



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Success factors of innovation networks: Lessons from agriculture in Flanders

Evelien Lambrecht^{1*}, Bianka Kühne¹, Xavier Gellynck¹

¹ Ghent University, Faculty of Bioscience Engineering, Department of Agricultural Economics, Division Agri-Food Marketing and Chain Management, Coupure Links 653, B- 9000 Gent, Belgium;

*Corresponding author: Evelien.Lambrecht@ugent.be
Others: bk.ugent@gmail.com; xavier.gellynck@ugent.be

Abstract

Innovation has been identified as a critical asset for SMEs to survive (Hitt *et al.*, 2001; Lee *et al.*, 2001). However, SMEs that need to improve their innovation process often lack the essential resources to innovate when relying solely on their in-house activities (Batterink *et al.*, 2010). A large body of literature therefore highlights the role of external partnerships, or networks (Lazzarini *et al.*, 2001; Pittaway *et al.*, 2004; Sawhney *et al.*, 2006).

Despite the increasing number of studies focusing on the relationship between networking and innovation, there is still considerable ambiguity and debate within literature regarding appropriate network characteristics for successful innovations (Nieto and Santamaria, 2007; Pittaway *et al.*, 2004). Furthermore, the existing studies focus mostly on high tech companies (Edquist 2006, van Galen 2008). The objective of our study is to gain insight into the network characteristics critical for successful innovations within the agricultural sector in Flanders.

The study is based on interviews and focus group discussions with farmers and network coordinators active in Flanders. In total, 109 respondents were consulted. This research is based on four innovation characteristics which seem crucial for each innovation (Kanter, 1988). For each of these innovation characteristics, we investigated how networks could contribute, via their network characteristics.

The results showed that networks serves as a net for knowledge about e.g. new technologies, or changing legislation in order that farmers are faster aware of developments. When farmers have multiple contacts, they have a higher chance to discover new things. Thereby, it is important that knowledge providers are part of the network and connected with the different actors, and not only provide their information to the farmers as an external actor. Also the face-to-face communication within a network is an essential issue. Furthermore, coalition can play a crucial role for some innovations, as a lot of farmers are not able to implement their idea because for example the retailer or research institute is not supportive or interested. If the farmers set up a self-initiated coalition, it can be easier to initiate the innovative idea. Fourth, it is important that individual actors from the agricultural system revisit their actual role. Successful innovation processes often originate in situations where creativity is not limited within one unit. Based on the findings, recommendations for farmers as well as network coordinators are formulated to increase the innovation capacity.

Keywords

Innovation; Networks; Success factors; Agriculture; Flanders

Introduction

Nowadays when it comes to innovation, networks have become increasingly important. The levels of innovativeness and competitiveness of the firm may not simply depend on skills that firms can find and exploit in house, but on the effectiveness with which they can gain access to external sources of knowledge and skills. Plenty of recent studies indicate that the locus of innovation is no longer the individual firm, but increasingly the network -the set of relationships through which the company acquires, assimilates, transforms and exploits knowledge- within which the firm is embedded (Chesbrough, 2003; Garbade *et al.*, 2013; Omta, 2002; Pittaway *et al.*, 2004; Powell *et al.*, 1996). Advantages of networks mentioned in literature are manifold. Through networking, firms are able to quickly identify and exploit opportunities and to manage their environmental uncertainties (Burt, 1997; Elfring and Hulsink, 2003). In addition, it enables knowledge exchange in a more efficient way and access to new technologies, know-how and resources, vital for developing innovations (Brennan and Dooley, 2005; Cowan and Jonard, 2004; Daskalakis and Kauffeld-Monz, 2005; MacKinnon *et al.*, 2002; Mu *et al.*, 2008; Omta, 2004; Pittaway *et al.*, 2004; Zahra and George, 2002). This allows sustainable growth, a shorter innovation time, an increasing flexibility of the operations, reduction of transaction costs, enjoying economies of scale and sharing risk and uncertainty among network organizations (Briz and Felipe, 2007; Håkansson, 1987; Håkansson and Snehota, 1995; Kale *et al.*, 2000; Lee *et al.*, 2010; Leeuwis, 2000; Molnár *et al.*, 2011; Omta, 2004; Powell *et al.*, 1996; Walter *et al.*, 2001).

Various types of networks exist, all having their specific characteristics. These characteristics differ in their impact on the innovation capacity of the firm (Inkpen and Tsang, 2005; Pittaway *et al.*, 2004).

Up to now, a great deal of literature about different network types, their characteristics and their importance for innovation and knowledge exchange is available. However, despite the increasing number of studies focusing on the relationship between networking and innovation, there is still considerable ambiguity and debate within literature regarding appropriate network characteristics for successful innovations (Nieto *et al.*, 2007; Pittaway *et al.*, 2004). There has been little empirical evidence on success factors in networks, and no comparison of success factors in networks with different objectives (Sherer, 2003). Additionally, there are arguments providing a basis for the contingency approach that assumes different impacts of network structure on innovations under different conditions (Fukugawa, 2006). Furthermore, the existing studies focus mostly on high tech companies (Edquist, 2006; van Galen and Verstegen, 2008). The objective of our study is to gain insight into the network characteristics critical for successful innovations within the agricultural sector in Flanders. The main novelty of the paper rests on the following aspects: first, we contribute to the literature of innovation networks in general. The results help to develop a better understanding in the success factors of innovation networks. Second, from a methodological point of view, we combine existing studies on innovation characteristics and network characteristics, which has, to the best of our knowledge, not yet been done so far. Finally, the majority of studies on networking for innovation, have paid attention to large high-tech and multinational companies, functioning with R&D units (Lefebvre, 2014). By studying issues related to networking and innovation within the agricultural sector, which has been acknowledged to be different from other sectors with regards to its innovation system, this paper contributes to empirical research. In contrast to other sectors, firms operating within the agricultural sector are often micro sized and owned and operated by a family. Another specificity for this sector is that within this sector, innovation is currently often generated outside the farms, and diffused afterwards by extensionists, to be adopted by farmers (OECD, 2013).

