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Participatory Guarantee System and Social Capital for Sustainable Development in Brazil: The Case Study of OPAC Orgânicos Sul de Minas

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Abstract: In recent years there has been a growing international interest in alternative certification strategies for organic products. Specifically, participatory guarantee systems (PGS) have proved to be particularly suitable not only to simplify bureaucratic procedures for small organic producers and reduce the cost of certification, but also to generate empowerment, social inclusion and mutual support among farmers. The purpose of this paper is to study the elements of social capital (SC) found in a PGS through the use of social network indicators using the Organizaçao Participativa de Acreditaçao e Certificaçao "Orgânicos Sul de Minas" (OPAC-OSM) as a case study. The research was carried out in the southern part of Minas Gerais, one of the states of the Brazilian Federation, where organic production represents a viable alternative for small and medium-sized farmers. In particular, a survey was carried out to capture the opinions of managers (presidents or directors) about their participation in the OPAC-OSM, and about the level of interaction and degree of trust between members. Relational skills, which are the basis of structural SC, were analyzed both at the level of individual units and at the level of the general network of the OPAC-OSM. An in-degree centrality score assigned to OPAC-OSM members was obtained from each network. These scores have been correlated with variables of the database that were chosen due to their relevance in assessing the level of social capital. According to the results, the factors that most reinforced the proof of SC among the OPAC-OSM members were the level of information and the degree of trust and collaboration networks, with special emphasis on female participation. From the analysis carried out, it is possible to conclude that PGS are powerful tools in the strengthening of SC far beyond the aspect of quality assurance, which remains the main objective of the OPAC.

Keywords: organic products; participatory guarantee system; social capital; social network analysis; OPAC; Minas Gerais

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1. Introduction

Over the past two decades, the organic food market has grown significantly. Worldwide sales of organic food has gone from 13 billion dollars, as recorded in 1998, to exceeding the 100 billion dollar threshold in 2018 [1], which corresponds to about 2.6% of the global food market.

In the market of organic products, consumer trust is a relevant and delicate component since it is difficult for the consumer to verify whether the food is really organic. Organic products are also defined as "credence goods", i.e., products whose qualities are fundamentally relevant for their purchase, but at the same time are difficult or impossible to evaluate autonomously [2–5]. Thus, consumers often rely on third-party certifications to develop

their own judgments about the quality of organic foods and to build trust in them [5]. Thanks to such certifications, suppliers of organic agricultural goods can demonstrate to consumers that they respect the standards and methods of production, which refers to the process rather than to the final product [4].

The distance between producers and consumers and the "conventionalization" of the organic markets have called for a system of quality control based on a third-party certification that follows international guarantee rules within an ISO standard (International Organization for Standardization). This certification is normally issued by private, profit-oriented certification bodies, which operate with recognition by their governments, and after approval by the official accreditation authorities. The certification bodies have offices, administrative and technical personnel, a variety of operating costs, and perform inspections to farms and firms in order to verify compliance with the organic production methods. Furthermore, the inspectors may take samples of soils, plants, raw and processed products to be analyzed in accredited laboratories to verify the absence of pollutants and chemicals. Without entering into a more detailed description of such a complex system of controls, which are implemented all along the agri-food chain, it is evident that this system is costly, and it is particularly expensive for small producers in both developed and developing economies.

The cost of certification keeps small producers out of the formal organic market, thus representing a barrier to entry that obliges them to remain within the boundaries of the very local distribution channels based on interpersonal trust, but without any official recognition (such as on-farm sale, Sunday open markets, community-based initiatives, etc.). To eliminate this barrier, some other approaches have been explored and are still under scrutiny: group certification, social control organizations (in Brazilian Organizaçoes de Controle Social, OCS) and Participatory Assessment Bodies of Organic Conformity (in Brazilian Organizaçao Participativa de Acreditacao e Certificacao, OPAC).

The first approach is already applied in many countries around the world [6], and has been recently recognized by the European Union (EU Regulation 2018/848), while the last two approaches are part of the Brazilian Participatory Guarantee System (PGS) (in Brazilian Sistema Participativo de Guarantia, SPG), as defined in 2003 by Law 10.831, the federal official legislation regarding organic agriculture in Brazil, and by Decree 6.323/07 [7].

The OCS are intended to control the organic quality of local markets where farmers sell their products directly to consumers, without the official seal. The OPAC is an alternative process to certification by third party.

Decree 6.323 establishes that the OPAC is a "participatory conformity assessment body and will have its own legal personality, with formal attributions and responsibilities in the Participatory Organic Quality Assurance System, enshrined in its bylaws" and is composed of "members of the system: producers, traders, transporters, warehouses, consumers, technicians and public or private organizations that operate in the organic production network" [7]. The structure of OPAC should include at least an Evaluation Committee and a Resource Council comprised of representatives of the members of the system, and must retain all records that guarantee the traceability of products following the organic conformity assessment process.

Specifically, PGS have proved to be particularly suitable not only to simplify bureaucratic procedures for small organic producers and reduce the cost of certification, but also to generate empowerment, social inclusion and mutual support among farmers. This is because the activities of the OPAC go beyond the simple quality assurance of organic production and achieve social capital (SC) through the original principles and the networking of associated members. In fact, in most cases, the OPAC includes first level organizations, registered as cooperatives and associations, and other groups of smallholders which are not formally registered, that together form a community of diverse actors pursuing common aims.

Through the analysis of a case study, the research carried out aims to understand whether the OPAC can be considered as a social capital-based organization. That is, if the

OPAC, a second level cooperative organism, born as user-controlled, but heavily relying on trust, participation, transparency, and self-determination and strengthened by mutual and constant contacts among its associate members, is in reality a user-benefitting agricultural producer organization [8].

In particular, the purpose of this paper is to study the elements of SC in a PGS through the use of social network indicators, using the OPAC "Orgânicos Sul de Minas" as a case study. This is a second level association, set up by several first level organizations, that certifies organic products in Minas Gerais, one of the states of the Brazilian Federation.

Our research questions are as follows: which types of relationships exist between the member associations? Which other benefits can the participatory process provide to members, besides the quality certification? How do members evaluate the achievement of the three principles of the PGS (trust, participation and exchange of ideas and experiences)? To answer these questions, a survey was carried out with the objective of capturing the opinions of managers (presidents or directors) about their participation in the OPAC, and about the level of interaction and degree of trust between members.

