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Relational patterns in the short food supply chains initiatives in the city of Rome: clusters, networks, organisational models

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Abstract

Short title: Short food supply chains in Rome

Urban agricultural practices contribute to strengthen the interaction of urban and periurban green space systems with local citizen's life, with a specific focus on human health. The production of ecosystem services by local farmers and the interest for urban agriculture has increased in Rome in the last 10-15 years, involving a high number of citizens. Following a network approach, the aim of this paper is to test blockmodelling as a tool to identify dynamics and innovative organizational models developed in Rome city region thanks to continuous interactions among short food chain actors, citizens and local administration. The blockmodelling identifies three clusters of actors with similar patterns of relations at the city region level. The interpretation of the clusters is integrated by a qualitative survey developed with the specific actors. The network analysis proves to be an interesting tool to explore agro-food dynamics in different city regions.

Keywords: Blockmodelling, social network analysis, urban agriculture, actors clustering

1. Introduction

1.1 Urban policies and food studies: a promising convergence.

Communities engaged in the development of sustainable food practices, generally based on short food supply chains, play a central role in defining sustainability strategies at the local or regional level. Local food policies, in this regard, represent an important governance tool, not least because changes in power relationships between actors have an important impact on the possible transition to sustainability (Steyaert and Jiggins, 2007).

In a context of increasing role for sustainable urban development strategies in the urban policies, local authorities are developing a growing interest for social practices related to food production. Mutually beneficial relationships that urban agriculture could have with city development are particularly relevant in a post-urban approach to metropolitan areas (Magnaghi, 2010), based on the development of networks of infrastructures for material and immaterial connections in city regions (Choay, 2008).

Food studies have largely developed in the last decades across different disciplines, from agricultural science to economics, sociology, geography and land planning, calling for an integrated approach which takes into consideration the perspective of all relevant actors. Multifunctional agriculture, alternative food networks, integrated food systems, organic agriculture have been studied as innovative practices by rural studies in the last decades (Berkes, Colding and Folke, 2003; Goodman, 2004, Sonnino 2009), but food is a relatively new topic for urban planning (Pothukuchi and Kaufman, 2000, Steel, 2008). However the diffusion of some of these practices in urban areas

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and the capacity of city consumers to uptake and to adapt them to their local needs are suggesting innovative social and environmental functions, such as the one of urban green infrastructures (Tzoulas, *et al.*, 2007, Wiskerke and Viljoen, 2012). Urban agricultural practices contribute to strengthen the interaction of urban and periurban green space systems with local citizens' life, with a specific focus on human health. The health of urban and peri-urban ecosystems becomes a private interest for citizen growing their own food there.

A need to reorganize rural-urban relations emerges in a context of evolving demands expressed by the society, including consumers, institutions and civil society organisations, in combination with the failure of the conventional productivist farm model (Renting *et al.*, 2008). In this frame, the need to design and manage metropolitan landscapes (Hester, 2006) represents an interesting opportunity for urban areas to learn from rural experiences.

If we consider a "city region" as a metropolitan area together with its hinterland that share resources and functions as a single unit while changing its shapes over time, increasing the intensity of relations among local experiences can give important contributions to planning activities at local level as well as to define city region identity itslef (Tillman *et al*., 1994, Magnaghi, 2010).

The range of considerations above suggested, underlines the role that features like "relations", "networks", "communities" and "interactions" play in the development short food chains initiatives and in their capability to influence (yet being influenced by) local policies and dominant food patterns. The small scale of each of the actors involved, and their complementarily, makes a network approach fundamental to explore their potential as transformative practices towards more sustainable provision system at the city region level. Social network analysis can provide useful insights in this research perspective.

This paper presents an application of blockmodelling, a technique drawn from Social Network Analysis (SNA), to identify clusters of actors that are likely to have similar behaviors in the Rome short food chain on the basis of their pattern of relations.

1.2 The case of Rome city region

The case of Rome is of particular interest in term of agro-food system interrelations within the city region, because its rural environment is historically integrated in the metropolitan area (Figure 1) and this proximity represents a structural urban green infrastructure that has always encouraged the development of a range of relations between rural and urban areas, with different characteristics (positive, and negative, stronger or weaker).

