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Capabilities to respond to institutional demands in the organizational field of the beef chain. Mapping and metrics of structural properties in Brazil and Argentina

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Abstract
The sociological approach of New Institutionalism premises that organizational responses to institutional demands depend on how the actors' networksare structured. This article proposes measures to assess the structural properties of the organizational fields of beef in Brazil and Argentina in two large producing regions, intending to evaluate their capacity to respond to the growing institutional demands of the agri-food sector. Four structural properties of networks were identified: openness, centralization, the density of central actors and their links with peripheral actors, and intermediation attributes. From these, a descriptive quantitative study was carried out based on primary and secondary data and analysis supported by the UCINET 6 software. It was mainly observed that both organizational fields are open to innovation, but the central actors are uncoordinated with few links touniversities and research centerswhile possessingdifferent characteristics to absorb and transfer demands and associate central and peripheral actors. This paper's contribution is on the application of a different theoretical approach that usually isnot associated with the agribusiness.
Keywords: Organizational Field. Structural Properties. Social Network Analysis. Beef.

Capacidade de respostas as demandas institucionais do campo organizacional da cadeia da carne bovina. Mapeamento e métricas de propriedades estruturais no Brasil e Argentina

Resumo
A abordagem sociológica do Neoinstitucionalismo presume que as respostasorganizacionaisàs demandas institucionaisdependem de como a rede de atores está estruturada. Este artigo propõeumquadro de medidas para avaliar as propriedades estruturais dos campos organizacionais da carne bovina no Brasil e na Argentina em duas

grandes regiõesprodutorascom vista a avaliar a capacidade de ambas asregiões de responder àscrescentes demandas institucionais do setoragroalimentar. Cinco propriedades estruturais de redes foram identificadas a partir da literatura: abertura, centralização, densidade de atores centrais e suasligaçõescom atores periféricos e atributos de intermediação, os quaisforamassociadas a medidas de análise de redes sociais. A partir destaproposição de medidas de redes sociais, realizou-se umestudoquantitativodescritivocom base em dados secundários e primárias e análiseapoiada pelo software UCINET 6. Observou-se que ambos os campos organizacionaispossuem abertura para a inovação, apesar da presença de atores centraisdescoordenados e baixorelacionamentocom universidades e organizações de pesquisa, mascom características distintas para absorver e transferir conhecimentoou se associaratores centrais e periféricos. A contribuição do artigo está naaplicação de um referencial teórico geralmentenãoempregado em campos agroalimentares.
Palavras–chave: Campo Organizacional. Propriedades Estruturais. Análise de Redes Sociais. Carne Bovina.

Capacidad de respuestas a demandas institucionales del campo organizacional de la cadena de carne bovina. Mapeamento y métricas de propiedades estructurales en Brasil y Argentina

Resumen
El Neoinstitucionalismo sociológico plantea que las respuestas organizacionales a las demandas institucionales dependen de cómo se estructura la red de actores de un campo organizacional. Frente a la necesidad de profundizar su mapeo empírico, este artículo propone un marco de medidas para valorar las propiedades estructurales de los campos organizacionales de la cadena de la carne bovina de Brasil y Argentina en dos grandes zonas productoras, que permita evaluar su capacidad de respuesta a crecientes demandas institucionales del ámbito agroalimentario. Se identificaron de la revisión bibliográfica quatro propiedades de la red: apertura, centralización, densidad de actores centrales y vínculos con periféricos y atributos de gatekeepers y brokers, asociados a métricas de análisis de redes sociales. Se realizó un estudio descriptivo comparativo cuantitativo, con base en fuentes secundarias y primarias, utilizando el software UCINET 6. Se observó que ambos campos organizacionales están abiertos a la innovación, aunque tienen actores centrales descoordinados conbaja vinculación con universidades y organismos de investigación y diferentes características para absorber y transferir demandas y asociar actores centrales y periféricos. La principal contribución es la aplicación de un referencial teórico apoyado en un estudio empírico habitualmente no empleado para el análisis de cadenas agroalimentarias.
Palabras clave: Campo Organizacional. Propiedades Estructurales. Análisis de Redes Sociales. Carne Bovina.

1 Introduction

From the sociological strand of Neo-institutionalism, the survival and success of organizations within the competitive structure of markets depend on factors related to efficiency and control of key resources, alongside the institutional influence of their environments that give them legitimacy (MEYER; ROWAN, 1977). This influence is translated into institutional demands that are conformity pressures exerted on other organizations through laws or regulations, normative prescriptions, social expectations, and institutional logic (DIMAGGIO; POWELL, 1983; PACHE; SANTOS, 2010). Institutional demands are in every organizational field

(PACHE; SANTOS, 2010). An organizational field includes organizations that provide similar goods or services, providers, buyers, consumers, regulatory agencies, etc., who share the same system of meanings and interact among themselves more frequently than with other organizations, constituting a recognized area of institutional life (DIMAGGIO; POWELL, 1983). This allows for a more precise delineation of the configuration of a given area of activity and enables the design and implementation of public policies more suitable for the strengthening of specific sectors that bolster local development (CARVALHO; VIEIRA, 2003).

For a while, neo-institutional studies focused on explaining the stability and growing homogeneity among actors of organizational fields by considering them simple passive recipients of contextual demands (DIMAGGIO; POWELL, 1983; SCOTT, 2012). Later DiMaggio (1988) initiated a re-evaluation, observing the existence of the interest and agency of the actors of an organizational field to influence their institutional contexts, a process that was classified as institutional entrepreneurship (SUDDABY, 2010; SCOTT, 2008). Consequently, the monolithic view of the power of institutional pressures to constrain organizational behavior was progressively replaced by a much more recursive approach, based on the fact that even when institutions condition organizational behavior it is always the product of human actions (CLOUTIER; LANGLEY, 2013). The implications of organizational responses to institutional demands have been addressed in the models of Oliver (1991) and Kraatz and Block (2008). Pache and Santos (2010) improved these models by analyzing the organizational responses to conflicting demands. These authors recognize that organizational responses depend on the structural properties of an organizational field. In this sense, Wooten and Hoffman (2008) suggested deepening the study of the relationships between the actors of a field to identify how these configurations are formed. For Machado-daSilva, Guarido Filho, and Rossoni (2006), a way to understand how organizational fieldsarestructured is to make the empirical mapping of the social network that makes up afield. However, studies are still lacking on how to measure the structural properties of an organizational field.

