.17	***	0.00	-20.64	0.22	***		-2.99	0.39	***	0.05	-2.77	0.91	**	0.06
edge covariance in kinship network	1.98	0.40	***	7.26	1.85	0.43	***	6.37	19.18	0.44	***		1.83	0.42	***	6.21	1.83	0.42	***	6.25
migration wave	-0.20	0.31		0.82	-0.10	0.32		0.90	-0.11	0.32			-0.12	0.32		0.88	-0.13	0.33		0.88
edge covariance in family farming employment network					3.13	0.63	***	22.81	3.19	0.64	***		3.18	0.64	***	24.12	3.19	0.67	***	24.26
engaged in family farming									-0.73	0.28	**		-0.82	0.31	**	0.44	-0.84	0.32	**	0.43
Geometrically weighted edgewise shared partners													0.52	0.19	**	1.68	0.52	0.19	**	1.68
Geometrically weighted degree													2.33	1.24	.		2.14	1.43		
Geometrically weighted dyadiwise shared partners																	-0.03	0.12		

Coefficients significance codes: p value<0.001 '***' p value =0.001 '**' p value =0.01 '*' p value = 0.05 '.'

Figure 4.27 Goodness of fit plots of village C stepwise model 3

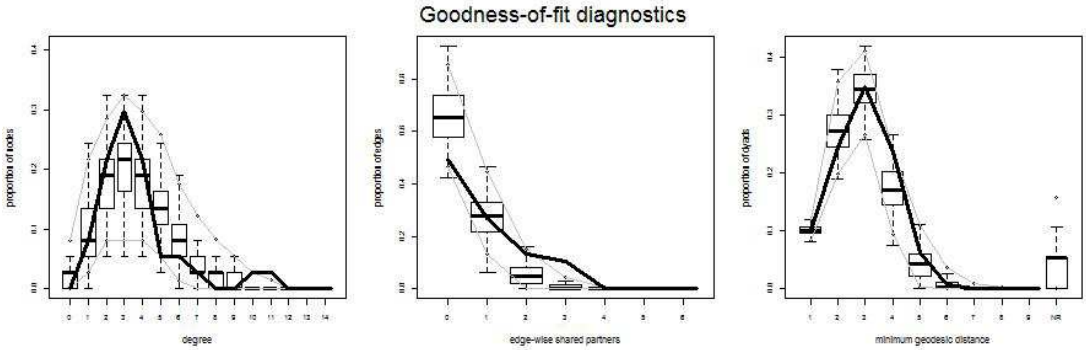


Figure 4.28 Goodness of fit plots of village C stepwise model 4

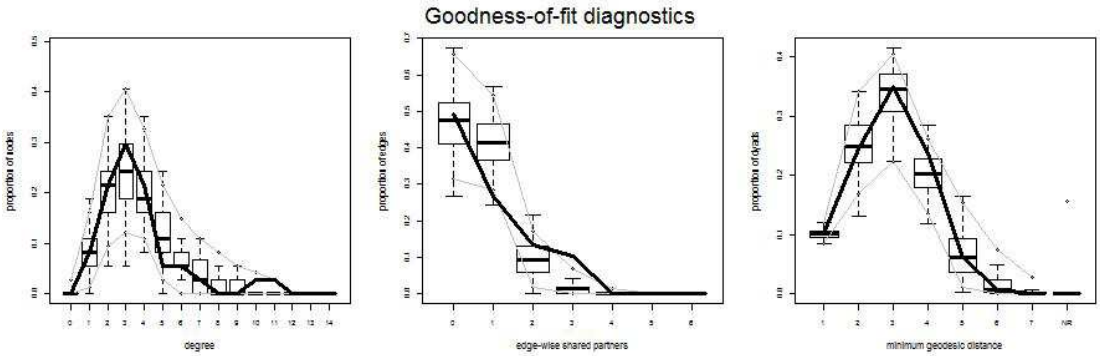
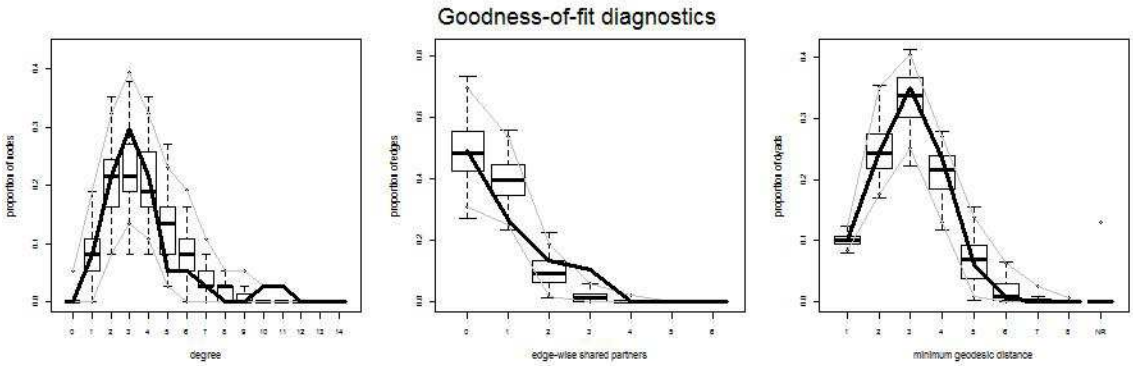


Figure 4.29 Goodness of fit plots of village C stepwise model 5



4.7 Concluding remarks

The chapter, using the combination of narrative of villages' histories and visualization villages' networks, allowed showing how the substantial variability across villages in households' attributes and social network features is influenced by recruitment patterns and early organization of villages.

The recruitment pattern had an effect on the number of households with previous experience in family farming and on the number of households that already knew each other before the occupation.

Village's early organization influences the selection rule to choose settlers after the period of encampment. Furthermore it influences the creation of collective activities, which favors the interaction between old and new settlers, and the density of kinship network.

The use of ERG models showed that homophily on some households' attributes and edge covariances are relevant elements in determining links in frequent contact network. The uniform homophily effects that influence ties formation in the frequent contact network are different across villages because they had diverse households' recruitment patterns and villages' early organization.

The homophily uniform statistics differ across villages: the only parameter that is significant across villages relates to family farming. Engagement in family farming is a mechanism that generates ties among households. Uniform homophily in family farming as main livelihood strategy is a mechanism that generates the presence of ties in the three villages. Family farming employment is non-overlapping to the main social processes generating ties.

Edge covariance in kinship is extremely important in village A and C where there were no limits in terms of households that could be linked by kinship in the phase of village creation but less in village B. In this village the social movement limited to five the number of households' members of the same family that can live in the same village.

Village A is the most complex village in terms of networks and the village with the highest family farming production. There are a wider number of factors contributing to network formation while in the other villages there is a smaller number of factors that are able to explain the contact network. In village A same geographical origin, edge covariance in kinship

network and employment in family farming are the most important elements to trigger links. The main homophily effect is “common village origin” as some households already knew to each other before coming to the encampment

In village B instead it is more difficult to identify what are the generator mechanisms of frequent contact network. In village B the main homophily effect is “common migration wave” because people did not know each other before coming to the village and friendship were created participating to encampment. The other important local configurations are node covariance of village president and engagement in family farming.

In village C the co-existence in the same network of households is the major factor that allows predicting the other networks while few shared attributes have a relevant effect. In village C the presence of a large group of old settlers, the lack of previous ties among new settlers and a short period of encampment of new settlers characterized by episodes of violence did not favor the creation of ties between households. Kinship represents the most important driving force of contact network and there is strong overlapping between different households’ ties. It is possible to argue that that this “multiplicity” can be considered as an anti-risk behavior in response to a long exposure to violence for old settlers and early tensions between the groups of old and new settlers. The lack of activities that allowed to create ties among settlers with different origins and the presence of conflicts in the early period of leadership definition led households to be conservative in their ties formation.

It was shown that village A is the most similar to scenario 2 of network overlap (presented in chapter one) as the frequent contact network is predicted by the combination of both family farming employment and kinship network that are not completely overlapping.

Family farming is an element that in all villages allows supporting the creation of a more integrated network. In village B however it was observed that family-farming employment is overlapping with the main ties’ generator mechanisms. In village C instead family-farming employment is a non-redundant mechanism but the fact that two households are both engaged in family farming refrains from building ties. These two elements can be referred to a role of hierarchy in ties’ creation.

5. Alagoas Sem Terra Cooperative and social networks in the villages

5.1 Introduction

A number of important economic and social transformations took place in the agrarian reform settlements. The new settlers arrived and created ties with the old settlers, who were mostly sugar cane workers. Many of the households in the settlements used family farming as their main source of livelihood, which was a new economic activity in the region.

A crucial difference between sugar cane plantations and family farming lies in the organization of labor, the distribution of power and the level of autonomy from urban areas. In the former, a large unskilled labor force lives in large estates that have one landowner, with whom they entertain vertical unequal relationships. In the latter, there is a large a number of very small land properties, and more horizontal relations connect the farm holders. In sugar cane plantations, intra-village ties are very unlikely because the labor force is very easily substituted — sugar cane cutters are potential competitors with one another. On the other hand, family farmers derive their main source of livelihood from inside the village and might develop intra-village relations when they face a common issue such as finding a market to sell their products to scale up their production. In contrast, sugar cane cutters derive their main source of income from outside the village.

The emergence of family farming, in the settlements object of analysis, has been supported, almost since the foundation of the village, by a series of projects and then by a producers' cooperative that was born in 2003 with the specific purpose of supporting this new economic activity by providing training, credit, technology and distribution of products. The fictional name used to refer to the cooperative is Alagoas Sem Terra Cooperative (ASTC).

Chapters three and four outlined how, in the three villages studied, there are two main factors that allow for the creation of ties between households that do not share homophilous traits: kinship and agricultural employment. On the one hand the history of villages' formation explains the marriages across households of different origins. On the other hand, the role of agricultural employment, as described in chapters three and four, varied greatly across villages as a result of different processes of village formation and is related to the importance of family farming.

Family farming can be considered an element that creates cross-cutting ties in the villages. Households that are engaged in family farming tend to communicate with one another. Family farming employment lies outside of the main tie-formation mechanisms in the villages and thus creates connections between households that otherwise would not be connected. This implies that households engaged in family farming are more likely to be connected with other households that do not share common traits than with households that have different livelihood strategies.

This chapter describes the history of ASTC and highlights its support to family farming. The possibility that cooperatives play a role in creating a bridge across groups is also outlined by a recent article (Majee and Hoyt 2011). The cooperative shapes and is shaped by pre-existing social network structures. Namely ASCT plays an important role in sustaining family farming.

The cooperative, by supporting the introduction of new crops and guaranteeing a market for some households' crops, supports farmers' productivity and family-farming employment networks. As ASCT focuses on high labor-intensive crops (chapter 3), it consequently supports the labor market of family farmers. Therefore by supporting agricultural employment, ASCT supports one of the main sources of brokerage across households. This implies that, in the three villages, the number of agricultural employment network's ties depends on the joined effect of the selection of crops produced by farmers and the guarantee of market destination for crops.

Not all households that have family farming as main income are members of the cooperative. There are farmers that do not sell to the ASTC. Initially the cooperative have provided training to introduce new crops such as soursop, citrus, passion fruit and pineapple, along with support to strengthen the production of old crops such as banana. While only members received credit and training, the entire villages, where ASCTC has members, benefitted from the introduction of new crops.

ASTC members' composition is heterogeneous in terms of most relevant village attributes, namely kinship, income, religion and party. These households' features are important because they could be lines on which conflict could arise.

It was collected information in village A and B on households' in "political parades" during the municipality electoral campaign in 2012, which coincided with the period of

fieldwork in the village. It was used the word “party” to denominate households’ participation to political parades. It is possible to argue that this can be considered a proxy for party membership.

The connections between emergence of family farming and the role of ASTC in the villages encompass three main dimensions: the dependence of the cooperative on external donors; municipal politics; and the trajectory of specialization of ASTC commercialized crops.

The role of ASTC in supporting agricultural employment is weakened by three main factors. First, continuing specialization of ASTC towards specific products creates barriers of entry for both current members and new members. Second, the ambivalent narrative of ASTC’s leader, when addressing different donors, produces difficulties in creating a uniform organizational culture and in setting ASTC members’ expectations. Third, the non-neutrality of the cooperative’s political position, due to its history, creates barriers to its own access to municipal funds. All of these factors can hamper the bridging role of ASTC and expose it to the strong risk of becoming the mirror of a specific political or economic group. The analysis presented in this chapter is based on the burgeoning materials produced by ASTC (project reports, cooperative power point presentations, cooperative management systems), as well as on participant observation of the cooperative activities, in depth interviews, and on a focus group with a sample of the cooperative members.

There were other studies on ASTC by bachelor’s students and experts on earlier missions. However, there has been no social inquiry into the effect of the cooperative on social structure. Most of the studies performed to date have focused mainly on technical and fiscal aspects, with the presence of experts as agronomists and accountants.

After this introduction, section 5.2 illustrates the objectives of the ASTC. Section 5.3 uses coalition theory to interpret the features of ASTC: the relevance of external funds over the years and the main turning points in the cooperative on its trajectory towards specialization in crops. Section 5.4 outline the cooperative’s positioning in local politics and the negative effects in terms of access to local funds and other municipality actions. Finally, section 5.5 focuses on village A to outline how the trajectory towards specialization has been influencing political position of villagers.

5.2 ASTC's mission

The producers' cooperative – the object of the analysis, was born from the initiative of a nun, a member of a philanthropic Catholic association, who has been operating in the municipality since the Seventies.

ASTC is active in 12 agrarian reform settlements, among the 18 settlements currently existing, and in a few other localities ("fazendas" and "sitios") in the same municipality and in the neighboring municipalities. Households living in those settlements represent 69.9% of the total households in the agrarian reform settlements. There are 65 participating households, representing 4.5% of households living in the 12 agrarian reform settlements where the ASTC is operating.

Households living in the 18 settlements are referred as "sem terra" in ASTC and in the general narrative beside their real land tenure arrangement, as outlined in the previous chapters. Agrarian reform settlers include households that have passed through a period of occupation as small landowners and sugar cane workers living in the village before the social movement occupation, and households that were living in surroundings of "assentamentos" and were invited to settle in the newly created villages. Most of them had to face a significant change both in terms of social role, from land labor workers or employed/unemployed individuals in the urban slums to small landholders or producers. Others had to transition from being sugar cane cutters to agricultural production. Households that arrived from other parts of Alagoas, attracted by the promise of a piece for land (varying from 3 to 11 hectares), had to cope with occupation and struggle that ranged from several months to several years in the case of the second wave of "assentamentos".

ASTC was born to support specifically these "sem terra". However, the ASTC statute has recently changed to include all small producers, not only those living in agrarian reform settlements and the municipality where the ASTC has its headquarters, but also in the neighboring municipalities.

The general objective of the cooperative is

[To] strengthen the productive activities, knowledge, information, organization and competitiveness of small producers, making possible, their sustainable insertion in the social and economic context of the region, having always as principles the respect for biodiversity in all of its manifestations (Art. 2 cooperative statute).

There are seven specific objectives stated in ASTC's statute. First, strengthening the subsistence agricultural production of farmers, the production of fruits and vegetables, the flower production, small animal breeding and the production of organic compounds. Second, supporting the process of industrialization of agricultural production, cattle breeding and handicrafts. Third, supporting the commercialization of processed and non-processed agricultural products. Fourth, promoting the protection of natural heritage with environmental education, promoting recycling, conservation of hydric resources, rational use of flora and fauna resources, and reforestation of impoverished areas. Fifth, promoting eco-tourism. Sixth, organize or coordinate the training of members and their family in family farming, ecology, organic agriculture, production and industrialization, gender issues, popular culture, folklore and entertainment, and marketing information systems. Seventh, providing credit to cooperative members responding to the amount of products provided by cooperative members or in phases of production, respecting the financial equilibrium of the cooperative (Art.3 cooperative statute).

"ASTC is an enterprise that helps members. If it were not for ASTC, members would suffer too much, because they would lose their production."

"ASTC is trying to change a little the reality of our municipality: before we produced, but we did not know where to sell. ASTC also tries to help the relations between farmers" Quotes from focus group

5.3 ASTC history and the role of donors

This section shows that coalition theory allows the interpretations of the turning points of ASTC history, the way in which decisions were made, and eventually forecast the cooperative's decisions. It also illustrates that ASTC trajectory towards specialization could hamper the brokering position of ASTC in the villages. Furthermore cooperative specialization makes narrative, used by the ASTC charismatic leader and founder, to attract funds for smaller farmers contradictory. The main argument of the charismatic leader is that ASTC plays a crucial role in supporting the most disadvantaged people. However, ASTC choice to buy mainly high value fruits is leading to the gradual exclusion less wealthy producers. The main obstacle for participation is the necessity of investments and additional labor force required to specialize in the production of high value fruits.

Organization theory identifies four key elements of which an organization is composed (Scott 1998): 1) Participants, who are the actors that play a role in the organization's activities

and derive some benefits from the organization; 2) Social structure, which captures the persisting patterns of relationship between participants in the organizations; 3) Technology, the way in which the organization accomplishes its objectives; 4) Environment, which defines the physical, cultural, technological and social context in which the organization is embedded.

The cooperative can be interpreted under the framework of coalitions theory (March 1962), (March 1992), (Hula 1999). The theory interprets actors as engaged in resource exchange that is regulated by rules. The choices taken by the organization are the result of the process of bargaining between actors.