The paper is structured as follows: first we give a review of the literature on innovation characteristics and network characteristics. Second the methodology section is provided, followed by the empirical findings, to end with the discussion and conclusion section.

Literature review

Innovation characteristics

Kanter (1985) identified that innovation –whether product, process, marketing or organizational innovation– tends to have four distinctive characteristics.

1. *The innovation process is uncertain*

The source of innovation or the occurrence of opportunity to innovate may be unpredictable. It can for example be a change in rules or legislation, a breakthrough in technology, the opening of a new market or a shift in demand. Hence, for innovators, it is important to watch out for opportunities.

2. *The innovation process is knowledge intensive*

The innovation process generates new knowledge intensively, relying on individual human intelligence and creativity and involving “interactive learning”. New experiences are accumulated at a fast pace; the learning curve is steep. The knowledge that resides in the participants in the innovation effort is not yet codified or codifiable for transfer to others. Efforts are very vulnerable to turnover because of the loss of this knowledge and experience. There need to be close linkages and fast communication between all those involved, at every point in the process, or the knowledge erodes.

3. *The innovation process is controversial*

Innovations always involve competition with alternative courses of action. Sometimes, the very existence of a potential innovation poses a threat to vested interests-whether the interest is that of a salesperson receiving high commission on current products, or a retailer not willing to adapt the innovation.

4. *The innovation process crosses boundaries*

An innovation process is rarely, if ever contained solely within one unit. First, there is evidence that many of the best ideas are interdisciplinary or interfunctional in origin, or they benefit from broader perspective and information from outside of the area primarily responsible for the innovation. Second, regardless of the origin of innovations, they inevitably send out ripples and reverberations to other organization units, whose behaviour may be required to change in light of the needs of innovations, or whose cooperation is necessary if an innovation is to be fully developed or exploited. Or there may be the need to generate unexpected innovation in another domain in order to support the primary innovation.

Taking into account these four characteristics, Kanter investigated the structural, collective and social conditions facilitating the ability to see new opportunities and to innovate. She found that *“innovation is most likely to flourish where conditions allow flexibility, quick action, and intensive care, coalition formation and connectedness. It is most likely to grow in organisations that have integrative structures and cultures emphasizing diversity, multiple structural linkages both inside and outside the organization, intersecting territories.”*

Network characteristics

The network characteristics can be subdivided into a structuring and a structural dimension. The structural dimension of the network refers to the physical characteristics of the network such as the network configuration, network membership and network ties, while the structuring dimension is related to the policies and activities occurring within the network that prescribe or restrict the behaviour of network members (Lefebvre *et al.*, 2010). In Table 1, an overview of network characteristics and their influence on innovation capacity is given, providing those most frequently mentioned in literature when studying the link between network characteristics and knowledge exchange and innovation.

Table 1: Network characteristics

Network Dimension	Network characteristics	Influence on innovation capacity
	NETWORK CONFIGURATION	
	<p>Network sparseness - Network density Some authors state that sparse networks generate more new information (<i>Respectively weak - high</i> and offer more diverse knowledge bases than dense networks (Lazzarini <i>et al.</i>, 2001) others claim the opposite (Omta, 2002; Pittaway <i>et al.</i>, 2004). <i>members</i>)</p> <p>Pattern of direct – indirect ties are most effective when they help units deal with difficult transfer (<i>Respectively ties that an organization</i> situations, which probably involve noncodifiable knowledge (Hansen, <i>has with its network partners</i> - ties that 2002). For knowledge easy to transfer, the maintenance costs of direct ties an organization has with the partners are too high (Inkpen <i>et al.</i>, 2005). of its network partners)</p> <p>Centrality (the extent to which a network revolves around one single firm in the network)</p>	<p>Direct ties provide immediate access to other members' knowledge. They are most effective when they help units deal with difficult transfer situations, which probably involve noncodifiable knowledge (Hansen, 2002). For knowledge easy to transfer, the maintenance costs of direct ties an organization has with the partners are too high (Inkpen <i>et al.</i>, 2005).</p> <p>Centralization is negatively associated with intracorporate knowledge sharing (Tsai, 2002). Decentralization can facilitate timely knowledge sharing among the members (Inkpen <i>et al.</i>, 2005)</p>
	NETWORK MEMBERSHIP	
	<p>Number of network members</p> <p>Type of network members</p> <ul style="list-style-type: none"> - Size - Industry - Horizontal/Vertical - Scope of activities - Resources - Past experience and knowledge - Geographical situation - Innovativeness - Legal status <p>Network stability (change of membership in a network)</p>	<p>The smaller the number of participants involved in a network initiative, the higher the chances are of achieving sustainability and strong ties, leading to knowledge exchange and innovation (Huggins, 2000).</p> <p>All those factors have an influence on the innovation capacity. Geographic proximity helps for example the formation of network ties and facilitates interfirm and especially interpersonal interactions through which knowledge is exchanged (Beckman and Haunschild, 2002; Inkpen <i>et al.</i>, 2005). Heterogeneity of network members has a positive influence on innovation. If all the members are similar, they are not able to learn a lot from each other (Beckman <i>et al.</i>, 2002)</p> <p>The stability of the network has serious implications for knowledge transfer (Inkpen <i>et al.</i>, 2005). A highly unstable network may limit opportunities for the creation of social capital, because when an actor leaves the network, ties disappear.</p>
	NETWORK TIES	
STRUCTURAL	<p>Strength of ties (the amount of time, emotional intensity, intimacy and of trust and which makes the network ties a perfect channel for reciprocal services which characterize the tie):</p> <ul style="list-style-type: none"> - <i>Weak ties</i> (low frequency and intensity of interactions) - <i>Strong ties</i> (high frequency and intensity of interactions embedded of trust) 	<p>Over time, weak ties develop into strong ties which leads to the creation of trust and which makes the network ties a perfect channel for reciprocal services which characterize knowledge exchange (Coles <i>et al.</i>, 2003; Larson, 1991). The trust based relations can, by their positive impact on information exchange, be seen as a crucial factor for innovation (Hausler <i>et al.</i>, 1994; Hoang and Antoncic, 2003) and they form the basis of long term networks (Lipparini and Sobrero, 1994). However, very strong, long term relationships often result in homogeneity, which leads to less diversity of experiences (Beckman <i>et al.</i>, 2002).</p>
STRUCTURING	<p>NETWORK MANAGEMENT</p> <p>NETWORK GOVERNANCE</p> <p>Formal – Informal</p> <p>Private initiative - government</p>	<p>The way in which a network is managed and governed plays a very important role on the effectiveness and capacity to contribute to the innovation process (Coles <i>et al.</i>, 2003; Pittaway <i>et al.</i>, 2004). Extremely formal and extremely informal networks seem both to have a baleful influence on innovation (Nooteboom, 2000).</p>

