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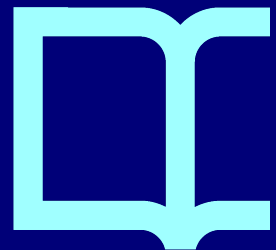
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Agroecology prosumption: the role of CSA networks

Abstract:

Community Supported Agriculture (CSA) promotes local and fairer food consumption, based on social innovation. CSAs also become active nodes for agroecology prosumption as a tool for socio-economic transformation, but have limitations in terms of their sustainability. The tools provided by the Social and Solidarity Economy (SSE) and the adoption of digital platforms can be a valuable instrument to counter these limitations. This research focuses on identifying which CSA models have greater prosumer potential, and what role Information and Communication Technologies (ICT) play in this challenge. The study focuses on the analysis of the agroecological network generated by the 56 CSAs in the city of Barcelona, and their 177 providers. The results show that professionalized CSA's with better ICT adoption and constituted as agroecology platform cooperatives, have a greater impact and an increased potential for promoting a food consumption model based on agroecology.

Keywords: Agroecology; prosumption; CSAs; ESS; ICT

1. Introduction

The term 'Community Supported Agriculture' was conceived when two European farmers, Jan Vander Tuin and Trauger Groh, influenced by Rudolf Steiner's biodynamic agriculture ideas, began parallel projects in the United States, during the mid-1980's. (McFadden, 2004). Beyond this type of production, CSAs are conceived to promote alternative markets, creating direct connections between producers and consumers with the goal to achieve fair prices and wages (Galt, 2013). CSAs reinforce the usual degree of involvement between consumers and other stakeholders, creating a stronger consumer-producer relationship (National Research Council, 2010).

There are three main types of CSAs: 1) Shareholder CSAs, formed by a core group of members who make administrative decisions and collectively hire a farmer; 2) Subscription CSAs, initiated by the farmer who maintains ownership of the operation and; 3) CSAs that operate as non-profit organizations, where decisions are made by a board of directors in collaboration with paid or volunteer staff (Harmon, 2014). Despite this basic characterization, each territory has developed its own CSA models. For example, the CSA Network in the UK considers these four typologies: producer-led, consumer-led, producer-community partnerships and, community-owned farms (CSA Network UK, n.d.).

CSAs are framed as a part of the models of the Short Food Supply Chains (SFSCs) which includes food consumption typologies, such as community orchards, direct purchase from the producer and food producers' sponsorship (Binimelis and Descombes, 2010). One of the main elements used to distinguish CSAs are their type of management; if the organization is fully managed by volunteers, or if some of

the tasks are paid (Volz et al., 2016). The professionalism of the CSAs, or the involvement of intermediaries as providers have been some controversial points of CSAs management (Martín et al., 2017).

Regardless of whether an organization is run by volunteers or professional staff, CSAs are considered as social innovation practices in a set of roles for active consumership, including prosuming and co-innovation, which should foster sustainability in agroecology food consumption (Blättel-Mink, 2014). Social innovation promoted by CSAs are a paradigmatic case of community active consumership, because the community organizes the production of food for a certain amount of people and consumes the goods (Bietau et al., 2013).

Despite the evidence of how CSAs (as a part of SFSCs), contribute to the sustainable development (Galli and Brunori, 2013) and promote social innovation as communities active consumerships (Blättel-Mink, 2014), some scholars, based on CSAs field research, have highlighted a challenge with their own sustainability (Galt, 2013; Martín et al., 2017). One of the main issues is the relatively small-scale of some CSAs, resulting in a low income for food producers (National Research Council, 2010; Blättel-Mink, 2014). The deficient economic balance when the CSA is small, or the lack of commitment from members during holidays, are some of the reasons why a change of the scale to achieve project economic sustainability is needed (Martín et al., 2017).

To face the challenge of sustainability, Martín et al. (2017) propose that the agroecological cooperative projects in general, and the CSAs in particular, adopt the cooperation tools and strategies which the Social and Solidarity Economy (SSE) has developed. Agroecology projects need to work from the logics of SSE to contribute to

their economic, social, ecological and political sustainability. In this way, SFSCs, considered from a joint perspective of agroecology and SSE, are offered as an umbrella for the democratization of the agri-food systems (Schwab do Nascimento et al., 2020).