In contrast, within agri-food studies, this approach has not been widelyexplored, since to understand the links between actors, coordination problems, and the competitive performance of agricultural and agro-industrial systems, research based on the contributions of the New Institutional Economics (SCOPONI; DIAS, 2015) have predominated. However, institutional demands are increasing to meet ever more demanding requirements from constituent stakeholders on quality, environmentally viable products, inclusiveness, and ethics of products. Measuring structural variables of the field can help identify conditions that affect the behavior of its actors to absorb and diffuse these demands. Therefore, this article aims to build a framework of measures that allow assessingthe structural properties of the network of an organizational field to evaluate its ability to provide strategic responses to the institutional demands that affect the agri-food chains and press for their transformation toward more sustainable production and consumption systems. The purpose is to verify whether the measures from Social Network Analysis (SNA) can help to reflect the structural properties of the organizational field and predict whether its structure contributes to stability or the renewal of responses to institutional demands, and assess whether it favors the presence of conflicting demands for the organizations that

make it up. Additionally, recognize whether the field structure facilitates the spread of demands from the center to the periphery of the network and whether the central actors are in a better position to capture, transfer, or impose such demands on other actors.

The research was carried out in the organizational field of beef from two major producing areas in Brazil and Argentina, given the lack of comparative studies that characterize the structure of the organizational fields of agri-food chains for sociological neo-institutionalism. This choice was primarily because both countries are key players in the international beef market.According to OECD-FAO forecasts (2020), withthe growing demand for protein, by 2029, producer countries in South America will represent 81% of beef supply. This poses an important challenge for Brazil and Argentina's livestock sector to contribute to the demands of food security through environmentally sustainable and inclusive production for small- and medium-sized rural producers. Secondly, the production areas in both countries, COREDE Sul in Rio Grande do Sul (Brazil) and the Southwest of the Province of Buenos Aires (Argentina), were selected for having production and cultural similarities because they are locatedinthe Pampa biome.

The Regional Council for the Development of the South of the State of Rio Grande do Sul (COREDE Sul) was officially established by State Law N° 10.283 on 17 October, 1994,andcovers 22 municipalities (FEE, 2020). The main objectives of the Regional Development Councils (COREDEs) are the: promotion of harmonious and sustainable regional development; improvement of the efficiency of the use of public resources in government actions to improve people'squality of life and the equitable distribution of the produced wealth; and stimulation of the permanence of people in the region and preservation and recovery of the environment. One of the most important activities of COREDE Sul is cattle ranching, and rice and soy production. Thesehavesteadily lost economic relevance in Rio Grande do Sul and Brazil and face problems of degradation of natural environments, low social indicators relating to health and education, changes in the population's age structure, migratory movements, and the need to promote land-use planning and improve of social infrastructure. One of thegreatest current challenges isto increase the competitiveness of traditional activities, with the strengthening of the productive matrix, which is the case forbovine production (SECRETARIA DE PLANEJAMENTO, GOVERNANÇA E GESTÃO RIO GRANDE DO SUL, 2020).

In Argentina, the Southwest of the Province of Buenos Aires (SOB) was institutionalized as a differentiated region by Provincial Law No. 13.647 on March 21, 2007 to promote, through public policies, the livelihood of inhabitants, job opportunities, and local development from their agricultural activities. It is an area relatively little explored academically because it is considered a marginal area of the Pampean region, given its agro-ecological limitations. It has transformedas a result of agriculturalization, although with the persistence of family farmers as it is more suitable for livestock farming (HANG; GONZÁLEZ, 2020).

It is therefore relevant to identify the capability of regional production chains and their organizational fields to introduce and respond to the new and growing societal demands for safe, cheap, and environmentally friendly products that provide development opportunities for small and medium farmers, reduce poverty, and contribute to food security (WILKINSON; ROCHA, 2013). This empirical

application is intended to complement regional development studies carried out under other approaches.

2 Structural properties and measures of SNA

The institutional demands are pressures of conformity exerted on organizations by institutional referents (PACHE; SANTOS, 2010). These demands can be coercive, normative, mimetic, or cognitive (DIMAGGIO; POWELL, 1983). Such pressures are therefore channeled through formal regulations (laws and administrative rules), regulations agreed by professional organizations, or beliefs and perceptions related to carrying out agricultural activities. Consequently, when an organization contemplates rules and social elements, it must adjust itself to achieve legitimacy and social support (MACHADO-DA-SILVA; COSER, 2006). From the literature review, four main structural properties of an organizational field were identified that can help to predict the potential to generate within the field, strategic responses to institutional demands. These properties are an organizational field's: relative openness (GRANOVETTER, 1973); degree of centralization (PACHE; SANTOS, 2010); number of central actors participating (KAUFFELD-MONZ; FRITSCH, 2013); and degree to which the central actors are densely connected among themselves and peripheral actors (WATTS; DODDS, 2007). Firstly, the insertion of demands in an organizational field depends on the existence of a relative openness of the same (GRANOVETTER, 1973). An organizational field that has a certain degree of openness to external links means that it can achieve an exponential increase of opportunities for contacts and, consequently, access to information, knowledge, and influence (GRANOVETTER, 1973). The actors who participate within an organizational field, in general, maintain strong ties between members, allowing them to strengthen their norms, values, guidelines, and subcultures (UZZI; SPIRO, 2005). They usually practice intermediation to obtain non-redundant information through weak links with external actors (GRANOVETTER, 1973). This allows them to explore and access new and heterogeneous ideas, while high group cohesion facilitates the active exploitation of these ideas (GIUSTINIANO; D'ALISE, 2015). Thus, this configuration favors the permanence of values and practices, providing stability to the relationship structures; while also creating a space for transformation and innovation through the strengthening of their weak links (ROSSONI; GUARIDO FILHO, 2009). These collaborative links facilitate the circulation of new knowledge among the various groups so that this knowledge gradually obtains credibility and value and can be used productively by other groups (UZZI; SPIRO, 2005). Giustiniano and D'Alise (2015) emphasize that Small World is an SNA measure that makes it possible to assess a network of cohesive groups with external links. Research on Small World inter-organizational networks has suggested the existence of higher innovative performance when networks exhibit this configuration (D'ALISE; GIUSTINIANO; PERUFFO, 2014).

