



# Collaboration for social innovation in the agri-food system in Latin America and the Caribbean

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## Abstract

**Aim of study:** This study reviews the state of the art of collaboration for social innovation in food and rural systems. The analysis focuses on cooperation by farms and agro-industry companies. The purpose is to identify not only the state of the art of this research topic but also the main authors, the countries where these studies are conducted and the dynamics of research networks in relation to these topics.

**Area of study:** Latin America and the Caribbean (LAC).

**Material and methods:** The Web of Science database was used to search for articles containing the terms ‘cooperation’, ‘networks’, ‘innovation’, ‘social’, ‘rural’ and ‘LAC’. Using VOSviewer network creation and analysis software, maps of citations, co-authorship, co-citations and co-occurrence of key-words were created and analysed. Content analysis was then performed. Finally, the research areas that the authors of the analysed articles consider to be of interest for future research were identified.

**Main results:** The results reveal that researchers from Latin America and other regions, especially Europe and the English-speaking world, are showing a growing interest in collaborative systems for development and social innovation in LAC.

**Research highlights:** The analysis enables further progress to be made in identifying the main drivers of collaboration in the LAC rural sector. These main drivers include social innovation, knowledge, sustainable management and social capital.

**Additional key words:** rural studies; developing countries; collective actions; agri-food

**Abbreviations used:** LAC (Latin America and the Caribbean); LAFS (Localised Agri-Food System); WoS (Web of science)

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## Introduction

Cooperation through innovative actions aids small producers’ access to local and global value chains, thus improving their income and well-being (Cook & Plunkett, 2006; Tregear & Cooper, 2016; Lazzarini, 2017; Orsi *et al.*, 2017; Mutonyi, 2019; Okonkwo *et al.*, 2019). These collaborative actions between actors within the food value chain have been examined as part of analysis of the formal and informal relationships within knowledge and innovation systems (García-Alvarez-Coque *et al.*, 2020). Innovation intermediaries (Kilelu *et al.*, 2011) have been

cited as the organisations that are officially committed to coordinating and facilitating these innovation processes between parties.

Research on innovation systems in Latin America and the Caribbean (LAC) in recent years has highlighted the crucial role of the private sector in promoting innovation (Hartwich *et al.*, 2007; Devaux *et al.*, 2018). However, there has been little research on the forms of cooperation used by farms and agro-industry companies to engage in innovative activities. The purpose of this study is to offer in-depth bibliometric analysis of the state of the art of innovation collaboration in food and rural systems in LAC

countries and the types of entrepreneurship employed in this area. This study aims to describe not only the development of this research topic in LAC but also the key authors, the countries where this research is conducted, the organisations involved and the dynamics of the research networks in relation to these topics. The paper also provides content analysis based on the key-words of the selected documents.

## Material and methods

### Conceptual framework

Social innovation is a social construct in which individuals participate in actions to achieve a certain purpose and carefully monitor the results (Cajaiba-Santana, 2014). Collaboration, learning and adaptation are central elements in this connective process of innovation (McElroy, 2002). This type of innovation is supported by strong social capital, which is central in explaining the endogenous development of regions and thus the companies that emerge in these areas. Several authors have reported its influence on regional and business innovation processes (Bakaikoa *et al.*, 2004). Steenwerth *et al.* (2014) emphasised the idea that social capital is crucial to encourage the adoption of innovations by farmers, particularly regarding the evaluation of costs and profits. This idea is reasonable given that it is the actors associated with a particular community who are best positioned to specify and solve specific problems that must be addressed collectively (Mulgan, 2006).

Social capital is also an essential part of collaborative initiatives, as reported by Cook & Plunkett (2006) in their analysis of new forms of producer-owned organisations. These initiatives, which include elements of group innovation, are oriented to the search for opportunities and new markets and can be considered collective business processes.

Cooperation in innovative activities must be analysed systemically, considering cooperation between several types of actors as a key part of individual and collective success. This cooperation between businesses in search of innovation often appears in the form of networks. Through these networks, companies pursue joint projects, share resources, reduce transaction costs, achieve economies of scale and economies of opportunity, and reduce risks. Moreover, they are able to do all of this and more whilst maintaining their competitive advantages (Cano López, 2002; Bakaikoa *et al.*, 2004; Burrell & Cook, 2009; Papadimitri *et al.*, 2020). Various agents, known as innovation intermediaries, enable access to knowledge, skills, services and goods from a wide range of organisations (Kilelu *et al.*, 2011). In the creation of networks, intermediaries enhance the connectivity of a varied group of actors by

strengthening ties and reducing structural differences (Klerkx & Leeuwis, 2009).

