SUPPLY CHAINS AS NETWORK- THE CASE OF ORGANIC PRODUCTION IN MACEDONIA

Tuna Emelj, Martinovska Stojceska Aleksandra, Janeska Stamenkovska Ivana

Faculty of Agricultural Sciences and Food-Skopje, Ss. Cyril and Methodius University in Skopje, Republic of Macedonia

Corresponding author: emelj.tuna@fznh.ukim.edu.mk

Abstract

The absence of relations between the primary producers and markets has been identified as one of the primary problems in the supply chain for producing organic products in Macedonia. Nevertheless, the organisation and network structure of the supply chains are often responsible for the economic performance, competiveness and information diffusion between the trading firms and their partners-farmers producing organic products. In this regard, analysing supply chains through social network analysis lenses helps to identify the actors and the important factors that contribute in the information diffusion across the supply chains. The aim of this paper is to identify and map the information diffusion channels of the largest distributers of organic products in Macedonia, by mapping the structure of their social networks. The Social Network Analysis includes networks on horizontal level - farmer's decision to get involved in organic farming, or transfer the conventional production into organic, and vertical level – information provided by the distribution and trading partners in the organic value chain. The results show that information and resources are often embedded in the farmers' personal network, however farmers producing organic products are a closed group with very few relations among themselves indicating to a low level of trust in sharing or receiving information. Most of the identified relations among the actors in the analysed network are based either on commercial basis (distributors) or friendship (other farmers). The identified absence of relations among farmers on horizontal level can seriously impede the transfer of information and decrease the motivation for entering, maintaining and introducing innovations in the organic production, thus further examination and improvement of the information channels is necessary.

Keywords: distribution channels, information, relations, Social Network Analysis.

Introduction

The socio-economic aspect is of key importance in organic production. Organic production provides large number of small producers a chance to be involved in production, since it requires minor investments in terms of preparations, materials and equipment. On the other hand, organic products are sold at higher prices that allow adequate incomes for producers and compensation for increased production costs (MOPF, 2015). This involvement of small producers has direct contribution to their subsistence in the rural areas where they live, and indirect contribution to the regional development and the economy of the country (MOPF, 2015).

Organic production in the Republic of Macedonia is evoking rising interest among the agricultural producers in the country. This is observed in the growing of the area and farmers producing organic products. Namely, in 2005, the total area under organic production was 266 ha (50 organic producers), and in 2016 this area mounted to 3,240 ha (533 organic producers). However, this trend reached its pick in 2011 and has a decreasing trend. Still, the changing preferences and increased awareness of the consumers in the country, as well as the awareness of the producers to meet the increased demand for fresh and locally produced organic products; which are often marketed at higher prices and provide better incomes for the farmers, make this segment of agriculture attractive for the enthusiastic farmers (MAFWE, 2016). Nevertheless, even though the number of organic farmers in the Macedonia is increasing, and institutions and bodies to provide coordination among the organic producers exist (such as the Macedonian Organic Producers Federation –

MOPF); information regarding organic production is still scarce and uncommonly shared among the farmers, and between the farmers and the other actors involved in the supply chain for organic products. The economic performance and competiveness of firms buying and selling organic products and their partners-farmers producing organic products is often dependent on the supply chains organisation and network structure. Most of the research in the links in the supply chains is focused on the analysis of the primary producer-processor relationship, and the network aspect of the supply-chains has received less consideration (McKitterick et al., 2016). The relational structure and power dynamics between the primary producer-processor, as well as the other actors in the supply chain becomes a key aspect for identifying the factors influencing information diffusion (Medicamento and Degennaro, 2006). The absence of relations between the primary producers and markets has been identified as one of the primary problems in the supply chain for producing organic products in Macedonia. 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 social network. More specifically, the aim is to map the information reach or among all involved actors in the organic production (including the distribution, trading and other partners in the organic value chain) on horizontal and vertical level. Social Network Analysis (SNA) provides description and graphic representation of the commercial relations and information channels among the actors in the supply-chain for organic products.

Material and methods

The data was collected in February-March 2017 through a combined face-to-face and telephone survey with farmers listed as suppliers for the two major retailers of organic products in Macedonia which are the sales channels "Beorg" – organic Bazaar and cooperative of organic products buyers and "Nasha Dobra Zemja". The farmers' in this sample are producing different types of products and are dispersed all over the country, which to some extent represents a limitation in the proposed research methodology. The survey was conducted through a short questionnaire, specially designed for this purpose and the selected method of analysis. Social Network Analysis 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. To achieve this task, it is necessary to construct a list which will include as many of the farmers/suppliers to these sales channels. Such list was available, however farmers were often difficult to reach, have ceased the cooperation with these sales channels, or have ceased to produce organic products in general. Table 1 (Channels of information) summarizes the general questions and the "Name generating table", which is a tool enabling collection of information on each farmer's personal networks; relation to other actors in the supply chain (alters) as well as the relations that alter (nominated farmers) have among them (Wasserman and Faust, 1994).