Secondly, the adoption of new demands also depends on the degree of centralization of the organizational field as a whole (PACHE; SANTOS, 2010),which shows whether organizations can impose their demands on the other actors of the field (PACHE; SANTOS, 2010). Centralized fields are characterized by dominant actors who support and reinforce the prevailing demands. Such central actors

include regulatory organizations (HOLM, 2015) that enforce certainbehaviors or other actors possessing more financial resources (RUEF; SCOTT, 1998) and exercising dominance through resource dependency relationships.They may also be represented by professional and educational organizations (GREENWOOD; SUDDABY; HININGS, 2002) that influence behaviors through socialization norms and accreditation processes. These central actors have legitimacy and authority to judge and resolve possible disagreements between actors and can also impose demands to organizations (PACHE; SANTOS, 2010). Decentralized fields are barelyformalized and characterized by the absence of dominant actors with the ability to restrict behaviors. In such decentralized fields, institutional pressures are quite weak and, when they are incompatible, can be easily ignored or challenged by the organizations, since the referents who exercise them have little capability to monitor them and make them compliant (PACHE; SANTOS, 2010). In contrast, centralized organizational fields are characterized by presenting some organizations or social actors on which members depend on.Pache and Santos (2010) explained that many uncoordinated organizations may internally generate conflicting demands. In a field with these characteristics, organizations rely on and respond to multiple and uncoordinated components and demandsthat may be contradictory. The authors suggest that such organizations face a dilemma: satisfying one demand may require not fulfilling others, which could jeopardize organizational legitimacy. The coexistence of multiple uncoordinated actors and their respective logics about what constitutes an adequate and legitimate behavior may increase the probability that institutional expectations are compromised (PACHE; SANTOS, 2010). Freeman (1979) proposes the centralization measure to understand if an organizational field is centralized. This measure shows the degree to which the structure and relationships are concentrated around a few actors, compared to an ideal star network. It allows knowing to what extent a network is similar to this configuration (FREEMAN, 1979). The centralization measure expresses the degree of variation or inequality in a network as a percentage of a perfect star network of the same size. The star network is the most centralized configuration possible, since only one actor relates to all the others, concentrating the links (WASSERMAN; FAUST, 1994).

Third, the adoption of new demands also depends on the central actors involved (KAUFFELD-MONZ; FRITSCH, 2013). This can refer to two types of central actors: gatekeepers and brokers. A gatekeeper is an organization that has the potential to absorb information from its direct links and transfer it to other members.Gatekeepers monitor the external environment and translate technical information in a comprehensible manner. In this way, gatekeepers go beyond the functions of a broker (KAUFFELD-MONZ; FRITSCH, 2013). Gatekeepers have the following characteristics: 1) they integrate a small community of individuals; 2) they are at the center of an information network; 3) they are overexposed to external sources of information; and 4) their links with external actors are mostly informal (ALLEN, 1977).

Gatekeepersareeven more important in underdeveloped regions. The absence of organizations that are well connected to the external environment and capable of transferring this knowledge can increase the risk of a region becoming isolated (regional lock-in situation), generating minor technological solutions to development problems (KAUFFELD-MONZ; FRITSCH, 2013). In these regions, private

organizations, which are usually well connected to global knowledge, are not present, so public research organizations should supplement (KAUFFELD-MONZ; FRITSCH, 2013).

The ARS measure known as intermediation centrality has been associated with gatekeepers (KAUFFELD-MONZ; FRITSCH, 2013). Intermediation centrality considers an actor as a means to reach other actors. It indicates how often a node appears on the shortest route connecting two other nodes in a social network. This measure values the dependence of non-adjacent actors on others, which serve as a bridge to allow interaction between them (WASSERMAN; FAUST, 1994). Therefore, an actor may have few direct contacts in the network, that is, be connected by weak links, and yet play a key role in information intermediation. The higher the degree of intermediation centrality, the greater the potential control of an actor over others concerning the information circulating in the network and itspotential path (MARTELETO, 2001). Another type of central actor are brokers (KAUFFELD-MONZ; FRITSCH, 2013). A broker participates in the direct exchange of information between organizations and also in the transmission of personal, complex, and recombined knowledge (KAUFFELD-MONZ; FRITSCH, 2013). A broker enables knowledge flows since knowledge hardly crosses a large number of actors that are not directly connected becauseit is more complex than information and usually involves tacit components. The benefits of the broker can be several: reduction of information asymmetry between agents, possible arbitrators in contracts, prevention of misunderstandings, and possibility of controlling and mediating in the construction of trust (KAUFFELDMONZ; FRITSCH, 2013).

Degree centrality is a measure of the ARS connected with brokers. The degree centrality of a node is the number of adjacent nodes Pj (i ≠ j) directly connected to the node (WASSERMAN; FAUST, 1994). It varies between 0 and (T-1), where T is the number of nodes. The node with degree zero is called an isolated vertex. Actors with a high degree of degree centrality can access and obtain more resources in the network. This type of centrality measure identifies the number of direct or adjacent contacts that an actor maintains in a network since it measures its level of communication and allows evaluating the local activity of actors (ROSSONI; GUARIDO FILHO, 2009).

Alternatively, the Eigenvector indicator represents an improvement in the measure of direct or degree centrality. It identifies actors that have a high centrality value and are connected to many nodes which, in turn, are well connected; therefore, they are good candidates for disseminating information (WASSERMAN; FAUST, 1994).So, the Eigenvector indicator measures the influence of a node in a network.In this sense, the most central nodes correspond to centers of large cohesive groups (WASSERMAN; FAUST, 1994). The Eigenvector is an attempt to find the most central actors, i.e., those with less distance than others for global or overall structure, focusing less on more local patterns (WASSERMAN; FAUST, 1994). Comparing degree centrality and Eigenvector, while in degree centrality each node has the same influence within the network, in the node Eigenvector, the influence varies according to the node's connection (WASSERMAN; FAUST, 1994). Bonacichpower is another measure of ARS centrality that recognizes the actor whose direct contacts have few relationships, a situation that makes the actorpowerful, as they aredepended on for communication and

connection,especially by those with little power and poor connections (BRAND; VERSCHOORE, 2014; WASSERMAN; FAUST, 1994). Bonacich'spower measure may be indicative of the presence of central actors with power to institutionalize their demands (PACHE; SANTOS, 2010) on their relatedorganizations.

Finally, the fourth structural property is where the diffusion of new demands depends on the central actors being densely connected amongthemselves and with peripheral actors (ROSSONI; GUARIDO FILHO, 2009; WATTS; DODDS, 2007). The institutional demands are introduced into a system by members of higher status. In networks that have a perfect structure of core-periphery, new ideas or behaviors reach the periphery of the network, since information tends to extend vertically, which accelerates the propagation. In this structure, having opinion leaders topromote the propagation is more important, because the information is not restricted to the central system (WATTS; DODDS, 2007). The so-called "core-periphery phenomenon" recognizes that in a social network there are actors in the center who are densely interconnected, and actors with a low degree of centrality in a network'speriphery, who are more linked to the central actors than their peripheral pairs (ROSSONI; GUARIDO FILHO, 2009).