The creation of inter-organisational networks enables the pursuit of strategies that go beyond defining new business models or achieving specific business objectives. In fact, business innovation networks can influence their environment, and the unforeseen effects of their actions and random external events outside the control of actors have the potential to reinforce or counteract their efforts (Klerkx *et al.*, 2010). Thus, collaborative innovation networks offer a way of achieving social and environmental objectives (Grimm *et al.*, 2013) through the search for solutions to meet a local need (Dufays & Huybrechts, 2014), the use of existing resources, the creation of new resources and the establishment of institutional agreements that support these changes (Montgomery *et al.*, 2012). Examples of such networks include the collaboration of family farmers to develop more profitable, resource-efficient and environmentally friendly products, which contributes to achieving sustainable growth in food production and reducing rural poverty (Dogliotti *et al.*, 2014; García-Flores & Palma Martos, 2019).

The introduction of innovations first requires the development of capabilities and learning processes (Nelson & Winter, 1982; Ernst, 2002; Lema *et al.*, 2018). In fact, innovation efforts in the agricultural sector differ according to their varying conditions. Studies have shown that innovative behaviour is positively influenced by the amount of available land, access to credit, education and membership to an organisation within this sector. In contrast, older farmers and part-time agriculture do not favour innovation (García Álvarez-Coque *et al.*, 2014; Läßle *et al.*, 2015).

### Methodology and data

The study was organised by following the phases displayed in Table 1. The first phase of the study was the selection of database and software tools. The main source of data for this study was the Web of Science (WoS) Core Collection database. This database was used because it offers one of the most comprehensive collections of scientific journals in the world. Thus, the relative importance of documents, authors, journals and references could be objectively quantified. Two main software programs, Microsoft Excel and VOSviewer 1.6.14, were selected for data management. Afterwards, data collection was carried out in April 2020. The search covered the title, key-words, and abstract fields (the subject area) for all available years in the WoS database at the time of the study.

The search string contained terms related to 'cooperation', 'networks', 'innovation', 'social', 'rural' and 'LAC'. Combining these terms helped limit the scope of the field of study. However, variations were used to

**Table 1.** Phases of the study carried out and description

Study phases			
I	Study design	Selection of databases with bibliometric data	Web of Science
		Selection of software tools for analysis	VOSviewer and Microsoft Excel
		Selection of query wording and boolean operators	Presented in Table 2
		Selection of timespan	1900- April 2020
II	Data collection	Dataset selection n=104	Presented in Table 2
III	Data processing	Microsoft Excel	Statistical analysis
			Documents sort by top publishing journals, most cited references, most cited authors, organizations, and countries
		VOSviewer	Bibliometric network analysis and visualization Bibliometrics maps of citations, co-authorship, co-citations, and co-occurrence of key-words
IV	Data analysis	Descriptive and content analysis	
		Evaluation of bibliometric networks, contents, and proposals for future research	
	Discussion and conclusions		

include different terms to refer to cooperation, to cover the private sector and to account for all relevant agents within the food or rural system (Table 2). The WoS search engine returned 135 documents that matched the search string up to the year 2020. The categories unrelated to the topic under analysis were excluded. The abstracts of these papers were examined to eliminate those that did not refer to LAC countries or a rural context and those that did not include some kind of collaborative innovation. Finally, the search returned 104 documents published up to April 2020.

The data collected were imported into Microsoft Excel to analyze the top publishing journals, cited references, cited authors, organizations, and countries. The VOSviewer software allowed to build bibliometric networks and maps.

We completed the study with: (i) descriptive and content analysis of the most relevant published articles, (ii) evaluation of the bibliometric networks and, (iii) proposals from the authors for future research.

The bibliometric analysis developed included citations, co-citations, co-authorship, and key-words co-occurrence. Citation analysis is a way of analyzing performance by measuring the number of times an article, author, organization, or country was cited. Citations are used as a rate of importance and relative influence.

As an indicator of the collaboration between researchers, institutions, and countries, a co-authorship analysis was made. This assessment provides information on relationships based on joint participation in one or more articles.

Co-citation analysis counts the number of times an author, article, or journal is cited together. This tool is helpful for constructing similarity measures based on the assumption that the more two articles are cited together, the more likely it is that their content is related (Zupic & Cater, 2015).

Finally, through a key-word co-occurrence analysis, the articles were grouped into clusters according to their key-words. This allowed us to perform a content analysis of the most cited documents based on their clustering.

