Journal of Agricultural, Food and Environmental Sciences, Vol 73 No 2 (2019) 47-56
DOI: https://doi.org/10.55302/JAFES19732047t

Original scientific paper

NETWORKS IN THE MACEDONIAN ORGANIC PRODUCTION CONTEXT

Emelj Tuna*, Aleksandra Martinovska Stojcheska, Ivana Janeska Stamenkovska, Ana Simonovska

Ss. Cyril and Methodius University in Skopje, Faculty of Agricultural Sciences and Food - Skopje, Republic of North Macedonia,
emelj.tuna@fznh.ukim.edu.mk (*corresponding author)

ABSTRACT
Economic performance and competiveness of commercial farms, in producing and selling organic products, is often dependent on the structure of networks and the organization of supply chains. Networks play an important role in information dissemination, particularly in the otherwise scarce information flow in rural areas. Informal networks are in most cases a valuable source of social capital and information exchange. The aim of this paper is to understand network and stakeholder position and relations in the information channels among the actors in the supply chain for organic productions, by mapping information diffusion on horizontal level - farmer's relations with other farmers. A survey on 122 organic farms was carried out in 2018 in the Republic of North Macedonia. The data were processed in UCINET. Mapping social capital structure contributes in identifying key individuals (social capital hubs), that can be activated for information dissemination and ultimately for active mobilization of organic production networks. The findings confirm that farmers with similar production type are more likely to cooperate and share information among each other.

Key words: ego networks, organic farming, social networks, social capita, stakeholders.

INTRODUCTION
Organic farming in Macedonia is an emerging sector, with high development potentials. The area under organic production (area under conversion and certified area) shows fluctuations during the period 2013-2018, mostly due to the area that is in process of conversion towards organic farming. However, the highest figures are obtained for 2018 when the total area under certified organic production according to the State Statistical Office (SSO, 2019) was 2942 ha. Different records are tracked by the Ministry of Agriculture Forestry and Water Economy (MAFWE). According to MAFWE (2019), the total area under organic production is 3909 ha. Larger value is obtained due to the area under medicinal/aromatic herbs, oilseed plants and fallow land. The number of organic operators has also increased in the last five years, from 344 (2014) to 799 (2018), showing the development trend of the organic farming in Macedonia. This increasing trend in the number of operators also indicates that the conversion to fully organic farms is an ongoing process which takes several years. This is also a case at the EU level, where the number of farms with organic land slightly increased from 2013 to 2016 as for holdings with some organic area by 0.08% and even more for holdings with only organic land, by 0.4% (EC, 2019).

The economic performance and competiveness of the firms buying and selling organic products and their partners-farmers producing organic products is often dependent on the organization of the supply chains and the network structure (Medicamento & Degennaro, 2006).

The absence of information on horizontal (information among farmers) and vertical (information among farmers and other relevant stakeholders in the network) can pose a major barrier and obstacle for developing effective distribution channels for organic products (Atanasoaie, 2011). Therefore, the network aspect of the supply-chain can be seen as one important approach in identifying factors influencing the information for organic production, as well as the actors that contribute in the diffusion of this information (Medicamento & Degennaro, 2006). Formal and informal social relations may also serve as valuable explanatory variables in organizational research, since each individual is enfolded to a specific network of others (alters), and the structure of this network is expected to expose certain patterns of behavior and attitudes (De Lange *et al.*, 2004).

One identified constraints of the organic sub-sector in North Macedonia is the lack of linkages between the organic producers and related institutions in the sub-sector. Therefore, the aim of this paper is to identify the information diffusion channels for producing organic products among the different actors in the supply chain, by mapping the structure of their personal social network. A social relational approach of analysis contributes in illustrating specific systems of relations through depicting human behavior on micro, individual level, or more specifically, the way patterns of relations affect (positively and negatively) human action (Bodin & Prell, 2011) and information diffusion. Although single actors are a central focus to this analysis, it is also important to assess the governance network of institutional relations that occur in terms of shared interests in solving a problem. More specifically, the analysis presents the relations and information sharing network of the actors at horizontal level and the vertical and horizontal interaction between the actors at different levels such as their institutional and commercial associates (among the organic producers, their trading partners, associations, state institutions and other identified stakeholders as seen from the perspective of the interviewed organic farmers).

