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Characterization of the dairy production chain in Córdoba-Colombia.

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***Abstract*—** The dairy production chain is a complex system made up of several links, where the basic product is milk production. This study aimed to characterize the dairy production chain in the Department of Córdoba in Colombia. The dairy chain analysis included identifying its links, actors, and the interrelationship between them. The primary information was obtained through observation visits and the application of a survey with a representative sample of actors from the productive chain, while the secondary information corresponded to institutional documents. The sample size was 53 suppliers of goods and services, 162 production units, four collection centers, 38 industrial organizations, 12 distributors, and 77 consumers, and the results were analyzed using descriptive statistics. The study's findings identified that the dairy production chain is comprised of links in the primary sector, transformation, intermediation, and final consumer, which also interact with government actors, academics, and agents of society. Most organizations comply with regulations, exchange capital and information, and perceive knowledge facilitators and competitiveness variables of the chain with high qualifications, while the use of ICTs was perceived negatively. The conclusion is that despite the existence of relationships between the links in the chain, there is a significant opportunity to improve the strengthening of these links and the application of technological and communication tools to improve their indicators.

Keywords: productive chain, characterization, competitiveness, link, dairy.

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I. INTRODUCTION

Business integration mechanisms allow the organization of productive systems and their technological and economic strengthening while building social interaction links. The literature reports different forms of business integration, such as clusters [1]-[3], supply chains [4]-[7], technology parks [8], [9], and business networks [10], [11], among others.

Agri-food chains are a mechanism for business integration, where the production and distribution of agricultural products are mainly aimed at human nutrition [12]. In addition, product and information flow occur simultaneously, and they differ from other chains due to the biological nature and perishability of their raw materials and products, restrictions in terms of safety, health, and environmental preservation, and the cultural component of their management environment, primarily linked to the rural setting, among other reasons [13].

The dairy production chain in Colombia consists of a complex system of several links, where the primary product is the production of milk from cattle in specialized or dual-purpose systems [14]. This research will diagnose the production chain in the Department of Córdoba, located in the Colombian Caribbean region.

II. THEORETICAL FRAMEWORK

The integration mechanism depends on a country's economy, level of development, social composition, and geographic location, among other reasons. Therefore, successful cases in one region do not ensure adequate functioning in different contexts [15]. For example, in Brazil, the production chain approach was useful for analyzing and understanding the complex macro-processes of production and determining the performance of systems and untapped opportunities in production, administrative and technological processes [16].

Production chains are considered a form of business integration that, through cooperative structures, allow economic and technological strengthening and promote the consolidation of the social fabric [17], [18]. Therefore, these chains have been considered relevant for the organization of the Colombian agricultural sector, but they are not the only forms of business integration. There are other structures and various authors who have proposed the following approaches in recent years: clusters [1]-[3], supply chains [4]-[7], technology parks [8], [9], business networks [10], [11], chaebol [19], kibbutz [20], among others, which can coexist and together provide particular elements in each of the sectors to which they belong [15].

Definitions given to a production chain [10] include the one that conceives it as a system comprised of the harmonious interaction between different participants, who directly or indirectly participate in the production and consumption of products and services. [21]-[39]. Others indicate that production chains are sets of social actors, represented by agricultural production systems, suppliers of services and inputs, the processing industry, distributors, and end consumers. And in Colombia, through Law 811, chain organizations have been defined as the set of technically and economically linked activities, from processing an agricultural product to its final marketing [22].

Production chains are a variant of the competitiveness approach proposed by Porter, which arose from work carried out by [23] for [24] and is therefore not equivalent to the concept of the value chain or supply chain [17]. This approach integrates key concepts related to agglomerations and collaborative inter-agent work in a productive, economic and social process; since the higher level of externalization and dynamism of the environment means that companies can no longer compete as individual entities but need to compete as value chains [5].

Production chains identify actors and activities that define their structure and functioning. Elements that comprise a production chain are the links, segments, flows, and organizational environments, which are differentiated, interacting structures that contribute to constructing a common objective [17]. The links are made up of actors involved in chain activities; the segments are groups of homogeneous actors within the same link; and the flows make it possible to understand the relationships between links and segments, thus increasing understanding of the chain [15].

