Social networks as the basis for agri+touristic value creation in Alpine regions

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Abstract

In large areas of the Alps, agriculture and tourism have great economic and social importance. Given their comparatively low value added both sectors face major challenges. Those can be met with new offers and organizational-structural innovation, which requires improved framework conditions and economic support. In addition, a more comprehensive understanding of agritourism is needed. This includes on-farm activities and is aimed at developing synergy and co-operation potentials between all involved actors in the regional value chains. We refer to this as "agri+tourism", which is essentially built upon social networks. Those can have different characteristics and structures in different regions and constitute an essential basis for the development and functioning of business relationships within industries and regions. Social network analysis is a method particularly suited to capturing and analysing connections between individual actors in a network and their interactions from an overall perspective. It enables to measure the strength of a network and to derive recommendations for further development.

This paper exemplifies the importance of actors' networks for the development of regional systems of value chains at the interface of agriculture and tourism and the possibilities offered by the method of social network analysis. For illustrative purposes, we use results from three case study regions in the canton of Grisons, Switzerland. Those reveal potential to further develop business relations between agriculture, the food processing and hotel/restaurant sectors, and thus strengthen regional value chains. To this end, additional business connections and new forms of co-operation are required, which must arise from within the local network.

1. Introduction

In many areas of the Alps, agriculture and tourism are of great economic and social importance. However, due to their comparatively low value added, they face huge challenges that need to be met with new offers and organizational-structural innovations. These require not only improved framework conditions and economic support, but also a rethinking and a more comprehensive understanding of agritourism. Such a broader perspective includes on-farm activities at the interfaces with para-agriculture and para-hotel business as well as the development of synergy potentials and co-operation in agricultural and touristic value creation.

We refer to this regional economic and cross-sector approach as "agri+tourism". It targets enhanced co-operation and strengthening regional value chains between agriculture, food processing, and the hotel/gastronomy industry. This can be achieved through a better inclusion of local agricultural products in the hotel and restaurant industry or joint offers of tourism experiences by farmers and hoteliers/restaurateurs. In addition to innovations in product development and marketing, this requires improved collaboration along the regional value chains. Although agriculture and tourism are already intertwined in many ways, there is still considerable potential in many places.

In this context, Weiss et al. (2016) emphasize both the function of agritourism in its original form as "farm vacations" and the need for appropriate legal and institutional frameworks for

innovative forms of horizontal and vertical co-operation. The latter is central when it comes to ensuring that the synergies and co-operations between family farms and tourism businesses are even better valued in the future. In addition, it is important to consider and strengthen the different forms of co-operation between farms and actors from the hotel and catering industry as well as food processing within a region. This broader perspective is increasingly important if resilient value systems are to thrive and the foundations for sustainable regional development are to be laid.

An important prerequisite for this are social networks, which can be developed and structured diversely in different regions. They represent an essential basis for the emergence and functioning of business relationships within industries and regions. Building on various relationships such as kinship, friendship, membership in associations and other organizations, networks connect individual actors and create a basis of trust. This is the most important factor for building new relationships and economic co-operation, as the mutual exchange of information and knowledge is essential.

When establishing new business relationships, many actors also orient themselves on existing and functioning networks. On the one hand, these enable more frequent and broader business opportunities for individual players, whereby a dense network structure can be a door opener to more orders and an innovative environment. On the other hand, participation in networks can lead to increased competition for limited resources. However, the dilemma between co-operation and competition in a network can also be seen as an impulse for targeted and optimized co-operation. Therefore, the question arises about the types and extent of connections that actors make in a network and how these connections are used strategically. This is particularly true when it comes to improved collaboration between actors in the agri+touristic value chains.

Knowledge of the structures and characteristics of regional networks, which are primarily shaped by previous developments, is a prerequisite for identifying points of contact for the expansion of agri+touristic value chains. The method of social network analysis (Jansen, 2003; de Nooy, 2010) provides a suitable approach for this purpose. In a first step, it enables a descriptive and comparative analysis of the considered networks that can be made available to the involved stakeholders very easily. In a second step, characteristic key figures provide in-depth insights into the structure and vulnerability or resilience of networks, and thus further information for their strengthening.

We illustrate and analyse this approach and the results obtained for three different study regions in the canton of Grisons, Switzerland (see Fig. 1): a nature park region (Parc Ela), a rural region developed for tourism (Lenzerheide), and a region with a successfully launched agri+touristic initiative (Valposchiavo). In all three regions there are actors who are open for innovation and already cooperate with each other in several manners.

The aim of this paper is to demonstrate the importance of actor networks for the development of regional value-chain systems at the interface of agriculture and tourism ("agri+tourism") and the possibilities offered by the method of social network analysis. For illustrative purposes, we use results of a completed study (Hediger et al., 2019; Ospelt et al., 2020), which aimed to determine and tap potentials for improved co-operation between actors from agriculture, food processing, and the hotel and catering industry in the three regions. Altogether, this should contribute to strengthening the competitiveness of providers in agritourism and the hotel and catering industry in peripheral areas. The findings are discussed on the one hand in the context of the underlying study and on the other hand put into a generalized framework, in order to gain

recommendations for similar projects of regional development and for a further methodological development.