The paper is structured as follows: Section 2 addresses the concepts of PGS and SC, while Section 3 describes the case study. In Section 4, we explain our methodology; Section 5 describes the results of the analysis, and the final section highlights some key conclusions.

2. Participatory Guarantee System and Social Capital

The growth of the market for organic goods is mostly based on costly and bureaucratic third-party certifications which leave the smallholders behind. To overcome this barrier to entry there is a growing interest in the adoption of alternative and participatory practices to ensure the authenticity of organic products, such as internal control systems (ICS), also known as group certification, and participatory guarantee systems (PGS) [9–13]. The International Federation of Organic Agriculture Movements (IFOAM) supports the development of PGS as an alternative and complementary tool to third-party certification within the organic sector, and advocates for the recognition of PGS by governments. Based on the voluntary survey conducted by IFOAM in 2019, there were 223 active PGS initiatives in 76 countries, with at least 567,142 producers involved and 496,104 certified producers. As of 2019, out of these PGS initiatives, 57 were under development and 166 were fully operational [14].

According to the IFOAM definition, the PGS is a "locally focused quality assurance system. PGS certifies producers based on active participation of stakeholders and is built on a foundation of trust, social networks and knowledge exchange" [8]. PGS relies on the relationships between famers and consumers' groups, adapted to the local contexts, and are engines of social development, promoting job creation and improving livelihood in the agricultural sector. Furthermore, the PGS covers issues that are not included in current regulations on organic production, such as compliance with labor standards, animal welfare, the enhancement of rural communities, and the rights of small agricultural producers.

Latin America is the continent with the greatest awareness of the meaning and value of the participatory approach, as these systems are highly recognised in national legislations (such as in Bolivia, Brazil, Costa Rica, El Salvador, Mexico, Paraguay and Uruguay). In particular, since 2003, the Brazilian Federal Government has recognized by law the validity of participatory procedures, whereby a system of peers validates the compliance to rules of organic production. Brazil was a pioneer in the acknowledgment of PGS as a mechanism to assess organic compliance, recognizing it at the same level as third-party certification [15]. The Brazilian law presents two important aspects which make it different from other legislation on the issue: it does not demand certification in cases of direct trade carried out by organized small farmers under social control, and it allows the development of alternative certification systems seeking to guarantee the organic quality of products [9] p. 24. The principle that inspired those aspects of the Brazilian law was that of strengthening the farmers' organizations, enabling them to find solutions to achieve sustainable production systems beyond the need to meet market demands [15].

Therefore, PGS is more than a simple certification tool to access the market. In fact, scholars have studied this participatory certification process from different points of view: some research explored the farmers' motivations and participation in PGS [16,17] while others investigated in depth the issue of policies and institutionalization of PGS [18–20]. Other researchers explored the benefits generated by this type of certification [12,13,21–25] or explored the methodology used by the PGS in the farmers' appropriation of agroecological principles [15,26]; lastly, one study explored the mechanism that generates credibility in PGS, in which social capital elements such as participation and trust are important for the creation of a participatory system [27].

The PGS is based on five principles: trust, participation, transparency, self-determination, and exchange of ideas and experiences. All principles presuppose pro-social behaviors and recall the concept of SC, intended as the creation of a network through shared norms, values and understanding that facilitates co-operation within and among groups [28].

Within the PGS the concept of cooperation is very broad and goes beyond the classic notion related to agricultural cooperatives. The PGS requires OPAC members to interact with one another (cooperatives, associations, groups of smallholders) and interaction is required also of the other actors in the production, consumption and distribution chain of organic food: consumers, traders, universities and rural extension agencies' members. This network, formed around certification, goes beyond the quality assurance required by the market as a result of the "participatory" process that facilitates cooperation for a mutual benefit.

Therefore, if firms have been considered as fundamental social structures in the creation and diffusion of social capital [29], an OPAC should have the capacity to extend its SC to other social structures of the territory.

The concept of SC was originally developed to describe the relational resources in the community of social organizations [30]. According to Putnam [31,32], two types of SC are most recognized: bridging and bonding. SC Bridging provides a foundation for collective action, and depends on the ability of a community to organize itself in a network. SC Bonding refers to the strong ties of attachment between relatively homogeneous individuals through norms and social relations established from trust, participation, and cooperation that lead to mutual benefit [32]. According to Hirata [27], the presence of SC can be associated with the proper functioning of a PGS, since the assets of SC are also basic requirements for this system.

The starting point of a PGS is the shared vision about organic production goals, social justice, fair trade, respect for ecosystems, the autonomy of local communities, cultural differences, and more [14]. We emphasize that SC is based on, and at the same time is nourished by, shared visions. Trust is a basic component of SC, and it is built by key stakeholders through the collective development of a shared vision.

In our study, SC was associated with the interaction between members of the PGS, and was measured through Social Network Analysis indicators.

3. The Case Study: OPAC Orgânicos do Sul de Minas

To be legally recognized, a PGS must have an OPAC as a responsible entity for issuing the certification; an OPAC, therefore, corresponds to the certification body. However, unlike third parties, it adopts alternative and participatory practices.

The structure of an OPAC should include at least an Evaluation Committee and a Resource Council, composed of members' representatives, and must retain all records that guarantee the traceability of products following the organic conformity assessment process. An OPAC evaluates, verifies, and certifies that both products and production units meet the requirements for organic production. It also represents the juridical entity which takes on the formal responsibility towards the activities carried out in a PGS. All members of an OPAC have the same level of responsibility and decision-making power regarding the evaluation of a particular farm. Therefore, an OPAC is characterized by a horizontal

management model, without hierarchies, with decision power shared among the members of the network, thus favoring the development of social capital" [27] p. 5.

Worldwide, Brazil is considered a point of reference in PGS, and currently there are 27 OPACs distributed throughout the country. These 27 OPACs include 7877 certified organic farmers, 85% of which are smallholders. Out of all farmers, 64% (4984) are men and 36% (2829) are women. As for the institutions that collaborate with OPAC, approximately 50% are Non-Governmental Organizations (NGOs), 23% are schools, 10% are extension agencies, 6% are municipalities and 11% are other types of institutions.