It is considered that combining methods such as social network analysis (SNA) and stakeholder analysis can often contribute to the richness in the analysis and understanding of the relations. Thus, the analyses in this report are additionally supplemented to identify and map most of the relevant stakeholders in the network for organic production.

MATERIALS AND METHOD

The first part of this research serves as base in the identification of the stakeholders relevant in the context of the organic production in Macedonia. Stakeholder analysis is a method of gathering and analysing qualitative information in order to define the interest groups, but also to provide understanding of their behaviour, intentions, interrelations and interest, that is to give answers to the following questions: Which are the most important interest groups with regard to the problem/issue? Who has power and interest in the information sharing network? What are the relationships between all of the identified stakeholders?

In order to identify the stakeholders, each of the interviewed farmers were asked to appoint their most important partners in the following six groups: 1) Buyers; 2) Input suppliers; 3) State Institutions; 4) Associations; 5) Cooperatives; 6) Supporting institutions; or to name other stakeholder that were not listed in the specifically designed part of the questionnaire aimed for this purpose. A total of 84 different individual stakeholders (grouped in the pre-defined six groups of stakeholders) and their relations to the organic farmers were identified, analyzed with Social Network Analysis.

Stakeholder Analysis (SHA) is an important technique for identification of the key stakeholders (primary and secondary) and their needs. The purpose is to develop a strategic view of the human and institutional landscape, and the relationships between the different stakeholders and the issues they care about most (Ketema, *et al.*, 2017)These relations are presented through a vertical network which is a more specific, two-mode network which gives

inside on the commercial relations that the farmers establish with different firms and institutions; therefore the networks have a more specific form, with resemblance to an ego-network form. The key identified stakeholders in this report are also presented in a stakeholder graph in order to classify their role and power positions, in regards to their importance for the organic farmers, measured through SNA and the number of relations that each farmer appointed to the different stakeholder.

Social network analysis (SNA) is a specific methodological approach which requires distinctive type of questions in order to construct and map relations among the pre-defined network of actors. In order to develop an understanding on the general pattern of connections, we focus on the personal-network design which compensates for the issue of losing relations. The network boundaries are often determined by the research question, and most groups have unclear boundaries. Therefore, the advantage of this type of data collection design is that this approach simplifies the issue of "bounding" the network, but also provides richness of the data in terms that, no costs are involved in allowing respondents to mention any other individuals outside the pre-determined list of network members (Borgatti *et al*., 2013). Although random sampling is not so common, in this type of research it is often applied, however, it is preferred that the sampling is preformed from a previous ethnographic pre-study of the studied group (Borgatti *et al*., 2013). The structure of the relations in the different types of networks may help the understanding and predicting the behavior of the existing actors (stakeholders) (Medicamento & Degennaro, 2006).

A questionnaire, was specially designed for the purpose and the selected method of analysis, part of a larger multi-purpose questionnaire and survey which includes different socio-economic attributes of each interviewed ego (organic producer). In our case, the sample is based on a pre-studied and recorded group of organic producers. A total number of 122 farmers were interviewed. Each of the surveyed farmers were asked to nominate certain number of (most often three to five) other farmers with whom they discuss or share information on important issues regarding the production and marketing of organic products. The number of nominations is usually given as motive for more nominations, since limiting this number could lead to measurement errors (Lin, 2005). After the nominations from the interviewed farmers, a total of around 250 actors in the network of horizontal ties were identified.

In the first step, we identified the existent subgroups (clusters) which are embedded in this network of organic farmers on a horizontal level. These are the farmers which form cohesive groups - farmers with such close relations that, if extracted from the network, they can be characterized as separate communities (Borgatti *et al.*, 2013). Nodes which belong to the same clique often incline to express similar patterns of behaviour, and certain part of the clustering of the networks can become as a result of these similar attributes. These properties are called "homophily", referring to the common norms/values that may bring nodes together (same kind of people flock together, in this process they influence each other, people can end up in the same places, geographical proximity –being in the same place influences to development of similarities) (Kadushin, 2012). The network clusters and key groups provide a general overlook of the organic farmers that hold power and central position in the network.

