

Relationship between innovation and networks in chestnut value chain: A case study in Italy

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Abstract

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In the last decades, the chestnut production has decreased in Italy due to diseases such as chestnut blight and chestnut gall wasp, and progressive depopulation of mountainous areas. The aim of the paper is to analyse the role of social network to enhance the dissemination of new ideas and innovations in view of the chestnut value chain development. The study was conducted in the Mugello-Val di Sieve area in the Tuscany region (Italy). A participatory value chain analysis approach was used for the strengthening of the local chestnut value chain. The data were collected by administering a questionnaire to a sample of 126 chestnut growers (83 chestnut growers enrolled and 43 not enrolled in the Consortium of “Marrone del Mugello Protected Geographical Indication”) to highlight the relationships between farmers and institutional actors. The network of the Consortium members was compared with the network of the non-members. The results show that a well-structured network allows for better dissemination of information and knowledge between farmers and greater diversification of product market sales.

Keywords: *Castanea sativa* Miller; social capital; network analysis; participatory value chain analysis; Mugello-Val di Sieve

Chestnut (*Castanea sativa* Miller) cultivation has a long-lasting tradition in Italy, being for centuries the main staple food for the population living in hilly-mountainous areas (CASTELLINI et al. 2011). At the beginning of the twentieth century, this forest cultivation played a key role in the Italian national economy, as it was present in almost all the Italian regions and covered an area of about 800,000 ha, corresponding to 14% of the forest area (MONDINO, BERNETTI 1998). In the years 1909–1913, the chestnut reached the peak of production accounting for an average of 913.000 t·yr⁻¹ (ISTAT 2010). Subsequently, the importance of chestnut cultivation is further diminished due to the chestnut gall wasp (*Dryocosmus kuriphilus* Yasumatsu, 1951) that has caused a progressive reduction of the production, with a heavy impact on the productive chain (SARTOR et al. 2015).

Conversely, the high number of cultivars is a factor of richness. In Italy, there are 17 products made with chestnuts that have received protected designation of origin or protected geographical indication (PGI) denomination plus 101 traditional products, which makes a total of 118 quality products (MiPAAF 2010).

Given the difficulties that the chestnut sector is suffering, a value chain analysis appears as an important tool in order to foster value chain development and to convey investments in an efficient and effective manner. The participatory value chain analysis (PVCA) approach is an appraisal method that enables stakeholders to be involved in the collection and analysis of information (EL TAHIR, VISHWANATH 2015). PVCA promotes responsibility because stakeholders analyse the functioning of

chains, and identify the interventions useful in improving the chain development (BAMMANN 2007). Within PVCA approach, the analysis of social capital and social networking of farmers (chestnut growers) can be useful as a tool for defining share strategies aimed at valuing supply chain processes (DUFHUES et al. 2006). Social capital refers to social characteristics – i.e. trust, social networks, civic participation and the level of compliance to social norms – which promote collective activity towards the common good (COLEMAN 1990). The social capital can be classified in institutional social capital and relational social capital. The institutional social capital refers to the quality of relations among institutional actors at the meso level (GRIX 2001), while the relational social capital includes the bonding (intra-group network) and bridging (inter-group network) social capital (SVENDSEN 2013). Particularly, the relational social capital has the potential to disseminate new ideas and innovations within a social network, to encourage social learning, to integrate scientific and traditional knowledge, to improve the common management of natural resources, and to reduce the potential conflicts (PALETTO et al. 2012, 2015). Consequently, a structured social capital with weak and strong ties among actors in the network can facilitate the diffusion of new ideas and innovative processes as highlighted by several studies (VALENTE 1995; FRITSCH, KAUFFELD-MONZ 2010). In a network, the diffusion of product or service innovations is associated with the concept of “contagion”, also known as “diffusion effect”.

This study shows a project developed in Italy in 2014 in which a PVCA approach was developed for the strengthening of the chestnut value chain in view of the crisis this production is facing. The project was developed in a case study in Tuscany Region (Mugello-Val di Sieve area) in which the production of chestnuts is very important for the local community. The aim of the paper is to analyse the potential role of relational social capital (network analysis) to enhance the dissemination of new ideas and innovative processes for the value chain development.