The core-periphery phenomenon can be measured through core-periphery ARS measures. Two perspectives can be adopted formeasure: the discrete and continuous models perspectives (BORGATTI; EVERETT, 2000).

In the discrete models perspective there are two groups of nodes: the "core" in which the actors are fully connected and the "periphery," which consists of not so strongly connected nodes. The ideal version of this structure is proposed by Borgatti and Everett (2000).

For the continuum model, each node in the network is assigned a measure of centrality of proximity Coreness. The model is consistent with the interpretation that the strength of the link between two actors is a function of the proximity of each one to the center. If the values of C are limited to 1 and 0, the continuous model reproduces the discrete model.

Box 1 summarizes the structural measures of ARS that were found to be associated with the structural properties of an organizational field.

Box 1 - Structural properties and associated measuresof SNA

Structural properties	Authors	Structural measures of ARS	Authors
Openness	Granovetter (1973)	Small World	Uzzi y Spiro (2005)
Centralization, decentralization	Pache y Santos (2010)	Centralization	Freeman (1979) Wasserman y Faust (1994)
Centralactor-gatekeeper	Kauffeld-Monz y Fritsch(2013)	Betweenness centrality	Wasserman y Faust (1994)
Centralactor-broker	Kauffeld-Monz y Fritsch (2013)	Degree centrality Eigenvector Bonacichpower	Wasserman y Faust (1994)
Densityofcentralactors andconnectionswithperipheralactors	Rossoni y Guarido Filho (2009); Watts y Dodds (2007)	Core–periphery	Borgatti y Everett (2000)

Source: own elaboration.

3 Methodological aspects

A comparative descriptive study was carried out using quantitative methods of SNA to obtain a systematic characterization of the actors withinthe organizational field of the beef chain in the producing zones of COREDE Sul and the SOB and of their links, since they are determinants of the structure of these fields. The descriptive studies of comparative type aim to identify and characterize the differences between variables related to the same phenomenon in two or more groups (HERNÁNDEZ SAMPIERI; FERNÁNDEZ COLLADO, BAPTISTA LUCIO, 2010).

Due to the advance of agriculture represented mainly by the growth of soybean, both areas in Brazil and Argentina face the challenge of achieving more efficient livestock farming that is profitable and simultaneously responds to social and environmental sustainability demands while increasing prospects for protein consumption (SCOPONI et al., 2020). From ARS metrics, the study sought to characterize the structural properties of both fields to evaluate their potential response to these institutional demands.

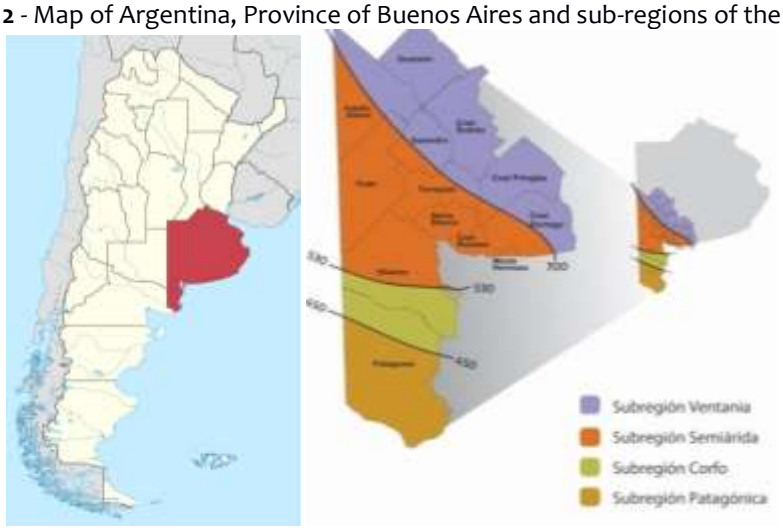
COREDE Sul comprises an area made up of 22 municipalities (Map 1). It is the second most important district for the number of head of cattle in Rio Grande do Sul, with a 12,38% share of the total cattle stock after COREDE Fronteira Oeste (23,48%) (IBGE, 2018). Unlike the previous district, since 2009 it has shown a drop in the participation of the state cattle stock, mainly due to the advance of soybean cultivation, and is undergoing a process of reconversion of its production systems.

Map 1 -Map of Brazil, Rio Grande do Sul, and municipalities of COREDE Sul

Source: Economics and Statistics Foundation (FEE) of Rio Grande do Sul.

In Argentina, the study was limited to two sub-areas that include 8 of the 12 districts that make up the Southwest region of Buenos Aires: Semi-arid and Depressed northwest of the Ventania system. This choice was made for two reasons: firstly, because they both account for 61% of the regional stock (SENASA, 2018) and secondly, because the shift of the agricultural frontier has generated in them an increasing competition for the use of the land factor with grain production. The Southwest of Buenos Aires (Map 2) has a Regional Council thatpromotes its development,taking into account its particular soil and climate characteristics of dry sub-humid, semi-arid and arid nature and agricultural and livestock production (art. 3 and art. 4).

Map 2 - Map of Argentina, Province of Buenos Aires and sub-regions of the SOB



Source: Ministerio de Desarrollo Agrario de la Provincia de Buenos Aires, Argentina.

To delimit the boundary of the networks under study,this studyfollowed the model of metatheoretical perspectives of Laumann, Marsden, and Prensky (1983).For this research, a nominalist-based perspective was adopted, combining two foci. The first is based on an initial selection of actors made by the researchers based on a distinctive characteristic, which, for the case studies, is centered on the

slaughtering and/or processing of meat (slaughterhouses, slaughterhouse suppliers). This criterion was based on findings obtained from the survey of secondary sources, which revealed that these organizations fulfill a key function for the multiplication of value-added to the consumer, and the consequent economic and social development of the areas analyzed. The second focus adds members to the previous ones, considering the relationships these actors have with others. To this end, the snowball method was employed, whereby the incorporation of new members followed the criterion of reaching the point where most of the new members were already cited by other actors in the group. In operational terms, a mapping of the actors in the organizational field was initially carried out using secondary information sources. A total of 68 publications related to cattle farming in2007–2013 were collected (Table 1).

