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Key words: network analysis, short food chains, knowledge transfer, food systems

JEL Codes: D85, Q01, R11, R12

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Regional nodes in European areas to boost innovation transfer and knowledge uptake. A social network analysis of building relationships in “Short Food Supply Chain Knowledge and Innovation Network (SKIN)” – H2020 project

This paper aims at conceptualizing the approach followed in designing the building European network within the H2020 project “Short Supply Chain Knowledge and Innovation Network”. It was brought together literature regarding the adoption of network analysis and the development of short food supply chain in order to describe the role of the regional nodes as means to transfer knowledge along and between local food systems around European areas. This resulted into the framework of SKIN network design. The approach is devised to overcome the parochialism of local food systems, and structure an interconnected design among economic players to fulfill regional and global impacts in knowledge transfer.

1. Introduction

European Commission (EC) has been pursuing many efforts in aligning European areas to the same standard of competitiveness by leveraging principles of sustainability and networking to spreading results. In fact, the macro European region, meant considering the countries in the Union, presents many heterogeneous features showing different capacity of development, even if the potential may emerge equal (Kneafsey, *et al.*, 2013). In particular, there are opposite situations between eastern and western countries and between the northern and southern ones. The southern and eastern ones suffer from a delay in undertaking growth whether compared to the western and northern areas (Favilli, *et al.*, 2015). To this extent, the EC has been allocating substantial financial resources for supporting equal opportunities and spreading competitiveness within the international community (Madureira, L. *et al.*, 2015). However, resources are granted by endorsing the players from different countries (mostly showing different features) that get together for undertaking initiatives to trigger equal growth (Materia, *et al.*, 2014). Within this context, actors living the territory try to get in contact for sharing ideas and engaging cooperation (EIP-AGRI, 2015). The cooperation is the prerequisite to build

network and in turn, the network is the precondition to gain in terms of efficiency and competitiveness (Šūmane, *et al.*, 2018). It indeed makes operators able to reduce transaction costs, innovation transfer and real uptake (Fritsch, M.; Kauffeld-Monz, M. 2010). Obviously, adopted and consolidated knowledge within delimited area are often unable to raise their visibility for spreading and facilitating the accessibility. In this regard, Social Network Analysis (SNA) plays a fundamental role in revealing latent and existing relationships. Whenever weak or not established linkage restrict opportunities (Contò, *et al.*, 2016), and interested players are not aware of marginal achievable improvement through alternative paths, the SNA can show the inefficiency and, simultaneously, makes rise optimal solutions (Valente, 1996). In this paper we show the assumptions that were considered for outlining the framework to build up an European Network within the activities of an European project. As a matter of facts, the analysis has been conducted considering the H2020 project “Short Food Supply Chain Knowledge and Innovation Network (SKIN)” granted to twenty-one European partners coming from fourteen different countries (Ton, G. *et al.*, 2015). The content of the project is focused on an innovative network through which innovation and knowledge will circulate. This introduction is the point of departure of conceptual paper aiming at focusing on the literature review regarding short food supply chains connections within their domain itself in order to identify the methodological approach that will be implemented on data that are being collected within the project activities.

This paper is composed by six additional sections. Sections (ii), (iii) and (iv) relate the background of short food chain, social network analysis and regional nodes, respectively; section (v) displays the method of the building innovative network according to the guidelines issued by EC; the third section (iii) arises how the network will be implemented within SKIN. The last section (iv) concerns the conclusion.

2. Short Food Supply Chain

Short Food Supply Chain (SFSCs) is raised within the Regulation 1305/2013, art. 2, providing the Rural Development scheme 2014-2020, as “a supply chain involving a limited number of economic operators, committed to co-operation, local economic development, and close geographical and social relations between producers, processors and consumers” (Canfora, 2015).

This is a general assertion concerning a comprehensive domain of the European Food Supply Chains (Galli & Brunori, 2013). However, the economic realities around the Europe, relate different local food systems according to the geographic position (Nagurny, *et al.*, 2018), and the relative background

that each one has developed over the years (Ciani, *et al.*, 2016). Each European area shapes quality (Carbone, 2016) by considering a specific scheme in operating. “For example, in southern European countries quality is shaped by the production context, which in turn conveys culture, tradition, terrain, climate, local knowledge systems. In northern and western countries, in contrast, quality criteria environmental criteria concern environmental sustainability or animal welfare, with innovative forms of marketing. In Central and Eastern European countries, traditional peasant culture survived especially in remote rural areas; quality criteria emphasize traditional and cultural aspects” (Kneafsey, *et al.*, 2013).

