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Consumer purchasing behaviour for "biodiversity-friendly" vegetable products: increasing importance of informal relationships

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Abstract: The consumer's central role within biodiversity conservation networks may be connected to the process of reconnecting models of production and proven local consumption within "alternative food networks" that have the ability to conserve biodiversity and create sustainable production. This research focuses of the indirect relationships between consumers of biodiversity-friendly vegetable crops surveyed at the main farmers' markets in Sicily, revealing details of purchasing behaviour and the factors related to product choice using social network analysis (SNA) to analyse the social relationships. The research highlights the consumer preferences for local produce or areas with an identity connection or an ethical-social affinity, as shown by the convergence of themes such as "territorial promotion" and "Sicilian quality". This result confirms the role of low-volume producers and local communities in protecting biodiversity-friendly farming and renewing their importance in policy-making. Different consumers highlighted how important it is to design more effective measures to maintain and increase ecosystem resilience. Future development in this area will need to include empirical research on defining the motivations that induce consumers to collaborate with producers in the co-creation of values and anticipating the willingness of consumers to be more pro-active and participatory with biodiversity-friendly farmers in managing their relationships.

Keywords: consumption; food; origin; social network analysis; sustainability

Currently, biodiversity is increasingly associated with extremely contemporary issues in terms of the relationships between "biodiversity-friendliness", "food safety", and "economic, social, environmental and cultural sustainability" (Willis et al. 2009; FAO 2013; Glamann et al. 2015).

Politically, the European Union (EU) has set 2020 as the deadline for countering the loss of biodiversity, thereby seeking to play a significant role in the world stage. The EU Commission's Report on Agricultural Genetic Resources (European Commission 2013), highlighted the role of the consumer in safeguarding biodiversity. Therefore, consumers, farmers, food processors, and traders will be increasingly relied upon to work together and, through networking, to guarantee quality, diversity, and sustainability (Skouloudis et al. 2019). According to the EU, networking promotes products that are derived from local ecotypes or selected breeds and traditional diversified varieties, contributes to expanding the agri-food market, and encourages farmers to use economically sustainable but neglected species or those at risk of genetic erosion.

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As modern marketing theory has demonstrated, the consumer/customer takes on a central role in developing the market for products with wide genetic biodiversity and, inspired by "customer satisfaction" (Schaffner et al. 2015), identifies people or groups of people who influence choices and strategies even at the micro-trading level. Small producers who are holders of local, biodiversity genetic material are not always successful in interacting with their own consumers/customers or building customer loyalty towards the product to significantly influence their purchasing choices or their perceptions of a product's market value. By not considering the consumer as a real stakeholder, the strategic choices of companies and product traders in terms being biodiversity-friendly, promote a top-down method instead of a bottom-up one; thus, from the perspective of consumers' needs, behaviour, and perceptions, biodiversity genetic material is often polluted or not cultivated.

Furthermore, it must be emphasised that food consumption tends to change over time as a result of a whole series of variables; motivations, the basis of consumer purchasing decisions, change, e.g. nutritional needs, desire to satisfy food security needs, health, geographical origin, belonging (Cicia et al. 2002). The modern consumer, defined by more than one consumer-actor or consumer-author (Zonino 2006; Morace 2008; Codeluppi 2011), tends to assume a central role in the complex food system and, through the purchase and consumption act, decides what role to take in society and how to be perceived by society itself (Fabris 2003). Among other things, more and more consumers are currently influenced by the information they come into contact with and by the informal relationships that increasingly characterise their everyday life. The post-modern consumer is no longer an "isolated" individual but seems to be increasingly at the centre of a dense system of direct and/or indirect relationships that often find the aggregation factor around a brand or a consumer practice that may be favoured by, among other things, phenomena such as social networks, word of mouth. All this has led to international interest in the field of consumption studies (Roininen et al. 2006), which emerged from the early 1980s, focusing on the analysis, not of the individual, but relations between consumers (Ostergaard and Jantzen 2000). This can acquire a certain level of significance for the consumption of products that are an expression of local biodiversity, the choice of which often derives not only from personal reasons but also from induced trends and interactions with other consumers. In this regard, social network analysis (SNA) is a technique capable of visualising and measuring social relationships or links (ties) between subjects, groups, organisations, or other entities (nodes) involved in information exchange processes and knowledge (Foti et al. 2016).

The present paper adopts the SNA technique to examine the phenomenon of the consumption of agri-food products and, in particular, of products that are an expression of Sicilian horticultural biodiversity, aiming to highlight the existence of indirect relationships among consumers that are realised around motivations that lead to the choice of an agri-food product. As this paper examines the consumption of food products, a network approach was adopted, which is an approach still little investigated in the literature.

In particular, the present study focused on certain horticultural products that are an expression of the local Sicilian biodiversity and that have not always been sustained by the authorities and are at real risk of extinction (tomatoes, aubergines, onions, zucchini, artichokes, fava, broccoli, cauliflower), which are autochthonous ecotypes, different, and traditionally grown in the production area, with specific characteristics due to the typical link with the environmental and cultural characteristics of the territory. Since there are no real databases from which to extrapolate the local ecotypes, for the purposes of this paper, reference has been made to existing scientific literature on the subject (Frese et al. 2012; Timpanaro et al. 2013), the expertise of privileged witnesses of the supply chains (producers, nurserymen, associations, commercial intermediaries), as well as utilising the lists of traditional products and typical products (PAT) to map out the native vegetable ecotypes, which are the result of local cultural and production traditions (Bellia et al. 2015).