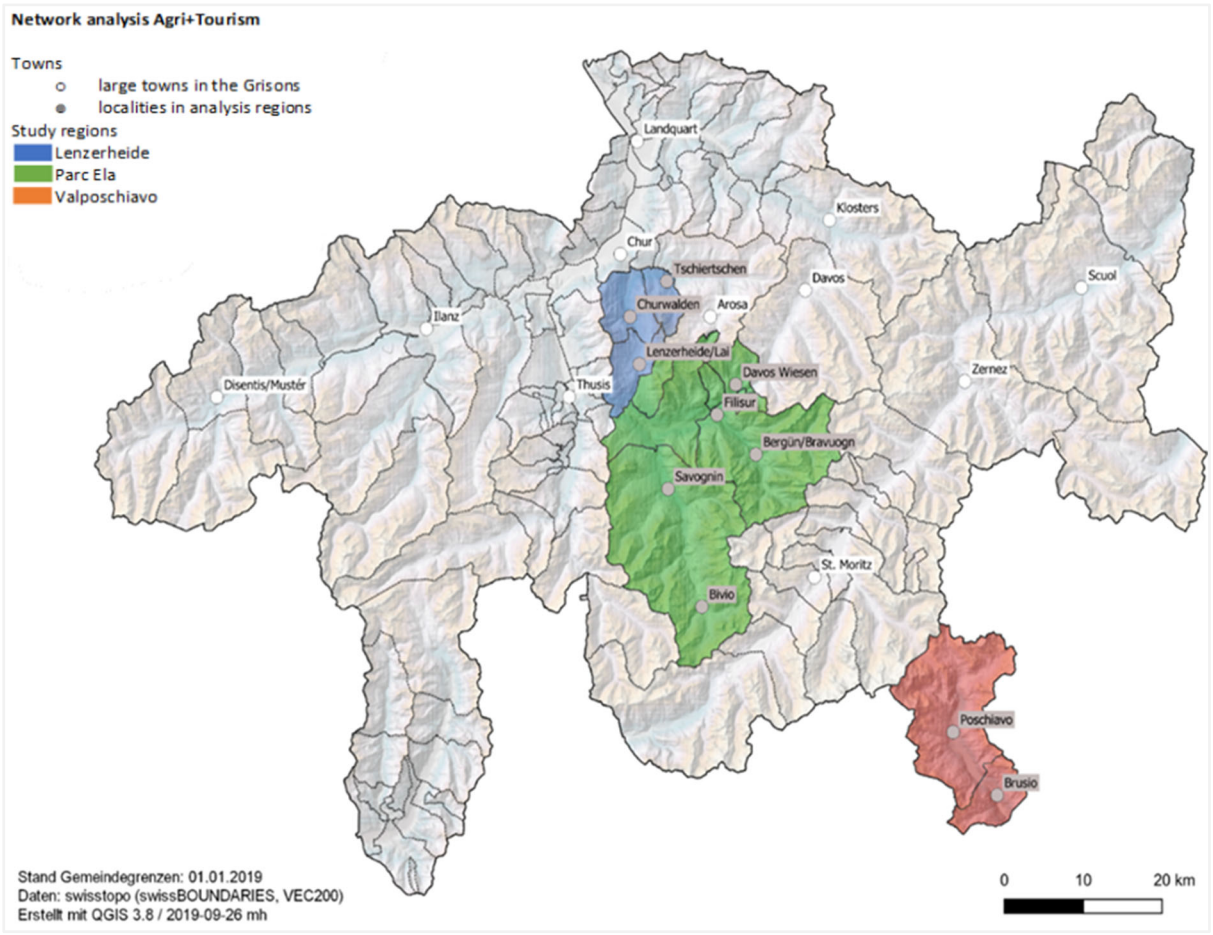


Fig. 1. The three study regions in the canton of Grisons

In the Section 2, the theoretical and methodological foundations for social network analysis are presented. Subsequently, Sections 3 and 4 provide an overview of the data and results. Section 5 offers a critical examination and discussion of the results and methodology, before we draw our conclusions and present recommendations in Section 6.

2. Theory and Methodology

Social networks, as mentioned above, play an important role for the emergence and functioning of business relations within industries and regions and thus also for the development and structure of agri+touristic value chains. The analysis and understanding of the respective systems are crucial for a targeted improvement of the co-operation between actors and the development of joint offers, and thus to increase the regional value creation in agri+tourism.

2.1 Social Network Theory

The term "social network" is used differently in research. Ziegler (1987) describes a social network as a form of organization in which social relationships exist, embedded in an environment, and in which the actors behave strategically. For Haythornthwaite (1996), a social network is a system of individuals, groups, or organizations that trade resources. This view can be extended to scarce goods and production factors. Accordingly, an economic network is created mainly through trade and business relationships rather than through the behavioural

strategy of the actors. In this regard, social networks form an essential basis for the emergence and functioning of business relationships within industries and regions. They connect individual actors operating in the market and institutional environment and are based on different forms of relationships, such as information or knowledge exchange, communication channels, type and scope of business ties, and innovation activities (Bellwald et al., 2013; Haythornthwaite, 1996; Lynch et al., 2000; Rürup et al., 2015; Scheer, 2008; Scott et al., 2008; Troeger-Weiss, 2020; Van der Zee & Vaneste, 2015).

In general it can be said that actors who are in deep contact with each other are more willing to enter new collaborations. Thus, social relationships through kinship, friendship, and membership in organizations are important for the emergence and functioning of networks (Jansen, 2003; Marwell et al., 1988; Sherchan et al., 2013). They create a basis of trust, which is the most important factor for building new relationships. Accordingly, many actors align themselves with pre-existing networks to establish new business ties (Granovetter, 1985; Fukuyama, 1995). Thus, networks are founded on a common basic interest and create relationship opportunities that can be activated when needed and transformed from a loose, non-binding relationship into a clearly regulated collaboration or co-operation (Bellwald et al., 2013). In this regard, a few key actors who dominate the network and drive innovation (Tsai, 2001) and bring other actors into the network over time often play an important role. These intermediary actors are the brokers (Chaudhary & Warner, 2018) who connect other actors in the network. This encompasses gatekeepers, who are connected to only a few actors but can decide on access to the network (Haythornthwaite, 1996).

Often, actors are only willing to invest time and money in a network if the costs are lower than the benefits of co-operation (Hennig, 2010), whereby the heterogeneity of the groups or actors involved is an important determinant for the functioning of a network. The more heterogeneous the actors in a network are, the stronger are the individual actors, because they cannot be replaced quickly. This also strengthens the network as a whole (Marwell et al., 1988).

Overall, social networks enable more and broader business opportunities for individual actors. A dense network structure can open the doors to more orders, stronger co-operation and profitable innovations (Jansen, 2003). Networks and collaborations are therefore of increasing importance in regional development (Bellwald et al., 2013). They bring the structure of relationships between actors and the systems that connect them into focus (Scheer, 2008). Intraregional networks play a special role in this regard. They serve not only to link regional actors with each other, but above all to bundle competencies and promote a dialogue on current developments (Troeger-Weiss, 2020). However, participation in networks can also lead to an increased competitive mindset, as actors inevitably compete with other actors in the market for limited resources (Wellman et al., 1988). Consequently, the line between co-operation and competition in a network is very thin. Hence, there is always the questions about what types of connection the actors in a network want to enter and how these connections should be used strategically (Jansen, 2003). In short, networks consist of actors who are connected by relationships and whose connections results different social structures, such that social networks affect the actors and actors in turn affect the networks (Gamper, 2020).

2.2 Methodology of social network analysis

To understand and classify the actions of individual persons in a network, the latter must be considered as a whole. Social network analysis is a method particularly suitable for this purpose. It enables the identification, representation and analysis of connections between individual actors in a network and the illustration of their interactions (Jansen, 2003). The analysis can be further supported by participatory action research, which addresses concrete real-world

problems and supports direct social or collective action (Dorenbos Theler & Hediger, 1999). In addition, it can help to activate locally available knowledge (Giuliani & Buchli, 2006) that is needed to strengthen the competitiveness of a region.

Basics

Social network analysis is a method of empirical social research for recording and analysing relationships between actors or groups of actors in the economic and social spheres of an industry or region. Formally, a network based on such relationships can be represented as a delimited set of nodes (elements, actors) and a set of connections (edges, lines) between them (Gamper, 2020; Jansen, 2006; Payer, 2008). The focus is on the connections and interdependencies between entities (persons or organizations), not their individual attributes and properties. However, the latter can have an additional explanatory value and should consequently be included in the further statistical analysis of networks.

Through social network analysis, social relationships and their structure become the object of research. The respective actors and their interactions within predefined (regional) boundaries are considered as an overall system. A differentiated view on different aspects or subsystems can contribute to a better and deeper understanding of the overall system and its modes of operation. The analysis includes several steps (cf. Hawe et al., 2004; Haythornthwaite, 1996; Jansen, 2006; Morrison et al., 2004; Rürup et al., 2015; Scott et al., 2008). These concern the definition of the network under investigation in terms of its boundaries (spatial, organizational, or institutional), relevant actors and network functions, which should be derived from the research question. The data collection provides information about relationships and forms of connection of actors in the network, which can be gained from direct observations, statistical data (secondary data) and interviews or questionnaires. The last step, which is the focus of this paper, includes the description and explanation of the results as well as an analysis of the network based on specific characteristics (key figures; cf. Tab. 1).

Representation

Formally, networks can be represented as graphs with nodes and edges, where nodes correspond to actors and edges correspond to their relationships (cf. Arif, 2015; de Nooy, 2010). Accordingly, each network is characterized by its underlying data. Core of the analysis are the visualization and calculation of metrics, which provide information about the strength (cohesion) of a network and allow the comparison with other, similar networks.

For our network analyses we use the software program Gephi and for the graphical representation of the networks Force Atlas 2 (Jacomy et al., 2014). This layout algorithm is based on the idea that networks essentially result from the interaction of attraction and repulsion: Actors without a relationship repel each other like magnets of the same polarity, while a relationship between two actors holds them together. With the action of these two forces, each actor is placed in the network based on its relationship with the other actors, and the algorithm avoids the overlapping of two actors. Attributes of the actor (e.g., place of business or industry affiliation) are not relevant in this consideration. The representation of the graph depends exclusively on which relationships are included in the analysis. Furthermore, the position of an actor in the network cannot be considered on its own but must always be viewed from the perspective of the overall network and accordingly by comparing an actor's position with that of the other actors.