The three main mechanisms adopted to manipulate and control coalition formation and outputs are to control rules' formation, to control access to resources, and to control identity and preferences. Actors usually decide to join coalitions to derive benefits from being able to reference an explicit policy or goal of the organization, to participate in the definition of coalitions goals, and to receive a symbolic reward from participation.

Actors have different positions in the coalition: core members, players and tag-alongs. Core members are the ones that are mostly involved in the activities of the coalition and that are at core of defining strategies. Players are actors that only have specific interests in the activities of the coalition. Tag-alongs are actors that only have small interest in being part of the coalition but still find it relevant to participate (D. A. McFarland and Gomez 2013).

5.3.1 Application of organization theory to ASTC

Organization theory captures the main features of the organization: ASTC actions are the result of resource exchange and the negotiation process between the different actors involved and the ability of the coalition coordinator to use different narratives towards different actors allows the coalition to persist.

Coalition theory is part of the group of theories that capture dependency inside the organizations and not with the environment. A critique to the application of this theory refers to the fact that ASTC has resource-dependency bonds with organizations that are strictly outside and not inside the cooperative. They are not sub-units of the cooperative but rather autonomous organizations whose existence is not questioned by the end of the cooperative. However, given their strong ability to influence the cooperative decisions and actions, and the inexistence of the cooperative as an autonomous organization, they can be considered

equivalent to subunits of the cooperative. It is possible to consider the actors that make cooperative action possible as members of a coalition. The process of exchange of resources between actors (Emerson 1962) is the constitutive element of the coalition. The interests of the different actors involved in the organization differ. The presence of ambiguity as an element allows the coalition to persist (March 1994).

Furthermore, the presence of such potentially high level of conflict between different stakeholders is an element that favors the emergence of a charismatic leader. The key element of coalitions is the fact that that they are characterized by the presence of different goals among stakeholders. The sustainability of coalitions can be considered related to the duration of key elements that constitute an organization: goals, participants, and the identity that this organization is able to promote (D. A. McFarland and Gomez 2013).

The other important element is that coalitions tend to start strong and end weak. This aspect is often referred in ASTC members' narratives referred to as follows: "the cooperative was born big and this makes it hard to make it sustainable". Being a large complex organization with a large physical building, quite a wide range of activities to support, and members distributed over different geographical areas is one of the reasons why the ASTC must always exist as a coalition of several actors that, besides having often diverging interests, can provide the support to her actions.

The creation and support of a producers' cooperative supported by external actors involves at least four actors: international donors that finance the intervention, local government that negotiates with the donors for the definition of priorities, NGOs that implement the project, and local elites that are the intermediaries between the NGOs and the rural population. It is possible that those different actors might have conflicting objectives; therefore, the characteristics of these new institutions are also the result of a negotiation process among different interest groups. It is important to analyze the dynamics of interdependence among such actors, identifying what is the resource that flows among them and what is the process of decision making.

The members of the coalition that compose ASTC are: 1) households that decide to join the cooperative and to sell products to it, 2) national or international donors financing cooperative activities, 3) customers that purchase cooperative products and 4) municipal political parties that support or hamper cooperative activities.

Chapter four has described the interaction between ASTC and the village social structure. This chapter focuses on outlining the presence of exchange flows between different members of the coalition that make the presence of the cooperative possible and explore the role of the coalition leader.

The main forms of exchange between actors involved in the coalition are the following: ASTC members sell their products to the ASTC that collects their products at their place and guarantee a market destination. Brazilian private enterprises claim social corporate responsibility by supporting the cooperative projects. Municipal politics trade political representation with vote. Italian donors respond to their necessity to donate to projects that support the most disadvantaged people and to promote organizations that are considered to be virtuous.

Coalition theory foresees three types of positions in a coalition: core members, players and tag alongs. The core members of the coalition are considered to be the most productive farmers' members of ASTC that have core interest in the continuity of cooperative action, as well as the Italian local authority and Italian associations that have been supporting the cooperative since its foundation. Players are cooperative members that have a small production, and Brazilian donors that support specific aspects of cooperative action. The category of tag-alongs is comprised of occasional donors such as groups of Italian volunteers, linked to Catholic church, that come to visit the project, as well as some ASTC members that are not producing anything for the cooperative but still receive some small benefits related to participation in some training and symbolic benefits from membership.

Under this framework, the nun, being the charismatic leader and founder of ASTC, is the coalition leader. She plays the role of broker between the different actors that are involved in ASTC activities. She is the one that attracts Brazilian and Italian funds to support the activities of the cooperative, which is yet far from obtaining financial autonomy. The nun plays a crucial role by ensuring funding for cooperative activity and self-sustains her position in the organization ("she brings resources from Italy, she writes the projects"). She is in contact with different organizations by means of project funding and, at the beginning of ASTC activities, she was directly involved in local politics as she was part of a special commission that created by the municipality for agrarian reform.

The coalition leader's use of different narratives for the different donors is reflected in the notion of ambiguity that is present in coalition theory. Ambiguity and control over resources are the strategies that allow coalitions to exist and persist over time. While the nun has no control over rulemaking, which is the responsibility of technicians in the cooperative, she plays an important role in the definition of identity and preferences. She presents the cooperative as an alternative model to the dominant role of landlords and political patronage. As other recent studies point out, poor people are the most dependent on politicians' bonds (De Wit and Berner 2009). The nun presents the cooperative as a way to escape from this captivity. Also, the choice of the founding date of the ASTC is strongly related to this narrative. The ASTC was founded on the day of Brazilian independence, on September 7, 2003. The difference in the narrative used for different donors will be presented in the next sections that will also explain the importance of local politics on cooperative actions.

5.3.2 The genesis of ASTC

Before the first project to support agricultural production and commercialization of new citizens of the municipality ("sem terra"), the nun's first activities in rural areas were related to evangelization. She had the idea to support family farming when she got involved in the council, created by the mayor (*prefeito*), for the management of agrarian reform "Conselho Municipal da Reforma Agraria". The presence of agrarian reform represented for the municipality a very relevant source of change in terms of the number of inhabitants.

> "We decided to enter in agrarian reform commission created by the municipality mayor. The mobilization of people by social movements, in the framework of agrarian reform, caused, in very short time, a dramatic increase of municipality inhabitants (with all of the problems that this brings also in countries with bigger resources!). During the discussions, that could have made us escape from the main objective, we remembered that the main characters of the story are "sem terra" and we tried to be the continuation of their shy and clumsy voices. Everybody understood that we are on their side, helping them to read with critical view the different proposals they received and creating space so that they can feel at their ease and they openly speak of their difficulties" Quote from letter to Italian association followers

> "The nun was taking part in the "Conselho Municipal da Reforma Agraria", created by the ruling mayor in 1997, and she, along with her congregation, was carrying out a work of evangelization in the rural areas. When she was doing her work of evangelization in rural areas, she noticed that people, besides having received land, some basic infrastructure and some financial help from the government, did not have the financial conditions to develop production and many households were in a worse condition than before. One

day, when I was in the "Conselho", she invited me, (I was at that time, municipal secretary of agriculture) to meet to discuss in order to have some ideas on how to improve living conditions of these people. Hence we had the idea that we could help them by providing technical assistance to improve the agricultural production and by supporting commercialization of their products. It was in the period when the nun was always travelling to Italy. She travelled to Italy with this idea and brought an agronomist from there to prepare a project to be presented in Italy. It was therefore in 2001 when the first project started with resources from Italy". Interview with the first ASTC director.

The nun started to operate in one of the most remote settlements. The choice to work with these settlements is a specific mission of her religious congregation. After the failure of the activities in this settlement and death threats to the priest living in the settlement who was supporting their project, the nun and her congregation started to focus on other settlements. More specifically, the following target of their action was village B and only later village A.

The general objective of the first project (2001-2003), financed by an Italian local authority, was supporting households in agrarian reform settlements to improve their living conditions. The main discourse referred both in the project description and in the cooperative general assemblies was: "the cooperative should help to undermine and eradicate the centennial culture of dependence from sugar cane industry for the people of Alagoas." More specifically the first project was to support "peasants" to become autonomous in their agricultural production and to create a communitarian organization that can transform and commercialize the crops produced. The dream was to fight with "sem terra" families to escape misery, conquer dignity, freedom and rights to citizenship in its deepest meaning". (Excerpt, project report 2009-2011 p.18)

"The nun got the idea of the cooperative. She came here to visit the settlement. She saw the necessity of members. She started the first project: we started with a weekly market ("feirinha") in the place that would have become the headquarters of the cooperative. She started to take our products, and at the time when we did not know how to process our crops, we took the products and sold them to the general markets in Recife. Then the cooperative was created and they started to make processed fruits in order to better preserve them and prevent them from losses." Interview id 4 village A

Coalition's members

Since its creation, the ASTC has been supported by several donors such as Italian local authorities, Italian religious organizations, and Brazilian funds both from public sector and from private enterprises. The importance of external funds for ASTC's existence is acknowledged to be extremely important by both a large number of the interviewed members and also by non-members. The nun has been the main person responsible for writing projects. She has been representing ASTC, both in Italy and in Brazil, to attract funds to support the projects she started.

> "Respondent Id 4: today this exists just because of the nun. If it were not for the nun, this cooperative would not exist.
>
> Interviewer: But let's imagine that one day she starts to be tired and she decides to go home. In your opinion will you continue with the cooperative?
>
> Respondent Id 4: yes, we will see if it can continue. I think it will not. Everything that exists in the cooperative is the nun.
>
> Respondent id 1: she is the heart of the cooperative
>
> Respondent Id 4: because if it were not her, it is her that elaborates the projects, it is her that makes the calculations, she acquires a lot of funds from Italy to be brought here, also with the Brazilian entities, was it not her that got the funds?"

The main partners of ASTC have been, from the beginnings of the activities, an Italian association and a Brazilian religious association. The Italian association was specifically created in 2001 to support the activity of the nun and her religious group that has been operating in the municipality since 1997. The association is based in the Northeast of Italy and initially composed of the nun's relatives, but later it grew bigger, and in 2012, it opened a branch of the association in a neighboring region where the nun has been promoting her projects for almost ten years. The Italian association has been the key partner of all initiatives promoted by the nun.

The initial activity of the Italian association and the Brazilian religious association was to support children. But from 1998 the main focus of their activity shifted to support "sem terra", or to be more precise, the inhabitants of agrarian reform settlements.

The first project to support agricultural activities started in 2001 and ended in 2003. It was financed by an Italian local authority and aimed at overcoming the following obstacles: 1)

lack of technical knowledge of “sem terra” in the management of their plot, 2) lack of transportation means to commercialize agricultural products, 3) impossibility to get access to credit at a facilitated price and 4) lack of knowledge of the principles of self-management and the rules of co-habitation. The main motivation behind the implementation of the project was that the Brazilian government was not able to support these new small farm holders closely enough. The government did provide them with a house, some infrastructure in the settlement and some initial credit to start their agricultural activity, but was insufficient in everyday technical assistance. The importance of having access to microcredit was particularly relevant as all settlers were not able to give back the credit received from the government and therefore they could never have access to any form of credit at a preferred rate from any Brazilian bank. (2000 project report).

Since the launch of the first projects promoted by nun, there have also been activities financed by Brazilian entities. Most of them were especially aiming at providing training and technical assistance to farmers. Only from did 2006 ASTC start to receive more funds from Brazilian than from Italian donors. The first important project with Brazilian donors started in 2006 and was supported by a very important federal enterprise (Table 5.1).

Table 5.1 First projects and ASTC access to funds

	Italian local authority	Italian other fund	Italian government fund	Brazilian federal funds	Brazilian Bank funds[27]	Brazilian state funds[28]	Brazilian private enterprise fund	Brazilian technical assistance funds[29]
2001								
2002	NA							NA
2003								
2004	€110,000							
2005		5,000 €						
2006	216,000 €		49,000 R$			135,000 R$		
2007		45,000 €			100,000 R$			
2008				216,000 R$			660,000 R$	
2009								
2010	60,000 €							
2011		2,500 €						
2012							590,000 R$	
2013								

5.3.3 ASTC history turning points

Currently the cooperative purchases, transports and processes a limited number of fruits to be commercialized as pulp to make juice. Such services represent an important facility to farmers because of the very difficult accessibility of rural areas.

The trajectory towards specialization can be understood as a result of negotiation inside a coalition. These turning points can be interpreted as a result of the dominant coalition because the most relevant changes always took place during times of fund shortages, and it was always the new donor that defined the new actions that the cooperative had to pursue.

In 2008 the project presented to the Italian local authority, which has provided support to "sem terra" since 2001, was not approved. ASTC had to cope with resource shortage, decide what were the most relevant activities and on what cuts to make. In order to evaluate the

[27] This fund supported the creation of a micro-credit fund.

[28] This fund supported the creation of a micro-credit fund

[29] This fund was devoted to support short training courses for farmers.

cooperative's activities, ASTC engaged a Brazilian consulting company to evaluate its own activities.

First turning point: end of weekly market ("feirinha")

The activities implemented by the first project (2001-2003) targeted agrarian reform settlers and aimed to support these new landowners in the production and commercialization of their crops, providing them with technical assistance, training and access to credit especially for small irrigation systems. There was no focus on triggering the production of some specific crops. The project aimed to enable farmers to diversify their diet and supported the production of several different types of crops.

The ASTC was founded in 2003. Since its creation, ASTC also processed fruits, such as passion fruit, to make frozen pulp to be sold, but this was still a very marginal activity. The project did not have sufficient infrastructures where they could perform these transformational activities.

A very important activity of this first period of the cooperative was the presence of a weekly market, called "*feirinha*", that had been operating in the headquarters of the cooperative since 2004. The actual physical structure of the cooperative was conceived as a covered market, where the cooperative's members could commercialize their products. ASTC members brought several types of products such as cassava, banana, oranges, lemons, passion fruits and vegetables. The revenues derived from selling such products were not disbursed directly to the ASTC. Rather, each farmer gained in proportion to products sold. ASTC offered to farmers was a space to sell. Furthermore ASCT facilitated sales of members' products to local hotels and restaurants.

According to key informants, the first two years were successful as "feirinha" took place on Saturday, which was a very convenient day as it did not coincide with the daily municipal market and it was the day that most tourists bought groceries. The main market clients beside tourists were hotels and restaurants from the municipality. The cooperative, during that period, started to create a list of regular clients to serve.

Several interviewees referred to *feirinha* as a very positive initiative: it was a moment of socialization where households from different settlements gather together every week and it guaranteed a market for some farmers' crops. Some members of the cooperative who lived

the farthest from the “feirinha”, for example, those from village A, would arrive on the night before the market, sleep in the cooperative’s headquarters, and sell their products to tourists, restaurants and hotels on the following day.

2007 was a difficult year because there was a surplus of passion fruit production. ASTC had been strongly promoting such production. As a result several households, especially in village A, had invested significantly in such crop and they had a very large production. ASTC however did not have enough buyers that could purchase the entire production. Therefore a large amount of the production of passion fruit got destroyed. This is considered a negative episode in the history of the cooperative.

In 2008, after four years of activities, the “feirinha” was put to a stop. There are three reasons why this activity ended: 1) contrary recommendations of a Brazilian consultancy company, 2) change of municipality weekly market that coincided with the day of cooperative “feirinha”, 3) difficulty in selling all of the products brought by farmers.

The Brazilian consultancy company, contacted to evaluate the efficiency of ASTC, argued that the “feirinha” was not an economically sustainable activity. To optimize revenue subject to expenditures the cooperative should focus on what is the core business of the organization and the commercialization of vegetables and other fruits was not. It was not useful to create income for the cooperative as the revenues from products sold were not directed to the cooperative itself but rather to the single ASTC members.

When town market day was moved from Friday to Saturday and the cooperative decided to move its own to Friday, problems emerged. This resulted in a reduction of customers to the “feirinha”.

It happened often that cooperative members brought more supply than necessary to meet the demand of tourists and hotels and restaurants. This resulted in losses in terms of farmers’ products at “feirinha”.

Some ASTC members felt betrayed by the shutdown of the “feirinha”. They had invested in many crops that ASTC initially supported both with credit and training. After the end of the “feirinha”, some crops, such as bananas, citruses, pineapples, and vegetables, were no longer commercialized by the ASTC and they had to find other markets to sell them.

Second turning point: decision to specialize on fruits and invest in agro-processing

After receiving the recommendations from the Brazilian consultancy company, from 2008 on ASTC decided to specialize in fruit production that responded to market requests, which are mainly related to the tourism sector. Indeed, the municipality was an important tourist destination in Brazil. The cooperative was therefore forced to provide a larger variety of fruits than cooperative members had ever produced. This decision also implied that cooperative members were strongly encouraged to plant new fruits' trees in their plots. In the meanwhile fruits, which are not produced by ASCT's members, are bought by the cooperative elsewhere.

The decision to specialize in fruit production, along with the different harvesting times of the fruits produced, made it necessary for the ASTC to invest in fruit processing in order to avoid losses. ASTC focused its investments on creating an agro-industry for fruit processing. Furthermore it endorsed credit to a limited number of ASTC members to build small buildings (two rooms) designed for the processing and storage of fruits ("casas das frutas") in their home village. Lastly it promoted fruit diversification and production planning. "Casas das frutas" allowed some farmers to process the fruits immediately after the harvest in order to prevent losses, especially on the most perishable fruits. They also allowed farmers to sell their products at a higher price. At survey time, there were only five "casas das frutas" working in village A. Especially in village A, where the production is the highest, the ASTC technicians visited plots and defined the number of trees that each member should plant.