Table 4. Channels of information framework

PART I. GENERAL QUESTIONS		
Q1	Motivation for starting with organic production.	Higher prices, ensured market for organic products, subsidies, future potential of the organic production, other.
Q2	Where do farmer sell their organic products?	Authorized trading partner, green market, specialized stores, individuals, restaurants, personal consumption, other.
Q3	The most important source of information?	Open question.
Q4	Does the trading partner provide important information regarding:	Production of organic products, prices, distribution channels, no information, other.
PART II. NAME GENERATING TABLE		
Q5	Nominating persons with whom the farmer discusses important issues regarding the production of organic products.	Relation to each of the nominated alters, if they are also producing organic agricultural products, whether the nominated persons are members of cooperatives etc.

A total number of 28 farmers were interviewed. Each of the surveyed farmers were asked to nominate certain number (most often three to five) of other people (farmers, trading partners, specialized stores for organic products, certifying bodies, associations), with whom they discuss or share information on important issues regarding the production 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). Following the nominations from the interviewed farmers, the information network was constituted of 69 actors (stakeholders). The "name generator" also includes a part titled as the "name interpreter" which refers each nominee's attributes in regards to their type of relation and production (Table 1, part II) (Borgatti et al., 2013). The structure of the relations in the different types of networks may help the understanding and predicting the behaviour of the existing actors (stakeholders) (Medicamento and Degennaro, 2006).

The analysis was executed using adjacency matrices (NxN in terms of number of nodes). The actors in the network were coded (1 in the case of an existing relation and 0 when the relation was absent). The total network of all the participants in the information channel network) and the structure of the information network are presented through sociograms. The SNA data was analysed using UCINET, a specialised software tool for analysing social structures (Borgatti et al., 2002), and their visualisation was presented using NetDraw (Borgatti, 2002).

Results and discussion

The first part of the questionnaire addressed the general motivation for starting with producing organic agricultural products, the channels of distribution, as well as the sources of information regarding organic production.

Motives. The major incentive to start with organic production among the interviewed farmers in this part of the study was the identified need and awareness of these farmers for the benefits of the organic food. The expected, higher prices and future prospective that this type of agricultural production provides for the primary producers are some of the important motives pointed out by the farmers. Demotivating fact is the absence of awareness on the consumer side and in most instances treating/pricing agricultural organic products by the wholesalers and final consumers as conventional. Absence of institutional support and quality controlling mechanisms from the certification institutions was also pointed as one of the discouraging factors for the organic producers and their incentives to invest in expanding and improving the production.

Distribution channels. The departing point in objective 4 was to analyse the ego networks of "Nasha Dobra Zemja" and "Beorg", hence their supplying partners (farmers) were included in this research. Nevertheless, these were not the only transacting partners identified by the primary producers as their trading partners. Farm producers are in most instances not tied to one buyer only, thus in order to secure their sales and in a way disperse the risk, they are using different procurement practices and sale channels: green markets, individuals, wholesalers, specialized stores etc. Around 50% of the farmers in our sample sell their products to "Nasha Dobra Zemja", yet many different specialized stores and wholesalers, and other types of distribution channels co-exist in this supply chain (See figure 1).

Major sources of information. Internet was pointed as the major source of information for the farmers. Farmers are often unaware or lack information on the other producers that produce organic products, being aware only for the producers of similar products through different types of Farmers' associations. Unfortunately, most of these associations were indicated to be un-functional or fail to fulfill their main purpose which is to provide ground for cooperation and provide information for its members.

The trading partner does not provide any information for the organic producers, other than the required quantities and the offered price for their production

Networking. When the farmers' producing organic products are spatially closer and are producing the same or similar products, then the probability that they are connected is higher. Since no information was provided by their trading partners Nasha Dobra Zemja and Beorg – the two major

retailers of organic products in Macedonia - and because of the dispersion of the farmers included in this study, there are not many relations on horizontal farmer level..

The information and communication network constructed applying Social Network Analysis tools includes all the identified actors in the sample supply-chain for organic products. The constructed network is based on the perception of the interviewed farmers, and it is a network with sparse relations, especially among the primary producers themselves. The network represents not only the personal relations when it comes to information, but also the existent commercial (relational) ties. The network analysis includes two important characteristics of social action: first, every actor (stakeholder) is part of a certain system, which influences its actions and decisions; and second, every actor's position in the network represents its influence, power, or in this case, ability to transfer information (Medicamento and Degennaro, 2006).