The network analyses of these indirect relationships among consumers were carried out utilising SNA to identify the strong and weak components of the local biodiversity-friendly markets using a purely bottom-up approach from the perception of an EU consumer.

SUMMARY OF LITERATURE ON ROLE OF NETWORKS IN PRESERVING BIODIVERSITY

An interesting biodiversity-friendly analysis on the role of networking was performed by Escobar (1998), who set out a series of parameters and players whose roles were influenced by the formal or informal

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existence of networks, including institutions, local communities, and ecosystems.

The importance of networks is reflected in:
– the production level for integrating conservation systems "*in situ*" and "*ex-situ*";
– the participatory approach that defines market-based incentives with high social values for the conservation of biodiversity-friendly produce;
– the exploitation of local resources through the "ori-Gin" network (200 producers from 50 countries);
– the introducing significant biodiversity-friendly measures beyond financial support and incentives (Siebert et al. 2006); and
– the specific nature of relationships within agri-food clusters to better understand the specificity and dynamics of innovation (Chiffoleau and Touzard 2014).

The consumer's central role within biodiversity conservation networks may be connected to the process of reconnecting models of production and proven local consumption within "alternative food networks" (Morris and Kirwan 2010; Brunori and Di Iacovo 2014; Migliore et al. 2015) for their ability to conserve biodiversity and create sustainable production systems (Johns et al. 2013; Simoncini 2015; Pinna 2016). These alternative food networks mean that local consumption models replace global consumption models as a consequence of the growing number of consumers interested in the impacts of their consumption choices on their own health, society, and the environment (Hand and Martinez 2010; Johns et al. 2013). Within local food supply chains, biodiversity/variety, a focus on local species, and farm ecosystem management are central issues for politicians and government decision-makers, industrialists, and society's decision-makers for their potential to overcome the impacts of more global and industrialised chains (Forssell and Lankoski 2015).

Consumer networks are significant for the future of markets because they stimulate development and new opportunities for less-common species, supporting the conservation of biodiversity-friendly produce; their influence lies in collective action in terms of the buying power of consumers and food product quality (Gruère et al. 2009). Furthermore, evidence of strong interpersonal ties within the transactions between small local producers and their customers is significant in the case of organic products and in general for "good foods", a term used for the ability to transmit the multiple attributes of food products and capture a heterogeneous series of components that generally make up a common set of values around food (Sage 2003).

Other studies have demonstrated that the factors fundamental to the development of EU organic agriculture include state financial support and the moral attitude of farmers who have perceived that this alternative and sustainable lifestyle can improve their quality of life and help them develop contacts with NGOs and other institutional networks within which consumer stakeholders operate (Michelsen and Soegaard 2001).

MATERIAL AND METHODS

Social network analysis (SNA) applications

SNA is a powerful tool for studying the formal and informal relationships among different subjects (Moreno 1951), and it has been widely applied to various social sciences and, more recently, to studying a variety of phenomena such as the dynamics and intensities of the relationships between different agents in territorial governance, the networks and food chains within ecosystems, and the defining models and behaviours in food consumption.

In studying the performance of business organisations, SNA has been applied to the strategic management of resources and the processes that define the operational strategies for obtaining a competitive advantage in markets subject to economic and social dynamism as may be seen in the definition of "stakeholder management theory" (Freeman 1984). SNA usefully identifies the stakeholder subjects and categories that influence the decision-making process and the management of natural resources to facilitate the formation and reinforcement of these relationships (Prell et al. 2009; Salpeteur et al. 2017).

In terms of territorial analysis and the evaluation of governance models, social networks allow the creation and management of complex networks of agents and different decision-making levels to measure the quality of participation at the local level. Networks have also become the subject of research and observations for "food webs" (Borgatti et al. 2009). The network approach has the capacity to reveal how single social ties aggregate into complex structures to create opportunities or constraints in the sharing and distribution of food resources.

Social networks also influence food behaviour such that certain models seem to be socially transmittable through various types of relationships. SNA has been used to understand the creation of new economic relationships between consumers and producers as well as new and innovative strategies for sustainable de-

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velopment, as in the case of solidarity purchasing groups (GAS) (Brunori et al. 2012).

Adopting a new consumer/producer organisational model to express the nature of the network and the significance of a territory's economic links stimulates local economic and social development as well as planning for public promotion policies (Scuderi et al. 2014). Therefore, SNA sheds light on food safety, safeguarding and exploiting biodiversity-friendly as well as traditional foods, the sustainable use of natural resources, and food education for a healthier and more balanced diet for a future that incentivises experimentation and relationships; SNA applies knowledge and resources to local economies and promotes the environmental and social well-being of territories (Kontoleon et al. 2007).

Specifications of model

In social network theory, society is seen and studied as essentially an extended and structured relationship network. This theory is based on the idea that every individual or agent relates to others, and his/her interactions mould and modify the behaviour of both.

Therefore, SNA aims to identify and analyse these ties between individuals (nodes) using different classes of measurement to examine network properties (e.g. cohesion and centrality) to find specific sub-networks (e.g. groups) and network similarities (e.g. automorphic and regular structural equivalence).