ASTC opened participation not only to households not residing in the agrarian reform settlements but also to neighboring areas including "fazendas" and "sitios". This choice to include farmers also from other municipalities is related to the specialization focus of the cooperative. Production becomes more important than location among the criteria to include farmers.

In chapter 3 I have illustrated the great difference between products that ASTC was promoting before 2008 (cassava, banana, citrus, coco, vegetables) and the type of products on which the cooperative focused afterwards (soursop, passion fruit and acerola). They differ in several dimensions: unitary costs for crop implantation and maintenance (pesticides and fertilizers application), amount of labor force needed both for production and harvesting, length and type of cycle of production, and level of perishability.

5.3.4 Ambivalent narrative to attract funds

Since the 1980's, there has been an attempt in development discourse to associate the conception of empowerment promoted by development agencies, especially NGOs, to voluntarism and de-politicization (Hickey S., Mohan G. 2004).

Despite this often-declared neutrality, all development actors, including ASTC and the organizations supporting it, follow guiding values in their activity, such that it is impossible to claim for neutrality (Bornstein 2011). Such values guide both the organization's actions and narrative used to attract funds (Chen, Lune, and Queen 2013).

The values of ASCT leader strongly influence ASTC activities both in the interpretation of reality and therefore the definition of priorities and in the representation of the cooperative to attract funds. There are two issues that hamper this self-declared neutrality of ASCT.

The choice of the nun to organize farmers in a cooperative rather than in other form of enterprise is certainly related to the biographical background of the nun. She comes from a Northeast region of Italy where cooperatives, especially in the agricultural sector, play an important role. In ASTC documents, the cooperative is often referred as "cooperative family". This is relevant as it mimics the name given to the first consumer's cooperatives in the region where the nun came from. The choice of this form of organization made it easier also to have access to funds in the nun's own region.

Also, the religious role of the nun certainly allowed significant mobilization of resources and fostered the participation of Italian volunteers that worked in the cooperative. Those other funds came from both large religious organizations and private funds from single families in Italy. The main Italian associations responsible for supporting cooperative activities also have the option to adopt a family member of the ASTC by long distance. Private donors can support one or more ASTC members or the studies of ASTC members' children. The amount of these funds are not well known to most people on the board of directors, and people more involved in the cooperative activities are not aware of how they are used. The main accountability of these founds is mostly related to supporters in Italy.

It is important to point out that this heterogeneous composition of funds that allow the cooperative to continue to exist is drawn upon different narratives for different donors. On the one hand the main objectives presented in projects to be founded by Brazilian donors are

more related to issues such as preventing migration from rural areas and making the cooperative an important economic engine. On the other hand the narrative adopted for Italian donors refer mostly to visions of humanitarian relief and the end of poverty.

A possible explanation to this phenomenon is that it is possible to interpret the flow of resources between donors and recipients as a conversation where the comprehension between the two actors involved in the dialogue is strictly related to the construction of the same common background (Scollon and Scollon 2001). The nun therefore needs to adapt her narrative and present the reality she is interacting with using the language that the people she is addressing to are able to understand and identify with.

The main objectives, of projects supported by the private Brazilian enterprise in the framework of corporate social responsibility, are comprised of the general goal to drive citizenship that include: supporting local development, promoting social insertion of people and groups, and reducing poverty and inequality. The main activities promoted in the enterprise program are: 1) promote income generating activities and work opportunities, 2) educate to achieve professional qualification and 3) guarantee the rights of children and teenagers.

The objectives of the projects to be financed by religious entities are more related to the discourse of humanitarian relief. In the project motivations, the more emphasized aspects of the project are the conditions of poverty of many households residing in the settlements, gender violence and the impact of corruption. The positive aspects emphasized include the changes that agrarian reform is offering to people. The presence of a number of family farmers instead is not emphasized in the projects' narrative.

5.4 ASCT economic and political position in the municipality

This section aims at showing that the trajectory towards specialization increases dependence on the market. As such, villages are more directly affected by local politics. The section starts by describing the influence of municipality decisions on ASTC actions, and then it summarizes the role that the cooperative plays in each of the villages. This section continues, presenting the differences in production and in the number of people hired among members and non-members. It shows the evolution of ASCT membership and production in the three villages over time. It outlines the difference in attributes and position in the

networks of members and non-members. Lastly it focuses on village A, as it is the most specialized in new crops, and the most vulnerable to the afflictions of municipal politics.

5.4.1 ASTC and the municipality

ASCT specialization in high value crops creates on the one hand barriers of entry in the cooperative and on the other increases dependence on the market.

The importance of political representation is related to the strong dependency of the agrarian reform settlements on public policy both at the municipal and the federal level. Furthermore political partisanship concerns some settlers' expectations from the state. They ask from the state the same protection that they received from sugar cane plantation landowner.

Villagers' conditions are strongly influenced by municipality decisions in the provision of services (school, hospital and roads). Furthermore the municipality influences the farmers' commercialization directly by the way in which it maintains roads' conditions and by its decision to purchase family farmers' crops, to be used for school meals[30]. In addition politicians, part of the municipality administration, often offer to villagers' individual benefits, such as to jobs, as a reward to settlers that more actively supported their electoral campaign. All agrarian reform settlements are organized in associations and they all have an elected president. It is very frequent in the municipality that villages' presidents are offered a job in the public administration such as school vigilantes ("vigia da escola") or village health officers.

As shown in the previous section, ASTC's activities have been largely dependent on foreign and national donors' support (given in a regime of extraordinary situation), and there is no ordinary line of state financing that regularly supports ASTC. Funds that the cooperative receives from external or national administration, except for one program, always have to pass through a process of grant competition.

Cooperatives working in agriculture aim at promoting one of the most challenging activities in the economy. Agriculture is one of the most subsidized sectors in richest countries. In Brazil, there are several federal budget lines specifically devoted to support family farming.

[30] Programa Merenda Escolar (art. 7, Law nº 11.947/2009)

The analysis of the focus group's transcript points out that producing high value crops, that constitute the core business of the cooperative, requires investments and training. During the focus group, the issue on which participants debated longer and with more emphasis was about fertilizers and technical assistance. Focus groups' participants argued that ASTC is asking them to further diversify their production without giving them credit, and this prevents them from taking all of the necessary actions to invest in these new products.

"Member 1: During the general assembly they say that you should diversify production. But if you do not have the conditions to preserve what you have, how can you diversify?

Member 2: Goyaba is impossible to produce. We already tried but it is impossible. Do you know that to do caja it takes more than fifteen years? Who has the financial resources to do that? The majority of acerola comes from non-members. ASTC tells us: "why don't you all plant a little of acerola, so we are all going to have acerola?" For this investments are necessary."

The last funds directed to the cooperative, such as Brazilian private enterprise and funds from religious institutions and Italian local authority, were mostly directed to activities of transformation and less to support activities in the field.

Member 1: ASTC board of directors, during the last period, has been forgetting about the activities on the fields. At the beginning of the projects there was investment for the field. I think that a closer connection with the field should be present. I think that this connection should be re-activated.

Members of the cooperative, during the focus group, said that a possible solution to this problem of funds shortage would be a greater role of the ruling municipality administration in supporting cooperative's activities.

Member 2: The issue is that the cooperative does not have strengths to do more than it does. After that there is the municipality. If the municipality would buy more for the school meals! There are many students, but the municipality does not buy, therefore it creates trouble for us.

Member 3: But it is not only about politics, we also have resources from outside (from projects).

In Brazilian legislation, since 2009, there has been a federal legislation (Law Nº 11.947, June, 16 2009) that imposes on local administration the obligation to purchase products from local family farmers operating in the municipality to provide schools with meals.

Art. 2 The guidelines of school food provision are: V the support to sustainable development as an incentive to purchase of diversified food, produced locally and preferentially by family farming and

by family farming entrepreneurs, prioritizing the traditional indigenous communities and remaining *quilombos*.

> Art. 14. Of the National Fund of Education Development (FNDE) in framework of the National program for School Food, a minimum of 30% has to be used to acquire food products directly from family farming and from rural family entrepreneurs or from its organizations, with primary emphasis on agrarian reform settlements, indigenous traditional communities and *quilombos* community ("Portal Do FNDE - Apresentação" 2013).

Despite this law ASTC have been selling its products to other local administrations in the neighboring municipalities but not to the municipality where it is located. The reason why the ruling administration does not support ASTC action is related to the political positioning of the cooperative. Most of the cooperative's members share the same political affiliation that differs from the municipality political coalition. Local politicians of the opposition party recognize the cooperative's actions as valuable. During the 2012 electoral campaign, in electoral radio advertisements blue party candidates referred to the cooperative as a successful example of entrepreneurship in the region and as a good partner. Furthermore during the electoral campaign, several political meetings were held in the cooperative's headquarters. It is important to point out that in the day of general assembly there was also a meeting with the blue candidate. According to nun's narrative the ruling party is against the cooperative's action because ASTC supports family farming.

The ASTC's proximity to one of the two parties is connected to a series of factors related to the history of the cooperative's creation. The project that then led to the ASTC's creation has been implemented during the ruling period of the blue party; the first land donation to build the cooperative infrastructures was given by the blue party administration. Furthermore all of the technical services and access to funds that village A received, were negotiated during the period of the blue party's administration. It is important to remember that members of village A both represent the majority of cooperative members and account for a major share of ASTC total production (approximately 60%). Lastly the first director of ASTC was a member of the local administration at the time when the first project to support agrarian reform settlements was implemented.

The municipality does not purchase cooperative products, namely fruit pulp, despite the federal legislation (Law Nº 11.947, June, 16 2009).

Local administration officials occupied a piece of land that was donated by the previous mayor. This land is extremely important, as it would have allowed the cooperative to build a structure devoted to one of the activities of crop processing, which, by Brazilian law, should be located outside the main transformation building.

There is no dialogue between ASTC and the agriculture municipal office ("secretaria municipal de agricoltura"). During one radio interview, one of the members of the ASTC board of directors, responding to the journalist question, pointed out that it would be good to have a partnership with the municipality in order to have a collaboration related to the improvement of road conditions but it has not been possible to have a dialogue on this issue. The problem of roads is crucial because, during the wet season, it is very difficult to transport products from the settlements to town by truck, where they will be transformed. It happened more than once that products had to wait for more than one day before the truck could come to pick them. In such occasions, in order to prevent this, usually the solution adopted by ASTC has been to send the cooperative tractor to collect products. This choice however implies higher costs of transportation and faster decay of the tractor, as the distance from several villages to town is more than 20 km of road in very bad conditions.

Considering therefore the huge influence that municipal politics have on ASTC activities, The main argument presented in this chapter is that it is crucial for ASTC to prevent a complete homogeneity of members' political positioning.

5.4.2 ASTC crops and labor supply

Since 2008, ASTC has decided to focus only on some fruits while the rest of farmers' crops have to find other market destinations. A more detailed analysis of crops' features is presented in chapter 3, using secondary data on villages studied. Data presented in all tables in this section is the result of the household survey that I have conducted in 2012.

The different crops have been categorized in terms of their possibility to be sold to the ASTC. Households have been therefore classified in four groups according to typology of crops they produce to be commercialized. First, households producing both crops that could be sold to the ASTC as well as those that could not. Second, households producing crops that cannot be sold to ASTC. Third, households that only produce crops for subsistence and not for commercialization. Fourth, households that produce and sell crops which the most important for the coop commercialization.

Table 5.2 illustrates that village A has the larger percentage of households that produce products that can be both sold to the coop and products that have to find other market destinations. Village A is also the only village in the municipality studied where a significant part of the population produces only crops that can be sold to ASTC. Instead, in the other two villages, households that produce crops that the coop does not buy constitute most of the population. The percentage of households that do not produce crops for commercialization ranges from 8% in village C to 19% village A. In table 5.2 does not show whether households actually sold such products to coop but only typologies of crops produced for the commercialization.

Table 5.2 Households by the type of crops commercialized by villages

	Both ASTC and non-ASTC	Only non-ASTC	Only for consumption	Only ASTC
Village A	41	12	19	30
	40%	12%	19%	29%
Village B	12	22	4	0
	32%	58%	11%	0%
Village B	11	23	3	0
	32%	62%	8%	0%

As outlined in chapter 3, the most important crops that ASTC commercializes are labor-intensive crops. Soursop and passion fruit, which are the core production of ASTC members, have high perishability and specific harvesting seasons while banana and pineapple have a continuous production cycle. This implies that while the former crops have peaks of labor force demand, the latter crops have more stable labor force demand over the entire year.

Table 5.3 compares households that hire and do not hire, in the same four groups of table 5.2. The variable hire describes the fact that the households employ, for their family farming activities, individuals that belong to other households in the same village where they reside.

Table 5.3 shows that there are more households that hire labor force among households that produce either only coop marketable crops or other crops. Village C represents the only exception where most households that hire labor force are households that produce only products that ASTC does not commercialize. This result can be explained by the presence of a large number of households that produce cassava and the presence of a mill in the village. The combination of the two factors can imply that a relevant number of people rather than

organizing the production of cassava to have frequent small harvests prefer to produce large quantity of cassava to be then processed in the mill. The price of cassava flour is higher than simple cassava. The necessity to plant and harvest large quantities of cassava at once requires therefore an amount of labor force that is comparable to labor force needed by fruit trees.

Table 5.3 Use of external labor force use by category of production

		Both ASTC and non- ASTC	Only non-ASTC	Only for consumption	Only ASTC
Village A	Do not hire	13	17	8	16
	Hire	17	2	4	25
Village B	Do not hire	5	17	3	0
	Hire	7	5	1	0
Village B	Do not hire	9	15	3	0
	Hire	2	8	0	0

Table 5.4 describes where households declared to sell their products. For what concerned ASTC members, the ASTC management system provides the exact value sold to ASTCs. For non-members, however, this is not available, as the coop tracks the total sold by non-members but not their identity. Table 5.4, differently from the previous tables on the potential places where households can sell their products, compares households that hire and do not hire, according to market destination of their products combined with households' membership in the ASTC. The four categories are: 1) households that are ASTC members and sell to ASTC, 2) households that are ASTC members but do not sell to ASTC and 3) households that are not ASTC members and do not sell to ASTC, 4) households that are not ASTC members and sell to ASTC.

The table 5.4 highlights that, in village A, 24 out of 26 members sell to ASTC; in village B, only 2 out 9 members; and in village C, only two members both sell to ASTC and have cooperative membership. In general, the table shows that among households that produce crops that are sold to the cooperative, there is a larger proportion that hire. In contrast, the opposite is true for households that do not sell to ASTC. Village C represents the only exception to the trends described where the only two members do not hire. This result is explained by the small production of these members that still have quite young soursop trees that yet did not achieve full potential productivity.

Table 5.4 Labor force use by market destination

		ASTC & Sell	ASTC & no sell	No ASTC & no sell	No ASTC & sell
Village A	Do not hire	8	0	45	1
	Hire	16	1	28	3
Village B	Do not hire	0	3	21	1
	Hire	2	4	7	0
Village C	Do not hire	2	0	25	0
	Hire	0	0	10	0

5.4.3 ASTC trends in membership and production

Figure 5.1 and 5.2 show the evolution over time of ASCT membership and production in the three villages. It presents data on production sold to the cooperative only from 2007, as there is no data available in ASCT reports and management systems before that year.

Figure 5.1 shows that in village B the number of members in the village does not significantly change over time. In village A instead there is a continuous increase in the number members. This trend does not show there was a turnover of members that left the cooperative and had been substituted. Between 2008 and 2009 four households (Id 15, Id 18, id 33 and 51) withdrew from the cooperative and have been substituted by four new other households that already had a higher level of productivity (id 40, id 63 and id 53).

Figure 5.2 shows the production sold to the cooperative per year. A crucial moment is the end of ASTC weekly market in 2008, which corresponds also to a bad year in terms of cooperative production. By analyzing the history of the villages and the production sold to the cooperative it is possible to observe that moments in which members exit from the cooperative correspond to moments of change. In village A ASTC actions are able to influence more members than B because several of them sell to ASTC the equivalent value of over one gross minimum salary per month, as also shown by tables presented in the next pages. Furthermore ASTC members in village A are perceived by the rest of the village differently than they are in village B. It is observed while in village A that households that stop to sell to the coop also withdraw from the coop.

In village B in terms of membership there were no important changes but instead the number of households that sell products to ASTC decreased. Figure 5.2 shows that in 2007 all of the members sold a quantity of products to the cooperative but after 2009 the products sold to the cooperative decreased significantly.