MATERIAL AND METHODS

Study area

The Mugello-Val di Sieve area (43°58'07"N; 11°34'03"E) is located in Northern Tuscany (Florence province) in Central Italy (Fig. 1). The study area covers an area of about 1,287 km² with a population of 65,800 inhabitants. In the Mugello-Val di

Sieve the average temperature is 13.0°C and the average annual rainfall is equal to 880 mm.

The designation of origin “Marrone del Mugello PGI” includes the cultivation of a particular ecotype of chestnut with high organoleptic and nutritional characteristics. The cultivation is carried out in mountainous and hilly areas between 300 and 900 m a.s.l. and it is conducted with traditional techniques. In the last decades, the incidence of the chestnut gall wasp, together with unfavourable seasonal trends, has progressively reduced the production to the current 20% of the potential production (BATTISTI et al. 2013).

The designation of origin “Marrone del Mugello PGI” is organized in a Consortium that brings together the various actors of the value chain. Currently, the Consortium has 96 members, 95% of which are only producers of fresh chestnuts, and the remaining 5% are transformers (chestnut flour and dried chestnuts) and/or packagers.

Survey methodology

The PVCA approach to the analysis of the value chain has been used to gather information and analyse the “Marrone del Mugello PGI” value chain development. Using the participatory approach, the survey was conducted from February to December 2014 (11 months) and structured in three phases: (i) identification and classification of chestnut growers, (ii) interviews with chestnut growers, (iii) focus groups with chestnut growers to discuss results and future strategies.

Identification and classification of chestnut growers. In the first phase, the chestnut growers in the Mugello-Val di Sieve area who are directly or indirectly involved in the chestnut value chain were



Fig. 1. Location of the study area in the Tuscany region

identified and classified. A comprehensive list of 300 chestnut growers was drawn up, based on the official statistics and the lists of enterprises recorded by the Chamber of Commerce, Industry, Handicraft and Agriculture (CCIIA) of the Florence province. Among the chestnut growers in the study one third belongs to the “Marrone del Mugello PGI” Consortium. 126 chestnut growers (about 42% of the total) were involved in the study and classified into two groups as follows: 83 chestnut growers enrolled in the “Marrone del Mugello PGI” Consortium, 43 chestnut growers currently not enrolled in the Consortium.

Interviews with chestnut growers. The study is based on quantitative-qualitative interview data collection. A questionnaire suitable for a face-to-face interview was developed to collect data and to work as an interview guide. The questionnaire investigated the main aspects about the entrepreneurship and innovation of the farms and the networks between farms and institutional actors in the study area. The questionnaire was divided into four thematic sections: “Personal information”; “Farm information”; “Innovation and entrepreneurship” and “Social capital and network”. In particular, the last thematic section focuses on the professional relationships between chestnut growers and institutional actors (public administrations, private organizations and associations) in order to quantify the social capital. The relational social capital was assessed by distinguishing between chestnut growers enrolled and not enrolled in the “Marrone del Mugello PGI” Consortium.

During the interview, the respondents indicated the institutions with which they had a professional relationship (e.g., the joint realization of technical projects and actions; the provision of services). In the present study, the weak ties between farmers and institutional actors are investigated, while the strong ties have not been investigated. The weak ties are those relationships established by different actors among which communication is sporadic and where emotional intensity is low or, occasionally, moderate. These ties are conducive to the transfer of knowledge and information in the network (GRANOVETTER 1973).

After the data collection, the two social networks were analysed and compared considering the complexity of each of them and the importance of key institutional actors in the network. The ego-network size of each institutional actor was used to identify the key institutional actors in the two networks. Ego-network size indicates the number of other actors with whom each actor has a direct relationship (MARSDEN 2002).

The data of network analysis were processed using UCINET software (Version 6.0, 2012), while the descriptive statistics drawn from the data collected through questionnaires were developed using XLSTAT (Version 2012).

Focus groups. The information collected with interviews was discussed during some focus groups. The choice of this participatory tool is motivated by the dynamics of group interaction to reveal participants’ similarities and differences of opinion (KAPLOWITZ, HOEHN 2001). Participants in focus groups were chosen based on their active roles in the Mugello-Val di Sieve chestnut value chain. Particular attention was paid to their representativeness and their technical competences vis-à-vis the specific problems at hand.