SNA uses topics, concepts, and tools from a branch of mathematics known as "graph theory". Graphs show a series of nodes or agents (N) and sets of links (L) consisting of ordinate pairs (i, j) that represent a link from node i (initial link node) to node j (final link node). Therefore, the path from node i to node j is a sequence of direct or indirect links with general coordinate ($uk_i uz_j$) with length k_i and z_i (i = 1, ..., n; j = 1, ..., n).

$$(uk_i uz_j) \quad (1)$$

In examining the consumption of agri-food products, this paper adopts a network approach, which is a perspective that is still little investigated. The study is concerned with investigating, through SNA, the relationships that are established between a sample of consumers around the event represented by the reasons for choosing vegetables with a wide biodiversity. Specifically, the survey was carried out in Sicily and aimed at a sample of consumers who make their purchases at a farmers' markets.

The indirect links between the customers for local biodiversity crops and farmers' markets are not only the most convenient but also the most effective because they are based on building relationships, reciprocal learning, with farmers' markets becoming a food alternative to conventional agriculture and an innovative governance model based on the principles of food sovereignty (Timpanaro et al. 2016).

From May to August 2017, 1 000 farmers' market customers were interviewed face to face, utilising a specially prepared questionnaire, regarding fresh, biodiversity vegetables and their purchasing of them. Stratified probability sampling was used to select interviewees. The criteria were the preference for this type of fresh fruit and vegetable venue and their average monthly frequencies of shopping for this produce.

These market visitors were questioned regarding their motivations for buying biodiversity products with a wide biodiversity, their buying behaviours were investigated, and any suggestions regarding "customer satisfaction" were collected to improve service quality, sales, and spread.

The questionnaire was divided into three parts: the first part aimed to investigate consumer behaviour by asking which products were purchased, the frequency, and the purchasing channels; the second part aimed to investigate the reasons driving the consumer to purchase; the third part collected consumer suggestions to improve the information and sales system. In the analysis phase, each part of the above questionnaire was used for the construction of three indirect relational systems: behavioural; motivational, and directional (or addressing). In order to obtain smart qualitative and quantitative SNA results, a keyword that identified the content was assigned to each question.

Positive or negative responses were assigned a 1 or 0, respectively, and three matrices of "keyword per consumer" were constructed and then analysed using UCINET 6.587 software. Subsequently, a co-membership matrix was made of only keywords in which each component indicated how many times two keywords were shared among consumers.

Every bimodal network was studied for density and centrality (Scott 2017). A function of node number and density indicates how many consumers, on average share two choice factors. For the non-direct chart of G, L links with N nodes, density D is defined as follows Equation (2):

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$$D = \frac{2 \times \left(\#L(G)\right)}{N(N-1)} \quad (2)$$

This parameter has been studied on non-weighted networks, but an opportune threshold value was dichotomised above.

Centrality is defined as the number of links per node. The present research studied the "degree" [$d(i)$] or number of links occurring on one node (links per node) [Equation (3)]:

$$d(i) = \sum_j m(i,j) \quad (3)$$

where $m(i,j) = 1$ if there is a link between nodes i and j, and $m(i,j) = 0$ if there is no such link; node "closeness" [$c(i)$] is the average distance between a node and all the other nodes in the network:

$$c(i) = \sum_i d(i,j) \quad (4)$$

where $d(i,j)$ is the number of links in a path that is shorter than node i to node j; "betweenness" [$b(i)$] is how often a node acts as a bridge along the shortest path between two nodes:

$$b(i) = \sum_{j,k} \frac{g_{jik}}{g_{jk}} \quad (5)$$

where g_{jk} is the number of shortest paths from node j to node k ($j, k \neq i$), and g_{jik} is the number of shortest paths from node j to node k via node i.

Research questions and questionnaire structure

This study set out to address research questions from the preliminary observation of what happens at farmers' markets and the demand/offer relationship created at the markets. The main questions addressed concerned: what specific was value attributed to product quality rather than the purchase price of fruit and vegetables; what importance was given to the local product and to know the producer and his/her practices; and what value was attributed to products with a high level of biodiversity.

To address these questions, consumer motivation was examined regarding "preference for local produce" (willingness to support local growers), "knowledge of certain aspects of sustainability", "value attributed to the quality of biodiversity vegetables per main attribute" (taste, low price), and the importance attributed to motivational aspects such as "health", "countryside conservation", "biodiversity-friendly" and "safety".

The "behavioural" aspects focused on digital data collection and social networks in making online purchases or joining discussion groups on food; the purchase frequency of biodiverse vegetables, especially specific types (tomatoes, potatoes), was also assessed.

The network analysis was designed to identify local products characterised by high levels of biodiversity with specific "logos" and "brands", the means of communication and diffusion of knowledge and traditions, and possible initiatives and support for the themes of "food education", "utilisation in school refectories", and "links with producers".

The questionnaire used nominal and ordinal scales to ensure significant statistical analyses. Multiple-choice questions were used to obtain preferences and, for some behaviour-related questions, a five-point Likert scale was used to measure the level of importance associated with each variable (from 5 = completely agree to 1 = completely disagree).