At the national level, the traditional structure of Italian agriculture based on individual enterprises, together with some important legislative acts like the regulation on direct selling activities (Law 57/2001) that define direct selling as part of the agricultural activities and introduce the concept of "agricultural entrepreneur", gave a new role to farmers in the last decades. Today farmers are more and more integrated in the urban context, and their role had a changing meaning overtime due to public debate, knowledge dynamics, scientific discourse and social practices.

Although Rome is the capital city of Italy and a metropolis with around 3 millions of inhabitants, forty per cent of its municipality is agricultural land (51729 ha). This makes Rome one of the local administrations with the largest area dedicated to agriculture in Europe. In such a large city suburban green areas receive a continuous strong pressure from the building sector for further edification of new suburbs. The definition of a network of protected areas in Rome Municipality contributed to protect the typically large green areas of the *agro romano* landscape, that reach even the city centre. An extensive agriculture based on sheep farming and cereal crops represents the traditional land use in these areas, yet it has recently been declining. In the last years different forms of urban and peri-urban agriculture ranging from professional farms to urban gardens are seen from some citizens and administrators as interesting opportunities to maintain such green areas as well as to create employment.

Rome has a well-established experience of sustainable food provision with a history of around 10-15 years, with several actors directly involved. The creation of an organized offer scheme in 2003 by a group of organic farmers had a positive effect on the growth of organic market in the city region both at private and public level. The possibility for consumers to find an aggregated offer gave a chance to increase the number of families adopting this alternative model of consumption. A paper from 2011 reports more than 90 consumers groups in Rome with different characteristics and life span (Fonte *et al*., 2011). The growth of consumers group and the increasing interest of city consumers towards quality production offered new market opportunities to many other small farmers and local business.

During the 2000s the local government adopted some important measures to promote local organic food. The main one is the use of organic products in the public school canteens with a total of 150.000 organic meals being distributed every day (Sonnino, 2009). Another important act was the

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conversion to organic farming of the two public farms belonging to the municipality (a total of around 3000 ha) and the completion of the organic dairy production chain that today produces mozzarella cheese and milk with the municipality logo. Further, in 2004 an information service to promote the contact between local producers' offer and local consumers' demand has been funded by the local administration. In the same years the *Azienda Romana Mercati*, (a technical branch of the Chamber of Commerce), promoted a project that aimed to give visibility to local producers in street markets, well spread in all the neighbourhoods of Rome and often used by consumers to get fresh fruit and vegetables.

Since the first occasional events of the beginning of 2000s, several farmers' markets managed by different actors (municipality, local associations, social movements etc.) are today well established in Rome. Some of them have been institutionalized and are today recognized by the citizens as common locations for food shopping. Cultural activities are often associated to direct selling of short chain products, making the market a social event that can contribute to increase consumers' awareness.

1.3. The potential of the social network analysis

As suggested above. the presence of several actors with different opportunities to interrelate with each others suggest the possibility for a network analysis of the short food supply chains in Rome aiming at exploring the relevance of these interrelations, their emerging patterns as well as their role in the creation of opportunities for development and change. It has been argued how the capacity of a specific region to produce and access innovation largely depends on interaction between local actors (Morgan, 2004).). Several definitions of SFSCs are opposing each other in a long debate involving both researchers and practitioners (is a SFSC defined by the number of steps between producers and consumers? Or by the geographical distance between them? Is the information flows related to food consumption a relevant variable for the definition of SFCSs or it is more important the control by local actors?). Different actors promote different definitions depending also on their market of reference. This study considered actors of SFSCs all the ones that contribute with the implementation of their practices to facilitate the consumption of local and healthy food (local farmers, consumers groups, local administrators, representatives of social and political movements etc.). Roman short food chains are seen in this context as a territorial system of innovation with strong internal interconnections but also open to external linkages, both bond and bridge links, that can be used to generate new knowledge and social practices in the urban green infrastructure context. The vision of agricultural innovation systems as processes of networking and iterative learning of heterogeneous set of actors (Hall *et al*., 2001, Leewis 2004, Roling, 2009) also suggests the opportunity to use social network analysis as a tool to analyse the short food chain dynamic at city region level.