The graphical representation of the networks is usually based on the degree centrality of the individual actors in the overall network. This measures the number of direct connections of an actor to other actors in the network. If an actor has many connections and thus a high centrality, the respective node moves closer to the centre of the network. In addition, the importance of

the connections is illustrated by the thickness of the connection lines. It was recorded based on statements made by the interviewees.

Tab.1: Key figures for network analyses

Terms	*Explanation*
Density:	Measure comparing the number of existing connections with the maximum number of possible connections (theoretical maximum = 1, i.e. all are connected to all).
Average degree:	Average number of connections of an actor to other actors.
Average path length:	Number of connections an actor needs on average to reach another actor.
Average clustering coefficient:	Indicates how strongly the neighbours of an actor and their neighbours are linked on average to an individual actor and its neighbours, i.e., how pronounced a regional cluster is.
Importance:	Importance of the connection mentioned by the respondents (represented by the thickness of the connecting lines).
Multiplexity:	Number of connections with multiple relationships between two actors in each case.
Centrality:	Depends on the number of connections (average degree and multiplexity) as well as their importance (key players, network drivers) and is calculated using different key figures.
Degree centrality:	Measures the number of direct connections of an actor to other actors in the network.
Betweenness centrality:	Considers not only the direct but also the indirect relationships (broker roles) in the network and enables the identification of brokers and gatekeepers.
Closeness centrality:	Considers the number of shortest paths (relationships) from one actor to all other actors. It measures the accessibility and thus the integration of actors in the network.

Advanced issues

Important for the stability and resilience of networks are a) the so-called cutpoints, i.e. nodes (actors) that connect two networks and whose elimination or removal would cause a network to disintegrate into two separate parts, and b) the structure of the relationships, which depends not only on the density and path length but also on the homogeneity of the network. An important metric for this is the clustering coefficient, which provides a measure of clique formation or transitivity in a network (Newman, 2003). It is defined by the ratio of the number of closed triples – triangular relationships of actors (accounts) created by the fact that all neighbours of a node are connected in pairs – to all triples (open and closed) in a network. With the help of this coefficient, it is possible to identify groups of nodes (clusters) whose interconnectedness is high. The higher the clustering coefficient, the stronger the clique or cluster formation, i.e. the stronger the individual nodes (actors) are connected to each other via edges (relationships). Consequently, the clustering coefficient can be used to assess mutual ties in a network, because the higher this coefficient, the more co-operation and homogeneity exists across the entire network (Müller, 2010).

The structure of relationships in a social network is additionally strengthened by the presence of multiple connections, i.e. the presence of simultaneous but different forms of relationships (types of connections). In this sense, the measure of multiplexity indicates the number of relationships through which two actors are connected at any given time. Together, these

quantities influence the stability and resilience of the network, i.e., its ability to withstand, absorb, or adapt to external disturbances and return to a positive development or growth path (Förster 2019, Holling 1973, Luthe et al. 2012, vom Orde 2018).

3. Data

In our analysis, we consider relationships with extra-regional actors in addition to purely intra-regional networks. The corresponding overall network includes all actors who participated in the survey, as well as actors who were named by the respondents and thus indirectly recorded, as well as their connections. In contrast, the intraregional networks only include actors and connections within the respective study region (cf. Tab. 2), whereby we distinguish between business relationships and social connections via memberships.

Tab. 2. Comparison of the key figures for the regional networks

a) Overall networks (incl. external connections)

	Valposchiavo	Parc Ela	Lenzerheide
Number of actors (nodes)	254	144	106
Number of connections (edges)	3'821	918	274
Density	0.059	0.045	0.025
Average degree	15.043	6.375	2.585
Average path length	3.001	2.599	3.058
Average clustering coefficient	0.277	0.160	0.101

b) Intraregional networks (without external connections)

	Valposchiavo	Parc Ela	Lenzerheide
Number of actors (nodes)	186	110	78
Number of connections (edges)	3'700	873	231
Density	0.108	0.073	0.038
Average degree	19.892	7.936	2.962
Average path length	2.829	2.541	2.833
Average clustering coefficient	0.359	0.201	0.144

c) Business relationships (only intraregional)

	Valposchiavo	*Parc Ela*	Lenzerheide
Number of actors (nodes)	132	86	65
Number of connections (edges)	481	135	122
Density	0.007	0.011	0.02
Average degree	1.776	1.227	1.564
Average path length	2.983	2.098	1.801
Average clustering coefficient	0.028	0.019	0.044

d) Memberships (only intraregional)

	Valposchiavo	Parc Ela	Lenzerheide
Number of actors (nodes)	139	38	24
Number of connections (edges)	3'219	736	109
Density	0.094	0.061	0.018
Average degree	17.306	6.691	1.397
Average path length	1.51	1.124	1.189
Average clustering coefficient	0.354	0.17	0.14

For interpretation of the individual key figures, see Tab. 1.

Our network analysis represents an incomplete snapshot at the time of the survey. On the one hand, this is due to the fact that social networks are always evolving and that not all actors and connections could be captured because of the incomplete response (cf. Tab. 3) and the design

of the question (Ospelt et al., 2020). However, thanks to the close co-operation with the most important organizations in the individual regions, it can be assumed that a reliable picture regarding the agri+touristic co-operation in the three regions is available. Existing gaps in this partial mapping of reality can be identified and subsequently closed by the actors themselves in reflection and creative processes, as illustrated by the example of the project "Agro+Tourism Grisons" (Hediger et al., 2019).

Tab. 3. Response rates and structural data on the survey

	Valposchiavo	Parc Ela	Lenzerheide	*Comparison with the food chain in Switzerland*
Survey period / source	Nov. 2016	Jan./Feb. 2018	June/July 2018	*BFS (2017)*
Response rate	49%	32%	18%	
Industry shares:				
- Agriculture	64.5%	56.4%	47.4%	*65%*
- Food Processor	14.5%	18.1%	14.1%	*5%*
- Hotels and gastronomy	21.0%	25.5%	38.5%	*31%*

Source: Hediger et al. (2019).

A complete compilation of the collected data and the calculated key figures for the three networks and the individual industries can be found in the Appendix.