RESULTS AND DISCUSSION

Sample characteristics

The sample of consumers buying at farmers' markets was predominantly female (62%), aged 30–60 (74%), and married (71%) or co-habiting (21%), while the predominant socio-economic status was medium-high expressed by income [20 000–40 000 EUR (35%); 40 000–60 000 EUR (43%)], the predominant educational level was high school (46%) [followed by graduates (16%)], and the predominant occupation was entrepreneur (39%) [followed by an autonomous worker (31%)]. The sample was made up of nuclear families of three (39%) and four (28%) members, often with members under the age of 18 (77%), who spent on average 35 min at farmers' market (Table 1).

The most frequently bought produce items in descending order were vegetables, fruit, cheeses, cured meats, wine, milk, bread, conserves, dried fruit, biscuits, and legumes. On average, each visitor spent 32.00 EUR per visit.

Analysing matrices

The motivational, behavioural, and directional matrices were represented by graph theory (Figure 1). In these graphs, the keywords represented the network nodes, and the lines connecting the nodes were links, i.e. two or more consumers sharing two keywords. The link thickness was directly propor-

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tional to intensity, i.e. the number of consumers who shared two nodes.

The behavioural network was densest and most homogeneous in terms of the distribution of link intensity. This means that shared consumer behaviour was widely distributed regarding produce choice, manner, purchase frequency, and the use of it to increase awareness.

Almost 70% of the interviewees asked about what they intended to buy expressed a preference for vendors who displayed their produce. This result shows how important creating a trusting relationship with the vendor/producer is, indicating that this relationship could reduce information asymmetry, which is one of the main issues faced by agri-food products, especially biodiversity products. Social media is becoming an increasingly important instrument of customer loyalty in terms of the weekly assortment and availability as well as alternative purchase strategies being sent to customers.

Analysing density and centrality measurements

To carry out density measurements, it was necessary to dichotomise the co-membership matrix.

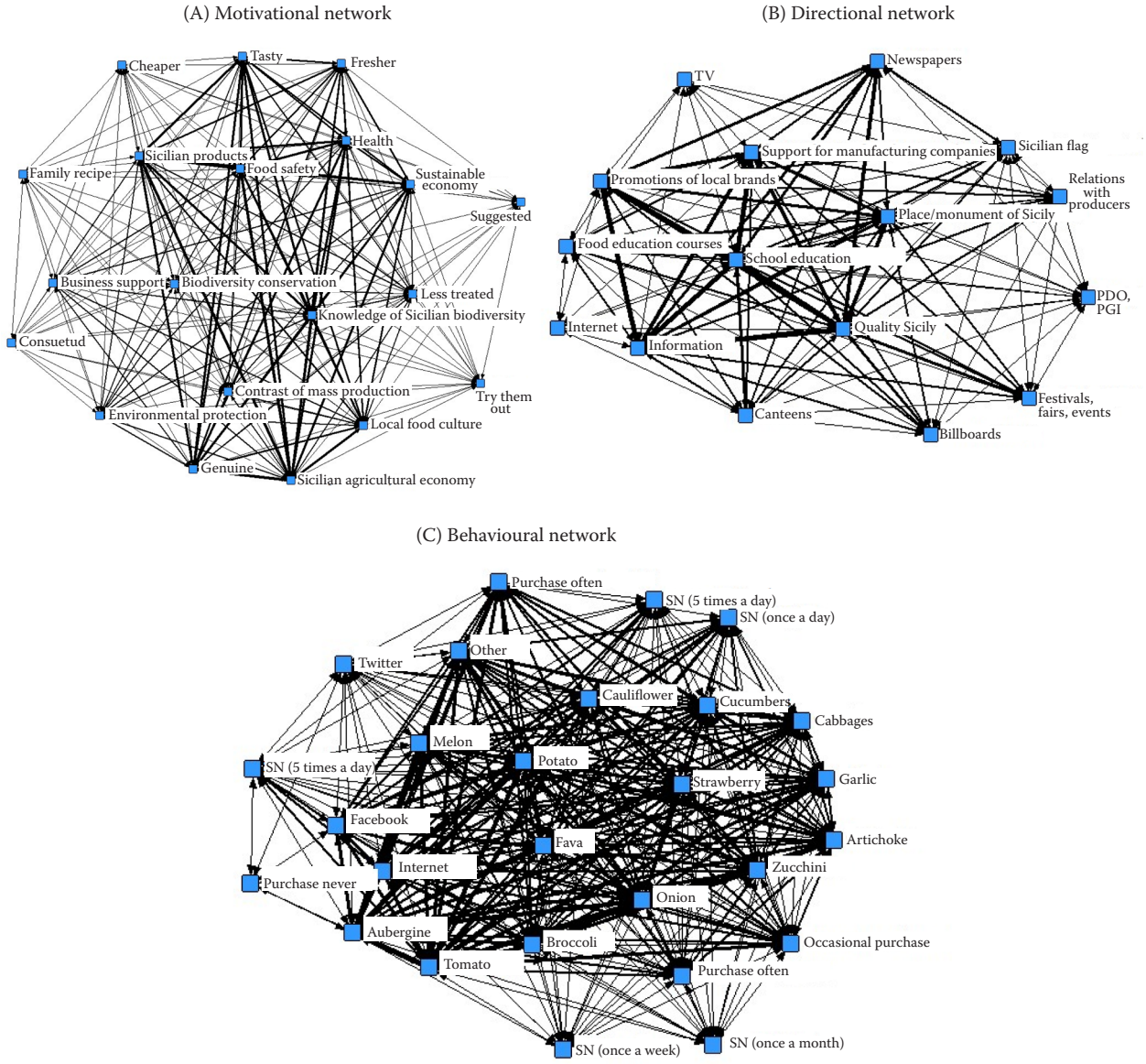

Figure 1. Graph of the "motivational", "directional" and "behavioural" networks (2017)