Network research has raised interest in the last decades across both physical and social science, as social network theory can help in understanding social structures through the analysis of how autonomous individuals can combine to create functioning societies. Several studies have shown how the location of an agent in the social network can determine his behaviour (Moreno, 1934, Galeotti *et al*., 2006). Individuals embedded in similar relational patterns face similar social environments and therefore could be expected to develop similar responses, attitudes and behaviours (Burt, 1987).

The objective of this work is to test the potential of social network analysis as a methodology to describe the behaviours of individual actors in a urban context. Cities are complex systems and several actors are involved in each field of action. If this is true, blockmodeling analysis, a methodology that reduces this complexity to a "network of networks" (a group of clusters constructed on the base if internal interactions and analyzed in their interaction with each other) offers a powerful tool to analyze the complex relational structure of short food chains initiatives in Rome.

2. Material and methods

2.1 Qualitative survey

The dynamics of Rome city-region have been studied through a multi-faced set of sources. First of all a desk analysis has been carried out, with a review of the most relevant literature, websites and documents available on line. In the meantime five on line social media have been monitored for four months to give more insights into ideas, activities and priorities of local communities. The information gathered through these sources and the long-term experiences of Italian Association for Organic Agriculture (AIAB) in the development of the agricultural sector in Rome were the basis for building of a first *mind map* of the short food chain dynamics in Rome (fig.1). The mind map has been build on the base of expert knowledge starting from a list of relevant actors and the description of how such actors are related to each other. Arrows indicate the existence of a relation, the direction of the arrow indicates the pro-active actor in the relation and finally the number on the arrow indicates the relevance of the relation. Considering that this is

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an expert knowledge map and not a map drawn with the actors' contribution, in this initial phase the value "1" has been attributed to all the relations. This first description of relationships between actors involved in sustainable food provisioning had the objective to define the key actors to include in the following analysis.

In the following phase 13 interviews have been realized with selected actors to provide more information about further relevant actors, projects and relations, that influenced the progressive modification of the relational map itself, until its final shape (Figure 2). The actors have been selected considering key actors of each group defined by the mind map based on experts' knowledge. The aim of the 13 interviews was to give voice to the various typologies of actors emerging by different kind of stakeholders: the public and the private sectors, the several farming and gardening initiatives, both large and small scale players.

The results emerged from the interviews have been discussed, validated and integrated in a workshop with a group of about 20 participants. The aim of the workshop was to include more actors in the analysis of food dynamics at city region level. The people invited for the workshop are privileged witnesses, not chosen among the people already interviewed, which have been more recently active in Rome sustainable food systems. After a brief presentation of the findings resulting from the interviews, two groups have been created to comment and integrate the analysis.

At the end of each qualitative interview a specific question for the social network analysis has been made. A roster with a fixed list of actors has been shown to the interviewed person asking if they have or not a relation with each actor. The main relations considered were the one of direct exchange of information relevant for the project. In case of presence of the relation the person has been asked to indicate its relevance and the frequency, on a scale from 1 to 5 with 1 as the less relevant relation and 5 as the more relevant one. The actors included in the roster are listed in Table 1, which also provides the ID used to identify each actor in the figures that follow.

Relational data collected during the interviews were used to generate an adjacency matrix recording the pattern of connections between the interviewed actors. Each cell (*i*, *j*) of the adjacency matrix was given value 0 if actor *j* had not listed actor *i* among its partners, and a value equal to the strength of the relation (between 1 and 5) if actor *j* had named *i* as a relevant partner. The matrix was used to generate the directed network presented in Figure 2. Actors are identified by the IDs provided in Table 1. Arrows point from the actor who was listed as a relevant partner to the actor that reported the relation during the interview; the direction of the lines represents therefore the flow of project-relevant information or resources as perceived by the interviewed actors. The width of the lines is proportional to the reported strength of the relation

This paper will concentrate on the result of the network analysis, whereas the qualitative survey and the social media analysis provide the base for data interpretation.

2.2. Regular equivalence and blockmodeling

As indicated in the introduction, the aim of blockmodeling is to cluster units of a network, which have substantially similar patterns of relationships with others, in this way giving the possibility to interpret the relational patterns among clusters. This process permits to reduce a large, potentially incoherent network to a smaller understandable structure (Batagelj *et al.*, 2004).