Table 1 - Secondary sources across 2008–2013

Source	2008	2009	2010	2011	2012	2013	Total
Rev. AAEA	--	--	1	1	--	--	2
EE INTA Bordenave	4	2	1	1	3	2	13
IPCVA	3	--	1	--	2	2	8
MAA/MINAGRI	--	1	1	1	3	1	7
CREEBBA	5	3	6	1	3	2	20
JIEAA (*)	--	4	--	2	--	--	6
AAEA (**)	--	--	4	8	--	--	12
Total	12	10	14	14	11	7	68

Source: ownelaboration.

(*) Interdisciplinary Conference on Agrarian and Agroindustrial Studies.

(**) Annual Meeting of the Argentinean Association of Agricultural Economics.

Once the first list of organizations was obtained, personal interviews were conducted with managers, directors, or those who hold positions in which strategic decisions are made. A total of 59 interviews were conducted in Argentina and 34 in Brazil from August, 2014 to May, 2015 to identify social relations. To identify the links between organizations, a structured questionnaire guide was used, which contained a central question: "With which organizations does your organization relate to meet the demands associated with beef production and marketing?" The possible organizations were already listed, and the interviewees informed whether they maintained links with them or not. Additionally, the interviewees were asked to add new organizations, in case any organization with which they were related was not included. The information collected was compiled into a spreadsheet, which was then reorganized into a new matrix database for the ARS (CLARK, 2006). The structural measures described in the theoretical framework (WASSERMAN; FAUST, 1994) were calculated. Data processing to obtain structural measures wereperformed using UCINET 6 software (BORGATTI; EVERETT; FREEMAN, 2002).

Regarding the actor centrality metrics, these were determined for the totality of actors that emerged from the processing and define the size of the network. However, the centrality values obtained for the three most central actors that exceeded the average value are shown for each network.

4 Results

First, the general characteristics found in the organizational field of the beef chain in Brazil and Argentina are described, considering each network as a whole. Then, the values found for the measures of ARS that were identified as associated with the four structural properties of the field are exposed.

4.1 General information about the organizational field

In SOB, the size of the network is 466 actors, with a principal component of 453 actors, while in COREDE Sul, the size is 116, with a principal component of 106 actors. In both networks, the principal component comprises more than 90% of the actors in the network (97% in Argentina and 91% in Brazil). When analyzing the density values, which measure the number of effective links out of the total number of possible links, in both networks a better use of relationships is observed for the organizational field of COREDE Sul, since the density amounts to 5%, while in SOB it reaches a value of less than 2%. In both countries the networks are not very dense, and there is the possibility to increase the number of links between their actors and achieve greater cohesiveness. Furthermore, in the SOB the shortest average distance is 2,93actors, while in the Brazilian network it is 2,76 actors. Also, the longest average distance between two actors in the network (diameter) amounts to 6 in COREDE Sul, while in SOB it is smaller (5), despite the network's larger size.

4.2 Degree of openness of the organizational field

To assess the degree of openness of the organizational field to new institutional demands, it was verified whether the analyzed networks follow the Small World logic. To this end, the parameters proposed by Watts and Strogatz (1998) were calculated to show the presence of this phenomenon in the main component of each network (Table 2).

Table 2 - Small World Organizational Field of Beef in SOB and COREDE Sul

Measures	Nomination/Formula	SOB (Argentina)	COREDE Sul (Brazil)
Observed Data			
Cohesion measures			
Density	Δ	0,02	0,06
Actors	T_{cp}	453	106
Average Degree	C_m	7,96	5,79
Mean distance (geodesic)	Geo dist	2,93	2,76
Grouping measures			
Clustering	CC	0,217	0,237
Random Data (Watts y Strogatz, 1998)			
Coef of expected random clustering	$ECC = C_m / T_{cp}$	0,0176	0,0546
Average expected distance	$Exp\ Geo\ Dist = \ln(T_{cp}) / \ln(C_m)$	2,9482	2,6555
Small World indicators			
Average distance ratio	Relation AD = Geodist / Exp Geo Dist	0,9938	1,0393
Clustering coefficient	CC Ratio = CC / ECC	12,3494	4,3389
Small World coefficient	Q = Relation CC / Relation AD	12,4262	4,1746

Source: own elaboration.

Watts and Strogatz (1998) established the Small World measures, concluding that it occurs when the actors of a large low-density network are highly grouped locally, forming different and well-defined clusters, and are also linked to actors from outside their groups through a small number of intermediaries. Contrary to what happens in random networks where the distance increases more and more with the number of nodes, the average distance in a Small World presents little variance. Therefore, the identification of the phenomenon occurs through two variables: the clustering coefficient (CC), which indicates the degree of connectivity of the actors with whom a certain actor connects, being a local density measure, and the mean distance (PL). To characterize the phenomenon, the following characteristics must be presented, calculated on the main component of the network (WATTS; STROGATZ, 1998):

- The PL rate (mean real network distance (real PL)/mean random network distance (random PL)) should be close to 1.
- The CC rate (Actual Clustering Coefficient (Actual CC)/Random Clustering Coefficient (Random CC)) must be greater than 1.
- The Small Worlds coefficient (Q) calculated as the ratio between the CC rate and the PL rate must be greater than 1.

The rate of the CC (CC Rate) is greater than 1 in both inter-organizational networks or fields, being noticeably higher in SOB where it reaches 12,3494 compared to 4,3389 in COREDE Sul. This is because the actual CC observed in both networks was much higher than the expected CC in random networks. Regarding the average distance observed, it was less than the expected average distance, for which the average distance rate (MD Rate) reached values close to 1 in both networks, being slightly lower in the SOB with 0,9938, in relation to the inter-organizational network of COREDE Sul (1,0393).

It emerges that the Small World phenomenon occurs in both networks. Likewise, the Small World coefficient (Q) of Uzzi and Spiro (2005) was

estimated, which reinforces what was previously found. It is thus observed that the values reached in said coefficient are greater than 1, being clearly higher in the inter-organizational network of Argentine beef (12,4262) compared to the Brazilian (4,1746).

4.3 Centralization of the organizational field and central actors

Both networks are also similar regarding centralization, which is low, reaching 24% in the Argentine network and 31% in the Brazilian (Table 3). No substantial variation was identified between the positional advantages of individual actors, as they are evenly distributed within the network.

Table 3 - Centralization of the beef organizational field in SOB and COREDE Sul

Structural Measures	SOB (Argentina)	COREDE Sul (Brazil)
Centralization	0,24	0,31

Source: own elaboration.

Table 4 shows the actors that could be gatekeepers in the SOB. This means that, given their position in the network, they are actors who have a great capability to absorb relevant knowledge that is dispersed, and then introduce and disseminate it, sharing it with their local links. Therefore, they areimportant in innovation processes whenresponding to institutional demands (KAUFFELD-MONZ; FRITSCH, 2013) and in the dissemination of these demands to other network actors (MACHADO-DA-SILVA; COSER, 2006).

