Sustainable Value Chain of Dry Hard Corn within the Analysis of Food Sovereignty

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EDITORIAL NOTE

The works that make up the chapters of this book are the result of research by expert teacher-researchers who contribute to the "Environment and Society" Research Line, in collaboration with the teachers of the ECOTEC University. The authors of this work had the responsibility to select said scientific research, taking into consideration the impact and relevance of the information, by virtue of the dissemination of knowledge.

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PRESENTATION

This book presents four essays starting from searching key pieces to deepen and analyse the structure and actors involved in the interaction of models and supply chains. Estimating a documentary and numerical review for decision-makers, and estimating economic relations at the national level and the foreign sector. Thereafter, strengthening the right to food sovereignty as a prevailing factor or mainstay for people.

The first chapter analyzes a knowledge gap to expand the cognition of agriculture value chains through bibliometric analysis, in which the review of multiple scientific works investigative, and methodological development is evaluated. A point to consider in the research is that local governments develop agricultural policies with regulations based on socioeconomic results, management systems improvement and food sovereignty promotion.

The second chapter deepens the analysis of the current structures from the value chains in Ecuadorian territory, regarding dry hard corn and its relationship with the actors that guide the various models in the food supply chain. It incorporates decision-makers for evaluating economic systems under the Food Sovereignty approach in synergy with the social and ecological process.

The third chapter critically reviews the information in documents and national statistics in high-impact databases, as well as specialized institutions at the international and national levels. It describes the agricultural raw material markets performance, especially the Corn Value Chain in Ecuador under the Food Sovereignty approach.

The fourth chapter estimates possible imports of products, such as fertilizer, oil derivates, agricultural chemicals, telephone, and communication equipment; related to agriculture for a defined short-term objective committed in guaranteeing food Sovereignty in Ecuador. It will be analyzed using homogeneous time series models with adjustments for partial periods such as AR, MA and ARMA.

The Authors

CHAPTER 1: WHAT IS KNOWN ABOUT THE AGRICULTURAL VALUE CHAIN? PERSPECTIVES OF THE BIBLIOMETRIC ANALYSIS

1.1. Introduction

Globalization increases and strengthens communication between people and places, and brings them closer to the whole world. The social, economic, environmental, political, and other contexts are changing rapidly in the world, which requires us to take new approaches to multiple stakeholders in performance, articulation within society, and economic activities. The development of the research shows how developed countries consume a large number of goods and services from the markets (Yang et al., 2013), and agro-export processors transform the marketing channels of small economies and their income (Barrett et al. al., 2011; Hodges, Buzbi and Bennett, 2011; Trapala et al., 2020).

To face the challenges of the sustainability of agricultural systems, the reduction of dependency links has become a central issue within food chains and agronomic practices at different spatio-temporal and trophic levels (Larsen and Marx, 2013). Highlighting that the potentially negative impacts of Covid-19 on agriculture and agricultural trade for developing countries exceeded the IMF's economic growth forecasts for 2020-2021 (Morton, 2020; Elleby et al., 2020; Bolwing et al., 2010).

About agricultural value chains, studies should be carried out on their different stages or product transformation routes (Beretta et al., 2012; Lixian et al., 2011; Ramírez Molina et al., 2021). While Govindan & Soleimani (2017) mention the process of implementing and controlling the efficient and profitable flow of raw materials, in-process inventory, finished products and related information from the point of consumption to the point of origin. The different links from the production cycle to the consumer, passing through the processes of handling, transformation, sale and access to homes, have a common problem in their sector. Thus, for example, in the last decade, research has been related to the concentrations of the metal component or nanomaterials in grains or fruits and their impact on the various trophic levels (Gardea et al., 2014; Martinho & Mourão, 2020).

Bibliometrics and its scientific development are based on the search for typical statistical behaviours over time and the production of scientific information consumption (Ardanuy, 2009; Akinlolu et al., 2020; Baranauskas et al., 2020), allowing changes to be evaluated.

Qualitative and quantitative (De Las Heras, 2018). The Thomson Reuters Web of Science database is currently the primary reference for scientific research worldwide (Llorent-Bedmar & Sianes - Bautista, 2018). Mapping and clustering are often used in bibliometric research to visualise structural aspects (Lei et al., 2018). The mapping technique is based on directly applying an occurrence data matrix with multidimensional scale words (Peters & van Raan, 1993; Barrios Guzman et al., 2017).

VOSviewer is a tool that allows building and visualizing bibliometric networks. Using the "distance-based" technique, the nodes are positioned in such a way that the distance between them indicates a proximity relationship (Van Eck & Waltman, 2020; Zhao et al., 2020). The bibliometric analysis allows highlighting information from the organized literature and identifying the bibliometric dimensions related to co-authorship, citation, bibliographic coupling and co-citation (Martinho & Mourão, 2020; Vergara-Romero et al., 2021).

The unsupervised clustering technique and pattern recognition are susceptible. The input parameters for the algorithm validation based on clustering (Kovács & Iváncsy, 2006; Guadalupe & León, 2019; Pascual et al., 2008) are frequently used in exploratory data analysis to extract the natural structure of the data (Lange et al. 2019; Baya & Granitto, 2013). Network visualizations can help to reveal complex and hidden patterns in textual sources (Düring, 2020.) Our attention is focused on colours and patterns (Tableu, 2020), while for the construction of bibliometric maps, we distinguish between maps and the representation of such maps (Van Eck & Waltman, 2010).

The usefulness of the Thesaurus model in the global use of records with keywords and added to improve search retrieval in databases (Elsevier, 2020) translates into improvements in the methodology of fractional counting of citations and grouping of the variable level with a maximum limit of the group size (Guadalupe & León, 2019; Small & Sweeney, 1985; Bollen et al. 2009). For example, the number of authors, citations or references of a publication (Perianes et al., 2016). Likewise, the h index proposed to characterize the scientific production of a researcher (Estrada-Cuzcano & Alhuay-Quispe, 2020) is the balance between the number of publications and their citations (Souto-Anido et al., 2020).

This work's objective focuses on analysing bibliometric indicators between the years 2010 and 2020 based on the theme of agricultural value chains. In addition, as a specific aim, it is proposed to obtain the research source and search criteria in order to obtain a database

that allows analyzing the information from the research source and interpreting the collected data in order to analyze the literary production generated worldwide by countries, organizations, and authors.

This study used publications and data retrieved from Web of Science (WOS), and subsequently using VOSviewer to map the data graphically for the co-occurrence of bibliographic connections. It is a sections structure document. The following section describes the methodology and the data used. Then, in the next section, the bibliometric analysis shows the general trend of the topic before discussing collaborative networks. And finally, the last section of discussion and conclusions regarding other research areas.

1.2. Materials and methods

This study aims to identify the main actors in research on agricultural value chains, taking into account that various links are formed and grouped around the world around agricultural activity. The different activities associated with the living conditions of farmers, producers, and consumers contribute to the study of value chains. In order to understand the trends and perspectives of research in this scientific field, it was essential to know the main features and structure of the current trend (Jimber del Río et al., 2020; Pérez González & Lutsak Yaroslava, 2017). The analysis of the results of the investigations was obtained from “WOS”. The software tool VOSviewer version 1.6.15 was chosen since it is free, functional, and updated software for processing the networks and obtaining the behaviour of the bibliometric indicators in the study period. Networks can include, for example, journals, research, and individual publications and build co-occurrences in keywords or co-authorship relationships from citations. The problem and motivation for this work are summarized in the following problem question: What is the information trend of the agricultural value chain worldwide?

In the preparation and visualization of the map of everyday expressions, the following must be distinguished: the identification of the keywords later, we use a filter of nominal phrases, which are called terms (Van Eck & Waltman, 2016; Ferasso et al., 2020; Hernández-Rojas et al., 2021).

For information analysis and results generation, aspects related to qualitative and quantitative analysis are considered. Thus, in the initial stage, information from records is considered, such as author, addresses, times cited, number of references cited, language, keywords, access number, open access, and research area, among others, and the

database obtained is downloaded. Subsequently, the data is migrated to the VOSviewer software, where the processing of the scientific information, analysis, and visualization of the indicators is finally achieved by obtaining the graphs that show the results of the proposed objectives.

1.3. Analysis and Results

The present study The research is presented in a general way according to the documents related to agricultural value chains entered in the WOS database in the Main Collection of Web of Science, with the terms " agriculture value chain". A systematic review was carried out. Obtaining a total of 1,669 records from the date and year of publication according to the analysis period. It should be mentioned that all documents in the sample maintain a Digital Object Identifier DOI or unique identifier of electronic publications. Most of the documents are journal articles or are part of book chapters 1660, in review 6, editorial material 3. Published scientific articles indicate the primary mode of scientific communication involving agricultural value chains. The works were written mainly in English with 94.85%.

The results were generated by searching for an "agriculture value chain" in WOS. It was observed that during the analysis period of 1,669 records, these were cited 21,979 times in different indexed elements within the WOS Main Collection, having an average number of citations for each element of 14.27 and reaching an h-index of 63.

Within WOS, this work has 111 visualization categories or research areas. The ten predominant categories in publications are environmental sciences with 359, agricultural economics policy with 211, economic sciences with 194, multidisciplinary agriculture with 148, green and sustainable science technology with 145, environmental studies with 140, food science technology with 134, agronomy with 101, environmental engineering 95, administration 79.

Regarding the research areas related to the present work, WOS groups 60 research areas, of which agriculture represents 31%, ecology of environmental sciences with 26%, economic business with 17%, science technology and other topics. 11%, engineering 10%, and 5% the remaining areas.

According to the information collected, the annual production of research between 2010 and 2020. Since 2010, 62 publications have been registered, increasing progressively until 2013 with 100 publications, suffering a slight drop in 2014 with 88 records, managing to recover and reaching 2020 with 273 records, increasing considerably.

The high-impact authors within the WOS registries, as shown in Table 1, the author with the highest number of registries is Klerkx, who published nine articles and represented a value of 0.54%. The following four authors were Hellin, Bijman, Bonney, and Poole, with many records of 7-6-6 and 6 for each of the authors, respectively.

Table 1.

High Impact Authors (Top 15)

	Authors	Number of records	% of 1,669
1	Klerkx L.	9	0.54%
2	Hellin J.	7	0.42%
3	Bijman J.	6	0.36%
4	Bonney L.	6	0.36%
5	Poole N.	6	0.36%
6	Swinnen J.	6	0.36%
7	Wang J.	6	0.36%
8	Yan B.	6	0.36%
9	Bellemare M.F.	5	0.30%
10	Dentoni D.	5	0.30%
11	Durr J.	5	0.30%
12	Phase A.	5	0.30%

13	Glasbergen P.	5	0.30%
14	Graef F.	5	0.30%
15	Lambin E.	5	0.30%

Organization-based distribution of research results can help understand research capacity and activities around organizations worldwide, thereby identifying leadership in agricultural value chain research. An essential feature in bibliometric networks is evaluating citations by analysing the most influential and cited organizations or universities. The analysis reveals the organisations' affinity level based on the number of registrations. Consequently, the twenty most-cited organizations in the agricultural value chain research domain are presented in table 2. Organizational production is headed by Wageningen University, which found 55 records. The following four organizations were: the Chinese Academy of Sciences, International Food Policy Research Institute, University Ghent, and Cornell University.

Table 2.

Leading Organizations (Top 20)

	Field: Organizations	**number of records**	**% of 1,669**
1	Wageningen University	55	3.30%
2	Chinese Akkad science	26	1.56%
3	Int Food Policy Res Inst	24	1.44%
4	University Ghent	18	1.08%
5	Cornell University	17	1.02%
6	University Hohenheim	17	1.02%
7	Int Livestock Res Inst	16	0.96%
8	Michigan State University	16	0.96%

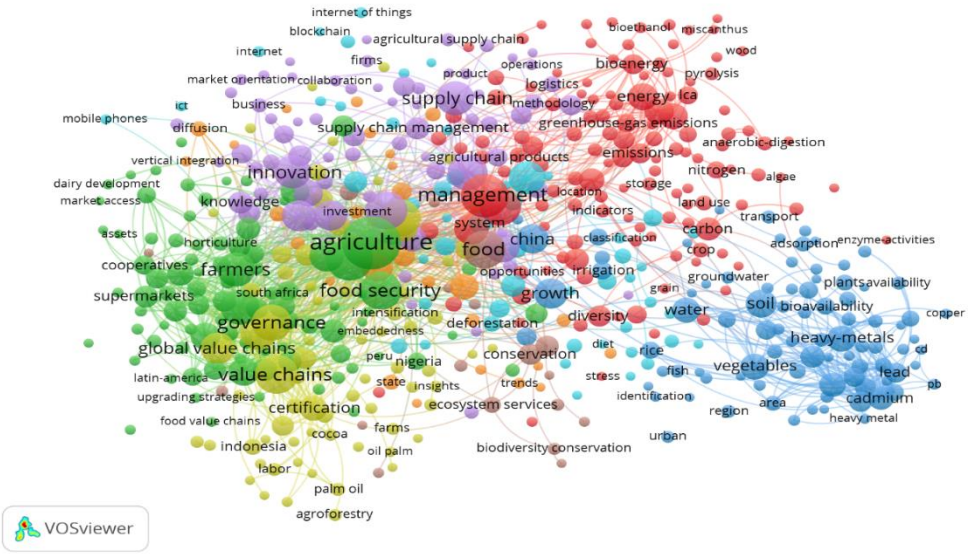
9	University Copenhagen	16	0.96%
10	Wageningen Univ Res	16	0.96%
11	Humboldt University	15	0.90%
12	University of Bonn	15	0.90%
13	University of Queensland	15	0.90%
14	Swedish Univ Agr Sci	14	0.84%
15	Cirad	13	0.78%
16	Penn State university	11	0.66%
17	University Calif Davis	11	0.66%
18	University of New England	11	0.66%
19	Zhejiang University	11	0.66%
20	University of Illinois	10	0.60%

For generating visual information through graphs of results, the keywords were considered, and their origin by country, considering the highest frequency in the records of the documents of the analyzed database. The graphic representations or visual maps found in the records aim to show the subject's exciting results based on the keywords' co-occurrence.

The distance between nodes can be observed, which reflects the relationship between them; the closer the distance, the greater the relationship. Network connections show the keywords that appear together most often in posts. The higher the presence frequency, the larger the circle will be. Finally, the node's colour indicates the relationship between research areas and those associated with a political or geographic area. The relevant trends can be extracted in the analysis with the nomenclature in terms of the territorial positioning of the research: Europe, Asia, North America and China show their interest in agricultural value chains

Figure 1.

Visualization of keywords in WOS publications.



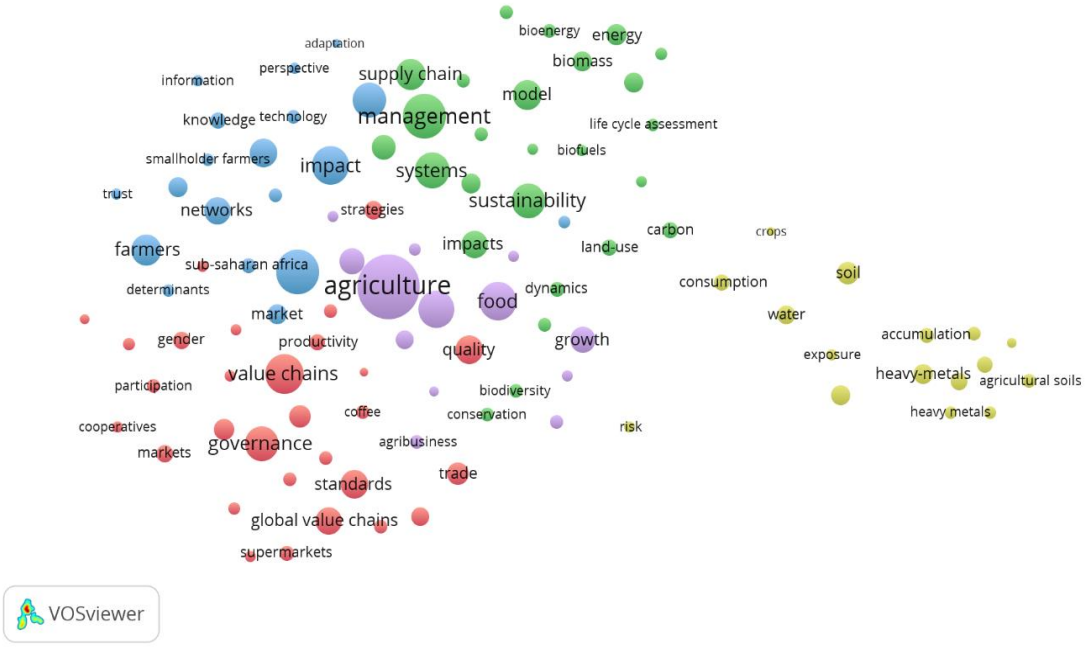
To generate the relationship graph and identify the most used keywords in research focused on value chains using VOSviewer. Figure 1 shows the most used keywords are “agriculture”, followed by “management”, “value chains”, “impact”, and “governance”, based on the number of times they are used in the records of the analyzed database. It can be seen that among the 20 main keywords, some are related to food and business, such as nutrition, quality, consumption, energy systems, growth, model, and poverty. There are also keywords related to the social sphere, such as “gender”, “farmers”, and smallholder farmer. In addition, the graph shows the formation of five conglomerates or clusters of the words with the most significant impact.

The term occurrence analysis, after the normalization process and the frequency threshold (n>1), was reduced to 101 keywords in the records, which were represented by colours in five clusters as shown in figure 2. keywords to identify the topics in the publication show the weight of appearance in the count through the size of each term. Thus, the first cluster in purple, made up of 13 items, shows the five most frequent: agriculture, food, growth, integration and nutrition. In the red cluster comprised of 29 items, five toponyms are seen as predominant: value chains, governance, global value chain, standards and gender. The third group in green comprises 24 items, highlighting: management, systems, supply chain, and sustainability model.

The stellar cluster comprises 18 items, the most common: farmers, impact, networks, smallholder farmers and sub-Saharan Africa. And finally, the yellow cluster with the five most frequent items: agricultural soils, consumption, heavy metal, soil and water.

Figure 2.

Network of the keywords in publications on agricultural value chains.



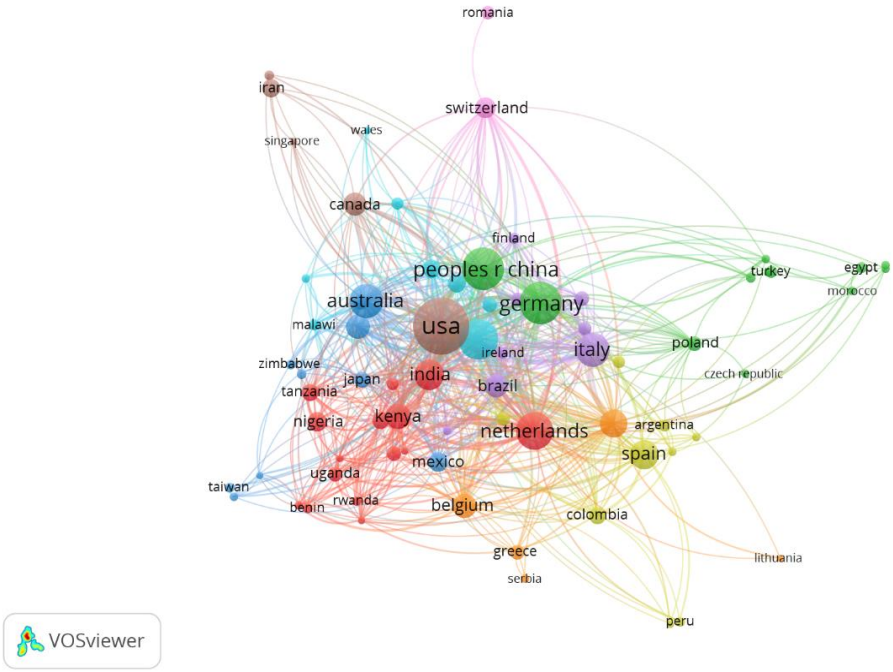
The elements involved in the development of the investigations demonstrate the number of elements involved in the different agricultural production links, the effect it can cause on the environment, and the social, economic, environmental, ecological, and political aspects framed in social development, and the populations where food is produced to supply the world population. Finally, it can be seen that the agricultural products that attract attention and are related to the theme are: coffee, corn and some unspecified vegetable products.

The analysis of records by country related to agricultural value chains can help us understand the capacity of a country for scientific production, as shown in figure 3. A total of 126 countries contributed to the scientific and academic production of the processes of agricultural value chains.

As shown in Figure 3, the size of the circles is proportional to the number of items. Thus we see that the countries that contribute the most concerning the subject are: the United States, England, Denmark, Germany, and France, leading scientific productivity in this area. In addition, countries such as the United States, the People's Republic of China, Ireland, Australia and Germany have more significant influence.

Figure 3.

Countries researching agricultural value chains.