The units of a network can be grouped according to the extent to which they are equivalent, according to some meaningful definitions of equivalence. Two types of equivalence have been widely used in SNA: structural equivalence and regular equivalence. Structural equivalence (Lorrain and White, 1971) has a strict definition: two units are structurally equivalent if they are linked to the same actors. To overcome the rigidity of structural equivalence, White and Reitz (1983) developed the notion of *regular equivalence*. According to this definition, two actors are regularly equivalent if they are connected to regular others (this means that the equivalence is not due to the connection with the same actors but to the connection with similar actors, part of the same cluster). Regular equivalence aims at capturing the intuitive notion of social roles in a role setting. To identify regularities in the Rome short food chain network, we adopted an inductive approach and used the blockmodeling algorithm implemented in the software Pajek (Batagelj and Mrvar, 1998, 2003; Batagelj *et al*., 2004) to identify regularly equivalent clusters of actors. Further elaborations were done using the R packages *sna* and *network* (Butts, 2013; Butts *et al*., 2013). Blockmodeling has already proved to be a useful methodological tool to investigate structural relations in food production networks (Prota and Beresford, 2012).

3. Result and discussion

The first network, designed relying upon the expert knowledge, defined four categories to which the actors belong: food production, food market, food consumption and institutions and second level organizations (fig.2). The total number of nodes defined in the first mind map is of 16 actors. Not all of them have been interviewed: some of them were not available for

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the research work, whereas some others have been substituted with other relevant actors emerged in the interviews with a snowball effect. In particular, it is interesting to notice that the social part was completely missing in the expert knowledge network, not because it was unknown by the experts group, but probably because it was not considered relevant in the short chain description.

The actors interviewed included the public institutions at two different territorial levels: the Rome Municipality, with the choice to talk to the Agricultural officer offered the perspective of short chain from his point of view, including the role of municipal farms and the public school canteens; and the Rome Province, which has the responsibility for social policies and created in 2005 the Forum of social farms. In this way we had a perspective on agriculture in the urban context both as an economic activity and as an important tool for social inclusion. Representatives of a couple of significant projects have also been included in the survey, using agriculture to work with people with disabilities and with prisoners. With regards to the consumers' perspectives, the actors interviewed have been one representative of a purchase group, with a quite long life span and experience in the context of a popular area where the choice of aggregate food consumption is related to the need of money saving; and a group of consumers who decided to go further and start gardening for vegetable production in a piece of land rented from a city farm. Two other actors have been considered relevant for their political aims: one group of young activists who are taking action to ask for access to farming land in Rome, with the aim of creating an employment opportunity in the city; and a group of people who created an urban garden with the support of environmental associations, in an area that was likely to be used to build further buildings. Some significant actors in local food markets have been interviewed (farmers markets, street markets). For farmers markets we interviewed the president of a foundation belonging to the larger Italian farmers union, responsible for the promotion of farmers market at local and national level. For neighbourhood market we talked to the person responsible for innovation policies in the technical branch of the roman chamber of commerce. Both these persons have been involved in more institutionalized SFSCs in Rome in the last 10-15 years with different responsibilities. Their perspective has been considered relevant to describe strategic relations of local administration. Finally, a small intermediary involved in door-to-door quality food selling has been interviewed as organizational innovation in SFSCs. Two farms were also included so as to represent different types of farmers that are working in Rome Municipality with a reactive approach (Grando *et al*., 2013).

Concerning the network data collection, while the interviewees were confortable with the idea of naming the actors with which they have relations, getting their attention on the process of giving a weight to the relations was more difficult. In particular they found hard to assign a value to the frequency of the relations. These problems were anyway overcome; weights were defined and used to build the matrix and the map that indicates the relevance of the specific relations for the actor interviewed.

The elicited network includes 13 actors and 56 arcs (directed ties); the density of the network (the proportion of present ties on all possible ties) is 0.36. The final shape of the network is presented in Figure 2; the numbers used to identify actors in the figure correspond to the actor IDs listed in Table 1. It is evident that, even with a small number of nodes, the relational map in its original form is quite complex and hard to interpret. To identify meaningful similarities and reduce the complexity of the map, we blockmodeled the network according to regular equivalence. We tried models with different numbers of clusters; the best-fitting model allocated the actors into three clusters with eight errors. Figure 3 summarizes the results of the blockmodeling. The matrix shows which actors have been allocated to the three clusters and the pattern of relations between them. The cells of the matrix are shaded according to the strength of the relation (white represents the absence of relations, while black represents a relation graded 5 on the relevance scale); a white diamond in a black cell identifies an error. The horizontal and vertical blue lines define the boundaries of the clusters and divide the matrix in nine sections called *blocks*. The ideal types found by the blockmodeling procedure for each of the nine blocks, and the distribution of errors across the blocks (the number of discrepancies between the ideal type and the actual pattern of relations observed in each block), are presented in Table 2.