Figure 5.1 ASTC number of members trend by village

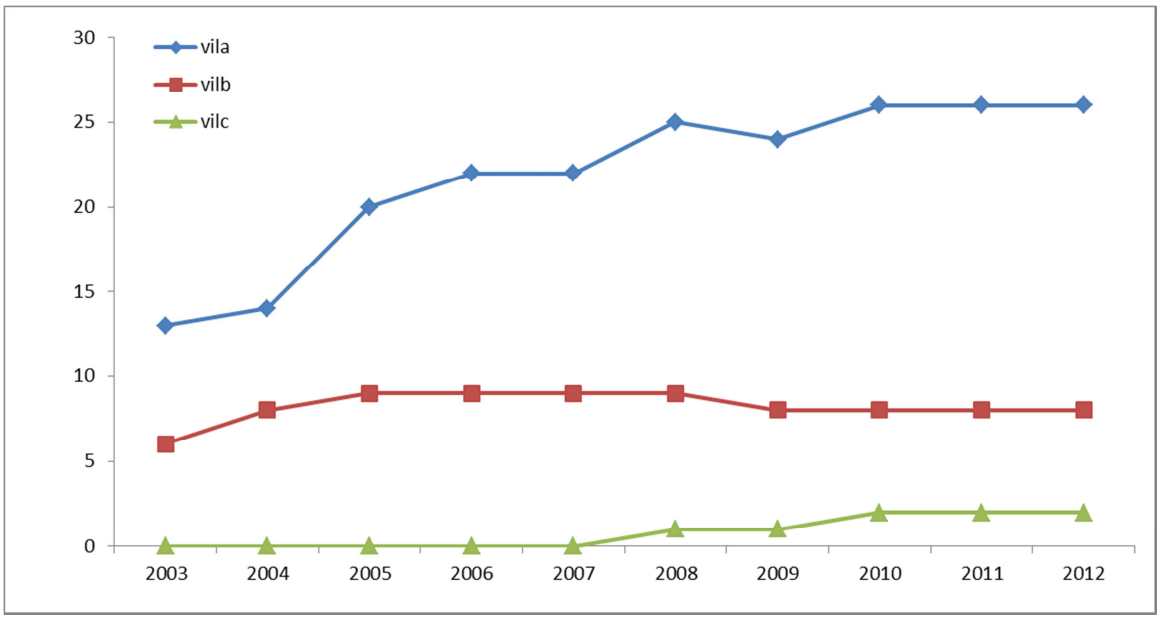
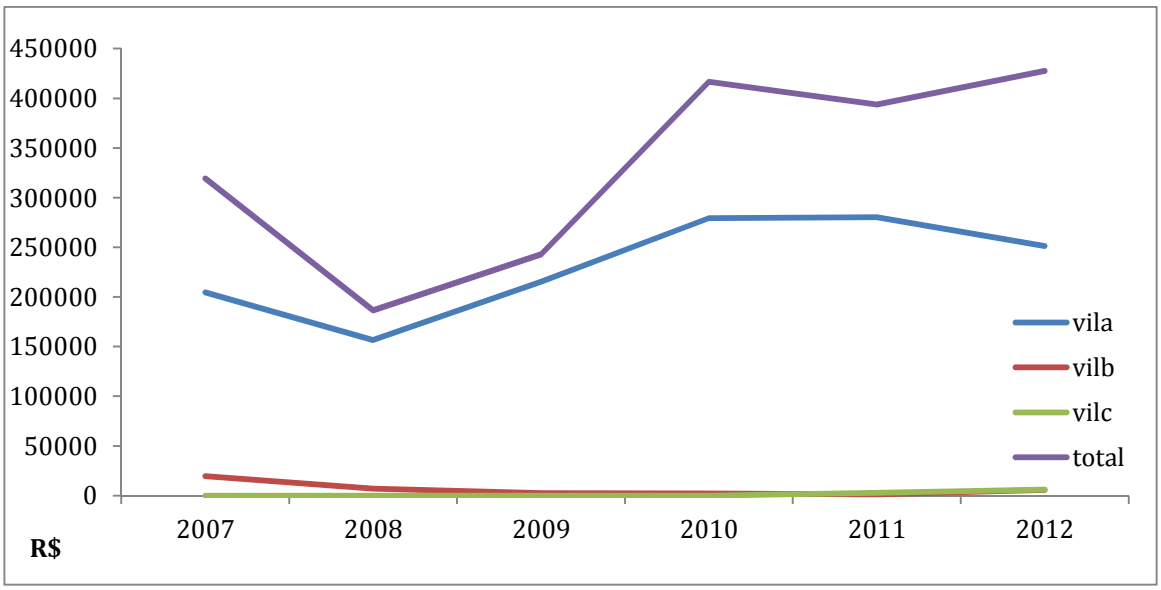


Figure 5.2 Production trend in R$ by village



5.4.4 ASTC attributes and position in the network

Referring back to one of the main findings of previous work on Community Based Organizations, such as producers' cooperatives, one of the crucial risks of these organizations is to be composed only by the most wealthy and most central individuals and to be segregated from the rest of the social structure where they are located. As shown in the previous sections, the possibility of ASCT to perform their action is related to local politics. It is crucial for the coop to have access to state or municipal funds that can support their activity of commercialization.

The next paragraphs illustrate households' features by ASCT membership comparing network position, party affiliation and income from family farming. ASCT membership is measured both in terms of simple affiliation and production sold to the cooperative. There is a prevalence of cooperative members supporting the blue faction, but there is no complete homogeneity. Table 5.5 illustrates the distribution of members and non-members by their political positioning.

Table 5.5 ASTC members' participation to political parades

	Households	No. of non-participant	No. of orange participant	No. of blue participant
Village A	Non-ASTC	44%	16%	15%
	ASTC	9%	4%	13%
Village B	Non-ASTC	53%	21%	5%
	ASTC	8%	0%	13%

The next pages analyze separately the two villages A and B, to show how despite similar percentage of ASTC members (26% and 21%) they differ in terms of family farming income but they have similar political party prevalence.

Village A

The first analysis refers to the relation between ASTC members and family farming income. Table 5.6 describes the distribution of ASTC members and not members by classes of

family farming income per month and proportion of ASTC members by class. Moreover it includes the average production sold to ASTC per month by members to make a comparison between the total income from family farming and the contribution of coop. However the two variables are not strictly comparable as the former is the net income while the latter still includes production costs. Looking at the proportion of ASTC members by class, it emerges that the number is very small in the two lowest classes, while from the third class and above the number grows together with the level of income. Table 5.6 also highlights how the average sold to ASTC is comparable with the class interval.

Table 5.6 Family farming income distribution in village A by ASTC membership

Income from family farming (R$)	No. of non-ASTC households	No. of ASTC households	Proportion of ASTC members	Average sold to ASTC (R$)
0-100	22	1	4%	104
101-300	15	0	0%	0
301-660	29	14	33%	753
661 -1242	8	6	43%	861
Over 1242	2	5	71%	1507
Total	76	26	25%	

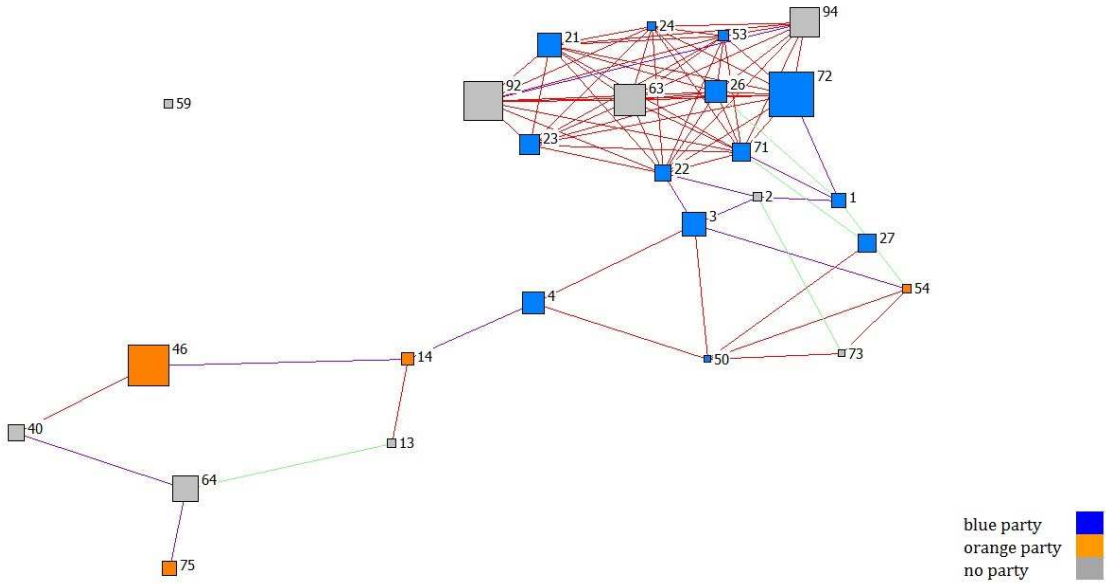
Table 5.7 describes ASTC members' distribution in parties by classes of value sold to ASTC. Furthermore it highlights the percentage of households that participate in blue party over the total. The table shows that the percentage of blue participants grows together with the level of value sold to ASTC. The highest class, where one is blue, one is orange and the third does not participate in any party, represents the only exception. However the three non-participants are connected by kinship ties to the largest clan in the village that is prevalently blue, as shown in figure 5.3.

Table 5.7 ASTC households' distribution by amount sold to the cooperative in 2011 by party

Monthly sold to coop (R$)	No. of non-participant	No. of orange party	No. of blue party	Total households	Blue party
0-100	3	0	1	4	25%
101-300	2	1	2	5	60%
301-660	1	2	2	5	80%
661 -1242	0	0	7	7	100%
Over 1242	3	1	1	5	40%
Total	9	4	13	26	65%

Figure 5.3 represents the joint graph of all the networks collected where only ASTC members are shown. Lines in red represent kinship ties, lines in purple frequent contact ties and lines in green agricultural employment ties. Dimension of nodes represents the value sold to ASTC. In the network it is possible to identify three groups that compose the cooperative. First relatives of ID 72 that were called to join his family in village A, which represents 42% all ASTC members. Second a group of new settlers with mostly blue affiliation. Third, there is a group of new settlers with mostly orange affiliation. It is possible to see that blue and orange members are divided in two groups and that there is only one tie that connects the two. Id 54, the only orange member inside the blue group, is the president of village A. ASTC are all connected except for id 59.

Figure 5.3 Village A ASTC members join graph of the all networks collected



Despite the prevalence of blue members in the cooperative, the social networks maps below illustrate how networks connect households, with different political affiliations. This element is crucial because ties between different groups, defined by political participation, offer the possibility to hamper conflicts among groups.

Figure 5.4 presents the frequent contact network. Nodes dimension represents income from family farming. Nodes' color represent participation to political parades: blue for blue party, orange for orange party and grey if no party has nominated. It shows that households

that participate in the same parades are close to each other in the network despite ASTC membership. However there is no complete segregation between blues and oranges as they are connected. It is important to observe that households that participate in political parades have the highest number of links and therefore they are central in the network.

Figure 5.4 Village frequent contact network

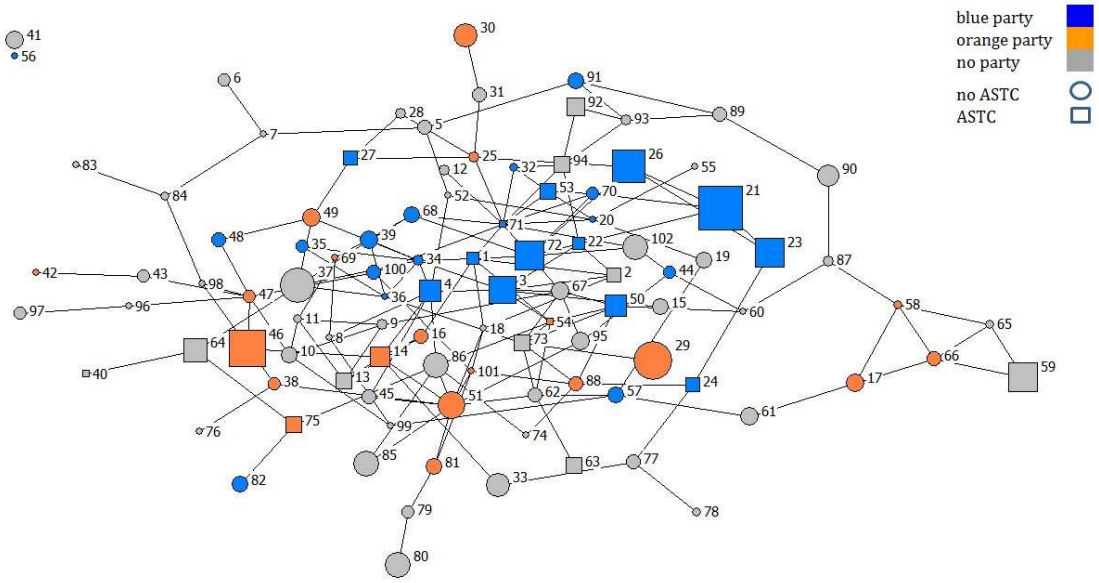


Table 5.8 represents the contact network degree distribution by ASTC. It shows that most of households with the highest degree are ASTC members. Furthermore there is higher percentage of ASTC members as the degree increases.

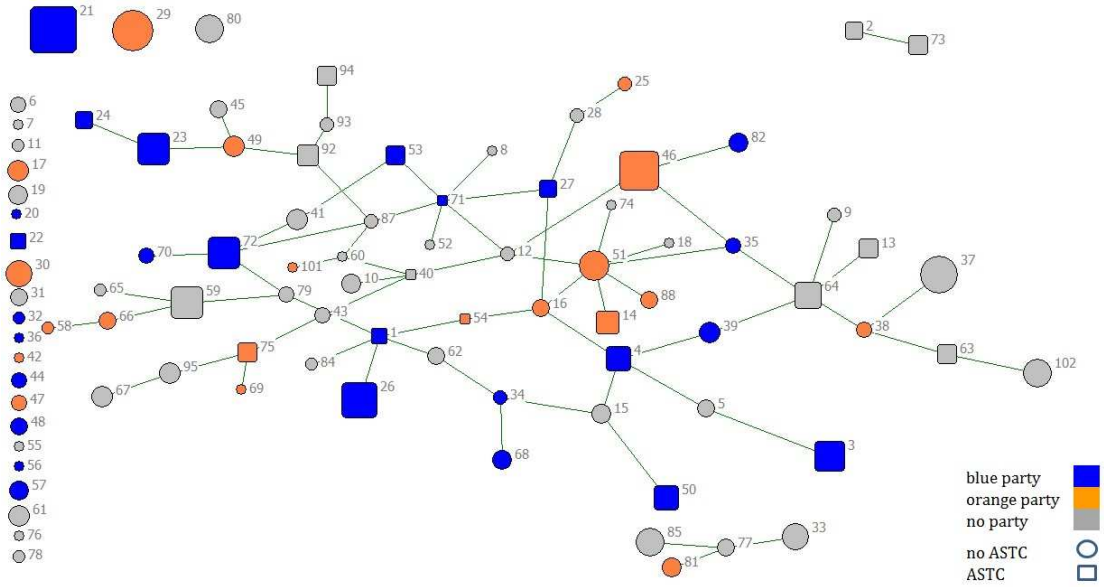
Table 5.8 Village A frequent contact network degree distribution by ASTC

Households' degree	No. of non-ASTC households	No. of ASTC households	Proportion of ASTC members
0	2	0	0%
1-2	27	5	16%
3	23	6	21%
4-5	19	7	27%
6-13	5	8	62%
Total	76	26	25%

Figure 5.5 portrays family farming employment network. The presence of a tie between two nodes signifies that one individual works in the family farming activity for the other. The shape, color and dimension of the nodes are the same as those used in figure 4. In the network

there are two most central nodes: id 51 and id 71. They have the highest degree, as they are the two households that have more people that work for them. They are the two owners of the only two local shops in the village and the ones that own a truck. Id 51 is a former ASTC member while 71 is still affiliated. Both households were key figures in the party activities in 2012 as they were the ones that brought households to the respective parades with their truck. However, despite their differences in political participation, they are still connected to each other.

Figure 5.5 Village A family farming employment network



Village B

This section presents the same tables and figures as in village A. Table 5.9 shows that ASTC only partially includes households that have relevant income from family farming. Most ASTC members have family farming income that ranges approximately from half to one salary. Only one ASCT member has over one salary. Furthermore only two members sell to ASTC and it is a very small value.

Table 5.9 Village B family farming income distribution by ASTC membership

Income from family farming (R$)	No. of non-ASTC households	No. of ASTC households	Proportion of ASTC members	Average sold to ASTC (R$)
0-100	9	1	10%	0
101-300	12	0	0%	0
301-660	4	5	56%	214
661 -1242	3	2	40%	0
Over 1242	2	0	0%	0
Total	30	8	21%	

Table 5.10 describes the ASTC members' distribution in political parades participation by range of amount sold to ASTC. Furthermore it highlights the percentage of households that participate in the blue political parade over the total.

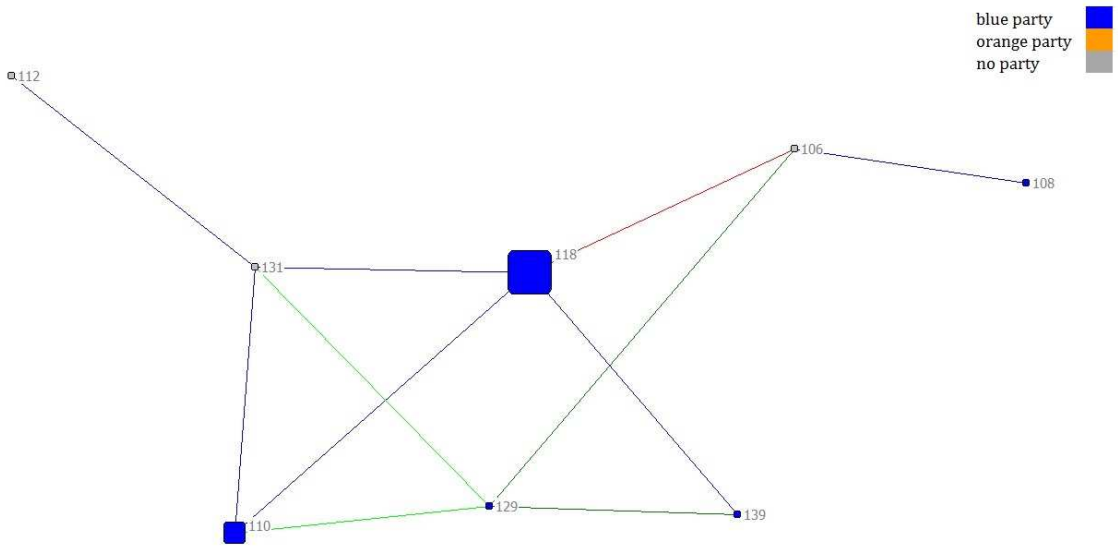
Table 5.10 shows that there are no households participating in the orange parade among ASTC members. Most members sell less than 100 R$ per month to the ASTC, and they are equally divided between blue and non-participants. The remaining two households sell the equivalent of less than two salaries and they participate in the blue parade. Figure 6 describes how the two that sell the most are central in the network and they are connected to each other.