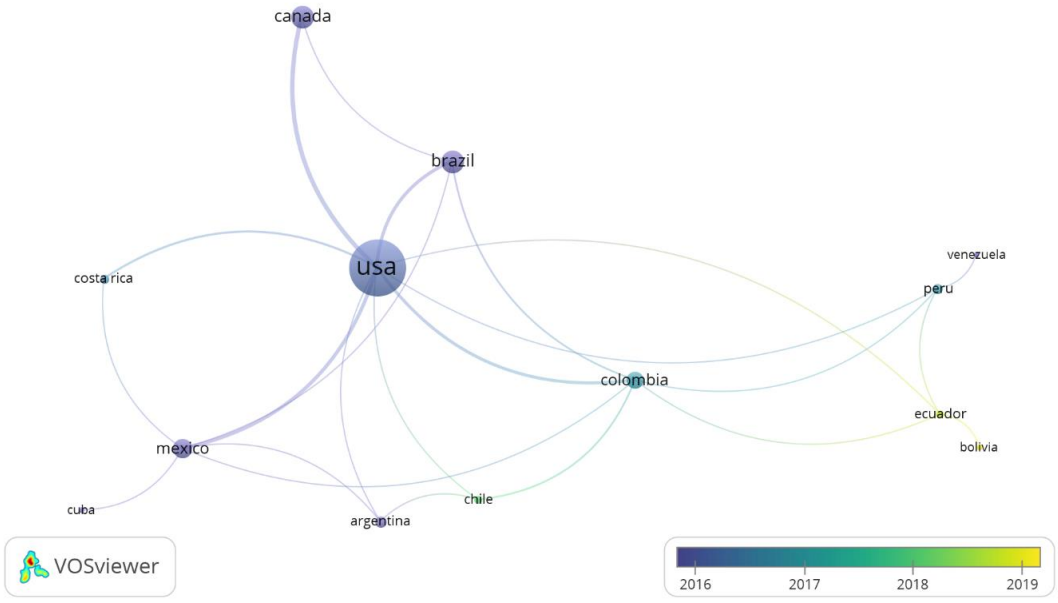
The closeness between these three countries is observed; although there is a scientific closeness between the countries mentioned, the United States are distant politically and geographically, but they are intellectually related; this contrasts with the geographical closeness between Germany and Italy, which is a show on the graph. Aiming at improving efficiency in the quality of agricultural value chains.

As can be seen in figure 4, the size of the nodes and the investigative work correspond to the weights of the nodes; that is, the larger the node and the word, the greater the weight. The distance between the nodes reflects the relationship that exists between them. The thicker the line, the greater the occurrence; as can be seen in the previous figure, the frequency and solidity of the countries with the greatest representativeness in investigations

of agricultural value chains in the American continent, according to the WOS report are: the United States, Canada, Brazil and Mexico. Thus, according to the curves' colour, the countries' annual contribution can also be appreciated. Furthermore, the initial contribution of countries such as Ecuador, Bolivia, Argentina and Peru in 2019 begin the articulation of research on this topic.

Figure 4.

Network of articles on agricultural value chains in terms of countries of the American continent.



1.4. Discussion

The research has a broad focus and relationship with different research areas; 111 categories are denoted, primarily related to the agricultural, environmental and economic parts. Compared to a bibliometric study of Covid-19 using a Scopus database, the documents were classified into four different areas: health sciences, physical sciences, life sciences, social sciences, and humanities (Aristovnik et al., 2020); this is possibly due to the relevance of the topic related to the pandemic and the search for solutions for the vaccine and its effects on health.

In the parametric analysis of the bibliometric data for the keywords and the citation analysis used in evaluating the quality of publications in scientific, technological and social science journals, a total of 15,400 keywords were obtained in the investigation of intelligent cities (Yi-Ming et al., 2019). In the present study, 8,375 keywords were obtained that have a relationship and impact related to agricultural value chains.

According to Medina-Mijangos & Seguí-Amórtegui (2020), the study on municipal solid waste management using WOS mentions the importance of the types of waste and the keywords "packaging waste" and its environmental and economic impact as way management of university social responsibility. Similarly, in our study, the research theme predominates words related to "agriculture" and agricultural, simple, supply and global "value chains" focused on different environmental, economic and agricultural areas.

The growing interest of the academy in search of problems related to networks identifies 1,863 records for the phrase “sustainable supply chain” in Scopus, and 1,182 in WOS, which served to map the scientific landscape of this topic (Andrzej et al., 2020). Values similar to those obtained in this investigation with 1,669 records. However, when collecting the information from WOS, Scopus and Google Scholar Metrics on Circular Economy (Enric Camón & Celma, 2020), record values of 3,391, 1,901 and 36,300 records, respectively, to compare the metrics based on bibliographic reference managers, obtaining considerable differences possibly due to the subject matter and the evaluation period.

Concerning the affiliation of researchers by countries in the theme of sustainable tourism worldwide (Pacherres Nolivos et al., 2020), there are 122, with the United States being the country that contributes 10.10% of a total of 415 records; this fact suggests a global theme that attracts the attention of authors from many countries (Niñerola et al., 2019; Pozo-Estupiñan et al., 2021a). Regarding the research, a global result of 126 countries was obtained, the trend being the United States with 268 records, England 204, Denmark 189, Germany 160, France 113, the countries with the most outstanding contribution at the level of connections on the subject, probably Because they are the most significant agricultural producers, something similar happens with the contribution of scientific articles related to agricultural value chains.

The delimitation of a sample can be defined by the selected publication period, geographical location of the authors, research area, magazine sample or keywords, among others; thus, from the Collection of WOS, from 2005 to 2014, a sample of 453 papers with a total of 9,207

citations distributed in the period of analysis on bioeconomy (Bugge et al., 2016). Meanwhile, in the present study, a sample of 1,669 publications with 21,979 citations was obtained within a more extended period, possibly in the exact geographic location.

Regarding publications by country, the bibliometric analysis study of Islamic economics and finance articles by Indonesian authors has a sample of 559 articles published in Indonesia; almost half were published in 24 magazines, the most popular magazine being Talent Developments and Excellence with 35 articles related to Scimago classification (Handoko, 2020; Ramos-Leal et al., 2021). In the present study, Indonesia has a sample of 19 publications, values lower than those shown by South American countries such as Brazil with 49 publications, Colombia with 28, but higher than those shown by countries such as Argentina with 13 publications, Peru, 10 Chile with seven and Ecuador with six publications in a variety of scientific journals, possibly due to the research conditions on the subject and the economic conditions of the study.

Reyes-Belmonte 2020, in a study, carried out on integrated solar combined cycles based on data analysis, obtained a total average of 15 citations per publication from 2000 to 2018. When comparing in the present study, there is a value mean of 14.27, with no significant variation between the research areas despite the current relevance of the study and the similarity of the analysis periods.

Using the InOrdinatio equation to rank articles in order of relevance based on Journal impact factor Citations Reports (JCR) and the criteria for choosing the most relevant articles, a sample of 39 articles was obtained for the bibliographic portfolio on intelligent cities (De Souza et al. 2019). Likewise, in the present study, the organizations that report a more significant number of citations are Wageningen University with 984 citations, far behind Cornell University with 455, Columbia University with 376 and Chinese Academic Science with 274 citations. Despite being the second in publications with 25 records, the latter is surpassed in citations by Columbia University, which has six publications. Its network of citations includes the World Bank and the international maize and wheat improvement research organization (Int maize & Wheat improvement).

1.5. Conclusions

From the analysis of bibliometric indicators of the publications in WOS applied to the investigation of agricultural value chains, the document shows the trends from a general perspective through the articles that analyze aspects of the subject; the importance of the document lies in the fact that until to date, no bibliometric studies have been carried out that analyze aspects related to agricultural value chains. Another point to consider is the methodology to analyze the external impact. What is evidenced as a result of the bibliometric analysis on the subject and in general, the increase in research related to the agricultural value chain since 2014, a trend that leads to the sustainable development of agriculture, becomes a potential research area in each country, in addition to the relevance for improving the quality of life of the actors and their environment, as a measure to mitigate the pollution of natural resources.

Since the livelihood of the world population depends on the production of agricultural products and by-products, it is expected that research will continue to increase mainly in countries identified in this study and improve publications in underdeveloped countries. In addition, the theme is related to the sustainable development goals and objectives set by the United Nations Organization for 2030.

The importance of the theme serves as a guide for decision-makers that the results will help them find samples of the economic, social, and ecological systems and evaluation methodology of the process, thus improving their decisions. Another aspect to consider in local governments is to develop agricultural policies and regulations based on socioeconomic results to increase or decrease the use of external technologies and improve management systems. The research visualized a series of networks of organizations that describe the relationships between various scientific domains that contribute to the connection between the natural, agricultural, environmental, social, economic, and political sciences. It is essential to evaluate bibliometric techniques not only for research fields but for the specific field of agricultural value chains.

In the political-administrative sphere, there is an urgent need to increase the commitment to agricultural value chains and the economy of South American producers to replicate and promote public policies. Promote the search for information on elements to promote the consumption of non-traditional agricultural products in consumers, in addition to knowing what they consume. Encourage companies that are competitive and make a profit in activities for the benefit of the community.

The dataset used for the visualizations requires context awareness to be meaningful; data coding and domain knowledge will make sense of the charts. For the future, it is recommended that the search for records be expanded through other databases, the comparative analysis of the number of results in pillars such as agricultural sustainability and agricultural economy.

CHAPTER 2: PROFILE OF CHARACTERISTICS OF DRY HARD CORN AND THE ACTORS OF THE VALUE CHAIN

2.1. Introduction

The value chain concept appeared when companies' success depended on the interaction between the flow of information, materials, money and labour (Ribas & Companys, 2014). With the growing importance of global value chains, trade has become a driving force for international trade (Suárez et al., 2016; Pérez, 2019). Today intermediate inputs constitute 60% of world trade, according to the Inter-American Development Bank (IDB, 2018). In the case of South America, it is expected to make possible the productive interrelationships in the various stages of the production process that include regional chains (Lámbarry, 2016; Niembro, 2017), that is, the aggregation of South American inputs (from more than one country) in the production process of another South American country (ECLAC-IPEA, 2016). In Ecuador, grain classification is governed by quality standards imposed by the market and the State, of which there are two types: standards and statutory bases. Regarding the nodes, the problem of the different links in the value chain, and their impact on the consumption of healthy foods, is of particular relevance in the provinces with the potential to produce dry corn. According to the type of work we found, a structure of sections has been identified and proposed to describe areas or patterns with problems in the chain, and we will briefly describe some of the works found that are considered the most representative of the state of the art. art.

The global value chain approach was flourishing in the 1990s (García et al., 2019), based on the literature, cost economics, production networks, and technological capacity and learning at the business level (Li et al., 2016; Ortega-Santos et al., 2021), developed by those who focus on the study of relationships and participation in fragmented value chains, giving rise to the "global production chains" approach. Gereffi et al. (2005) postulate the types of governance of the hierarchical global chain, from the captive, relational and modular to the market. However, the understanding of the governance of supply chains, existing the possibility of transferring processes between countries and emerging new business opportunities (Feenstra, 1998; Vergara-Romero, 2011), demanding changes in the institutional environments and economic growth of developing countries (De Vasconcellos et al., 2015; Olea et al., 2016).

The agri-food value chain is a network of organizations that work together, in different processes and activities, in order to bring agricultural products from the farm to the table and meet the demands of consumers (Ramírez Molina et al., 2021; Sanabria et al., 2017), the added value generates profitability or increased productivity and growth (Fuentes et al., 2016; Vergara-Romero et al., 2021). The growing interest in the study of supply chain management has occurred in parallel with the trends in world trade. Today internationally successful companies source from the part of the world that offers them the best comparative advantages manufacture their products in countries where they can achieve low operating costs, and sell in multiple markets in search of maximizing their income (Sarache et al., 2009).

The growth of companies and supplies has shown positive growth, the result of integrated work processes and continuous improvement, which leads to a configuration of new value chains (Hanclova et al., 2021; Vergara-Romero, 2022b). The Ecuadorian agricultural sector still has disadvantages related to efficiency and yield, technology and post-harvest management, and aspects related to competitiveness such as production costs about other countries, the diversity of climate, soil, and genetics. Where it is linked to the social, economic and institutional aspects must have comprehensive responses.

In the value chain, four primary functions are distinguished: production, grouping, elaboration and distribution, being essential the efficient grouping and storage due to the minimum volumes of product coming from small farmers, many of them scattered and with little availability of mobilization, being a challenge essential to overcome. The planning, evaluation and control of inventories are activities of transcendental importance for the fulfilment of the objectives of a company, especially in the manufacturing industry. Therefore, these activities must be supported by adequate optimization and simulation models to obtain the best results (Valencia et al., 2015; Martinez-Valero et al., 2021; Vergara-Romero, 2021b). The idea is to connect the planning domain of each of the organizations to exchange relevant information for the global planning process (Ribas & Companys, 2014; Sed'a et al., 2021).

From the perspective of governance, agricultural value chains in Ecuador have not been extensively studied. The governance research of the corn value chain from a socioeconomic approach allows understanding of the relationship between actors, which allows assimilating the relationship in the different links of the chain in terms of the distribution of the value created and, therefore, of the relationships of power that are formalized.

Studying the socioeconomic and competitive importance of the agricultural maize chain is necessary to know its position as a fundamental part of the growth of the region, measured through the economic indicator of the Gross Domestic Product (GDP). For the State, it is a strategy to dictate policies that encourage the permanence of successful chains, but also for those that need investment and technological innovations to make them competitive (Sánchez at al., 2013; Souto-Anido et al., 2020).

All those farms and companies, as well as their subsequent activities that add value in a coordinated manner, produce certain agricultural raw materials and transform them into specific food products that are sold to final consumers and are discarded after use, so that is profitable at all times, provides broad benefits to society, and does not permanently consume natural resources (Neven, 2015).

This paper presents an existing bibliographic review on the subject seeking to achieve the objective of distinguishing and identifying the typology of the value chain of hard corn in Manabí, knowing the nature of the chaining processes individually and in groups. The corn value chain has received special attention from various sectors due to the agricultural structure, availability of irrigation water, agricultural insurance, and market price instability.

2.2. Materials and methods

The study of the structure of the corn agrifood network was carried out in Ecuador, in the coastal area of the Province of Manabí, from the second quarter of 2018 to the last quarter of 2019.

2.2.1 Description of the methodology

A value chain comprises a wide variety of activities that are essential for the product to transit and remain from conception to final disposal in the consumer. The analysis focuses on the contribution of the steps or links, the socioeconomic aspects, and the production until the final use. The relationship between links and actors with the denomination of homogeneity or heterogeneity within the key elements and the generation of specific public policies.

The appropriation of added value, not all links or actors, have the same space within the same link, or the ability to appropriate added value within manufactured products, such as research, development, sales and marketing.

The governance of the chain, to analyze the mechanisms of processes and regulations in companies, producers together with the government and other actors, to know the behaviour of the actors and their type of link and conduct.

The methodology focuses on solving the problems or bottlenecks present in the chain, which can be reflected in the improvement of the articulation of the links, the incorporation of new alternatives of new actors and economic and social improvements, reflected in the productive transformation of the product. Bibliometric analysis is a technique that makes it possible to provide a macroscopic view of large amounts of academic literature through a quantitative analysis of the information on the publication history (Mendieta-Cepeda et al., 2021; Valenzo et al., 2012).

Studies that used governance mechanisms that influence the chain were considered as follows:

1. Mapping of the food chain, considering the dry hard corn as a reference, is considered the leading social actor for the investigation.

2. Identify actors in the hard dry corn value chain using information from the census carried out by the Ministry of Agriculture and Livestock (MAG).

3. Secondary data collection, complementary to the investigation, a series of surveys and interviews were carried out with interested actors such as producers, entrepreneurs, and experts on the subject. Based on investigative work and information collected in workshops, the survey was constructed and validated using the Cronbach's Alpha test, obtaining a general value of 0.685, confirming the instrument's reliability (Hernández-Rojas et al., 2021; Jimber del Río et al., 2020).

4. Descriptive analysis

5. Governance identification.

2.3. Analysis and Results

In the last decade, the agricultural sector in Ecuador had modest participation in the economy, around 10% of GDP, or 14% if the agribusiness sector is also taken into account.

However, it is still an essential source of employment for the rural sector since more than two-thirds of the economically active rural population work in the sector (Egas et al., 2018; Pozo-Estupiñan et al., 2021b).

According to the reports of the Agricultural Public Information System (SIPA), the national area planted in hectares (has) of dry hard corn (dry grain) in 2018 was 255,376, with production in tons (t) of 1,513,635 and a yield (t/ha) of 5.93. The same report shows the prices for the dry hard corn producer (qq) between 2017 and 2018 it was 13.44 and 14.04, respectively, with a variation of 4% reaching 15.25 as the Minimum Price of Sustainability, with the requirement of having 13% humidity and 1% impurities at the time of delivery to the warehouse-vendor “collection center” (Ministry of Agriculture and Livestock, 2019). The participation in the total planted area of dry hard corn, and dry grain, according to the National Institute of Statistics and Censuses (INEC-ESPAC, 2019), is in Los Ríos with 38.8%, Manabí with 24.9%, le followed by Guayas with 17.5%, Loja with 12.3% and other provinces with 5.7%, with Manabí's production in metric tons (thousands of metric tons) being 135, 315 and 271 for 2016, 2017 and 2018, respectively.

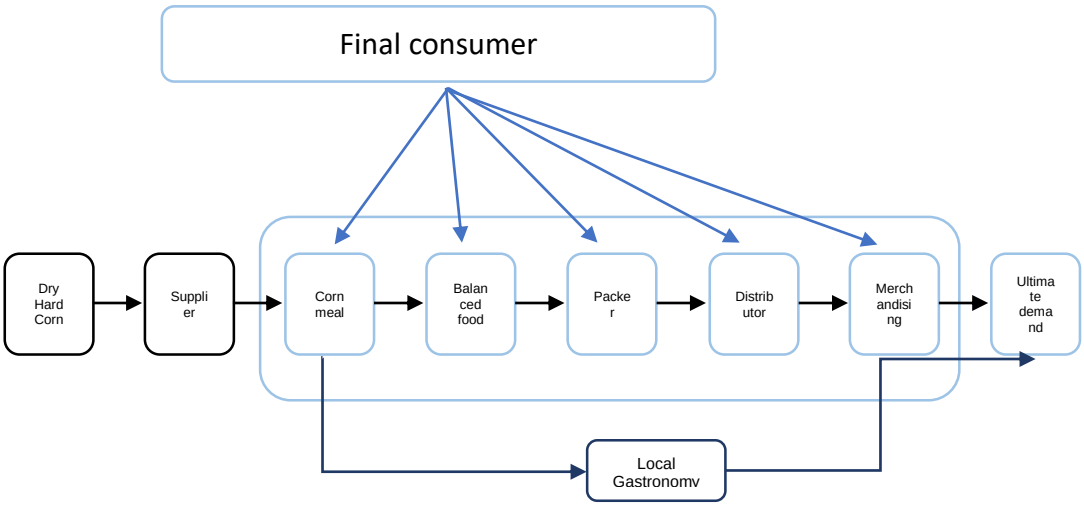
The corn value chain in Manabí presents a complex structure characterized by a high degree of intra-link heterogeneity and marked inter-regional differences; production and productivity levels vary throughout the regional geography, with some excluded links in specific sectors, such as the sectors of Santa Ana.

2.2.2 Food Chain Mapping

The core of the dry hard corn value chain comprises producers and industrial corn processing companies, which are companies dedicated to preparing feed for some animal species and flour. From this, two backward links were identified: the producers and suppliers of inputs and three forward links that culminate in the final consumer (see Figure 5). In a simplified way, the general characteristics of the links and their links are highlighted.

Figure 5.

Value chain of dry hard corn



2.2.3 Production

In the characterization of complex corn production in winter 2018, it was as follows: sowing begins between January and February, the density of ears/ha is 48,257, of which 93% was certified seed, with an average weight of ear of 134 grams, the varieties used at this time were: Dekalb 7088, Triunfo & Somma, the perception of the problem being the lack of irrigation water, pests such as the armyworm and leaf spot (MAG, 2018).

The production of dry hard corn can be classified into three systems, according to the extension of sowing, technology and availability of infrastructure and irrigation water: i) technified facilities; ii) standard or semi-technified installations; and iii) non-technician rural systems. There is significant productive heterogeneity among the three (see table 3). Each activity in the value chain has a different potential to catalyze economic development and productive transformation (Kim, 2017; Márquez-Sánchez et al., 2022).

Table 3.

Production Systems

Production system	Size and capacity	Installations	Characteristic	Availability of irrigation water	Main markets
Technified facilities	More extensive than 16 hectares, they represent 45% of the production	Automated, state-of-the-art technology.	Technical preparation of soils, Biosafety Export Vertical integration	Yes	National and international
traditional installations	Between 6 to 15 hectares. They represent 30% of the production	Traditional with a certain degree of technology	average productivity Complete cycle intermediate quality	Something	Provincial
rural system	Less than 5 hectares. They represent 35% of the production	Rudimentary, without technology.	Low quality and low yields local consumption Little technical management	Any	Local

2.2.4 Socioeconomic and production findings

For the analysis of the associative trajectories, we have selected the following organizations: Union of Peasant Organizations of the Southeast of Manabí (UOCSEM), Federation of Peasant Organizations of the South Zone of Manabí (FOCAZSUM), Provincial Union of Peasant Organizations of Manabí (UPOCAM) and the Cooperative of Agricultural Services of the Olmedo Canton (CEDOCAO) according to (Guerrero, 2012; Ochoa-Rico, Vergara-Romero et al., 2022). These offer a range of services such as technical assistance (organic

production), training, and organizational processes of the agricultural sectors. The associativity and empowerment of a joint work serve as a means of sustainable development.