## Results

Although collaboration in innovation activities is a topic of current interest, its growth is relatively recent in terms of research on LAC. As indicated earlier, the search returned 104 articles corresponding to the area of 'innovative cooperation in rural areas of Latin American countries'. Although the WoS database contains publications since 1900, the first Latin American study on the topic appearing in the database was not published until 1998. There has been a significant increase in the number of articles published in recent years. There has also been steady growth in citations year on year.

Below, analysis of the metrics and relationships between articles is presented. This analysis sheds light on the degree of development of the topics of interest in the present study.

**Table 2.** Steps taken in the search for the selected documents

Step	Topic	Results
#1	(SOCIAL)	1,477,782
#2	(COLLABORATION OR LINKAGES OR NETWORK* OR COOP* OR ALLIANCE OR ASSOCI* OR PARTNERS OR ORGANIZ* OR COLLECTIVE)	9,288,649
#3	(ENTREPRENEUR* OR INNOVAT*)	557,635
#4	(RURAL OR AGRI* OR FARM OR 'FOOD SYSTEM*' OR PEASANT OR SMALLHOLDERS)	810,565
#5	('LATIN AMERICA' OR IBEROAMERICA OR 'SOUTH AMERICA' OR 'ANTIGUA AND BARBUDA' OR ARGENTINA OR BAHAMAS OR BARBADOS OR BELIZE OR BOLIVIA OR BRAZIL OR CHILE OR COLOMBIA OR 'COSTA RICA' OR CUBA OR 'DOMINICAN REPUBLIC' OR DOMINICA OR ECUADOR OR 'EL SALVADOR' OR GRENADA OR GUATEMALA OR 'COOPERATIVE REPUBLIC OF GUYANA' OR HAITI OR HONDURAS OR JAMAICA OR MEXICO OR NICARAGUA OR PANAMA OR PARAGUAY OR PERU OR 'SANTA LUCIA' OR 'FEDERATION OF SAINT KITTS AND NEVIS' OR 'SAINT VINCENT AND THE GRENADINES' OR SURINAME OR 'TRINIDAD AND TOBAGO' OR URUGUAY OR VENEZUELA)	726,694
#6	(PRODUCERS OR BUSINESS OR FIRM OR ENTITIES OR ENTERPRISE OR ORGANIZATION OR ORGANISATION OR COMPANY OR VENTURE OR JOINT OR PROJECT OR ACTIVITY)	7,211,744
#7	#6 AND #4 AND #3 AND #2 AND #1	1,718
#8	#7 AND #5	186
#9	refined by: [excluding] WEB of SCIENCE categories: (NUTRITION DIETETICS OR ENGINEERING CIVIL OR FISHERIES OR HEALTH CARE SCIENCES SERVICES OR HEALTH POLICY SERVICES OR HISTORY OR HOSPITALITY LEISURE SPORT TOURISM OR INDUSTRIAL RELATIONS LABOR OR LANGUAGE LINGUISTICS OR PHARMACOLOGY PHARMACY OR LAW OR TROPICAL MEDICINE OR LINGUISTICS OR WATER RESOURCES OR MARINE FRESHWATER BIOLOGY OR ARCHAEOLOGY OR MEDICINE GENERAL INTERNAL OR ARCHITECTURE OR METEOROLOGY ATMOSPHERIC SCIENCES OR PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH OR ONCOLOGY OR REGIONAL URBAN PLANNING OR PARASITOLOGY OR PRIMARY HEALTH CARE OR PSYCHOLOGY MULTIDISCIPLINARY OR REHABILITATION OR ENDOCRINOLOGY METABOLISM OR ENGINEERING INDUSTRIAL OR SOIL SCIENCE OR URBAN STUDIES ) AND document type: (ARTICLE OR EARLY ACCESS OR PROCEEDINGS PAPER OR BOOK CHAPTER OR BOOK) AND [excluding] organization-consolidated: (UNIVERSITY OF CALIFORNIA SYSTEM)	135
#10	[manually excluded] NOT LATIN AMERICA, NOT RURAL, NOT INNOVATIVE COOPERATIVE ACTIVITIES IN RURAL AREAS IN LATIN AMERICAN COUNTRIES	104

Period = annual; indices = SCI-EXPANDED (Science Citation Index Expanded), SSCI (Social Science Citation Index), AHCI (Arts & Humanities Citation Index), CPCI-S (Conference Proceedings Citation Index – Science), CPCI-SSH (Conference Proceedings Citation Index – Social Science & Humanities), BKCI-S (Book Citation Index – Science), BKCI-SSH (Book Citation Index – Social Sciences & Humanities), ESCI (Emerging Sources Citation Index), CCR-EXPANDED (Current Chemical Reactions), IC (Index Chemicus).