These differences reveal different role of the supply chains within the territories they take place (Šūmane, *et al.*, 2018). Yet whilst some local systems focus on environmental issues, there are others giving rise to factors being more or less parochial (Levidow, *et al.*, 2014). The challenge is to enable European short food chains to get together in order to mix their approaches to deliver sustainability (Tregear, 2011). For sure, it is a hard objective because shortening supply chain means reducing connections, and in turn their capacity of being able to reach out with far markets where opportunities in terms of applied knowledge may come out. These opposed sides of the same coin are tackled with this conceptual study.

The definition of SFSCs conveys the relevance given to the matter by the European legislator. Importantly, it is the specific commitment of co-operating for engaging Rural Development. Indeed, co-operation is the prerequisite to establish connections so that operators get enabled to find a channel to transfer the held knowledge (Fonte & Cucco, 2017). By cooperating, economic operators find the way to address and change their organization towards new solutions consistent with their sustainability. The cooperation comes therefore from the social consideration of the sustainability that is purported to be in the scope of economic, environmental and social goals (Tregear, 2011).

3. Social Network Analysis

Supply Chain Management has focused on the existing and potential relations between buyers and suppliers (Borgatti, *et al.*, 2018; Dubey, *et al.*, 2017). In other words, it regards the relations between the operators from the upstream of the supply chain and those one placed at the downstream (Croxtton, *et al.*, 2001).

According to Borgatti & Li (2009), the relative position of one firm with respect to another one affects both behavior and strategy. The expressed power was already showed in 1993 by Ibarra, who argued that the influence de-

rives from the specific position in the network and the surrounding networks.

Along with these assumptions the adoption of SNA method in understanding the relations within the supply chains (Bortolini, *et al.*, 2018), allows to determine the role that each player should assume in the network to intensify the dynamism of the connections (Borgatti & Li, 2009).

Starting from these considerations, framing supply chains as networks is what Kim *et al.* (2011) stated in the automobile sector. However, they also claimed that a network approach for designing and enhancing the efficiency of the supply chains can be harnessed into any other sector.

4. Regional Nodes

In networks, nodes represent the intersections of the connections flows. Connections, instead, are depicted by edges. Edges are the ways to allow the nodes to communicate to each other. Yet, it doing that, it is needed to consider what to be transferred. Regional nodes take place in this perspective as hubs concentrating knowledge in the field of short food supply chains (Barham, *et al.*, 2012).

In literature, it is common to find words as food collecting center (Facchini, *et al.*, 2018), or Food Hubs (Matson & Thayer, 2016). However, such definitions point intermediaries where food is sorted to be distributed for sales. In the case of regional nodes, it means that knowledge is held by experts able to lead economic operators to their real application. Regional nodes are therefore kind of knowledge hubs. In the wake of this assertion, organizations need to acquire competences and innovations related to each scope of the organizational units/functions, such as governance, product quality, logistics and so forth (De Pascale, *et al.*, 2017).

5. Methodology

This study has been conducted by reviewing some relevant literature related to the topic of SNA and Short Food Chains, and how SNA allows for easing the fulfillment of sustainability in short food chains. Throughout the literature review, the selected studies have been chosen why focusing on the importance of nodes and edges building the network. As a consequence of this assumption, only few studies have been made by approaching in that perspective. Our aim was to confirm that the choice of the SKIN method was supported by the scientific literature, and in turn, whether the role of regional nodes is more relevant than the edges.

SNA is therefore the chosen method to investigate relationship features revealing the interaction intensity among actors operating in SFSC. One of the major question for which scholars have been spending studies, concern the more and more complexity that characterizes the relationships. The complexity is the main cause of failing in understanding firm's strategy and behavior. The complexity depends on the wide extension of supply chain network that involves farms (Choi & Kim, 2008). Network is made up by nodes and edges. Nodes represent actors (farms or persons) able to make choices (Ketchen, D.J. & Hult, G.T.M., 2007). SNA analyzes pattern of ties within a network. The challenge consists in discovering the importance of each considered resource within the emerging relations (Valente, T.W. 1996). The evaluation can be implemented at node level and network level. In other words, it enables stakeholders to understand how much each node is important and how the consistency of connections are efficiently harnessed. Within SKIN project, SNA represents an instrument to explore actors behavior along the supply chain. It consists of a method useful for managing supply chain and the fields of logistics (Kim, *et al.*, 2011). SNA results can be calculated at two levels: at nodes level and edges level. The first one indicates how the considered resources are involved in the network. The node position identifies the centrality metrics. The concept of centrality explains the importance of the vertices within a graph. There are different types of centrality metrics. According to Everett and Borgatti (1999) and Marsden (2002), the most prominent are degree centrality, closeness and betweenness centrality. The degree centrality is the most influential and understandable method to show the role of each actor within the assessed network. It shows the most important facets of connections animating the interested areas, coming up potential or actual economic powerful operating in the analyzed areas (Mahoney, 1992). In the other words, the degree of centrality checks where the critical resources are mainly used to concentrate values and pursue the local growth and innovation spread. SNA is also a method applied to discover connections between rural and urban and peri-urban areas. There can appear different kinds of degree, the ones "rural placed" and the other ones "urban or peri-urban placed". The rural one means that rural area is well using resources and engaging more or less strategies to pull urban and peri urban inhabitants in dealing with local development, and, in this regard the next step consists in depth understanding the linkages meaningful (Calisti, 2016). The urban and peri-urban ones reveal that cities can lead the local development. Obviously, the analysis of connections made on the edges comes up as a fundamental step to capture the resources flows to rural areas and vice versa (De Pascale, *et al.*, 2017). The closeness centrality in supply network is calculated minimizing the length of a path between two nodes. The methodologist will be used within SKIN project, in case, will