Strategies for value chain programs should be prioritized to identify where value is created and who captures it for the multiplier development of the links.

2.2.5 Findings of distribution and commercialization.

The commercialization of corn is under the action of the intermediaries, this to the weakened organizational and union sector of the farmers, being the merchants the ones who place the product in the market, local or national, this intervention causes an oligopoly and high speculation. It is estimated that 57% of national production goes through intermediaries, followed by the Storage Unit (26%), direct sales to the consumer (9%), stackers (4%) and other channels (4 %) (ECB, 2019). As indicated, some large companies distribute and market their product directly, have transportation (specialized or not), have their portfolio of fixed customers, and some go-to collection centres, supermarkets, and local stores, to supply products. Where they sell them exclusively, other companies, especially the smaller ones, resort to intermediaries (merchants and agents of local and national balanced companies) to buy the direct harvest to distribute and market the product.

2.2.6 Market aspects between demand and supply

The setting of minimum support prices (PMS) began in 1988 in the case of sugarcane and is currently one of the most critical commercial policies for hard yellow corn (MAG, 2016).

Currently, the production of corn covers the needs of the country; the use of hybrid technology, production yields, the cost makes it attractive to bet on the crop. With an increase in production, since 2014, the growth in 5% of the planting area, the variation in prices was between 12 to 15 dollars; therefore, farmers covered the production costs (BCE, 2019).

The smuggling of agricultural products across borders causes severe problems for formal commerce, industry, and national production, causing unfair competition, especially for the agricultural producer of corn.

2.2.7 Identification of governance dynamics

As of the Constitution of the Republic of Ecuador in 2008, the agricultural policy is reorganized together with the National Plans for Good Living and the Whole Life Plan, establishing general guidelines for the design of policies, programs and projects focused on promoting production, food security and sovereignty and rural development. A mandate by which production for the provision of food is one of the critical objectives of the National Plan for Irrigation and Drainage, compliance with which must be linked to the peasant family economy of small and medium plots, framed in the efficient management of irrigation and national drainage.

Public institutions influence the chain's behaviour through the main channels, such as the regulations for managing phytosanitary products and their products and the set of supports that the chain actors can access (SENAGUA, 2019).

Most of the support received by the agricultural value chain comes from the Ministry of Agriculture and Livestock (MAG) and its agencies. The support is granted for the benefit of people dedicated to the production of corn. Among them, the Agricultural Development Program, the Undersecretary of Corn, provide constant training. Other public entities offer support to the chain of value-added to production, among them the National Institute of Agricultural Research-INIAP (Zambrano et al., 2018) together with the International Center for the Improvement of Maize and Wheat (Cimmyt) are working on the creation of laboratories to certify improved corn seed, the Interministerial agreement between the Ministry of Agriculture, Livestock, Aquaculture and Fisheries (MAGAP) and the Ministry of Industries and Productivity (MIPRO), with the Competitive Improvement Plan for the corn chain, whose objective is to achieve sustainable and competitive self-sufficiency of corn to produce balanced feed and animal protein feed at affordable prices for the final consumer, together with the "High-performance seed program" (MAG, 2016).

Involved in the productive activity, the Secretary of Science and Technology (SENESCYT), the Universities present in the province through their research projects and links with the community.

The actors in the chain have a wide range of instruments that they can use to improve their performance. Given the multiplicity of institutions involved and the related activities, there are spaces to improve institutional coordination for the continuous improvement and use of

resources. Currently, the complexity of the procedures to promote dissemination and training campaigns for social actors by some universities in multiple agreements such as the HUBs favours medium and large companies that have their specialists and encourage the emergence of intermediaries whose added value is questioned.

In the macroeconomic field, factors such as government changes are a risk due to the ideology of what should be produced, appearing as a risk to the supplier (Barrientos, 2019), hence the importance of establishing a state policy to opt for diversification as a strategy.

2.2.8 Chaining and links of the actors

The links make up the dry hard corn value chain, presenting significant levels of vertical and horizontal integration, with producers participating in various production phases, such as technified maize growers who make up their chain in the production of balanced feed. There are also medium and large producers responsible for supplying and distributing their products in regions that are even close to countries like Colombia. It is worth mentioning that most corn growers are part of the chain by themselves. In most of the links of the production process, a crucial horizontal integration is observed through associations, among which those already mentioned above stand out. In the Pronaca industrialization sector, the Association of Balanced Food Manufacturers (AFABA) in the production of balanced food in the transformation link, as the last report, the requirement of 3 months of consumption to match the 2015 winter harvest is 50,796 Tm (AFABA, 2015). Specializing in common aspects for its members. The activities are subject to animal health regulations, which are the responsibility of Agrocalidad, and the regulations for products for human consumption through the National Institute for Standardization (INEN).

The general relationships between transformation actors agree on prices, production, volumes, quality and delivery, acting without contracts and market conditions. We must mention that the informality of the producers is a disadvantage compared to medium and large companies, which import raw materials at competitive prices, favouring the ability to negotiate with national raw material suppliers.

2.4. Discussion

Value chains are interdependent systems connected by links, so the acquisition of competitive advantages requires that a company's chain be managed as a system, as mentioned by Mestre (2019).

In-depth agricultural research can be used to support data-driven planning and policy-making through the use of specialized statistical methods. The methods can quantify the relationships between the various characteristics to understand better why farmers make confident decisions and their possible response to specific policy measures.

The process of determining quality is an activity that, despite the evolution of technology in agricultural practices, continues to be carried out manually by specialist laboratory technicians, referred to Saleres (2016).

In Manabí, information barriers are a leading cause for failed attempts to export corn products since potential producers lack knowledge of the international market and also national suppliers have difficulty finding reliable suppliers.

Hence the need not only to increase the participation of small and medium-sized agricultural producers in the most dynamic agro-industrial chains (Rioux et al., 2015) but also to expand the process of generating jobs and non-agricultural income in rural areas. In addition to improving education, health and other public services (CAF/FAO, 2006), the impact and importance of periodic diagnoses throughout the value chain using key indicators (Amjath et al., 2020; Bhattacharjee & Lisauskaite, 2020; Noboa Salazar et al., 2022), should be a regulated governance factor in the functioning of food production systems.

The input-output model, quantifying the exchange relationships between sectors, suppliers and demanders of intermediate inputs, allows identifying those sectors whose relative importance in such interdependencies is significant, according to Schuschny (2005). The idea of impact is that not all intermediate activities have the same capacity to produce a positive and multiplier impact on the foundations of the productive sector. Thus, the key sectors in the transformation or manufacturing activities can stimulate other economic activities, linking the linkages with the growth of industrialization due to the small scale's lack of industrialization and intervention in the sector.

The input-output matrix summarizes the relationships between intersectoral supply and demand, which makes it possible to identify the sectors that have the most significant weight in the economy, or how changes in one sector affect the supply and demand of other sectors. of the economy as a whole, explained by Hernández (2014). In Argentina, about 4.4 Mt/year is produced in 37 factories in the biodiesel industry (Díaz et al., 2019).

A strategy to overcome barriers within territorial planning consists of developing effective training programs, workshops, in public-private collaboration since the public sector supports this service, the experience within the agricultural business community, the orientation of the merchants national, the success of agro-industrial companies in the production of corn derivatives, together with professionals related to these areas.

According to the OECD/FAO (2019), agricultural productivity is the strengthening of human and social capital, sometimes facilitating the reduction of transaction costs and improving economic returns in generating added value (Avalo et al., 2016). Improved management skills are complemented by rapid growth in information technology, which improves technical and distributional efficiency.

Address the main regulatory challenges related to innovation, such as the improvement of intellectual property regimes, labour regulation, and competition policies, as well as simplifying other administrative and regulatory procedures (primarily related to the registration and operation of companies) that mainly affect innovative companies (Kim, 2017; Rubalcaba et al., 2017), in addition to environmental and ecological ones by Ardisana et al. (2018) and since the beginning of 2020 with the covid-19 pandemic, the prolonged block in all the links of the value chain (Solomon et al., 2020).

Three key factors contribute to this situation in Latin America: 1) the state of regional integration—with multiple and overlapping agreements—is not conducive to the formation of supply chains throughout the region; 2) the quality of transportation and logistics infrastructure may be inadequate for modern supply chain practices; and 3) the existence of information frictions that keep potential providers on the sidelines (Development, 2018). The local economy shows weaknesses in the chain between the production sectors, and the industrialization, storage, transport and communication sectors significantly influence the demand and supply of products.

Since the beginning of 2020, with the global situation of the Covid-19 pandemic, a decrease in sales and agricultural inputs is likely. It will translate into reduced cash flows for social actors, contributing to a liquidity crisis that may affect the capacity of the intermediary agents, producing a cascade throughout the food production system of this product.

2.5. Conclusions

The interest in value chains has increased due to the importance that they are acquiring in the consumption of dry products and their derivatives around their production. Relevant strategies such as the location of facilities are essential in designing value chains and their distribution and perishable aspects in storage. The topic has been poorly developed, mainly due to the difficulty of modelling, the type of product, and the number of variables to consider in this type of gearing of factors.

Public and private institutions have been involved in the corn production network, and social actors have participated in the production stage, providing seeds, fertilizers, agrochemicals, and financing, among others. The processing and distribution functions in the post-harvest stage of the network are well-differentiated, being the small agricultural companies that strengthen and participate in value-added activities and belong to agricultural organizations or associations. Distribution companies present a sense of associativity.

In the province, a correct location of collection centers, processing companies, and the location of consumers is necessary, which contributes to the formation of the architecture of the management model, incorporating commercial customs and infrastructure flows and distribution characteristics. Among the products derived from corn, there are perishable products, the exact grain in which aspects such as climate, temperature, humidity, storage place, and quality must be taken into account, opening doors for future research that models perishable aspects such as climatic changes, internal and external factors, not only to penalize it with an additional cost for the farmer due to the humidity and state of the grain but also to represent the state and conditions in the trip and transport in the different links of the value chain, what allows this to quantify the cost-benefit relationship between the losses of the product due to decomposition and an increase in the quality of the product.

The lack of infrastructure forces producers to be at the expense of uncertain conditions (rain, irrigation, prices), with technology transfer being a factor in developing this priority sector in the local and national economy, along with financial support.

A strategic plan should be carried out that covers the value chain and the pre-availability of agro-industrial investments in new fields (biofuels) and protect the added value with an in-depth analysis of the territory's socio-economic dynamics.

Finally, the bibliographic information on the value chain in Ecuador is minimal, which could become a pioneering investigation on the subject, in addition to the grouped study using the Leontief adjustment technique for the country.

CHAPTER 3: SUSTAINABILITY OF THE VALUE CHAIN OF HARD CORN IN ECUADOR

3.1. Introduction

Commodities as a tool serve to protect price risk or a source of instability for spot markets; its importance lies in the variations in future contracts traded in the spot markets of agricultural raw materials, the transmission of volatility and providing information for the construction of public policies (Coronado et al., 2015; Dos Santos et al., 2020).

Corn is a fundamental input in producing food in the Mesoamerican culture due to its flavour and nutritional benefits (Echeverria & Muñoz, 1988), in addition to the production of balanced feed for animal species. The importance makes it a highly demanded product, considering its different presentations, making it accessible to all audiences. In the national and international market, the commercialization of hard corn is influenced by producers' demand for the food and balanced industry in countries such as the United States, China, and India, among the most important. The demand for the product for cultivation extends worldwide.

Ecuadorian corn and its traditional varieties constitute one of the national agricultural and gastronomic heritages; it is cultivated in all climatic zones, excluding the paramos and subparamos above 3000 meters of altitude. The Ecuadorian indigenous people knew the four varieties of corn being white, yellow, black and hard yellow corn, which they called morocho and used in unique preparations. The grain of corn is a vital principle within the worldview of indigenous peoples as it is part of life and a fundamental element of identity (Arroyo Aguilar, 2019; Echeverria & Muñoz, 1988; Sorhegui-Ortega et al., 2022). Corn as human food is the basis of a variety of gastronomic forms, these are classified according to the state of development and maturation of the grain at the time of consumption and if it were consumed in the form of food, drink and in some cases, medicinal, for example, corn hair as a diuretic if prepared as an infusion.

The production of hard corn in Ecuador has become a source of income for producers, thus improving the region's gross domestic product (GDP). Organized work allows direct and indirect growth and integration into the international market. The opportunities of small producers for economic sustainability, if we consider hard yellow corn in the coastal region, especially with an increase in yield that went from 3 tons per hectare (t/ha) to 6.60 t/ha.

However, its potential for production yield and demand has many expectations, and the crop must be sustainable over time.

Within the research, the objective is to describe the characteristics of the value chain of hard corn in the Ecuadorian economy. Considering the methodology of a documentary type, the development of the levels of performance and commercialization of agricultural raw materials " commodities " is shown.

The research is presented in sections entitled as follows: the commodity market in Ecuador, agricultural commodities in Ecuador, the market and the Ecuadorian hard corn value chain, the global marketing of hard corn, the hard corn chain in Ecuador, Characteristics of local production, corn in the national development strategy and finally the reflections and conclusions of the research are presented.

3.2. Materials and methods

To meet the objective of this research, a documentary or non-intrusive analysis is carried out, where scientific articles are included in indexed journals with the search for the following terms "AND value chain AND hard AND corn", "AND value chain", "corn AND hard AND Ecuador", “value AND chain AND hard AND corn”, “value AND chain”, “hard AND corn AND Ecuador”. Expanded the search in the Journal Indexing Citation Report (JCR) and Scimago Journal Rank (SJR). In the case of Web of Science, the Social Sciences Citation Index (SSCI), Science Citation Index Expanded (SCIE), Art and Humanities Citation Index (AHCI) and Emerging Sources Citation Index (ESCI) were included.

Several articles were selected from 2000 to 2021 for a preselection focused on addressing the problem by reading the title, theme, abstract and keywords. A bank of articles was created on the Mendeley platform, and the study of these articles was deepened, building a systematization of the indicated field and a comparative analysis between the various studies.

The systematization was carried out through each author's conceptual representation and discursive analysis. However, the article's relevance is measured by its impact factor and immersion in the thinking of its scientific discipline, oriented towards the results of substantial changes in praxis and the formative theory of the search for real solutions in multiple problem situations.

3.3. Developing

3.3.1 Commodities Market in Ecuador

Of the total Ecuadorian exports during 2020, raw materials represent 74.44%, USD 16,623 million, consumer goods with 18.73%, intermediate goods represent 6.05%, and capital goods 0.77 %. Of these, the non-oil raw material products with a higher percentage of participation in the Ecuadorian Gross Domestic Product GDP are agricultural products. The primary sector represents 14.7% of GDP, with the agricultural segment representing traditional products, bananas, cocoa, and coffee, added to developed products such as flowers, fruits, and vegetables such as broccoli, hearts of palm, asparagus, and tomato.

In the same way, it imports consumer goods, intermediate goods and capital goods in 39.79%, 33.40% and 21.59%, respectively. Within imports of raw materials with 4.78%, materials Relevant premiums include non-oil products such as cake and solid residues from soybean oil extraction (Commission & Bank, 2021). This segment of raw material is called commodities (Barrientes, 2017).

Table 4 shows the evolution of the national GDP in thousands of USD, from 2010 to 2019, together with the Gross Added Value and the participation in the national GDP. The GDP is the economic indicator that reflects the wealth generated in the monetary value of the goods and services produced in the territory (Ochoa-Rico, Jimber del Río et al., 2022), its importance in the last decade has had a significant growth until 2015, after a slight fall and achieving a recovery in 2017, possibly being affected by the 2016 earthquake that mainly affected the productive sector of the province of Manabí. These drops in GDP influence the value of goods-services and exports, especially non-traditional agricultural products, and affect the national economy. As argued by (Thomasz et al., 2016), dependence on exports of primary products increases the macroeconomic vulnerability of developing countries, increasing the volatility of the growth rate and reducing the long-term growth rate and risks in the balance of payments.

Table 4.

Evolution of GDP according to variation rates (2010-2020)

	National GDP	Agricultural GVA	Agricultural GVA	Participation of the Agricultural Sector in the National GDP	Participation of the Agricultural Sector in the Agricultural GVA
2010	56,481,055	4,360,989	3,288,101	5.82%	75.40%
2011	60,925,064	4,689,213	3,526,649	5.79%	75.21%
2012	64,362,433	4,667,557	3,482,558	5.41%	74.61%
2013	67,546,128	4,967,197	3,705,479	5.49%	74.60%
2014	70,105,362	5,258,169	3,912,371	5.58%	74.41%
2015	70,174,677	5,366,126	4,039,443	5.76%	75.28%
2016	69,314,066	5,356,735	4,044,671	5.84%	75.51%
2017	70,955,691	5,593,352	4,288,107	6.04%	76.66%
2018	71,870,517	5,540,844	4,239,635	5.90%	76.52%
2019	71,879,217	5,511,269	4,216,523	5.87%	76.51%

Source: Central Bank of Ecuador (2020).

Primary agricultural products have a share in the Ecuadorian GDP; these products traditionally represent about 9.63% with $9,626,014 thousand of the Gross Added Value of both the agricultural sector and the agricultural sector, including livestock forestry and fishing, according to preliminary data from the Bank. Central del Ecuador (BCE, 2021), the interannual rate for Gross Value Added (GVA) in the agriculture industry is -2 and a contribution per industry of -0.16 to GDP in 2021 (BCE, 2020). In the same way, world

growth is projected at -4.9 per cent in 2020, reflecting the more significant alteration of commercial activity than expected due to the situation of the Covid-19 pandemic, demonstrating the contraction of production, lower-income and higher costs of commodities and external credits (International Monetary Fund, 2020; World Bank Group, 2020).

Among the macroeconomic indicators related to the trade balance is the People's Republic of China with 25.53% and the United States with 23.83%, the countries that dominate Ecuadorian exports, far behind Panama, Germany, Peru, Japan, France, and South Korea. Similarly, the United States and China dominate imports with 21.65% and 18.93%, respectively, far behind, followed by Colombia, Panama and Brazil.

The oilseed and cereal cultivation sector and industries registered a growth rate of 2.4% of GDP (BCE, 2019). Affected by the fall in the prices of petroleum products worsened the Ecuadorian economy. Being a state's objective with the private sector to find ways to prevent the country from increasing severe economic problems and intelligently and agilely control the economy compromised by external variables.

In this sense (Aguiar de Medeiros & Vital, 2015; Delfín, 2014; Dos Santos et al., 2012; García-Leonard et al., 2022) state: that China, despite being a significant world producer of raw materials with agricultural products, metals and energy, domestic consumption grew at much higher rates than production, generating a high demand for imports, together with the demand came the internationalization of its state companies (Sinopec, CNPC, CNOOC, State grid Corporation, Golden Dragon Precise Cooper Tuhe Group, Chinalco, among others) its focus is trade, mining and oil production.

According to Goulart & Bragatti (2020) and Michelotti & Siqueira (2019), make an essential dimension in the economic dynamics of Latin America and its relative boom period during the decade of the 21st century due to the appreciation of raw materials in the market. Globally, China is the primary buyer of its exports of agro-industrial products, metals and hydrocarbons, strengthening income and contributing to the expansion of the margin of autonomy of Latin American countries. Since finance is the instrument of Chinese political power to promote and guarantee the supply of agricultural commodities (Macedo & Costa, 2017), with the Covid-19 pandemic, speculation by East Asian financial institutions influence the value real value of raw materials (Franz, 2021; García Leonard et al., 2021).

In the Brazilian case, according to Fauro et al. (2016), the state supports actions in agricultural policies such as credit incentives, technical assistance, subsidies and others to encourage prices in soybean, corn and wheat crops, in addition to the acquisition of machinery, inputs, seeds, among others. All these essential products for food security. In addition to these incentives in Argentina, an increase in the area planted with agricultural commodities is observed (Parnás & Fonzo, 2021). While in Colombia, the formal recognition of coffee cultivation, the associative and collaborative style of coffee growers, and international experience regarding international price risk use future standardized contracts as alternatives to avoid speculative risks in raw materials (Moreno & Pereira, 2015).

3.3.2 Agricultural Commodities in Ecuador

Concerning the price of commodities in dollars, a devaluation of this currency increases the relative purchasing power of the rest of the world currencies, raising its price. In addition, as the participation of the demanding nations in world trade increases, this indicator is amplified (Ortega-Santos et al., 2021; Rondinone & Thomasz, 2016).