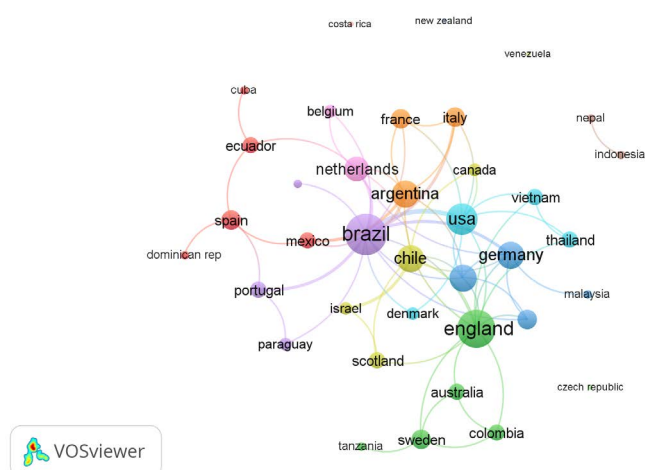
### Impact in terms of citations: Most cited authors, organisations and countries

The total number of citations of all selected articles was 740. Table S1 [suppl] presents the 20 most cited articles of those considered in this study. The total number of authors of the analysed articles is 323. Of these authors, 70 have received at least 10 citations of the selected articles. The co-authorship network shows that most of the nodes, which in this case represent the authors, are not connected. However, there are six clusters of authors connected to each other through co-authorship or citations. There are 209 connections or links in the network. These links indicate co-authorship or citation relationships. The analysis of the network implies that the authors collaborate little in this subject area.

Of the 10 most cited organisations where research on innovative cooperation in rural areas of LAC countries has been conducted, only four are in Latin America (two in Chile and two in Brazil).

The network depicted in Figure 1 shows the 37 countries where the authors of the articles have their affiliations. There are 75 links between 13 clusters. The size of each node indicates the productivity of each country. There is collaboration amongst researchers in LAC countries and between these researchers and scholars from the rest of the world.

The country with most citations is the United States, with 208 citations and 10 documents. The United States is followed by Chile, with 10 articles and 147 total citations, and then Canada, with 4 articles and 144 citations. The most productive country is Brazil, with 24 articles.



**Figure 1.** Network of countries where the authors of the selected documents are affiliated. *Source:* Map in VOSviewer of links by country based on Web of Science data. Nodes = 37 countries; minimum articles per country = 1; minimum citations = 0.

However, in terms of citations, it is in fourth place (116 citations). Other productive countries that have received few citations are Mexico (15 documents and 15 citations) and Argentina (12 documents and 14 citations)

**Co-citations: Most cited references**

Co-citations indicate which references are cited the most often in the documents considered in this study. The analyzed articles cite 5,005 documents, of which 188 appear in at least two articles.

The most cited article is that of Porter (1998), who discusses the competitive advantages embedded in local knowledge, relationships and motivation. The second most cited article is that of Coleman (1988), who descri-

bes the concept of social capital. The third most cited article is that of Eisenhardt (1989), who proposes and discusses the case study method. Following this is the study by van Dijk & Sverrisson (2003), who discuss the dynamics of the progress of business clusters in developing countries. This article also has strong linkages. The fifth most cited article is that of Granovetter (1973), who suggests that the analysis of social networks can contribute to the discussion of relationships between groups. The author emphasises the cohesive power of weak ties in terms of the study of social structures.

Although the most frequently cited article is that of Porter (1998), which contributes to the analysis of clusters, the article with the most links to others (in terms of total links) is the study by Brown & Bell (2001), who also contribute to the study of industrial clusters and the internationalisation of small businesses.

**Top publishing journals**

The articles analyzed were published in 82 sources. The most used sources are detailed in Table 3. However, the most used sources are not necessarily the most cited. The three most cited journals are the “International Journal of Physical Distribution & Logistics Management”, with 91 cites, “Proceedings of the National Academy of Sciences of the United States”, with 63 cites, and “Economic Geography”, with 62 cites.