III. METHODOLOGY OR PROCEDURES

A descriptive study consisted of compiling institutional documents from primary information sources, observation visits, and the application of a survey in each of the links identified in the production chain to diagnose the structure of the dairy production chain in Córdoba in Colombia, located at the following geographical coordinates: 09º 26' 16" and 07º 22' 05" north latitude and between 74º 47' 43" and 76° 30' 01" west longitude.

The surveys were applied to the corporate personnel and main leaders of the organizations selected in each link. The structured personal interview [38] was used as the interrogation procedure to restrict the space of expression of the respondents and simplify the statistical analysis. The study population consisted of the organizations that make up the links of the production chain. The sample consisted of a representative number of companies selected in each of the links, according to the suggestions of [25]. Table 1 shows the characteristics of the sampling carried out in each of the links of the production chain.

Table 1: Dairy chain sampling characteristics.

	Supplier	Farm	Collection	Ind.	Retailers	Consum.
Population	149	5814	6	58	--	--
Calculated sample	84	197	6	51	14	100
Real sample	53	162	4	38	12	77
Error (%)	7	7	5	5	5	5
Confidence level (%)	95	95	95	95	95	95
Sampling method[1]	Prob.	Prob.	Prob.	Prob	No Prob.	No Prob.

Source: Prepared by the authors.

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A panel of experts with recognized experience in the subject was enquired to construct the survey questionnaires. The validation of the questionnaires was carried out through fieldwork in each link of the chain and with the concept of experts. The reliability of the questionnaire was measured using the most frequently used method, Cronbach's alpha [26]. The surveys included an identification section with general data on the respondent, a section describing the organizations of each link, and others with the perception of knowledge management [40] and competitiveness. Ordinal scale, list, and commentary questions were considered. The results of the surveys were recorded in a spreadsheet and then analyzed and processed using R and Spad statistical software.

IV. RESULTS ANALYSIS AND INTERPRETATION

The characterization of the Córdoba dairy production chain results from the description and analysis of its links, obtained through surveys, observation visits, and the collection of documents. The reliability of the questionnaires determined by Cronbach's alpha yielded a value of 0.86, indicating an adequate internal consistency of the questionnaire. On the other hand, the dimensionality of the questionnaire measured through the KMO Test and Barlett's Test revealed values of 0.814 and 2022.43, respectively, which allows concluding the adequacy of the data to the analysis model proposed.

Identification of actors and links in the chain.

Milk production in Córdoba is carried out under the dual-purpose system, which represents 22% of the registered farms in the Department [27]. The Department had a cattle inventory of 2,126,190 head of animals and a daily production of 652,323 liters of milk in 2019 [28]. The dual-purpose system in the Department has an important influence on the economy of small and medium producers, who use the high capital turnover derived from the sale of milk to cover business administration expenses, and periodically sell weaned and discarded animals for capitalization or other purposes [29].

The following links were identified in the dairy production chain in Córdoba: suppliers of goods and services, production units, collection centers, processing industry, retailers, and consumers. Figure 1 shows the representation of the dairy chain in Córdoba, presenting a model that can be categorized as conceptual since it is an abstract representation of reality that records the characteristics of the production chain, illustrating its concept and structure. The model shows the production chain comprised of the different links in the sector, governmental and academic actors, and agents of society [30]-[32].

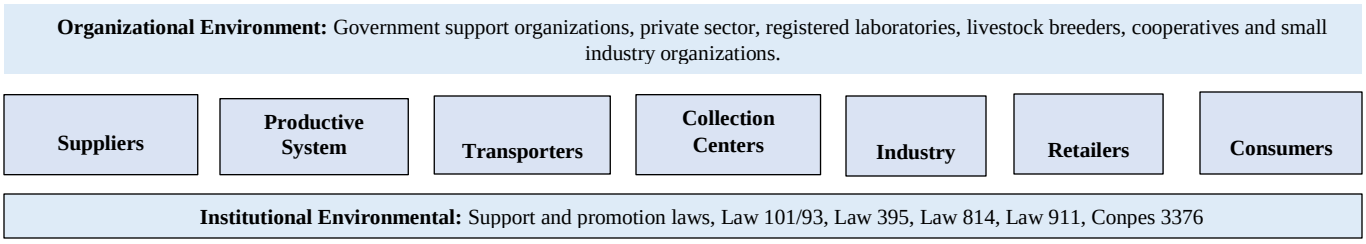

Figure 1: Dairy production chain model.
Source: Prepared by the authors.