Thus, the participation of the primary agricultural commodities that are produced in Ecuador is crustaceans (19%), bananas (18.2%), flowers (4.1%), cocoa beans (4%), being the main destinations States United States (23.7%), China (15.8%), Panama (12%), Russia (4.5%), Chile (4%), Colombia (3.9%).

In table 5, it is observed that the agricultural commodities that show significant development are bananas, plantains and shrimp, on which the country has been developing strategies in the differentiating market promoted by State agencies and the private sector local and global.

Corn is also part of the international commodity market, but its production volume does not occupy an important place in the national economy. There have been improvements in production in recent years; however, yield is not very competitive if we consider other products, with Colombia and Guatemala being the leading exporters.

Table 5.

Exports of traditional agricultural products from Ecuador (2016-2020)

Products	2016	2017	2018	2019	2020
banana and plantain	2,734.2	3,028.2	3,215.9	3,295.2	3,669.0
Coffee and processed	148.6	119.4	83.4	80.2	69.8
Shrimp	2,580.2	3,043.0	3,189.7	3,890.5	3,823.5
Cocoa and processed	750.1	672.4	788.0	763.9	935.1
tuna and fish	244.3	252.6	308.1	308.0	315.2
Non-traditional*	4,875.2	5,050.9	5,235.1	5,306.1	6,157.6

Note: *Excludes goods for repair or storage without transfer of ownership.

Source: Central Bank of Ecuador (2021)

Ecuador, in the past decade, experienced an "economic Big Bang ", a product of the rise of China, which implied the great global shocks: first, imports of Chinese manufacturers flooded the world, and second, an increase in the demand for imports of primary products and the latter, an increase in global savings associated with current account surpluses in China and other emerging countries (De la Torre et al., 2020; Vergara-Romero, 2021c).

According to figures from the (BCE, 2019; CFN, 2017), imports of merchandise during the last five years concerning the agricultural sector, as shown in Table 3, have a progressive evolution until the subsequent 2018 tend to decrease both for agricultural raw materials and agricultural capital goods, reaching values in USD of 1401.2 (million), and USD 155.0 (million) respectively.

Table 6.

Evolution of Ecuadorian merchandise imports (millions of dollars)

Years	2016	2017	2018	2019	2020
Raw Materials	5,687.7	6,711.4	7,490.6	6,940.8	5,992.7
agricultural	1,042.1	1,164.1	1,401.2	1,351.1	1,337.5
Capital goods	3,935.2	4,675.5	5,196.8	5,367.7	4,146.0
agricultural	110.0	134.0	155.0	111.0	119.0

Source: Central Bank of Ecuador (2021).

Ecuador is highly dependent on commodities and the cyclical sensitivity of its income. Hence, it is necessary to build effective countercyclical fiscal policies avoiding cuts in public investment, and that social transfers are not cut, thus avoiding possible shocks in the volatile oil revenues thus avoiding boom and bust cycles (Camino & Brito, 2021).

3.3.3 The market and value chain of Ecuadorian hard corn

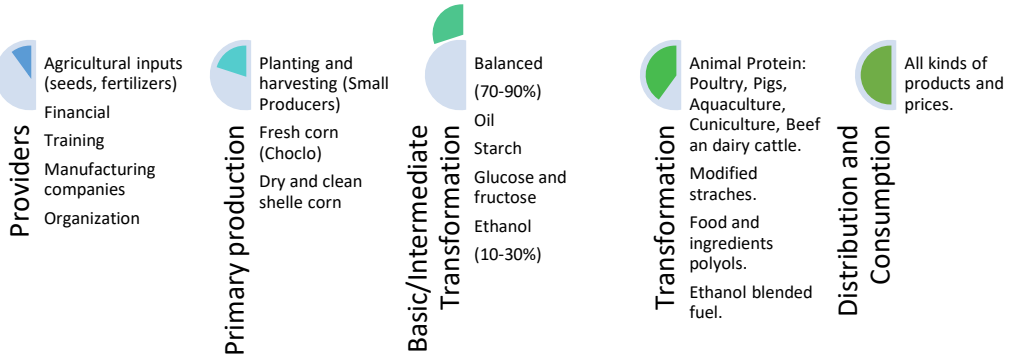
The behaviour of the economic flows that articulate a sector and the difference in its environment is perceived by the analysis of the value chains, all the essential activities to have a product or service from the initial phase through different production stages and/or services until it reaches the consumer and the final availability of being used or consumed (Dilla et al., 2020; García et al., 2014). As a whole, it is possible to improve the economic analysis of the value chain by coordinating and optimizing activities in the calculation of added value in operations in supply chain activities (Pocaterra, 2019; Vinajera et al., 2017; Vergara-Romero, 2021a).

Countries with abundant natural resources and participation in exports exhibit lower rates of economic growth because they block the diversity and modernization of the economic structure. Illustrating the "Sickness of the Dutch economy", affecting the competitiveness of primary exports compared to an alternative manufacturing economy. This is due to the greater volatility of the prices of primary goods, reducing the possibility of long-term economic growth.

Figure 5 shows the supply, production and marketing chain of hard yellow corn. The initial suppliers give rise to agricultural inputs, manure, fertilizers, and tractors for ploughing, among others; financial ones are also included due to the requirements and high costs of credit, factors that limit access to small producers, whom many times look for the usurer or "chulquero" as a source of money. Some companies sometimes provide this requirement in exchange for the safe purchase of the production. In the case of manufacturing companies, a division is observed, locating two types: 1) industrial processing with a national presence in which companies such as Pronaca, AFABA, Agripac, Balanced Nutrients, Nutril, Alibaec, Bioalimentar, Avesca, Liris are identified, Wayne, Unicol, Alcón, Coprobalan, Grupo Fernández, together produce 53% of national balanced livestock feed, 2) processing within the farms, especially poultry. The influence of the former reaches the management of the corn crop; that is, they are not only concerned with production and purchase but also with the development of the crop and grain.

Figure 6.

Chain of production, transformation and distribution.



According to the Ministry of Industries and Productivity (MIPRO, 2019), 386 companies process around 87% of corn, its destination being balanced production, while the rest is dedicated to the industry of other derivatives such as starch-based foods, canned ingredients and others.

In the international market, there is a demand for new or alternative products, prices must be considered, and factors demand a competitive advantage. One factor to consider is the product innovation and their presentation formula. One of the innovative products in the market for Colombia and Guatemala in 2020, according to the report of exportable products

such as vegan hamburgers, vegan sausage and snacks are among the leading products in the market based on modified corn starch and corn flour for processed products (MIPRO, 2020). One contribution of value chains is the ability to generate structural changes in economies, especially in agricultural countries whose benefits would generate quality jobs associated with the knowledge and research economy (Almonacid Z., 2018; Gilles, 2018; Vergara-Romero, 2019). Regarding price formation, raw materials are influenced by the national supply and fluctuations in demand, as well as by the currency exchange rate and tariff rates (Henrique et al., 2017; Vergara-Romero, 2021d).

Among the market alternatives, a new type of buyer must be sought, and added value must be added, so the question must be considered to create and strengthen the competitive advantage of the producer: How to be more competitive in the Ecuadorian corn industry?

3.3.4 The global marketing of durum corn

In the international trade of corn, as shown in table 7, it is appropriate to analyze the market for yellow corn exports, with the United States predominating in total exports worldwide with 44.1%, followed by the countries South Americans such as Brazil and Argentina with 8.4% and 14.1%, this relationship possibly goes hand in hand with the extension of the countries. Most of the exports will continue to be dry beans, despite attempts by producers to add value.

Table 7.

World exports of yellow corn during 2019

No	Country	Total, Exports 2018 (millions of USD)	Value in Tons
1	USA	8013010	41562313
2	Brazil	7289548	42752102
3	Argentina	5948632	36075720
4	Ukraine	4761997	24463903
5	Romania	1377507	6676219

6	France	1350725	3672345
7	Hungary	820156	3025729
8	Russian Federation	617625	3119665
9	Serbian	550951	3132823
10	Bulgaria	460578	2588956
11	Paraguay	399833	2993286

Source: Food and Agriculture Organization (2021).

The values of Ecuadorian yellow corn exports in 2020 as shown in table 8. The countries of Colombia and Venezuela are the largest consumers of Ecuadorian yellow corn; the contribution of corn concerning exports of the international FOB price in 2019 is USD 30,501 million.

Table 8.

Net weight of yellow corn exports and FOB prices.

Destination country code	Destination country	MT (Net Weight)	FOB
BEL	Belgium	42.80	26.30
CABBAGE	Colombia	117,741.60	24,469.30
ESP	Spain	52.70	95.90
ITA	Italy	49.20	39.40
MEX	Mexico	600.00	184.80
PER	Peru	70.80	39.60
USES	USA	33.80	90.60
COME	Venezuela	18,438.70	5,555.60
Total		**137,029.60**	**30,501.50**

Source: Central Bank of Ecuador (2021).

We must highlight the characteristics of productive specialization in each country and the governance structure of global value chains. The consequences on economic growth and the effectiveness of macroeconomic policy decisions to influence international trade flow at the national level based on internal development plans (Chena & Noguera, 2020; OECD/FAO, 2019; Vergara-Romero, 2014).

With the above background, it can be seen in table 9 that the trend of the price the producer received per metric ton has the highest peak in 2016 and the lowest value in 2018.

Table 9.

Producer prices for corn.

	Annual Average Producer Price (USD/t)
2014	335.6
2015	357.1
2016	381.6
2017	363
2018	314
2019	324.5

Source: Food and Agriculture Organization (2021).

In the Mexican case, the short- and long-term price elasticities vary in the total supply, the unit changes in the real rural average price of corn, the subjection to coverage of future contracts, the number of placements, the behaviour of world growth and the global food uncertainty (Delgadillo et al., 2016; Guzmán et al., 2012; Ortiz & Montiel, 2017). For Latin American countries, on the other hand, in general, the export prices of corn are lower than in 2019, in the case of Chile, Peru, Uruguay and Paraguay, due to the wide availability of the product, in Colombia, a factor to consider is the depreciation of the currency for the drop in prices, while Argentina and Brazil have an upward trend in prices in the first quarter of 2020, possibly due to sustained demand and abundant exports in the feed industry (Organization of the United Nations for Food and Agriculture, 2020).

3.3.5 The hard corn chain in Ecuador

In Ecuador, the yields in the production of corn are closely related to the environmental conditions of the sector where it is grown; the climatic conditions can affect the production in the plantation, humidity, and temperature; they must be adequate for the crop. Thus, the period of the plant is regulated by the climate, the climatic seasonality and the vegetation period, allowing two planting and harvesting periods to be established.

- **Productive link and support services in production.** Corn farmers who produce their Agricultural Productive Unit (UPA's) participate. Among the external economic agents that intervene, we have suppliers of supplies, training, machinery, transportation, and financial system (formal and informal).

- **Transformation link.** Within the chain, it constitutes the most complex link. Information on this segment is limited. From the grain to its processing, intermediate products (flour, beverages) and finished products (biodegradable packaging) can be obtained.

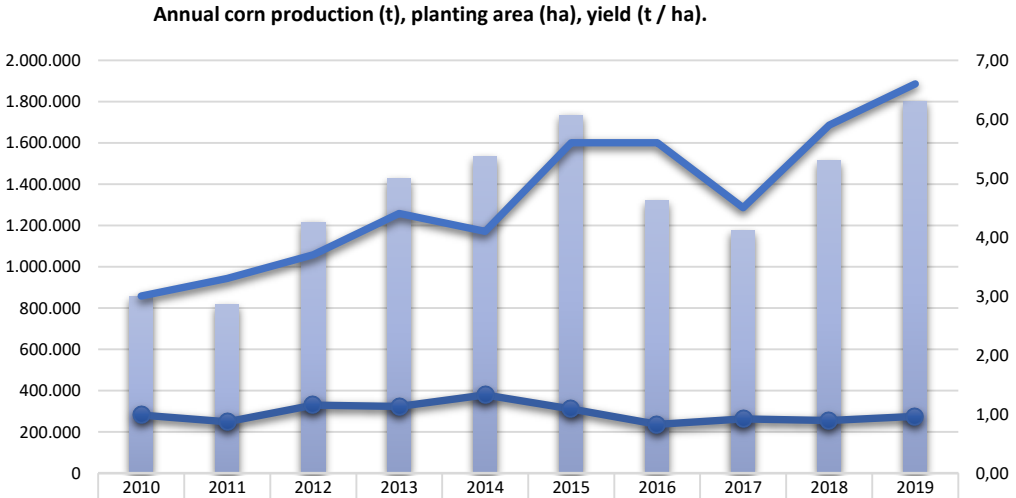
- **Marketing link.** Mainly involved are organizations, associations, and owners of collection centers of industrial companies that set the price. The concepts of quality and appreciation are subject to the degree of humidity and percentage of impurities.

- **Consumer link.** Various intermediate and final products are involved, resulting from processing and/or industrialization: flours, balanced meals, beverages, and biodegradable containers.

The links must consider current trends worldwide (Padilla, 2017), active participation in the markets allowing farmers and producers to meet the demand for the base product, protect the environment, strengthen the social and economic development of small and medium producers, together with the community.

Figure 7.

Annual production, planting area and corn crop yield.



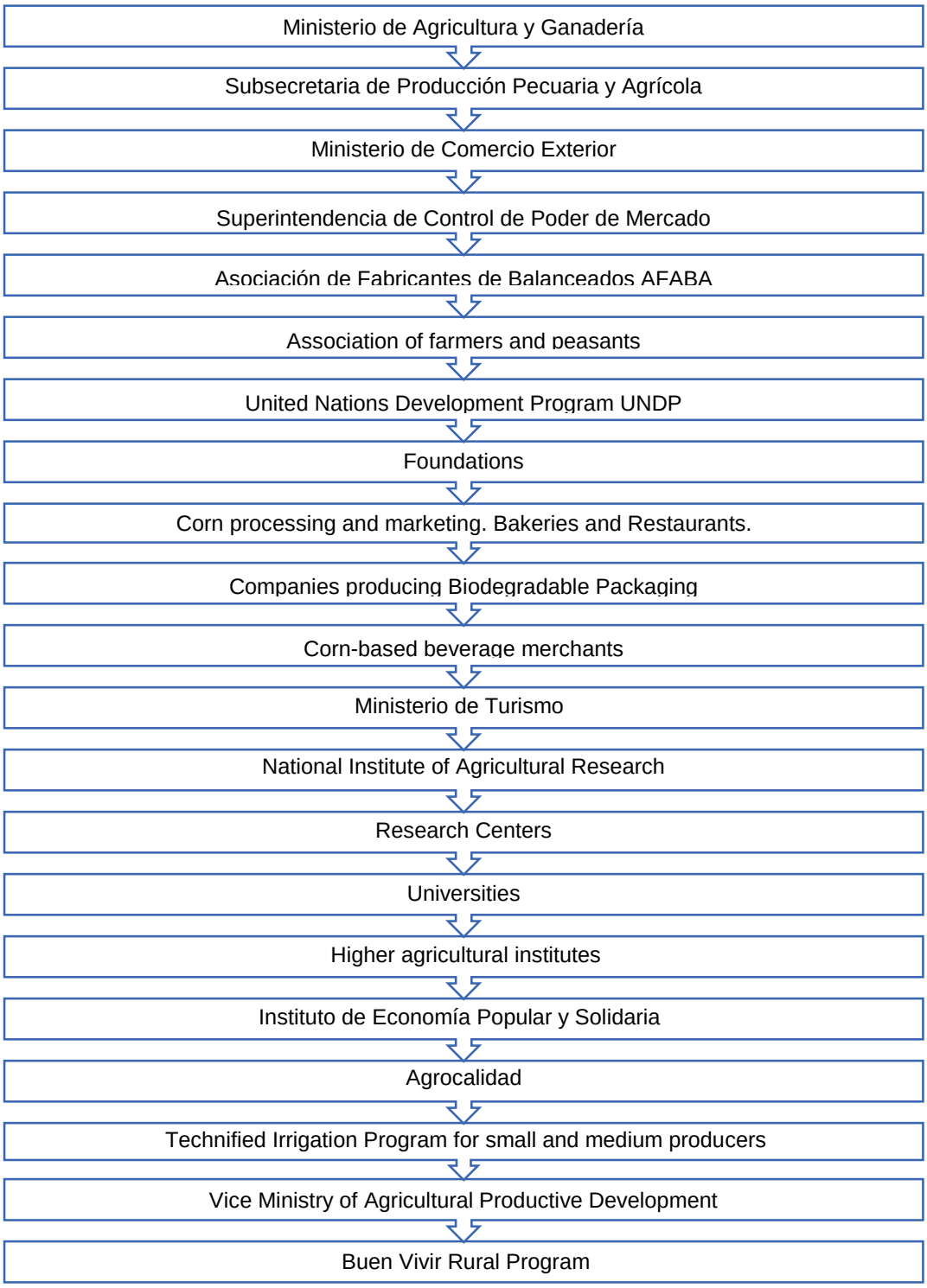
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Producción (t)	854.981	815.129	1.215.193	1.425.848	1.533.219	1.734.066	1.319.379	1.174.048	1.513.635	1.801.766
Área siembra (ha)	282.017	249.628	330.058	322.590	378.542	310.788	236.240	262.351	255.376	274.465
Rendimiento (t/ha)	3,00	3,30	3,70	4,40	4,10	5,60	5,60	4,50	5,90	6,60

The production of corn-based on the seed and the yield per hectare of improved and certified seed, added to the quality of the cob, give it competitive advantages in terms of price. Figure 6 shows the yield of tons/hectare, its evolution in production, the increases in the results from 2010 to 2019, observing decreasing values in 2017, and subsequent recovery. In 2019, a maximum yield figure of 6.6 (t/ha) was reached. The growth was 220%, considering corn is a product of recent economic importance in exports. The improvements in yields are thanks to the quality of certified and improved seeds, farming activities, favourable weather conditions, research, links with the corn sector and the development of crops in the Ecuadorian coastal zone, being the provinces of Los Ríos, Manabí and Guayas as well as the province of Loja with the best yield per hectare at the national level.

3.3.6 Main actors in the Ecuadorian hard corn value chain

Figure 8.

Actors in the production of Hard Yellow Corn.



Ecuadorian corn has very little representation in the international economy, with less than 1% of the global; this figure in the medium term can improve, considering the improvements in free trade agreements, and commercial activities with importers. Sometimes, corn prices exceed international prices, so the challenge is to be more competitive at the time of marketing if we consider that the demand for dry corn grain exceeds the capacity of producers.

The research works that analyze the impact on the primary activities of the value chain are scarce (Cardona, 2020; González et al., 2013; Ochoa-Rico, Concha-Bucaram et al., 2022); the value chains are characterized by the production of manufactured and/or finished products for the final consumption and by the chains are made up of the public, private, research and linkages with the sector (Oddone & Padilla Pérez, 2017; Vergara-Romero, & Ceular-Villamandos, 2022), with the leading actor being the farmer or corn producer who generates the base product (see figure 7).

3.3.7 Characteristics of local production

The Ministry of Agriculture and Livestock (MAG, 2019) stated that the main characteristics of corn producers are the following, in some cases, they are being strengthened by other members of the value chain:

- The average age is 46 years, and most have primary education (Castellanos Dorado et al., 2021; Ortega-Ortega et al., 2021).
- Yellow corn producers self-identify as Montubios (51%), mestizos (46%) and others (3%).
- Regarding training related to corn cultivation, 40% received training, with the MAG responsible for 91%.
- Most farmers do not control production costs.
- Most producers do not have access to productive credit (37%).
- Concerning land ownership, 44% are owners with title, 30% are owners without title, multiple groups lease the land to produce 20% and the remaining 4% are produced on communal lands; of the total, a 4.57 is obtained ha as average cultivation area.

- The destination of the production at the moment of commercialization is with the intermediary mainly 58%, the delivery in the collection centers is 36%, and the rest is to another 6%.

- Among the provinces with the best performance are Loja with 7.64 t/ha, Los Ríos with 6.97 t/ha, and Guayas with 6.59 t/ha.

3.3.8 Maize in the national development strategy

From the above, it can be reflected that the possibilities are favourable for Ecuadorian corn; the current yields give it greater importance in the innovation of the international market. Influenced by new behaviours in consumption patterns, consumer demand for new forms of product presentation, and being friendly to the environment. The national strategy is to promote new forms of innovation and generate ventures within the market (Chamba & Cordero, 2017; Vergara-Romero, 2021e).

It is necessary for Ecuador to determine differentiated strategies and competencies that allow taking advantage of comparative competitive advantages in raw materials concerning free trade agreements and treaties, approaches in agricultural policies to incorporate climate-smart programs (OECD/FAO, 2019; Tezanos, 2019), adopt strategies that account for the solution of complex problems in an integral way and define training strategies with training based on competencies with the interaction of knowledge, abilities, skills and international agricultural standards, product differentiation (Aguilar et al., 2018; Carvajal et al., 2019; Mercado, 2021), as well as the non-use of transgenics, such as the proposal of the Constitution of the Republic on maintaining the natural heritage, conservation of biodiversity and food sovereignty (Constituyente, 2008; MAG, 2016).