The clusters identified through blockmodeling have a quite straightforward interpretation. We first describe the composition of the clusters, to then focus on the patterns of relations between them.

Cluster 1. The first cluster includes all actors characterized by larger markets in term of volumes: private sector actors like hotels, restaurants and catering (Ho.Re.Ca); large municipal farms; and public school canteens. The increasing attention of hotels, restaurants and catering for quality local food provides a new opportunity to sustain agricultural activities in Rome Municipality. Public school canteens appear

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however to be the least accessible actor for local small-scale producers; their demand for large quantities of organic food cannot always be met by local farmers or intermediaries.

Cluster 2. The second cluster groups actors that are involved in the food chain for social, ethical or political purposes, as well as actors participating in projects on local food: social cooperatives; urban gardens; Rome Coordination for Access to Land (a network promoted by young farmers with the aim of achieving the right to have access to public agricultural plots of land); Solidarity Purchase Groups; Forum of Social Farms; and Rome municipality. Social cooperatives, a more established experience in the social sector, have a low level of connections with other actors of food and agricultural sector, while more recent initiatives (urban gardens) have important connections with the civil society and agricultural food networks. Actors included in this cluster come from the public sector or from the civil society; they have an important role in promoting interrelations at city region level.

Cluster 3. The last cluster includes actors (both producers and distributors) in the local food market that operate on a smaller scale than actors in Cluster 1: short chain farmers; neighbourhood markets; farmers markets and intermediaries. These actors contribute to the design and management of the landscape with concrete economic activities.

To facilitate the interpretation of results, we calculated the *indegree* (the number of incoming ties) and the *outdegree* (the number of outgoing ties) for each node in the network. This allowed us to generate the two graphs presented in Figure 4 and Figure 5. Nodes are coloured according to the cluster to which they were assigned by the blockmodeling procedure (light blue for Cluster 1; light green for Cluster 2; orange for Cluster 3) and are scaled according to the oudegree (Figure 4) or to the indegree (Figure 5).

Having identified the clusters and calculated the degrees, it is possible to focus on the patterns of relations in each of the nine blocks. We will refer both to Figure 3 and to the ideal block matrix presented in Table 2. We first look at the diagonal blocks of the matrix presented in Table 2, which represent the connections between actors within each cluster. In this case, actors in Cluster 2 and Cluster 3 have a rather dense pattern of relations within the group. Public organizations and civil society experiences are often looking to each other in the development of specific projects. Similarly, small-scale actors in the short food chain rely extensively on each other and show a very high degree of coordination. The opposite is true for actors in Cluster 1, which appear to operate in isolation (block (1,1) is null) from other short food chain actors.

Moving to relations across clusters, the first thing to notice is that actors in Cluster 1 (large-scale market actors) have very limited interactions in either direction (incoming or outgoing) with other actors in the chain, with the only exception of the small-scale market actors in Cluster 3. In this case, however, the relationship is strongly asymmetrical. The first column in the model matrix (Table 2) is composed entirely of null (empty) blocks; this means that large-scale market actors do not recognize any of the other nodes in the network as a relevant partner. The null block (1,2) indicates that actors in Cluster 2 do not receive relevant inputs or information from large-scale market actors; the large-scale private sector appears therefore not to raise much interest among social and political actors. The only non-null block involving Cluster 1 is block (1,3), which is very dense (see Figure 2): this means that small-scale actors look instead at actors in Cluster 1 as important partners. This can be explained by noting that actors in Cluster 1 represent appealing market opportunities for small-scale producers and distributors. Since actors in Cluster 1 have the global market as a reference, the reverse is not true so they are not overtly dependent on connections with other short chain actors. The asymmetric position of actors in Cluster 1 can be also seen by comparing Figure 4 and Figure 5. In Figure 4, in which the size of nodes is proportional to the outdegree, actors in Cluster 1 are relatively large (this is particularly true for Ho.Re.Ca., with node ID 8). When looking at the indegree (Figure 5), these nodes however disappear since they do no recognize any other actor as a relevant partner.