The concept of a production chain is more than just a link between the actors of a production sector since it involves actors from the State and academia and their interrelationships. These interrelationships are important for building the social fabric, solving the problems of sustainability of the production sector [33], and achieving successful agricultural development.

In the Córdoba dairy chain, the presence of primary production sector associations in addition to the links was identified. These associations include Ganacor, Ganabas, Ganaltos, Asogan, Cogasa; territorial government entities, such as the departmental and municipal Health Secretariats; and Economic Development and Competitiveness Secretariat. Additionally, inspection, surveillance and control entities, represented by INVIMA, educational institutions, including the University of Córdoba, the Pontifical Bolivarian University, and SENA, among others; and trade associations such as the Chamber of Commerce of Montería, which have a direct and indirect influence on the functioning of the production chain [34].

In some of them, such as the primary and processing sectors, the exchange of information is adequate. Still, there are opportunities to improve the interrelationship between the chain's actors to improve their indicators.

Suppliers of goods and services.

Suppliers include agricultural warehouses that provide veterinary drugs, agricultural inputs, supplies, technical assistance, and advice to livestock farmers. Farmers were distributed in the main municipalities of the Department and had an average of 15 years of experience, four permanent workers, and most of them (83%) were legally constituted as sole proprietorships (Table 2). Most of the interviewees had managerial functions (90%), had an average of more than ten years of experience in the sale of goods and services to the agricultural sector, and 59% had professional training with degrees in veterinary medicine, animal husbandry, agricultural engineering, agricultural administration, among other professions. All of the companies had public utilities such as electricity and drinking water, 96% had telephone and internet services, but only 10% had a website to show their services.

Production units.

According to the 2019 census, 56,918 agricultural production units were in the Department of Córdoba [28]. According to the Colombian Federation of Cattle Breeders, 22% of the farms are dedicated to dual-purpose cattle production, and the rest to fattening and breeding [36].

Eighty-seven percent of those interviewed in the production units had a managerial role, with a predominant level of secondary education (31%) and technological studies (24%), which suggests an adequate level of formal education for the tasks to be performed. These figures contrast with those reported by Fedegan [35], which highlights that the level of education in rural areas is 27% complete primary school, 7% complete secondary school, and 3% have advanced training. The average number of years in livestock production activities was 21, representing a considerable time of experience acquisition, which, as indicated by Arceo [36], constitutes the main intangible asset of the companies since tacit knowledge is developed based on observation, imitation, and practice. Sixteen percent of the interviewees have access to the internet from their workplace, which is comparable to 20% of those who have access to the primary sector of the supply chain of the Venezuelan corn-producing industry [13].

Table 2: Characteristics of the links.

Variable	Supplier	Farms	Collection	Industry
Activity (years)	14.5 ± 8.0	19.6 ± 15	8.5 ±10.0	12.0 ± 10
Permanent Workers	3.64 ± 2.9	3.8 ± 9.4	3.8 ± 2.7	16.6 ± 40
Temporary workers	0.53 ± 2.0	2.5 ± 3.3	0.0 ± 0.0	1.9 ± 3.2
Leader's Experience	11.4 ± 6.9	15.3 ± 9.4	6.0 ± 5.7	9.3 ± 7.9
Regulatory Compliance (%)	100	95.7	100	97.4
Registration Information (%)	100	61.7	100	85

Source: Prepared by the authors.

The use of the productive units for cattle activities represented 61%, and the rest of the land was used for agriculture and cattle raising; in the farms with cattle raising activities, 96% of the farms used a dual-purpose system, thus showing the predominant method of exploitation in the region studied. Regarding public services, 84% of the productive units had electricity, 36% had drinking water, and 19% had telephone and internet, indicating low levels of computer tools in this link.