Decentralized governments must follow up on social programs, especially cash transfers and peasant social security, to reduce rural poverty, address health needs, and improve the living conditions of small producers. The strengthening of organizations, cooperatives, fair prices, and popular and solidarity economy, for the revitalization of trade and exports, as well as the improvement in the differentiation of products (organic, geographical denomination), horizontal and vertical integration of strategic areas.

The state must plan and generate strategies that allow access to socio-cultural diversity according to the context in production that are highly efficient in demonstrating significant variables or facts in the added value of the raw material for a more excellent socio-productive approach with the industry and national manufacturing and consider an exchange of experiences and their requirements.

“Feminization in agriculture” is necessary as part of differentiated policy strategies as management of this segment of the population in agricultural activities is becoming more noticeable as men seek new opportunities in other sectors.

3.4. Conclusions

In the case of agricultural commodities, Ecuador involves products such as bananas, coffee, and cocoa, of which the banana maintains a sustainable and profitable behaviour over time. Coffee and cocoa show scattered behaviours over time and in exports. Regarding yellow corn, also as a commodity, it is not representative in terms of production volume, but it improves annual yields, enabling future projections.

The analysis of the results achieved in this research, under the prism of the development conditions of the corn value chain, allows reaching relevant conclusions. The estimates highlight the national tendency to structure the value chain limited by exchange policies as an instrument to promote productivity growth and increase net exports, reduce the effects on the trade balance and enhance the sensitivity of trade flows to domestic income and external.

The strengthening of the value chain must promote trade policy and promote, manage and execute actions to guarantee fair prices for small and medium producers as a market strategy for the world economy. The development of the rural maize sector under the associative perspective implies building a favourable context for producers and investors, fostering complementary incentives in the rural territory, and promoting sustainable development at the local level. The goal of zero hunger, the fight against rural poverty, and the guarantee of sovereignty and food security proposed in the changes in the productive matrix may be possible in a social environment with policies that favour the agricultural activity of corn and complementary incentives.

In Ecuador, the corn value chain focuses on the use and preparation of balanced foods, favouring national consumption of the protein produced, similar to other countries such as Brazil and Argentina. Research efforts should be made to maintain or improve grain quality and yields per hectare. Likewise, it is necessary to strengthen the value chain that ensures the storage and purchase of products at fair prices, maintaining the grain's quality as a productivity culture.

CHAPTER 4: AGRICULTURAL VALUE CHAIN: AN APPROXIMATION OF IMPORTS

4.1. Introduction

Imports represent an essential item in the country's economy. Economic activity and stock market activity, measured as volume, traded value, and some operations, are the purpose of financial markets, being the variability that affects the decision-making of investors, who determine its evolution and evaluation in the future. Import and export market. Forecasting volumes of import and export containers are primary in the planning and operation of port agencies. At the seaport level, container forecasts are needed for strategic planning, finance, and accounting activities.

The demand for products has a social and economic nature, which is associated with the demand or quantity of products that are imported or the consumer wishes to acquire, based on the characteristics, price, price of substitutes or complements and the political conditions of the market, country and international trade. In this way, changes in prices, supply and demand of commodities, economic growth in the region, and trade partners, among others, affect the diversity of imports (Carballea-Orihuela et al., 2021; Vergara-Romero, 2022a). The information on the demand and the projection turns out to be a variable in the decision-making of those involved in the commercialization sector, from small companies to international investors; they must have a support of growing potential demand by the representatives of commercial firms and their forecasts of reliable demand predictions to support competitiveness and investment decisions in their derived projects. In addition, in the current times of the pandemic, it can serve as an input in an attempt to promote a collective reflection on the response to the Covid-19 health crisis and its economic and social effects on our societies (Alzúa & Gosis, 2020; Cuadrado-Rodríguez et al., 2021; Hevia & Neumeyer, 2020). At the sectoral level, import studies allow a vision of productive specialization and gains from the exchange in the economy (Fares et al., 2017; Vergara-Romero, & Moreno-Silva, 2019).

Within the commercial import activities of the country, international trade import containers are produced. Monitoring is vital for the work of the government, banks, and the private sector, as it allows them to react appropriately to the economic cycles in which the economy moves.

In Ecuador, the entities in charge of making the projections have historical data to make the projections, the same as in the annual frequency database (Yaselga, 2019), which refers mainly to time series methods related to the variables of the activity economy. Currently, the task of most excellent attention in time series databases is the measurement of the similarity between time series (García et al., 2016; Guillén-Alvarado et al., 2022).

The estimation of the elasticities of projections of supply and demand for imports presents incredible difficulties due to the variation over time in the number of varieties of goods or products existing in an economy (Echavarría et al., 2019). Classic estimates ignore the appearance of new product varieties, resulting in biased and spurious estimates. In Ecuador, many series present problems that make it difficult to use them promptly, which leads to the loss of information; they are long series; on other occasions, the publication of information is delayed to carry out a short-term forecasting analysis. A pattern of specialization with specific characteristics entails a series of risks for the country (Argudo-garcía et al., 2021; Clavijo, 2017).

Considering the importance of highly reliable data for projections, these products with reliable references can be considered, and the objective of this research work is to estimate and project the demand for four imported products for the period 2021. For this, a daily frequency database was considered for the analysis; a monthly series was built, and then processes related to data analysis were applied to estimate and project demand under the time series methodology with AR models, MA, WEAPON, and ARIMA. We believe that the research results can serve as input to improve learning conditions and public policy. Likewise, to be a reference for future studies for the social actors involved in the import of products and supplies sector. The second contribution consists precisely of a contribution to the empirical literature on the subject to reveal the relationship between the demand for products and their variables.

The methodology used in this research can provide the reader with more tools to evaluate demand projections and trade traffic in the different seasons according to the product type. The case study describes the most relevant contributions of the forecast technique and reviews the methodology in the application of the study, after which the results obtained from the information are discussed, reviewing lines of work.

Ecuador, being an agricultural producer after oil producer, needs consumer goods, fuel, raw materials, capital goods, and various products (BCE, 2020b), a market that provides supplies for agricultural production, mainly of bananas and plantains, coffee, corn, cocoa, flowers and non-traditional fruits, agricultural export products at the margin of the economy, according to the Central Bank of Ecuador BCE and the country's trade balance (BCE, 2020a).

The analysis of the historical behaviour of each variable begins with the graphic representation of the information with simple lines that describe its historical behaviour and possible antecedents of the successions in a period. The importance of container throughput for researchers and port managers becomes important according to the methods used to analyze it.

A model that explains the pattern or variation in the data of a real-time series is known as a time series model (Farooqi, 2014; Morejon-Calixto, & Vergara-Romero, 2022). The most significant characteristic of time series is that events that occurred in the past tend to influence future events (Cervantes et al., 2017). For Idrees et al. (2019) and Jiménez et al. (2008), every time series has the following components: "Trend component (T)"; "Cyclic component (C)"; "Seasonal component (S)"; "Irregular component (I)". Regularization is a reasonably straightforward exercise from a computational point of view that seeks to minimize the error in the model data approximation by penalizing the absolute values of the coefficients and effectively reducing the insignificant coefficients to zero at each step (Fokin & Polbin, 2019; Vergara-Romero, Jimber-del-Río et al., 2022).

Studies related to topics such as demand projections indicate that, in general, autoregressive integrated moving average models (ARIMA) are an alternative for short-term estimates (Paniagua, 2017; Merchán-Acosta, & Vergara-Romero, 2022); they have a greater tendency to provide better results with data referring to a quarterly or monthly frequency; and better capture the behaviour of demand (Chang, 2019; Vergara-Romero, Morejón-Calixto et al., 2022). The integrated moving average auto-regressive model is a statistical model based on data variations and regressions to find patterns for a future prediction (Contreras et al., 2016; Flores, 2019). However, accurate prediction of real data is unattainable, as real-time series data are commonly volatile and non-stationary (Kamal et al., 2020).

4.2. Materials and methods

A time series is a sequence of N observations (data) ordered and chronologically equidistant on a typical or several characteristics of an observable unit at different times.

An estimate is a fair value of a condition or action that represents a smaller value and constitutes a reference in the process or market; the expected value of actions import containers are estimated based on variables such as weight, feet of the container, and necessary space among others.

The time series analysis is based on the assumption that the values taken by the observation variable are the consequence of three components: trend, seasonal, and random. For Villavicencio (2018), the series can be denoted as:

$$Z_t = T_t + E_t + I_t Z_t = T_r + E_r + I_r \quad (1)$$

Z_t is considered as the observation at the current time t.

In the analysis of time series, different processes are available. AR(p) autoregressive processes are based on the idea that the current value of the series Z_t can be explained as a function of p past values Z_{t-1}, Z_{t-2} …, Z_{t-p} where p is the number of delays. An autoregressive model of order p is given by:

$$Z_t = c + \varphi_1 Z_{t-1} + \ \ldots + \varphi_2 Z_{t-p} + \alpha_t \qquad (2)$$

C is a constant value of the series; the φ are coefficients corresponding to each of the lags or past observations, at is white noise with zero mean and constant variance.

The models determined by external sources assume linearity, the values of the external source influence the current value of the series Z t. A general linear process Z_t can represent a linear combination of past and present weights with white noise terms. If a finite number of weights are not zero, there is a process called moving average of order q, MA(q); the notation is as follows (Cryer & Chan, 2008).

$$Z_t = \alpha_t - \theta_1 \alpha_{t-1} - \theta_2 \alpha_{t-2} \ \ldots - \theta_q \alpha_{t-q} \qquad (3)$$

at is a white noise with zero mean and constant variance, the coefficients θ correspond to white noise in previous times. This model is known as short memory since the current observation does not depend on past observations.

Pooling these two models results in another model referred to as the ARMA (p, q) moving average autoregressive model. The general notation of the ARMA model is (Idrees et al., 2019), the p-values defined from the autocorrelations, indicative of the lag in the AR, q estimated in the moving average or MA model (Saturnino et al., 2013).

$$Z_t = c + \varphi_1 Z_{t-1} + \varphi_2 Z_{t-2} + \ \ldots + \varphi_p Z_{t-p} + \alpha_t - \theta_1 \alpha_{t-1} - \theta_2 \alpha_{t-2} \ldots - \theta_q \alpha_{t-q} \quad (4)$$

The series is partially autoregressive and partially moving average, the parameter p is referred to as the autoregressive part, and the parameter q to the moving average, c is a constant value of the time series.

There are series that present variable means; these series are non-stationary. These series present positive or negative trends. The name knows the models that allow this type of series to be analyzed by ARIMA.

A stochastic process (Z_t) is integrated of order d (d ≥ 0 integers) if and only if (Z_t) follows a moving integrated autoregressive model of order (p, d, q) or ARIMA (p, d, q) of the type:

$$\emptyset(B)\nabla^d Z_t = \mu + \theta(B)\alpha_t \qquad (5)$$

For all t = 0, ±1, ±2, …

∅ is the coefficient of the autoregressive part, B is the lag operator, d is the number of differences needed to make the series stationary, Z_t is the current observation, θ is the coefficients related to the moving average at noise blank with zero mean and constant variance. A forecast refers to a scientifically expected, being a vital activity for the organization or the state mainly for decision making to future strategies, and must be accurate, reliable, time-efficient, easy to understand, and as simple as possible (Idrees et al., 2019; Puglla et al., 2017; Salazar et al., 2019; Vanegas & Vásquez, 2017).

For the analysis of homoscedasticity, the graph of the residues must be examined, as it presents an increasing or decreasing trend, it will indicate possible heteroscedasticity (Antunez, 2011).

According to Gentleman et al. (2014) and Villarreal (2005), white noise is a covariance stationary stochastic process with zero mean and covariance. $E(\varepsilon_t \varepsilon_t) = \gamma_t$, for t and 0, where is white noise, complete the formula.

AR model (autoregressive model)

$$Z_t = c + \phi 1 Z_t - 1 + \alpha t \qquad (6)$$

MA model (moving averages)

$$Z_t = c + -1 + \alpha t \qquad (7)$$

ARMA model (autoregressive moving average models)

ARIMA models have been used to estimate agricultural products in various countries. For the deductions of estimates with statistical properties with the ARMA and ARIMA parameters, the series used must be stationary in mean and variance and specify the degree of dispersion at any moment in time (Cuenca et al., 2018; Dobson & Barnett, 2018).

A descriptive analysis was carried out; it consists of observing and evaluating specific characteristics of a particular situation related to imports in Ecuador and its behaviour in the years that are analyzed, quantified and forecast. The Cargo Manifests Company database has a record of imports of various products from 2017 to 2019, of 250 products and a total of 508,798 records of the arrival of containers in different periods. Our sample indicates the port of arrival, date of arrival and the number of 20-foot containers, 40-foot containers and gross kilos. We select four relevant products, among which we have: Petroleum derivatives, Fertilizers, Telephone equipment and telecommunications, and Agricultural chemicals.

Once the time series with the same classification was obtained, an analysis of the time series was carried out, the identification or not being stationary, the construction and estimation of graphs and the search for parameters to later identify the models and forecast.

The quantitative forecasting technique based on the analysis of historical data and the behaviour of the products, divided periodically (daily, later combined monthly), corresponds to the import data of the company's cargo manifests of products that arrive at the ports from Guayaquil and Posorja.

The time series are considered below, followed by an adjustment for seasonality. With the identification of trend lines in the data, the need to apply time series forecasting techniques described above is corroborated.

The study of the activity of imports by containers and products between 2017 and 2019 of the manifest companies allows to determine the evolution over time, both internal and external needs of the market and port, in general theory to predict the containers that arrive product of importation into our country, we developed a framework for modelling and forecasting the volatility variability and correlations made, using the WOLFRAM program, the idea is to estimate the number of containers based on the density and estimates of the associated models. A series is considered stationary if the statistical considerations (mean and variance) are constant over time. If the series is not stationary, the data must be transformed until a stationary temporal record is obtained (Delgadillo et al., 2016; Dunn & Smyth, 2018; Vergara-Romero, Márquez-Sánchez, 2021).

4.3. Analysis and Results

Imports for 2018 show an increase of 1.6%, with the products with the highest demand being refined petroleum oils, transport equipment and transport and storage services (BCE, 2020b).

Table 1 shows the behaviour of imports of products between 2017 and 2019. It can see the minimum and maximum values of the containers that arrive at the ports. The importance of each product lies in the significance and contribution to the country for being purely agricultural. In the case of petroleum derivatives, they are manufactured and processed products, such as Vaselines, and oils, among others.

After product specifications and treatment with outliers, an variability and correlation analysis was performed. Currently, there is an excellent variety of methods available to analyze the fit of economic series, with two tendencies to use said fit: the parametric (empirical) approach and the non-parametric (based on models). The first allows estimating unobserved components in a time series without resorting to the specificity of the statistical model; the seasonal adjustment methodology used in the ARMA program and ARIMA are the most used for this type of economic approach (Villarreal, 2005; Vergara-Romero et al., 2020). There is no universally acceptable loss function for ex-post and nonlinear model forecast comparison (Andersen et al., 2001).

Table 10.

Descriptive import statistics of the analyzed products

Items	Pass	Petroleum derivatives	Telephone equipment and telecommunications	Agricultural Chemicals
Half	707	5	35	94
Maximum	1026	13	78	171
Minimum	428	1	12	56
Standard deviation	163.64	3.22	14.47	23.84
Observations	24758	180	1227	3286

It is possible to obtain stationary series from non-stationary homogeneous series if the differentiation process removes certain local and trend levels; a standard process to differentiate the homogeneous series consists in transforming the original series with the lag operator (1- L) d, being L is the delay operator and d is the degree of taxable differentiation in the series (Chaves et al., 2007; Vergara-Romero et al., 2022).

The results of the models adjusted and used for the data evaluation during the years 2017-2019 are shown in Table 2 of the models for each product. Where the first parenthesis evidences a differentiation between the regular part and a moving average parameter, and the second, the autoregressive parameter, with a confidence level of %, in the graphs of the series, for the stability of the time series is modified to obtain seasonality. ARMA indicates the autoregression parameter and differentiation in the regular part of the moving averages parameter in the regular and seasonal parts. When predicting the export and real exchange rate forecasts, they are more accurate under the ARIMA model than the VAR and VAR-LASSO models (Fokin & Polbin, 2019).

Table 11

Models adjusted and used in the evaluation of the data in the period 2017-2019

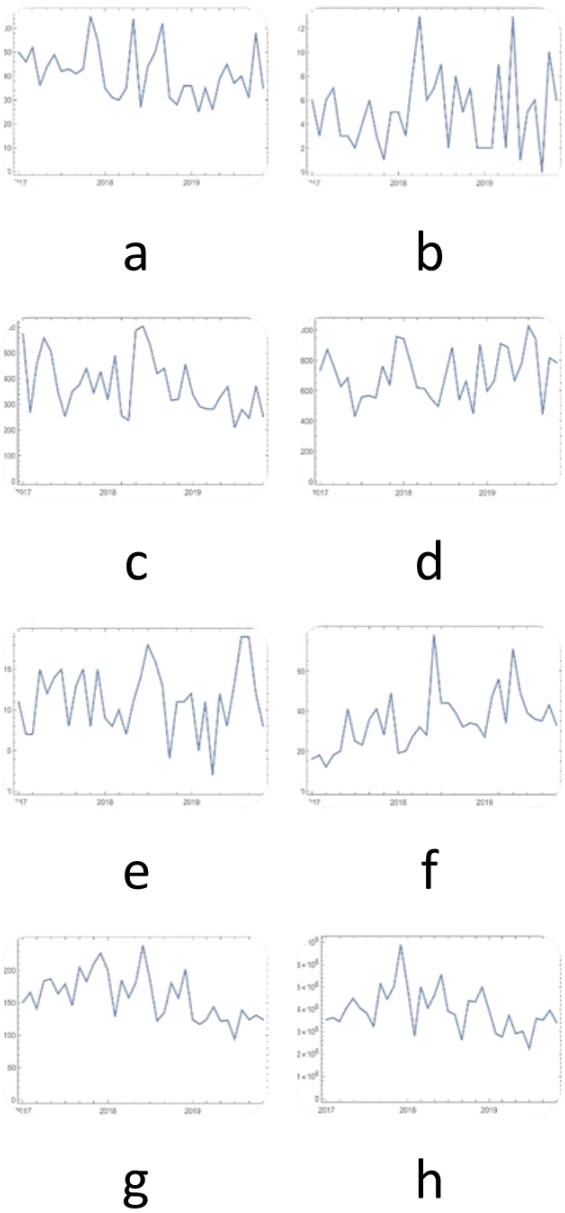
Product	Model	Result	Equation
petroleum derivatives	MAProces (0) 81.4317	$Z_t = c - \Theta 1 a_{t-1} + a_t$	$\mathbf{Z_t} = 5.14+0.1886\ \mathbf{t\text{-}1} + \mathbf{t\text{-}1}$ where **t-1** is the white noise with mean μ=0 and variance $\sigma^2 = 9.80$
Fertilizers	ARMAPro ces(1,2) 352.259	$Z_t = c + \Phi 1 Z_{t-1} - \Theta 1\ a_{t-1} - \Theta 2\ a_{t-2} + a_t$	$Z_t = 763.281 + 0.0790379 Z_{t-1} + 0.419494\ a_{t-1} - 0.0770349\ a_{t-2} + a_t$; where a_t is the white noise with mean μ=0 and variance $\sigma^2 = 26062.5$
Telephone and communicatio n equipment	ARProces s(1) 188.482	$Z_t = c + \Phi 1 Z_{t-1} + a_t$	$Z_t = 24.1222 + 0.311917 Z_{t-1} + a_t$; where a_t is the white noise with mean μ=0 and variance $\sigma^2 = 183.788$
agricultural chemicals	ARMAPro cess(3,1) 220.313	$Z_t = c + \Phi 1 Z_{t-1} + \Phi 2 Z_{t-2} + \Phi 3 Z_{t-3} - \Theta 1 a_{t-1} + a_t$	$Z_t = 116.84 - 0.156786 Z_{t-1} - 0.0948617 Z_{t-2} + 0.00719298 Z_{t-3} + 0.476145 a_{t-1} + a_t$; where a_t is the white noise with mean μ=0 and variance $\sigma^2 = 524.998$

From the results, we can deduce that the equations are based on the demand for the products and their behaviour; thus, petroleum derivatives have an adjusted MA model, telephone and communication equipment an adjusted AR model, while fertilizers and chemical products, agricultural equipment and telephone equipment have ARMA models, the result in the equation will serve to predict their behaviour in the future.

Sankaran (2014), cited by Paniagua (2017), demonstrated the excellent behaviour of the ARIMA models for the demand for fresh vegetable products incorporating seasonal trends (Vergara-Romero, Márquez-Sánchez et al., 2022).

Figure 9.

Products and their adjusted time series (40 Tm). a & b) Petroleum derivates, c & d) Fertilizers, e & f) Telephone and communication equipment, g y h) Agricultural chemical products.