Methodology

Approach

By combining the insights about innovation characteristics and network characteristics, we identified how a network, through its network characteristics, copes with the four innovation characteristics, and hence contributes to the facilitation of an innovation process.

In-depth interviews and focus groups

In-depth interviews and focus group discussions were conducted. Both techniques are qualitative research methods (Malhotra, 1999). Although the application of in-depth interviews and focus groups is different, both methods assemble detailed attitudinal and experiential information from the respondents by using open-ended questions in a semi-structured way (Powell and Single, 1996).

First, interviews with farmers were conducted. They were asked open ended questions a.o. with regard to the networks they participate in, and its characteristics, how their networking activities contribute to their innovation capacity and which factors hamper or facilitate networking for innovation. Second, coordinators of diverse networks were interviewed, focusing on the innovations and knowledge exchange they support. Third, focus groups with farmers were conducted. While in the interviews with farmers, the focus was more on innovations, during the focus groups, main point of interest was the networks, and how they contribute to innovations. Though, both focus on the relationship between networks and innovation.

Recruitment

The research was conducted between June 2011 and March 2013. Data were collected from farmers and network coordinators active in the Flemish (northern Belgium) agricultural sector (see Table 2). Four subsectors were selected: vegetable (V), poultry (P), ornamental plant (O), and fruit (F) sector. In Flanders, these sectors are respectively characterized by a highly cooperative attitude for the supply of products (V), a strong vertically integrated supply chain (P), a non-contract based direct relationship with buyers (O) and a strong collaboration within a producer organisation (F). In total, 38 farmers were interviewed. Furthermore, 23 interviews were conducted with network coordinators active in the agricultural sector. Afterwards, seven focus groups were organized, reaching 48 respondents. In total, 109 respondents were consulted.

Respondents were selected via sector organizations, research institutes or via the other responding farmers. Respondents were contacted by telephone to arrange an appointment for a personal interview or focus group. The interviews were conducted at the respondents' place in order to make them feel at ease. All interviews were done by the same interviewer in order to exclude interviewer bias. This required one to two hours per respondent. The focus groups found place at a place familiar for the farmers. They were moderated by a well-trained moderator and took about two hours per group.

Table 2: Composition and number of the in depth-interviews and focus groups

Sector	In depth-interviews		Focus groups	
	Farmers	Network coordinators	Farmers	Number
Vegetable sector	10	12	18	2
Poultry sector	11	4	12	2
Ornamental plant sector	14	6	9	2
Fruit sector	3	1	9	1
Total	38	23	48	7
	109			

Development of a guide for the in-depth interviews and focus groups

Based on a comprehensive literature review on innovations and networking, an interview guide for farmers and network coordinators and a focus group discussion guide were set up to explore answers on the formulated research question. The interview and focus group discussion guide were pilot tested and adapted accordingly.

The interview guide for the farmer interviews and focus groups consisted of the following four parts:

- (a) Generic section about profile, background and company characteristics
- (b) Innovation and innovation capacity
- (c) Social relationships and networks
- (d) Knowledge for innovation via networks

Second, coordinators of diverse networks were interviewed, focusing on the characteristics of the networks concerned. This interview guide focused on the following aspects:

- (a) General profile
- (b) Network inception
- (c) Network evolution and network membership
- (d) Network composition and network ties
- (e) Network activities
- (f) Network management
- (g) Network performance

Through all parts, questions related to the innovation characteristics were asked. All questions were presented in an open-ended format in order to obtain a broad range of information and to stimulate interaction among participants in case of the focus groups.

Data analysis

All interviews and focus groups were audio-recorded and transcribed. The data were sorted and coded using NVIVO. The fragments related to the network characteristics were coded structural and structuring. The sections related to the four innovation characteristics were coded 'in.char 1', 'in.char 2', 'in.char 3' and 'in.char 4'. Via matrix coding queries, we identified the network characteristics related to the four innovation characteristics.

Empirical findings

Per studied subsector, we analysed for each innovation characteristic how the networks present, through their characteristics, contributes to the facilitation of the innovation process.