**Key-word co-occurrence**

The co-occurrence network is made up of the keywords repeated in at least five articles. There are 613 key-words overall. The following 15 appear in at least five articles: ‘innovation’, ‘management’, ‘systems’,

**Table 3.** The top ten journals publishing on innovative cooperation in rural areas of Latin American countries.

Journal	Documents	Cites
Sustainability	5	21
Ciriec-España, Revista de Economía Pública Social y Cooperativa	5	0
Journal of Cleaner Production	4	22
Proceedings of the National Academy of Sciences of the USA	2	63
Agricultural Systems	2	34
Cuadernos de Desarrollo Rural	2	19
Interciencia	2	18
Ecosystem Services	2	10
Entrepreneurship and Regional Development	2	9
Academia-Revista Latinoamericana de Administracion	2	8

*Source:* Compiled by the authors based on data from Web of Science.

'networks', 'governance', 'agriculture', 'Brazil', 'impact', 'Mexico', 'social innovation', 'sustainability', 'knowledge', 'conservation', 'development' and 'social capital'.

These words can be grouped into four clusters, each shown by a different colour in Figure 2. The size of the circles corresponds to the number of articles where the key-word appears. These four clusters show the groups of words that relate most strongly to each other and enable the identification of possible relationships between articles.

#### Cluster 1: Innovation and knowledge

The key-word that has the most occurrences and the strongest linkages and that links the most articles to one another is 'innovation'. This key-word forms a cluster with the key-word 'knowledge'. Amongst the most cited articles that include these words is the study by Geldes *et al.* (2017). They found that the interorganisational cooperation of companies is positively related to cognitive and organisational proximity but negatively related to social and institutional proximity, perhaps due to previous negative experiences amongst members. The results show that cooperative innovation in non-developed countries with low levels of social capital differs from that in developed economies.

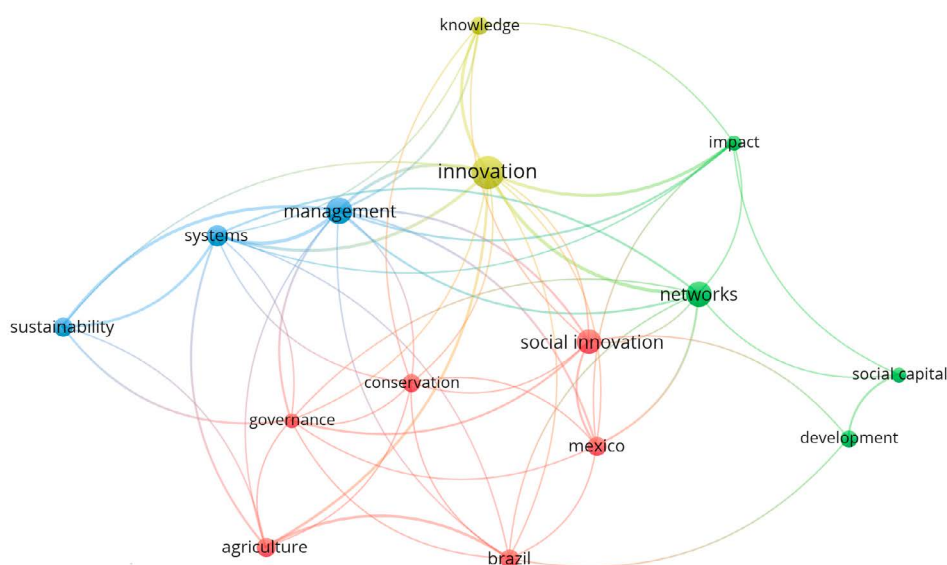
Within this cluster, the article by Lebel *et al.* (2016) also has a high number of citations. They found that the social networks that producers belong to are crucial for filtering out misinformation and multiplying insights from personal experience in learning by doing. They report that

government and industry initiatives to improve the links between knowledge and practice for sustainability have succeeded when the incentives are aligned with those of producers (*i.e.* sustainable production and the rational use of resources).

Ortiz *et al.* (2008) argue that for interactive or mutual learning between organisations to take place, participative learning environments for individuals or groups must be encouraged. Moreover, public relations help create knowledge and collaboration when formalised in the form of inter-institutional mechanisms. They conclude that individuals, groups or organisations innovate when they are exposed to and actively participate in a learning process that involves producing, testing, evaluating and making sense of a certain innovation, especially new methods.

In another article in this cluster, Schröter *et al.* (2015) use a technical innovation to analyse the intermediaries of this kind of sustainable land management innovation. The innovation intermediary in this case is a group originating from a university. This innovation intermediary influences the acceptance and application of the innovation by providing access to resources and reducing uncertainty in the early stages of the process through the creation of trust and a network. Another key role of this intermediary in the overall innovation process relates to overcoming uncertainty and convincing farmers and institutions that the system can function effectively. The group performs this role not only by distributing knowledge but also by showing a commitment to and interest in social change.