An OPAC must perform three steps before completing the quality assurance and certificate issuing processes: peer visits, verification visits and documentary analysis by the Evaluation Committee. In the first stage, that of peer visits, farmers visit each other and check that the production unit has completed and adopted the procedures provided in the management plan. In the second stage, verification visits are carried out with the participation of collaborating institutions and representatives of farmers groups. In the third and last stage, the evaluation committee verifies the documents and issues the certificates, provided the process has been completely satisfactory. In case a certificate cannot be issued, the farmer may resort to a resource council, another mandatory OPAC body [7].

For this study, we have chosen as a case study the OPAC "Orgânicos Sul de Minas", a second level association that certifies organic products in Minas Gerais, one of the states of the Brazilian Federation.

This OPAC was established on 27 November 2012, and it has initiated an organization to create the first PGS in the state, thus awakening the interest of partner institutions in supporting the initiative through extension actions. The region where the OPAC "Orgânicos Sul de Minas" (hereafter OPAC-OSM) was established is the south and southwestern Minas Gerais region, popularly called "Sul de Minas", and includes 146 municipalities, with an effective population of 2,929,424 people [33]. Only four of these municipalities have more than 100,000 residents, and 33 have more than 20,000. High altitudes, good soils, and a mild and rainy climate characterize the geography of this part of Brazil, where agriculture still plays an important role, with a predominance of small family-run farms. The most prominent crops in the region are coffee, strawberries, potatoes, and vegetables of great importance for employment, income and foreign exchange [34].

The higher education complex called IFSULDEMINAS -Instituto Federal do Sul de Minas (Federal Institute of the South of Minas) and the public extension agency EMATER-Empresa de Assistência Técnica e Extensão Rural (Company of Technical Assistance and Rural Extension) originated as an idea during a project involving a first group of organizations composed of certified organic farmers.

Presently, the OPAC-OSM includes 15 first level organizations, which are the core of the social network analysis, formally registered as cooperatives and associations (Figure 1), and includes six other groups of smallholders which are not yet formally registered. Its headquarters is in the town of Inconfidentes. The certification by the OPAC-OSM is issued to individual producers or to groups of tiny smallholders, and it is given through procedures that require the participation of other members of the association. This certification allows small and tiny producers to enter the local, state, and Brazilian markets with their goods labelled as organic-a label which, however, does not allow them to enter export markets. The OPAC-OSM is presently financed by fees paid by its members, and receives official support from IFSULDEMINAS, the Federal Brazilian Educational Institute, and from EMATER, the state extension agency. The OPAC-OSM does not have formal and salaried employees and relies on the voluntary participation of its associate members. However, a monthly fee is charged for the purpose of maintaining the organization's operating expenses.

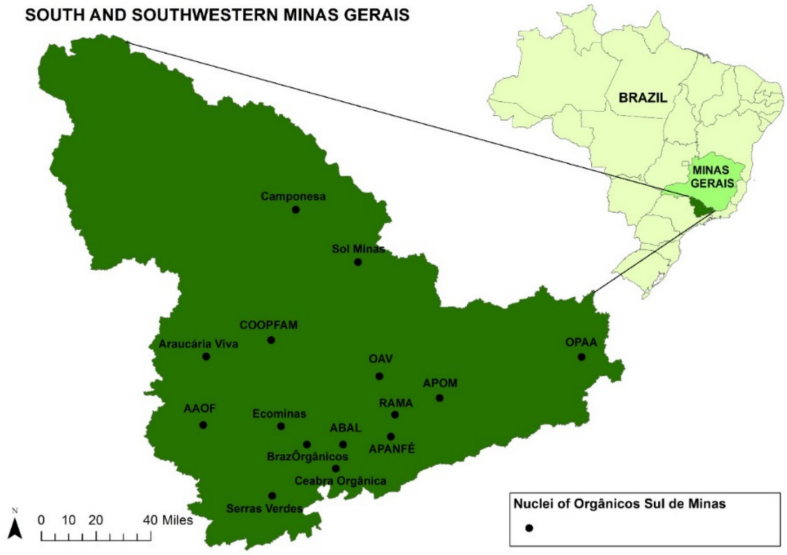

Figure 1. Core of organic farmers certified by OPAC-Orgânico Sul de Minas. Source: own construction.

The farmers who are part of the core are all organic and certified by OPAC-OSM. Most of them are smallholders, with very diversified production, such as vegetables, fruits, coffee, processed products (sweets, jellies, flours, etc.), milk and dairy products.

The principles of OPAC-OSM are based on trust, participation, transparency, and self-determination, strengthened by mutual and constant contacts among its associate members. The OPAC-OSM, through its operating procedures manual, establishes its social control mechanisms and determines that all documents and records kept in the production unit, peer visits, and verification visits are to be considered. These activities, however, go beyond the simple quality assurance of organic production, and achieve SC through the original principles and the networking of associated members.

4. Methodological Procedures

A direct survey by means of a questionnaire was carried out from December 2020 to February 2021 to assess the results achieved by the OPAC-OSM in terms of PGS, and to highlight the role of social capital in the PGS.

Due to the COVID-19 pandemic, all research procedures were carried out remotely, from the definition of the object to the choice of respondents (core representants). All interviews were also conducted remotely, using communication technologies such as Skype and WhatsApp. The questionnaire was submitted to managers, presidents or directors of each member organization through a traditional telephone call or via Skype. One of the members of the research team, a Brazilian national based in Minas Gerais, well known by most respondents, oversaw the interviews. Three managers decided to answer only a few questions, so their points of view are incomplete; however, we know what the other respondents think about them and their cooperatives.

The questionnaire included 39 questions divided into nine sections: (A) characteristics of the members (10 questions); (B) benefits from the participation in OPAC (5); (C) general assessment about the OPAC activities(6); (D) relationships with other stakeholders (4); (E) presence of internal problems (6); (F) reputational power (2); (G) participation (3); (H) exchange of ideas and experiences (2); and (I) trust (1).

Excluding questions about the members' characteristics, four qualitative options were given for each question: never, sometimes, most times, and always. The answers given by the 15 respondents were first elaborated to obtain their absolute and relative distribution. Subsequently, a score was attributed to each option (never = 0, sometimes = 2, most times = 3, always = 4), to elaborate a total score for each variable and consequently rank the answers.