The results are presented per network type with a specific subsector as example. Results are illustrated with verbatim quotes from the participants.

Highly cooperative attitude for the supply of products - Vegetable sector

Within the vegetable sector, numerous cooperative auctions are present for the supply of products. The auction is responsible for the marketing of the products delivered by grower-members.

Characteristic 1: The innovation process is uncertain

To decrease the involved uncertainty in an innovation process, the auctions have a commercial cell, that is *"observing the consumer needs and the opportunities to respond to those needs"* (focus group). The management board of the auction, which is characterized by a high centrality, is highly connected with the farmers, via consultation of grower groups. In this way, *"there is always close contact with the needs of the market and the possibilities to fulfil those needs, enabling the presence of the necessary knowledge to innovate"* (interview network coordinator).

Characteristic 2: The innovation process is knowledge intensive

The management board of the auctions has frequent contact with the members to inform them about new knowledge via newsletters, intranet and extension activities. Farmers as well as the management board of the auction frequently mentioned that attention for research and the good relationship with researchers is very important. This enables that the auction comes into contact with people with other knowledge and past experiences, which facilitates the exchange of knowledge and innovation. In addition, the coordinating role of the management team of the auction is extremely important. This team ensures, in agreement with the members and the research centres, that everything functions well and that information and research results are shared and communicated efficiently. A negative point mentioned is that the news which is present in the management board, *“is not always timely and sufficiently communicated with the members who are not appointed in the board or in a supporting growers group”* (focus group). Farmer-members mention for example that when there are special market demands, the auction is not always informing everyone, *“only the most active farmers are timely aware of those opportunities”* (farmer interview).

Characteristic 3: The innovation process is controversial

Farmers delivering their products to an auction, often experience some difficulties to distinguish themselves from their colleagues as the products are sold in bulk. Some farmers mention that they *“produce products of higher quality, or more uniform, but we do not earn something in return”* (farmer interview). Few farmers are hence looking for opportunities to distinguish themselves within the cooperative. For this, a horizontal coalition between several farmers will be required, for example via a group farmers distinguishing themselves from the others via an extra quality label.

Characteristic 4: The innovation process crosses boundaries

The auction is relatively attached to routines and structures that were developed in the past. However, there is some kind of evolution in their way of organizing, which boosts the innovation capacity within the sector. Within the auctions, there is for example a shift from the pure producer-oriented services towards more marketing and buyer oriented activities.

Strong vertically integrated supply chain- Poultry sector

The Flemish poultry sector is characterized by a high number of vertically integrated farms, which refers to ownership and/or management of two or more successive links in the chain by a single firm, i.e. the feed firms or hatcheries taking over ownership of the farm or the animals of the farm, or offering a contract with a guarantee to buy the animals for a fixed price several years, if the farmer buys his products.

Characteristic 1: The innovation process is uncertain

Via his multiple direct ties with suppliers, farmers, and buyers the integrator is immediately aware of changes occurring in the market. In principle, this information could be spread among the integrated farmers in no time, decreasing the uncertainty of their innovation process. However, we noticed that vertically integrated farmers take only limited innovative steps. They focus foremost on fulfilling their tasks in order to receive their monthly salary and hardly look for new techniques or opportunities to innovate. One employee of the integrator helps the farmers to obtain good results, and the farmers trust this person. The source for knowledge and innovation for these farmers is often limited to this person and thus very unidirectional, illustrated by the following citation: *“We obtain a lot of information and support via the representative of the hatchery. We trust him and often ask for advice. As he visits a lot of poultry farmers, and he is already several years active in the sector, he knows a lot”* (farmer interview).

In contrast, the farmers trading on the spot market need more information than that for obtaining good technical results and face way more uncertainty. They have to be aware of all the trends and evolutions to make the necessary decisions. They have to know the best places to buy and to sell their products and to invest

in the best machines. Since their earnings are dependent on their performance, they have to be aware of every aspect related to their business and even beyond, and hence need an extended, heterogeneous network.

Characteristic 2: The innovation process is knowledge intensive

The farmers who are part of an integration are only indirectly bounded to each other. The ties between integrator and farmer are strong, and more than simply the contract. Additional services as the exchange of knowledge is present. To increase the performance of the farmers, representatives of the feed firms and the hatcheries visit the farms on a regular basis to present the newest developments and in this way improve the performance. In order to guide the farmers in a proper way, integrators try to obtain as much information as possible and are continuously involved in or conducting research projects. Thereby, they make use of the knowledge of the own employees, such as the representatives, the expert in building of stables, manure processing, veterinarians, etc. They have mutual contact, but also with other parties such as wholesalers, retailers, attending policy related meetings. From time to time, the integrators organize a meeting where all clients are invited, and certain topics are considered and presented. Next to that, integrators are present on agricultural fairs, where they invite their clients and they help with the organisation of open farm days where new stables are presented. The farmers obtain personal guidance by their integrator. Via this personal guidance, a relationship characterized by trust often grows.

Characteristic 3: The innovation process is controversial

By offering contracts and funding, integrators offer farmers the opportunity to implement their innovative ideas. However, the interests of both parties are not always on the same line. Both strive for profit maximisation on their level. Other striking remarks are that within this setting, farmers have only sparse networks and hence limited contact to exchange knowledge. Although they have contact with each other, these contacts are not used for the organisation of the production process within the vertical chain, for example group buying of products, or communication about sales. The majority of the farmers do not have a structural deliberation on these subjects. However, from our study, we noticed a pertinent need for horizontal collaboration.