SN – social networks

Source: elaboration on data directly acquired

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Table 1. Demographic profile (2017)

Indication	Attributes	Percentage (%)
Gender	male	38.0
	female	62.0
Age	< 30	9.0
	31–45	36.0
	46–60	38.0
	> 60	17.0
Status	single	8.0
	married	71.0
	cohabiting	21.0
Income	< 20 000 EUR	10.0
	20 000–40 000 EUR	35.0
	40 000–60 000 EUR	43.0
	> 60 000 EUR	12.0
Occupation	self employed	31.0
	businessman	39.0
	government employee	12.0
	housewife	18.0
Educational level	none	8.0
	primary school	17.0
	middle school	13.0
	high school	46.0
	degree	16.0
Number of family member	1	8.0
	2	11.0
	3	39.0
	4	28.0
	5 and more	14.0
Time of stay	average (minutes)	35.0

Source: elaboration on data directly acquired

This mathematical process assigns a link every time the link intensity exceeds 50. The cut-off threshold takes into account a reasonable 5% error attributable to insincere consumer responses.

Every keyword in the motivational network was shared once on average by at least two consumers together with 55% of the keyword sets of the same network and 63% for the behavioural network and 45% for the directional network. These results imply that a good proportion of the consumer pool share common motivations, behaviours, and directions. However, the high standard deviations for all three networks mean that the average density value is not significantly showing a high level of consumers not sharing common motivations, behaviours, or directions (Table 2).

Table 2. Mean and standard deviations density values for "motivational", "directional" and "behavioural" networks dichotomised with threshold values equal to 50 (2017)

	Density (average value)	Standard deviation
Motivational network	0.5526	0.4972
Behavioural network	0.6338	0.4818
Directional network	0.4550	0.4975

Source: elaboration on data directly acquired

This result occurred because 70% of the consumers said that they had started buying biodiversity products at least two to three years previously for a healthier lifestyle; 25% ate biodiversity products items almost

Table 3. Degree (deg.), closeness (clos.) and betweenness (bet.) values normalised for behavioural pattern network (2017)

Keywords	Deg.	Clos.	Bet.
Tomato	0.412	1.000	0.018
Aubergine	0.383	1.000	0.018
Potato	0.314	1.000	0.018
Onion	0.310	1.000	0.018
Zucchini	0.258	0.975	0.012
Artichoke	0.249	0.975	0.012
Melon	0.238	0.975	0.012
Strawberry	0.236	0.975	0.012
Other	0.229	0.975	0.012
Internet	0.224	0.975	0.012
Fava	0.223	0.975	0.012
Broccoli	0.216	0.975	0.012
Facebook	0.216	0.975	0.012
Cauliflowers	0.210	0.975	0.012
Garlic	0.204	0.975	0.012
Purchase always	0.193	0.975	0.012
Cabbages	0.184	0.952	0.015
Cucumbers	0.158	0.952	0.011
Occasional purchase	0.121	0.929	0.010
SN* (once a day)	0.116	0.929	0.010
Purchase often	0.099	0.929	0.010
SN* (5 times a day)	0.057	0.908	0.013
SN* (+5 times a day)	0.055	0.888	0.008
Twitter	0.018	0.888	0.008
SN* (once a month)	0.011	0.868	0.007
SN* (once a week)	0.009	0.849	0.006
Purchase never	0.001	0.664	0.002

*consulting social network (SN)

Source: elaboration on data directly acquired

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Table 4. Degree (deg.), closeness (clos.) and betweenness (bet.) values normalised for consumer motivational network (2017)

Keywords	Deg.	Clos.	Bet.
Sicilian agricultural economy	0.446	0.982	0.164
Sicilian products	0.423	0.882	0.138
Genuine	0.391	0.787	0.110
Food safety	0.388	0.765	0.105
Knowledge of Sicilian Biodiversity	0.382	0.742	0.098
Tasty	0.345	0.687	0.085
Health	0.330	0.667	0.080
Sustainable economy	0.318	0.607	0.058
Local food culture	0.299	0.583	0.052
Fresher	0.257	0.55	0.045
Less treated	0.132	0.429	0.011
Environmental protection	0.128	0.421	0.009
Business support	0.078	0.392	0.004
Contrast of mass production	0.071	0.390	0.004
Consuetude	0.040	0.372	0.001
Biodiversity conservation	0.039	0.370	0.001
Cheaper	0.031	0.368	0.001
Family recipes	0.024	0.367	0.001
Try them out	0.018	0.363	0.001
Suggested	0.007	0.359	0.001

*consulting social network (SN)

Source: elaboration on data directly acquired

Table 5. Degree (deg.), closeness (clos.) and betweenness (bet.) values normalised for network orientation (2017)

Keywords	Deg.	Clos.	Bet.
Quality Sicily	0.477	0.592	0.277
School education	0.461	0.548	0.218
Information	0.420	0.516	0.170
Promotions of local brands	0.381	0.513	0.163
Support for manufacturing companies	0.362	0.503	0.107
Place/monument of Sicily	0.275	0.422	0.033
Newspapers	0.241	0.410	0.024
Canteens	0.160	0.405	0.035
Festivals, fairs, events	0.133	0.384	0.017
Billboards	0.129	0.382	0.017
Relationships with producers	0.118	0.376	0.007
Food education courses	0.113	0.376	0.006
Sicilian flag	0.111	0.371	0.004
PDO, PGI quality products	0.043	0.354	0.001
Internet	0.019	0.351	0.001
TV	0.019	0.349	0.001

*consulting social network (SN)

Source: elaboration on data directly acquired

daily or at least once a week (43%). Even dietary habits influence the propensity to buy biodiversity products items: in families with vegetarians or vegans, the frequency increased to 87%; it also rose in cases where one or more family members had specific needs (health issues/preferences, or generational dietary differences) that restricted their diets.