Since the early 2000s there has been a noticeable spike in the uptake of technologies to support food sharing activities such as CSAs (Davies, 2019; Espelt et al., 2015). Many of the claims around the sustainability of such technologically augmented sharing are however, still to be proved empirically (Davies et al., 2018). Rather than focusing only on the ICT dimension of sharing initiatives, it is important to have a socio-technical-ecological perspective to understand both the practices and impacts of food sharing (Davies and Doyle, 2015).

At this point, the role of CSAs has been observed as an active community of consumers, in the perspective of social innovation, and the greatest challenges of sustainability and scalability of projects.

In the next section, SSE and digital technologies are defined and contextualized as a potential instrument for the scalability of CSAs. Further, the hypothesis on which the research is structured and the methodology, results and conclusions are presented.

2. The role of SSE and digital technologies for CSAs' network scalability

SSE is recognized as “a broad set of organizations and enterprises that are specifically geared to producing goods, services and knowledge while pursuing economic and social aims and fostering solidarity” (United Nations, 2014). The definition of SSE feeds off the conceptualization of the social and solidarity economies and has been extended in different sectors such as mobility, education,

food or financial services to attend the needs of the communities and their development (Barea, 1990; Calle Collado and Casadevente, 2015). SSE organizations promote economic activities through relationships of solidarity, reciprocity, self-organization, articulation, self-management, cooperation and inclusion, thus avoiding economic, social and political issues generated by the neoliberal capitalist economy (Singer, 1998; Laville, 2004; Lechat, 2007 among others). In counterpart to capitalism, SSE allows the construction of a social market, which is democratic, ecological and supportive by nature (Garcia, 2002). For this reason, according to Laville and Roque Amaro (2016), SSE should be the basis of social innovation and its promotion.

Focusing on agroecology and with the goal to escalate it, Martín et al. (2017) propose that agroecology projects adopt the cooperation strategies promoted by SSE to improve the collaboration among them. Agroecology networks based on local food are responsible for the income remaining at the local level, thus forming an input chain of resources and jobs. This improves the economic situation of people and even eradicates poverty, strengthening the grassroots organization, preserving the environment and restoring relationships within the community of solidarity through SSE and agroecology (Schwab do Nascimento et al., 2020).

In this context, ICT promotes new types of potential relationships, as they create a network of interconnections within the framework of a network society (Castells, 1996). Through social media platforms, users can create profiles and connect among them (Boyd and Ellison, 2007), generating new flows of content (Cormode and Krishnamurthy, 2008). These networks can be dense if the number of links of each node is close to the total number of nodes, or sparse if it has fewer links than the

maximum possible. The result of the close relationship between members of the same collective, open and diffused, is a consequence of the flexibility of these same organizations (Wellman et al., 1997).

Regarding the impact of ICT in the network society and focusing on the economic perspective, the sharing economy allows for the exchange of distributed groups of people (matching supply and demand) supported by digital platforms (Codagnone et al., 2016). Sharing economy has created high sustainability expectations due to its potential to contribute to a sustainable development of society (Botsman and Rogers, 2011; Heinrichs, 2013; Cohen and Kietzmann, 2014). Despite this, the sharing economy has generated huge controversy due to the different types of models (Codagnone et al., 2016), from the most extractionist, associated to new forms of platform capitalism, to the more collaborative ones such as platform cooperatives (Srnicsek and De Sutter, 2017). The characterization between models is a key point, because the design of a digital platform is correlated to its model of sustainability and its social, economic and environmental impact (Fuster Morell and Espelt, 2019). In this regard, platform cooperativism promotes digital platforms based on cooperative principles that ensure a democratic management of a digital platform (Scholz, 2016). This new type of relation between cooperativism principals and ICT should adopt Free Open Source Software (FOSS) and open licenses (Fuster Morell et al., 2016) to take platform cooperativism to an open cooperative model (Bauwens, 2014).

The expansion of digitalization has also impacted upon the sector of sharing food from the 2000s, when digital technologies became more widely accessible, affordable and easier to use (Davies et al., 2017) and the salient role that ICT has as

a facilitator in the relational network established between the agents that take part in it, thus becoming a key characteristic element of the new agroecological consumer cooperativism (Espelt et al., 2019).