A reversed asymmetry can be noted, although to a lesser extent, in the relations between Cluster 2 and Cluster 3. In this case, block (2,3) is a null block with five errors. This means that actors in Cluster 3 (small-scale market actors) rarely see actors in Cluster 2 (political and civil society groups) as relevant partners. There is however an important exception, that explains most of the errors: neighborhood markets in three cases see actors in Cluster 2 as relevant partners. On the other hand, block (3,2) is very dense; this means that political and civil society actors consider small-scale market actors as relevant partners. This is particularly true for Short Chain Farmers (node ID 1), which are considered an important partner from all actors in the chain except than from the large-scale market actors. This can be also seen from the difference between the size of node 1 in Figures 4 and 5. This shows how, even if sometimes production comes also from outside the city region, local farms have a fundamental role to connect all the existing initiatives of urban agriculture. The existence of a traditional agricultural sector represents in this sense an

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opportunity for many Italian city regions. It is also interesting to observe that farmers markets and street markets have identical patterns of relations with actors in Cluster 1.

The analysis helps in understanding the innovative organizational models developed in the last 10-15 years in Rome, thanks to the continuous (albeit not always symmetrical) interactions among short food chain actors and citizens. Social, political and economic actors are working together even if they have different individual goals. The qualitative analysis tells us that even if often the aim of the described relationships is to create synergies, sometimes the interactions are also related to the need to observe each other for an evaluation of other actors' activities. For example, as can be seen by the density of intra-cluster relations in block (2,2), civil society has often connections with the public administration in relation to specific requirements such as access to land, management of agricultural areas, support in the competition with the building sector etc.

Another interesting result emerging from this analysis is that the good practice of policies related to the use of locally-sourced and organic products in public school meals does not have a direct link to the local experiences focused on social practices that give a specific sense to food production, "rural" and ecosystem services. This reduce the positive impact of the specific policy: even if the health and education aspect of defining public school menu remain, the impact on local rural development is lost. This is mainly due to the different dimensions of the school canteens market and to the quantity and type of production of local farms and social experiences. The public administration, together with some farmers associations have been working on the public call for food delivery in public school canteens to increase the relevance of this connection, but some limits still exist.

The network analysis shows how local food production and consumption, as well as practices focusing on urban green infrastructure that include not just agricultural land but also environmental and social services produced by a multifunctional use of land, are creating an important opportunity of exchange between producers, consumers, farmers, citizens and public administrators. The blockmodeling analysis reveals however that a certain degree of asymmetry persists in the network. This give evidence on how representative of large-scale initiatives, often directly tied to the public administration, such as in the case of municipal farms and school canteens, do not recognize the relevance of other actors in the chain. This behavior do not allow to maximize the efficiency of the specific initiatives or policies, as already stated for school canteens.

4. Conclusions

The analysis presented in this paper shows how the use of a social network approach can contribute to understand the agro-food dynamics of the city-regions. The social practices developed at the city-region level (short food chain, urban farming, social farming but also more commercial ones such farmers markets and public catering) are often strongly interrelated and look at each other with different aims. The possibility to map such interconnections provides a vision of the innovative organisational models proposed by local short food chain. Moreover, the use of a network approach can highlight the capacity of short food chains, often seen just as economic activities, to provide, interrelate and sustain different services, from the ecosystem to the social and cultural ones. The use of a network approach can also contribute to measure the intensity of relations among local experiences, an element which is particularly significant for the design and implementation of local planning activities.

Blockmodeling could be an effective methodology to describe the relations among actors of one specific city region, particularly if integrated with other more qualitative methodologies. As already said, the interpretation of blockmodeling results has been done on the base of the qualitative survey, the previous expert knowledge and the social media analysis. However the clustering results of the block model integrate the qualitative analysis suggesting some interesting interrelations.