4. Results

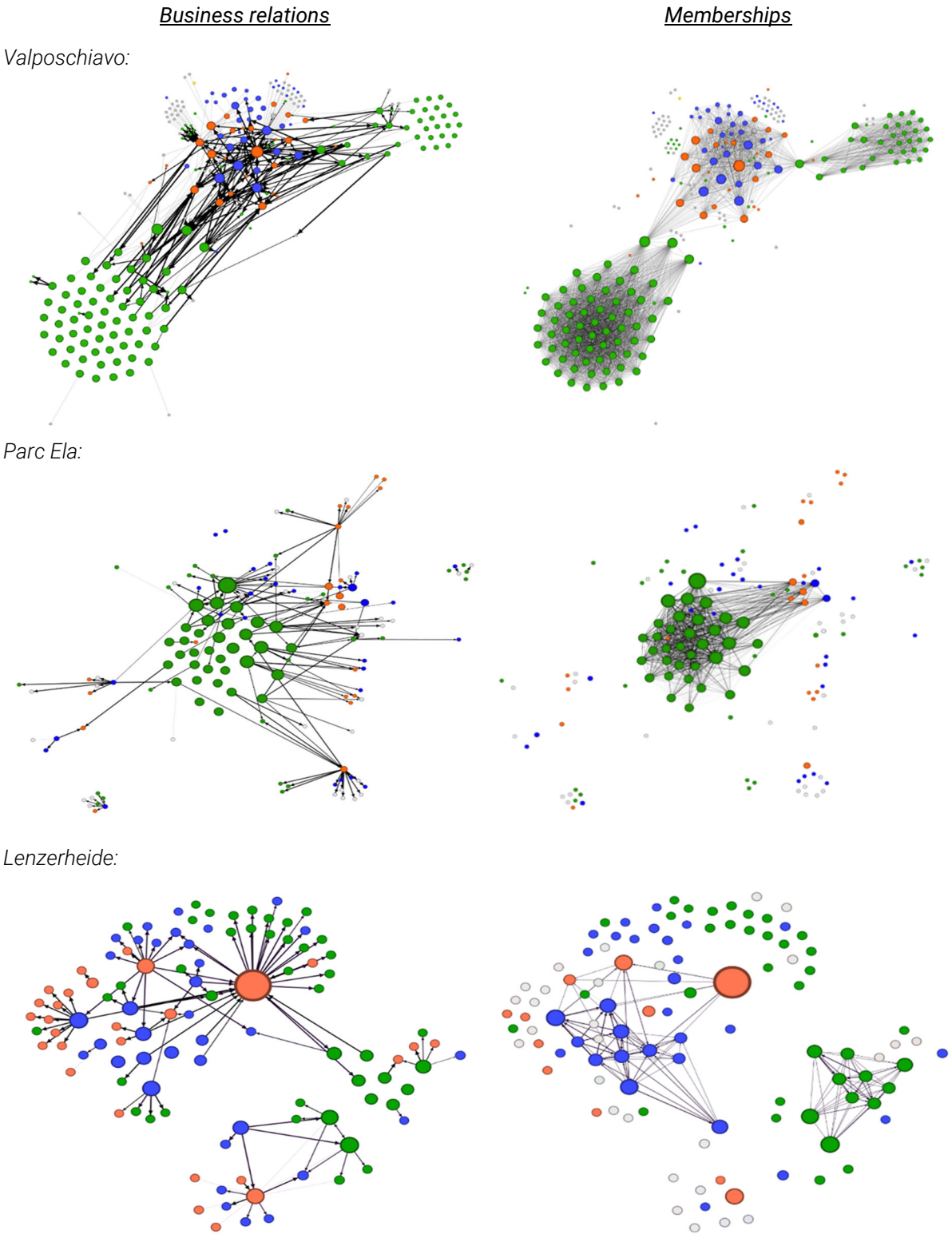
The following section provides a descriptive analysis of the agri+touristic networks in the three study regions with a focus on memberships and business connections, which we consider in a differentiated manner. The analysis is based on graphical representations as well as on selected key figures regarding the diversity and strength of the considered networks.

4.1 The regional networks

As shown in Fig. 2 and Tab. 2, the networks in the three study regions have very different characteristics and structures. This is due to the different economic structures, the different importance of the local industry organizations, the different characteristics of the agri+touristic business relations, and different types of key players in these networks.

First, it should be noted with reference to the key figures listed in Tab. 2 that the theoretical maximum of 1 is by no means reached in the case of density. This would require that all actors are connected to every actor in the network, which is not possible due to the study design and is hardly ever the case in reality. However, it is noticeable that the density of intra-regional networks is almost twice as high as in the overall networks that include relationships across the region's borders. The average degree, i.e. the average number of connections of an actor is larger in the intraregional networks than in the corresponding overall networks. Moreover, it is noticeable that the most important descriptive indicators (number of nodes and connections, density and degree) are higher for the Valposchiavo region than for the other two regions. This can be partly explained by the different response rates (cf. Tab. 2) that may be due to the different urgency of the problem of agri+touristic co-operation and the different degree to which the actors are affected. In Valposchiavo, the perception is very high due to the initiative "100% Valposchiavo". In addition, the engagement with the topic is certainly the highest in Valposchiavo, followed by the Parc Ela region, where the goals of strengthening the regional value added and the integration of agriculture and tourism came on the top of the agenda with the creation of the nature park. The Lenzerheide region finally had a very different development

of agri+touristic networks. Those were primarily shaped by individual innovative key players, as the following analysis illustrates.



Legend: Agricultural businesses (green), food processors (orange), hotel/gastronomy businesses (blue), non-regional players (gray).

Fig. 2. The agri+touristic networks in the three study regions

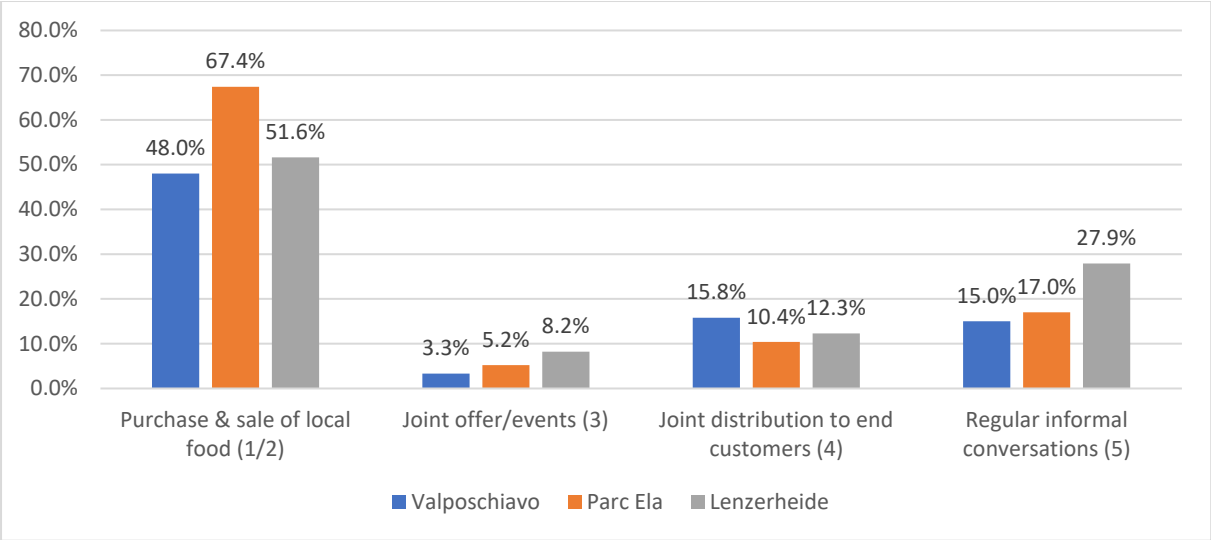


Fig. 3. Types of business relationships

Valposchiavo

The agri+touristic network of the Valposchiavo region consists of three main clusters, as illustrated in Fig. 2. On the outside, there two clusters of farms from each of the municipalities of Poschiavo (left) and Brusio (right), respectively. In the middle is a cluster mainly consisting of food processors and hotel and restaurant businesses. Their central position in the network is explained by the relatively large number of connections to other actors (degree centrality). From this and the graphical representation with the thicker connection lines (importance) and the point sizes (number of connections mentioned), it can be concluded that the food processors, together with the hotel and gastronomy businesses, drive the network in Valposchiavo. The farmers play a less central role.

The two subnetworks with business relationships or connections via memberships in local industry organizations (see Appendix) show different degrees of integration and importance. For example, the majority (85.1%) of the actors are connected via memberships. However, these connections were rated as of little importance by the actors themselves. This is reflected by the comparatively thin connection lines in Fig. 2. The network of business relationships, on the other hand, is based on thicker connecting lines, which underlines the importance of these connections. This sub-network, as illustrated in Fig. 3, is based primarily on the purchase and sale of local food. In this context, many food processors as well as hotel and restaurant operators play a role as intermediaries. Through business relationships, they integrate other actors into the business network and connect them with each other. In some cases, they also maintain extra-regional connections, while many agricultural businesses do not participate in the region's business network, i.e. they are not integrated into the regional network of business relations, neither through the sale of food nor in any other manner.