3. Research question: Which CSA networks promote agroecology prosumption and how is this done?

This article aims to analyze the role of CSA networks as a promoter of agroecology prosumption. In the previous sections, the contribution that CSAs have for the promotion of local and fair food consumption has been observed, matching producers and consumers. In addition, SSE tools and ICT adoption have been presented as potential instruments to challenge the sustainability of the CSAs.

At this point, this research will study the characterization of CSA agroecology networks, in order to analyze the connection between CSAs and their providers with SSE principles. Moreover, the analysis focuses on the role that digital platforms and social media have in the different organizations that configure a CSA's network. According to the different CSAs' models, the study takes into account if the entity is fully managed by volunteers or if there are some paid tasks.

The methodology and findings are summarized below in a way that addresses this article's research aim: to identify and understand the models of those CSAs which promote a sustainable agroecology prosumption, considering their connection with SSE principles and ICT adoption.

4. Methodology

The methodology is based on a triangulation of methods (Patton, 1999, Della Porta

& Keating, 2008), qualitative interviews with the main stakeholders (CSAs and suppliers) and quantitative web content analysis. This type of methodology has been performed in previous research around sharing food and cooperation which involves the impact of ICT (Juliá Igual et al., 2006; Arcas Lario and Meroño Cerdán, 2006).

4.1 Sample

This research analyzes the CSA agroecology network of Barcelona, which means the 56 CSAs identified in the city (Espelt et al., 2015) and their 177 suppliers (163 direct producers and 14 intermediaries).

4.2 Data collection

Data collection has been performed from November 2016 to April 2017 by semi-structured interviews and a netnography.

4.2.1 CSAs

The outline of the interview has three main parts focused on characterizing each entity, assessing the SSE's principles and rating the impact of digital platforms.

Firstly, regarding the characterization of the CSA, the interview takes consideration of the type of organization management (voluntary or professional), the number of members affiliated, and the producers and intermediaries involved in food supply. Secondly, in relation to the SSE's principles, the interview gains information about the proximity of CSAs' suppliers, the type of relationship with them in terms of fair trading and, the grade of cooperation the CSA has with other SSE entities. This part of the interview takes advantage of the variables which measure the level of an organization's accomplishment of the SSE's principles at Catalan level ("The 15 Pam a Pam criteria that define the solidarity economy," 2015). Of these, the three variables used here — proximity, fair trade, and cooperation — are assessed using a

scale from 0 (not accomplished) to 5 (fully accomplished). Thus, each variable is discriminatory (either it is accomplished or not) and the different gradations dictate their level of excellence. In the case of proximity, the grade of accomplishment is given by the following scale (from less to more excellence): 1. If the CSA prioritizes buying local products; 2. If there has been an internal reflection and there is a policy that limits the origin of the products or supplies that are bought; 3. If awareness materials are provided to the CSA's members to promote the local economy; 4. If there is a commitment to co-responsibility with local production (e.g., assuring a minimum of purchase); 5. If the CSA participates in political advocacy (i.e. pressure on decision-making bodies to modify structures or legislation) to strengthen local economies. Regarding fair trade, the gradation considers (from less to more excellence): 1. If the CSA attempts to promote fair trade products that guarantee decent wages and the minimization of intermediaries; 2. If there has been an internal reflection and it is considered the policy of the entity to prioritize the purchase of fair trade products or those that guarantee decent wages and the minimization of intermediaries; 3. If awareness materials are provided to the CSA's members to promote fair trade consumption; 4. If dialogue channels are promoted when setting the exchange prices of goods or services; 5. If the CSA participates in political advocacy to promote fair trade. In relation to cooperation, the grade (from less to more excellence) is: 1. If the principles and activities of the SSE are disseminated by the CSA; 2. If the group has an SSE provider at least; 3. If the SSE's suppliers are sought when a product or service is needed; 4. If most of the CSA's suppliers belong to SSE; 5. If the CSA contributes to the creation of a social market in a strategic way. Hence, these three variables adopted from Pam a Pam value the consumption of

local products in fair trade conditions, the promoting of SSE principles as a minimum accomplishment and, the political commitment and structural transformation for a maximum level of excellence.