This paper gives also some inputs for further research. On the one side it could be interesting to compare the type of relations between short food chain actors in different city regions. A comparative analysis can help in understanding if there are similar patterns of interrelations and cluster of actors. Rome is a particular case study, considering the dimension of the city and the long-term experience of local agriculture and short chain development. However, the network approach allows comparing also city regions with completely different contexts in term of pattern of relationships patterns and cluster of actors. The same approach could also be used to look at relations with actors outside the border of the city region, enlarging the geographical scale.

On the other side, a dynamic approach to the analysis could be developed through a comparison between two different surveys conducted in the same area. Changes could occur at different levels (clusters, number and relevance of incoming and outgoing ties), and could provide a basis for the analysis of development trends.

Other opportunities for further research emerge with regard to the possibility to investigate in more depth contents and meanings of the ties with

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relation to economic and social innovation literature. Do they mainly represent flows of information, one-way dependency, joint actions for common purposes, or other kind of relations? This qualitative analyses would shed further light on the dynamics of the socio-economic innovative practices, to be built upon the relational structure that blockmodeling methodology offers.

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Table 1. Nodes in the Rome short food chain network	
ID	Name
1	Short chain farms
2	Neighbourhood markets
3	Social cooperatives
4	Urban gardens
5	Rome municipality
6	Farmers'market
7	Small intermediaries
8	Hotels, restaurants and catering (Ho.Re.Ca.)
9	Rome coordination access to land
10	Forum of social farms
11	Municipal Farms
12	Purchase consumers groups
13	Public school canteens

Table 2. Blockmodel: the final image and error matrix

null	null	regular
(0)	(2)	(0)
null	regular	null
(0)	(0)	(5)
null	regular	regular
(0)	(0)	(0)

Note: Only results for the first (meaningful) solution are presented. Number in parentheses report the errors in each block.

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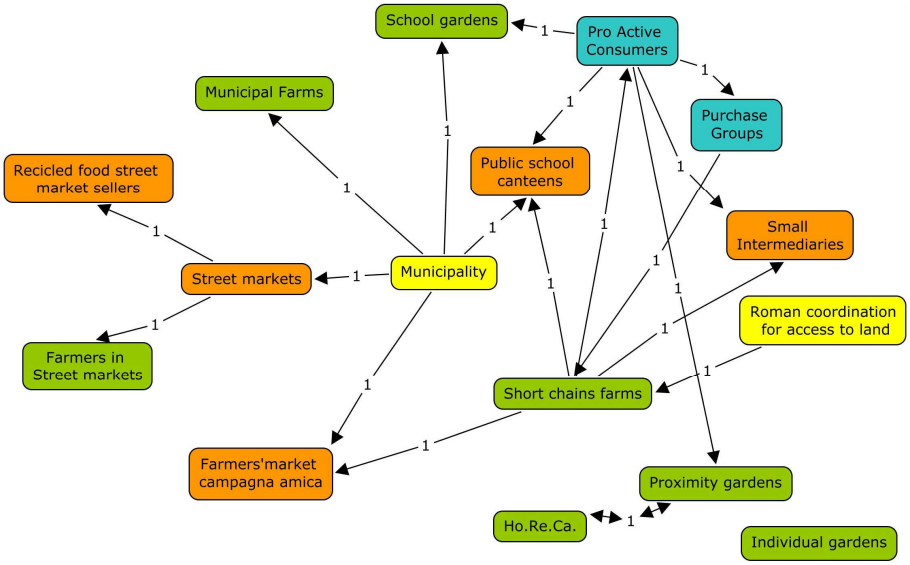

Figure 1. Mind map based on experts' knowledge

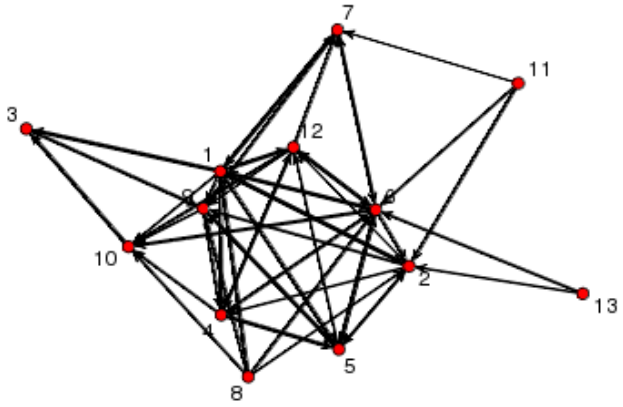

Figure 2. The network of relations in the Rome short food chain

Note: Line width is proportional to the relevance of the relation. The numbers used to label the nodes correspond to the IDs in Table 1. Graph layout: Kamada-Kawai.