In the case of memberships, the integration of farmers is much higher and two agricultural actors are gatekeepers that connect the agricultural clusters of the two municipalities with the central network of actors downstream in the value chain. These are two farmers who are members of both the local trade association and the respective municipal farmers' association.

Parc Ela

The agri+touristic network of the Parc Ela region shows a collection of farms that are very centrally positioned. One reason for this is probably the distinct agricultural structure of the region. The food processors and the hotel and restaurant businesses have a lower centrality

and are therefore arranged with a certain distance around the central cluster, which is mainly supported by the members of the Albula Farmers' Association. However, some food processors act as brokers and connect hotel and restaurant businesses to the central agricultural cluster through business relationships. In addition, some small separate networks ("satellites") can be identified, which have no or hardly any contacts with the main network. They are solely connected to each other via a gatekeeper. The latter have few but strategically important contacts and can provide access to the network for other actors, especially through trade in local food products.

In the Parc Ela region, the networks with the business relationships and memberships in local organizations (see Appendix) show a different degree of integration and importance. The degree of integration of the business relations with a density of only 19.6% is significantly lower than that of the memberships. In contrast, the thickness of the connecting lines (edges) shows that the business relationships are rated as comparatively important by the actors themselves. It is also noticeable that only a few farms are integrated into the network through business relationships. On the other hand, numerous non-regional actors are involved in this network (cf. Fig. 3).

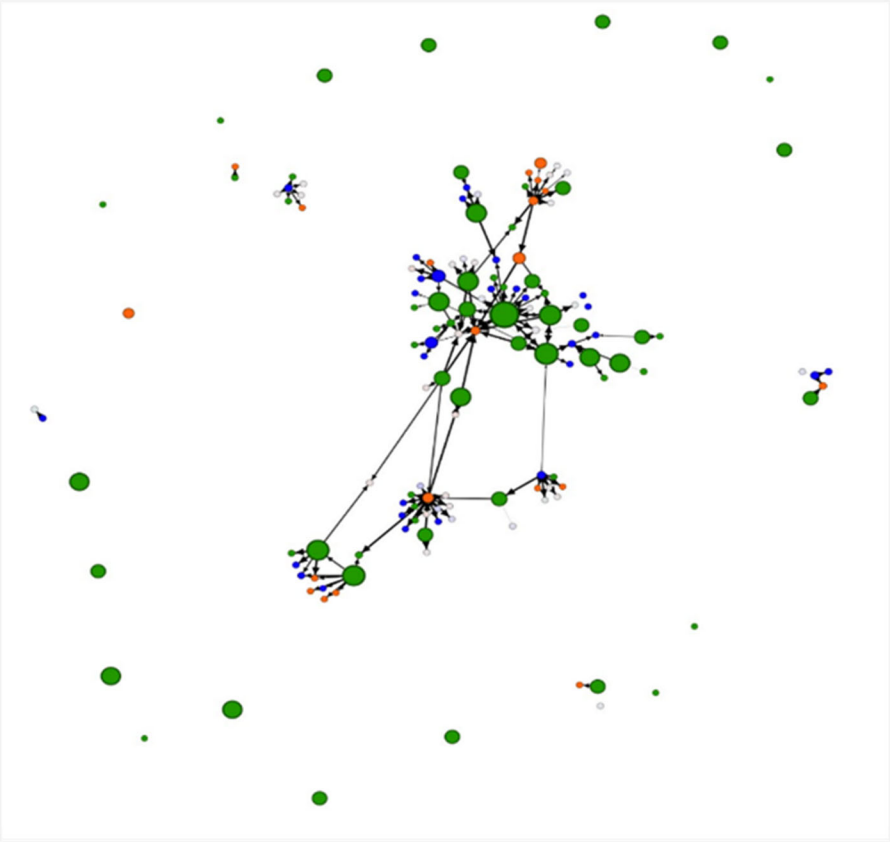


Fig. 4. Alternative representation of the business network in Parc Ela

The structural peculiarity of the agri+touristic network in Parc Ela becomes even more evident if the actors' centrality in the business relationships is used instead of that in the overall network. As illustrated in Fig. 4, a star-shaped structure appears at its core. It consists of a central cluster and various "local" clusters that are connected to the central network via a gatekeeper. Surrounding this central structure, we find numerous independent clusters ("satellites") and individual actors (mainly farmers) that are not connected to the central network.

Lenzerheide

The agri+touristic network of the Lenzerheide region has a very different structure than those of the previously considered regions. The key players in this network are mainly food processors and hotel/restaurant businesses, with one strong food processor standing out as having ties to all three industries. This is the "Puracenter," which takes on a central gatekeeper role and serves as a strategic contact for other actors in the network. Farmers, on the other hand, tend to be positioned on the periphery of the network. This might be a consequence of the strong touristic character of the region.

The network of memberships (see Appendix) accounts for only 39.8% of all connections and is divided into two separate networks. One network includes only agricultural businesses, the other exclusively food processors and hotel and restaurant businesses. The actors are predominantly connected in their own industries and the membership network is only weakly developed in the Lenzerheide region. Consequently, none of the memberships connects all three industries; in the trade association, there are only representatives from food processing and hotel/gastronomy.

In terms of business relationships, which account for 60.2% of all connections in this region, a clear division into three separate clusters is noticeable: The main cluster around the Puracenter (top); a smaller, autonomous local network in Tschiertschen-Praden (bottom); and a separate set of relationships around a single farmer (right).