Finally, to rate the impact of digital platforms, the CSAs have been asked to confirm:

1) The value given to digital platforms for CSA management (this variable is also discriminatory: 0 indicates digital platforms are not used, while the scale from 1 to 5 grades its relevance); 2) The digital platforms used for the management organizational consumption activity; 3) If and how the CSA uses social media platforms to interact with their community (e.g., cooperative members, suppliers or other CSAs). In addition, a netnography of the CSA websites and social media profiles has been performed to collect data about if and how digital technologies are used, the update frequency and the number of followers.

4.2.1 Suppliers

The 14 intermediaries of Barcelona's CSAs have also performed the second part of the interview, which considers if an organization accomplishes SSE's values of proximity, fair trade and cooperation and the grade of excellence. Furthermore, a netnography of the 177 CSAs' suppliers — both the 163 direct producers and the 14 intermediaries — websites and social media profiles has been performed to collect data about if and how digital technologies are used.

4.3 Data Analysis

Data collection has afforded quantitative data (e.g., level of accomplishment of SSE's variables or the assessment of value given to digital platforms) and qualitative data (e.g., a detailed report on how each SSE's variable is accomplished or the description of a technological tool which has been adopted). The following details

how the data is analyzed with respect to CSAs, their suppliers (direct producers and intermediaries), and the whole agroecology network (Espelt, 2020).

4.3.1 CSAs

To analyze a CSA's data, descriptive statistics have been conducted considering: the percentage of each type of entity (voluntary versus professional); average members; proximity; fair trade and cooperation SEE principles' accomplishment assessment; level of digital adoption; digital tools rate and, FOSS platforms usage and social media presence. As previously indicated, this analysis has been conducted taking into account if the CSA management is fully run by volunteers or has professional tasks.

4.3.2 Suppliers

To analyze the suppliers' typology, a descriptive statistical analysis to differentiate between direct producers and intermediaries has been performed on the suppliers of each CSA. To assess the grade of accomplishment of a CSA's intermediaries, a descriptive statistic of the three variables of the SEE (proximity, fair trade and cooperation) has been conducted. The impact of digital adoption of a CSA's suppliers, performed by a netnography, has been included in the descriptive statistics in order to rate it.

4.3.3. Network analysis

A comparative analysis of SSE's principles between CSAs and their intermediaries has been performed in order to balance the grade of excellence of each type of organization. In addition, a comparative analysis of the use of the whole actors of the network (CSAs, producers and suppliers) has been carried out to observe the grade of use of social media.

Finally, to examine the structure of relationships between social entities, a social network analysis (Wasserman and Faust, 1994) has been conducted. The data about the CSAs and their suppliers (producers and intermediaries) has been analyzed by using Gephy (an open-source network analysis and visualization software) to identify the key actors, the relations among them, and the centrality of certain nodes (Sudhahar et al., 2015).

5. Results

This section is divided into three parts, which correspond to the analysis of the results of the CSAs (Table 1), their suppliers and the agroecology network.

5.1 CSAs

5.1.1 Characterization

Most of the CSAs are constituted by voluntary members (91.2%). The remainder (8.8%), have some paid members who take care of specific tasks such as economic and logistics management. In this regard, CSAs with professionalized tasks have a higher average of members (72) compared to the groups run by volunteers (29). In addition, all the CSAs with professionalized tasks analyzed do not have a specific membership limit, while all those run voluntarily do. If new members want to join the CSA, a waiting list is set up and, when it has a minimum number of members, a new entity is created.

5.1.2 SEE principles accomplishment

CSAs accomplish the proximity SSE variable without significant variation between the volunteer (4.05 out of 5) and professional (4 out of 5) groups. CSAs prioritize purchasing local products after performing an internal consideration process to establish a geographical scope limit to the products purchased. At the same time,

informational materials to promote proximity trade are provided to the members of the entity. Some CSAs also have a political commitment (e.g., participating in spaces of political advocacy at local level).

Fair trade analysis shows a good level of accomplishment, with a small variation between volunteer (3.65 out of 5) and professional (3.6 out of 5) groups. This indicates that CSAs try to purchase fair trade products, with a minimization of intermediaries after entities have undertaken an internal consideration process. Likewise, CSAs also offer informational materials to promote fair trade and communication channels with producers to set prices. Most CSAs visit their main producers regularly and encourage them to be involved in assemblies, while some groups even help producers with hard tasks such as sowing or harvesting. In addition, it is worth noting that the majority of CSAs do not consider intermediaries (such as second grade cooperatives) as capitalism intermediaries because these organizations are considered to be part of SSE.