The search for sustainability and the evaluation of both scientific and empirical knowledge can lead to new



**Figure 2.** Network formed by the main key-words in the selected articles. *Source:* Map of co-occurrence of key-words in VOSviewer based on Web of Science data. Nodes = 15 keywords; minimum keyword occurrence = 5; links = 59; clusters = 4.

forms of collaboration. This idea is developed in a study of agro-ecological producers in Brazil (Teixeira *et al.*, 2018). The authors of that study found that farmers who identified themselves most as agro-ecological farmers usually had stronger commitments to the network of farmers' organisations, universities and non-governmental organisations (NGOs). These farms also revealed great potential to provide a wide range of ecosystem services. Another conclusion of the study is that the recognition of farmers' knowledge and know-how is essential for the development of agro-ecology.

In summary, the leading articles in the cluster corresponding to the key-words of 'innovation' and 'knowledge' cite individual and group experiences as drivers of knowledge and innovation. Moreover, they highlight the role of institutions as not only innovation and knowledge intermediaries but also generators of trust and cohesion. The analysed documents point to the knowledge and organisational similarities shared by the key drivers of collaboration in LAC.

#### *Cluster 2: Management, systems and sustainability*

The second cluster links the key-words 'management', 'systems' and 'sustainability'. The word management has the second highest occurrence and total strength of linkages amongst the 15 key-words in the network.

The most cited article in this cluster is the study by Hall & Matos (2010), who describe the incorporation of impoverished communities into sustainable value chains. The authors report that new development opportunities can come from sectors at the base of the pyramid. However, there is a need to develop new business models that are more inclusive, trustworthy and environmentally friendly.

Another article in this group focuses on the conservation of maize agro-diversity in Bolivia versus the rise of other crops. Zimmerer (2013) concludes that various factors have contributed to the preservation of this crop. These factors include agricultural intensification, the management of the available productive resources, social and ecological links, and extensive knowledge systems (combining indigenous and non-indigenous elements).

Along these lines, Florin *et al.* (2013) analysed the decision making of Brazilian family producers in the production of biomass for biofuels. The authors conclude that to achieve family farmers' engagement and thus move towards a 'sustainable programme that promotes social inclusion and regional development', the following elements are simultaneously required: improvements in technical crop management, reductions in farm-level financial constraints and innovations in the production chain such that family farmers' engagement extends beyond the cultivation of a low-value crop at the expense of current agricultural activity.

Also in relation to the management of agricultural businesses and sustainable production systems, Urquiza & Billi (2020) studied how local systems cope with and adapt to present and future water stress, also analysing whether different types of water management structures influence this situation positively or negatively.

The analysis of the articles in this cluster (management, systems and sustainability) shows that to ensure that the sustainable management of productive resources leads to sustainable development in LAC, these actions must aim to strengthen social capital and develop more affordable crop management systems from a technical and financial point of view.

#### *Cluster 3: Networks, development, impact and social capital*

Cluster 3 consists of the key-words 'networks' (the third most important in terms of mentions and number of links), 'development', 'impact' and 'social capital'.

The most cited article combines these concepts by analysing female entrepreneurship through the economic geography of different countries. The article presents a case in Peru as an example for Latin America (Hanson, 2009). The author highlights the fact that women use entrepreneurship to change their lives and the lives of others. In the process, they change the places where they live. Crucial aspects for this purpose are developing skills, building trust and establishing business networks.

Another widely cited article in this cluster is the study by Schwittay (2011), who analysed the potential of social networks from a gender perspective by focusing on the Costa Rican coffee sector. Using participant observation, the author found that although the initial goals of the company were not met, the intervention in the programme's region led to social and technological changes and the inclusion of female labour. This intervention had a positive social impact that led to a new development path in this highly traditional sector and the inclusion of women entrepreneurs.

The relationship between networks and social capital in local development has been analysed by Felzensztein & Gimmon (2009), Felzensztein *et al.* (2010) and Geldes *et al.* (2017). These analyses suggest that informal social networks help explain the relationship between geographical proximity and cooperation between firms, especially for those located in peripheral rural communities in Chile.

Along these lines, Hunecke *et al.* (2017) examined the impact of social capital on the adoption of irrigation technologies amongst wine producers in central Chile. The authors identified seven components of social capital: general trust, trust in institutions, trust in water communities, norms, formal networks, informal

networks and size of networks. They found that trust in institutions, formal networks and informal networks positively influence technology adoption. The authors conclude that, as expected, physical and human capital have a significant positive relationship with technology adoption. The authors also cite networks as the main catalysts for social capital.