only consider the contractual relationship (Kim, *et al.*, 2011). It means that the contractual (power?) impacts on the ability to activate and control the information flow. The latter is the definition associated to the closeness approach to implement the SNA. Lastly, the betweenness centrality considers the shortest path that it passes through (Holloway & Kneafsey, 2017). These different ways of considering the distances between nodes will be used to analyze the network data. As explained, the connections will be qualified according to the type of relations (contracts, resources etc.) so that it will be possible to match data to the related assessment method.

6. Results

Networks represent a useful way for the development of rural areas, offering support to the exchange of ideas and knowledges (Valente, T.W. 1996). Rural areas are characterized by heterogeneous actors, with their knowledge and experiences, which can be put together in an innovative system for a mutual interaction, generating in the long term new development possibilities, throughout employment and social wealth (Esparcia, 2014).

In this sense, the ability of local actors to access, recognize and transmit knowledge and information gathered through a collective learning system, influence greatly the competitiveness of a geographical area or territory.

The definition of actors may vary according to the field of interest, but referring to the agri-food system there could be included firms and other organizations, for example universities, innovation centers, educational institutions, financing institutions, industry associations and government agencies, as well as suppliers and consumers (Materia, *et al.*, 2015).

For this purpose, as also indicated by the European Commission (EC) through its recent programmes, as in the actual Horizon 2020, it is necessary to build up a consolidated network combining private and public organizations, at local and non local scales.

The project SKIN addresses the call RUR-10-2016 “Thematic Networks compiling knowledge ready for practice”. The call was focused on innovation and in particular on the role of Innovation Support Services and the European Innovation Partnership.

Indeed, this project intends to systematize and bring knowledge to practitioners, promote collaboration within a demand-driven innovation logic and provide inputs to policymaking through links to the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI). It also fully takes into account EC expressed needs (EIP-AGRI, 2015), such as the lack of coverage of short supply chain knowledge by the existing Farm Advi-

sory Systems (FASs), and by improving user-acceptance through co-creation of best practices with end-users.

The EIP-AGRI aims at fostering competitive and sustainable agriculture and forestry bringing together innovation actors (farmers, advisors, researchers, businesses, NGOs, etc.) and supporting the cooperation between research and innovation partners. To this extent, SKIN reflects the EIP approach in terms of the consortium composition and scope of the partnership; it integrates and complements the work of the EIP for the activities carried out and aims to feed the obtained results within the Partnership (De Pascale, *et al.*, 2017). SKIN integrates the EIP interactive innovation model and bottom-up approach for linking multi-actors partners, thus it reflects the EIP-AGRI Operational Groups approach, making the best use of practical, scientific, technical and organizational knowledge in an interactive way.

SKIN is designing the path for performing several initiatives in order to build and animate a community of stakeholders (with the goal of about 500 representatives), with the strategic objective of setting up, at the conclusion of the project, a European association permanently working for the improvement of SFSCs efficiency and for the benefit of stakeholders and growth in the sector (Carbone, 2016).

Although competitiveness and sustainability of the agri-food sector can be enhanced through innovation at the level of individual farms or producers, additional gains can be obtained through innovation at the level of the supply chain itself (Carbone, 2016). This requires cooperation between the different actors involved as well as leadership to drive the overall innovation agenda.

These small and medium sized farmers however, often have no information about supply chains in their environment and so they do not have the ability to track or monitor the chain, nor do they have the ability to invest in the research needed to drive supply chain innovation adapted to their specific context (Ciani, *et al.*, 2016).

The SKIN approach is stimulating a collaborative innovation in different EU agriculture sectors through the improvement of knowledge exchange between academia and practitioners, in particular about the management of SFSCs. Replying to farmers, and small farmers in particular, that are calling for more knowledge exchange and sharing, as also pointed out by the results of the EIP-AGRI Focus Group on SFSCs (Kim, *et al.*, 2011).

As main result of the SKIN activities, it will promote an interactive innovative model aimed at, on the one hand, integrating practical knowledge as building blocks for research and innovation and, on the other hand, at making the available knowledge accessible and exploitable by those who would benefit the most from it.