RESULTS

SHA analysis - The first aim of this report was to produce a list of key stakeholders in the organic farming sector in the country. Therefore a graphical representation of the stakeholders and their relations to the organic farmers in presented in Figure 1.

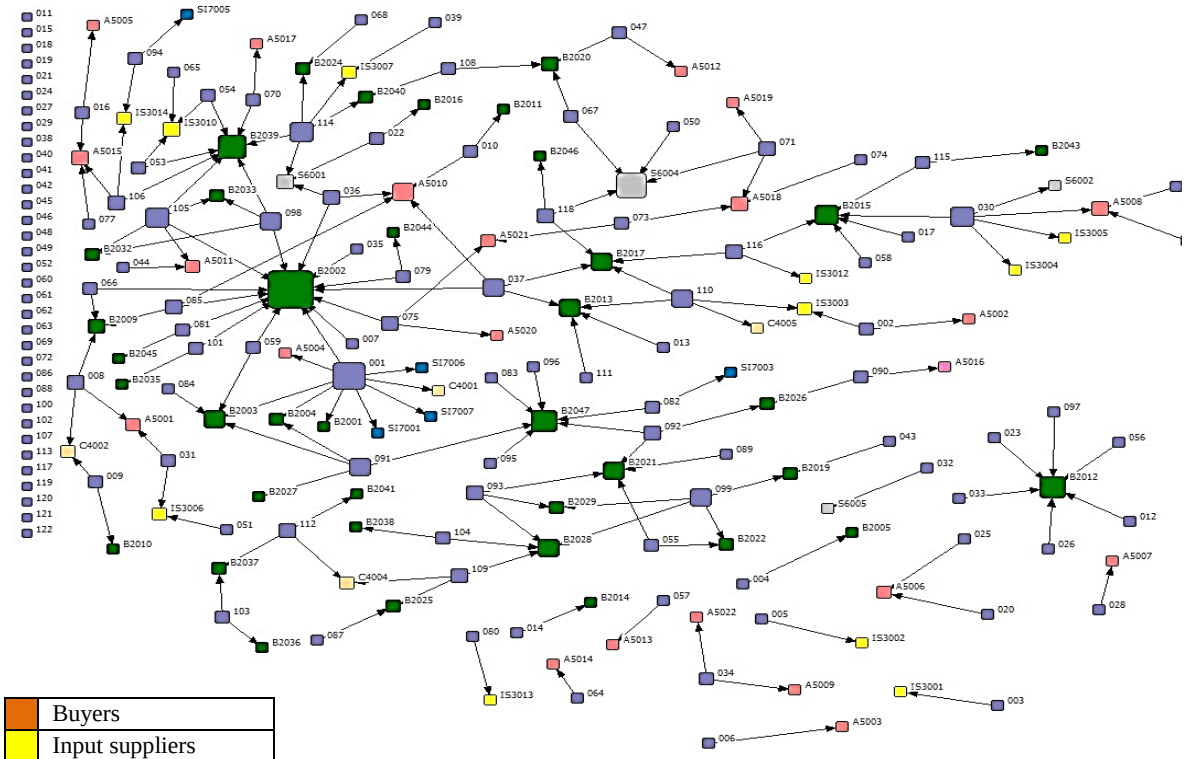

Figure 1. Relations with different stakeholders in the organic value chain (size in accordance to degree)
Source: Own representation

The different colors represent the different stakeholder groups, and the size of the nodes represents their position in the network of relations, and the number of relations that they were appointed with by the interviewed organic farmers. Understandably, the most important stakeholder interactions in terms of the number of relations (in degree) are formed with their trading partners (buyers). The most important buyer or actor in general is "Nasa Dobra Zemja", with twice as many relations compared to the other buyers - Agricom and Balkan Bioplant. Regardless of the number of relations, the most common type of information that the organic farmers receive from their buyers is the price and quantities of products, and in some instances they provide packing and marketing advices for the organic producers. Another group of stakeholder with relevant number of relations is the group of associations, as an important broker in the diffusion of information for the organic producers. In this group, the Federation of organic food associations – Organologistika has the largest number of relations with the organic farmers. It should be noted that the beekeepers are the most organized group of organic farmers, with the largest number of associations. There are no firms or individuals that stand out in the group of input suppliers, except for Bioagroverija with three relations. The information received by the input suppliers are more substantial and are concerning technical instructions, but also information on previous or experience of other farmers with the