Five focus groups were realized in different municipalities of the study area. The focus groups – where participants are asked to discuss issues as pre-determined by the organizers – were chosen in reason of the advantages they provide to qualitative research. Firstly, they are valuable tools when the participants have different roles in the network; secondly, the group interaction enables to examine participants’ different perspectives and thirdly they introduce a valuable approach to learning the level of consensus on a specific matter (SHAW, CLARKE 1999).

The focus groups were moderated by a facilitator supported by the members of the research team. Questions for the focus group were structured for a two-hour focus group, and an average response time of five minutes per question was given to respondents.

The following topics were discussed in the focus groups: (i) strategies to improve the level of innovation and entrepreneurship, (ii) strategies to enhance the chestnut value chain from the economic point of view, (iii) future expectations and potential problems for the chestnut sector in the Mugello-Val di Sieve area. At the end of each focus group, a summary final document was elaborated containing guidelines and strengthening strategies useful for the development of the value chain in the framework of the new Rural Development Programme (2014–2020) of Tuscany region.

RESULTS

Characteristics of the respondents and farms

The results show that the Mugello-Val di Sieve chestnut value chain is quite fragmented, with relevant differences between the chestnut grow-

ers enrolled and not enrolled in the “Marrone del Mugello PGI” Consortium (Table 1). From the socio-demographic point of view, the chestnut growers enrolled in the Consortium have a higher level of education than those not enrolled in the Consortium, while the gender distribution is similar in the two groups. In addition, the majority of the chestnut growers – both PGI members and non-members – are farmers (66.2 and 57.5% respectively), but in the second group the percentage of pensioners is much higher (10.8 and 27.5% respectively).

The members of the Consortium are mainly producers (95% of total members), while in the group of non-members there is a greater number of transformers (14% of total non-members). The packagers are very few in both groups: 4% of total members and 0% of total non-members.

Concerning the number of years of activity in the chestnut sector, the non-members have more years of experience in the sector. Specifically, about 75% of not enrolled respondents have more than 25 years of activity, while about 25% of enrolled respondents have less than 15 years of activity.

The average farm size of “Marrone del Mugello PGI” Consortium members is 87 ha (range be-

tween 0.3 and 800 ha), while the average farm size of non-members of the Consortium is 47 ha (range between 1 and 220 ha).

Observing farmers enrolled in the Consortium, 63% declared that chestnut production represents the main or exclusive source of income. The non-members have a different profile, since 77% of respondents are not professional chestnut growers, chestnut production bringing additional earnings to their income.

Innovation and entrepreneurship

The average productivity before the diffusion of chestnut gall wasp was 9.67 q·ha⁻¹ for the farmers enrolled in the Consortium and 9.46 q·ha⁻¹ for the non-enrolled ones. After the diffusion of chestnut gall wasp, the average productivity dropped down to 2.64 q·ha⁻¹ for PGI members and to 2.70 q·ha⁻¹ for non-members. Consequently, the decline in productivity in the period 2012–2016 (four years) was similar for both groups.

The small size of chestnut orchards is reflected also in the diversification of the market. In general terms, the highest price is obtained with direct selling in the farm or in the village fairs during harvesting. The certified product fetches a 5% higher price than the non-certified one. The results of wholesale trading show that the chestnut growers enrolled in the Consortium have a greater diversification of sales channels than those not enrolled in the Consortium. The PGI members sell 47.5% of the total product with the PGI label (certified product) and the remaining 52.5% without the PGI label (non-certified product). The certified product is sold through two sales channels: PGI packers (96.4% of the total certified product) and supermarkets (3.6%). The non-certified product is sold through many sales channels: directly sold in the farm (39.2% of the total non-certified product), through intermediaries (35.2%), in village fairs (19.0%), in supermarkets (4.0%), local market door (2.4%), and delivery to final consumers (0.2%). The wholesale trading of the chestnut growers not enrolled in the “Marrone del Mugello PGI” Consortium is distributed in the following way: through intermediaries (61.4%), directly sold in the farm (23.3%), in village fairs (14.1%), and local market door (1.2%).