The analysis of social capital was carried out by using Social Network Analysis (SNA), which allows the researcher to represent the existing relationships (ties) between the actors involved (nodes) in formal and informal groups, organizations and so on (35) by elaborating data with indexes and graphs.

For the SNA purposes, the expressed Likert values (4 = very relevant, 3 = relevant, 2 = partially relevant, 1 = not relevant, and 0 = absent) were transformed into dichotomic values through the following thresholds:

Threshold >1 = partially relevant, or marginal members of the network;

Threshold >2 = relevant relations;

Threshold >3 = very relevant relations, thus considered key actors within a network.

About the relevance of the three cooperative societies whose managers declined to be interviewed, the answers given by the other respondents were symmetrized, although their decision to not participate clearly underestimated the results of the network analysis, because the views of these three actors are missing from the analysis. The network analysis was performed by using UCINET [35]. This analysis is based on different SNA indicators focusing both on the whole network and on the position of the nodes within the network [36,37]. The measures used to describe the network as a whole (cohesion measures) are: density (the proportion of the number of network ties out of all possible ties); isolated nodes (nodes without contacts with any other node); average distance (the average number of steps needed to reach every node in the network); and reciprocity (the number of times a link has a two-way relation between nodes) [38]. The sum of a node's incoming relationships (in-degree centrality) is used as a proxy indicator to measure the prestige and popularity of each of the nodes [36].

The nodes are arranged in space through a multi-dimensional algorithm. The distances between the associations depend on the relationships between the nodes themselves and on the similarities in the geodesic distances to the other nodes of the network.

5. Results and Discussion

5.1. Characteristics of the OPAC-OSM Members

The 15 member organizations of the OPAC-OSM have different legal status: there are two cooperatives, eight associations, one association of associations and four informal groups/networks. Four have been established in 2019 and have immediately joint the OPAC-OSM, while the others have been founded throughout the last 20 years, with the oldest member established in 1999. Also, they joined OPAC-OSM at different times, with the first founding member joining in 2013 and the last entry in 2019.

The total number of producers involved is 731, out of which 17.5% are women, but this amount is biased by the presence of one outlier, established in 2003, which is considerably larger than all the other member organizations. In fact, it includes 519 producers (15.4% of which are women), with about five hectares each. If this outlier is not considered, the remaining 14 organizations have 212 producers (22.6% women), with an average membership of only 15 farmers.

The total area cultivated by the farmers is about 5000 hectares, with a compounded average of almost seven hectares each, but again there are large differences between the various organizations. In two cases, the average area goes up to 50 hectares and 30 hectares, respectively, whereas there are several organizations whose members only tend to one or two hectares each. The largest organization represents 51% of the total area, and declares to pay salaries has a staff of 40 people. Another organization declares one employee, whereas all other organizations are managed through volunteer work.

These 15 member organizations are scattered across a very vast territory in which the distances are of relevance: these range from 51 km (average of the shortest distance) and 255 km (average of the longest one) thus bringing the average distance between two organizations to 153 km. In a few cases, the nearest association is only a few km away, but in several other cases the farthest associations are 300 km away (see Figure 1).

Respondents from 11 organizations stated that they contribute to the costs of the OPAC-OSM with voluntary amounts between 100 and 5000 reais per year (one USD = five reais). It is a symbolic payment that is only used to cover some small expenses when the representatives of the organizations meet, and some running costs of the coordinator who offers her services on a voluntary basis. Indeed, most respondents say they commit 12–30 days per year to the functioning of the OPAC-OSM to attend coordination meetings, elaborate and review the production methods, read the documents, and participate in the visits.

5.2. Benefits from the Participation in OPAC-OSM

The respondents' opinions about the consequences of their participation in the OPAC-OSM are shown in Table 1.

Table 1. Benefits from the participation in the OPAC-OSM (% of respondents).

Consequences	Never	Some Times	Most Times	Always	Total	Score
Elaboration of production codes for the certification of products	0.0	0.0	20.0	80.0	100.0	57.0
Introduction of cropping methods oriented to higher economic and environmental sustainability	0.0	6.7	46.7	46.7	100.0	51.0
Increase of income	13.3	13.3	46.7	26.7	100.0	41.0
Opening of new markets	13.3	26.7	20.0	40.0	100.0	41.0
Improvement of the qualities of the products	20.0	26.7	20.0	33.3	100.0	37.0
Planning of the member organizations	6.7	66.7	20.0	6.7	100.0	33.0
Increase of employment	40.0	26.7	20.0	13.3	100.0	25.0

Source: own construction.

Technical matters appear to be the most important aspects: indeed, in the first position there is the "Elaboration of production codes for the certification", with a total score of 57 out of 60 points, followed by "Introduction of cropping methods . . . " with 51/64. Then, three economic considerations ("Increase of income", "Opening of new markets", and "Planning of the member organizations") are given a lower score; "Increase of employment" has happened less frequently, and gets the lowest score. These are important characteristics that reinforce the social character of the PGS adopted by the OPAC.

All respondents stressed that the COVID-19 pandemic had a strong impact on organic farmers and their organizations linked to OSM, both in terms of the difficulties in finding the necessary inputs for production, and commercialization of their products. Regarding the commercialization of products, sale by delivery gained considerable strength. However, the greatest impact was certainly in the quality control process of the participatory system, with inspection visits between farmers and supporters severely hindered, which required the creation of alternative forms of control.

5.3. General Assessment about the OPAC-OSM Activities

The overall opinion of the respondents about the OPAC is positive (Table 2), since the total score of the opinion "The OPAC deserves our trust" gets almost the highest score, with 57 points out of 64. This is probably justified by the fact that respondents think that their suggestions are taken into consideration, and that they normally receive the necessary information and support from the coordinator, or from other members of the OPAC-OSM. Trusting relationships are fundamental in building and consolidating social capital among the members of an OPAC.

Table 2. Opinions about the OPAC-OSM (% of respondents).