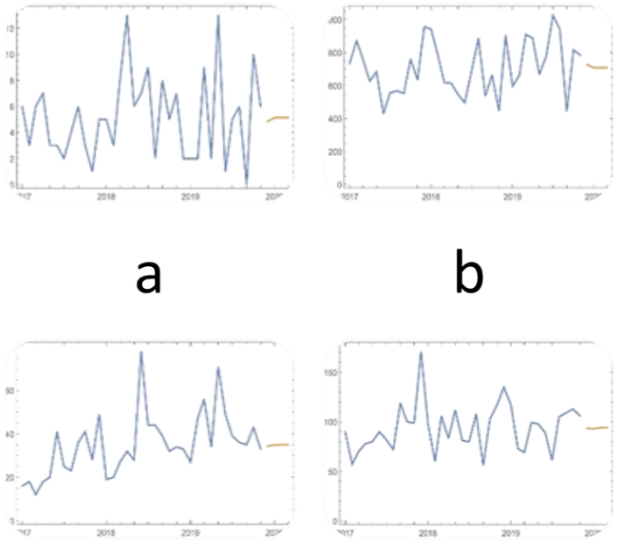
The winter, simple seasonal model, additive evaluation result for import-export volume used in the ports of Korea and China was the ARIMA model (0,1,0) (1,1,0) by import-export volume. export, coastal and transshipment respectively (Kim, 2008; Liu & Park, 2011; Neira et al., 2016; Vergara-Romero, Olalla-Hernández et al., 2020). The "ARMA model" is best suited for stationary time series data, but most real-world time series data show non-stationary behaviour (Idrees et al., 2019). Regarding econometrics, the ARMA model was proposed by Box & Jenkins (1976) and Dos Santos et al (2008).

Next, in the set of figure 8, the distributions by-product every month and container movements are shown for the analyzed products and attach the differences with the adjusted time series.

An early forecast can help predict the net margin; for example, in the CFN product (2017), with the Subscription product for every $100 of subscription sales, $6.7 of net profit remains for the owners. Below is the forecast of the selected products for the following months.

Figure 10.

a) Prediction of petroleum derivatives of 5 with a confidence interval of 1 to 11 containers. b) Fertilizer prediction of 343 with confidence intervals from 135 to 550 containers. c) Prediction of telephone equipment and communication of 34 containers and a confidence interval between 8 and 61 containers. d) Prediction of agricultural chemical products of 93 with a confidence interval between 48 and 138 containers.



Note: For t = ± statistically significant values with a confidence level of 95%

According to the present investigation, the impact of imports of products such as telephone and communication equipment has a more excellent projection or stability to be maintained in 2021; in addition, the projections of fertilizers present better projections for the future considering the average values, petroleum products they have a slight drop similar to that of agricultural chemical products, with a confidence level of 95% it can be defined that the product with the greatest confidence in imports are fertilizers and telephone equipment.

The import and forecast of raw materials for non-traditional products increase according to the unsatisfied needs of consumers. Modifying the seasonality of a series is more stable throughout the year (Flores, 1997). From the economic point of view, imports are explained mainly by household consumption spending and capital formation as an investment measure (Pocaterra, 2019).

4.4. Conclusions

Imports in Ecuador have evolved, primarily through the new product alternatives in the market; however, transportation products continue to predominate within the highly heterogeneous structure. The selected products serve as examples of the projections and models found with differences despite the homogenizations; they serve as a basis for monitoring products that have a diversity of factors influencing demand, such as seasonality and product innovation, especially related to technology.

The models used can forecast the demand for the products after an adjustment, first estimating the consumer's needs, the same ones that presented stable confidence intervals to forecast up to five months in the future. However, it is necessary to consider the observation period to incorporate new data that generates a series to run the model and incorporate this new information. The usefulness of forecasts in investors' decision-making is demonstrated; consequently, it reduces uncertainty in operations and allows for more precise planning of processes.

According to the results of this study, there are similarities between series and differences between products. In the case of fertilizers, the series shows higher imports than products; Telephone and communication equipment, agricultural chemical products, and petroleum derivatives depend on the investments, acquisition capacity, and location in the port, among other factors. However, the economic levels considered in the time series indicate a growth in the number of products. After comparing the series, we must be more competitive in the

prediction; the order of influence of factors helps to have greater clarity and efficiency in future works in the collection and analysis of other products in more extended periods, using the methodology of cause and effect of the series of time in future studies.

4.5. Recommendations

It is proposed to carry out the implementation of the primary methodology for purging the data of each of the products, in a cyclical manner of at least three annual periods, the purging of all the imported products, a time in which the results of the implementation of this methodology that count the ports, socialize with organizations that require making inferences and standardization of requirements in the units. For the logistics and decision-making of the service, an added value to the budget is understood and conducive to generating strategies and, therefore, optimising resources. The predictive model may present periodic imbalances, possibly due to structural changes, so it is advisable to periodically evaluate the models to improve the accuracy of the forecasts. Practical experience shows that we have to model and obtain different results from different models and generate greater confidence in the prediction at the time of decision making. It is recommended to use specific indicators when possible, consider important events that affect the study factor, correct atypical observations, follow up on prediction errors in case of applying corrections to the mean, and plot the predictions with the respective confidence intervals.

Concerning economic forecasts, possibly factors such as inflation, supply and demand, and external factors (pandemic) can affect the volatility values in variables subject to exogenous changes with economic insecurity, uncertainty and expectations; the models are difficult to model, and therefore, the prediction results would tend to have a high error component.

REFERENCES

AFABA. (2015). Estadísticas Maíz Duro (pp. 6-14). Asociación de Fabricantes de Balancedos.

Aguiar de Medeiros, C., & Vital, M. (2015). Impacto da ascensão chinesa sobre os países latino-americanos. Revista de Economia Política, 35(1), 28–42. https://doi.org/http://dx.doi.org/10.1590/0101-31572015v35n01a02

Aguilar, E., Reyes, K., Ordoñez, O., & Calle, M. (2018). Uso y valoración de los recursos naturales y su incidencia en el desarrollo turístico: Caso Casacay, cantón Pasaje, El Oro-Ecuador. Revista Interamericana de Ambiente y Turismo, 14(1), 80–88. https://doi.org/10.4067/s0718-235x2018000100080

Akinlolu, M., Haupt, T. C., Edwards, D. J., & Simpeh, F. (2020). A bibliometric review of the status and emerging research trends in construction safety management technologies. International Journal of Construction Management, 1-13. https://doi.org/10.1080/15623599.2020.1819584

Almonacid Z., F. (2018). Southern Chile as a part of global value chains, 1985-2016: Blueberry production and the regional economy. Ager, 2018(25), 131–158. https://doi.org/10.4422/ager.2018.08

Alzúa, L., & Gosis, M. (2020). Impacto Social y Económico de la COVID-19 y Opciones de Políticas en Argentina. PNUD América Latina y el Caribe, 6, 1-27. www.latinamerica.undp.org

Amjath, T. S., Krupnik, T. J., Thilsted, S. H., & McDonald, A. J. (2020). Key indicators for monitoring food system disruptions caused by the COVID-19 pandemic: Insights from Bangladesh towards effective response. Food Security, 761-768. https://doi.org/10.1007/s12571-020-01083-2

Analuisa, I. A., Guerrero, J., Fernández, J. A., & Rodríguez, O. (2020). Caracterización socioeconómica del agricultor maicero en la Provincia de Manabí mediante técnicas de análisis multivariantes. Podium, 38, 1-16. https://doi.org/10.31095/podium.2020.38.1

Analuisa, I., García, S., Rodríguez, O., & Paredes, M. (2020). Análisis Primario de las cadenas de valor en el maíz Portoviejo-Ecuador. Eca Sinergia, 11(11), 44-57. https://doi.org/https://doi.org/10.33936/eca_sinergia.v%vi%i.1692Código

Andersen, T., Boilerslev, T., Diebold, F., & Labys, P. (2001). Modelling and forecasting realized volatility. Finance, January. httpswww.kellogg.northwestern.edufacultyandersenhtmabdl4.pdf.pdf

Andrzej, L., Sudolska, A. & Tomanek, M. (2020). Mapping research on sustainable supply-chain management. Sustainability, 12(10), 3987. https://doi.org/10.3390/SU12103987

Antunez, C. (2011). Análisis de Series de Tiempo Lineales: Vol. I.

Ardanuy, J. (2009). Breve introducción a la bibliometría. Universitat de Barcelona, 63. https://doi.org/10.1038/nmat3485

Ardisana, E., Torres, A., Millet, B., & Fosado, O. (2018). Agricultura en Sudamérica: la huella ecológica y el futuro de la producción agrícola. Chakiñan, Revista De Ciencias Sociales Y Humanidades, 3(5), 90-101. https://doi.org/10.37135/chk.002.05.06

Argudo-García, A., Armas-Ortega, Y., Guillén-Alvarado, K., & Vergara-Romero, A. (2021). Una Revisión del Acoso Laboral y Estrategias de Prevención en las Organizaciones. En IX Congreso Internacional “Tecnología, Universidad y Sociedad”. Samborondón, Ecuador.

Aristovnik, A., Ravšelj, D., & Umek, L. (2020). A bibliometric analysis of covid-19 across science and social science research landscape. Sustainability, 12 (21), 1-30. https://doi.org/10.3390/su12219132

Arroyo Aguilar, S. (2019). Simbología del maíz en la cultura andina milenaria: resistencia e identidad del hombre andino. Investigaciones Sociales, 22(41), 37–55. https://doi.org/10.15381/is.v22i41.16756

Artuzo, F. D., Foguesatto, C. R., De Souza, Â. R. L., & Da Silva, L. X. (2018). Gestão de custos na produção de milho e soja. Revista Brasileira de Gestao de Negocios, 20(2), 273–294. https://doi.org/10.7819/rbgn.v20i2.3192

Atuahene-Gima, K., & Amuzu, J. (2019). Farmcrowdy: digital business model innovation for farming in Nigeria. Emerald Emerging Markets Case Studies, 9(2), 1-22. https://doi.org/10.1108/EEMCS-03-2019-0065

Ávalo, J., Yagüe, J., & Cangahuala, G. (2016). El capital social y la planificación adaptativa en una comunidad industrial innovadora del Perú. Estudios Gerenciales, 32(139), 162-169. https://doi.org/10.1016/j.estger.2016.05.001

Baranauskas, G., Raišienė, A. G., & Korsakienė, R. (2020). Mapping the Scientific Research on Mass Customization Domain: A Critical Review and Bibliometric Analysis. Journal of Risk and Financial Management, 13 (9), 220. https://doi.org/10.3390/jrfm13090220

Barret, C. B., Bachke, M. E., Bellermare, M. F., Michelson, H. C., Narayanan, S., & Walker, T. F. (2011). Smallholder Participation in Contract Farming: Comparative Evidence from Five Countries. World Development, 40 (4), 715-30. https://doi.org/10.1016/j.worlddev.2011.09.006

Barrientes, P. (2017). La cadena de valor del cacao en Perú y su oportunidad en el mercado mundial. Semestre Económico, 14(29), 27. http://search.proquest.com/docview/1784559886?accountid=27871%5Cnhttp://sfx.library.wur.nl:9003/sfx_local?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&sid=ProQ:ProQ:abiglobal&atitle=LA+CADENA+DE+VALOR+DEL+CACAO+EN+PERÚ+Y+

Barrientos, P. (2019). Estrategia de integración del pequeño agricultor a la cadena de exportaciones. Semestre Económico, 22(51), 83-123. https://doi.org/10.22395/seec.v22n51a5

Barrios Guzman, L., Cárdenas Escorcia, Y., & Valencia Ochoa, G. (2017). Análisis tendencial de las investigaciones de eficiencia energética en sistemas de refrigeración durante los años 2013 a 2017. Espacios 38 (54).

Basarir, C., & Bayramoglu, M. F. (2018). Global macroeconomic determinants of the domestic commodity derivatives. Contributions to Economics, 331–349. https://doi.org/10.1007/978-3-319-78494-6_16

Baya, A., & Granitto, P. (2013). How Many Clusters: A Validation Index for Arbitrary-Shaped Clusters. https://doi.org/https://doi.org/10.1109/TCBB.2013.32

Borin, A., & Mancini, M. (2019). Measuring What Matters in Global Value Chains and Value-Added Trade. In D. Economics (Ed.), World Bank Group (Issue April 2019). World Development Economics. https://doi.org/10.1596/1813-9450-8804

BCE. (2019). Reporte de Coyuntura Sector Agropecuario: Vol. IV (www. bce.ec, Número 91). http://www.economia.gob.mx/files/comunidad_negocios/industria_comercio/informacionSectorial/minero/reporte_coyuntura_mineria_nacional_0514.pdf

BCE. (2020a). Evolución de la Balanza Comercial. Banco Central Del Ecuador (BCE), 1, 37. https://www.bce.fin.ec/index.php/component/k2/item/299-evolución-de-la-balanza-comercial%0Apub.econ@bce.ec

BCE. (2020b). Estadísticas macroeconómicas presentación coyuntural. Banco Central Del Ecuador, 104.BCE. (2021). Cuentas nacionales Trimestrales del Ecuador. Resultados de las Variables Macroeconómicas, 2021.I. Banco Central Del Ecuador, 27. https://contenido.bce.fin.ec/home1/estadisticas/cntrimestral/CNTrimestral.jsp

BCE, (2020c). Información Estadística Mensual No. 2019 - Mayo 2020 Exportaciones FOB por grupos de productos (p. IEM-312-e). https://contenido.bce.fin.ec/home1/estadisticas/bolmensual/IEMensual.jsp

BCE, (2020d). Información Estadística Mensual No. 2019 - Mayo 2020 Importaciones CIF por uso o Destino Económico (1) (p. IEM-317-e). https://contenido.bce.fin.ec/home1/estadisticas/bolmensual/IEMensual.jsp

Beretta, C., Stoessel, F., Baier, U., & Hellweg, S. (2012). Quantifying food losses and the potential for reduction in Switzerland. Waste Management, 33 (3), 764-73. https://doi.org/10.1016/j.wasman.2012.11.007

Bhattacharjee, A., & Lisauskaite, E. (2020). Covid-19 Impacts on destitution in the UK. National Institute of Economic and Social Research, 12(1), 77-85. https://doi.org/10.1017/nie.2020

Bollen, J., Van de Sompel, H., Hagberg, A., Bettencourt, L., Chute, R., Rodriguez, M. A., & Balakireva, L. (2009). Clickstream data yields high-resolution Maps of science. PLoS ONE, 4 (3). https://doi.org/10.1371/journal.pone.0004803

Bolwing, S., Ponte, S., Du Toit, A., Rissgaard, L., & Halberg, N. (2010). Integrating Poverty and Environmental Concerns into Value-Chain Analysis: A Conceptual Framework. Journal of Child Psychology and Psychiatry. https://doi.org/10.1111/j.1467-7679.2010.00480.x

Bugge, M. M., Hansen, T., & Klitkou, A. (2016). What is the bioeconomy? A review of the literature. Sustainability, 8 (7). https://doi.org/10.3390/su8070691

CAF/FAO. (2006). Ecuador Nota de Análisis Sectorial Agricultura y Desarrollo Rural (C. A. de F. de las N. U. para la A. y la Alimentación (ed.); Direeción). Investment-Centre@fao.org

Camino, S., & Brito, L. F. (2021). Cyclicality of Fiscal Policy in Ecuador. Revista de Analisis Económico, 36(1), 49–84. https://doi.org/10.4067/S0718-88702021000100049

Carballea-Orihuela, M., García Leonard, Y., Vergara-Romero, A., & Ibañez-Fernández, A. (2021). Pautas para el diseño de un modelo de gestión hotelera que incorpore la innovación en entidades del MINTUR en La Habana. Revista Científica ECOCIENCIA, 8, 212–224. https://doi.org/10.21855/ecociencia.80.642

Cardona, L. (2020). La noción de cadena de producción solidaria desde las experiencias de circuitos cortos de comercialización circuitos cortos de comercialización. Journal of Business and Entrepreneurial Studies, 4(1), 1–11.

Carvajal, M., Zuluaga, P., Ocampo, O. L., & Duque, D. (2019). Las exportaciones de plátano como una estrategia de desarrollo rural en Colombia. Apuntes Del Cenes, 38(68), 113–150. https://doi.org/10.19053/01203053.v38.n68.2019.8383

Castellanos Dorado, R., Sorhegui-Ortega, R., Vergara-Romero, A., & Macias Quintosa, T. (2021). Universidad en la Sociedad del conocimiento. En VIII Congreso Internacional “Tecnología, Universidad y Sociedad”. Samborondón, Ecuador.

CEPAL-IPEA. (2016). La matriz de Insumo-producto de América del Sur. Principales supuestos y consideraciones metodólogicas. Comisión Económica para América Latina y el Caribe (CEPAL), 56.

Cervantes, L., Caro, A., & Chávez, M. (2017). Filtros econométricos en el análisis de series de tiempo. En F. Editorial (Ed.), Universidad Inca Garcilaso de la Vega. Textos Universitarios. http://repositorio.uigv.edu.pe/handle/20.500.11818/1221

CFN. (2017). Ficha Sectorial: Cultivo de Maíz (Vol. 1, Issue 1, p. 24). https://www.cfn.fin.ec/wp-content/uploads/2017/10/FS-Octubre-2017.pdf

Chamba, M., & Cordero, F. (2017). Implicaciones sociales, técnicas y económicas de la comercialización de Zea mays L . en el cantón Espíndola, Social, technical and economic implications of the commercialization. 7, 55–70.

Chang, V. (2019). Un análisis de series de tiempo mediante modelos SARIMAX para la proyección de demanda de carga en el puerto del Callao. Análisis económico y financiero, 1(3), 15-31. https://www.aulavirtualusmp.pe/ojs/index.php/raef/article/view/1694/1707

Chaves, R., Góis, M. R., & Ulises, C. (2007). Previsão de preços futuros de Commodities agrícolas com diferenciações inteira e fracionária, e erros heteroscedásticos. Revista de Economia e Sociologia Rural, 45(3), 621-644. https://doi.org/10.1590/s0103-20032007000300004

Chena, P. I., & Noguera, D. M. (2020). Efectos macroeconómicos de las cadenas globales de valor en la balanza comercial. Revista de Economía Mundial, 54, 43–64.

Clavijo, P. (2017). Balance comercial y volatilidad del tipo de cambio nominal: Un estudio de series de tiempo para Colombia. Economía y Región., 11(1), 37-58. httpsrevistas.utb.edu.coindex.phpeconomiayregionarticleview146135.pdf

Commission, U. N. S., & Bank, W. (2021). World Integrated Trade Solution WITS. https://wits.worldbank.org/countrysnapshot/en/SLE/textview

Constituyente, A. (2008). Constitución del Ecuador. Registro Oficial, 20 de Octubre, 173.

Coronado, S., Celso, P. L., & Rojas, O. (2015). Adaptive market efficiency of agricultural commodity futures contracts. Contaduria y Administracion, 60(2), 389–401. https://doi.org/10.1016/S0186-1042(15)30006-1De las Heras-Pedrosa, C., Martel-Casado, T., & Jambrino-Maldonado, C. (2018). Análisis de las redes académicas y tendencias científicas de la comunicación en las universidades españolas. Revista prisma social, (22), 229-246.

Cryer, J. D., & Chan, K.-S. (2008). Time Series with Applications in R.

Cuadrado-Rodríguez, G., Gutiérrez-Alarcón, C., Ibañez-Fernández, A., & Vergara-Romero, A. (2021). Desafíos de la Planeación Estratégica frente a Crisis Financiera de un Centro de Diálisis. En Vergara-Romero, A. (Comp.). PYMES, Gestión Empresarial y Sostenibilidad: Estrategias en diversos Sectores. Universidad Ecotec.

Cuenca, N., Chavarro, F., & Díaz, O. (2018). Ciencia y Desarrollo. Universidad Alas Peruanas. Revista Facultad de Ciencias Económicas: Investigación y Reflexión, 21(2), 49-59. https://doi.org/10.21503/CienciayDesarrollo.2015.v18i2.05

De la Torre, A., Cueva, S., & Castellanos, M. A. (2020). The Macroeconomics of the commodities boom in Ecuador: a comparative perspective. In Assessing the Left Turn in Ecuador. Springer International Publishing. https://doi.org/10.1007/978-3-030-27625-6

Delbianco, F., & Fioriti, A. (2018). External cycles and commodities in Latin America and the Caribbean: A cointegration analysis with breaks. Lecturas de Economia, 88, 51–76. https://doi.org/10.17533/udea.le.n88a02

Delfín, Y. T. (2014). ¿Es importante la comida en China? Cuestiones de política agrícola moderna. Economía Informa, 384, 70–90. https://doi.org/10.1016/s0185-0849(14)70411-6

Delgadillo, O., Ramirez, P., Leos, J., Salas, J., & Valdez, R. (2016). Pronósticos y series de tiempo de rendimientos de granos básicos en México. Acta Universitaria, 26(3), 23–32. https://doi.org/10.15174/au.2016.882

De Vasconcellos, S., Garrido, I., Vieira, L., & Schneider, L. (2015). Effects of path dependence on capabilities in captive global value chains. BAR - Brazilian Administration Review, 12(4), 384-402. https://doi.org/10.1590/1807-7692bar2015150041

Díaz, J., Leporati, J., & Díaz, N. (2019). Biocombustibles como agregado de valor en la cadena agrícola de San Luis. Asociación Argentina de Economía Agrícola, 1-18.