application of the inputs. The National Extension agency is the most noticeable representative of the "State institutions" stakeholder group and "Cooperatives" are seldom present in organic farming, and in this respect, cooperatives and supporting institutions were the least recognized groups in our horizontal network. Several supporting institutions were identified by the farmers, such as IME, Slowfood, USDA and the certification bodies. Assistance from the supporting institutions is in most instances indirect, through different organizations or their buyers, and farmers are often not aware of the origin of this kind of support. The role and importance of the different groups of stakeholders are presented in Figure 2.

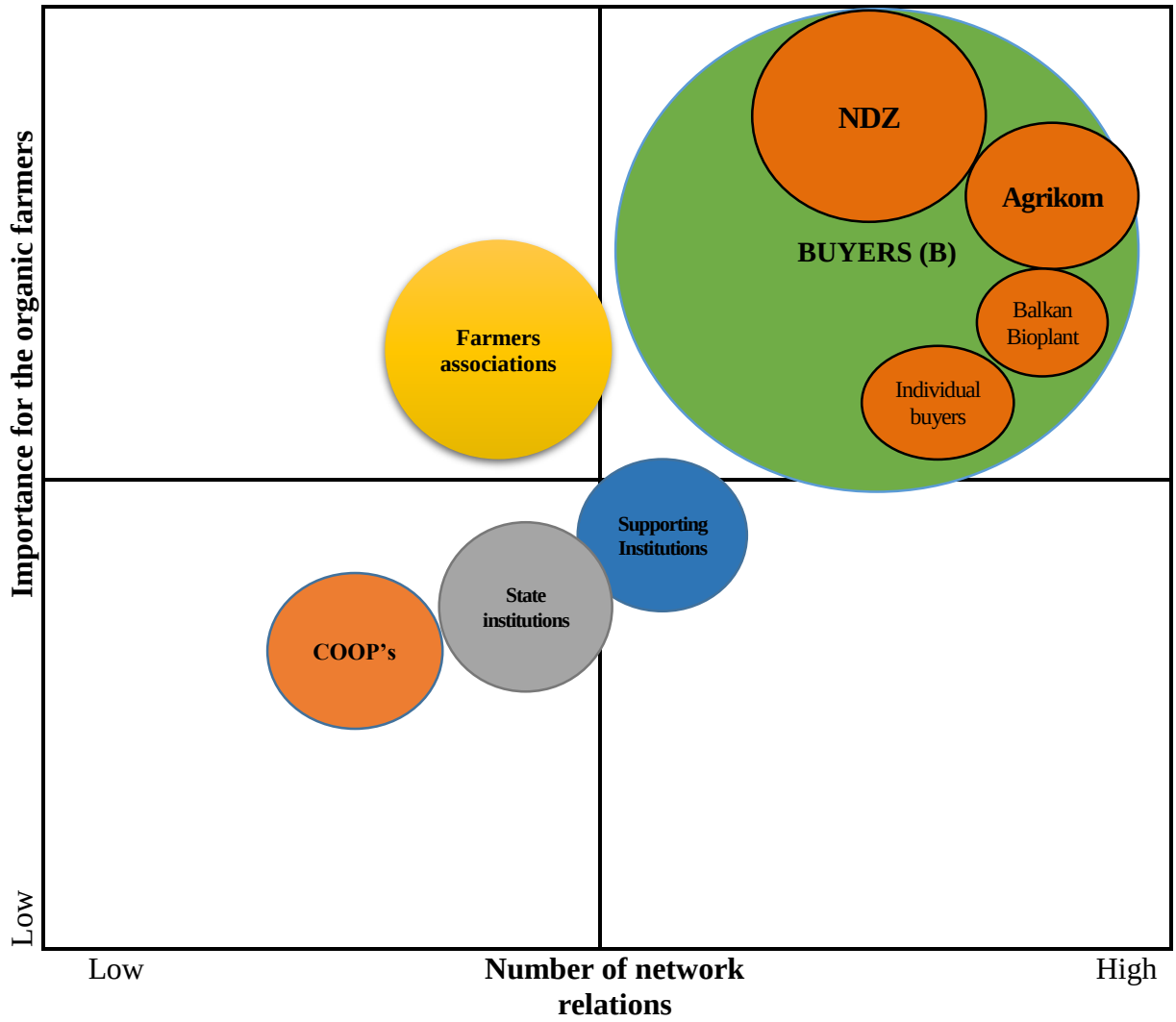

Figure 2. Stakeholders in accordance to the importance for the organic farmers and the number of relations with the organic farmers

Source: Own representation

SNA analysis - The information network of farmer relations (horizontal level) in the selected sample of organic farmers is constituted of very large number of 310 components which suggests that the network is very fragmented. This is confirmed also by the fragmentation measure which is close to 1 (0.997), a fact that additionally influences the low level of density of this network, and is one of the primary indicators of low social cohesion of the network. The density measure is relative to the network size and in bigger networks is expected to express lower values (Borgatti *et al.*, 2013), and especially when the sample contains fiscally dispersed individuals, such as in this case. In accordance to the extremely low density measures, we can conclude that the ***information transfer through the network is also***

very difficult. The average degree of the nodes or the farmers in the network is also very low, mostly due to the significant number of outliers (nodes without relations), and dyads (separate pairs of nodes) (Figure 3). There is no reciprocity, or ties between the nodes in both directions between the nodes, but this is mostly due to the fact that the organic producers were much geographically dispersed. The "distance" measure analyses the shortest path between the more distant nodes, and if the connecting relations are absent than those nodes would be unreachable (Wasserman and Faust, 1994). The average distance in the studied networks has a value of 1.209, indicating that the network contains ***relatively close relations in terms of informational flow*** (Kadushin, 2012), and each actor in the network might be reached in approximately 1.2 steps.