Social networks with greater density, size and links are positively related to the adoption of innovations and greater social capital. This conclusion was reached by Zarázua *et al.* (2012), who evaluated the indicators of social capital and the innovation dynamics of two groups of producers in the Mexican maize social network. Following this line of network analysis, scholars have studied the collaborative processes that support the development of rural tourism in rural communities in Argentina and Italy. Chiodo *et al.* (2019) provide a framework for the study of these collaborative processes. These processes start with the integration of local agricultural, environmental and heritage resources through commitment from private and public actors. They are then strengthened by integration and collaboration with extra-local networks. The results of the aforementioned study reveal the need for the co-evolution of two factors: first, the integration or unification of initiatives (resources and actors), and second, the coordination of these initiatives, many of which are individual and isolated, with agents and institutions at different levels of interconnection.

Enriquez-Sanchez *et al.* (2017) used social network analysis to assess the pre-existing social capital and thereby examine the activation of a localised agri-food system (LAFS). They analysed the case of cream cheese from Chiapas, concluding that the process of creating value from traditional know-how requires collective action by the cheese makers in the region. This process requires a certain amount of social capital based on trust, solidarity, reciprocity and shared values.

The articles in this cluster (networks, development, impact and social capital) reveal a positive relationship between social capital and social networks and their impact on regional development. Social capital based on trust and networks, which can be developed in rural environments, lays the foundations for collective action.

#### *Cluster 4: Social innovation, agriculture, Brazil, Mexico, conservation and governance*

The leading key-word in this cluster is ‘social innovation’. This key-word is the fourth most important key-word in terms of occurrence and links. The key-words ‘Brazil’ and ‘Mexico’ suggests that these are the LAC countries with the strongest links between these concepts.

The most cited article in this cluster analyses the results of policies on the environment and livelihoods in

Quilombola communities (Adams *et al.*, 2013). The authors conclude that future interventions in the region should build on the new, functional links between sustainable livelihoods and biodiversity, where less restrictive state policies leave room for new opportunities in self-organisation and innovation.

Another article with the key-words ‘social innovation’ and ‘Brazil’ discusses the evolution of the Brazilian Ecovida network. Rover *et al.* (2016) present the main components of the network’s social innovation and collaborative dynamics. The combination of diversification through agro-ecology and social innovation are the key factors that have enabled the growth and development of the network.

Doroteu *et al.* (2018) studied the disparity between Brazilian state promotion and investment in social technology and the promotion and investment in conventional technologies. They define social technology as products, techniques and methodologies that can be applied and developed through interaction with the community and that offer effective solutions for social transformation. Unlike conventional technologies, these technologies are developed in collaborative environments, promote social and human development through popular knowledge, social organisation, and technical and scientific knowledge, and generate social innovation.

Within the evolutionary theoretical framework of social innovation, Gallego-Bono & Tapia-Baranda (2019) analysed the dynamics of the sugar cane cluster in Veracruz (Mexico). The aim of the study was to show that in LAC clusters, social innovation is a precondition for extracting value from local knowledge. The authors emphasise the idea that transparent and participative governance and values and principles such as those embraced by entities in the social economy are necessary to enable the functioning of mechanisms that promote change and the modernisation of clusters.

Tolentino Martínez & del Valle Rivera (2018) also focused on Mexico, using the theoretical approach of the localised agri-food system (LAFS) and the operational concepts of governance and social innovation to analyse new organisational and socio-productive dynamics in communities. These dynamics cover food diversity, heritage and cultural conditions in rural areas. The results of this analysis reveal that social innovation and governance contribute to empowering productive groups, providing communities with the opportunity to continue their learning processes to contribute to rural development.

The results of research in this cluster (social innovation, agriculture, Brazil, Mexico, conservation and governance) reveal the importance of concepts such as social innovation and governance in LAC agri-food systems. The analysis of these articles once again shows that collaboration, linkages and local knowledge are the pillars of rural development in this region.