Dilla Alfonso, H., & Contreras, C. (2020). Flujos comerciales agroalimentarios en una región transfronteriza dominico/haitiana: Elías Piña/Departamento Central. Si Somos Americanos. Revista de Estudios Transfronterizos, 20(1), 8–32. https://doi.org/10.4067/s0719-09482020000100008

Dobson, A., & Barnett, A. (2018). An introduction to generalized linear Models (C. Press (ed.); Fourth Edition).

Dos Santos, D., Batalha, M. O., & Pinho, M. (2012). A evolução do consumo de alimentos na china e seus efeitos sobre as exportações agrícolas Brasileiras. Revista de Economia Contemporanea, 16(2), 333–358. https://doi.org/10.1590/S1415-98482012000200008

Dos Santos, V. F., Maciel, L., & Ballini, R. (2020). Efeito Das Operações De Hedge E Especulação Sobre a Volatilidade Dos Preços De Commodities Agrícolas Nos Eua*. Economia Aplicada, 24(3), 343–366. https://doi.org/10.11606/1980-5330/ea155701

Dos Santos, L., Portela, A., & Da Costa, N. (2008). Podemos prever a taxa de cambio brasileira? Evidência empírica utilizando inteligência computacional e modelos econométricos. Gestao e Producao, 15(3), 635-647. https://doi.org/10.1590/s0104-530x2008000300016

Dunn, P. K., & Smyth, G. K. (2018). Generalized Linear Models with Examples in R Springer Texts in Statistics (Springer (ed.)). Springer. https://doi.org/10.1007/978-1-4419-0118-7

Düring, M. (2020). De la hermenéutica a las redes de datos: Extracción de datos y visualización de redes en fuentes históricas. The Programming Historian. https://doi.org/10.46430/phes0002

Echavarría, J., Giraldo, I., & Jaramillo, F. (2019). Estimaciones de las elasticidades de oferta y demanda de importaciones en Colombia. Borradores de Economía, 1081. https://repositorio.banrep.gov.cobitstreamhandle20.500.121349710be_1081.pdfsequence=7&isAllowed=y

Echeverria, J., & Muñoz, C. (1988). Maíz: Regalo de los Dioses (Colección Curiñan- Instituto Otavaleño de Antropología (ed.)). Auspicio Especial de FOncultura. https://biblio.flacsoandes.edu.ec/catalog/resGet.php?resId=54445

Egas, J., Shik, O., Inurritegui, M., & De Salvo, C. (2018). Análisis de políticas agropecuarias en Ecuador (www.iadb.org/agrimonitor (ed.)). http://creativecommons.org/licenses/by-nc-nd/3.0/igo/legalcode

Elleby, C., Domínguez, I. P., Adenauer, M., & Genovese, G. (2020). Impacts of the COVID-19 Pandemic on the Global Agricultural Markets. Environmental and Resource Economics, 76(4), 1067-1079. https://doi.org/doi:10.1007/s10640-020-00473-6

Elsevier, S. (2020). Scopus Content coverage guide. Amsterdam. https://www.elsevier.com/__data/assets/pdf_file/0017/114533/Scopus_GlobalResearch_Factsheet2019_FINAL_WEB.pdf

Enric Camón, L., & Celma, D. (2020). Circular economy. A review and bibliometric analysis. Sustainability, 12(16). https://doi.org/10.3390/SU12166381

Estrada-Cuzcano, A., & Alhuay-Quispe, J. (2020). Aproximación bibliométrica a la Revista de Comunicación (Perú), 2002-2019. Revista de Comunicación, 19 (2), 111-24. https://doi.org/10.26441/rc19.2-2020-a6.

FAO. (2020). Programa mundial del censo agropecuario 2020. Programas, definiciones y conceptos. www.fao.org/publications (ed.)

FAO. (2020). Boletín: Seguimiento y analisis de los precios alimentarios. Boletín #7. Septiembre 2020, 20. http://www.fao.org/3/cb0974en/cb0974en.pdf

FAO. (2021). FAOSTAT-Países por producto. http://www.fao.org/faostat/en/#rankings/countries_by_commodity_exports

Fares, F., Zack, G., & Martínez, R. (2017). Cálculo de los índices de precio sectorialaes de las importaciones argentinas. Revista Economía y Desafíos del Desarrollo, 1, 1-476. https://doi.org/10.1017/CBO9781107415324.004

Farooqi, A. (2014). ARIMA model building and forecasting on imports and exports of Pakistan. Pakistan Journal of Statistics and Operation Research, 10(2), 157-168. https://doi.org/10.18187/pjsor.v10i2.732

Fauro, J. C. da S., Toniol, F. P. da F., & Serra, E. (2016). Técnicas Agrícolas, Preservação E Impactos Ambientais Na Região Oeste Do Paraná. Raega - O Espaço Geográfico Em Análise, 36, 302. https://doi.org/10.5380/raega.v36i0.43667

Feenstra, R. C. (1998). Integration of Production in the Global Economy. Journal of Economic Perspectives, 12(4), 31-50.

Ferasso, M., Beliaeva, T., Kraus, S., Clauss, T., & Ribeiro-Soriano, D. (2020). Circular economy business models: The state of research and avenues ahead. Business Strategy and the Environment, No. May, 3006-24. https://doi.org/10.1002/bse.2554

Flores, M. (1997). Importaciones totales: Reformulación del Modelo ARIMA y actualizaciones de los factores estacionales. Banco Central de Costa Rica. Departamento de Investigaciones Económicas. httpsactivos.bccr.fi.crsitiosbccrndieDocNdieEC-11-1997.PDF.PDF

Fokin, N., & Polbin, A. (2019). Forecasting Russia's Key Macroeconomic Indicators with the VAR-LASSO Model. Russian Journal of Money and Finance, 78(2), 67-93. https://doi.org/10.31477/rjmf.201902.67

Franz, T. (2021). Spatial fixes and switching crises in the times of COVID-19: implications for commodity-producing economies in Latin America. Canadian Journal of Development Studies, 42(1–2), 109–121. https://doi.org/10.1080/02255189.2020.1832881

Fuentes, N., Osorio, G., & Mungaray, A. (2016). Capacidades Intangibles Para La Competitividad Microempresarial En México. Problemas del Desarrollo, 47(186), 83-106. https://doi.org/10.1016/j.rpd.2016.03.003

Garcia, F., Batyrshin, I., & Gelbukh, A. (2016). Similitud de series de tiempo basada en longitud de patrones de la transformada por aproximación móvil. Research in Computing Science, 115(1), 79-92. https://doi.org/10.13053/rcs-115-1-7

García, F., Dominguez, A., Galvan, A., & Sanchez, N. (2019). Governance in Agricultural Value Chains in Tamaulipas, Mexico. Management Dynamics in the Knowledge Economy, 7(1), 105-124. https://doi.org/10.25019/mdke/7.1.06

García, R., Perdomo, A., Perdomo, A., Ortiz, O., Ortiz, O., Beltrán, P., Beltrán, P., López, K., & López, K. (2014). Characterization of the supply and value chains of Colombian cocoa. Dyna, 81(187), 30–40. https://doi.org/10.15446/dyna.v81n187.39555

García-Leonard, Y., Márquez-Sánchez, F., Jimber del Río, J. A., & Vergara-Romero, A. (2022). Tourist Destination Management and Cultural Heritage: A Perspective of the City of Havana. En Hernández Rojas, R. (Comp.), La Gestión Turística del Patrimonio: Una Visión Multidisciplinar (93-114). Córdoba, España: Editorial Arazandi/Civitas. ISBN 978-84-1125-521-9.

García Leonard, Y., Sorhegui-Ortega, R., Vergara-Romero, A., & Nogueira Moya, L. (2021). Análisis prospectivo de la gestión del destino turístico de la Habana. Revista Científica ECOCIENCIA, 8(2), 1-21. https://doi.org/10.21855/ecociencia.82.446

Gardea, J., Rico, C., & White, J. (2014). Trophic transfer, transformation, and impact of engineered nanomaterials in Terrestrial Environments. ACS Publications, 48 (5), 2526-40. https://doi.org/10.1021/es4050665

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. Review of International Political Economy, 12(1), 78-104. https://doi.org/10.1080/09692290500049805

Gentleman, R., Hornik, K., & Parmigiani, G. (2014). Data Mining with Rattle and R (S. S. Media (ed.)). http://www.springer.com/series/6991. https://doi.org/10.1007/978-1-4419-9890-3

Gil, A., Monroy, A. L., & González, J. S. (2019). Minería de datos espacial en la agricultura en Latinoamérica - Una aproximación conceptual. Pensamiento y Acción, 1(28), 19-33. https://doi.org/10.19053/01201190.n28.2020.10976

Gilles, E. (2018). Cadenas globales de valor, empleo y servicios: Evidencia para algunos países Latinoamericanos. Tec Empresarial, 12(2), 7–18. https://doi.org/10.18845/te.v12i2.3717

González, A. A., Carballo Mendivil, B., Orrantia Lopez, M., & Salazar Rivera, R. (2013). Diagnóstico de la madurez de los procesos de la cadena de valor de una pequeña empresa mexicana de productos de maíz Diagnostic process of maturity value chain of a small. 6276. http://rcientificas.uninorte.edu.co/index.php/pensamiento/article/viewFile/5642/3341

Gorenstein, S. (2019). Enfoques y debates sobre recursos naturales, acumulación y territorio. Semestre Económico, 22(51), 125–148. https://doi.org/10.22395/seec.v22n51a6

Goulart, R., & Bragatti, M. (2020). Dragon in the “backyard”: China’s investment and trade in Latin America in the context of crisis. Brazilian Journal of Political Economy, 40(3), 446–461. https://doi.org/10.1590/0101-31572020-2963

Govindan, K., & Soleimani, H. (2017). A review of reverse logistics and closed-loop supply chains: A Journal of Cleaner Production focus. Journal of Cleaner Production,142, 371-84. https://doi.org/10.1016/j.jclepro.2016.03.126

Guadalupe, T., & León, J. (2019). Factores asociados a la evolución de clusters en México: Validación de un instrumento para su caracterización. https://www.semanticscholar.org/paper/FACTORES-ASOCIADOS-A-LA-EVOLUCIÓN-DE-CLUSTERS-EN-DE-Bustamante-Balderramaa/d443b9818bbceb1cb48c6bbe63a1df03c37d1dd5

Guerrero, F. (2012). Proceso organizativo del campesinado en el sur de Manabí y desarrollo rural. Revistas de Ciencias Sociales, 45, 127-140.

Guillén-Alvarado, K., Pérez-Zulueta, M., Sorhegui-Ortega, R., & Vergara-Romero, A. (2022). Challenges and Opportunities for the Development of Tourist Businesses in Guayaquil and Their Value Chain. En Hernández Rojas, R. (Comp.), La Gestión Turística del Patrimonio: Una Visión Multidisciplinar (115-138). Córdoba, España: Editorial Arazandi/Civitas. ISBN 978-84-1125-521-9.

Guo, Y-M, Huang, Z-L., Guo, J., Li, H., Guo, X-R, & Nkeli, M. J. (2019). Bibliometric analysis on smart cities research. Sustainability, 11 (13). https://doi.org/10.3390/su11133606

Guzmán, E., De la Garza, M., García, J., Hernández, J., & Rebollar, S. (2012). Determinantes de la oferta de maíz grano en México. Agronomía Mesoamericana, 23(2), 269. https://doi.org/10.15517/am.v23i2.6488

Hanclova, J., Márquez-Sánchez, F., & Vergara-Romero, A. (2021). La Política Pública en el Desarrollo Territorial hacia una Descentralización y Autonomía del Territorio. En Vergara-Romero, A. (Comp.). Políticas Públicas para el Desarrollo Local Sostenible. Universidad Ecotec.

Handoko, L. H. (2020). Bibliometric analysis and visualization of Islamic economics and finance articles indexed in Scopus by Indonesian authors. Science Editing. 7 (2), 169-76. https://doi.org/10.6087/KCSE.213

Henrique, D., Capitani, D., & Mattos, F. (2017). Measurement of commodity price risk: An overview of Brazilian agricultural markets. Revista de Economia e Sociologia Rural, 55(3), 515–532. https://doi.org/10.1590/1234-56781806-94790550306

Hernández, G. (2012). Matrices insumo-producto y análisis de multiplicadores: una aplicación para Colombia. Revista de economía institucional, 14(26), 203-221.

Hernández-Rojas, R. D., Jimber del Rio, J.A., Ibañez Fernández, A., & Vergara-Romero, A. (2021). The cultural and heritage tourist, SEM analysis: the case of The Citadel of the Catholic King. Heritage Science, 9(52), 1-19. https://doi.org/10.1186/s40494-021-00525-0

Hevia, C., & Neumeyer, A. (2020). Un marco conceptual para analizar el impacto económico de COVID-19 y sus implicaciones políticas. Undp.Org, 1, 1-18. www.latinamerica.undp.org

Hodges, R. J., Buzby, J. C. & Bennett, B. (2011). Postharvest losses and waste in developed and less developed countries: opportunities to improve resource use. The Journal of Agricultural Science, 149 (S1), 37-45. https://doi.org/10.1017/S0021859610000936

Idrees, S., Alam, A., & Agarwal, P. (2019). A Prediction Approach for Stock Market Volatility Based on Time Series Data. IEEE Access, 7, 17287-17298. https://doi.org/10.1109/ACCESS.2019.2895252

Idrees, S. M., Alam, M. A., & Agarwal, P. (2019). A Prediction Approach for Stock Market Volatility Based on Time Series Data. IEEE Access, 7, 17287-17298. https://doi.org/10.1109/ACCESS.2019.2895252

INEC-ESPAC. (2019). Encuesta de Superficie y Producción Agropecuaria Continua (ESPAC) 2018. Instituto Nacional de Estadística y Censos, 17-19.

International Monetary Fund (IMF). (2020). World Economic Outlook Update June 2020. In World Economic Outlook (Issue 2).

Iriban, M. A., Vázquez, Á. C. A., & Paez, C. C. T. (2019). Procedimiento para el cierre de la cadena productiva de la carne bovina en entidades pecuarias. Cooperativismo y Desarrollo, 7(3), 435-444. http://coodes.upr.edu.cu/index.php/coodes/article/view/265

Jimber del Río, J. A., Hernández-Rojas, R. D., Vergara-Romero, A., & Dancausa Millán, M. (2020). Loyalty in Heritage Tourism: The Case of Córdoba and Its Four World Heritage Sites. International Journal of Environmental Research and Public Health, 17(23), 8950. https://doi.org/10.3390/ijerph17238950

Jiménez, C., José, N., Miranda, C., Gantiva, D., Humberto, O., Miranda, F. C., Humberto, O., & Gantiva, D. (2008). El sector de ganadería bovina en Colombia, aplicación de modelos de series de tiempo al inventario ganadero.

Kamal, I. M., Bae, H., Sunghyun, S., & Yun, H. (2020). DERN: Deep ensemble learning model for short and long-term prediction of baltic dry index. Applied Sciences (Switzerland), 10(4). https://doi.org/10.3390/app10041504

Kim, M. (2017). República del Ecuador Mejorando la innovación en las empresas para el fomento de la productividad y la diversificación. Refuerzo Competitivo de las cadenas de valor en Ecuador (T. W. Bank (ed.)). pubrights@worldbank.org

Kim, J. (2008). The forecasting of port-container volume in Korea. The journal of Shipping and Logistics, 59(1), 175-194. httpwww.kci.go.krkciportalcisereArticleSearchciSereArtiView.kcisereArticleSearchBean.artiId=ART001299806&locale=en&SID=7CSJRQTXXVFELdg26ZS.pdf

Kovács, F., & Iváncsy, R. (2006). Cluster validity measurement for arbitrary-shaped clusters. In Proceedings of the 5th WSEAS international conference on artificial intelligence, knowledge engineering and databases. https://dl.acm.org/doi/10.5555/1364262.1364325

Krone, M., Dannenberg, P., & Nduru, G. (2016). The use of modern information and communication technologies in smallholder agriculture: Examples from Kenya and Tanzania. Information Development, 32(5), 1503-1512. https://doi.org/10.1177/0266666915611195

Lámbarry, F. (2016). Análisis estructural de la red económica de la Alianza del Pacífico y el Mercado Común del Sur. Estudios Gerenciales, 32(141), 319-325. https://doi.org/10.1016/j.estger.2016.10.004

Lange, T., Roth, V., Braun, M., & Buhmann, J. (2019). Stability-based validation of clustering solutions. Neural Computation, 16(6), 1299-1323. https://doi.org/10.1162/089976604773717621

Larsen, R. J., & Marx, M. L. (2013). Introduction to Mathematical Statistics and Its Applications: Pearson New International Edition PDF eBook. Pearson Higher Ed.

Lei, N., Faust, O., Rosen, D. W., & Sherkat, N. (2018). Uncovering design topics by visualizing and interpreting keyword data. In DS 92: Proceedings of the DESIGN 2018 15th International Design Conference, 57-68. https://doi.org/10.21278/idc.2018.0370

Li, Z., De Souza, R., & Goh, M. (2016). Supply Chain Orchestration Leveraging on MNC Networks and Local Resources: Approach Strategies. Journal of Service Science and Management, 09(04), 303-319. https://doi.org/10.4236/jssm.2016.94036

Liu, L., & Park, G. K. (2011). Empirical analysis of influence factors to container throughput in Korea and China ports. Asian Journal of Shipping and Logistics, 27(2), 279-303. https://doi.org/10.1016/S2092-5212(11)80013-1

Lixian, Xu, Wim D., Withag J., Brem, G., & Kersten, S. (2011). Assessment of a dry and a wet route for the production of biofuels from microalgae: Energy balance analysis. Bioresource Technology, 102 (8), 5113-22. https://doi.org/10.1016/j.biortech.2011.01.066

Llorent-Bedmar, V., & Sianes-Bautista, A. (2018). Claves para publicar en revistas educativas JCR en alemán, inglés y español. Chasqui. Revista Latinoamericana de Comunicación, 0 (137), 349-65. https://doi.org/10.16921/chasqui.v0i137.3073

Macedo, M., & Costa, E. (2017). China em transformação: transição e estratégias de desenvolvimento. Brazilian Journal of Political Economy, 37(2), 381–400. http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0101-31572017000200381&lang=pt%0Ahttp://www.scielo.br/pdf/rep/v37n2/1809-4538-rep-37-02-00381.pdf

MAG. (2019). Prácticas agronómicas de Maíz amarillo duro, invierno 2019. SIPA, 2019. http://sipa.agricultura.gob.ec/descargas/caracterizacion/maiz/caracterizacion_social_maiz_2019.pdf

MAGAP. (2016). La política Agropecuaria Ecuatoriana. Hacia el desarrollo territorial rural sostenible 2015-2025. I Parte Ministerio de Agricultura (ed.)

Márquez-Sánchez, F., Sorhegui-Ortega, R., Vergara-Romero, A., & Peña-Arcos, D. (2022). Cultural and Intangible Heritage: Street Art in Guayaquil. En Hernández Rojas, R. (Comp.), La Gestión Turística del Patrimonio: Una Visión Multidisciplinar (245-264). Córdoba, España: Editorial Arazandi/Civitas. ISBN 978-84-1125-521-9.

Martínez-Valero, D., Gutiérrez-Alarcón, C., Modrznski, P., & Vergara-Romero, A. (2021). Protocolo de Sucesión para la Sostenibilidad de una Empresa Familiar del Sector Alimentario. En Vergara-Romero, A. (Comp.). La Gestión Empresarial Sostenible en la Rentabilidad Financiera y de Capital. Universidad Ecotec.

Martinho, V. D., & Mourão, P. R. (2020). Circular economy and economic development in the European Union: A review and bibliometric analysis. Sustainability, 12 (18), 7767. https://doi.org/10.3390/SU12187767

Medina-Mijangos, R., & Seguí-Amórtegui, L. (2020). Research trends in the economic analysis of municipal solid waste management systems: A bibliometric analysis from 1980 to 2019. Sustainability, 12 (20), 1-20. https://doi.org/10.3390/su12208509

Mendieta-Cepeda, E., Armas-Ortega, Y., Gutiérrez-Alarcón, C., & Vergara-Romero, A. (2021). Uso de Plataformas Web educativas y Herramientas Informáticas como soporte Didáctico en los procesos de Enseñanza. En IX Congreso Internacional “Tecnología, Universidad y Sociedad”. Samborondón, Ecuador.

Mercado, S. de C. de P. de. (2021). Estudio de Mercado N°SCPM-IGT-INAC-002-2019 “Sector lácteo” Versión pública (S. de control de P. de Mercado (ed.)). https://www.scpm.gob.ec/sitio/wp-content/uploads/2021/04/estudio_de_mercado_sector_lacteo_SCPM-IGT-INAC-002-2019.pdf

Merchán-Acosta, B., & Vergara-Romero, A. (2022). Potencial de Desarrollo del Cantón Santa Clara de Daule: Un Análisis Factorial. En Vergara-Romero, A. (Comp.). Gran Guayaquil: Propuesta de un Modelo Potencial de Desarrollo. Universidad Ecotec.