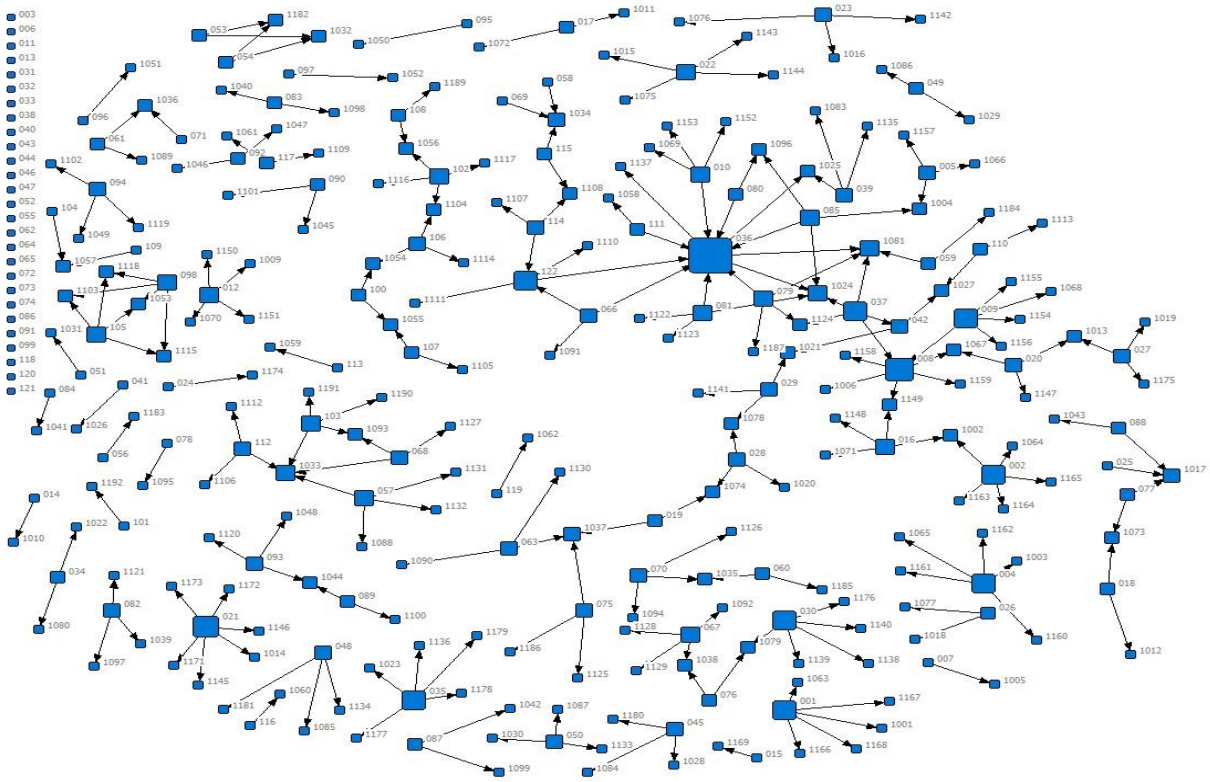

Figure 3. Horizontal information sharing network of organic producers (farmers)
Source: Own representation

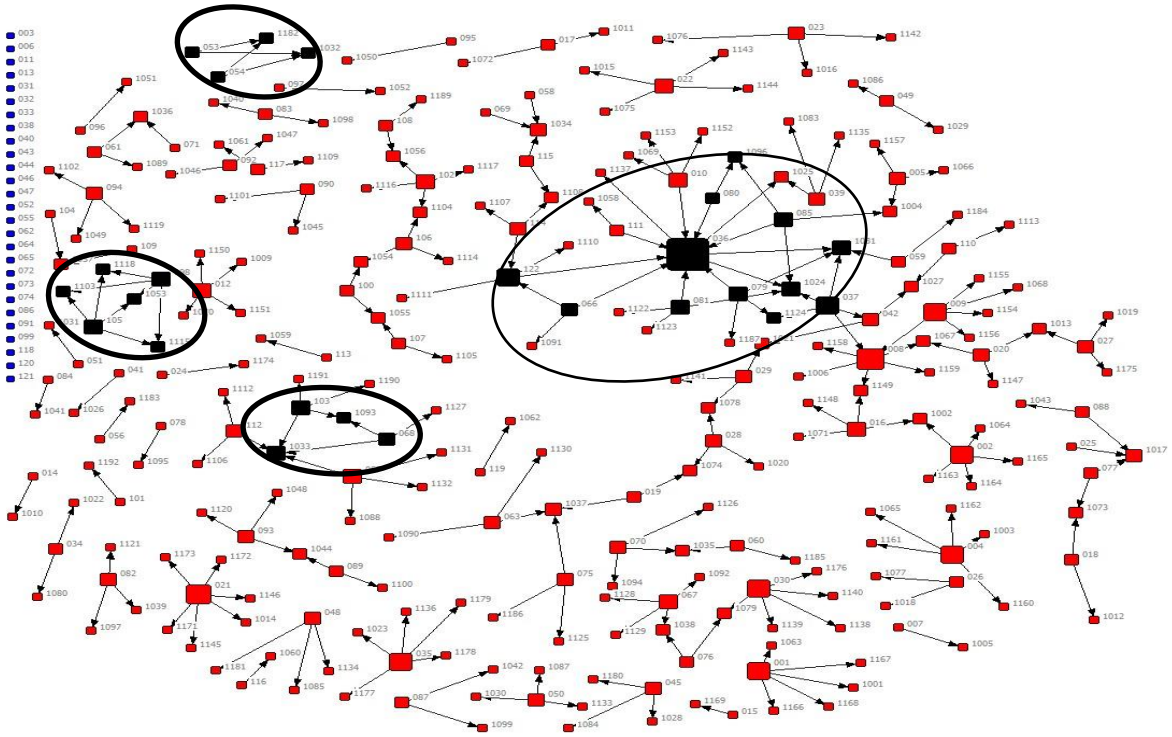

Figure 4. K-cores in the horizontal information sharing network

Source: Own representation; Legend: node colour black constitutes the networks' k-core (circled parts). Node size represents the degree of ties each of the nodes (larger node size – larger degree of ties)

Because of the expectation of larger network disconnections, we also included the measure of "breadth", or the distance weighted fragmentation which shows the average distance among nodes in the case of removing certain nodes in the network (Borgatti *et al.*, 2013). The majority of the nodes in the network are at distance close to 1 point to a complete graph. The diameter of the graphs shows the maximum distance on which the information in the network can travel between any pair of nodes in the network, or how -distant are the remotest two actors in the network, which in this case is very low, and ***all actors in the networks are reachable in three steps*** (Table 1).