Table 5.10 Village B ASTC households distribution by amount sold to the cooperative in 2011 by political parade

Monthly sold to coop (R$)	No. of non-participant	No. of orange participant	No. of blue participant	Total households	Blue participants
0-100	3	0	3	6	50%
101-300	0	0	1	1	100%
301-660	0	0	0	0	0%
661 -1242	0	0	1	1	100%
Over 1242	0	0	0	0	0%
Total	3	0	5	8	63%

Figure 5.6 represents the joint graph of all the networks collected where only ASTC members are shown. The meaning of ties and nodes featured is the same used in figure 3. Multiple category ties connect all nodes, except for ID 108 and 112, and kinship plays a minor role as it connects only two households.

Figure 5.6 Village B ASTC members joint graph of the all networks collected



However, there is no orange among ASTC members. Figure 6, which portrays frequent contact network, illustrates that there is no polarization between blue and orange in village B. There is a very dense clique that includes households belonging to both political groups. In this clique there are households that arrived together, live nearby and are connected by kinship ties, but they are not homophilous on political parade participation.

Figure 5.7 Village B frequent contact network

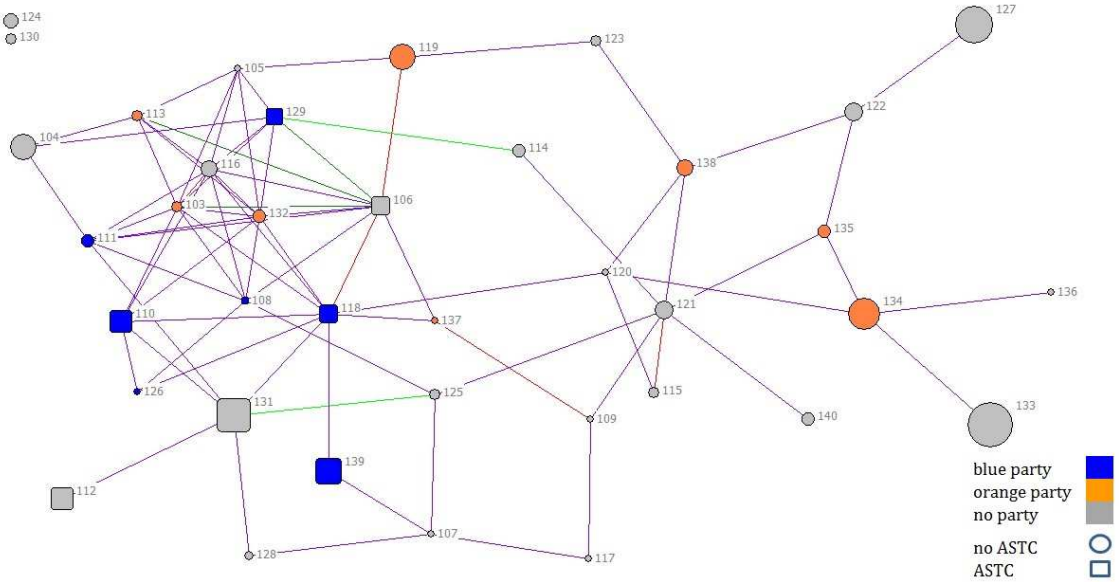


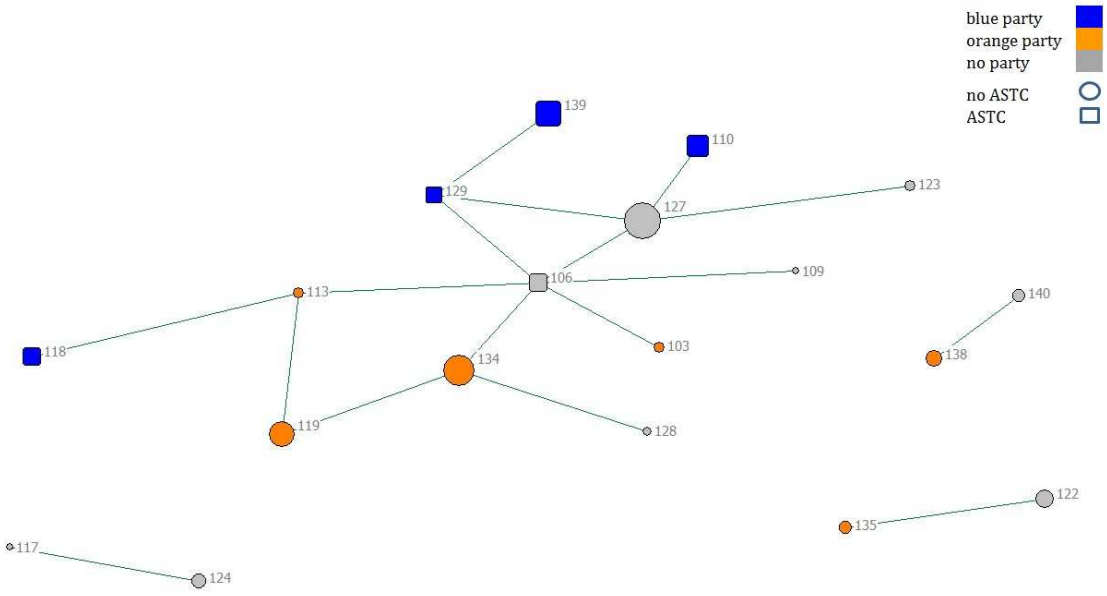
Table 5.11 represents the contact network degree distribution by ASTC. It shows that most of the households with the highest degree are ASTC members.

Table 5.11 Village B frequent contact network degree distribution by ASTC

Households' degree	No. of non-ASTC households	No. of ASTC households	Proportion of ASTC members
0	2	0	0%
1-2	9	2	18%
3	7	0	0%
4-5	5	0	0%
6-10	7	6	46%
Total	30	8	21%

Figure 5.8 illustrates the agricultural employment network. As the number of households that live on family farming is quite small, the network is not dense. Furthermore it shows that the households that hire more are involved in political parades. However the network is quite polarized by parade participation. The two groups are connected but with indirect ties. The most central households have a brokering role between the two groups.

Figure 5.8 Village B family farming employment network



5.4.5 ASTC focus on village A

Village A is the focus of the analysis as it is the most specialized in new crops, it is more vulnerable to be captured by municipal politics. There is no complete overlap between blue

faction and cooperative because there are households that do not produce much for the cooperative or do not produce but still are members of ASTC. The breakdown of households by amount sold to cooperative shows that the majority of households that sell to ASTC more than the equivalent of one minimum salary per month prevalently participate in the blue party parade (Table 5.7).

The main argument is that there is a risk that specialization will also cause political homogeneity. If the trajectory of cooperative specialization continues, the least productive members are likely to be excluded from the cooperative. The risk is that, in the medium run, only the most productive and only blue party affiliates will be members of the cooperative. The next paragraph illustrate the trajectory of exclusion and political homogenization of the cooperative in the history of village A.

Village A household "in ASTC they only want [people] who produce a lot. ASTC makes a distinction between who produces a lot and who produces not so much".

Village A household "ASTC brings investment from Italy. In my opinion people that benefitted from ASTC and connected projects are only those that had something before. Many already had some savings before the first projects started. ASTC only want people that work a lot. Those that do not produce so much cannot stay."

The choice of village A has two main reasons. First village A is where ASTC action has been more relevant in supporting economic activities, as value of production (60% of total ASTC production in 2011) and the proportion of members that sell products to ASTC among all members attest (54%). Second, village A is where the period of fieldwork was longer.

In village A, where a large percentage of people make their livelihood mostly out of family farming, two are main forces that are able to mobilize consent: the will to find political representation and the necessity to transport and sell agricultural crops.

ASTC played a role in both spheres. In the early period of the village, it offered some help in mediating the relationship between the village and the municipal administration. In this village where there was no social movement guiding the process of village creation. The main ASTC role however has always been guaranteeing a market and transport for farmers' products. The certainty of a sure market is especially crucial for fruits, high value cash crops that are the core business of ASTC, but which are easily perishable and therefore need to be quickly transported.

The necessity to transport and sell agricultural crops is extremely important in village A, more so than in the other villages for three main reasons: first the village is furthest from town weekly markets, second, the village has more households that produce fruit crops, and third, there are more households to produce a large number of crops. A proxy of this importance is the value of income from family farming.

The emergence of political factions in agrarian reform settlements are only partially explained by local dynamics, portrayed by social networks, described in the previous sections but more by the intertwine between the above referred factors: political representation and transport and commercialization of agricultural crops. The importance of political representation is related to the strong dependency of the agrarian reform settlements to public policy and to the growing expectations from the state. In village A the local mayor ("prefeito") had an important role in the village creation. It was the main authority with which settlers have negotiated access to funds. Most of the population was in favor of the ruling mayor, who was a representative of the blue party. During two electoral campaigns, for political office in the municipality council, village settlers were mobilized to support id 72 political campaigns. However, none of the two electoral campaigns was successful. In 2002 when the results of the elections replaced the political party in charge, some households stayed with the old party but many decided to change political representation. The lack of alignment with the ruling party was perceived as a possible lack of representation of village at the municipal level, and also a possible threat to personal benefits such as "bolsa familia", the conditional cash transfer fund.

The change of political representation at the municipal level was closely followed by ASTC specialization in specific products. In 2008 there was the withdrawal of some relevant figures from the cooperative. The main reasons asserted were losses in cooperative production along with some personal incompatibilities with the ASTC leading figure. One person in particular started to, using the words of the nun, "become an alternative to the cooperative". The cooperative, with the end the "feirinha", left a space for who would be able to support the commercialization of such products. Id 51, the owner of a truck in the cooperative, was able to find alternatives for the work he was doing for the cooperative. Since 2008, he has been offering to transport either only crops or crops and people to sell their products at the nearest town market, in exchange for a small amount of money.

In 2012 election id 51 gained one political office in the municipality with the opposite faction from ASTC majority.

It is therefore possible to argue that if a representative of the other faction provides transport to commercialize crops that the cooperative does not buy, these households will benefit from his services and eventually abandon the cooperative. If these smallest producers will leave ASTC, it is likely that ASTC will increase its homogeneity in blue faction's members.

In the following two pictures I present the joint graphs of the all networks collected where only ASTC members are shown. Figure 5.9 presents all ASTC members present in 2009 while figure 5.10 only presents members in 2011. The meaning and coding of the links and colors of the nodes are the same as those used in figure 3. Square nodes are members in 2011, triangles with lower arrow represent members that withdrew from ASTC in 2009, while triangles with higher arrows are members that entered after 2011. Comparing the two socio-graphs, it is evident that the withdrawal of four members caused the loss of a connected part of the graph.

Figure 5.9 Joint graph of the all ties among village A ASTC members in 2009

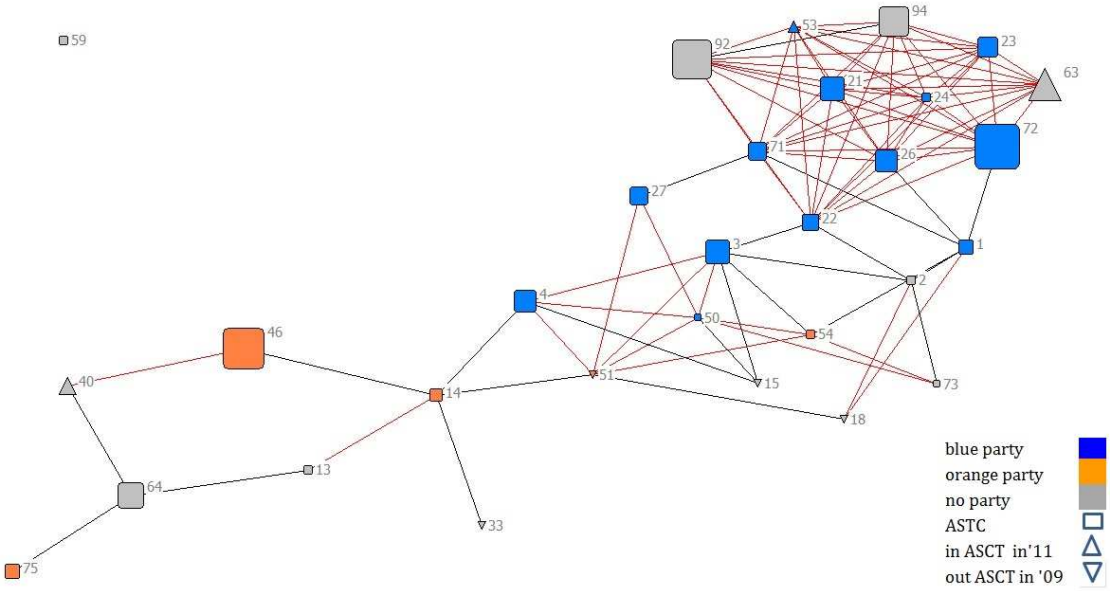
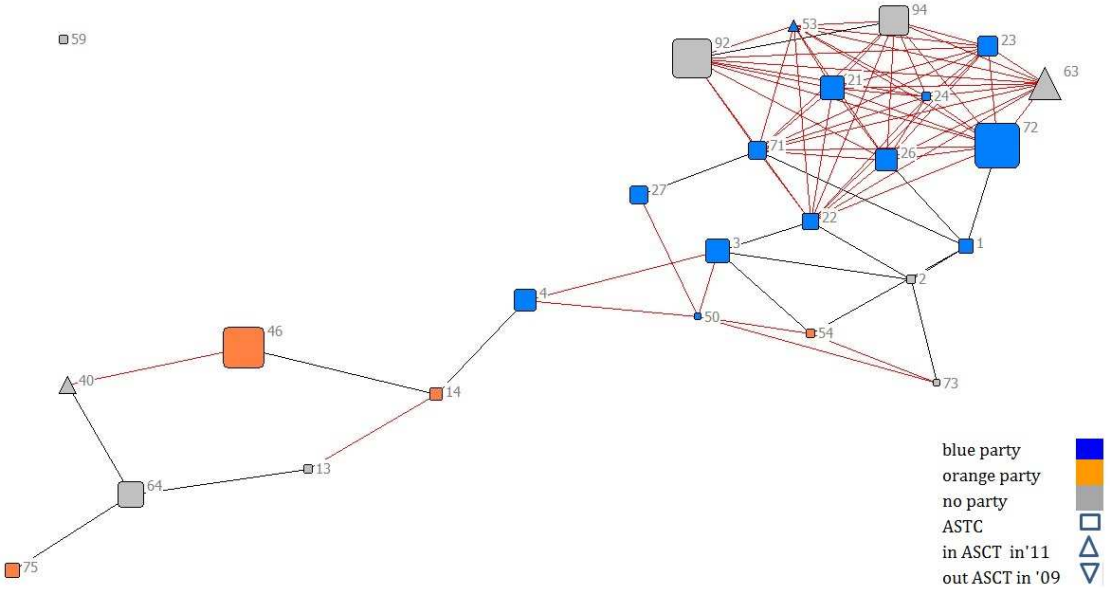


Figure 5.10 Village A ASTC members joint graph of the all ties without members that exited in 2009



5.5 Concluding remarks

The analysis of the trajectory of ASCT specialization, driven by donors, shows that crucial decisions taken by ASTC only marginally reflects the needs and requests of ASTC members. The debate on the crucial role of donors in shaping ASTC decision and the future of the cooperative is central to some of the most productive members. They would like ASTC to gain financial autonomy to increase the bargaining power of ASTC members. "If ASTC was able to walk with its own legs, it would be able to contribute to the quality of life or our families". Quote from focus group.

However, not all members of ASTC's board of directors completely agree with this position and the ambivalent discourse of the cooperative persists. While dependence from external funds provides some members with personal benefits, it strongly hampers the ability of members to take decisions in ASTC.

Referring back to coalition theory, it is possible to argue that, small, tag-along members are important as they force the cooperative leader to be consistent when she justifies her narrative to some donors saying that ASTC supports the more disadvantaged farmers. On the contrary the narrative that is starting to emerge among villagers, especially in village A, is that ASTC only supports the biggest producers.

While ASTC's support to the introduction of new crops has played a role in the emergence of village family farming employment network, its trajectory towards specialization has some drawbacks.

ASCT specialization in very costly crops creates on the one hand barriers to entry in the coop, and on the other hand increases dependence on the market. Furthermore ASTC has always praised farmers that were able to produce large quantities of crops. During ASTC annual meeting, a list of the largest producers is often presented to show who was the first producer of ASTC. However, producing higher quantity of the same crop makes it more difficult for the cooperative to find a destination for its members' production. Despite ASTC's ambition and planned strategy, its members are not able to diversify their production beyond several high value crops. Members, because of financial and land constraints, tend to produce high quantity of the same crop. Being able to find enough buyers for ASTC farmers' products is a crucial issue. The market represented by municipality schools is important for ASTC.