Social capital and network

The results of the social network analysis show interesting differences between the chestnut grow-

Table 1. Socio-demographic characteristics of chestnut growers of the Mugello-Val di Sieve study area

Socio-demographic characteristics	Members of the Consortium (n = 83) (%)	Non-members of the Consortium (n = 43) (%)
Gender		
Male	80.2	80.0
Female	19.8	20.0
Level of education		
Elementary school degree	50.7	65.9
High school degree	41.3	29.3
University degree	8.0	4.9
Main profession		
Farmer	66.2	57.5
Pensioner	10.8	27.5
Other	23.0	15.0
Role in chestnut value chain		
Producer	95.1	86.1
Transformer	1.2	13.9
Packager	3.7	0.0
Activity in the chestnut sector (yr)		
< 5	2.6	7.0
6–10	11.5	4.7
11–15	10.3	4.7
16–20	6.4	2.3
21–25	10.4	7.0
> 25	59.0	74.4

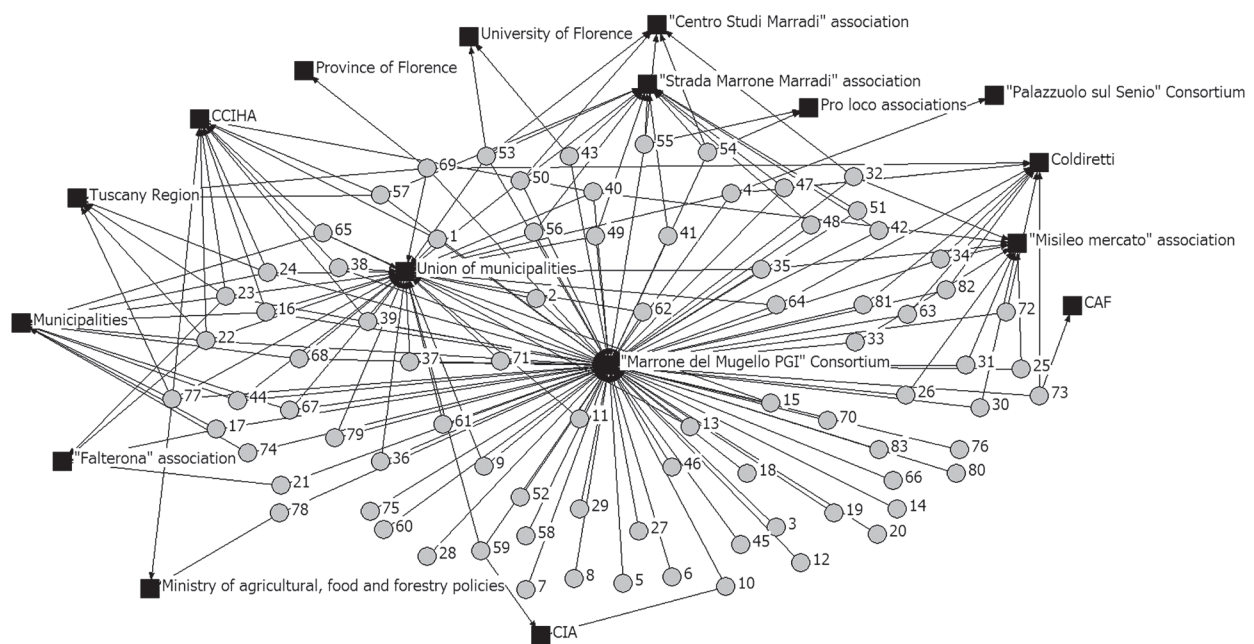


Fig. 2. Network of the chestnut growers enrolled in the "Marrone del Mugello PGI" Consortium

CAF – "Confagricoltura", CCIHA – Chamber of Commerce, Industry, Handicraft and Agriculture, CIA – Confederazione Italiana Agricoltori, PGI – protected geographical indication

ers enrolled in the "Marrone del Mugello PGI" Consortium (Fig. 2) and those not enrolled in the Consortium (Fig. 3). In the first network, the chestnut growers have professional relationships with 17 institutional actors (including the "Marrone del Mugello PGI" Consortium), while in the second network the chestnut growers have professional re-

lationships only with 9 institutional actors. In the first network there is a greater flow of information (dissemination of technical and practical information) and a higher diffusion of innovation among farmers, while the non-members are more isolated from the professional point of view, with a high difficulty in finding information.