We further identified the existent subgroups (clusters) embedded on a horizontal level (Table 2). The farmers which form cohesive groups, farmers with such close relations that can characterize them as a separate community, were extracted (Borgatti *et al.*, 2013). This enabled identification of nodes which belong to the same clique hence express similar patterns of behaviour, and indicate existence of similar attributes. Such "homophily" properties refer to the common norms/values that may bring nodes together (same kind of people flock together, in this process they influence each other, people can end up in the same places, geographical proximity - being in the same place influences to development of similarities) (Kadushin, 2012).

In Figure 4, the graphical analyzed network of horizontal information diffusion clearly shows the existence of four components with higher density of relations, within which there is a group of nodes which constitute the cohesive sub-group of the network, so called the k-core. These are the nodes where the highest level of social capital is concentrated and these nodes are forming the cliques (subgroups) of the network (Table 2). Two of the nodes in these cliques (122 and more evidently 036) have been intensely involved in different types of IME interventions, different types of trainings including the training for advisory services. This can be an indication that these types of activities which are provided by this program had an effect on building their social capital and network of relations. Although, the results indicated that

the formal advisory services activities have not been fostered yet, it is important to see that the informal networking is present. The identified subgroups are mainly based on individuals with the same type of production, are from the same region, selling to the same buyer or trainings and education.

Table 1. Cohesion network measures - horizontal network of information transfer

Measures	Values	Range and explanations
Average degree	0.797	Average number of ties of each node
In degree (H-index)	4	Average of ties received by each node
Density	0.003	Values closer to 1 - better connectedness of the actors in the network
Components	310	Number of component comprising the network
Component ratio	1	1- every node is isolate, 0 – there is one component
Connectedness	0.003	1 – each node belongs to the same component, 0 – every node is in a different component
Network fragmentation	0.997	1- all nodes are at distance1 from each other (complete graph), 0 – all nodes are isolates
Average distance	1.209	The time length for information diffusion across the network
SD distance	0.445	Sees distances beyond actors' direct relations.
Diameter	3	The longest path of the information flow (between the furthest nodes in the network)
Distance - Breadth	0.997	Average distance among nodes when certain nodes in the networks are removed (nodes distance 1 from each other - complete graph, 0 - all nodes isolates)
Reciprocity	0	Average reciprocated ties (ties in both directions)
Dyad reciprocity	0	Reciprocity between pairs

Table 2. Identifying cliques (subgroups)

	Farmer's code		
Clique 1:	036	081	1024
Clique 2:	036	085	1024
Clique 3:	036	066	122
Clique 4:	036	079	1081

CONCLUSION

One of the identified constraints of the value chain of organic products is the lack of linkages between the organic producers, and the organic producers and their markets (distribution, trading partners). Therefore, the aim was to identify the information diffusion channels for producing organic products among the different actors in the supply chain, by mapping the structure of their personal and trade social networks, as well to describe the nature of their relations. More specifically, we identify the stakeholders that occur in the value chain for organic products in the country as seen from the farmers' perspective. Particular interest is put on the description and analyses of certain aspect of social complexity in the relations among the organic farmers on horizontal and the farmers and the different stakeholders that they form different relations with.

Illustration of the informal and formal relations and networks of information sharing among the various actors requires specific data, data gathering and analyzing approaches. In this regard, the main objective was performed by applying Stakeholder and Social Network Analysis for analyzing the structural characteristics that underline the network structures and governance. These approaches were applied since they identify not only the main Stakeholders and Stakeholder groups, but also their relations and position and relevance (power) in the transfer of information.