	Never	Some Times	Most Times	Always	Total	Score
All considered, the OPAC deserves our trust	0.0	0.0	20.0	80.0	100.0	57
The contribution of my organization to the OPAC proposals is relevant	0.0	13.3	26.7	60.0	100.0	52
When I contact the OPAC, I get easily the information I was looking for	0.0	13.3	33.3	53.3	100.0	51
The OPAC satisfies the information needs of the memebers	0.0	13.3	46.7	40.0	100.0	49
The OPAC works efficiently to solve the problems of our sector	0.0	26.7	40.0	33.3	100.0	46
Each member supports efficiently the OPAC according with its resources	0.0	46.7	53.3	0.0	100.0	38

Source: own construction.

On the other hand, the opinion about the support given to the OPAC is slightly disappointing: not one respondent thinks that all members support efficiently the OPAC-OSM. This variable receives only 38 points out of 64. This could be an opinion about the respondents' own organizations and/or an opinion about other organizations. This aspect will be considered in further depth within the reputational power in Section 5.6.

5.4. Relationships with Other Stakeholders

The relationships with other stakeholders, such as the University and the public research and extension system, seems to be clear (Table 3).

Table 3. Relationship with other stakeholders (% of respondents).

	Never	Some Times	Most Times	Always	Total	Score
OPAC is well understood by the "external" stakeholders	0.0	6.7	20.0	73.3	100.0	55
OPAC is well known among the population	20.0	60.0	20.0	0.0	100.0	27
OPAC risks overlapping with other Institutions	40.0	13.3	33.3	13.3	100.0	24

Source: own construction.

In fact, the establishment of the OPAC-OSM partly originated within these bodies, thanks to the efforts of professors, scientists, and agricultural advisors. This leads some respondents to maintain that there is no risk of "Overlapping with other Institutions", but their optimism is counterbalanced by some others who consider such overlapping as frequent or permanent.

This aspect should be an object of monitoring and reflection, to avoid wasting time and resources. It is important to emphasize that the participation of external members is mandatory in the Brazilian regulation of the PGS and that this greatly reinforces the social capital, as the audit activity transforms into a relationship of advice and collaboration.

5.5. Presence of Internal Problems

The overall positive opinion of the respondents about the functioning of the OPAC-OSM and its impact on the member organizations is confirmed by the data in Table 4, which includes six problems that are likely to occur, and all of them receive a relatively low score. A positive assessment within an OPAC is an important factor in strengthening and maintaining SC among its members.

Table 4. Problems within the OPAC-OSM (% of respondents).

Internal Problems	Never	Some Times	Most Times	Always	Total	Score
Absenteeism of some members	20.0	53.3	13.3	13.3	100.0	30
Administrative problems	13.3	73.3	6.7	6.7	100.0	29
Inefficient communication among members	33.3	53.3	6.7	6.7	100.0	23
Problems in the definition of procedures	33.3	60.0	0.0	6.7	100.0	22
Opportunist behaviors	53.3	40.0	6.7	0.0	100.0	15
Conflicts between members	53.3	46.7	0.0	0.0	100.0	14

Source: own construction.

"Absenteeism", for example, receives only 30 points out of 64. The most frequent answer in this case has been "Sometimes", indicated by about half the respondents. Absence implies that other members are involved in the certification visits, and that the absentees accept the deliberations of the coordination council. Other internal problems that might require some actions to be fixed, range from "Administrative problems" to "Conflict between members", which are never felt by most of the participants in the survey. Participation is a key factor in an OPAC and is linked to social capital, and for this reason it is a factor that must surely be reviewed by the OPAC-OSM.

5.6. Reputational Power

The value of a cooperative network can be assessed through the perception that the various members have of the balance between contributions and benefits as experienced by other members of the network (reputational power).

In the OPAC-OSM, reputational power was assessed through two variables: level of proactivity within the OPAC (RP.1) and perception of the benefits received from the OPAC (RP.2).

For both variables the self-assessment received an average value of three which, in the scale adopted, corresponds to a high score, equal to 75% of the maximum average value expressed (4). Instead, cross-evaluations were valued differently: RP.1 is valued on average at 43.80, equal to 73% of the maximum average value expressed (60), while RP.2 is valued on average at 34.40, equal to 57% of the maximum average value expressed (60).

For each member, Table 5 shows the self-assessment, the total of the evaluations expressed by the other members, and the ranking in relation to the two variables considered. These data show strong differences between the members that can be divided into three groups: (1) a first group of four members, in which all members are recognized as having a high level of proactivity within the OPAC compensated by high benefits received; (2) a second group of six members, to whom an average proactivity within the OPAC is granted, and (3) a third group of five members, in which all members recognize a low proactivity within the OPAC and a low level of benefits received. It is interesting to note that four members claim to contribute more to the OPAC than what they benefit from it, three members claim exactly the opposite and, finally, seven members claim that their level of contribution is equal to the level of benefits obtained.

5.7. Participation, Exchange of Ideas and Experiences, Trust

Participation, exchange of ideas and experiences, and trust are basic elements of social capital and the basic principles of a Participatory Guarantee System. Relational skills, which are the basis of structural social capital, were analyzed both at the level of individual units and at the level of the general network of the OPAC-OSM.

The variables taken into consideration are:

i. Informative interaction between the OPAC-OSM members (P.1) and level of conflict between OPAC-OSM members (P.2) as proxy for the PGS principle of participation
ii. Exchange of information between OPAC-OSM members outside the association (E.1) and a collaborative network with respect to joint projects and activities (E.2) as proxy for the PGS principle of exchange ideas and experiences.

iii. Level of trust among OPAC-OSM members (T.1) for the PGS principle of trust.

All variables are dichotomous by construction, except T.1, which was dichotomous with respect to the medium-high level 3 of confidence. The E.1 and E.2 variables have been symmetrized by higher value.

Table 5. Reputational power.