While proximity and fair trade variables remain similar, cooperation with other SSE entities highlights a significant variation between voluntary (2.1 out of 5) and professional (4.2 out of 5) CSAs. Voluntary groups spread the SSE principles and their organizational activities, while professional CSAs search for SSE suppliers whenever a product or service is needed, and most of their suppliers are part of SSE. Some of these intermediaries even accomplish excellence by strategically contributing to the creation of the social market.

5.1.2 ICT adoption

Regarding the use of digital platforms, 82% of voluntary CSAs have a type of digital platform for organization management, compared to 100% of professional CSAs.

Professional CSAs value slightly higher the relevance of the digital platform than voluntary ones (4.2 compared to 3.9). With regard to the type of technology, two trends have been observed with no significant variance between voluntary and professional CSAs: the majority of entities (66%) have adopted private software (especially Google tools); while the remainder have created or adopted FOSS. The development of FOSS platforms has taken three forms:

- 1) *A member or a group of members develop a digital platform used only by the CSA:* The technology working-group — sometimes composed of a single volunteer member — has developed a digital platform which is only used internally by the CSA. Because it is a voluntary task, sometimes, when the person responsible or the team in general have less time or leave the entity, the platform cannot be updated.
- 2) *CSA develops a digital platform that is shared with other entities:* A volunteer or group of volunteers, has developed a platform which has been adopted by other CSAs. The majority of time the developers voluntarily help those entities which adopt the platform. Sometimes they even help to personalize certain functions that the other CSA adopters request. This form of FOSS development improves the use of the platform, but usually the community around software is small and limited. Thus, technological development depends on a small group of volunteers.
- 3) *CSA platform cooperative:* Some professional developers search sources to develop a digital platform and its maintenance. In the case of Barcelona, Katuma is an agroecology consumer consumption platform based on commons collaborative economy values. The project began in 2012 and was

developed by Coopdevs, a non-profit cooperative focused on free and open-source software to promote social and solidarity economy projects. From early 2017, Katuma became part of the international project Open Food Network. The digital platform is managed by a cooperative whose members are producers, second grade and consumer organizations, with a democratic decision-making process. The platform, which obtains funding from projects promoted by public administration (it is also a part of a H2020 project: Platform Labour in Urban Spaces), has participated in a match-funding campaign and receives monthly quotas from its members. Thus, in this third form of FLOSS development, the sustainability of the platform, its maintenance and improvements are more assured.

Table 1: CSAs' variables studied summary.

	Voluntary CSAs	Professional CSAs
Characterization	91.2%	8.8%
Members average	29	72
Proximity	4.05 out of 5	4 out of 5
Fair trade	3.65 out of 5	3.6 out of 5
Cooperation	2.1 out of 5	4.2 out of 5
Digital adoption	82%	100%
Digital assessment	3.9 out of 5	4.2 out of 5
FLOSS	34%	34%
Social media	53%	100%

Regarding their social media footprint, the results show that 53% of voluntary CSAs

have opened a social media profile at least, while 100% of the professional CSAs have one. Nonetheless, their usage varies significantly: while professional CSAs update regularly, the voluntary entities update only occasionally, depending on the time that the responsible volunteer has. The content shared is about responsible food management (e.g., food waste) or to amplify political campaigns (e.g., against Transatlantic Trade).

5.2 Suppliers

The results (Table 2) show that there is a significant difference between suppliers used by both types of CSAs: 91.7% are direct producers (163) and 8.3% intermediaries (14). However, 23 of the 56 CSAs have an intermediary supplier.

Regarding the three key SSE variables studied, it is noted that fair trade achieves the highest score (3.5 of 5), followed by proximity (3.25 of 5) and cooperation (2.5 of 5).

Table 2: Intermediaries ESS variables studied summary.