The non-neutrality of ASTC members, due to its history, creates barriers to its own access to municipal funds. As a result of municipal political politics and ASTC history, villagers

participate in opposite political parades. Recent events in village A show that political affiliation is starting to be a reason for division. ASTC members are prevalently blue party participants, and many of the members that withdrew from the coop are now orange participants. There is a risk that ASCT could become politically homogenous. This would imply on the one hand even more difficult relations with the municipality and the on the other hand it can create tension inside the villages. Barth study on *pastung* tribes in Afghanistan (Barth 1980) showed that the presence of men's club allowed for meeting of people of different tribes prevented landlord to segregate them. If ASTC is no longer an organization composed by politically heterogeneous households, it would no longer represent an element that can respond adaptively to external threats but it would become instead vulnerable for local politics to control.

6. Conclusions

This thesis explored how the response to external policies, varies across three Brazilian agrarian reform settlements (*Projetos de assentamentos da reforma agraria*) of the same municipality. *Assentamentos* are new villages that emerge from expropriated unproductive farms of sugar cane plantations. They can be considered quasi-natural experiments in terms of village composition and network formation as they include both old and new settlers.

Starting from the desegregation of a highly hierarchical society of sugar cane plantation (*engenho*/*fazenda*) there is the opportunity to recreate a more plural system where family farming employment could become a way to bridge households that otherwise will not be connected.

The main argument is that family farming plays a crucial role in allowing for the possibility to create new rural villages that differ from previous sugar cane plantation production units. The possibility of family farming to become a relevant livelihood strategy is associated with the features of villages' social networks. The co-presence in the same village of old and new settlers does imply neither interaction nor peaceful co-existence, especially because the two groups have very different features. Moreover, villages' creation in the framework of the agrarian reform does not mean that their main economic activity is family farming.

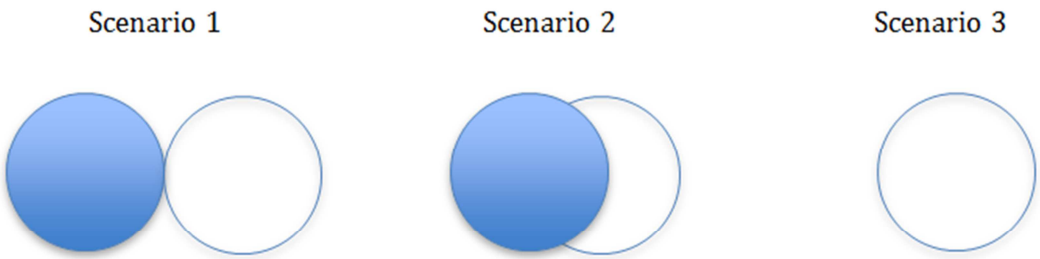
This research is related to three main strands of literature. First, the debate on the role of Brazilian agrarian reform: promotion of structural change or social policy (A. Pereira 2003)? Second the discussion on the role of Community Driven Development and Community Based Organizations (CBOs): do they promote social change or do they reproduce social and economic domination patterns (Arcand and Fafchamps 2012; Agarwal 2001; Labonne and Chase 2011; Dorsner 2004; De Wit and Berner 2009)? Third, the scholarship on the role of social relations in influencing institutions and organizations (M. Granovetter 1985; Padgett and Powell 2012).

Critical scholars of agrarian reform and CBOs argue that these two policies do not trigger any change. They argue that they limit the agrarian reform action to simple resettlement of poor people from urban to rural areas. Furthermore they tend to involve only very few

people, normally the most central in the network and therefore they tend to reproduce the pre-existing social structures.

The main argument of the thesis is framed in the theory of emergence of organizations from the intertwine of social networks in which organizations are embedded (Padgett and Powell 2012). The capacity of social structure to respond to change depends on the ways in which multiple social networks, that constitute social network structure, overlap (Parkinson 2013b; Petersen 2001).

Figure 6.1 Scenarios of networks' overlap



Adapted from Sara Parkinson doctoral dissertation (Parkinson 2013, 59)

The different circles represent the overlap between the different networks studied namely kinship, frequent contact and agricultural employment.

The majority of studies on CBOs and Community Driven Development analyze the process of innovation diffusion with linear-in-means models or innovation diffusion models (Bandiera and Rasul 2006; Banerjee et al. 2012) or identify the homophilous traits that favor households participation in CBOs by using dyadic regression (Arcand and Fafchamps 2012; A. Barr, Dekker, and Fafchamps 2010a).

This study instead focuses on how agrarian reform and a producers' cooperative interacts with the relational systems of three villages. This choice has both a theoretical and empirical motivation. The theoretical motivation is that change emerges from the dialogue between multiple social networks. It is therefore possible to trigger change, and by supporting networks that do not totally overlap with the existing ties, supporting ties between people or

groups that otherwise would not have been in contact (Figure 1, scenario 2). The empirical motivation is related to the fact that the number of households involved by CBOs is usually very small. However mapping and analyzing multiple networks allows understanding what the features of the relational system and therefore how much the society target of CBOs intervention can respond to its action. If CBOs members are not an island (Figure 1, scenario 1) but instead they are connected by network with the rest of the people (Figure 1, scenario 2), CBOs influence not only its members but also the rest of the people living in that context.

This research analyzes three villages created by agrarian reform (*Projetos de assentamentos da reforma agraria*) in the Northeast of Brazil where a cooperative, with the invented name of Alagoas Sem Terra Cooperative (ASTC), aims at promoting family farming by supporting the introduction of new crops and the commercialization of some products.

These three villages have been selected out of the 18 assentamentos in the municipality object of analysis based on two main criteria. The first rule aimed at selecting villages whose creation has been headed by different social movements. Because the process of creation was mainly led by Movimento Sem Terra, the criteria was comparability in terms of cooperative intervention. It was selected therefore Village B because it has highest percentage of ASTC households' members in the village after village A, that is the only village that was not created by a social movement but by a private association (village A).

For each of the settlements data comprised both households' attributes and social, economic and kinship ties among them. In total the interviews were 102 households in village A, 38 in village B and 37 in village C. The number of households interviewed represent all households permanently living in village A and B and 95% of those living in village C.

The agrarian reform settlements can be considered a quasi-natural experiment of village creation as new and old settlers with different professional background and geographical origin become neighbors. The innovative element of Brazilian agrarian reform is not only access to land but also the mobilization of a large number of people from different parts of the country and the creation of rural settlements with heterogeneous composition in terms of professions. *Assentamentos* represent an opportunity to create a new rural space (Bergamasco 1997). They represent a novelty in Brazilian rural areas as they create a rural space where residency and property coincides and family farming favors the creation of rural spaces independent from the town (Wanderley 2000).

The agrarian reform and ASTC operate in a context that have been characterized for centuries by sugar monoculture and where a large majority of unskilled labor force lived in large estates that had one landowner, with whom they entertained vertical unequal relationships. Families that took part in the agrarian reform comes mostly from this background and only a small part of them already had experience with family farming before coming to the village. There is therefore the risk the agrarian reform settlements will reproduce the pre-existing forms of domination's structure present in sugar cane plantations. The transposition across domains of the same role concept has been defined as "refunctionality" (Padgett and McLean 2006a). People, besides residing in a new physical space (agrarian reform settlements), would reproduce the same relational patterns (sugar cane plantation) experienced during their biography.

The decision to focus on intra-village ties responds to the necessity to understand whether these villages became social systems wherein social and economic reproduction functions take place mostly inside the village. By analyzing three agrarian reform settlements that were created by three different social movements it is possible to show that different households' recruitment strategies and different early organizations of villages (different villages' histories) led to different village composition and social processes behind network formation.

The villages can be defined as organizations. The unit of analysis is the household and they are the nodes in the network. A network describes the social relationships (such as friendship) among nodes. Multiple networks that connect households in each village define villages' structure.

It was collected information on three networks: frequent contact network, kinship and agricultural employment. Frequent contact network, which describes frequent meetings of households in the village, is considered an approximation of how people interact in each of the three villages. Furthermore it can be considered as a behavioral network that is the result of constitutive social networks such as kinship and agricultural employment.

For each village, I estimated Exponential Random Graphs Models (Robins et al. 2007) that analyzes the effects of particular network configurations on the presence of ties in the frequent contact network among households. Such analysis aims at testing whether differences in villages' histories and social composition are reflected in different social

processes and local structures that trigger frequent contact with network formation. Specifically it aims what are the common attributes or common edges that increase the probability of a link in the frequent contact network.

The three villages are statistically different in terms of number and homophilous traits behind frequent contact network formation. Namely the homophilous traits that trigger tie formation are more numerous and less redundant in village A than in the other villages.

In the three villages the agricultural employment has a brokering role. On the one hand households, that have family farming as main livelihood strategy, are more likely to form a tie in a frequent contact network and on the other hand agricultural employment creates non-overlapping ties between households. Households that produce more labor intensive crops need to hire more labor and they tend to hire households with whom they have no other ties or share few or no common attributes. This favors a higher number and more complex system of intra village ties that is different from the social structure of these villages before the agrarian reform. In sugar cane plantations most of social reproduction took place mostly outside the village. Instead after the agrarian reform, in the villages analyzed, especially in village A, it is possible to observe a complex system of intra-village ties inside the village.

The analysis of the three villages shows that village A differs from the others both on features of the relational social system and on family farming production profile.

On the social dimension several homophilous traits are able to trigger frequent contact ties between families. Moreover the number of marriages between people of different geographical origin and/or between new and old settlers is higher in village A than in the other villages. Village A is the one where there is higher agricultural production and prevalence of new crops, that require the higher employment of labor force as testified by an agricultural survey conducted in 2007 (COATES 2007).

On family farming production, chapter 3 explains the production cycle of the most widespread crops across settlements and shows that besides the absence of differences in soil properties, in village A new crops are most widespread. Furthermore, cooperative management system, project reports and leaders' narratives show that members of the cooperative residing in village A have been always the major contributor to the cooperative production.

Lacking longitudinal data it is not possible to clearly disentangle the direction of causality between the relational system configuration and major agricultural production. However village A is the one that most resembles the scenario 2 of Petersen theory (Petersen 2001) as the frequent contact network is predicted by the combination of both family farming employment and kinship network that are not completely overlapping.

Also in the other villages agricultural employment plays a brokering role but the number of ties is smaller and the effect on the overall system is smaller. In village B there is overlapping between kinship and family farming employment network.

In village A it is possible to observe how the cooperative influences not only its members but also the rest of the village because several households produce the crops that cooperative supported and that represent a novelty for the context.

After having shown how social relational system of village A resemble more to scenario 2, the thesis ends by highlighting how this brokering role of family farming is hampered by a process of political homogenization of producers' cooperative.

ASTC interacts with family farming employment network by supporting the introduction of new labor-intensive crops and it plays a role in providing the market for some products. However, ASCT specialization in very costly crops, influenced by the strong role of donors on cooperative's decision, on the one hand created barriers to entrance in the coop and on the other increased dependence towards market. Furthermore if only biggest producers are ASTC members and all of smaller family farmers are left out, there is a risk that these ASTC members share no or very little space of social interaction with the other villagers (scenario 1). The situation that would be produced could strongly mimic what was observed during sugar cane plantation period where there were very powerful landlords and a very large number of salaried workers. If instead ASTC is able to not exclude smaller producers and to be heterogeneously composed by both small and large producers it can actually supports the creation of more complex relational system characterized by the presence of several small and medium family farmers.

The choice to specialize made the cooperative more dependent from market as it has to sell large amount of a limited selection of products. Being able to find enough buyers for ASTC farmers' products is a crucial issue. The market represented by municipality schools is important for ASTC. The political positioning of ASTC members, due to its history, creates

barriers to its own access to municipal funds. Villagers have started to be affiliated to two political opposite parties. Recent events in village A show that political affiliation is starting to be a reason for division. ASTC members in fact prevalently support the party represented by the color blue and many of the members that withdrew from the cooperative support the orange party. Therefore there is a risk that ASCT could become politically homogenous. This would imply on the one hand even more difficult relations with the municipality and on the other tensions inside the villages that would hamper the brokering role of agricultural employment.

The contribution of this work to extant research is to study role of external policies to promote change not in a methodological individualism perspective (Arrow 1994) but rather in terms of emergence of new organizational form (Padgett and Powell 2012). We can in fact refer to local development not only in terms of expansion of individual capabilities (Nussbaum 2011) but also in terms of emergence of new organizational forms (Padgett and McLean 2006b). The methodology adopted is a mixed methods approach. The qualitative tools allowed to better understand the process of villages' creation and to inform the meaning of social ties in the society analyzed while quantitative tools allowed testing for the differences in villages' social networks' formation.

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8 Appendix

8.1 Interview guide

Parte I: Características socioeconômicas da família

1.Origem das famílias e profissões anteriores

Antes de tudo gostaria de saber os vossos nomes (e alcunhas) e conhecer um pouco historia da sua família.

Vocês (o senhor e a esposa) são naturais de onde?

Já viveram em outros municípios? Qual foi ultimo local onde vocês viveram?

Alguém da sua família ainda vive o trabalha por lá?

Com qual frequência vocês visitam esses lugares? (uma vez por ano, duas vezes por ano, uma vez por mês) [31]

Quais foram as suas atividades anteriores (prestação de serviços, cana de açúcar, agricultura do lote, pequeno comercio) [32]?

2. Historia de como chegaram a viver no assentamento

a) Há quanto tempo vocês vivem nesse local?

b) Como chegaram a viver aqui?

- Morador
- Seguindo um movimento social
- Acompanhando um parente que já se tinha instalado aqui?
- Aquisição do lote depois da reforma agrária?

c) Quem vos informou da possibilidade de poder ter terra nesse assentamento?

d) Se forem dos primeiros moradores pode me contar um pouco de como foi o período do acampamento até reconhecimento da terra por parte do INCRA[33]..

Part I: Socio-economic features of the household

1. Origin of households and previous professions

First of all I would like to know your names (and your nicknames) and to know a little about the history of your family.

Where were you born?

Have you already been living in other municipalities? What was the last place where you lived before coming to this village?

Does somebody of your family still live or work there?

How often do you visit such places (once per year, twice per year, once per month)?

What were your previous activities (services, sugar cane, family farming, small trading activities)

2. History of how they got to live in the settlement?

a) How long have you been living in the settlement?

b) How did you get to live here?

- Old settler
- Following a social movement
- Following a relative/sibling
- Plot acquire after agrarian reform?

c) Who told you about the possibility to get access to the land in this settlement?

d) If you are in the group of first settlers could you tell me a little about the process that led from the period of encampment to land access recognition from INCRA.

[31] I did not provide these possibilities to the respondent but I used them to code the answers.

[32] Idem note 14.

[33] This question was asked only to the first people of each village interviewed and not to everyone. The objective was to reconstruct the story of the village.

3. Composição da família e atividade atual

Quantas pessoas moram consigo na sua casa?

Qual é a relação de parentesco que tem com eles?
Vocês estudaram até que serie[34]?

Quais são as vossas atividades (não trabalha, trabalha em casa, estuda, procura por trabalho, se trabalha - prestação de serviços, cana de açúcar, agriculturas do lote, pequeno comercio)

No ultimo ano trabalhou fora do assentamento? Quantos meses? Qual foi a atividade?

Algumas das pessoas, que vivem na sua casa, tem aposentadoria o tem beneficio?

5. Bens da família

Tem algum equipamento eletrônico? Qual (TV, celular, radio, computador)?

Qual é a sua fonte água (cacimba, água encanelada, rio)?

Vocês para cozinhar usa fogão a lenha o gás de cozinha ou os dois?

6. Características da produção agrícola

Qual e' a distancia da casa ao lote (em minutos) [35]

Quanto do seu lote esta cultivado (se sabe o numero de contas ou hectares, se não quanta parte esta cultivada)?

Qual é a sua produção agrícola (cana de açúcar, lavoura branca, fruticultura, vegetais)

Vocês possuem algum animal? E´ para consumo o venda? (pequenos animais, piscicultura, bovinos)

A quem entrega a produção? (atravessadores, CEASA, vizinhos, cooperativa, feira semanal)

Alguém da sua família tem mais de um lote?

3. Household composition and current activity

How many people live with you in your house?

What is the kinship tie to them?
Did you study until which grade?

What are your activities (do not work, work at home, look for job, if somebody works what are your current activities (services, sugar cane, family farming, small trading activities)

During last year did somebody in your household work out the village? How many months did he or she stay away? Which was his activity?

Does somebody in your household have pension or social benefit?

5.Family goods

Do you have any electronic equipment? Which? (TV, cell phone, radio, computer)?

What is your source of water (well, channeled water, local stream)?

What do you use to cook: wood or gas or both?

6.Features of family farming production

What is the distance from plot (in minutes)

How much of your plot is cultivated (if you know how many *contas* or hectares, if not which part is cultivates)?

What is your production (sugar cane, temporary crops, fruits, vegetables)

Do you have any animal? Is it for consumption or to be sold (small animals, fishery, cattle)

To whom do you sell your production? (Middlemen, large local warehouse (CEASA), neighbors, coop, weekly local market)

Has anybody of your family more than one lot?

[34] To be intended you and your wife or the opposite

[35] Asked just in village B as distance to the plot is higher just in this case.

Parte 2: Relações sociais

1. Relações de parentesco:

Tem parentes que vivem no assentamento?

2. Participação em grupos

Vocês na vossa vida já participaram de algum grupo (igreja, associação, sindicato, cooperativa)?