Table 4 – Betweenness centrality in the organizational field of bovine meat of the SOB

N°	Actor	Betweenness
58	CAGP	26739,3
145	INTERM1	13203,4
367	SUPP33	11081,1

Source: own elaboration.

The results indicate that the actors of the regional agricultural-livestock cooperative (CAGP), intermediary 1, and supplier 33 have the condition to act as gatekeepers within the organizational field of beef of the SOB. The CAGP is a cooperative of producers that provides inputs for livestock activity and provides marketing services. It is an organization with many direct ties, representing many producers. Intermediary 1 is a consignee of property that organizes regional auctions. Supplier 33 refers to a locally recognized private professional who provides laboratory and advisory services. This condition is explained by the SOB beinga predominantly breeding and rearing area, in which, due to the nature of these activities, these actors, respectively, play an important commercial and support role within the value chain. These three actors are private organizations.

COREDE Sul identified the actors that could be gatekeepers through the intermediation centrality measure (Table 5). The three most prominent organizations are the: Department of Rural Development, Fisheries and Cooperatives of Rio Grande do Sul (SDR), Secretary of State for Agriculture, Livestock and Supply of Rio Grande do Sul (SEAPA) and Technical Assistance and Rural Extension Company (EMATER). These organizations are public. The SDR

identifies problems in the organizational field of COREDE Sul beef, alongside proposing and implementing public policies to provide solutions to said problems. SEAPA is the state organization mainly involved in sanitary control and the dissemination and application of good management practices in the beef chain. In recent years, the interference of these actors in the absorption of knowledge and carrying out controls to ensure the quality of the final product at critical points in the meat chain has increased. EMATER is a Brazilian service company seeking to transfer technologies and develop rural areas.

Table 5 - Betweenness centrality in the organizational field of beef in COREDE Sul

N°	Actor	Betweenness
101	SDR	1701,72
102	SEAPA	1492,20
36	EMATER	766,07

Source: own elaboration.

The previous analysis can be complemented with the identification of influential actors that could play a key role in the organizational field. The following tables show the results obtained for the actors of beef forthe SOB with the three highest values. Table 6 analyzes the actors that could function as brokers.

Table 6 – Degree centrality and Eigenvector in the beef field of the SOB

N°	Actor	Degree centrality	N°	Actor	Eigenvector
145	INTERM1	119	145	INTERM1	0,27
367	SUPP33	106	367	SUPP33	0,24
58	CAGP	93	130	SLAUGHT5	0,19

Source: own elaboration.

This analysis is based on measures of degree centrality and Eigenvector; they represent nodes (actors) that maintain more direct links and, in turn, are linked to other well-connected nodes. Therefore, they are actors that connect different contexts and can build trust, reduce asymmetries, interpret demands, and translate sophisticated knowledge into the network (KAUFFELDMONZ; FRITSCH, 2013). These results indicate that intermediary 1, supplier 33, the CAGP, and slaughterhouse 5 are the most central actors. These are the same actors that presented the highest centrality of intermediation, except for slaughterhouse 5,which is a family business with a history in the regional meat industry thatis only qualified to slaughter for domestic consumption (national traffic). Unlike the CAGP, this organization does not appear as a more important actor regarding the number of direct relationships with other actors (degree centrality). However, it is an organization that exerts its influence by being linked to more central or related actors (Eigenvector) in the value chain.This position is likely due to a decline in the industrial activity of meat processing plants in the SOB region in the period analyzed, which led to the closure of plants as a result of public policies of export retention and state intervention in the domestic market. As a result, meat production was discouraged and a fall in the regional cattle stock was generated.

In Table 7, the actors able to exercise power and impose institutional demands are analyzed through Bonacichpower. It is observed that the actors with the greatest power are the same with those with the highest values of

intermediation centrality and Eigenvector: intermediary 1, supplier 33, and slaughterhouse 5. Therefore, these results reinforce these actors as brokers regarding their capability to absorb knowledge, interpret institutional demands, and channel them through the field.

Table 7 –Bonacichpower in the beef field of the SOB

N°	Actor	BonacichPower
145	INTERM1	18778,19
367	SUPP33	16799,07
130	SLAUGHT5	12963,26

Source: own elaboration.

From the analysis of the structural position of the different public and private organizations in the Argentine inter-organizational network, it can be inferred that the field is made up of multiple, misaligned actors. While the influence of private organizations that participate directly in the commercial chain can be observed, these do not share a determined area, since the greatest centralities are found in a service provider, an intermediary that connects producers to the market and in a slaughterhouse. In contrast, within the chain, we are dealing with actors that act "upstream," which may explain the difficulty that the Argentine beef value chain presents to quickly interpret the signs of an increasingly segmented and demanding market. Next, the centrality measures of actors in COREDE Sul with the three highest values are analyzed. Firstly, the results obtained from the actors that could be brokers are in Table 8. It should be noted that SDR and SEAPA also have the highest betweenness centrality.

Table 8 –Degree centrality and Eigenvector in the beef field in COREDE Sul

N°	Actor	Degree centrality	N°	Actor	Eigenvector
102	SEAPA	18778,19	102	SEAPA	0,36
65	INMETRO	16799,07	65	INMETRO	0,27
101	SDR	12963,26	53	SLAUGHT F	0,26

Source: own elaboration.

The SEAPA and National Metrology Institute (INMETRO) are the organizations with the most direct links to other actors (degree) and are connected to well-connected actors (Eigenvector). INMETRO is an organism linked to the metrology activity in Brazil which aims to strengthen national companies by increasing their productivity by adopting mechanisms to improve the quality of products and services. Its mission is to give confidence to the Brazilian society in the measurements and products, through metrology and conformity assessment, the promotion of harmonization of consumer relations, innovation, and competitiveness after symmetrical relations with consumers. These three organizations have a wide range of qualified human resources such as agronomic engineers and veterinarians. They are involved in the technical control and technological improvement of companies in the beef chain.As for slaughterhouse F, it has the potential to disseminate market information on consumer demands and,

as a result, can demand new and better organizational and productive processes from rural producers.

Finally, the actors who could exercise power and apply their demands are analyzed through the Bonacichpower measure (Table 9). The actors with the highest values are two public organizations with regulatory power (SEAPA and INMETRO) and a private organization (slaughterhouse F).