Figure 2 shows the description of the productive units in terms of land extension, showing that 70% of the producers interviewed own less than 50 ha. This figure coincides with the one reported by Fedegan [27], which established that 71% of the farmers in Córdoba are small producers, with landholdings of less than 50 ha, and with Vega et al. [29], where 61% of the producers had farms of less than 50 ha. However, it contrasts with those reported in the recent National Agricultural Survey, which indicates that 89% of the Agricultural Production Units have a maximum extension of 50 ha [28].

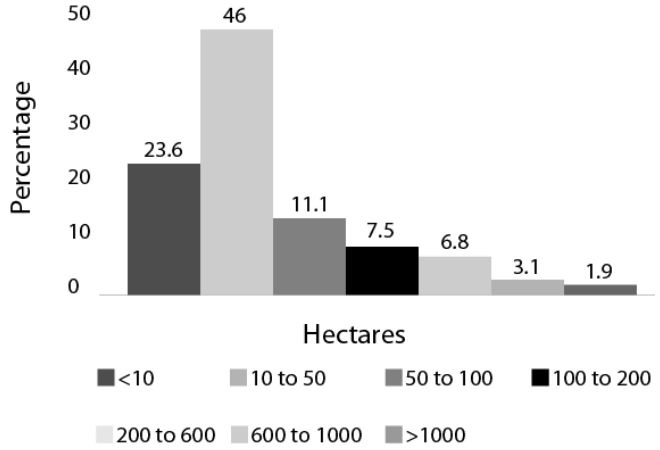

Figure 2: Extension of productive units.
Source: Prepared by the authors.

The inventory of males and females in the production units indicates that 87% of the farmers interviewed have less than 50 heads of males and 69% have less than 50 heads of females. Regarding the predominant breeds in the production units interviewed, the Brahman breed was found to be dominant (66%), followed by Gyr (12%) and Romosinuan Creole breeds (8%). Similarly, some production units were found with buffalo farms of the Murrah breed. According to data from the National Agricultural Survey, at least 95% of the national herd has zebu genetics, indicating that zebu breeds such as Brahman, Guzerat, Gyr, and their crosses in the low tropical regions predominate.

Fifty percent of the milk from the production units goes to informal cheese producers, 30% to the processing industry, 16% is disposed of on the farm for self-consumption, and the remaining 7% is taken to a collection center. Fedegan has established that of the 6,520 million liters/year produced in the country, 41% went to informal channels, 47% took the route of collection or formal processors, and 8% consisted of on-farm self-consumption [35].

Collection centers.

The collection centers are the sites where the milk is stored as raw material. Some of these centers belong to producers' cooperatives, and most of them are owned by the processing companies. All of the respondents in the collection centers performed administrative functions, and half of them had professional training. The interviewees had an average of 20 years of experience in milk collection activities, and 75% indicated having and using the internet in their workplace, which shows that most of the companies have adopted tools for the organization of their activities. The collection centers had electricity, potable water, and telephone services; on average, they had four permanent workers, cooperatives, joint-stock companies, producer associations, and sole proprietorships according to their legal form. All companies are familiar with and apply Good Manufacturing Practices, use physical accounting records for milk collection, and prepare management reports.

Industry.

The industry link comprises establishments that include sanitization, pulverization, and dairy derivatives processing plants, where milk is modified or transformed to make it suitable for human consumption. Most of the interviewees performed administrative functions, had basic secondary education, and reported using ICTs in their daily activities. Dairy processors are incorporated as sole proprietorships, simplified joint-stock companies (SAS), and Corporations. Most industries have an average of 17 workers, have access to public services, and make their business visible through a website.

The products produced by the companies interviewed are mainly marketed regionally and nationally, and a small percentage export dairy products such as cheese, arequipe, and fermented milk products to the United States. All companies reported having been audited by the oversight and control entities, most of which obtained a conditional favorable concept.

Retailers.

The marketing or distribution activities are carried out by intermediaries, wholesalers, or retailers, who make the encounter between the supply of products and their demand, receive the title of ownership of the products, and deliver them to the final consumer. Most of the retailers interviewed perform administrative functions and have a professional level of schooling, and have an average of almost ten years of experience. Dairy marketing companies have an average of 30 workers; most operate as sole proprietorships and have all public services. In terms of the product line they distribute, 80% of those interviewed sell pasteurized, UHT, and lactose-free liquid milk, 50% sell cheese of different types and presentations, coastal, pasta filata, matured, and a smaller proportion of respondents distribute arequipes, desserts, powdered milk, and milk beverages.