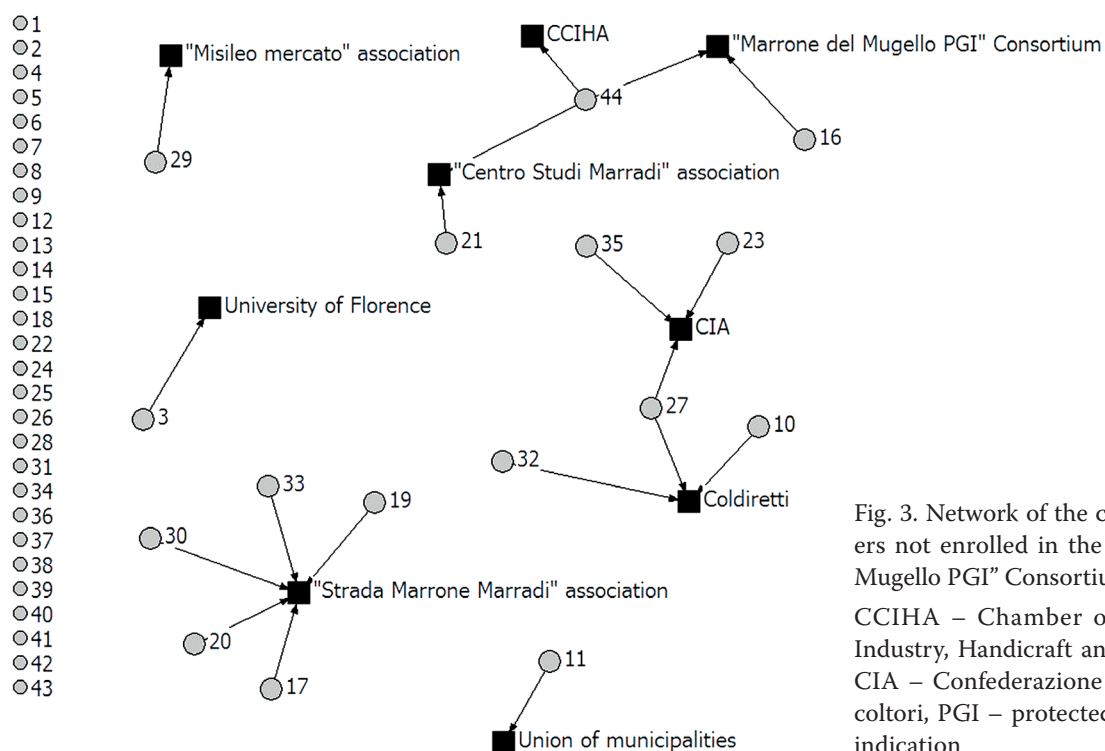


Fig. 3. Network of the chestnut growers not enrolled in the "Marrone del Mugello PGI" Consortium

CCIHA – Chamber of Commerce, Industry, Handicraft and Agriculture, CIA – Confederazione Italiana Agricoltori, PGI – protected geographical indication

The ego-network size of each institutional actor in both networks is shown in Table 2. The results document that the key institutional actors of the first network are: the Union of Municipalities (40% of respondents have a professional relationship with this actor), the “Strada Marrone Marradi” Association (16%), the CCIHA of Florence (13% of respondents), the municipalities of Mugello-Val di Sieve area (13% of respondents), and the Coldiretti (12% of respondents). The latter institutional actor – as the Confederazione Italiana Agricoltori (CIA) – is a national trade association that represents the interests of farmers and forest owners. Conversely, the key institutional actors in the second network are: the “Strada Marrone Marradi” Association (11.6% of respondents), the two national trade associations – Coldiretti and CIA (7% of respondents for both), followed by the “Marrone del Mugello PGI” Consortium (5% of respondents). About the latter, only a small number of non-member farmers have a relationship with the Consortium, making the two networks almost completely separated.

The role of various public administrations is very marginal in both networks: 1, 7 and 2% of chestnut growers enrolled in the Consortium have professional relationships with the Province of Florence, Tuscany region and Ministry of Agricultural, Food and Forestry Policies, respectively. Non-members do not have any professional relationships with these public administrations.

Also some associations (i.e. “Pro Loco” associations, “Centro Studi Marradi” Association) cover a relevant role in the network of the Consortium members. “Pro Loco” associations play a role in promoting tourism in the supply chestnut chain of the Mugello-Val di Sieve area, while the “Centro Studi Marradi” association plays an important role in the diffusion of historical knowledge and information about chestnut cultivation in the area.