Como é que vocês souberam desses grupos? Foram convidados por alguém o como é que souberam?

Vocês participam de alguma igreja? Qual? Quantas vezes por semana se encontram?

3. Relações laborais

No ultimo ano no seu lote precisaram contratar alguém ou vocês foram contratados por outra família? Se sim quem?

No ultimo ano alguém da sua casa trabalhou para outro assentado, o por outra pessoa de fora?

4. Canais de informação/amizades

Tem alguma pessoa que vocês se reúnem frequentemente para conversar? Quem são, poderia saber os nomes?

Como è que você se informa sobre as novidades da cidade? tem alguém que vocês gostam de conversar para ter essas informações?

Se estiverem precisando de alguma ajuda para enfrentar uma dificuldade na roça a quem pedem?

Quem vocês acham que é mais popular no assentamento?

Se estiverem precisando de alguma ajuda para enfrentar uma dificuldade no assentamento a quem pedem?

6. Mobilidade

Alguém da sua família se desloca para a cidade, ou outros assentamentos ou outros locais (para fazer compras, para ir ao medico, para vender os produtos cultivados)

Part 2: Social relations

1. Kinship ties:

Do you have relatives living in this settlement?

2. Participation in groups

Did you ever participate in the activities of some groups (church, cooperative, union, association)

How did you get to know about these groups? Did someone invite you or how did you get to know?

Do you participate in the activities of some church? Which? How many times per week do you attend to?

3. Labor relations

During last year have you called someone to work on your plot? If yes can you name the main workers that you contracted? (Hires)

During the last year have you worked on the plot of some villages' holders? If yes can you name the main people that called you? (Work for).

4.Access to information and friendship

Are there some people that you frequently meet to talk? Who are they? Can I know their names?

How do you get to know about the news from town? Is there somebody that you like to talk with to get this information?

If you need help to solve some issue related to your plot, whom do you ask to?

Who do you think is the most popular in the settlement?

If you needed some help to solve some issue in the settlement who would you call?

6. Mobility patterns

Do somebody of your family go to town or other settlements or other place to buy groceries, visit a doctor or sell products?

Qual é o meio de transporte (mota/bicicleta de propriedade, carro/ camião de propriedade, transporte semi-coletivo):

Além da citade vocês vão para outros locais? Em media quantas vezes por ano?

7. Renda e gastos

Quanto é a renda por mês juntando tudo (a renda da agricultura, de outros trabalhos e bolsa família e/o aposentadoria)?

Quanto a agricultura contribui para a renda (valor exacto ou percentagem)?

Vocês gastam quanto por mês (eletricidade, alimentação, remédio, transporte, compra de adubes o outros equipamentos para a agricultura)?

8. Houve mudanças na sua vida, produção agrícola, convívio desde que a sua família se transferiu para este assentamento?

- ·Muito
- razoável
- ·Pouco
- ·Nada

O que melhorou?

O que piorou?

What is your transportation mean (own motorbike, own bicycle, own car, own truck, semi-collective transport)

Beside the nearest town do you go to other places? Which and how many times per month?

7. Income and expenses

How much is income per month putting together family farming, other jobs and bolsa familia and/or pension?

How much family farming contributes to the overall income (either you tell the exact amount or indicate the approximate percentage)
How much do you spend per month (electricity, food, medicine, transport, supplies for agricultural production)?

8. Are there changes in your life after you moved to the settlement (social environment, agricultural production, safety or others)

- A lot
- Moderately
- a little
- nothing

What improved?

What got worse?

8.2 Focus group questions

1	Vocês sabem o que a cooperativa faz? Pode explicar	Do you know what the cooperative do? Can you explain.
2	Na sua ótica a cooperativa esta a responder aos seus problemas?	In your opinion do the cooperative answer to your problems?
3	Na sua ótica a cooperativa esta a responder as suas necessidades de assistência técnica?	In your opinion do the cooperative answer to your technical assistance issues?
4	O que vocês pensam que não funciona na cooperativa. O que esta a funcionar? O que vocês queriam mudar?	What do you think that does not work in the coop? What is working? What would like to change?
5	Na vossa ótica e' difícil participar na vida da cooperative: propor as vossas ideais e fazer atividades em comum?	In your opinion is it difficult to participate to coop activities: propose you own ideas and do activities with other members?
6	Já tiveram a sensação que alguém decidiu por você na cooperativa?	Have you ever had the impression that somebody decided for you?
7	O que vocês pensam da divida do agricultor em relação ao INCRA?	What do you think about settlers' debt towards INCRA?
8	Vocês continuariam a trabalhar na cooperativa se ela parasse de trabalhar com projetos?	Will you still continue with coop if it would stop working with projects?
9	O que vocês acham daqueles cooperados que não participam das atividades da cooperativa?	What do you think about those people that did not take part in the activities of cooperative?
10	No futuro vocês pensam que a cooperativa terá um papel na vossa vida?	Do you think that the cooperative will still play a role in your life?

8.3 Variables collected

Variable name	Variable description	Type of variable
Age	Age (mean of male and female age)	ordinal
hh	Number components in the household	ordinal
village	Number of years in the village (mean man and female household head years in the village)	ordinal
school	Number of years of school (mean man and female years of school)	ordinal
income	Monthly average total income	ordinal
aincome	Monthly average family farming income	ordinal
mobility	Number of times outside the village per year	ordinal
land	Plot dimension in hectares	ordinal
cows	Number of cows possessed	ordinal
hires	Number of households that they hire to work on their plot	ordinal
workfor	Number of households for whom they work for	ordinal
kind	Number of households to which they have kinship relationship	ordinal
aff	Sum of all events in which families take part that are represented by the sheet events	ordinal
popular	Number that household that referred the household in object as among the most popular	ordinal
moto	Possess of motorcycle	nominal
car	Possess of car	nominal
truck	Possess of truck	nominal
bike	Possess of bicycle	nominal
female	Female leaded household	nominal
intm	Interviewed male	nominal
inf	Interviewed female	nominal
intb	Interviewed both	nominal
ac	Possess of animals for consumption	nominal
as	Possess of small animals to sell	nominal
at	Possess of horse	nominal
as1	Possess of cows to sell	nominal
orange	Participation in political parade orange	nominal
blue	Participation in political parade blue	nominal
geremias	Household that arrived in the village in the group of Geremias	nominal
severino	Household that arrived in the village in the group of Severino	nominal

aut96	Autonomous worker before agrarian reform	nominal
em96	Employee before agrarian reform	nominal
mix96	Mixed employment status before agrarian reform	nominal
ret96	Retired before agrarian reform	nominal
une96	Not employed before agrarian reform	nominal
aut12	Autonomous worker after agrarian reform	nominal
em12	Employee after agrarian reform	nominal
mix12	Mixed employment status after agrarian reform	nominal
une12	Retired after agrarian reform	nominal
ret12	Not employed after agrarian reform	nominal
3sect96	Working in the third sector before agrarian reform	nominal
agri96	Family farming before agrarian reform	nominal
cane96	Sugar cane before agrarian reform	nominal
offcane96	Sugar cane industry officer before agrarian reform	nominal
oth96	Other before agrarian reform	nominal
mixx96	Mixed employment sector before agrarian reform	nominal
mun+oth96	Municipality + other livelihood strategies	nominal
3sec12	working in the third sector y after agrarian reform	nominal
agri12	family farming after agrarian reform	nominal
cane12	sugar cane after agrarian reform	nominal
oth12	other after agrarian reform	nominal
mun+oth12	municipality + other livelihood strategies	nominal
mixx12	mixed employment sector after agrarian reform	nominal
offcane12	sugar cane industry officer after agrarian reform	nominal
land96	access to land either personal or family land	nominal
land12	access to land either personal or family land after agrarian reform	nominal
3rd comers	3rd wave	nominal
2nd comers	2nd wave	nominal
originary dependents	son of already in village before encampment	nominal
1st com dependants	kids of first comers that arrived in the village with parents	nominal
1st comers	1st wave of people	nominal
originary	people that were living in the village before agrarian reform	nominal
pen	coming from the town of penedo	nominal
sanseb	coming from the town of san sebastiao	nominal
bj	already living in bom jesus before sem terra	nominal
jun	coming from the town of junqueiro	nominal
pind	coming from the cooperative pindorama	nominal
munov	coming from nearby engenho mundo novo	nominal
piab	coming from nearby engenho piabas	nominal

riac	coming from nearby engenho riachao	nominal
other	coming from other areas	nominal
coop07	production sold coop in reais in 2007	ordinal
coop08	production sold coop in reais in 2008	ordinal
coop09	production sold coop in reais in 2009	ordinal
coop10	production sold coop in reais in 2010	ordinal
coop11	production sold coop in reais in 2011	ordinal
coop12	production sold coop in reais in 2012	ordinal
MLST	member of MLST local association	indicator
futbol	member of local futbol team	indicator
landasso	member of local land association	indicator
cath	following catholic church	indicator
evang1	following local evangelical church #1	indicator
evang2	following local evangelical church #2	indicator
Manacleto	commercializing products with anacleto*	indicator
Mbarros	commercializing products in the market in barros*	indicator
Mcoop	commercializing products in the coop	indicator
Mmunicipality	commercializing products in the market in municipality	indicator

* fictional name

8.4 Variables specified in the Exponential Random Graph Models

	Variable description	Type of variable	Number of levels in village A	Number of levels in village B	Number of levels in village C
Uniform homophily effect					
nodematch.agri12	Declared to be engaged in agriculture as main livelihood activity at time of survey (2012)	indicator variable			
nodematch.cath	Following catholic church	indicator variable			
nodematch.contact	Information about the possibility to get access to land in the village by the same contact	categorical variable	19	11	15
nodematch.cop11	Production sold coop (R$) in 2011	continuous variable			
nodematch.coopavr	Average production sold coop in reais from 2007 to 2012	continuous variable			
nodematch.empl0	Previous employment sector before agrarian reform	categorical variable	7	7	7
nodematch.empl1	Employment sector at time of survey (2012)	categorical variable	7	7	7
nodematch.evang1	following local evangelical church #1	indicator variable			
nodematch.evang2	following local evangelical church #2	indicator variable		Not present	Not present
nodematch.futbol	member of local futbol team	indicator variable			
nodematch.hires	number of household that they hire to work on their plot	discrete variable			
nodematch.local.association	belonging to the same local association	indicator variable			
nodematch.market.place	selling product on the same market place	indicator variable			
nodematch.village.office	total number of years that the household had some office in the village	continuous variable			
nodematch.origin	matching on the same origin from the same geographical origin before coming to the village	categorical variable	10	6	9
nodematch.party	matching on the same political participation	categorical variable	4	4	NA
nodematch.popular	number that household that referred the household in object as among the most popular	continuous variable			
nodematch.migration.wave	matching on the same level of the categorical variable that describe migration waves	categorical variable	7	5	7
nodematch.workfor	number of households for whom they work for	continuous variable			
Edge covariance effects					

edgecov.nhA	edgecovariance in hire network	continuous variable
edgecov.nkA	edgecovariance in kinship network	continuous variable
edgecov.nwA	edgecovariance in workfor network	continuous variable
Structural effects		
gwdegree	Geometrically weighted degree	
gwesp	Geometrically weighted edge wise shared partners	

8.5 Sensitivity analysis

Village A correlations

	migration wave	employment sector before agrarian reform	employment sector at survey time	geographical origin	contact to get in the village	popularity score	number of workers hired	number of households work with	political parade participation	value sold to coop in 2011	average production sold to coop 2007-2012	footbal team member	membership in village association	catholic church	evangelical church 1	evangelical church 2	production sold in the same local market	village president	engaged in family farming
migration wave	1.000																		
employment sector before agrarian reform	0.067	1.000																	
employment sector at survey time	-0.066	0.134	1.000																
geographical origin	0.332	0.040	0.160	1.000															
contact to get in the village	-0.259	-0.021	0.146	-0.156	1.000														
popularity score	-0.086	-0.086	0.138	-0.078	-0.042	1.000													
number of workers hired	0.171	-0.139	0.040	-0.087	-0.132	0.240	1.000												
number of households work with	0.048	0.111	0.050	0.109	0.131	-0.140	-0.304	1.000											
political parade participation	0.211	0.178	0.087	0.213	-0.197	0.233	0.165	0.018	1.000										
value sold to coop in 2011	0.114	-0.119	-0.182	0.149	-0.169	0.320	0.303	-0.236	0.170	1.000									
average production sold to coop 2007-2012	0.033	-0.097	-0.199	0.076	-0.141	0.392	0.272	-0.219	0.262	**0.907**	1.000								
footbal team member	0.004	-0.036	0.245	0.123	0.121	0.203	0.104	0.125	0.206	0.048	0.055	1.000							
membership in village association	-0.296	0.025	0.013	-0.087	0.082	-0.016	0.095	-0.109	-0.026	0.261	0.238	-0.029	1.000						
catholic church	0.122	-0.129	-0.151	0.042	-0.049	0.038	0.320	-0.107	0.251	0.093	0.067	0.049	-0.069	1.000					
evangelical church 1	0.011	0.103	-0.031	-0.011	-0.027	-0.074	-0.233	0.260	-0.212	-0.067	-0.073	-0.090	0.078	-0.218	1.000				
evangelical church 2	-0.047	-0.060	0.107	0.067	0.060	-0.065	-0.161	0.111	-0.146	-0.102	-0.100	-0.117	-0.004	-0.173	-0.074	1.000			
production sold in the same local market	-0.230	-0.080	-0.068	-0.126	0.088	-0.072	0.058	-0.037	-0.103	-0.134	-0.126	-0.010	0.087	-0.102	-0.018	-0.069	1.000		
village president	-0.157	-0.169	0.057	-0.086	-0.004	0.327	0.217	-0.065	0.041	0.227	0.261	0.007	0.120	-0.028	-0.052	-0.042	-0.057	1.000	
engaged in family farming	0.068	-0.200	**-0.869**	-0.044	-0.143	-0.079	0.052	0.004	-0.005	0.248	0.256	-0.198	0.175	0.159	0.076	-0.058	0.138	-0.055	1.000

Village A – sensitity analysis

	Model 1			Model 2			Model 3			Model 4		
	estimates	S.E.		estimates	S.E.		estimates	S.E.		estimates	S.E.	
edges	-4.969	0.528	***	-4.818	0.520	***	-4.884	0.523	***	-4.913	0.526	***
Actor relation effects (exogenous) - Homophily												
engaged in family farming	0.296	0.239								0.305	0.173	.
catholic church	0.237	0.200		0.282	0.198		0.242	0.200		0.275	0.197	
evangelical church 1	0.278	0.215		0.252	0.215		0.281	0.215		0.249	0.215	
evangelical church 2	0.618	0.297	*	0.606	0.296	*	0.624	0.297	*	0.602	0.296	*
average production sold to coop 2007-2012				-0.116	0.188					-0.142	0.188	
political parade participation	0.105	0.177		0.091	0.176		0.093	0.176		0.102	0.176	
migration wave	0.217	0.199		0.212	0.199		0.215	0.199		0.214	0.198	
geographical origin	0.511	0.197	**	0.502	0.197	*	0.500	0.197	*	0.512	0.197	**
contact to get in the village	0.014	0.205		0.033	0.204		0.008	0.205		0.037	0.204	
popularity score	-0.648	0.183	***	-0.624	0.183	***	-0.636	0.182	***	-0.633	0.184	***
membership in village association	0.018	0.175		0.022	0.175		0.017	0.175		0.024	0.175	
number of workers hired	0.283	0.180		0.295	0.180		0.284	0.180		0.293	0.180	
number of households work with	0.009	0.178		0.006	0.178		0.020	0.178		-0.005	0.178	
employment sector before agrarian reform	0.408	0.184	*	0.425	0.184	*	0.421	0.184	*	0.410	0.184	*
employment sector at survey time	0.010	0.246		0.209	0.178		0.227	0.178				
footbal team member	0.049	0.175		0.035	0.176		0.045	0.175		0.038	0.175	
value sold to coop in 2011	0.032	0.190					0.065	0.188		0.026	0.203	
production sold in the same local market	0.015	0.203		0.024	0.203		0.014	0.203				
village president	-0.175	0.323		-0.164	0.320		-0.207	0.322		-0.136	0.320	
Covariate network (exogenous) - Covariate edges												
hire network	1.476	0.386	***	1.502	0.387	***	1.487	0.386	***	1.493	0.387	***
work for network	1.739	0.395	***	1.668	0.395	***	1.725	0.396	***	1.683	0.394	***
kinship network	2.817	0.191	***	2.813	0.191	***	2.817	0.191	***	2.814	0.191	***