	Self Valuation		Total		Rank	
OPAC members	**RP.1**	**RP.2**	**RP.1**	**RP.2**	**RP.1**	**RP.2**
Associação Agroecológica de Ouro Fino (AAOF)	4	3	56	42	1°	1°
Rede Agroecológica da Mantiqueira (RAMA)	4	4	55	39	2°	4°
A Cooperativa dos Agricultores Familiares de Poço Fundo e Região (COOPFAM)	1	4	55	42	3°	2°
Cooperativa dos Camponeses Sul Mineiros (Camponesa)	4	4	53	40	4°	3°
Núcleo Sol Minas (Raes (Sol Minas))	3	3	49	38	5°	5°
Associação de Produtores de Agricultura Natural de Maria da Fé (APANFÉ)	4	3	48	35	6°	7°
Grupo Araucária Viva (Araucária Viva)	3	4	47	35	7°	8°
Associação de Produtores Orgânicos da Mantiqueira (APOM)	3	0	44	27	8°	13°
Núcleo BrazOrgânicos de Brazópolis (BrazOrgânicos)	1	1	43	38	9°	6°
Associação dos Agricultores Ecológicos do Sul de Minas (Ecominas)	3	4	43	35	10°	9°
Associação de Produtores de Agricultura Orgânica e Biodinâmica Serras Verdes (Serras Verdes)	2	4	39	28	11°	12°
Central de Associações de Brazópolis (Ceabra Orgânica)	3	2	38	34	12°	10°
Associação de Bananicultores da Luminosa (ABAL)	3	3	38	33	13°	11°
Associação Orgânicos das Águas Virtuosas (OAV)	3	3	27	26	14°	14°
Organização de Produtores Agroecológicos do Alto Rio Grande (OPAA)	4	4	22	24	15°	15°

Source: own construction.

With respect to the analysis of the network as a whole, we have used cohesion indices. It is evident that the trust network is the densest and most connected: the average of relationships per node is 4.5, and each member is connected with all the others in less than two steps.

On the contrary, the less dense network is the collaborative one (E.2), as demonstrated by the values reported in Table 6. This highlights the fact that trust and information relationships are drastically reduced when they turn into concrete collaborations.

Table 6. Cohesion indices.

	P.1	**P.2**	**E.1**	**E.2**	**T.1_dic_3**
Avg Degree	1.7	1.0	2.0	1.2	4.5
Density	0.1	0.1	0.1	0.1	0.3
Connectedness	0.2	0.2	0.6	0.2	0.8
Avg Distance	1.3	2.3	2.4	2.0	1.9

Source: own construction.

A separate analysis must be made with respect to conflicting relationships: the data show that on average there are few situations of conflict between the members of the OPAC-OSM, but it is important to underline that question P.2 concerns a sensitive topic for respondents, and that the results with respect to this network could be underestimated.

An in-degree centrality score assigned to OPAC-OSM members was obtained from each network. These scores have been correlated with some variables of the database which were considered relevant to assess the level of social capital: years since foundation (C.1), years in the OPAC (C.2), number of members (C.3), female % age of members (C.4), surface area in hectares (C.5), distance from the nearest organization (C.6), contribution paid to

the OPAC (C.7), level of proactivity within the OPAC-OSM (RP.1), and perception of the benefits received from the OPAC-OSM (RP.2).

The variables used to describe the five relational networks are not correlated with each other, except for the year of foundation of the organizations and their entry into the OPAC-OSM–two variables which, however, are not correlated with any of the network ones, as can be seen from Table 7.

Table 7. Correlation indices.

	C.1	C.2	C.3	C.4	C.6	C.7	RP.1	RP.2	P.1	P.2	E.1	E.2	T.1
C.1	0.514	0.296	−0.531	−0.295	−0.015	−0.240	0.325	0.349	0.170	−0.169	0.187	−0.242	0.308
	C.2	0.410	−0.188	−0.292	−0.190	0.175	0.254	0.159	0.208	−0.101	0.201	−0.087	0.344
		C.3	−0.159	−0.144	0.004	0.026	0.354	0.405	0.113	0.005	0.216	0.258	0.673
			C.4	−0.046	0.203	0.422	0.293	0.119	−0.037	−0.340	0.286	0.471	0.127
				C.5	0.423	0.190	−0.378	−0.499	−0.328	0.104	−0.344	−0.235	−0.446
					C.6	0.177	0.231	0.256	−0.231	−0.461	−0.340	−0.119	−0.033
						C.7	0.034	−0.046	−0.271	0.111	0.121	0.221	−0.146
							RP.1	0.879	0.491	−0.267	0.710	0.241	0.784
								RP.2	0.531	−0.241	0.494	0.073	0.731
									P.1	−0.052	0.499	−0.108	0.615
										P.2	0.041	−0.314	−0.244
											E.1	0.318	0.682
												E.2	0.331

Legend: green = positive correlation with significance level <0.05; blue = positive correlation with significance level < 0.1; yellow = negative correlation with significance level <0.1; orange = negative correlation with significance level < 0.0. Source: own construction.

Furthermore, the year of foundation is inversely proportional to the female % age of members: younger associations tend to have a higher number of women within them; length of experience and female participation are fundamental factors for the analysis of social capital in an OPAC.

It is interesting to note that the two variables used to study the reputational power of organizations within the OPAC-OSM (the level of proactivity and the benefits derived from being part of the network) are highly correlated with each other; this means that in future studies it will be sufficient to explore only proactivity to explain the benefit received.

5.7.1. Informative Interaction between OPAC-OSM Members (P.1)

The level of consultation between OPAC-OSM members (P.1) is positively correlated with the level of proactivity of the organizations (RP.1 and RP.2), but above all with the consequent level of trust (T.1). The graph shows that the members who most receive the trust of the other members are those who are consulted (in-degree), and not those who consult.

Comparing the geographical position of the organisations (Figure 1) with the network of informative interaction (Figure 2), it appears that there is no direct relationship between the organisations' physical distance and the level of consultation between them. For example, APOM has a great ability to keep the network united even if it does not have a central position with respect to other organizations. Among the most distant organizations, while Camponesa has a good level of interactive information, others do not, such as OPAA and Araucária Viva.