The Stakeholder analysis revealed the existence of large number of stakeholders, grouped in six predefined groups. Understandably, the most important stakeholder in terms of the

number of relations (in degree) are formed with their trading partners (buyers). The most important buyer or actor in general is "Nasa Dobra Zemja". Having in mind the position of the buyers in the vertical network of cooperation with the organic farmers, it is important that they are more involved in the diffusion of different kinds of information for improvement of the assortment, quality and production, other than "price and quantity" as reported by the organic farmers. The role of the associations, which are present and are especially evident in the Beekeeping subsector, should be strengthened, since cooperatives were not in our sample. Assistance from supporting institutions is in most instances indirect, through different organizations or their buyers which makes their interventions hardly recognizable for the organic farmers.

Evidently, there are very few relations on purely horizontal level, among the organic farmers, and many outliers with none reported relations. The information sharing through this kind of a dispersed network is therefore quite difficult. Nevertheless, the SNA measures identified relatively close relations in terms of information flow, since actors in the network can be reached in 1.2 steps, and in this respect, the distance between the remotest nodes is also low. The analysed network is consisted of sub-groups of organic farmers which express similar attributes and patterns of information sharing, or in this case, the horizontal sharing of information is based on similarities in terms of the type of production, geographical proximity, same buyer or trainings and education.

Tailored interventions, or the different types of knowledge and skills transfer, including training for advisory services, are beneficiary for the organic farmers, since the most influential nodes in the horizontal network of information sharing have been included in the supporting activities. This is a signal that these activities have effect on building these farmers' social capital and network of relations. Although, the results indicated that the formal advisory services activities has not been fostered yet, it is important to see that the informal networking is present and can serve as base for future activities and formalization of these services, especially for the farmers with larger number of relations which is one of the main indicators of trust.

ACKNOWLEDGEMENT

This research was carried out within the project "Impact assessment of IME programme interventions in green economy sector in 2018", supported by Swisscontact, Swiss Foundation for Technical Cooperation.

REFERENCES

Atanasoaie, G. (2011). Distribution channels on the organic foods market. Journal of Horticulture. Forestry and Biotechnology 15(3).

Bodin, Ö. & Prell, C. (eds.). (2011). Social Networks and Natural Resource Management: Uncovering the Social fabric of environmental governance. Cambridge University Press.

Borgatti, S. P., Everett, M. G. & Jeffrey, C. (2013). Analyzing Social Networks. London, UK: SAGE Publication Ltd.

SSO. (2019). Republic of North Macedonia: State Statistical Office.

De Lange, D., Agneessens, E. & Waege, H. (2004). Asking social network questions: a quality assessment of different measures. Metodoloski zvezki 1(2): 351-378.

Kadushin, C. (2012). Understanding Social Networks, Theories, Concepts and Findings. Oxford University press.

Ketema, D.M., Chisholm, N. & Enright, P. (2017). Chapter 20: Examining the Characteristics of Stakeholders in Lake Tana Sub-basin Resource Use, Management and Governance. In: Stave, K.; Goshu, G. & Aynalem, S. (eds.). Social and Ecological System Dynamics. Springer. p. 318.

EC, European Commission. (2019). Organic Farming Statistics. https://ec.europa.eu/eurostat/statistics-explained/index.php/Organic_farming_statistics [Accessed 10 April 2019].

Lin, N. (2005). A network theory of social capital. In: Castiglione, D., van Deth, J. W., Wolleb, G. (eds.). The handbook of social capital, pp. 50–69. London: Oxford University Press.

MAFWE, Ministry of Agriculture, Forestry and Water Economy of the Republic of North Macedonia. (2019). http://www.mzsv.gov.mk/ [Accessed 20 May 2019].

Medicamento, U. and Degennaro, B. (2006). Social Networks and Supply chain Management in rural Areas: A case Study Focusing on Organic Olive Oil. MPRA Paper No. 14558 (Munich Personal ReOPEc Archive), posted 12 April 2009.

Prell, C., Hubacek, K. and Reed, M. (2009). Stakeholder Analysis and Social Network Analysis in Natural Resource Management. Society & Natural Resources 22(6): 501-518.

SSO, State Statistical Office, Republic of Naort Macedonia. (2019). MakStat database. http://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/ [Accessed 20 May 2019].

Wasserman, S. & Faust, K. (1994). Social Network Analysis, Methods and Applications. New York, USA: Cambridge University Press.