The community will be built and animated around the identification of good practices in short supply chains across Europe. That part of the agri-food sector whose production feeds into these short food supply chains, faces a much greater challenge to growth via innovation (Fritsch & Kauffeld-Monz, 2010).

We expect our work to identify specific aspects, experiences and shortcomings in SFSCs management that might generate demand driven innovations (Fritsch & Kauffeld-Monz, 2010). This will be reflected in the creation of a specific type of working group, which will be identified as Regional Node (Fonte & Cucco, 2017). Through the SKIN approach twenty-five regional nodes will be organized, composed by the community of stakeholders active at the different regional levels involved within the SKIN consortium.

The rationale for the Regional Nodes is on the one hand to provide inputs from the grassroots level for the identification of good and innovative practices in SFSCs (De Pascale, *et al.*, 2017), and on the other to help spreading practical knowledge (Farahani, *et al.*, 2014). They will use a participatory approach in order to translate the reservoir of available knowledge into materials adapted to end-users, in line with the practice-abstracts format. At the same time, the other SKIN activities, will contribute to the Regional Nodes through territorial-based initiatives (regional) and technical issues, such as for the translations of the knowledge exchange's results into end-users materials appropriate to the different regional needs (Galli & Brunori, 2013).

This preparatory work will be structured during the project implementation, thanks to the definition of the engagement strategy that will identify actors (Contò, *et al.*, 2016), methods and opportunities to aggregate around SKIN a large and representative, multi-party community of stakeholders from as many countries and regions possible in the EU and associated countries. A pull of selected stakeholders and actors from the entire supply chain will be thereby directly involved in the dialogue promoted by SKIN and take part in the main knowledge sharing activities of the project (De Pascale, *et al.*, 2017). The engagement strategy will be appropriately declined into regional approaches by the regional nodes, thus providing indications for organizing the exchange of knowledge and information at the different regional levels, according to the specificities of the local contexts. Regional nodes will be set up in a way ensuring the involvement of all partners and a homogeneous representation at geographical level.

To this extent, different learning methods we will be used from facilitation techniques, which enable face-to-face interaction and participation in multi-stakeholder workshop settings, to social learning analytics, which focuses on elements of learning that are relevant in a participatory online culture. Facilitation techniques will include world café, story-telling, best practice exchange,

peer reviews, creative labs, triangular interviews, positive elicitation, repertoires of innovation support, and other methods of knowledge brokering during multi-stakeholder meetings.

Such approach takes into consideration the specific characteristics of each of the regional contexts involved in the project. Our initiative will therefore have an impact at two main levels:

- *Impact at regional level.* The creation of regional nodes bringing together local stakeholders involved in the SFSCs issue will be beneficial in terms of (Ciani, *et al.*, 2016): i) the identification of specific needs and priorities which might differ from region to region, also due to the different legislation and market situations; ii) a dissemination and communication strategy tailored on the regional specificities, which requires a “personification” of tools and channels which are to be considered when addressing regional contexts (Crescenzi, *et al.*, 2015).
- *Impact at EU/global level.* The creation of a EU community gathering practice-oriented knowledge from all the regions (Crescenzi, *et al.*, 2015) involved in the project (in a first phase) and later on from the whole EU territory and beyond (once the mechanism has been tested and the network of stakeholders expanded) represents a unique opportunity to make such knowledge accessible to the single farmers and consumers. Relation between the activities at global and regional level is therefore a two-way process, which bears huge potential to positively impact both sides.

7. Conclusions

In conclusion, the project SKIN is being brought together a critical mass (what we refer to as the “community”) of various types of stakeholders (farmers and producers, extension services, research organizations, innovation agencies, etc.), to tackle the issue of knowledge-fragmentation and the lack of access to information and experience on short supply chains. It has the potential to structure such a community with a view to delivering continuous impact via a permanent network with its associated exchange and collaboration mechanisms, well beyond the life of the project. SNA analysis will investigate territorial existing connections, using the three indicated levels from the methodology. The building network is an opportunity to exploit benefits from the actor cooperation and to come up critical points within the relations describing the network (Madureira L., *et al.*, 2015). The critical points will be managed to improve the value of the linkages (Marsden T., 2000). Reviewed articles state that to come off managing the network is of course necessary to establish a kind of connection, in the framework of the network identified as edges, however, the

bigger is the network the bigger is the importance of the role of the nodes. In the case of SKIN project, the regional nodes play that crucial role.

Further step of this preliminary study is to verify the conceptual assertions hereby proposed from reviewing literature by analyzing data that are being collected within the development of the SKIN project activities.

Acknowledges

The result presented in this paper is part of the SKIN project (www.short-foodchain.eu). This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement N. 728055.

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