Consumers.

Consumers are the link that makes final use of dairy products [41], and because of their income, they are classified into three segments: high, medium, and low-income consumers. Consumers were surveyed in all department regions, concentrating on the main municipal capitals, where most inhabitants live. Surveys were applied where people buy the products, such as in supermarkets, stores, and distribution points. Sixty percent of the respondents were women, and 52% were between 20 and 40 years of age, while 74.1% said they belonged to strata 2 and 3, and most of them had professional training.

Concerning dairy consumption, it was observed that the dairy product most consumed by those interviewed was liquid milk in its different lines (raw, pasteurized, UHT and lactose-free) and presentations, followed by cheese and fermented milk. The majority of consumers say they consume coastal cheese, and there is less culture of consumption of matured cheese. Regarding the place and frequency of purchase of dairy products, it can be noted that more than 80% purchased their products in neighborhood stores, 65% in supermarkets, and 26% in wholesale and retail distribution points. More than half purchased daily, and 25% bought weekly regarding the purchase frequency.

Perception of knowledge management and competitiveness of the dairy production chain.

The analysis of the descriptive statistics of knowledge management and competitiveness in the dairy production chain is detailed in Table 3.

Table 3: Descriptive statistics of the knowledge management of the production chain.

Variable	Mean	Standard Deviation	Minimum	Maximum
Organizational Culture	4.27	0.73	1.00	5.00
Leadership	3.50	0.65	1.00	5.00
Organizational Learning	3.94	0.95	1.00	5.00
Attitudes	3.99	0.91	1.00	5.00
Organizational Structure	3.15	0.75	1.00	5.00
Organizational Strategy	3.70	1.02	1.00	5.00
ICT	1.75	1.12	1.00	5.00
Knowledge Creation	3.01	0.96	1.00	5.00
Knowledge Storage and Transfer	3.37	0.91	1.00	5.00
Productivity	3.42	1.02	1.00	5.00
Economic Profitability	3.39	0.93	1.00	5.00
Success Indicator	4.09	0.99	1.00	5.00
Product Quality	4.27	1.00	1.00	5.00

Source: Prepared by the authors.

It can be inferred that all the actors in the links of the production chain perceive a high rating (>4) facilitating elements of knowledge management such as organizational culture and attitudes and competitiveness variables, such as the global indicator of success and product quality [37]. On the other hand, ICT was assigned low scores (<2), while the rest of the variables were rated with medium scores. Similar results were found in evaluating knowledge management in the maize agri-food chain in Venezuela [13].

V. SOLUTION PROPOSALS OR IMPROVEMENTS

Among the proposals for making the dairy production chain in Córdoba more dynamic is the strengthening of associative structures, continuous training for the chain's actors [41], the application of ICTs, and the formalization of the chain's information and capital exchange relationships, which will allow for the solution of its problems and the improvement of its indicators.

VI. CONCLUSIONS

In the dairy production chain in Córdoba, links were identified in the primary sector, processing, intermediation, consumers, and governmental, academic, and social actors. The organizations in the chain comply with current regulations and exchange capital and information flows. The actors have a good perception (>4) of the elements that facilitate the management of the chain's knowledge and competitiveness variables but a negative perception (<2) of the use of ICTs, which is why actions are needed to make the chain more dynamic and provide solutions to the sector's problems.

Analyzing the different segments of the production chain makes it possible to recognize the strengths and weaknesses of each one because it is necessary to strengthen them individually so that each link provides support to the entire chain. Finally, the research contributes to the academic community and will serve as a basis for future research and the sector's organizational activities.

VII. REFERENCES

[1] M. Porter, "La Ventaja Competitiva de la Naciones", Editorial Plaza & Janes; Bogotá, 1991.