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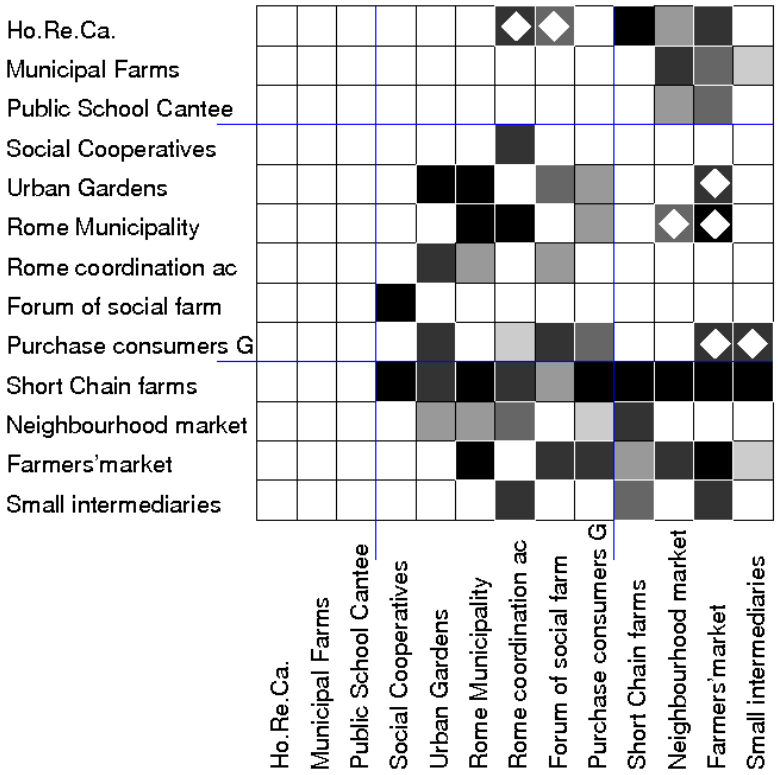

Figure 3. Results of the blockmodelling

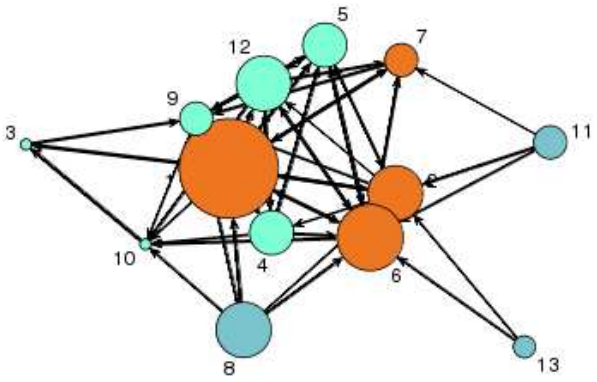

Figure 4. Rome short food chain network: cluster and outdegree

Note: the colour of nodes corresponds to the clusters identified by the blockmodeling. Node size proportional to the outdegree (number of outgoing ties). Node labels are the IDs in Table 1. Graph layout: Kamada-Kawai.

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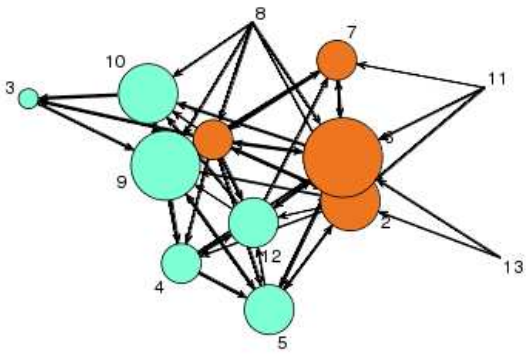

Figure 5 Rome short food chain network: clusters and indegree

Note: the colour of nodes corresponds to the clusters identified by the blockmodeling. Node size proportional to the indegree (number of incoming ties). Node labels are the IDs in Table 1. Layout: Kamada-Kawai.