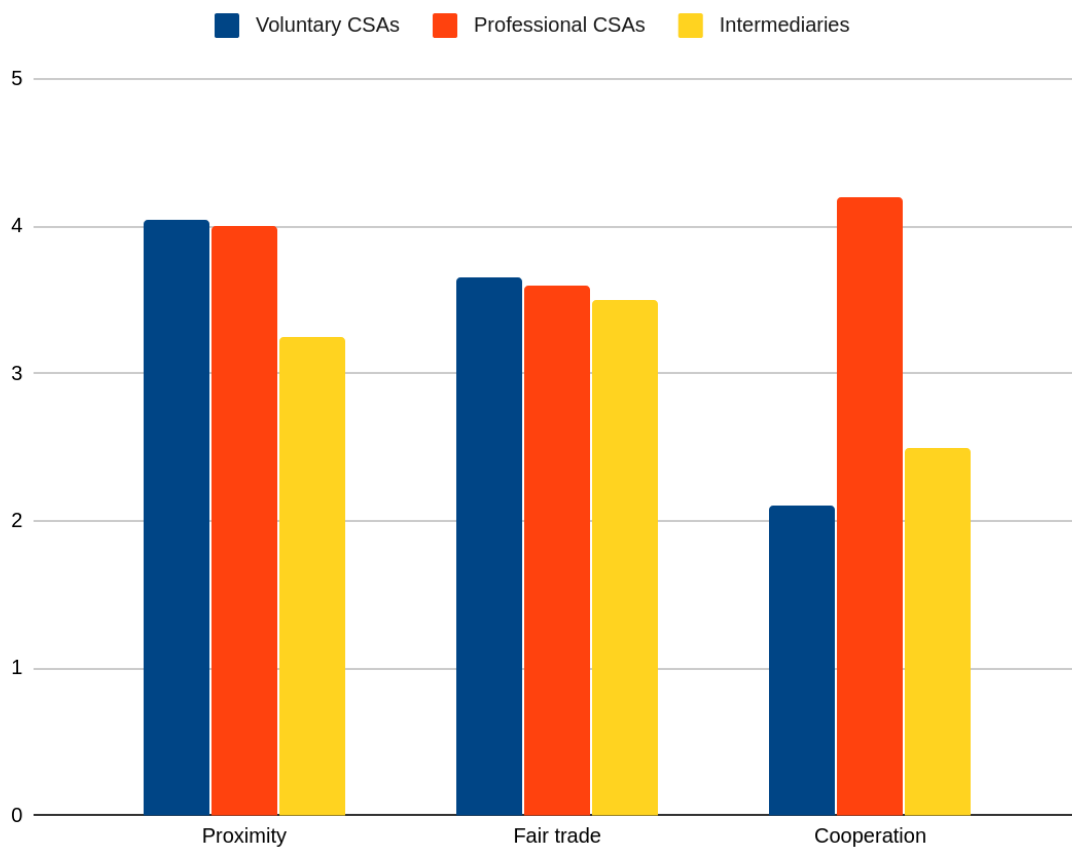
	Intermediaries
Proximity	3.25 out of 5
Fair trade	3.5 out of 5
Cooperation	2.5 out of 5

The netnography indicates that 69.2% of intermediary suppliers have an open profile on Facebook, while 46.2% also use Twitter and 15.3% other social networks, such as Instagram, YouTube or Google+. When it comes to producers, 62.4% of them are on Facebook, 36.9% on Twitter, 28% on Instagram and 14.6% on other social networks, such as YouTube, LinkedIn or Flickr.