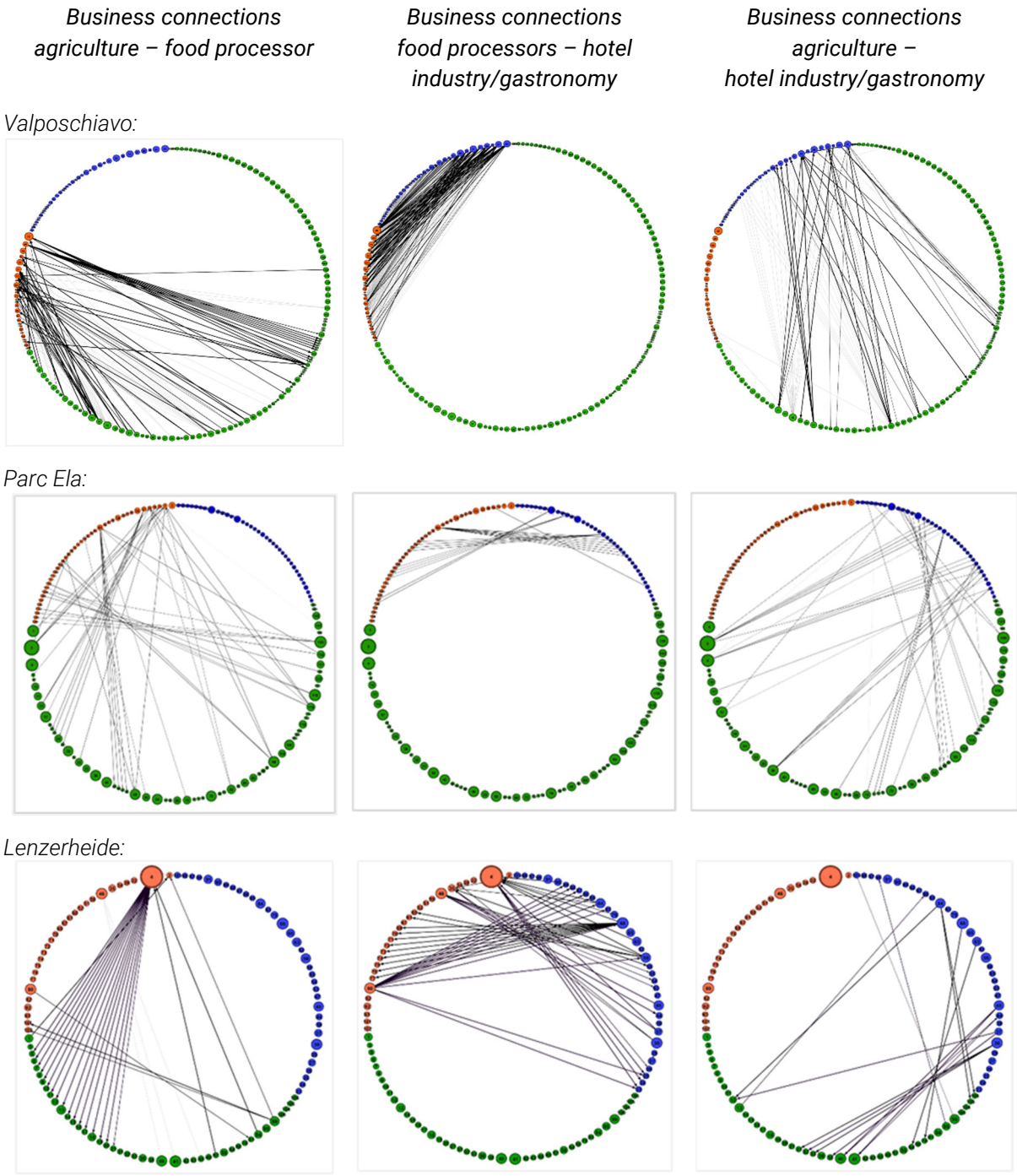
4.2 The agri+touristic value chains

For the further analysis of the agri+touristic value chains, we use a circular representation. This visualises the structure of the business links (especially flows of goods) of the actors along the value chain from agriculture to food processing to the hotel and restaurant industry.

Tab. 4 and Fig. 5 illustrate the intermediary role of food processors within the value chains of all three regions. In most relationships involving commodity flows, they act between farmers and hotel and restaurant operators. However, it is also evident that, on the one hand, some hotel and restaurant businesses maintain direct business relations with farmers, and that, on the other hand, numerous farms as well as hotel and restaurant businesses are not integrated into the regional value chains. This reveals that considerable potential in the business connections for expanding the agri+touristic systems exists in all three regions.

Tab. 4. The agri+touristic value chains

Number of business connections …	Region		
	Valposchiavo	Parc Ela	Lenzerheide
… agriculture – food processor	110	26	42
… food processor – hotel industry/gastronomy	162	17	45
… agriculture – hotel industry/gastronomy	87	37	18
Total	**359**	**80**	**135**



Legend: Farms (green), food processors (orange), hotel/gastronomy businesses (blue).

Fig. 5. Co-operation networks between the industries

In the regions of Valposchiavo and Lenzerheide, there are the largest number of business links between food processors and hotels/gastronomy. These include mainly those players that are positioned close to the centre in the overall network. However, there are also direct links between farms and the hotel/gastronomy industry that bypass food processors. This is particularly evident in the Parc Ela region, which is the most rural of the three regions.

If all forms of business connections are considered (cf. Fig. 3), it is evident that the dominant form of collaboration is the purchase and sale of local food. In the Parc Ela region, this accounts for more than 60% of all business connections; in the other two regions for about 50%. In

addition, it can be observed that in the Valposchiavo and Lenzerheide regions the majority of business relationships are based on multiple connections, but not in the Parc Ela region. This is important as the multiplexity of connections, in addition to cluster formation, is likely to be important for the resilience of networks, which constitutes an issue for further research.

5. Discussion

As already mentioned, the networks of the three study regions have very different characteristics and structures. On the one hand, this is due to the different shares of the individual industries in the local economy (cf. Hediger et al. 2019). On the other hand, differences in the institutional framework are also likely to have a decisive influence on the social networks in the distinct regions.

Lenzerheide, for example, is the region that is most strongly shaped by tourism. Here, a formative influence can be attributed to the initiative of individual hoteliers or restaurateurs in the procurement of local food as well as to the farmers' centre ("Puracenter") as a collection point. In addition, the graphical network representation shows a largely isolated cluster with actors from all three sectors in the community of Tschiertschen-Praden, which seems to function autonomously.

In Valposchiavo, the network reflects the political structure with the two municipalities Poschiavo and Brusio, in which farmers are mainly organized (cf. Scala 2017; Ospelt et al., 2020). In addition, the agri+touristic network in the valley is very much characterized by actors in the hotel/gastronomy and food processing industries, which seem to play a dominant role. This has to do both with the local industry organizations, which strive to bring the regional actors together within the industry, as well as with the project "100 % Valposchiavo", which contributes significantly to motivating the actors of the individual industries to cooperate.

In Parc Ela, the agri+touristic network is mainly characterized by a central cluster with farmers organized in the Albula Farmers' Association and a few additional actors from the Parc Ela Association. However, considerable gaps are evident in the network of business relationships. Thus, the economic relationship network of this region, which includes several valley communities, is characterized by the existence of many small networks, some of which are connected to each other and to the main network through a key actor, next to which a large number of isolated actors and isolated networks ("satellites") exist. Most of the isolated actors, however, are likely to be connected to other actors in the region through memberships or linked to extra-regional partners, for example by supplying their products to bulk buyers outside the region, which are not included in this network analysis or were not explicitly mentioned by the responding actors.

In all three regions, our network analysis clearly reveals considerable potential for integrating players from all three sectors into the network of business connections and thus into the regional value creation system. This assessment is confirmed by comparing the key figures for the individual networks compiled in Tab. 2.

In the more rural regions of Valposchiavo and Parc Ela, both the density of the network and the average degree, i.e. the average number of connections of an actor to other actors in the network, are significantly lower for the business relationships than for the overall network. Conversely, the average path lengths in the business networks of these two regions are almost the same as those of the respective overall network. Overall, this confirms that the majority of connections in these two regions are based on memberships in regional organizations rather than business relationships. The average cluster coefficient for the networks of business connections in both regions is also significantly lower than those of the respective overall

network. This is probably because the business networks in the Valposchiavo and Parc Ela regions are considerably less developed than the connections through memberships and the social fabric created by them. The business networks of these two regions are thus also likely to be more vulnerable to internal and external disruptions, such as the disappearance of individual players, price changes, or temporary interruptions of value chains and business connections, as during the Corona pandemic. In comparison, the corresponding key figures for the Lenzerheide region indicate a stronger economic connectedness. This is empirically captured by the greater density, higher degree and larger clustering coefficient of the business network compared to the overall network of the region.

In addition, the graphical representations illustrate that very different actors play a key role in the three regions. These, together with the existing structures, can be decisive for the long-term development of the regional value creation systems. The question thus arises as to which of these structures is more susceptible (more vulnerable) to disruptions or more capable to absorb them, i.e. is more stable and/or resilient:

a) A close-knit structure of an adequate number of actors from all three sectors – with potential for further development and expansion of the network – as in Valposchiavo?
b) A network consisting of several "satellites" that are connected via a gatekeeper or broker to the rest of the network within the regional value-chain system, as can be observed in the Lenzerheide and Parc Ela regions?

Since most farmers in Valposchiavo and Parc Ela are linked through the local farmers' organizations, the latter could play an important role in expanding business relations and strengthening the regional network, together with regional organizations such as the local trade and commerce association, the local tourism organization or the Parc Ela association, as well as the relevant regional developers.

In the Lenzerheide region, on the other hand, the picture is quite different. Here, the economic integration of all actors seems to be more advanced, as indicated by both the graphical representations and the key figures used. The shortened average path length makes it clear that many business relationships are bilateral, i.e. actors are directly linked to each other. The fact that the average cluster coefficient of the business network is also significantly lower in the Lenzerheide region than that of the overall network indicates a remaining potential for expanding and thus strengthening the business network (advanced integration of regional flows of goods and of business relationships) and thus its resilience. Here, the Puracenter or another regional institution could play a key role. Whether this is desired by the players, however, must be decided by them themselves.