[2] M. Blázquez y G. García, "Clusters de innovación tecnológica en Latinoamérica", GCG-Revista de Globalización, Competitividad y Gobernabilidad, vol 3, no. 3, pp. 16–23, 2009. https://www.redalyc.org/pdf/5118/511851322001.pdf

[3] C. Pérez, G. Lara y D. Gómez, "Evolución de la capacidad tecnológica en México. Aplicación del análisis estadístico multivariante de cluster", Contaduría y Administración, vol 62, no. 2, pp. 505–527, 2017. https://doi.org/10.1016/j.cya.2017.01.002

[4] J. L. Calderón y F.C. Lario, "Simulación de Cadenas de Suministro: Nuevas Aplicaciones y Áreas de Desarrollo", Inf tecnol, vol 18, no. 1, pp. 137–146, 2007. https://scielo.conicyt.cl/pdf/infotec/v18n1/art18.pdf

[5] M.T. Frohlich and R. Westbrook, "Arcs of integration : an international study of supply chain strategies", J. Oper. Manag., vol 19, pp. 185–200, 2001. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.198.8584&rep=rep1&type=pdf

[6] F. Salazar, J. Cavazos y J. Martínez "Metodología basada en el modelo de referencia para cadenas de suministro para analizar el proceso de producción de biodiesel a partir de higuerilla", Inf tecnol, vol 23, no. 1, pp. 47–56, 2012. https://scielo.conicyt.cl/pdf/infotec/v23n1/art06.pdf

[7] Y. Qi, B. Huo, Z. Wang and H.Y. Hoi Jeff, "The impact of operations and supply chain strategies on integration and performance" Int. J. Prod. Econ., vol 185, pp. 162–174, 2017. https://doi.org/10.1016/j.ijpe.2016.12.028

[8] P.H. Phan, D.S. Siegel and M. Wright, "Science parks and incubators: observations, synthesis and future research", J. Bus. Ventur, vol 20, no. 2, pp. 165–182, 2005. https://doi.org/10.1016/j.jbusvent.2003.12.001

[9] S. Schmidt and A. Balestrin, "Projetos Colaborativos de P&D em Ambientes de Incubadoras e Parques Científico-Tecnológicos: Teorizações do Campo de Estudo", RAI Revista de Administração e Inovação, vol 11, no. 2, pp. 111–131, 2014. https://doi.org/10.5773/rai.v11i2.1117

[10] C. López, "Redes Empresariales: Experiencias en la Región Andina". Editorial Minka- Cooperación Italiana y CEPAL, Perú, p. 216, 2003. http://www.asocam.org/sites/default/files/publicaciones/files/96ad29c2d4fe66bfe3ecc955245d6515.pdf

[11] M. A. Brandão and M.M. Moro, Social professional networks: A survey and taxonomy, Computer Communications, vol 100, pp. 20–31, 2017. https://doi.org/10.1016/j.comcom.2016.12.011

[12] J.O. Bijman, "Essays on Agricultural Co-operatives: Governance Structure in Fruit and Vegetables Chains", tesis doctoral, Erasmus Research Institute of Management (ERIM), Erasmus University Rotterdam, Amsterdam, 2002.

[13] M. E. Martínez, "Desarrolo de un modelo de gestión del conocimiento en la cadena de suministro de la industria agroalimentaria", tesis doctoral, Universidad Politécnica de Madrid, 271 p, 2011. http://oa.upm.es/6199/1/MOISES_ENRIQUE_MARTINEZ_SOTO.pdf

[14] F. Mojica, R. Cabezas, D. Castellanos y N. Bernal, "Agenda prospectiva de investigación y desarrollo tecnológico de la cadena láctea colombiana", Ministerio de Agricultura y Desarrollo Rural, Bogotá, p. 168, 2007. https://sioc.minagricultura.gov.co/SICLA/Normatividad/2007-06-30%20Agenda%20Prospectiva%20Investigacion%20Cadena%20Lactea.pdf

[15] O. Castellanos, L. Torres, y K. Dominguez, "Manual metodológico para la definición de agendas de investigación y desarrollo tecnológico en cadenas productivas agroindustriales", Giro Editores Ldta, Bogotá, p. 199, 2009. http://bdigital.unal.edu.co/2079/1/2009__Manual_I.pdf