5.3 Network

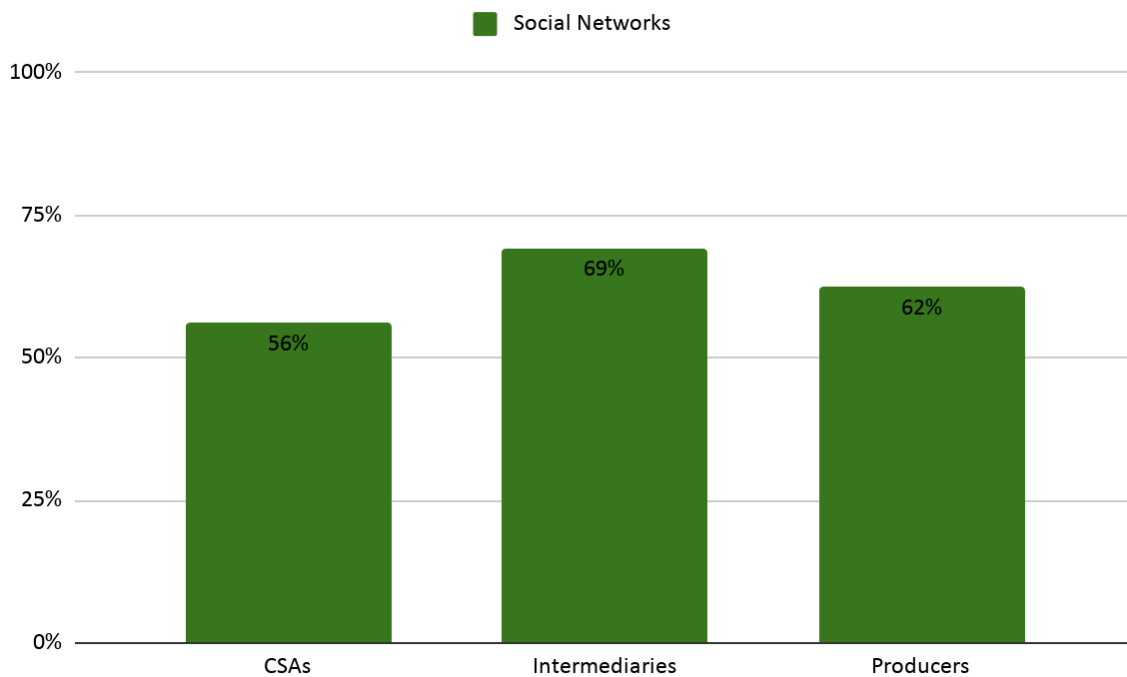
The SSE criteria-based accomplishment comparison between CSAs and intermediaries graphic (Figure 1) shows no significant variation between them, with the exception of cooperation amongst professional CSAs, which have higher levels of cooperation capabilities.

Figure 1. SSE principles accomplishment comparative analysis between voluntary CSAs (n=51), professional CSAs (5) and intermediaries (n=14).



The social media presence comparison between CSAs, intermediaries and direct suppliers (Figure 2) displays a lower level of interest among CSAs to spread their activity in such networks compared to producers and intermediaries.

Figure 2. Presence in social media comparison between CSAs (n=56), intermediaries (n=14) and producers (n=163).



The network analysis shows the relationships between consumer cooperatives intermediaries and producers (Martín and Espelt, 2018). In the nodes table of the network of agro-ecological cooperatives of Barcelona, arranged by the number of connections and centrality (Espelt and Martín, 2018), it has been noted that the two intermediary organizations best positioned, Queviure and Món Verd, are listed 30th and 43rd respectively.

6. Discussion and conclusions

In Barcelona, the first CSAs date back to the 1980s because of citizens' interest in the acquisition of agroecology products based on fairer conditions for both producers and consumers (Huerta and Ponce, 2010). The area has the highest number of

CSAs in Spain and SSE represents 7% of the city's GDP (Fernández and Miró, 2016). CSAs are the most represented organizations (51.8%) in a set of socially innovative practices mapping close to the Social Solidarity Economy (SEE) (Blanco et al., 2015). In addition, Barcelona is one of the top 10 food-sharing areas in the world with 106 initiatives (Davies, 2019).

The analysis shows that there are three CSA sizes in Barcelona: small CSAs (>25 members) representing 58%; medium CSAs (25-50 members) which represents 35% and, big CSAs (<50 members) making up the final 7% of the organizations in the city.

The most widespread legal form of the entities is association. The fact that the constitution of a cooperative requires a longer and more complex process and a minimum capital investment of 3,000 euros, are the main reasons argued for choosing to form an association instead of a cooperative. The CSAs are located in different types of places: own premises (rented or owned by one of the members); athenaeums (sharing spaces with other entities); in public buildings (civic centers, schools or universities), and sometimes in spaces occupied by squatters.

CSAs are formed by two rings of members: the heart of the organization, usually founding members, and temporary members that, for reasons of change of residence or economic issues, leave the entity after a period of membership. The CSAs identified are generally intergenerational and intercultural, with a predominant age range of 30 to 45.