Characteristic 4: The innovation process crosses boundaries

Here, the tension between productivity increase and market-oriented innovation is observable. The actors within the innovation system are used to routines in which the farmer is considered as the adopter of productivity increasing innovations.

Non-contract based direct relationship with buyers - Ornamental plant sector

The horticultural sector is mainly concentrated in the region of Ghent, where growers, researchers, wholesalers and retailers are active. We studied some collaborative initiatives which were developed among these actors to implement innovations..

Characteristic 1: The innovation process is uncertain

As ornamental plant production is subject to trends and consumers are keen on new products and product varieties, product innovation is necessary and hence an important type of innovation. However, these market characteristics make it often difficult for the growers. If they are revolutionary and develop new products, they face the risk of investing a lot of time and money in a product which is difficult to grow, or in which consumers are not interested. Respondents mention that it is not evident to bring a totally new product to the market, and that this often takes several years. For that reason, a lot of growers are rather reluctant to introduce product innovations. To reduce this uncertainty, several collaborative initiatives with different types of network members are set up, for example with a consultancy agency, a coordinator for the purchase of slips, a coordinator for the sales, a research institute to improve or develop new strains. The products developed within this group can only be sold by the members of the group, and are labelled with the name of the

association, which gives the members the possibility of differentiating themselves from other growers. Furthermore, in this way, the cost of developing new products is shared. Yet, collaboration with colleagues for the development and improvement of products is scarce in Flanders.

Within the chain, we observed the trend of eliminating several intermediary links, which brings the grower of plants closer to the end-consumer. In this way, the grower is better aware of the market needs because of his closer contact with the end-consumer. Another observed possibility to be better aware of the market needs is close collaboration with the vertical chain partners.

Characteristic 2: The innovation process is knowledge intensive

To innovate, knowledge is needed and should be communicated in an effective way. In our study, we observed a network established and coordinated by a research institute (ILVO) with the aim to improve the translation and transfer of research results to the sector. A lot of knowledge and other resources important for innovation within the ornamental plant sector are centralized in the Ghent area. To remain competitive, Flanders holds hence the trumps of a technological lead. Flemish research institutes are after all active in front-rank research and have access to scientific literature worldwide. However, the translation of knowledge to the sector seemed to be difficult. Hence, a network, called Sietinet, was established to overcome this. *“They organize workshops, courses and answer questions of individual ornamental plant growers”* (Farmer interview). The coordinating research institute collaborates with eight other Flemish research institutions to support innovation in the sector. Only the 60 members of the network can make use of the offered services. Moreover, this network brings multiple growers together, which offers numerous opportunities for horizontal networking. Simultaneously, *“this network brought about the lowering of the threshold to research institutes”* (farmer interview), increasing the strength of the ties and the network density. In addition, the role of consultancy agencies in the ornamental plant production is significant. Formerly, research was organized for all growers. As the ornamental plant production sector is characterized by very diverse players, questions are specific per subsector, and multiple of these questions could not be answered. Besides, as the knowledge is accessible for all the growers, growers perceive the resources as less valuable and expect less innovative results, and less competitive advantage. They are used to work for their own, characterized by a strong individualism and are looking for information which gives them the opportunity to differentiate themselves. Hence, there came an evolution in the direction of paid private consultancy. When they pay for the information of experts, they are not willing to share this information, limiting the exchange of knowledge between growers. However, some consultants organize frequently a meeting for all their clients which increases the connectedness between the growers, offering the opportunity for horizontal networking which enables the exchange of ideas with colleagues. Other network activities for entrepreneurs in general are also often consulted by ornamental plant growers. Here, they can meet colleagues from outside the sector.

Characteristic 3: The innovation process is controversial

If new products are developed, they have to be promoted. Retailers and end-consumers should be open for the new product. Direct contact with end-consumers is an important factor to introduce product and market innovations. In this way, producers of end-products face fewer difficulties to distinguish themselves with labels, packages, etc. Another alternative observed was the collaboration between growers to promote their novelties. *“We complement each other well so that we can offer a good mix of plants, can assure delivery continuity, and the collaboration enables the exhibition of our products at fairs as we can share the exhibition costs.”* (farmer interview) This gives the growers access to each other’s networks, makes the group more visible and leads to competitive advantage for all the members.

Characteristic 4: The innovation process crosses boundaries

More than in the other studied cases, networking with people from outside the sector is perceived as much more important than with people from within the sector. Next to the traditional networks in the agricultural sector, cross-sectorial networks such as business clubs where employers of different sectors can meet each other play a significant role within the ornamental plant sector. Those contacts and conversations are *“fruitful*

and inspiring for issues related to generic business and management such as marketing, financial and business planning, which are frequently better developed in other sectors than within the agricultural sector” (farmer interview).

Strong collaboration within a producer organisation – fruit sector

This case is a recently developed network focusing on the one hand on the exchange of knowledge supporting the development of the product and the market of the radical new product kiwiberry, and on the other hand on the organisation of the producers, suppliers and buyers within the chain.

Characteristic 1: The innovation process is uncertain

In 2010, the first Belgian berries were sold in the supermarket, but sales were not that good because the fruit was still unknown. In 2011, the kiwi berry was for the first year in huge amount available in the supermarkets, and this was also for an interviewed farmer the first huge harvest, who indicated that he was *“still uncertain about the possible return on investment. I hope it will evolve in the right direction”* (farmer interview) According to the farmers, the success of the product largely depends on the coordinator. The coordinator of the producer organisation forms the link between several stakeholders -researchers, growers, auction, suppliers- which ensures that the network members are rapidly aware of changes. For example if a problem occurs on the level of the cultivation techniques, a quick consultation of the research institute can take place, and solutions can be spread timely and efficiently through the network. Another example is when out of the collaboration among the research institute and a supplier of pollen, a good technique could be developed for the fertilisation of the plant, which was spread very fast.