[16] A. Castro, S. Valle y C. Neves, "Cadeia Produtiva : Marco Conceitual para Apoiar a Prospecção Tecnológica Cadeia Produtiva: Marco Conceitual para Apoiar a Prospecção Tecnológica". In Simpósio de Gestão da inovacão tecnológica, Salvador-Brasil, p. 14, 2002. https://fcf.unse.edu.ar/archivos/posgrado/2002.cadeiaprodutiva.marcoconceitual.prospeccaotecnologica.pdf

[17] M. M. Simanca, L. A. Montoya y C. A. Bernal, "Gestión del Conocimiento en Cadenas Productivas: El Caso de la Cadena Láctea en Colombia", Inf tecnol, vol 27, no. 3, pp. 93–106, 2016. http://dx.doi.org/10.4067/S0718-07642016000300009

[18] M. Simanca y L. Montoya, "Analisis de la gestión del conocimiento en cadenas productivas", In XVIII Congreso Internacional de Ciencias Administrativas, Tijuana-Baja, California (México), p.1–27, 2014. https://docplayer.es/3480608-Universidad-autonoma-de-baja-california-facultad-de-contaduria-y-administracion-academia-de-ciencias-administrativas-a-c-coordinacion-de-edicion.html

[19] M. Douglass, "Creative communities and the cultural economy-Insadong, chaebol urbanism and the local state in Seoul", Cities, vol 56, pp. 148–155, 2016. https://doi.org/10.1016/j.cities.2015.09.007

[20] I. Amit and M. Sofer, "Cultural heritage and its economic potential in rural society: The case of the kibbutzim in Israel", Land Use Policy, vol 57, pp. 368–376, 2016. https://doi.org/10.1016/j.landusepol.2016.05.031

[21] S. Valle, A. Castro, O. Mengo, M. Medina, M. Maestrey, V. Trujillo y O. Alfaro, "La dimensión de entorno en la construcción de la sostenibilidad institucional", Isnar, p. 168, 2001. https://conexionsurmza.files.wordpress.com/2012/08/la-dimensic3b3n-de-entorno-en-la-construccion.pdf

[22] Congreso de la República de Colombia, Ley 811, Bogotá, p. 15, 2003. https://www.minagricultura.gov.co/Normatividad/Leyes/Ley%20%20811%20de%202003.pdf

[23] K. Esser, W. Hillebrand, D. Messner y J. Meyer, "Competitividad Sistémica: nuevo desafio para las empresas y la política", Revista de la Cepal, vol 59, pp. 39-52, 1996. https://repositorio.cepal.org/bitstream/handle/11362/37977/1/RVE59_es.pdf

[24] J. Isaza, "Cadenas productivas-Enfoques y precisiones conceptuales", Sotavento MBA, vol 11, p. 8-25, 2008. https://revistas.uexternado.edu.co/index.php/sotavento/article/view/1602/1441