Table 9 - Bonacichpower in the beef field in COREDE Sul

N°	Actor	Bonacichpower
102	SEAPA	6769,01
65	INMETRO	5026,90
36	SLAUGHT F	4951,79

Source: own elaboration.

4.4 Density of central actors and connections of peripheral actors

This section analyzes whether the inter-organizational networks that make up the organizational fields of beef in SOB and COREDE Sul present the center-periphery phenomenon. For this purpose, the correlation coefficient proposed by Borgatti, Everett, and Freeman (2002) was determined using the UCINET 6 software through a continuous model, alongside the Gini coefficient and coefficient of heterogeneity calculated complementary by the software (Table 10).

The Gini coefficient measures how centrality is distributed in a population and reflects the degree of inequality in the data. Values close to 1 indicate greater inequality while values close to 0 show greater equality between the actors. The coefficient of heterogeneity measures the degree to which scores are evenly distributed.

The correlation coefficients presented by both networks (0,15 for SOB and 0,197 for COREDE Sul) indicate that the networks studied have low correlation for an ideal center-periphery model. The highest Gini coefficient (0,629 in the Argentine network and 0,852 in the Brazilian) indicates a concentration of proximity centrality in few actors (Coreness), which would be one of the premises of the existence of the center-periphery phenomenon. While the low degree of heterogeneity in both networks (0,004 in the Argentine network and 0,045 in the Brazilian) indicates that these more central actors are not densely connected with peripheral actors.

Table 10 –Center-periphery of the beef organizational field in SOB and COREDE Sul

Networks	Correlation	GINI Coefficient	Heterogeneity
SOB (Argentina)	0,15	0,629	0,004
COREDE Sul (Brazil)	0,197	0,852	0,045

Source: own elaboration.

5Discussion

Four structural properties of the networks that make up the organizational fields of beef corresponding to two major producing areas in Brazil and Argentina

have been valued through their association with measures of ARS to understand the potential of both fields to introduce new institutional demands and respond strategically to them, given the growing demands of stakeholders for quality, accessible, products obtained under sustainable conditions. The results indicate that the networks of both organizational fields show differences in the size as a whole and in its main component. Likewise, both networks present similar values of distance, diameter, and density, showing that these fields tend to be more unified, which may indicate that the organizations respond to few coordinated actors and this generates an understanding of the reality about what is more effective for the legitimacy of the organizations, reducing the probability of the emergence of conflicting demands (WHETTEN, 1978; DEEPHOUSE, 1996; RUEF; SCOTT, 1998).

The assessed structural characteristics of the organizational fields, analyzed as a whole, and the central position of their actors based on the theoretical framework, are in Box 2.

Regarding the degree of openness, the Argentine and Brazilian inter-organizational networks present a Small World configuration. So, although both networks favor thestability of values and practices, contributing to the creation of lasting relationship structures, contrastingly, they have the potential to provide transformational and innovative responses through the strength of their weak ties (ROSSONI; GUARIDO FILHO, 2009). These collaborative ties could facilitate the circulation of new knowledge about new institutional demands among the various groups, so that this knowledge gradually becomes more credible and valuable in new contexts and can be used productively by other actors (UZZI; SPIRO, 2005). Regarding the degree of centralization, both networks are moderately decentralized. Therefore, in both countries, the organizational fields present uncoordinated actors. This condition is likely to lead to conflicting or contradictory claims. However, the pressures generated will be weak and the organizational field can easily ignore or challenge them (PACHE; SANTOS, 2010). Finally, both organizational fields do not present the center-periphery phenomenon. This suggests that new ideas or behaviors will not reach the periphery of the network, since the information will typically spread among the central actors, delaying its propagation. Consequently, the importance of the central actors for the promotion and dissemination of institutional demands is limited, because the information is restricted to the system's core (WATTS; DODDS, 2007).

Box 2 - Structural characteristics of the organizational fields of beef analyzed

Characteristics of the organizational field	COREDE Sul (Brazil)	SOB (Argentina)	Interpretation
Degree of Openness	Small World Present	Small World present	Both fields show conditions for the stability of values and practices, but there is room for transformation and innovation.
Centralization	Middle term toward decentralization	Middle term toward decentralization	Some uncoordinated actors generating conflicting demands, but these demands tend to be weak.
Density of central actors and connections of peripheral actors	Phenomenon center-periphery absent	Phenomenon center-periphery absent	Central actors with low connection intensity between themselves and no connection with peripheral actors.

Source: own elaboration.

Regarding the central actors and their role, Box 3 summarizes all centrality metrics analyzed and the characteristics recognized by their position in the network in the most central actors of both organizational fields. It is observed that in the network of the organizational field of beef in SOB the most central actors are located from the slaughter link backward in the "upstream" chain. They are represented by a slaughterhouse and by organizations that provide support services in the marketing of livestock, including a cooperative, which is explained by the production atomization.Although within the network there are links with public and private organizations that carry out actions of dissemination and technology transfer, such as INTA (National Institute of Agricultural Technology), INTI (National Institute of Industrial Technology), IPCVA (Institute for the Promotion of Argentine Beef), breeders associations, and Universidad Nacional del Sur, it was observed when analyzing the number of links, that the articulation is still scarce. In the network for COREDE Sul, unlike the Argentinean network, the actors with the highest measures of centrality are present in the forward boundary of the commercial chain "downstream," with high participation of public entities of sanitary control and extension/technological transfer, which is a better condition of the network to channel market oriented demands. In the Brazilian network, the presence of actors with high Bonacichpower who have regulatory power, combined with central actors without this power, limit the possibility of questioning the decision on how to compete in the field and consequently in the markets where they operate.

Box 3 - Characteristics of the central actors of the organizational fields analyzed

Characteristics	Central organizations CORede Sul (Brazil)					Central organizations SOB (Argentina)			
	SDR	SEAPA	EMATER	INMETRO	SLAUGHTF	CAGP	Interm1	SLAUGHT5	SUP33
Potential to absorb and transfer information to other groups (Betweenness centrality)	X	X	X			X	X		X
Potential to directly transfer new knowledge. High number of direct links (Degree centrality)	X	X		X		X	X		X
Direct links with well-connected actors (Eigenvector)		X		X	X		X	X	X
High number of direct links with barely connected actors (Bonacichpower)		X		X	X		X	X	X

Source: own elaboration.