In addition, other associations of chestnut production (i.e. “Falterona” Association and “Mercato di Misileo” Association) have a key role in gathering growers and promoting common actions such as opening of new market channels or circulation of chestnut-related technical information. Only just 14% of non-member farmers are enrolled also in other associations of chestnut production (11.6% have relationships with “Strada Marrone Marradi” Association and 2.3% with “Mercato di Misileo” Association). These consortia of chestnut production promote the innovation and influence the practices and behaviour of farmers in different parts of the Mugello-Val di Sieve area.

DISCUSSION

A comparison of the results between the two groups shows that the two networks – members and non-members of the “Marrone del Mugello PGI”

Table 2. The ego-network size of the institutional actors involved in the two networks

Institutional actors	Members (<i>n</i> = 83)		Non-members (<i>n</i> = 43)	
	No. of ties	(%)	No. of ties	(%)
Ministry of Agricultural, Food and Forestry Policies	2	2.4	0	0.0
Tuscany region	6	7.2	0	0.0
Province of Florence	1	1.2	0	0.0
Municipalities of the Mugello-Val di Sieve area	11	13.3	0	0.0
CCIHA	11	13.3	1	2.3
Union of Municipalities	33	39.8	1	2.3
Coldiretti	10	12.1	3	7.0
“Palazzuolo sul Senio” Consortium	1	1.2	0	0.0
CIA	2	2.4	3	7.0
“Falterona” Association	4	4.8	0	0.0
“Centro Studi Marradi” Association	5	6.0	2	4.7
“Mercato di Misileo” Association	9	10.8	1	2.3
“Strada Marrone Marradi” Association	13	15.7	5	11.6
University of Florence	2	2.4	1	2.3
“Pro loco” associations	2	2.4	0	0.0
“Confagricoltura”	1	1.2	0	0.0
“Marrone del Mugello PGI” Consortium	83	100.0	2	4.7

CCIHA – Chamber of Commerce, Industry, Handicraft and Agriculture, CIA – Confederazione Italiana Agricoltori

Consortium – differ markedly both in the structure and position of the key institutional actors.

The network of the Consortium members is a well-structured network with some reference institutions for the farms. However, in this network many institutional actors take up a marginal position. This deficiency – although it strengthens to some extent the institutional power and the efficiency of the decision-making process – represents a limit in legitimizing the choices and broadening the spectrum of options. In order to increase the efficiency of this network, a greater interaction between the “Marrone del Mugello PGI” Consortium and other consortia of producers would be required. With regard to the innovation process, the network among the Consortium members has a higher potential for the diffusion of product and service innovations than the network among non-members. This is partially demonstrated by the larger number of sales channels used by the members of the Consortium compared to non-members. A wider differentiation of sales channels allows better product allocation in terms of both quantity and sales price. Furthermore, in the future the certification process – which can be considered an important process innovation – has a higher potential to expand within the network among the Consortium members than in the network among non-members (“contagion effect”).

As an example of the importance of the interaction among actors CRESPO et al. (2014), using also the social network analysis, illustrates the influence of social structures in determining the cooperative behaviour of cheese producers in Aculco (Mexico) in terms of the decision to adhere or not to the local cooperative.

A low number of ties between farmers and institutional actors characterises the network of the chestnut growers that are not enrolled in the Consortium. In a poorly structured network, forms of aggregation among farmers may therefore be crucial for a success in the market. In another part of the Tuscany region (Garfagnana area) a study conducted by PETTENELLA and MASO (2011) presented a case study of effective networking based on the creation of chestnut growers’ associations with positive effects on chestnut marketing valorisation. Referring to the present study, the two municipalities of Marradi and Firenzuola provide a good example. Marradi shows a strong network with high subscriptions to the “PGI Consortium” and the “Strada Marrone Marradi” association. Consequently, the constant exchange of information and mutual help among actors have developed a balanced chain where the market channels are diversified and chestnut grow-

ers can fetch a higher price. In addition, other actors that are not directly involved in chestnut production such as chestnut by-product transformers or restaurants benefit from this context. Thus, the territory as a whole, through chestnut valorization, can develop in a sustainable manner and be more resilient to adverse conditions such as those faced with the incidence of the chestnut gall wasp.