Among the motivations behind produce choice were health and safety (27%), environmental friendliness (20%), and greater control (14%); the economic factor (promotions or low prices) was only secondary.

Tables 3,4,5 show the results of degree (deg.), closeness (clos.), and betweenness (bet.) normalised for the behavioural pattern, consumer motivational and network orientation.

The three networks do not present single central keywords but a wide distribution of consumer sharing. The highest level of node attraction (keywords) was lower than 50% of all possible attracting nodes in the networks. This result means that consumers' shared choices are not concentrated on one precise idea but a package of ideas. This result is confirmed by the relatively low intermediate values that indicate that there is no repeatability of the sharing between two consumers of a clear behaviour, motivation, or direction.

Nevertheless, in terms of closeness, the directional network shows lower values and very low mean distances among the keywords shared by consumers.

Figure 2 shows the betweenness versus closeness versus degree values. It is even more evident how the behaviour network, with its relatively constant closeness and betweenness values, identifies varied consumer behaviour unconnected to clear rules.

However, the directional network exhibits a group of keywords such as "Sicilian quality", "teaching in schools", "information", "promoting local brands", and "supporting producers", whose centrality and intermediate values are higher than the others. Moreover, the closeness values are on average lower than that of the other networks, showing the convergent thinking of the consumers.

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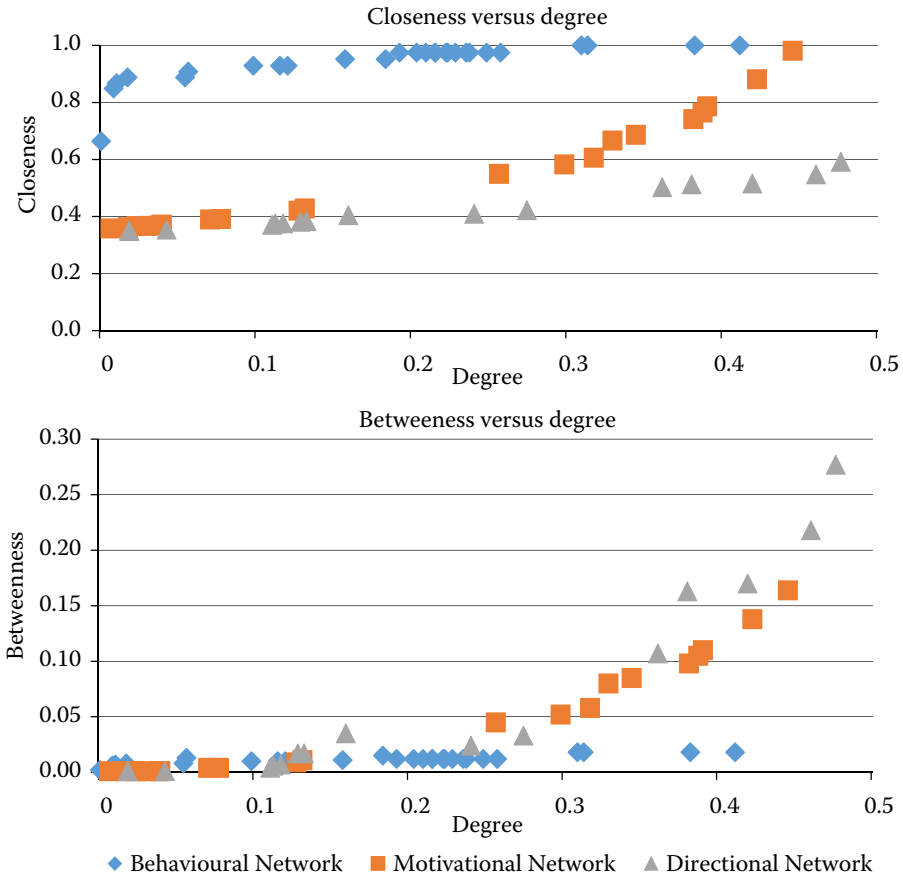

Figure 2. Closeness versus degree and betweenness versus degree for the networks analysed (2017)

Source: elaboration on data directly acquired

Finally, the motivational network shows high intermediate values and high power but tends to show high closeness values that indicate shared motivations but not consistently shared. This result tends to create groups of intellectual and numerous units.

CONCLUSION

This study on the indirect relationships among consumers interested in buying products with a wide genetic biodiversity highlights the role of farmers' markets, the ideal venue for their placement, and therefore where demand meets the supply of high-quality production linked to the seasons, location, proximity, and sustainable techniques.