Characteristic 2: The innovation process is knowledge intensive

Within the network, there is a continuous exchange of experiences among different types of network members. Newsletters and a website are provided, pruning demonstrations and growers meetings where all members interact with each other are organised. The coordinator plays here an important role, by bringing the different stakeholders together on a regular basis. *“Furthermore, he is always approachable for all the members, with all kind of questions”* (farmer interview). *“From the start-up of the network, he was involved, which leads to extra stability”* (focus group).

Characteristic 3: The innovation process is controversial

An additional advantage is that the coordinator is associated with a neutral institution. In this way, no conflicts of interest are involved like making profit, which is often the case within other networks. However, we noticed that the interests of growers and auction are not always similar about the expansion and support of the product. The auction for example is not prepared to market the biggest berries, as they do not possess the right package.

Characteristic 4: The innovation process crosses boundaries

Concerning the fourth innovation characteristic, we observed that the network is a young network, focusing on radical new product development. This ensures that the members are not yet rooted in expectations and routines, which could hinder innovation.

Discussion and conclusions

By taking into account the innovation characteristics, a network becomes stronger in anticipating, developing and implementing innovations.

Through their bearing, networks can serve as a net for new knowledge and increase the chance to notice and validate opportunities. To decrease the **uncertainty** inherent to innovation, it was observed in our cases that the management via a central coordinator who forms the link between multiple stakeholders is very important.

Similarly, the role of connecting people was found to be important by Koopmans et al. (2011). Furthermore, we observed the importance of close contact with a heterogeneous group of people such as farmers, suppliers, buyers, researchers. Other literature confirms that firms in networks composed of partners with heterogeneous experiences will be in a better position to benefit from the present experiences than firms in networks composed of partners with homogeneous experiences and will therefore make better decisions (Beckman *et al.*, 2002). Also Koopmans et al. (2011) and Kanter (1988) found that innovation is often stimulated when a heterogeneous group of people come into contact. Everybody has his own vision on the challenge and possible solutions. Kanter (1988) found that multiple contacts lead to a higher chance of discovering new things, decreasing the uncertainty. However, the difference between the members may not be too big, in order that they still can understand each other (Heyman and Walls, 2002). In addition, the four cases revealed the importance of strong and direct ties to decrease the uncertainty. In the literature, we found that strong ties lead to the creation of trust, which makes the network ties a perfect channel for exchange of knowledge (Coles *et al.*, 2003; Larson, 1991), decreasing the uncertainty. Kanter (1988) found potential innovators benefit from being linked directly to the market, to gain a fuller personal appreciation for what users need, as well as from being connected with those functions inside the organization that manage the interface with the outside. These contacts ensure that ideas generated or encountered opportunities have a chance of success, both on the level of rentability and market potential (Kanter, 1988).

As the innovation process is **knowledge intensive**, communication and innovation in communication is important. Distant one way communication which is very formalised and impersonal and directed at a large group hinders creativity. According to our findings, an innovation oriented network better aims at effective face-to-face, or direct communication. Direct ties provide immediate access to other members' knowledge and are especially helpful for knowledge which is difficult to transfer (Hansen, 2002). The direct communication can be managed through the logistical support and organisation of knowledge transferring processes by appointing an independent person or management board which can arrange regular meetings, set up the agenda, guide the discussion, send out newsletters, etc. and by providing an inspiring and professional environment in which network members can communicate.

Additionally, a close link between research and practice has a positive impact on the transfer of knowledge. Despite the continued generation of knowledge through scientific projects, research results are often insufficiently exploited and taken up in practice, and innovative ideas from practice are not captured and spread (EC, 2013).

These findings are in line with the evolution from the linear innovation model in which an innovation is developed within a research institute and communicated to the sector to the more interactive approaches considering innovation as the result of networking and interactive learning among a heterogeneous set of actors (e.g. Chesbrough, 2003; Hall *et al.*, 2006; Leeuwis, 2004; Röling, 2009). In these approaches, the members and coordinators play a significantly other role and have more specific tasks to fulfil. They have to care for optimal conditions in the search for solutions (Koopmans *et al.*, 2011).

The third challenge for an innovation network is to handle the different, often **controversial**, interests which are involved in an innovation process. The question whether or not the interests of the network members are homogeneous or heterogeneous is an important issue to take into account. For networks with different, opposite interests, the network coordinator should try to find a good balance between the different needs of network members, which is the case in the poultry sector where both the integrator (coordinator) and farmer try to optimize their profit. Other networks focus on the strengthening of shared interests, which is for example the case in the ornamental plant sector in which buyers collaborate to promote their novelties and the kiwi berry association where everybody wants to improve the production process and increase the sales. In general, the success of an innovation is often more depending on the determinants of the quality of a coalition, than on the technical-economic aspects (Kanter, 1988; Leeuwis and Van den Ban, 2004). Thereby, the promotion, defence and presentation of the innovation and the building up of a network around the innovation are key

elements. In the four cases studies, the horizontal collaboration to promote innovation was observed as a key element to improve their power. Thereby, it is important that the coalition is self-initiated. However, for the management, again the role of an independent coordinator was expressed. His task is only to facilitate, not to set-up the network.