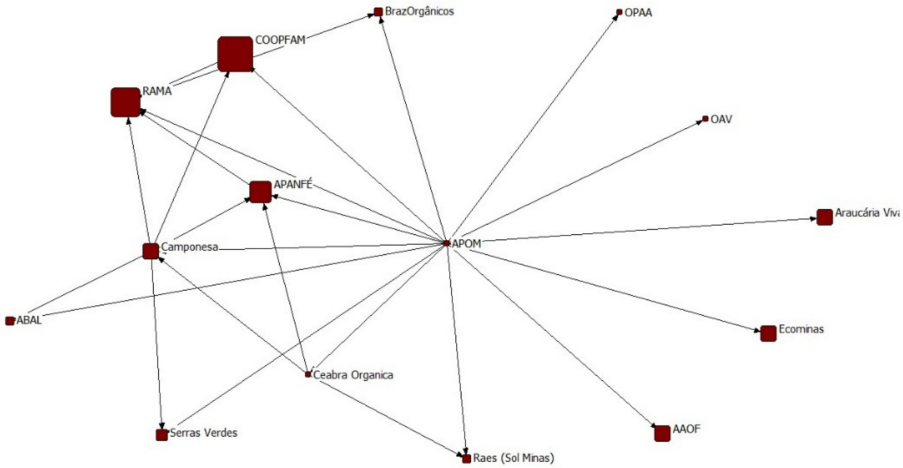

Figure 2. Network of informative interaction. Legend: Ties are binary and oriented, and represent P.1; nodes' size represents T.1. Source: own construction.

5.7.2. Level of Conflict between OPAC-OSM Members (P.2)

The level of conflict is inversely proportional to the distance from the other members of the OPAC-OSM: the closer an association is to other associates, the greater is the probability of having conflicting relationships. In the graph, however, it is clear that the declared conflictual relations are very few and that many nodes are isolated, that is, that they do not declare to have any conflicting relations, nor are they considered generators of conflict.

An important feature to be highlighted in this criterion is the continental dimension of the Brazilian territory: for instance, the State of Minas Gerais is as large as Italy. Distances of 200 or 300 km between associate members of the OPAC-OSM are common (Figure 3).

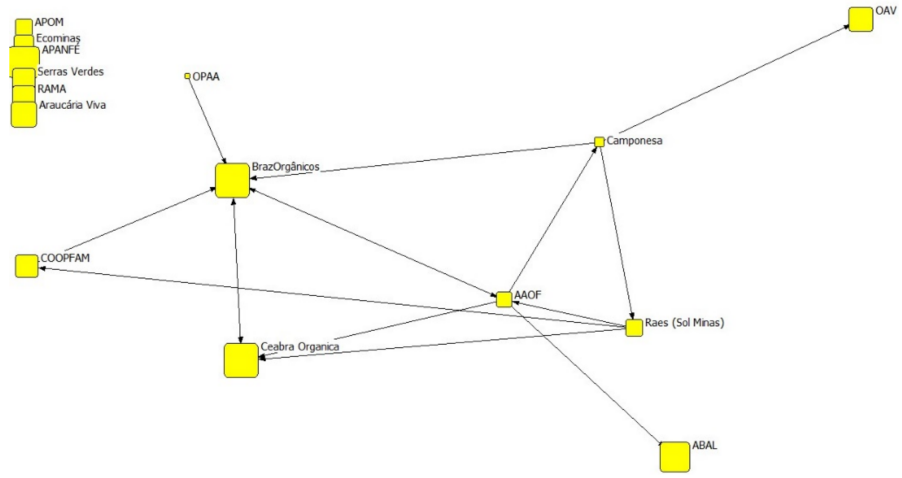

Figure 3. Network of level of conflict. Legend: Ties are binary and oriented, and represent P.2; nodes' size represents C.6. Source: own construction.

5.7.3. Exchange of Information between OPAC-OSM Members Outside the Association (E.1)

It is easier to exchange information, even outside the OPAC, with those within the network who are more proactive (RP.1), something which also leads to greater mutual consultation (P.1). The network is more compact than others, and only one actor (COOPFAM) has a high value of centrality, in the sense that if this is removed from the graph, the network is no longer connected (Figure 4).

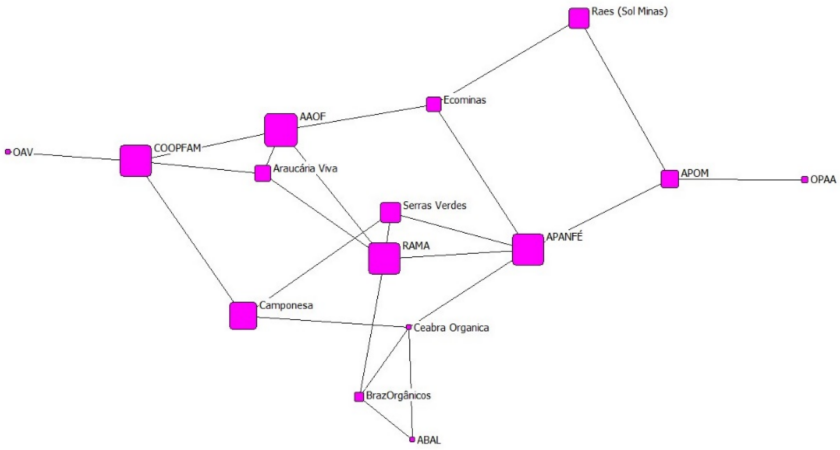

Figure 4. Network of information exchange. Legend: Ties are binary and not oriented (symmetrized by the maximum) and represent E.1; nodes' size represents RP.1. Source: own construction.

5.7.4. Collaborative Network with Respect to Joint Projects and Activities (E.2)

The ability to carry out projects and concrete actions with other actors is an independent variable with respect to the others analysed. The only statistically significant positive correlation is with the percentage of female members of the organization (C.4). All the members have at least one project in place with other associations, but from the graph it is evident that some of them play a more strategic role, both for the absolute number of active collaborations (Araucaria Viva), and for their ability to keep the network united (Coopfam and APOM) (Figure 5).

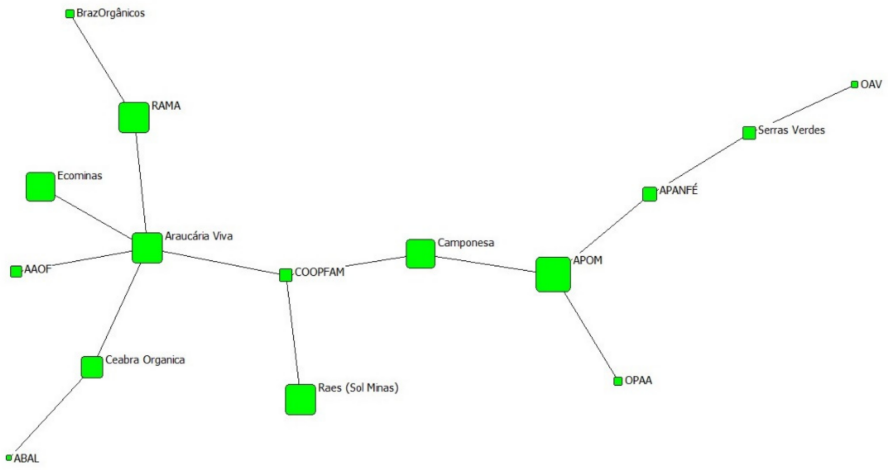

Figure 5. Collaborative network. Legend: Ties are binary and not oriented (symmetrized by the maximum), and represent E.2; nodes' size represents C.4. Source: own construction.