[25] R. Hernández, C. Fernández y P. Baptista, P. “Metodología de la investigación”, 5th ed., Mc Graw Hill/Interamericana Editores S.A., México D.F., 656 p., 2010. https://www.esup.edu.pe/descargas/dep_investigacion/Metodologia%20de%20la%20investigaci%C3%B3n%205ta%20Edici%C3%B3n.pdf
[26] R. Ledesma, G. Ibañez, y P. Mora, “Análisis de consistencia interna mediante Alfa de Cronbach: un programa basado en gráficos dinámicos”, Psico-USF, vol 7, no. 2, pp. 143–152, 2002. [En líneas]. Disponible en https://www.scielo.br/pdf/pusf/v7n2/v7n2a03.pdf
[27] Fedegan, “Foro Gandería Regional Visión 2014-2018”, Cuadernos Ganaderos, vol 5, no. 11, p. 48, 2014.
[28] DANE, Encuesta Nacional Agropecuaria ENA-2019-Departamento de Córdoba, p. 1–45, 2020. https://www.dane.gov.co/files/investigaciones/agropecuario/enda/ena/2019/presentacion-ena-cordoba-2019.pdf
[29] A. Vega, A. Martínez y L.E. Meneses, Acuerdo regional de competitividad de la cadena productiva láctea en el departamento de Córdoba y en la zona del Bajo Cauca Antioqueño, Cereté-Córdoba, p. 25, 2002.
[30] M. Vila, C. Ferro y M. Rodríguez, “Agrupamientos sectoriales territoriales (A.S.T.): reflexiones acerca de los recursos compartidos”, Revista de Economía y Empresa, vol 14, no. 40, pp. 87101, 2000. https://dialnet.unirioja.es/servlet/articulo?codigo=251275
[31] M. Beckerman y G. Cataife, “Encadenamientos productivos: Estilización e impactos sobre el desarrollo de los países periféricos”, Facultad de Ciencias Económicas, Universidad de Buenos Aires, 2001. https://aaep.org.ar/anales/pdf_01/bekerman_cataife.pdf
[32] E. Moncayo, “Nuevos enfoques de política regional en América Latina: El caso de Colombia en Perspectiva Histórica”. Las políticas regionales: un enfoque por generaciones (separata 2 de 7). Archivos de Economía 195, Departamento Nacional de Planeación, Bogotá, p. 168, 2002. https://colaboracion.dnp.gov.co/CDT/Estudios%20Econmicos/195.pdf
[33] B. Milanez, "Dialogues between social and natural sciences: contribution to the debate on socio-environmental conflicts", An Acad Bras Cienc, vol 87, no. 4, pp. 2335–2348, 2015. https://www.redalyc.org/pdf/327/32743236036.pdf
[34] M. M. Simanca. “Modelo conceptual para la gestión del Conocimiento en la Cadena Productiva de Lácteos en Colombia. Caso Córdoba”, tesis doctoral, Universidad Nacional de Colombia Sede Medellín, p. 219, 2016. http://bdigital.unal.edu.co/52746/1/50913728.2016.pdf
[35] Fedegan, “La ganadería colombiana grandes cifras-Plan Estretégico de la Ganadería colombiana” PEGA 201, p. 80, 2016. https://www.fedegan.org.co/plan-estrategico-de-la-ganaderia-colombiana-2019
[36] G. Arceo, “El impacto de la gestión del conocimiento y las tecnologías de información en la innovación: un estudio en las pymes del sector agroalimentario de Cataluña”, tesis doctoral, Universidad Politécnica de Cataluña, p. 259, 2009. https://www.eumed.net/tesis-doctorales/2010/gam/gam.pdf
[37] Z. Xiaofei, P. Wang, and R. Pal. "The effects of agro-food supply chain integration on product quality and financial performance: Evidence from Chinese agro-food processing business." International Journal of Production Economics 231. 2021: 107832. https://www.sciencedirect.com/science/article/abs/pii/S0925527320302024
[38] C. Lopezosa,"Entrevistas semiestructuradas con NVivo: pasos para un análisis cualitativo eficaz." Lopezosa C, Díaz-Noci J, Codina L, editores Methodos Anuario de Métodos de Investigación en Comunicación Social, 1. Barcelona: Universitat Pompeu Fabra; 2020. p. 88-97. https://repositori.upf.edu/handle/10230/44605
[39] H. Fernandez-Mena, et al. Flows in Agro-food Networks (FAN): An agent-based model to simulate local agricultural material flows. Agricultural Systems, 2020, vol. 180, p. 102718. https://www.sciencedirect.com/science/article/abs/pii/S0308521X19301969
[40] J. Gast, et al. Knowledge management and coopetition: How do cooperating competitors balance the needs to share and protect their knowledge?. Industrial marketing management, 2019, vol. 77, p. 65-74. https://www.sciencedirect.com/science/article/abs/pii/S0019850118303298
[41] Bt. Musa-Shahiida; Boniface-Bonaventure; G. Tanakinjal, “Relationship marketing moderating effect on value chain of horticulture produce: an intermediaries” perspective. UMK Procedia, 2014, vol. 1, p. 82-92. https://www.sciencedirect.com/science/article/pii/S2214011514000125
[42] Otsuka-Keijiro; A. Mubarik. Strategy for the development of agro-based clusters. World Development Perspectives, 2020, vol. 20, p. 100257. https://www.sciencedirect.com/science/article/abs/pii/S2452292920300771.