There are two main intertwined motivations to constitute a CSA. Some organizations started because of a concern for "what we eat", while for others, the main reason is related to the goal of creating a political structure alternative to capitalism. Indeed,

some CSAs are constituted during, or linked with, social movements (Badal et al., 2010; Espelt et al., 2018), because the people involved in CSA's tend to have political, social, as well as ecological motivations (Blättel-Mink, 2014) and food growing is seen as a form of quiet or everyday activism (Chatterton and Pickerill, 2010). In addition, the results of the analysis of SSEs highlights the CSAs' commitment to pressuring decision-making bodies to modify structures or legislation to promote local economies, fair trade and the creation of a social market. This links with the incremental development of "food citizenship", which connects eating with political and social engagement by CSAs (Hassanein, 2003; Feagan and Henderson, 2009; Lang, 2010).

At this point, it is clear that CSAs are a social and political actor to spread the consumption of agroecology food in Barcelona from social innovation. Like other world areas, it seems that cities are ideal spaces for innovation and experimentation around environmental issues, involving different types of stakeholders (Castán Broto and Bulkeley, 2013). The reasons for this are various, but a higher average level of GDP and high levels of internet penetration are two of them for the sharing-food social innovation (Davies, 2019).

The theoretical framework has opened two main elements relevant for this investigation: the type of management of the entity (voluntary versus professional) and the type of providers (whether the CSAs include intermediaries).

The results of the analysis shed light on the voluntary contribution of CSAs' members (91.2% of them fully run by volunteers). Despite that, the CSAs with professional tasks (8.8%) have a larger number of members affiliated (72 on average, compared to 29 in the case of volunteer-run organizations). In addition, the

professional CSAs have better levels of cooperation (double the level of their voluntary counterparts) with other SSE organizations. It appears that the social capital of the members increases with the probability of positive and effective inclusion of members through ties and contacts in other organizations (Miralbell, 2012). Therefore, it is possible to conclude that professional CSAs have greater potential, as they exert their influence over a larger group of consumers compared to volunteer groups.

The consumption of products directly supplied by producers stands at 90.7%. Despite that, the analysis demonstrates that intermediaries have good levels of the three SSE principles studied: proximity, fair trade and cooperation. Moreover, the CSAs do not have the feeling that their intermediaries play the same role as capitalist market intermediaries. Therefore, it constitutes a new indicator which reinforces the presence of professionals as a requirement for the expansion of a consumption model that draws on the values of SSE. This is especially relevant as professional groups do not set themselves a growth limit, unlike those groups run by volunteers.

Regarding the impact of digital platforms, CSAs give a high valuation to the role of digital platforms in the daily management of the organization. Professional CSAs regard more highly than the voluntary ones the role of ICT (4.2 compared to 3.9 out of 5). To be more precise, 100% of the professional CSAs have adopted a digital platform, in comparison to 82% of the voluntary ones. Despite the relevance of its adoption, FOSS is only used by 34% of the CSAs. Thus, taking advantage of open software and open licenses is still a challenge for CSAs, which links to a general lack of attention to this issue by SSE entities (Fuster Morell, 2016). In terms of FOSS, the

research has indicated that the CSAs have created open source initiatives but are not majoritary and the constitution of platform cooperativism is still initially. In the case of social media, professional CSAs have a far better adoption rate (100%) than voluntary ones (53%). In conclusion, professional CSAs have more interest in and better adoption of ICT for entity management.

Regarding the network analysis (Martín and Espelt, 2018), it seems obvious that the network-based structure and the nature of CSAs positively correspond with a diffuse and open network (Wellman, 1997). With the exception of very specific zones, such as in the case of Poblenou, where CSAs of the same zone organize activities and manage orders of specific products jointly, or some other groups that articulate part of their offer through intermediary organizations, CSAs present only an occasional level of relations among them. The fact that the two most relevant intermediary organizations, second-grade cooperatives Quèviure and Món Verd, occupy a low-level centrality in the network analysis (30th and 43rd position respectively), also sheds light on their moderate influence as cooperation agents.

In summary, this article contributes to previous literature in food sharing and the role of ICT. The research has strengthened the socio-technical, ecological and even political perspective that CSAs have as a social innovation phenomenon. It has been shown that both ICT and SSE integration is related to increased scalability of the CSAs and their sustainability. The research has also contributed to clarify the value of the professionalization of CSAs, which does not contradict with losing its principles. However, the results highlight numerous challenges for CSA networks in terms of cooperation and digitalization. Future research can be aimed at assessing the progression of cooperation among CSAs' network entities and study the

relevance of ICT in terms of collaboration. In any case, CSAs have an important role as a space for social innovation and prosumption, for agroecology sustainability.

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