In both networks, the structural positions of their central actors allow a better understanding of the changes that have occurred in the last ten years in cattle farming in Brazil, compared to Argentina. Given that while Brazil surpassed the European Union and United States in export performance, Argentina was relegated (DE LAS CARRERAS, 2010), reflecting a lower orientation toward the external market, which poses more demanding demands, and a scarce centrality of public organizations to channel these institutional demands, promote arbitration in the face of conflicting demands and generate conditions so that private actors can provide innovative responses. Contrastingly, the analogies identified in both fields are associated with the specific conditions of developing countries, in relation to the scarce articulation of actors in the value chain and the slow diffusion of institutional demands and innovations for their modernization, recognized in various studies in both countries (PALAU, 2006; MALAFAIA; MACIEL; CAMARGO, 2009). Additionally, there is a weak link between the organizations, universities, and research centers to develop innovative responses within the fields analyzed. This confirms Trigo, Pomadera, and Villarreal (2012) regarding agricultural innovation systems in Latin American countries. Following Kauffeld-Monz and Fritsch (2013), these types of organizations must act as gatekeepers to prevent the areas under study from becoming isolated and limited in their development possibilities, which is observed as a weakness of the field organizations of the beef chain in both countries. Box 4 shows the potentialities and limitations identified from the analysis of the structural properties of each organizational field and its most central actors.

Box 4 -Potentialities and limitations of the organizational fields of COREDE Sul and SOB to respond to institutional demands based on their structural characteristics

Characterization of response capability	COREDE Sul (Brazil)	SOB (Argentina)
Potentialities	−Openness to introduce new demands and disseminate them through its central actors, represented by public bodies with regulatory power, given that the field presents a certain stability of values and practices. −The most central actors are located “downstream.” −It reflects conditions to respond with greater coordination to the demands of consumers and other stakeholders based on public programs. −This can accelerate demands toward peripheral actors and limit conflicting demands.	−Openness to introduce new demands and disseminate them through the central role played by private actors. −The most central actors are located "upstream" in the chain, mainly represented by an input supplier and a commercial intermediary. −The demands channeledby these actors can contribute rapid production transformations. −Private initiative appears as an essential element to promote changes in the face of the lack of centrality of public entities.
Limitations	− Knowledge of the institutional demands introduced in the field does not have the possibility of reaching a large number of actors, concentrating on the most linked, which infers a capability for slow transformation. −There is little link between the chain's organizations and universities and research centers to develop innovative responses.	
	−It shows dependence on the central role of public actors for the propagation of demands. −It presents low centrality of private actors that can favor productive innovations.	−Evidence low centrality of public bodies to promote demands and resolve conflicts or limit those contradictory. −It presents a low centrality of public and private actors that can promote commercial innovations.

Source: own elaboration.

This characterization of the organizational fields of the beef chain from the sociological perspective of Neo-institutionalism seeks to complement research based on other theoretical approaches that adopt a meso level of analysis, to obtain a diagnosis from the knowledge of the structure of their social networks, which contributes to guide the formulation and implementation of public policies for local development in the study areas in Brazil and Argentina (CARVALHO; VIEIRA, 2003; SCOPONI; DIAS, 2015).

6 Final considerations

This research aimed to build a framework of assessment measures that identify the structural properties of the network of an organizational field to recognize its ability to provide strategic responses to institutional demands. These measures were validated in a comparative empirical study in the organizational fields of beef in Brazil and Argentina to understand their potential to introduce new institutional demands that lead to transformation, given the traditional coordination problems that other studies have identified and that affect

the competitiveness of these chains and their possibility of sustainably contributing to a greater extent to local development.

A set of demands for local development through sustainable cattle ranching in the Pampa biome were identified by Scoponi et al. (2020). For Brazil, the need for rural producers to adapt to Law No. 12.651, called the "New Forest Code." Initially, rural producers successfully complied with the obligation to submit a diagnosis on the adequacy of their properties in the Rural Environmental Registry (CAR). A second demand from the same law refers to rural producers registering an environmental recovery plan (PRA), which has not yet been required by the Environmental Agency of the State of Rio Grande do Sul (SEMA). Another demand identified by Scoponi et al. (2020), which is common to both countries, is the mandatory introduction of animal welfare practices throughout the production chain, especially in slaughterhouses,alongside the need to implement more sustainable cattle production systems, while accounting fora biome'secological specificities.

When analyzing the structural characteristics of the field associated with COREDE Sul, the presence of central actors with a structural position capable of recognizing and transferring knowledge is observed, for which are expected toimplement the coercive demands derived from environmental and animal welfare legislation, especially in slaughterhouses. However, it is inferred that the non-coercive demand for a more sustainable cattle production system that considers the ecological specificities of the biome will have greater difficulty in being adopted. A positive aspect of the field's structure is that it is sufficiently open to innovation and transformation. Even when it is characterized by uncoordinated central actors with little connection with the periphery and lack of centrality of research organizations or universities that can, in a coordinated and comprehensive manner, generate and disseminate a technological response to this latest demand. Comparatively, the SOB presents a lower degree of centralization, which increases the probability of conflicting demands and evidences conditions to the possibilities of coordination between the actors, given the low centrality of public actors. Private actors appear to have greater capability to spread demands, but limited "upstream" of the beef chain, so it can be expected that there will be less difficulties in transforming production approaches. This has been observed in improvements introduced in genetics, in forage and farmer management practices. Although from the structural configuration found in the ties of the field, weaknesses are inferred to achieve commercial added value in the region, to the extent that there are no incentives such as public programs that, integrated into Buenos Aires' Provincial Law No. 13.647, stimulate responses to the demands of environmental and social sustainability of production to serve increasingly demanding markets and stakeholders, while covering economic aspects. The programs that are formulated must be broad and differentiated in their receivers to sustain the subsistence of the high number of small- and medium-sized family farms (HANG; GONZÁLEZ, 2020), considering the low connection found between central and peripheral actors. Whereas, having stability over time to support transformations in a field where the structural properties infer a slow propagation of institutional demands.

In summary, in both fields, due to their Small World configuration, there is room for innovation. However, in both countries it was observed that other

organizations with greater potential to access external sources of knowledge and with more qualified human resources, such as universities and research organizations, still play a timid role and should be strengthened so that Brazil and Argentina develop the capability to respond with a scientific-technological basis and based on their local realities, to the growing and complex demands for food security, action against climate change, and territorial rural development.

Although the present research covers a restricted number of actors that do not equate the total population of the areas under study, given that they represent a sample of their social relationships, it has sought to advance the knowledge of the functioning of the organizational fields of chains with high impact for the local development of both countries, combining barely explored and validated theoretical perspectives in agri-food studies. Future research may advance the identification of the type of responses to different institutional demands and the discussion of the hypothesis that demands are confirmed to be conflicting in moderately centralized fields. Also carry out larger statistically based predictive research.

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