Protecting biodiversity embraces environmental, cultural, and socio-economic issues, all of which are of specific interest to diet-aware consumers. Communication, produce promotion, and taste education represent an important opportunity for evaluating biodiversity-friendly products and, as the study shows, these factors become the object of specific interest for consumers, particularly if the information is acquired through ICT and social networking. The latter can strengthen relationships among producers and their backgrounds and becomes the means for guaranteeing the quality, freshness, and good crop practices (Scuderi et al. 2016).

Another result of this study is related to consumer preferences for local products or from areas with an identity connection or an ethical-social affinity (Fiut et al. 2019). This preference is shown by the convergence of themes such as "territorial promotion", "Sicilian quality" and "support for produce growers". This result confirms the role of low-volume producers and local communities in protecting biodiversity-friendly produce and renewal of their importance in policy-making. Different consumers highlighted how important it is to design more effective measures to maintain and increase ecosystem resilience. From the interest in the production of vegetables with a wide genetic biodiversity, the question arises as to whether this interest will lead to sustainable development for the territory through a return to re-cultivating

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small abandoned agricultural areas with "old" species and varieties, both for personal consumption and the local market.

The health implications of biodiversity-friendly produce appear significant, as shown by a growing interest in foods with functional properties (Figure 3). Overall, a circular system is generated among consumers, health, land, and farmers around a central axis of cultivation of species with high levels of biodiversity.

In their marketing strategies, biodiversity farmers must include consumer expectations in their planning and economies of scope as well as in resource specialisation and specific competencies. Their goals will be realised in efforts to protect natural resources and genetic varieties, as well as in protecting inherited knowledge and flavours by reproducing local genetic heritage.

The network that is created among consumers around the event represented by the motivations that drive the purchase and consumption of horticultural products, an expression of local biodiversity, can become a tool that can facilitate the flow of material and immaterial resources, while providing useful information that can be useful to public and/or private operators that can lead to appropriate production and market interventions and the development of appropriate marketing strategies aimed at the development of the territory as a whole. Future development in this area will need to include empirical research on defining the motivations that induce consumers to collaborate with producers in the co-creation of values and anticipating the willingness of consumers to be more pro-active and participatory with biodiversity-friendly farmers in managing their relationships and defining their value.

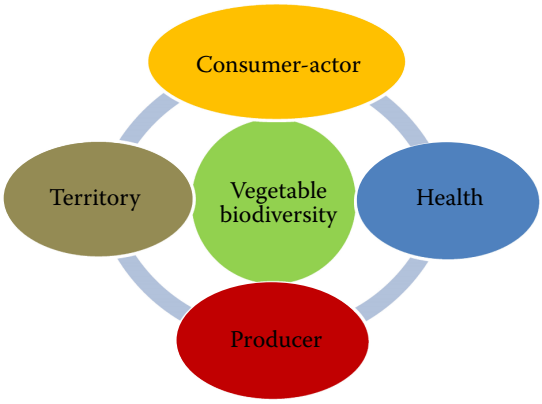

Figure 3. Possible aspects of interaction of vegetable biodiversity-friendly

Source: elaboration on data directly acquired

REFERENCES

Bellia C., Aderno C., Allegra V. (2015): Economic sustainability of a niche supply chain: The case of maletto strawberry. Quality – Access to Success, 16: 47–55.

Borgatti S.P., Li X. (2009): On social network analysis in a supply chain context. Journal of Supply Chain Management, Spring.

Brunori G., Rossi A., Guidi F. (2012): On the new social relations around and beyond food. Analysing consumers' role and action in Gruppi di Acquisto Solidale (Solidarity Purchasing Groups). Sociologia Ruralis, 52: 1–30.

Brunori G., Di Iacovo F. (2014): Urban food security and landscape change: A demand-side approach. Landscape Research, 39: 141–157.

Cicia G., Del Giudice T., Scarpa R. (2002): Consumers' perception of quality in organic food. British Food Journal, 104: 200–213.

Chiffoleau Y., Touzard J.M. (2014): Understanding local agri-food systems through advice network analysis. Agriculture and Human Values, 31: 19–32.

Codeluppi V. (2011): Il mito del consum-attore. Cultura e Comunicazione, 2: 12–18. (Italian)

Escobar A. (1998): Whose knowledge, whose nature? Biodiversity, conservation, and the political ecology of social movements. Journal of Political Ecology, 5: 53–82.

European Commission (2013): Report from the Commission to the European Parliament, the Council and the European Economic and Social Committee. Agricultural Genetic Resources from Conservation to Sustainable Use. European Commission, Brussels, 28.11.2013 COM, 838.

Fabris G. (2003): Il nuovo consumatore verso il postmoderno. Franco Angeli, Milano. (Italian)

FAO (2013): Sustainability Pathways: Sustainability Assessment of Food and Agriculture systems (SAFA). Food and Agricultural Organization of the United Nations, Rome.

Forssell S., Lankoski L. (2015): The sustainability promise of alternative food networks: an examination through "alternative" characteristics. Agriculture and Human Values, 32: 63–75.

Frese L., Bjorn G.K., Branca F., Ford-Lloyd B.V., Germeier C.U., Iriondo J.M., Negri V. (2012): Genetic reserve conservation of European crop wild relative and landrace diversity. Agrobiodiversity Conservation: Securing the Diversity of Crop Wild Relatives and Landraces, 1.