In this sense, LUDVIG et al. (2016) described the positive example of the Italian chestnut association “Associazione Tutela Marroni di Castione” in Trentino: 100 associated chestnut growers supported by a municipality developed innovations in the chestnut value chain organizing activities, services and gourmet events around their chestnuts.

In order to facilitate information flows and diffusion of innovations, 2 or 3 institutional actors that can play a key position in the future network should be identified. These institutional actors may have three different roles: (i) the first institutional actor may facilitate the flow of information between farmers, (ii) the second actor may provide technical advice and innovation brokering to farmers in order to facilitate the innovation process startup, (iii) the third institutional actor may facilitate the relationships between the farmers of the Mugello-Val di Sieve area and farmers of neighbouring areas.

With focus groups, as the last step of PVCA, guidelines and strengthening strategies useful for the development of the value chain in the framework of the Rural Development Programme of Tuscany region were defined. In particular, activities and strategies to revive the chestnut cultivation have been evidenced. From the productive point of view, the main activity highlighted has been the implementation of silvicultural treatments aimed at increasing productivity together with the systematic integrated control of chestnut gall wasp. From the marketing point of view, management strategies must be oriented to enhance the market and to identify new sales markets; specifically new niche markets or new customers for the quality product. At the same time, the definition of promotional strategy of a product associated with broader marketing in the territory could have a positive impact on the local economy in the medium-long period.

The importance of the PVCA approach to support the value chain development has already been highlighted by the international literature about rural development. Most of the literature is focused on the importance of the PVCA approach to identify strategies and interventions for value chain progress in developing countries, in order

to limit poverty reduction and contribute to economic growth (ALTENBURG 2007; RIISGAARD et al. 2010; NANG'OLE et al. 2011). LOWITT et al. (2015) illustrated how the social relations that are derived from smallholder-related value chains can be reinforced and how a community of practice approach to value chain development can support the formation of social capital.

Concerning developed countries, manuals illustrating concepts and strategies to better link small-scale producers to modern markets using the PVCA approach are those of SPRINGER-HEINZE (2007) and VERMEULEN et al. (2008).

In the international literature, several studies have focused on factors that influence innovation processes with special regard to non-wood forest products (NWFP). SHACKLETON et al. (2007) highlighted that in many countries (Brazil, Cameroon, South Africa) diffusion of NWFP innovations – i.e. intensification of agro-forestry management or cultivation of new species – is a direct response to increasing demand at a local level (market). RAMETSTEINER and WEISS (2005) showed that in the Central European region the development of NWFP is supported by the innovation system and that for strengthening NWFP innovations forestry agencies would have to provide more information on new market opportunities to forestry sector actors. Always referring to Central Europe, RAMETSTEINER et al. (2005) found that the innovation process was affected by both personal and external factors but the most important factor is the cooperation among all forest-wood chain actors. In addition, NYBAKK and HANSEN (2008) found that the degree of social networking by various individuals and organizations had a positive effect on innovativeness among Norwegian nature-based recreation tourism companies. NYBAKK et al. (2009) showed that social networking and learning orientation positively impact innovativeness in NWFP and services.

The results of this study as those of other studies mentioned above highlighted the positive role of social networking in dissemination of product and service innovations.

CONCLUSIONS

The present study has highlighted that the network structure plays an important role in disseminating new ideas and innovation processes among entrepreneurs. A suitable network for this purpose is a dense network with few marginal and isolat-

ed actors and some key actors who play a central role in dissemination of information and technical specifications.

From the methodological point of view, this study has confirmed that the PVCA approach is a good tool for the management and decision making in a project. We have shown that the tool can be used as an aid to define the most important actions and strategies for the development of the “Marrone del Mugello PGI” value chain in an effective, efficient and ethical way.

Information assembly and analysis were carried out largely by chestnut chain stakeholders during focus groups, with the support of the facilitator. The outcome of focus groups helped to visualize easily the main problems and to define guidelines and strategies useful for the development of the value chain in the framework of the Tuscany Rural Development Programme. Our findings evidenced the key role of understanding the stakeholders participating in a project so that the intended results are attained.

Finally, a key role in strengthening the chestnut value chain can be played by those institutions that have greater centrality in the network. They should encourage greater involvement of associations through participatory processes. Such processes can expand the views and involve, in the political agenda, alternatives that would not otherwise be considered.

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