Concerning the importance of **crossing boundaries** to innovate, it is vital that a network provides the means to meet several expertises and experiences, for example by organizing a study trip, a workshop, network meetings, etc. and hence meet people with different background, for example from another sector. However, the required heterogeneity in the membership is not the only prerequisite. Network members should also be willing to change their routines. Reconsidering the own role in the innovation process can be relevant for all type of members: the farmers, policy makers, researchers, extensionists, consumers and suppliers. This is also related to the strength of the network ties. In the poultry sector for example, the relationships are especially based on routines. These long-term relationships are very strong and often result in homogeneity, leading to less diversity of experiences (Beckman *et al.*, 2002).

To conclude, we can state that when farmers have multiple contacts, they have a higher chance to discover new things. Thereby, it is important that knowledge providers are part of the network and connected with the different actors, and not only provide their information to the farmers as an external actor. Also the face-to-face communication within a network is an essential issue. Furthermore, coalition can play a crucial role for some innovations, as a lot of farmers are not able to implement their idea because for example the retailer or research institute is not supportive or interested. If the farmers set up a self-initiated coalition, it can be easier to initiate the innovative idea. Fifth, it is important that individual actors from the agricultural system revisit their actual role. Successful innovation processes often originate in situations where creativity is not limited within one unit.

Regarding the limitations of this study, despite that we already reached 109 respondents spread over four agricultural subsectors in a qualitative research setting, it is advisable to include in future research more subsectors into this kind of study in order to draw conclusions for the agricultural sector in general.

References

- Batterink, M., Wubben, E., Klerkx, L. and Omta, S. (2010). Orchestrating innovation networks: the case of innovation brokers in the agri-food sector, *Entrepreneurship & Regional Development*, 22 (1), pp 47-76.
- Beckman, C.M. and Haunschild, P.R. (2002). Network learning: The effects of Partners' Heterogeneity of Experience on Corporate Acquisitions, *Administrative Science Quarterly*, 47 (1), pp 93-124.
- Brennan, A. and Dooley, L. (2005). Networked creativity: a structured management framework for stimulating innovation, *Technovation*, 25), pp 1388-1399.
- Briz, J. and Felipe, I. (2007). Challenge to SME to survive in food dynamic markets: innovation and efficient networks, 1st International European Forum on Innovation and System Dynamics in Food Networks, European Association of Agricultural Economists (EAAE). Innsbruck-Igls, Austria.
- Burt, R.S. (1997). The contingent value of social capital, *Administrative Science Quarterly*, 42 (2), pp 339-365.
- Chesbrough, H.W. (2003). The era of open innovation, *MIT Sloan Management Review*, 44 (3), pp 35-41.
- Coles, A., Harris, L. and Dickson, K. (2003). Testing goodwill: conflict and cooperation in new product development networks, *International Journal of Technology Management*, 25), pp 51-64.
- Cowan, R. and Jonard, N. (2004). Network Structure and the Diffusion of Knowledge, *Journal of Economic Dynamics and Control*, 28 (8), pp 1557-1575.
- Daskalakis, M. and Kauffeld-Monz, M. (2005). "Trust and knowledge in the behavioural dynamics of innovation networks".
- EC 2013. Research and innovation. from <http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2295-isib-02-2015.html>.
- Edquist, C. (2006). Systems of innovation: perspectives and challenges, IN: Fagerberg, J., Mowery, D. C. and Nelson, R. R. *The Oxford Handbook of Innovation*. Oxford, Oxford University Press, USA: 680.