For strengthening regional networks and value-chain systems, it seems appropriate to rely on regional initiatives and organizations. They can help to increase the density of the network and the proximity of the individual players to each other. The focus should be on the respective business networks. These include, in addition to the purchase and sale of local food, joint activities for tourists (e.g. agri+touristic experiences and events) and in sales to end customers, as well as regular informal discussions.

As illustrated in Fig. 3, the actors in all three regions have so far been linked in their business relationships mainly through the purchase and sale of local food. Joint activities are less significant but could still hold some potential when it comes to strengthening local value chains.

6. Conclusions

The social network analysis has proven to be a helpful tool in the project "Agro+Tourism Grisons", which aimed at contributing to improve the co-operation between agriculture and

tourism. It is particularly suitable for preparing, visualizing and communicating structural information based on official statistics and results of surveys with local actors in an accessible form. This can support a well-founded problem analysis with representatives of different stakeholder groups, including the identification of existing bottlenecks and potentials, as well as an informed basis for participatory stakeholder processes (cf. Hediger et al. 2019).

The graphical representation of the regional networks, taking into account different aspects such as memberships and business relations – overall and differentiated according to their types – enables the elaboration and presentation of a differentiated analysis that can also be communicated to a wider audience with interested stakeholders in a simple and understandable way. Supplemented with the most important key figures for network analyses, the visualization helps to recognize structural peculiarities of the considered networks. This is an essential prerequisite for the recognition of potentials to expand and strengthen agri+tourism in the individual regions.

In this regard, it is also important to highlight the importance of individual innovative actors who have established a network with regional farmers through the sourcing of local food for their menu, such as individual hoteliers and restaurateurs in Lenzerheide. The role of these actors, who maintain direct contact with the end customers (guests), is essential, even if a broader-based initiative, as in Valposchiavo, is responsible for the development of an agri+touristic network. It should be noted that also in such networks the hoteliers and restaurateurs have a key function. In tourist regions, the direct marketing by farmers and food processors as well as the retail trade, which has not yet been included in the analysis, can also play an important role, since they also have direct contact with the guests. In addition, the possibilities of local organizations and associations should not be underestimated when it comes to establishing and expanding social networks and new business models.

For further work, however, it also appears necessary to place these analyses in a dynamic context of changing, evolving relationships and frameworks. For this purpose, quantitative or semi-quantitative analyses using statistical and qualitative data will be increasingly necessary. This applies in particular to research into the stability and resilience of regional value creation systems, not only at the interface of agriculture and tourism, but also including and considering other industries.

Particularly against the backdrop of the current Corona crisis and the associated challenges for individual players, industry associations and politicians, the question arises as to the resilience of existing regional economic structures and suitable measures for improving them. The same applies in the context of building a circular economy, which is at the top of the agenda for regional development in many places. The method of social network analysis, as illustrated in this report, provides an excellent and innovative tool to investigate the issues and challenges raised and to gain new insights. A particular strength of this approach is that it allows qualitative and quantitative research to be methodologically integrated and combined with a participatory approach. This ultimately allows for a joint validation of the findings and development of recommendations for action with the stakeholders involved. In the process, the individual stakeholders can also recognize potential for further development and consolidation of the social and economic relationships and structures themselves and, on this basis, take their own initiatives and create something new.

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APPENDIX

Valposchiavo - Network	Total-Network				Subnetwork Agricultur				Subnetwork Food Processors				Subnetwork Hotel industry / Gastronomy			
Netzwerk by operating location	Total		Valposchiavo		Total		Valposchiavo		Total		Valposchiavo		Total		Valposchiavo	
Attributes	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Actors	**254**	**100%**	**186**	**100%**	**125**	**100%**	**120**	**100%**	**58**	**100%**	**27**	**100%**	**70**	**100%**	**38**	**100%**
By location:																
In region	186	73.2%	186	100%	120	96.0%	120	100%	27	46.6%	27	100%	38	54.3%	38	100%
Outside region	68	26.8%	-	-	5	4.0%	-	-	31	53.4%	-	-	32	45.7%	-	-
By sector:																
Agriculture	125	49.2%	120	64.5%	125	100%	120	100%	-	-	-	-	-	-	-	-
Food Processors	58	22.8%	27	14.5%	-	-	-	-	58	100%	27	100%	-	-	-	-
Hotel industry / Gastronomy	70	27.6%	38	20.4%	-	-	-	-	-	-	-	-	70	100%	38	100%
Not assignable	1	0.4%	1	0.5%	-	-	-	-	-	-	-	-	-	-	-	-
Connections	**3821**	**100%**	**3700**	**100.0%**	**2561**	**100%**	**2560**	**100%**	**183**	**100%**	**152**	**100%**	**309**	**100%**	**305**	**100%**
By location:																
In region	3700	96.8%	3700	100%	2560	100.0%	2560	100%	152	83.1%	152	100%	305	98.7%	305	100%
Outside region	121	3.2%	-	-	3	0.1%	-	-	31	16.9%	-	-	4	1.3%	-	-
By type of cooperation:																
Business relations	545	14.3%	481	13.0%	49	1.9%	49	1.9%	62	33.9%	46	30.3%	6	1.9%	2	0.7%
Purchase & sale of local food (1/2)	270	7.1%	231	6.2%	25	1.0%	25	1.0%	23	12.6%	20	13.2%	2	0.6%	-	-
Joint offer/events (3)	18	0.5%	16	0.4%	3	0.1%	3	0.1%	-	-	-	-	1	0.3%	-	-
Joint logistics / storage (4)	6	0.2%	6	0.2%	4	0.2%	4	0.2%	-	-	-	-	-	-	-	-
Joint distribution to end customers (4)	79	2.1%	76	2.1%	5	0.2%	5	0.2%	14	7.7%	12	7.9%	-	-	-	-
Regular informal conversations (5)	78	2.0%	72	1.9%	12	0.5%	12	0.5%	-	-	-	-	1	0.3%	-	-
No specific indication (8/12)	94	2.5%	58	1.6%	-	-	-	-	25	13.7%	14	9.2%	2		2	0.7%
Memberships	3252	85.1%	3219	87.0%	2509	98.0%	2509	98.0%	120	65.6%	105	69.1%	303	98.1%	303	99.3%
Membership Associazione Agricola Poschiavo (9)	2013	52.7%	2013	54.4%	2013	78.6%	2013	78.6%	-	-	-	-	-	-	-	-
Membership Unione Contadini Brusio (10)	495	13.0%	495	13.4%	495	19.3%	495	19.3%	-	-	-	-		0.0%	-	-
Membership Associazione Artigiani e Commercianti Valposchiavo (11)	561	14.7%	528	14.3%	1	0.0%	1	0.0%	120	65.6%	105	69.1%	120	38.8%	120	39.3%
Membership Hotellerie Suisse Poschiavo (13)	91	2.4%	91	2.5%	-	-	-	-	-	-	-	-	91		91	29.8%
Membership Gastro Suisse Poschiavo (14)	91	2.4%	91	2.5%	-	-	-	-	-	-	-	-	91		91	29.8%
Membership Osti Brusio (15)	1	0.0%	1	0.0%	-	-	-	-	-	-	-	-	1	0.3%	1	0.3%
Future cooperation (7)	24	0.6%	22	0.6%	3	0.1%	2	0.1%	1	0.5%	1	0.7%	-	-	-	-
Key figures	Value		Value		Value		Value		Value		Value		Value		Value	
Average degree	15.043		19.892		20.488		21.333		3.155		5.63		4.414		8.026	
Density	0.059		0.108		0.165		0.179		0.055		0.217		0.064		0.217	
Average path length	3.001		2.829		2.487		2.482		1.726		1.432		1.859		1.837	
Average cluster coefficient	0.277		0.359		0.388		0.404		0.143		0.304		0.176		0.327	