Village B – correlations

	migration wave	employment sector before agrarian reform	employment sector at survey time	geographical origin	contact to get in the village	popularity score	number of workers hired	number of households work with	political parade participation	footbal team member	membership in village association	production sold in the same local market	catholic church	evangelical church	average production sold to coop 2007-2012	value sold to coop in 2011	village president	engaged in family farming
migration wave	1.000																	
employment sector before agrarian reform	-0.051	1.000																
employment sector at survey time	-0.260	-0.158	1.000															
geographical origin	-0.112	0.190	-0.112	1.000														
contact to get in the village	-0.334	-0.227	0.111	0.313	1.000													
popularity score	0.013	0.053	0.092	0.155	-0.171	1.000												
number of workers hired	0.000	-0.009	0.174	-0.020	-0.022	0.125	1.000											
number of households work with	-0.022	0.076	-0.136	-0.082	0.243	0.044	-0.187	1.000										
political parade participation	-0.037	0.026	0.004	-0.002	-0.156	0.280	0.171	0.058	1.000									
footbal team member	-0.024	0.348	-0.093	-0.083	0.091	0.358	0.144	0.243	0.221	1.000								
membership in village association	-0.149	-0.199	0.397	-0.041	-0.192	0.460	-0.063	-0.006	0.335	0.086	1.000							
production sold in the same local market	-0.091	-0.196	-0.014	-0.055	0.009	0.206	0.168	0.205	-0.078	0.156	0.131	1.000						
catholic church	-0.150	-0.139	-0.077	-0.192	-0.105	0.105	-0.096	-0.120	0.171	0.117	0.091	-0.133	1.000					
evangelical church	0.339	-0.148	-0.165	0.042	0.186	-0.111	0.015	0.333	-0.096	-0.116	-0.142	0.014	-0.260	1.000				
average production sold to coop 2007-2012	-0.137	-0.178	0.160	-0.007	0.070	0.352	0.307	0.197	0.531	0.367	0.344	0.256	0.026	0.026	1.000			
value sold to coop in 2011	-0.079	-0.072	0.200	0.189	-0.192	**0.808**	0.221	-0.093	0.395	0.320	0.554	0.196	0.110	-0.125	**0.658**	1.000		
village president	0.045	-0.016	0.202	-0.128	-0.296	0.514	0.000	-0.147	0.294	-0.049	0.525	-0.036	0.027	-0.237	0.100	0.424	1.000	
engaged in family farming	0.196	0.032	**-0.776**	0.024	-0.032	-0.080	-0.034	0.250	-0.192	-0.042	-0.335	0.064	-0.017	0.256	-0.101	-0.196	-0.136	1.000

Village B sensitivity analysis

	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7		
	estimates	S.E.		estimates	S.E.		estimates	S.E.		estimates	S.E.		estimates	S.E.		estimates	S.E.		estimates	S.E.	
edges	-2.2435	0.4321	***	-1.948	0.460	***	-1.828	0.415	***	-1.742	0.437	***	-2.142	0.444	***	-2.0443	0.4355	***	-1.623	0.428	***
Actor relation effects (exogenous) - Homophily																					
engaged in family farming	0.5938	0.2538	*	0.589	0.253	*							0.593	0.254	*	0.5977	0.2529	*			
catholic church	-0.3295	0.2696		-0.159	0.281		-0.301	0.274		-0.264	0.284		-0.281	0.275		-0.1962	0.2689		-0.169	0.280	
evangelical church 1	-0.2366	0.3325		-0.352	0.328		-0.165	0.331		-0.161	0.332		-0.232	0.333		-0.3433	0.3275		-0.291	0.326	
evangelical church 2																					
average production sold to coop 2007-2012							-0.275	0.292					-0.269	0.295		-0.4137	0.2836				
political parade participation	-0.1074	0.2803		-0.198	0.276		-0.078	0.283		-0.109	0.280		-0.067	0.284		-0.1427	0.2803		-0.211	0.275	
migration wave	0.8155	0.2667	**	0.799	0.265	**	0.757	0.269	**	0.798	0.265	**	0.768	0.271	**	0.7412	0.2688	**	0.790	0.263	**
geographical origin	0.1691	0.3357		0.212	0.336		0.131	0.330		0.142	0.332		0.163	0.334		0.1981	0.3334		0.176	0.333	
contact to get in the village	-0.7222	0.4539		-0.804	0.451	.	-0.672	0.444		-0.695	0.445		-0.696	0.451		-0.7634	0.4503	.	-0.787	0.445	.
popularity score	-0.7113	0.3038	*				-0.655	0.311	*	-0.683	0.308	*	-0.646	0.312	*				-0.787	0.445	.
membership in village association	-0.1485	0.2801		-0.176	0.283					-0.118	0.286		-0.094	0.287		-0.1505	0.2835		-0.192	0.283	
number of workers hired	0.5137	0.2678	.	0.452	0.270		0.551	0.272	*	0.568	0.277	*	0.562	0.273	*	0.4673	0.2686	.	0.441	0.269	
number of households work with	0.3242	0.5698		0.366	0.565		0.336	0.572		0.360	0.571		0.340	0.572		0.3543	0.5664		0.372	0.567	
employment sector before agrarian reform	0.454	0.2895		0.366	0.287		0.439	0.288		0.418	0.289		0.454	0.289		0.4022	0.2865		0.350	0.286	
employment sector at survey time							0.162	0.271		0.182	0.272								0.186	0.270	
footbal team member	0.1531	0.2609		0.118	0.262		0.149	0.260		0.181	0.262		0.155	0.262		0.0796	0.2592		0.115	0.261	
value sold to coop in 2011				-0.497	0.406					-0.415	0.409								-0.536	0.405	
production sold in the same local market	-0.1809	0.2497		-0.191	0.249		-0.196	0.249		-0.197	0.249		-0.186	0.250		-0.1865	0.2494		-0.201	0.248	
village president	-0.467	0.2996		-0.545	0.302	.	-0.521	0.305	.	-0.412	0.303		-0.524	0.307	.	-0.6769	0.3012	*	-0.536	0.299	
Covariate network (exogenous) - Covariate edges																					
hire network	-0.1827	0.8049		-0.158	0.810		-0.214	0.805		-0.200	0.806		-0.189	0.802		-0.1803	0.8056		-0.203	0.813	
work for network	0.9347	0.666		1.070	0.662		0.787	0.661		0.912	0.653		0.887	0.672		0.9056	0.6734		0.980	0.652	
kinship network	0.8519	0.5516		0.897	0.545		0.878	0.554		0.851	0.551		0.877	0.554		0.9351	0.5494	.	0.915	0.544	.

Village C – correlations

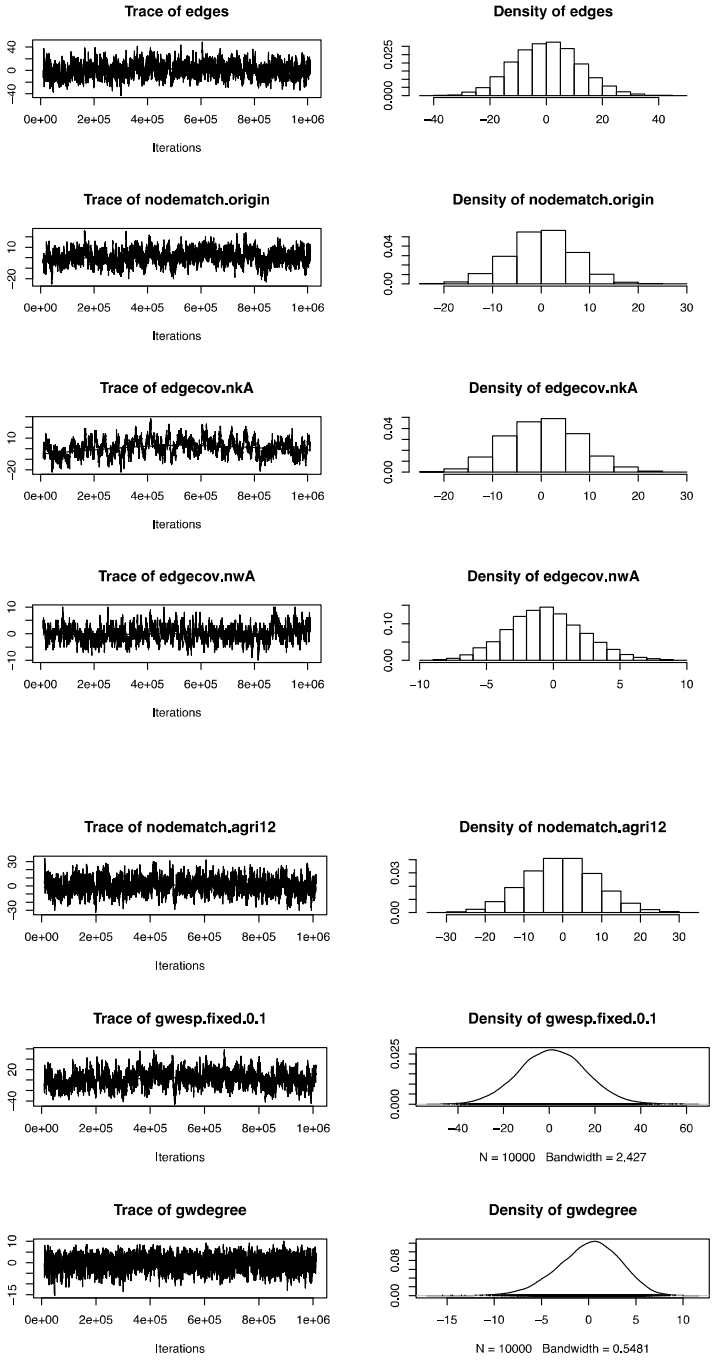
	migration wave	employment sector before agrarian reform	employment sector at survey time	geographical origin	contact to get in the village	popularity score	number of workers hired	number of households work with	footbal team member	membership in village association	production sold in the same local market	catholic church	evangelical church 1	average production sold to coop 2007-2012	village president	engaged in family farming	value sold to coop in 2011
migration wave	1.00																
employment sector before agrarian reform	0.07	1.00															
employment sector at survey time	-0.08	0.01	1.00														
geographical origin	0.52	0.04	0.06	1.00													
contact to get in the village	0.24	-0.02	0.10	0.21	1.00												
popularity score	-0.20	0.09	-0.05	-0.16	0.02	1.00											
number of workers hired	0.18	0.13	0.11	0.12	0.09	-0.22	1.00										
number of households work with	-0.12	-0.22	-0.02	0.16	0.08	-0.12	-0.20	1.00									
footbal team member	-0.07	0.16	0.32	0.31	-0.16	0.25	-0.13	0.07	1.00								
membership in village association	-0.52	-0.02	-0.02	-0.38	0.22	0.13	-0.31	0.03	-0.13	1.00							
production sold in the same local market	-0.30	0.03	-0.02	-0.22	-0.20	0.08	-0.15	0.07	-0.03	0.23	1.00						
catholic church	-0.08	-0.34	-0.17	-0.05	-0.13	-0.11	-0.14	-0.03	-0.23	0.12	-0.12	1.00					
evangelical church 1	-0.23	0.31	-0.06	-0.21	-0.04	0.30	-0.11	-0.09	0.00	0.13	0.34	-0.13	1.00				
average production sold to coop 2007-2012	-0.06	-0.17	-0.20	-0.08	-0.19	-0.02	-0.12	-0.10	-0.24	0.07	0.32	-0.07	0.10	1.00			
village president	0.02	0.38	0.02	-0.06	0.07	-0.04	0.08	0.33	-0.13	0.14	0.26	-0.04	0.16	0.05	1.00		
engaged in family farming	-0.03	-0.09	**-0.79**	-0.06	-0.14	0.05	0.04	-0.07	-0.40	0.20	0.04	0.27	-0.09	0.26	-0.04	1.00	
value sold to coop in 2011	-0.08	-0.09	-0.18	-0.10	-0.19	0.01	-0.13	-0.11	-0.25	0.08	0.34	-0.08	0.18	**0.99**	0.11	0.23	1.00

Village C – sensitivity analysis

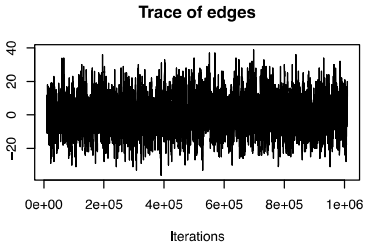
	Model 1			Model 2			Model 3			Model 4		
	estimates	S.E.		estimates	S.E.		estimates	S.E.		estimates	S.E.	
edges	-1.339	0.751	.	-1.904	0.712	**	-1.339	0.751	.	-1.904	0.712	**
Actor relation effects (exogenous) - Homophily												
engaged in family farming	-0.862	0.302	**				-0.862	0.302	**			
catholic church	0.388	0.317					0.388	0.317		0.376	0.313	
evangelical church 1	0.511	0.394		0.594	0.399		0.511	0.394		0.594	0.399	
evangelical church 2												
average production sold to coop 2007-2012							-0.923	0.469	*	-0.976	0.468	*
political parade participation												
migration wave	-0.414	0.417		-0.400	0.417		-0.414	0.417		-0.400	0.417	
geographical origin	-0.035	0.458		-0.055	0.457		-0.035	0.458		-0.055	0.457	
contact to get in the village	0.425	0.396		0.299	0.399		0.425	0.396		0.299	0.399	
popularity score	-0.858	0.337	*	-0.835	0.340	*	-0.858	0.337	*	-0.835	0.340	*
membership in village association	0.205	0.408		0.416	0.401		0.205	0.408		0.416	0.401	
number of workers hired	-0.329	0.314		-0.364	0.309		-0.329	0.314		-0.364	0.309	
number of households work with	-0.716	0.306	*	-0.705	0.304	*	-0.716	0.306	*	-0.705	0.304	*
employment sector before agrarian reform				0.238	0.330		0.335	0.333		0.238	0.330	
employment sector at survey time				-0.456	0.358					-0.456	0.358	
footbal team member	0.671	0.298	*	0.607	0.295	*	0.671	0.298	*	0.607	0.295	*
value sold to coop in 2011	-0.923	0.469	*	-0.976	0.468	*						
production sold in the same local market	0.308	0.313		0.297	0.311		0.308	0.313		0.297	0.311	
village president	-0.160	0.357		-0.004	0.355		-0.160	0.357		-0.004	0.355	
Covariate network (exogenous) - Covariate edges												
hire network	1.007	0.783		0.955	0.800		1.007	0.783		0.955	0.800	
work for network	3.127	0.688	***	3.077	0.671	***	3.127	0.688	***	3.077	0.671	***
kinship network	1.704	0.490	***	1.690	0.478	***	1.704	0.490	***	1.690	0.478	***

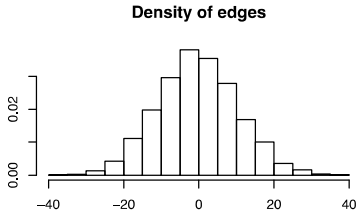
8.6 Monte Carlo Markov Chain stepwise model diagnostics

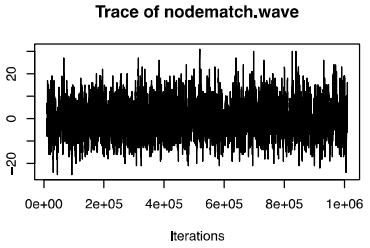
8.6.1 Village A stepwise model 4 MCMC diagnostics

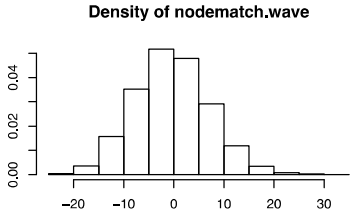


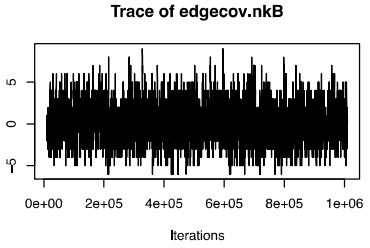
8.6.2 Village B stepwise model 4MCMC diagnostics

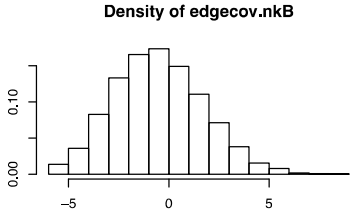


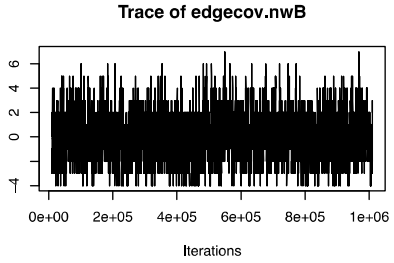


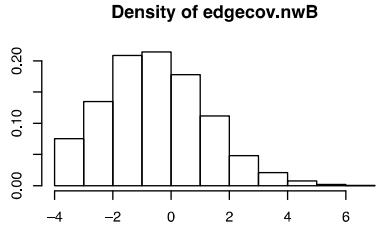


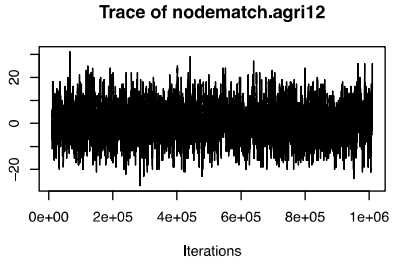


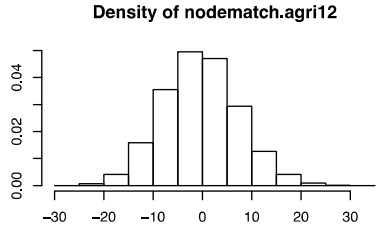


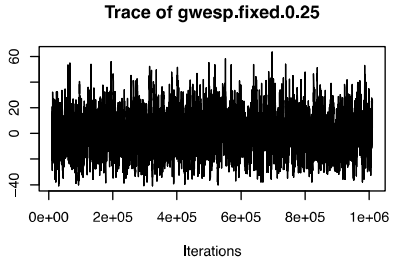


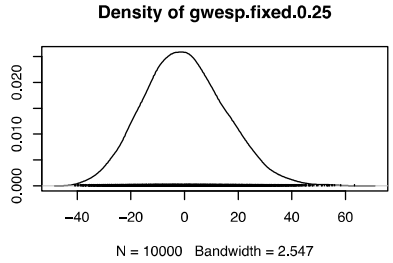












8.6.3 Village C stepwise model 4 MCMC diagnostics