- Elfring, T. and Hulsink, W. (2003). Networks in Entrepreneurship: The Case of High-technology Firms, *Small Business Economics*, 21 (4), pp 409-422.
- Fukugawa, N. (2006). Determining factors in innovation of small firm networks: a case of cross industry groups in Japan, *Small Business Economics*, 2006 (27), pp 181-193.
- Garbade, P.J.P., Omta, S.W.F., Fortuin, F.T.J.M., Hall, R. and Leone, G. (2013). The Impact of the Product Generation Life Cycle on Knowledge Valorization at the Public Private Research Partnership, the Centre for BioSystems Genomics, *NJAS - Wageningen Journal of Life Sciences*, 67 (0), pp 1-10.
- Håkansson, H. (1987). *Industrial technological development: a network approach*, London, Croom Helm.
- Håkansson, H. and Snehota, I. (1995). *Developing relationships in business networks*, London, Routledge.
- Hall, A., Janssen, W., Pehu, E. and Rajalahti, R. (2006). "Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems".
- Hansen, M.T. (2002). Knowledge networks: Explaining effective knowledge sharing in multiunit companies., *Organization Science*, 13), pp 232-248.
- Hausler, J., Hohn, H. and Lutz, S. (1994). Contingencies of innovative networks: a case study of successful R&D collaboration, *Research Policy*, 23), pp 47-66.
- Heyman, F.V. and Walls, A.E.J. (2002). Cultivating conflict and pluralism through dialogical deconstruction, IN: Leeuwis, C. and Pyburn, R. *Wheelbarrows full of frogs: social learning in resource management*. Assen, Netherlands, Van Gorcum.
- Hitt, M.A., Ireland, M.D., Camp, M.S. and Sexton, D.L. (2001). Geust editors' introduction to the special issue - strategic entrepreneurship: entrepreneurial strategies for wealth creation, *Strategic Management Journal*, 22 (6-7), pp 479-491.
- Hoang, H. and Antoncic, B. (2003). Network-based research in entrepreneurship: a critical review., *Journal of Business Venturing*, 18), pp 165-187.
- Huggins, R. (2000). The succes and failure of policy-implanted inter-firm network initiatives: motivations, processes and structure, *Entrepreneurship & Regional Development*, 12), pp 111-135.
- Inkpen, A.C. and Tsang, E.W.K. (2005). Social Capital, Networks, And Knowledge Transfer, *Academy of Management Review*, 30 (1), pp 146-165.
- Kale, P., Singh, H. and Perlmutter, H. (2000). Learning and Protection of Proprietary Assets in Strategic Alliances: Building Relational Capital, *Strategic Management Journal* 21 (3), pp 217-237.
- Kanter, R.M. (1988). When a thousand flowers bloom: structural, collective and social conditions for innovation in organization, *Research in Organizational Behavior*, 10), pp 169 - 211.
- Koopmans, C.J., van Veluw, K. and Wijnands, F.G. (2011). *Participatieve ontwikkeling: samenwerking in een vraaggestuurde context van biologische landbouw*, Netherlands, Report
- Larson, A. (1991). Partner networks: leveraging external ties to improve entrepreneurial performance, *Journal of Business Venturing*, 6), pp 173-188.
- Lazzarini, S.G., Chaddad, F.R. and Cook, M.L. (2001). Integrating supply chain and network analyses: The study of netchains, *Journal on Chain and Network Science*, 1 (1), pp 7-22.
- Lee, C., Lee, K. and Pennings, J.M. (2001). Internal capabilities, external networks, and performance: a study on technology-based ventures, *Strategic Management Journal*, 22 (6-7), pp 615-640.
- Lee, S., Park, G., Yoon, B. and Park, J. (2010). Open innovation in SMEs - An intermediated network model, *Research Policy*, 39), pp 290-300.
- Leeuwis, C. (2000). Reconceptualizing participation for sustainable rural development: Towards a negotiation approach, *Development and Change*, 31 (5), pp 931-959.
- Leeuwis, C., Ed. (2004). *Communication for Rural Innovation: Rethinking Agricultural Extension*. Oxford, Blackwell Science.
- Leeuwis, C. and Van den Ban, A.W. (2004). *Communication for rural Innovation- Rethinking Agricultural Extension*, UK, Blackwell Science.
- Lefebvre, V. (2014). "Learning and Innovation in Food SMEs: Network Composition and Management", Doctoral Dissertation.
- Lefebvre, V.M., Molnár, A. and Gellynck, X. (2010). Network performance- What influences it?
- Lipparini, A. and Sobrero, M. (1994). The glue and the pieces: entrepreneurship and innovation in small-firm networks, *Journal of Business Venturing*, 9), pp 125-140.
- MacKinnon, D., Cumbers, A. and Chapman, K. (2002). Learning, innovation and regional development: a critical appraisal of recent debates, *Progress in Human Geography*, 26), pp 293-311.
- Malhotra, N.K. (1999). *Marketing Research - An Applied Orientation*. Upper Saddle River, New Jersey, Prentice Hall Inc. 3rd edition: 150-160.

- Molnár, A., Lefebvre, V.M. and Gellynck, X. (2011). Determinants of innovation network performance: the case of selected SME focused networks in the agro-food sector, 5th International European Forum (IGLS-Forum) on system dynamics and innovation in food networks.
- Mu, J., Peng, G. and Love, E. (2008). Interfirm networks, social capital, and knowledge flow, *Journal of Knowledge Management*, 12 (4), pp 86-100.
- Nieto, M.J. and Santamaria, L. (2007). The importance of diverse collaborative networks for the novelty of product innovation, *Technovation*, 27), pp 367-377.
- Nooteboom, B. (2000). Institutions and forms of coordination in innovation systems, *Organization Studies*, 21), pp 915-939.
- OECD 2013. *Agricultural Innovation Systems: A Framework for Analysing the Role of the Government*.
- Omta, O. (2004). *Management of Innovation in Chains and Networks*, IN: Camps, T., Diederer, P., Hofstede, G. J. and Vos, B. *The Emerging World of Chains and Networks. Bridging theory and practice*. 's-Gravenhage, Reed Business Information.
- Omta, O.S.W.F. (2002). Innovation in chains and networks, *Journal on Chain and Network Science*, 2 (2), pp 73-80.
- Pittaway, L., Robertson, M., Munir, K., Denyer, D. and Neely, A. (2004). Networking and innovation: a systematic review of the evidence, *International Journal of Management Reviews*, 5-6 (3-4), pp 137-168.
- Powell, R., A. and Single, H., M. (1996). Methodology Matters - V - Focus Groups, *International Journal for Quality in Health Care*, 8 (5), pp 499-504.
- Powell, W.W., Koput, K.W. and Smith-Doerr, L. (1996). Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology, *Administrative Science Quarterly*, 41 (1), pp 116-145.
- Röling, N. (2009). Pathways for impact: scientists' different perspectives on agricultural innovation., *International Journal of Agricultural Sustainability*, 7), pp 83 - 94.
- Sawhney, M., Wolcott, R. and Arroniz, I. (2006). The 12 different ways for companies to innovate, *MIT Sloan Management Review*, 47 (3), pp 75-81.
- Sherer, S.A. (2003). Critical success factors for manufacturing networks as perceived by network coordinators, *Journal of Small Business Management*, 41 (4), pp 325-345.
- Tsai, W. (2002). Social structure of "coopetition" within a multiunit organization: Coordination, competition, and intraorganizational knowledge sharing, *Organization Science*, 13), pp 179-190.
- van Galen, M. and Verstegen, J. (2008). *Innovatie in de agrarische sector: We kunnen er niet genoeg van krijgen!*, Den Haag, Report
- Walter, A., Ritter, T. and Gemünden, H.G. (2001). Value-creation in buyer- seller relationships: Theoretical considerations and empirical results from a supplier's perspective *Industrial Marketing Management*, 30 (4), pp 365- 377.
- Zahra and George (2002). Absorptive Capacity: A Review, Reconceptualization, and Extension, *Academy of Management Review*, 27 (2), pp 185-203.