The network of farmers in the selected sample of organic farmers is constituted of 24 components which indicate a relatively compact network, fact supported by the fragmentation measure which is very close to 0 (0.027, see Table 2), meaning that all the actors in the network belong to the same component. This fragmentation also contributes to the low level of density, which shows the probability that a relation (tie) exists between any pair of nodes in the network, and is one of the primary indicators of 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*). In accordance to the low density measures, we can conclude that the information transfer trough the network expresses extremely small values. 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) (see Figure 1), The reciprocity value which is 0.111, shows that that 1/10 of the ties in the network are reciprocal (ties between the nodes in both directions), but this is mostly due to the fact that not all of the actors in the selected network were available for the survey. The majority of these reciprocated ties are between the isolated pairs of nodes (see Figure 1).

Table 5. Cohesion network measures - commercial relations and network of information transfer

	Values	Range and explanations
Average degree	0.882	o Average number of ties of each node
In degree (H-index)	5	o Average of ties received by each node
Density	0.009	o Values closer to 1 - better connectedness of the actors in the network
Components	24	o Number of component comprising the network
Component ratio	0.228	o 1- every node is isolate, 0 – there is one component
Connectedness	0.027	o 1 – each node belongs to the same component, 0 – every node is in a different component
Network fragmentation	0.973	o 1- all nodes are at distance1 from each other (complete graph), 0 – all nodes are isolates
Average distance	1.318	o The time length for information diffusion across the network
SD distance	0.466	o Sees distances beyond actors' direct relations
Diameter	2	o The longest path of the information flow (between the furthest nodes in the network)
Distance - Breadth	0.977	o Average distance among nodes when certain nodes in the networks are removed (when all nodes are distance 1 from each other - complete graph, and 0 when all nodes are isolates)
Reciprocity	0.111	o Average reciprocated ties (ties in both directions)
Dyad reciprocity	0.059	o Reciprocity between pairs

The "distance" measure analyses the shortest path between the more distant nodes, and if the connecting relations are absent, then those nodes would be unreachable (Wasserman and Faust, 1994). The average distance in the studied networks has a value of 0.977, 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 one step, which is logical since all the actors in the network are able to reach other farmers or stakeholders in the network through the common sales trading partner, certification institution, association etc. 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 and Everett, 2006). 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 two steps.

Very few representatives of institutional bodies were identified in this network (Faculty of Agricultural Sciences and Food - Skopje, Faculty of Forestry - Skopje, MAFWE, foreign experts), few associations (AOPSE-Association for organic production in south-east region, ASN-Association in Sveti Nikole). Nonetheless, these relations were based on friendship and personal contacts, rather than on institutional (formal) level of cooperation, thus are presented as horizontal level information sources. Important role in the transmission of information was assigned by the farmers to the two certification institutions (BIOSERT and PROSERT). Clearer picture of the presented measures and the structure of the commercial relations and information channels among the actors in the supply-chain for organic products is presented in Figure 1.
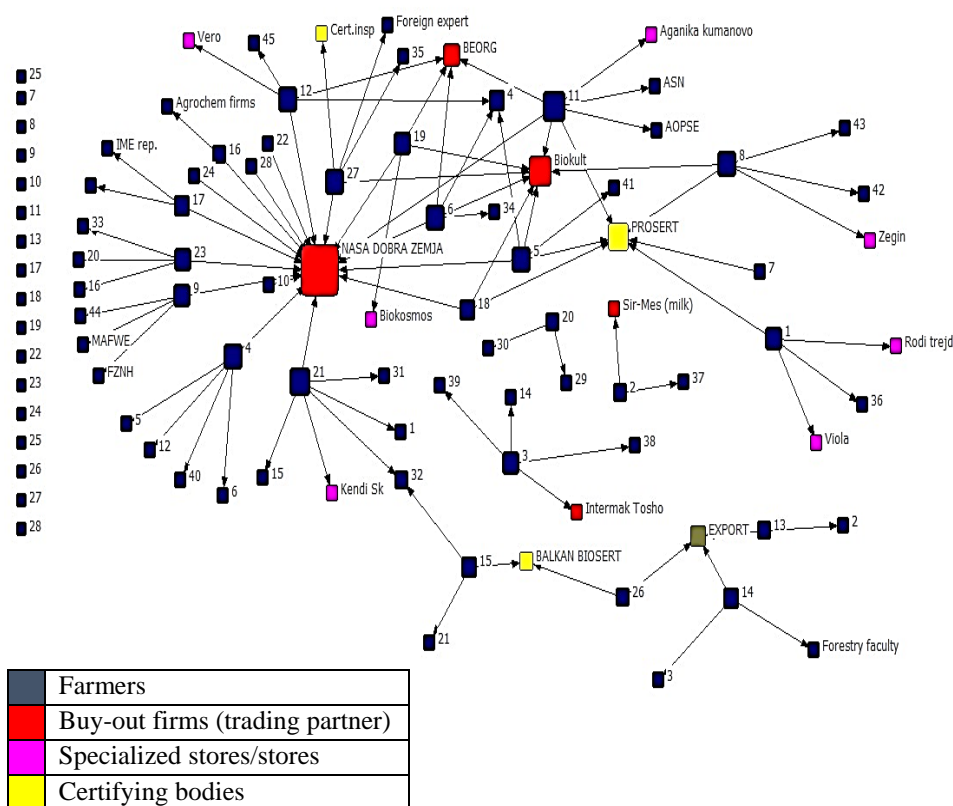