Fiut I.S., Urbaniak M. (2019): Education in defence of biodiversity. Will the ecological and ethical footprint counteract environmental changes? Edukacja wobronie bioróżnorodności. Czy ślad ekologiczno-etyczny zrównoważy zmiany środowiskowe? Problemy Ekorozwoju, 14: 73–78.

https://doi.org/10.17221/377/2018-AGRICECON

Foti V.T., Scuderi A., Stella G. (2016): The study of indirect relationships among the consumers of products of the Buffalo Chain. Quality – Access to Success, 17: 205.

Freeman R.E. (1984): Strategic Management: A Stakeholder Approach. Pitman, Boston.

Glamann J., Hanspach J., Abson D.J., Collier N., Fischer J. (2015): The intersection of food security and biodiversity conservation: a review. Regional Environmental Change, 17: 1303–1313.

Gruère G., Nagarajan L., Oliver King E.D.I. (2009): The role of collective action in the marketing of underutilized plant species: Lessons from a case study on minor millets in South India. Food Policy, 34: 39–45.

Hand M.S., Martinez S. (2010): "Just what does local mean?" Choices. The Magazine of Food, Farm and Resources Issues, 25.

Johns T., Powell B., Maundu P., Eyzaguirre P.B. (2013): Agricultural biodiversity as a link between traditional food systems and contemporary development, social integrity and ecological health. Journal of the Science of Food and Agriculture, 93: 3433–3442.

Kontoleon A., Pascual U., Swanson T. (2007): Biodiversity Economics. Cambridge University Press.

Michelsen J., Søgaard V. (2001): Policy Instruments for Promoting Conversion to Organic Farming and Their Effects in Europe 1985–97. University of Southern, Denmark.

Migliore G., Schifani G., Romeo P., Hashem S., Cembalo L. (2015): Are farmers in alternative food networks social entrepreneurs? Evidence from a behavioral approach. Journal of Agricultural and Environmental Ethics, 28: 885–902.

Morace F. (2008): Consum-Autori. Le generazioni come imprese creative. Libri Scheiwiller, Milano. (Italian)

Moreno J.L. (1951): Sociometry, Experimental Method and the Science of Society. An Approach to a New Political Orientation. Beacon House, New York.

Morris C., Kirwan J. (2010): Food commodities, geographical knowledges and the reconnection of production and consumption: a case of naturally embedded food products. Geoforum, 41: 131–143.

Ostergaard P., Jantzen C. (2000): Shifting perspectives in consumer research: from buyer behavior to consumption studies, 2000. In: Codeluppi V.: Tra produzione e consumo. Processi di cambiamento della società italiana. Franco Angeli, Milano, 2004: 19–20. (Italian)

Pinna S. (2016): Alternative Food Networks, agro-biodiversity and landscape protection: lessons from two rural parks. Regional Studies, Regional Science, 3: 455–462.

Prell C., Hubacek K., Reed M. (2009): Stakeholder analysis and social network analysis in natural resource management. Society and Natural Resources, 22: 501–518.

Roininen K., Arvola A., Lähteenmäki L. (2006): Exploring consumers' perceptions of local food with two different qualitative techniques: Laddering and word association. Food Quality and Preference, 17: 20–30.

Sage C. (2003): Social embeddedness and relations of regard: alternative 'good food' networks in south-west Ireland. Journal of Rural Studies, 19: 47–60.

Salpeteur M., Calvet-Mir L., Diaz-Reviriego I., Reyes-García V. (2017): Networking the environment: social network analysis in environmental management and local ecological knowledge studies. Ecology and Society, 22: 41.

Skouloudis A., Malesios C., Dimitrakopoulos P.G. (2019): Corporate biodiversity accounting and reporting in mega-diverse countries: An examination of indicators disclosed in sustainability reports. Ecological Indicators, 98: 888–901.

Scuderi A., Sturiale L., Bellia C., Foti V.T., Timpanaro G. (2016): The redefinition of the role of agricultural areas in the city of Catania. Rivista di Studi sulla Sostenibilita. (Italian)

Scuderi A., Timpanaro G., Cacciola S. (2014): Development policies for social farming in the EU-2020 strategy. Calitatea, 15 (S1).

Scott J. (2017): Social Network Analysis. 4th Ed. SAGE Publications, Los Angeles, London.

Siebert R., Toogood M., Knierim A. (2006): Factors affecting european farmers' participation in biodiversity policies. Sociologia Ruralis, 46: 318–340.

Schaffner D., Demarmels S., Juettner U. (2015): Promoting biodiversity: do consumers prefer feelings, facts, advice or appeals? Journal of Consumer Marketing, 32: 266–277.

Simoncini R. (2015): Introducing territorial and historical contexts and critical thresholds in the analysis of conservation of agro-biodiversity by alternative food networks, in Tuscany, Italy. Land Use Policy, 42: 355–366.

Timpanaro G., Di Vita G., Foti V.T., Branca F. (2013): Landraces in Sicilian peri-urban horticulture: A participatory approach to Brassica production system. Acta Horticulturae, 1005: 213–220.

Timpanaro G., Scuderi A., Foti V.T. (2016): A network for the conservation of agrobiodiversity of local ecotypes. Acta Horticulturae, 1142: 163–170.

Willis K.J., Bhagwat S.A. (2009): Biodiversity and climate change. Science, 5954: 806–807.

Zonino M.R. (2006): Il consumAttore. Cleup, Padova. (Italian)

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