Parc Ela - Network	Total-Network				Subnetwork Agricultur				Subnetwork Food Processors				Subnetwork Hotel industry / Gastronomy			
Netzwerk by operating location	Total		Parc Ela		Total		Parc Ela		Total		Parc Ela		Total		Parc Ela	
Attributes	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Actors	**144**	**100%**	**110**	**100%**	**66**	**100%**	**62**	**100%**	**42**	**100%**	**20**	**100%**	**36**	**100%**	**28**	**100%**
By location:																
In region	110	76.4%	110	100.0%	62	93.9%	62	100%	20	47.6%	20	100%	28	77.8%	28	100%
Outside region	34	23.6%	-	-	4	6.1%	-	-	22	52.4%	-	-	8	22.2%	-	-
By sector:																
Agriculture	66	45.8%	62	56.4%	66	100%	62	100%	-	-	-	-	-	-	-	-
Food Processors	42	29.2%	20	18.2%	-	-	-	-	42	100.0%	20	100%	-	-	-	-
Hotel industry / Gastronomy	36	25.0%	28	25.5%	-	-	-	-	-	-	-	-	36	100%	28	100%
Connections	**918**	**100%**	**873**	**100.0%**	**696**	**100%**	**695**	**100%**	**17**	**100%**	**11**	**100%**	**6**	**100%**	**5**	**100%**
By location:																
In region	873	95.1%	873	100%	695	99.9%	695	100%	11	64.7%	11	100%	5	83%	5	100%
Outside region	45	4.9%	-	-	1	0.1%	-	-	6	35.3%	-	-	1	17%	-	-
By type of cooperation:																
Business relations	180	19.6%	135	15.5%	44	6.3%	43	6.2%	13	76.5%	7	63.6%	4	67%	3	60%
Purchase & sale of local food (1/2)	128	13.9%	91	10.4%	22	3.2%	21	3.0%	12	70.6%	6	54.5%	2	33%	2	40%
Joint offer/events (3)	9	1.0%	7	0.8%	3	0.4%	3	0.4%	1	5.9%	1	9.1%	-	-	-	-
Joint distribution to end customers (4)	15	1.6%	14	1.6%	8	1.1%	8	1.2%	-	-	-	-	-	-	-	-
Regular informal conversations (5)	28	3.1%	23	2.6%	11	1.6%	11	1.6%	-	-	-	-	2	33%	1	20%
Memberships	738	80.4%	736	84.3%	652	93.7%	652	93.8%	4	23.5%	4	36.4%	2	33%	2	40%
Membership farmers club Albula (7)	563	61.3%	561	64.3%	561	80.6%	561	80.7%	-	-	-	-	-	-	-	-
Membership Gastro Suisse Section (9)	1	0.1%	1	0.1%	-	-	-	-	-	-	-	-	1	17%	1	20%
Membership trade association (10)	3	0.3%	3	0.3%	-	-	-	-	1	5.9%	1	9.1%	-	-	-	-
Membership Association Parc Ela (11)	171	18.6%	171	19.6%	91	13.1%	91	13.1%	3	17.6%	3	27.3%	1	17%	1	20%
Future cooperation (6)	2	0.2%	2	0.2%	-	-	-	-	-	-	-	-	-	-	-	-

Key figures	Value	Value	Value	Value	Value	Value	Value	Value
Average degree	6.375	7.936	10.545	11.21	0.405	0.55	0.167	0.179
Density	0.045	0.073	0.162	0.184	0.01	0.029	0.005	0.007
Average path length	2.599	2.541	1.753	1.718	1.118	1.182	1.333	1.4
Average cluster coefficient	0.16	0.201	0.264	0.282	0.023	0.051	0	0

Vaz/Obervaz, Churwalden, Tschiertschen - Network	Total-Network				Subnetwork Agricultur				Subnetwork Food Processors				Subnetwork Hotel industry / Gastronomy			
Netzwerk by operating location	Total		Vaz/Obervaz, Churwalden, Tschiertschen		Total		Vaz/Obervaz, Churwalden, Tschiertschen		Total		Vaz/Obervaz, Churwalden, Tschiertschen		Total		Vaz/Obervaz, Churwalden, Tschiertschen	
Attributes	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Actors	**106**	**100%**	**78**	**100%**	**43**	**100%**	**37**	**100%**	**28**	**100%**	**11**	**100%**	**35**	**100%**	**30**	**100%**
By location:																
In region	78	73.6%	78	100.0%	37	86.0%	37	100%	11	39.3%	11	100%	30	85.7%	30	100%
Outside region	28	26.4%	-	-	6	14.0%	-	-	17	60.7%	-	-	5	14.3%	-	-
By sector:																
Agriculture	43	40.6%	37	47.4%	43	100%	37	100%	-	-	-	-		-	-	-
Food Processors	28	26.4%	11	14.1%	-	-	-	-	28	100.0%	11	100%		-	-	-
Hotel industry / Gastronomy	35	33.0%	30	38.5%	-	-	-	-	-	-	-	-	35	100%	30	100%
Connections	**274**	**100%**	**231**	**100.0%**	**57**	**100%**	**57**	**100%**	**16**	**100%**	**6**	**100%**	**55**	**100%**	**52**	**100%**
By location:																
In region	231	84.3%	231	100%	57	100.0%	57	100%	6	37.5%	6	100%	52	95%	52	100%
Outside region	43	15.7%	-	-	0	0.0%	-	-	10	62.5%	-	-	3	5%	-	-
By type of cooperation:																
Business relations	165	60.2%	122	52.8%	12	21.1%	12	21.1%	13	81.3%	3	50.0%	6	11%	3	6%
Purchase & sale of local food (1/2)	88	32.1%	63	27.3%	4	7.0%	4	7.0%	6	37.5%	2	33.3%	2	4%	1	2%
Joint offer/events (3)	15	5.5%	10	4.3%	3	5.3%	3	5.3%	2	12.5%	1	16.7%	1	2%	-	-
Joint distribution to end customers (4)	16	5.8%	15	6.5%	3	5.3%	3	5.3%	1	6.3%	-	-	1	2%	1	2%
Regular informal conversations (5)	46	16.8%	34	14.7%	2	3.5%	2	3.5%	4	25.0%	-	-	2	4%	1	2%
Memberships	109	39.8%	109	47.2%	45	78.9%	45	78.9%	3	18.8%	3	50.0%	49	89%	49	94%
Membership Farmers' Association Section (7)	45	16.4%	45	19.5%	45	78.9%	45	78.9%	-	-	-	-	-	-	-	-
Membership Gastro Suisse Section (9)	28	10.2%	15	6.5%	-	-	-	-	-	-	-	-	15	27%	15	29%
Membership trade association (10)	21	7.7%	28	12.1%	-	-	-	-	-	-	-	-	28	51%	28	54%
Membership trade association (11)	-	-	21	9.1%	-	-	-	-	3	18.8%	3	50.0%	6	11%	6	12%
Future cooperation (6)	6	2.2%	3	1.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	3	5%	-	-

Key figures	Value	Value	Value	Value	Value	Value	Value	Value
Average degree	2.585	2.962	1.326	1.541	0.571	0.545	1.571	1.733
Density	0.025	0.038	0.032	0.043	0.021	0.055	0.046	0.06
Average path length	3.058	2.833	1.363	1.363	1.389	1	1.113	1.098
Average cluster coefficient	0.101	0.144	0.107	0.124	0.02	0.152	0.126	0.156