5.7.5. Level of Trust among OPAC-OSM Members (T.1)

The trust network of the OPAC-OSM is relatively dense. There is a tendency to place trust in very proactive large partners (C.3) (RP.1 and RP.2) with whom there are frequent exchanges of information, both inside and outside the OPAC-OSM (P.1 and E.1). Trust, on the other hand, is inversely proportional to the area managed (C.5). This can be due to the history of association and solidarity among smallholders, which, as a rule, gave rise to member organizations. These factors tend to be weaker as farms get larger (Figure 6).

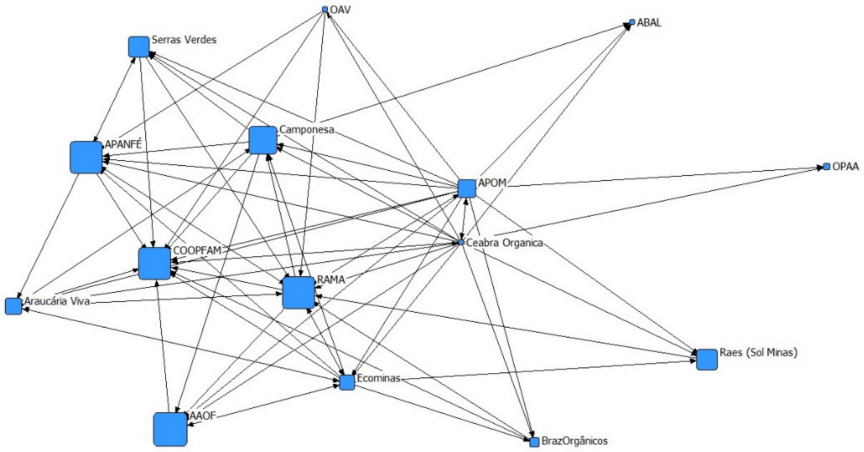

Figure 6. Trust network. Legend: Ties are numeric (dichotomized by threshold 3) and oriented, and represent T.1; nodes' size represents RP.1. Source: Source: own construction.

6. Conclusions

Our study started from the assumption that the OPAC, based on shared principles belonging to the PGS and structurally represented through a network, represents the tangible expression of SC. Then, aware that the existence of a network is a necessary but not sufficient condition for the formation of SC [39], we analyzed the intangible part of the SC by focusing on the interaction between the members of the OPAC-OSM in order to assess information flows, reputational power, and the level of trust between members.

We based our analysis on the individual members' perception of the characteristics of the OPAC-OSM, its social organization and the resulting benefits for the community of organic farmers that are part of it. In light of the results obtained and with relation to the question of whether the OPAC-OSM has developed SC, we can answer affirmatively by linking it to the effect of the horizontal structure of the network, and especially the composition and behavior of network members. The size of reputational power has highlighted a wealth of cooperative networks generated in particular by some of the network members (AAOF, Rama, Coopfam, Camponesa). It would be worth exploring in depth whether the authoritativeness of these members comes from the possibility of mobilizing more resources than others, or simply from the ability to influence the judgment of other members. Considering the less tangible side of SC [40], the study of relational skills allowed us to assess the degree of connection and density of the network. The trust network was the densest and most connected and underlines the internal expectations of the members of the OPAC-OSM about predictable, correct and cooperative behavior based on commonly shared standards. The relationship between SC and trust is widely treated in the literature, although there is no common hypothesis on whether trust is a cause, an effect or a constituent factor of SC [41]. In the case under study, it would appear that trust is an effect of SC which has its roots in shared values, and at the same time a constituent factor fueled by the cooperative behavior of individual members. In the trust network, what emerges is the role assumed by some partners, including the aforementioned AAOF, Rama, Coopfam, Camponesa, in addition to Apanfè, Auracaria Viva, APOM and Serras Verdes. As already mentioned, the fact that the collaborative network is less dense highlights that trust and information relationships are drastically reduced when they turn into concrete collaborations. But we must also keep in mind the structural characteristics of the Brazilian territory and of the agricultural organic sector, such as the long distances and the limited size of farms, which seem to have a negative impact on SC, according to the results. The distance between the members of the OPAC-OSM also influences the level of conflict between them, which seems inversely proportional. It should be noted how some of the members play a more strategic role, both in terms of the absolute number of

active collaborations (Araucaria Viva), and the ability to keep the network united (Coopfam and APOM).

The analysis shows that the length of experience and female participation are fundamental factors for the analysis of social capital in an OPAC. In particular, the presence of women is positively correlated with the collaborative network, a result that corroborates what has already been reported in the literature on the role of women farmers in many PGS initiatives and into PGS implementation [12,15].

This research confirms that a certification and quality assurance experience can increase the social capital of its members when this process is configured as an OPAC, a second level association of cooperatives, associations, and service providing public institutions.

From the analysis carried out, it is possible to conclude that the PGS are powerful tools in the strengthening of social capital, going far beyond quality assurance, which nevertheless remains the main objective of the OPAC. In turn, the strengthening of this SC goes beyond the interaction between farmers and their institutions, involving other actors in the process, such as consumers, extension organizations and universities.

Given the peculiar characteristics of the OPAC-OSM and of the region where it is located, it would be worth repeating the analysis of other OPACs from other regions, to verify whether this behavior occurs in the same way, with the same levels of importance of the variables, and whether the same main conclusions are found. Regardless, it seems clear to us that regardless of location, the PGS is an important tool for raising SC among organic farmers and within their different forms of organization. Obviously, all networks have room for improvement, and the research has also highlighted the critical points on which it is necessary to work in order to increase involvement and collaboration within the network.

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