Figure 4: Network aspect of the commercial relations and information channels among the actors in the supply-chain for organic products

An alarming detail that is evident on the relational map (Figure 1) is the large number of outliers which indicates to the fact that many of the farmers involved in the organic production are ailenated and do not communicate with other farmers or other identified parties in the supply chain for distribution of organic products. In this figure (socigram), it is noticeable that farmers which are the blue rounded squares have very few relations on horizontal level i.e. among themselves. Farmers have more relations with their trading partners; however these are purely commercial relations with no reversal information for the farmers, other than the quantities and prices.

Nodes that occupy more central in the network and were indicated as important actors in providing information are the certifying institutions (their representatives). There are also, many outliers who did not report any relation or sharing of information with the other actors in the supply chain, suggesting that many of the producers are often alienated, or were unable to identify any person from their immediate or wider surrounding to obtain or share information on different aspects regarding the organic production.

Conclusions

The aim of this paper was to identify the key actors in the information diffusion network of the supply chain regarding organic production on horizontal farm and vertical level. This included the motives and information diffusion among the farmers, their distribution channels, trading and other partners in the organic value chain. In regards to the motives for organic production, farmers generally have high awareness about the benefits and future prospects of the organic production, however are largely unmotivated by the absence of institutional support and quality controlling mechanisms from the certification institutions. On the other side, representatives of the certification institutions were identified as an important source of information. The access to information and resources are often embedded in the personal networks of farmers, though farmers producing organic products are a closed group of farmers with very few relations among themselves and low level of trust in sharing or receiving information. The identified absence of relations among farmers on horizontal level can seriously impede the transfer of information on various aspects (market, prices, labour etc), innovations and decrease the motivation for starting and maintaining the organic production. As certification bodies and contact persons were identified as one of the most involved in the day-to-day communication with the farmers, a possible prospect would be to engage them as "information brokers". In order to effectively include and use their position in the information relations, one possibility is to find a way to upgrade their capacities and knowledge with novel information on the newest trends and technologies in the organic production.

The absence of extension support and advice is evident, hence particular attention should be paid in developing this segment of communication. Although institutions and organizations that should support of access to information as well as information transfer are present, they are not perceived as mediators in the case of the organic producers in the country. Most of the identified relations among the actors in the analysed network are mostly based on commercial or friendship basis, and the obvious necessity of improvement of the informal information channels should be further examined and strengthened. There is a need to find instruments which will enhance communication channels among the farmers and their major trading partners. The absence of information from the major sales channels Beorg – Organic Bazaar and cooperative of organic products buyers and Nasha Dobra Zemja should also be subject of further analysis. These partners are connected to the farmers through commercial relations and can be used as information and communication brokers for bypassing the absence of relations among the farmers and transfer of various types of information through the supply chain network for organic products.

Acknowledgments

References
1. Borgatti, S. P., Everett, M. G and Freeman, L. C. (2002). UCINET for Windows Software for Social Network Analysis, Harvard MA: Anal Technologies. ¨
2. Borgatti, S. P. and Everett, M. G. (2006). A graph-theoretic perspective on centrality. Social Network, 28: 466-484.
3. Borgatti, S. P. and Everett, M. G and Jeffrey C. (2013). Analyzing Social Networks. SAGE Publication Ltd. London/UK.
4. Lin, N. (2005). A Network Theory of Social Capital. Handbook on Social Capital, edited by Dario Castiglione, Jan van Deth and Gugli elmo Wolleb. Oxford University Press.
5. Kadushin, C. (2012). Understanding Social Networks, Theories, Concepts and Findings. Oxford University press.
6. 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.
7. Wasserman, S. and Faust, K. (1994). Social Network Analysis, Methods and Applications. New York, USA: Cambridge University Press.
8. MOPF. (2015). Macedonian Organic Producers Federation. http://www.fpopm.com/.
9. MZSV. (2016). Organsko proizvodstvo sostojba.
   http://www.mzsv.gov.mk/files/Organsko%20proizvodstvo_sostojba%202016.pdf