## Discussion

### Key characteristics of collaboration for social innovation

The previous analysis, based on the assessment of bibliometric networks and contents, suggests the following characteristics of collaborative social innovation in LAC agricultural and rural system:

- Schröter *et al.* (2015), Geldes *et al.* (2017) and Teixeira *et al.* (2018) found that knowledge and organisational similarity are the greatest determinants of cooperative innovation in Latin American countries with low levels of social capital. This finding differs from those for developed economies reported by Bakaikoa *et al.* (2004) and Cook & Plunkett (2006), who observed that social capital and the search for joint actions form the basis for social innovation and collaborative ventures.
- As reported by Granovetter (1973), some authors have found that the social networks with the greatest impact are not necessarily the closest networks. Weak links between individuals who are further away from each other in a given network can also lead to collaboration and innovation (Hanson, 2009).
- In rural areas, social innovation can help transform the organisation of the food system, creating the right conditions for small farmers to improve their access to the market and receive differentiated treatment from public policies. Examples include the institutionalisation of participatory certification schemes and structural support for the organisation of local and networked markets (Rover *et al.*, 2016; Enriquez-Sanchez *et al.*, 2017).
- Social innovation in LAC occurs through participation, integration, local knowledge, trust and sustainable production (Rover *et al.*, 2016; Teixeira *et al.*, 2018; Gallego-Bono & Tapia-Baranda, 2019).

Some prospects and guidelines for research on innovative collaboration in the region are also indicated:

- In relation to economic geography, Felzensztein & Gimmon (2009), Felzensztein *et al.* (2010) and Geldes *et al.* (2017) consider that future research should study how various types of economic activity shape a location in terms of quality of life and opportunities to empower those with the least influence.
- As for smallholder intensification strategies, studies should focus on sustainability and agro-diversity, new forms of self-organisation, regional culture, innovation, linkages and land use planning (Adams *et al.*, 2013; Zimmerer, 2013; Teixeira *et al.*, 2018). This focus would create possibilities to define poli-

cies or at least broad knowledge-inclusive and comprehensive strategies.

- Many of the assessed research is exploratory or based on case studies. Therefore, some of the findings cannot be extrapolated to larger populations. To provide more general results, it would be useful to expand samples and conduct research to compare countries and regions (Felzensztein *et al.*, 2010; Chiodo *et al.*, 2019; Gallego-Bono & Tapia-Baranda, 2019). There is still some way for agricultural social science to implement control trials oriented to assess the impact of public policies in rural economies (Banerjee & Duflo, 2012).
- A large number of the authors report that their findings can contribute to creating public policies that promote different types of innovation and the quality of life of a region's inhabitants. Specifically, the emphasis should be on studying the possible networks and stimulus policies aimed at inclusion, trust and participation. Gallego-Bono & Tapia-Baranda (2019) suggest that these policies to promote participatory and inclusive governance should be based on the transparency of institutions. Likewise, Hall & Matos (2010) report that collaborative approaches can be conducive to such policies. However, they must be combined with further research on business dynamics in poor communities.
- In addition to the above lines of research, specific questions arise about the supply chain and horizontal collaboration. There are also question marks over the role of regional organisations in improving cooperation, including various types of institutional or facilitating mechanisms such as social linkages and information technology. A more in-depth analysis of specific regional culture is also required.

### Final remarks

- In recent years, interest in learning about innovative collaborative systems in LAC has increased substantially. The results show that the study of collaboration in innovation is a subject of current interest. The development of research in connection with Latin America has been relatively recent, with a substantial increase in the number of published articles and citations in recent years. Certain universities and research centres in the region play a prominent role in this field, although they often collaborate with others located in the United States, Europe and other advanced countries. The bibliometric analysis leads to the following conclusions:
- The subject of collaborative systems for development and social innovation in LAC has attracted

the interest of researchers from other regions, especially Europe and the English-speaking world.

- There is notable collaboration between authors from different countries, especially between those from Latin American countries and those from outside the region.
- The majority of the most cited authors, organisations and countries are not associated with Latin American institutions.
- Collaborating with authors from other countries may offer a way for Latin American researchers to publish in the top journals.
- Chile, Brazil, Mexico and to a lesser extent Argentina are the Latin American countries responsible for the most research on collaborative innovation systems.

Along with studies that exclusively address innovation and collaboration in rural areas of LAC, the articles with the most citations present analysis from various perspectives. Examples include the environment, gender equity, inequality and poverty. The most popular methodological approach is the case study. The latest articles reflect a growing interest in the cases and experiences of social innovations.

Databases are becoming more and more relevant for the analysis of scientific relevance and research collaboration. Our review of these articles reveals the most widely used conceptual frameworks and results on these issues in LAC. Two main limitations emerge. The first is the study's sole focus on WoS database. Being the most widely used database, it cannot be expected to cover all publications and research on innovation systems in the agri-food and rural system in LAC. Despite this limitation, most bibliometric studies use this database as a data source. A second limitation is that the analysis should be completed with the consideration of grey literature which would contribute to assessing the state of research in the policy dimension. Future research could consider the monitoring of results related to societal missions or to the Sustainable Development Goals (Mazucatto, 2018; Klerkx & Begemann, 2020).

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