Mestre, L. (2019). Procedimiento para el desarrollo de clústeres como pilar para la sostenibilidad de la cadena de suministro. Universidad de Holguín.

Michelotti, F., & Siqueira, H. (2019). Financeirização das commodities agrícolas e economia do agronegócio no Brasil: notas sobre suas implicações para o aumento dos conflitos pela terra. Semestre Económico, 22(50), 87–106. https://doi.org/10.22395/seec.v22n50a5

Ministerio de Agricultura y Ganadería. (2019). Panorama Agroestadístico. Octubre 2019. Panorama Estadístico octubre 2019, 2018.

Ministerio de Agricultura y Ganadería MAG. (2018). Resultados Operativos de Rendimientos Objetivos 2018. Resultados Operativos de Rendimientos Objetivos 2018. Maíz Duro, Arroz, Soya, Papa, Quinua, Café, Cacao.

MIPRO (2020). Visión agroindustrial. http://servicios.produccion.gob.ec/siipro/downloads/temporales/8_Vision Agroindustrial 2025.compressed.pdf

Morejón-Calixto, S., & Vergara-Romero, A. (2022). Potencial de Desarrollo del Cantón San Francisco de Milagro: Un Análisis Factorial. En Vergara-Romero, A. (Comp.). Gran Guayaquil: Propuesta de un Modelo Potencial de Desarrollo. Universidad Ecotec.

Moreno, P., & Pereira, C. (2015). Why does Colombia lack agricultural commodity futures? Revista Finanzas y Politica Economica, 7(2), 325–339. https://doi.org/10.14718/revfinanzpolitecon.2015.7.2.6

Morton, J. (2020). On the susceptibility and vulnerability of agricultural value chains to COVID-19, World Development, 136, 105132. https://doi.org/10.1016/j.worlddev.2020.105132

Neira, A. M., Martínez, A. M., & Orduz, J. O. (2016). Análisis del mercado de piña Gold y Perolera en dos principales centrales mayoristas de Colombia. Corpoica Ciencia y Tecnologia Agropecuaria, 17(2), 149-165. https://doi.org/10.21930/rcta.vol17_num2_art:486

Neven, D. (2015). Desarrollo de cadenas de valor alimentarias sostenibles. Principios rectores. Publications-sales@fao.org. (ed.)

Niembro, A. (2017). Una tipología de empresas latinoamericanas exportadoras de servicios intensivos en conocimiento y los determinantes de su competitividad internacional. Estudios Gerenciales, 33(142), 64-75. https://doi.org/10.1016/j.estger.2016.12.004

Niñerola, A., Sánchez-Rebull, M. V., & Hernández-Lara, A. B. (2019). Tourism research on sustainability: A bibliometric analysis. Sustainability, 11 (5), 1-17. https://doi.org/10.3390/su11051377

Noboa Salazar, J. G., Vergara-Romero, A., Zamora Boza, C. S., & Granizo, A. W. N. (2022). Estrategias para la optimización de la gestión administrativa en una empresa constructora usando el Balanced Scorecard. Revista Científica Res Non Verba, 12(1), 56-73. https://doi.org/10.21855/resnonverba.v12i1.623

OCDE/FAO. (2019). OCDE-FAO Perspectivas Agrícolas 2019-2028 Enfoque especial América Latina (O. Publishing (ed.)). Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO).

Ochoa-Rico, M. S., Concha-Bucaram, A., Romero-Subia, J., Sorhegui-Ortega, R., & Vergara-Romero, A. (2022). Análisis de la Satisfacción Ciudadana desde la perspectiva de los Servicios Públicos en Zonas Urbanas. Amazonia Investiga, 11(50), 245-259. https://doi.org/10.34069/AI/2022.50.02.23

Ochoa-Rico, M. S., Jimber del Río, J. A., Cornejo-Marcos, G., & Vergara-Romero, A. (2022). Characterization of the Territory and Estimation of a Synthetic Index of Social Welfare. TEM Journal, 11(3), 1254-1264. https://doi.org/10.18421/TEM113-34

Ochoa-Rico, M. S., Vergara-Romero, A., Romero-Subia, J. F., & Jimber del Río, J. A. (2022). Study of Citizen Satisfaction and Loyalty in the Urban Area of Guayaquil: Perspective of the Quality of Public Services Applying Structural Equation. PloS ONE, 17(2), e0263331. https://doi.org/10.1371/journal.pone.0263331

Oddone, N., & Padilla Pérez, R. (2017). Fortalecimiento de cadenas de valor rurales. En Cepal. https://repositorio.cepal.org/bitstream/handle/11362/42077/S1700166_es.pdf

Olea, J., Contreras, O., & Barcelo, M. (2016). Las capacidades de absorción del conocimiento como ventajas competitivas para la inserción de pymes en cadenas globales de valor. Estudios Gerenciales, 32(139), 127-136. https://doi.org/10.1016/j.estger.2016.04.002

Ortega-Ortega, A., Vergara-Romero, A., & Sorhegui-Ortega, R. (2021). Educación digital como condición integradora de Sistemas educativos. In VIII Congreso Científico Internacional" Tecnología, Universidad y Sociedad". Samborondón, Ecuador.

Ortega-Santos, C. E., Márquez-Sánchez, F., Sorhegui-Ortega, R., & Vergara-Romero, A. (2021). Impacto socioeconómico causado por la Covid-19 en zonas vulnerables de Guayaquil a un año de la pandemia. Revista Científica ECOCIENCIA, 8(4), 60–83. https://doi.org/10.21855/ecociencia.82.563

Ortiz, F., & Montiel, A. N. (2017). Transmisión de precios futuros de maíz del Chicago Board of Trade al mercado spot mexicano. Contaduría y Administración, 62(3), 924–940. https://doi.org/10.1016/j.cya.2016.01.004

Pacherres Nolivos, S., Vergara-Romero, A., & Sorhegui-Rodríguez, R. (2020). Repensando el concepto de arte a través del turismo: el turismo de arte callejero en Guayaquil. Revista Científica Res Non Verba, 10(2), 136-153. http://revistas.ecotec.edu.ec/index.php/rnv/article/view/419

Padilla, R. (2017). Política industrial rural y fortalecimiento de cadenas de valor. Desarrollo Económico (CEPAL-FIDA (ed.); N° 145 (LC).

Paniagua, J. (2017). Modelación econometrica de la demanda de semilla de chile dulce lamuyo y blocky en Costa Rica mediante series de tiempo unvariadas. e-Agronegocios, 3(2), 1-12. https://sites.google.com/site/eagronegociosucr/

Parnás, M., & Fonzo, C. (2021). ¿La reina comparte el trono? La soja en Santiago del Estero durante el periodo 2015-2018. Trabajo y Sociedad, 21, 315–332. www.unse.edu.ar/trabajoysociedad

Pascual, D., Pla, F., & Sánchez, J. S. (2008). Cluster stability assessment based on theoretic information measures. Lecture Notes in Computer Science. In Iberoamerican Congress on Pattern Recognition, 219-226. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-85920-8_27

Peña, D. (2010). Análisis de series temporales (Www.alianzaeditorial.es (ed.)). alianzaeditorial@anaya.es

Pérez, J. (2019). Cadenas globales de valor: Una Revisión Bibliográfica. Cadernos PROLAM/USP, 18(34), 142-163. https://doi.org/https://doi.org/10.22395/seec.v22n51a4

Pérez González, M., & Lutsak-Yaroslava, N. V. (2017). La producción científica sobre la innovación social para el desarrollo local. Una revisión bibliométrica. Revista Prisma Social, 0 (19), 146-82.

Perianes-Rodriguez, A., Waltman, L., & Van Eck, N. J. (2016). Constructing bibliometric networks: A comparison between full and fractional counting. Journal of Informetrics, 10 (4), 1178-1195. https://doi.org/10.1016/j.joi.2016.10.006

Peters, H. P., & Van Raan, A. F. (1993). Co-word-based science maps of chemical engineering. Part I: Representations by direct multidimensional scaling. Research Policy, 22 (1), 23-45. https://doi.org/10.1016/0048-7333(93)90031-C

Pocaterra, V. (2019). Elasticidades de corto y largo plazo en las importaciones de Ecuador. Revista De Ciencias Sociales, 25(2), 217–231. https://doi.org/10.31876/rcs.v25i2.27349

Pozo-Estupiñán, C., Sorhegui Ortega, R., Márquez-Sánchez, F., & Vergara Romero, A. (2021a). Soberanía alimentaria desde la política pública y sus argumentos. Revista Científica ECOCIENCIA, 8, 79–93. https://doi.org/10.21855/ecociencia.80.635

Pozo-Estupiñan, C., Sorhegui-Ortega, R., Márquez-Sánchez, F., & Vergara-Romero, A. (2021b). Pensamiento Económico: Sostenibilidad y Economía Agraria. En IX Congreso Internacional “Tecnología, Universidad y Sociedad”. Samborondón, Ecuador.

Prause, L., Hackfort, S., & Lindgren, M. (2020). Digitalization and the third food regime. Agriculture and Human Values. https://doi.org/10.1007/s10460-020-10161-2

Puglla, R., Andrade, D. M., & Vanegas, J. L. (2017). Análisis comparativo de las exportaciones e importaciones 2013-2016 al implementar la nueva matriz productiva ecuatoriana. Killkana Social, 1(3), 1. https://doi.org/10.26871/killkana_social.v1i3.56

Ramírez Molina, R. I., Ríos-Pérez, J. D., Lay Raby, N. D., & Ramírez Molina, R. J. (2021). Estrategias empresariales y cadena de valor en mercados sostenibles: Una revisión teórica. Revista de Ciencias Sociales. https://doi.org/10.31876/rcs.v27i.36999

Ramos-Leal, E.; Márquez-Sánchez, F., & Vergara-Romero, A. (2021). Los Modelos de Gestión Municipal como componente de Desarrollo Local. En Vergara-Romero, A. (Comp.). Modelo de Gestión Municipal en Guayaquil para el Desarrollo Sostenible. Universidad Ecotec.

Reyes-Belmonte, M. A. (2020). A bibliometric study on integrated solar combined cycles (ISCC), trends and the future based on data analytics tools. Sustainability, 12 (19). https://doi.org/10.3390/su12198217

Ribas, I., & Companys, R. (2014). Estado del arte de la planificación colaborativa en la cadena de suministro: Contexto determinista e incierto. Intangible Capital, 3(3), 91-121.

Rioux, M., Ares, M., & Huang, P. (2015). Beyond NAFTA with Three Countries: The Impact of Global Value Chains on an Outdated Trade Agreement. Open Journal of Political Science, 05(04), 264-276. https://doi.org/10.4236/ojps.2015.54028

Rivera, D., Pérez, J., & Cándano, L. (2019). Propuesta metodológica para añadir valor a cadenas agroproductivas. Cooperativismo y Desarrollo, 7(1), 97-106. http://coodes.upr.edu.cu/index.php/coodes/article/view/209

Rondinone, G., & Thomasz, E. O. (2016). Riesgo de precio en commodities: ¿profundización en la sensibilidad de precios agrícolas ante shocks de tasa de interés? Contaduria y Administracion, 61(4), 746–761. https://doi.org/10.1016/j.cya.2016.02.002

Rubalcaba, L., Slavova, S., Kim, M., Merino, F., & Franco, E. (2017). República de Ecuador Innovación en sectores ecuatorianos para el crecimiento de la productividad. En The World Bank (Ed.), Práctica Global de Comercio y competitividad. Banco Mundial. pubrights@worldbank.org.

Salazar, L., Nicolis, O., Ruggeri, F., Kisel'ák, J., & Stehlík, M. (2019). Predicting hourly ozone concentrations using wavelets and ARIMA models. Neural Computing and Applications, 31(8), 4331-4340. https://doi.org/10.1007/s00521-018-3345-0

Saleres, A., Tristan, P., & Felice, L. (2016). Clasificador automático de la calidad de los granos de maíz. Congreso Argentino de Agroinformática CAI, 205-218.

Sanabria, L., Peralta, A., & Orjuela, J. (2017). Modelos de Localización para Cadenas Agroalimentarias Perecederas: una Revisión al Estado del Arte. Revista al Estado del Arte Ingeniería Ingeniería, 22(1), 23-45. https://doi.org/http://dx.doi.org/10.14483/udistrital.jour.reving.2017.1.a04

Saturnino, O., Lucenam, P., & Saturnino, V. (2013). Liquidez y valor de mercado de Stock Brasileño: Modelo de cinco factores. Journal of Chemical Information and Modeling, 53(9), 1689-1699. https://doi.org/10.1017/CBO9781107415324.004

Sánchez, B., Zegbe, J., Rumayor, A., & Moctezuma, G. (2013). Estructura económica competitiva del sector agropecuario de Zacatecas: Un análisis por agrocadenas. Revista Mexicana de Agronegocios, 33, 552-563.

Sarache, W., Castrillón, Ó., & Ortiz, L. (2009). Selección de Proveedores: Una aproximación al Estado del Arte. Cuadernos de Administración, 22(38), 145-167.

Schuschny, A. (2005). Tópicos sobre el Modelo de Insumo-Producto: teoría y aplicaciones (CEPAL (ed.); Serie 37.).

Sed'a, P., Sorhegui-Ortega, R., Márquez-Sánchez, F., & Vergara-Romero, A. (2021). Estudio del Impacto de la Ayuda Humanitaria en crisis sanitaria por COVID-19. En Vergara-Romero, A. (Comp.). Políticas Públicas para el Desarrollo Local Sostenible. Universidad Ecotec.

SENAGUA. (2019). Plan Nacional de Riego y Drenaje. 2019-2027 (S. de R. y Drenaje (ed.)).

Small, H., & Sweeney, E. (1985). Clustering the science citation index using co-citations. Scientometrics, 7(3), 391-409. https://link.springer.com/article/10.1007%2FBF02017157.

Solomon, S., Pratap, G., & Swapna, M. (2020). Impact of COVID-19 on Indian Sugar Industry. Sugar Tech, 22(4), 547-551. https://doi.org/10.1007/s12355-020-00846-7

Sorhegui-Ortega, R., Jimber del Río, J. A., Márquez-Sánchez, F., & Vergara-Romero, A. (2022). Natural and Cultural Heritage in the Tourism Economy of the Province of Guayas. En Hernández Rojas, R. (Comp.), La Gestión Turística del Patrimonio: Una Visión Multidisciplinar (421-440). Córdoba, España: Editorial Arazandi/Civitas. ISBN 978-84-1125-521-9.

Souto-Anido, L., Vergara-Romero, A., Marrero-Anciza, Y., & Márquez-Sánchez, F. (2020). Incidencia de la Gestión de los Recursos Humanos en los resultados Organizacionales: ¿mito o realidad?. GECONTEC: Revista Internacional de Gestión del Conocimiento y la Tecnología, 8(1), 1-23. https://upo.es/revistas/index.php/gecontec/article/view/5410

Souza, J. T. D., de Francisco, A. C. D., Piekarski, C. M., & Prado, G. F. D. (2019). Data mining and machine learning to promote smart cities: A systematic review from 2000 to 2018. Sustainability, 11 (4). https://doi.org/10.3390/su11041077

Stathers, T., Holcroft, D., Kitinoja, L., Mvumi, B. M., English, A., Omotilewa, O., Kocher, M., Ault, J., & Torero, M. (2020). A scoping review of interventions for crop postharvest loss reduction in sub-Saharan Africa and South Asia. Nature Sustainability, 3(10), 821-835. https://doi.org/10.1038/s41893-020-00622-1

Suárez, M., Hernández, G., Roche, C., Freire, M., Alonso, O., & Campos, M. (2016). Cadenas de valor de productos agropecuarios en seis municipios de Cuba. I. Metodología para su diseño. Pastos y Forrajes, 39(1), 56-63.

Tableu. (2020). Guía de visualización de datos: definición, ejemplos y recursos de aprendizaje. https://www.tableau.com/es-es/learn/articles/data-visualization

Tamayo Herrera, A. D. P., Pazmiño Romero, D. A., Medina Pinoargote, G. E., & Sandoval Colina, N. E. (2019). Análisis de la aplicación de los microcréditos otorgados por las entidades financieras sector agrícola. Pro Sciences, 3(29), 91-99. https://doi.org/10.29018/issn.2588-1000vol3iss29.2019pp91-99

Tezanos, S. (2019). América Latina y el Caribe en la Agenda 2030 Hacia una clasificación del desarrollo sostenible y el “desarrollo en transición.” Documentos de Trabajo. Fundación Carolina, 2019(2), 24. https://unican.academia.edu/SergioTezanosVazquez

Thomasz, E., Massot, J., & Rondinone, G. (2016). Is the interest rate more important than inventories? The case of agricultural commodities in the context of the financialization process. Lecturas de Economia, 85, 127–153. https://doi.org/10.17533/udea.le.n85a04

Trapala, J., Bustos-Jaimes, I., Manzanares, P., Bárzana, E., & Montiel, C. (2020). Purification and characterization of an inulinase produced by a Kluyveromyces marxianus strain isolated from blue agave bagasse. Protein Expression and Purification, 176, 105718. https://doi.org/https://doi.org/10.1016/j.pep.2020.105718.

Upreti, B. R., Ghale, Y., Shivakoti, S., & Acharya, S. (2018). Feminization of Agriculture in the Eastern Hills of Nepal: A Study of Women in Cardamom and Ginger Farming. SAGE Open, 8(4). https://doi.org/10.1177/2158244018817124

Valencia, M., Díaz, F., & Correa, J. (2015). Planeación de inventarios con demanda dinámica: Una revisión del estado del arte. Dyna, 82(190), 183-191.

Valenzo, M., Bejar, V., & Martinez, J. (2012). Análisis de la cadena de suministro desde el punto de vista de la administración y negocios. Una revisión bibliométrica. En Red Internacional de Investigadores en Competitividad. XII Congreso. Universidad Michoacana de San Nicolás de Hidalgo.

Van Eck, N. J., & Waltman, L. (2020). VOSviewer Manual. Universiteit Leiden, CWTS Meaningful metrics.

Van Eck, N. J., & Waltman, L. (2016). Text mining and visualization. Text Mining and Visualization, 1-5. https://doi.org/10.1201/b19007

Van Eck, N., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics, 84(2), 523-538. https://doi.org/10.1007/s11192-009-0146-3

Vanegas, J., & Vásquez, F. (2017). Multivariate Adaptative Regression Splines (MARS), una alternativa para el análisis de series de tiempo. Gaceta Sanitaria, 31(3), 235-237. https://doi.org/10.1016/j.gaceta.2016.10.003

Vergara-Romero, A. (2011). Análisis de las carteras de créditos orientados a la Microempresa de los Bancos Privados del Ecuador 2009-2010. (Tesis de Licenciatura). Repositorio Universidad de Guayaquil. http://dx.doi.org/10.2139/ssrn.3849102

Vergara-Romero, A. (2014). Valoración de Empresas: Caso ESNOBIS S. A. (Tesis de Licenciatura). Repositorio UEES. http://dx.doi.org/10.2139/ssrn.3849117

Vergara-Romero, A. (2019). Soberanía Alimentaria en Ecuador: Un modelo de medición. Alcácer Santos, C. (Comp.). Agricultura y Soberanía alimentaria (55-81). Universidad Ecotec.

Vergara-Romero, A. (2021a). La Economía creativa en el Territorio. Universidad Ecotec. https://doi.org/10.21855/librosecotec.43

Vergara-Romero, A. (2021b). Políticas Públicas para el Desarrollo Local sostenible: Caso Guayaquil. Universidad Ecotec. https://doi.org/10.21855/librosecotec.68

Vergara-Romero, A. (2021c). Modelo de Gestión Municipal en Guayaquil para el Desarrollo Sostenible. Universidad Ecotec. https://doi.org/10.21855/librosecotec.69

Vergara-Romero, A. (2021d). PYMES, Gestión Empresarial y Sostenibilidad: Estrategias en diversos Sectores. Universidad Ecotec. https://doi.org/10.21855/librosecotec.70

Vergara-Romero, A. (2021e). La Gestión Empresarial Sostenible en la Rentabilidad Financiera y de Capital. Universidad Ecotec. https://doi.org/10.21855/librosecotec.71

Vergara-Romero, A. (2022a). Gran Guayaquil: Propuesta de un Modelo Potencial de Desarrollo. Universidad Ecotec. https://doi.org/10.21855/librosecotec.76

Vergara-Romero, A. (2022b). Liderazgo y Clima Laboral para la Sostenibilidad Empresarial. Universidad Ecotec. https://doi.org/10.21855/librosecotec.77

Vergara-Romero, A., & Ceular-Villamandos, N. (2022). Motivación del Clima Organizacional entre el Liderazgo Autocrático y Transformacional. En Vergara-Romero, A. (Comp.). Liderazgo y Clima Laboral para la Sostenibilidad Empresarial (9-32). Universidad Ecotec.

Vergara-Romero, A., & Márquez-Sánchez, F, (2021). Economía Creativa, Territorio y Políticas Públicas. Vergara-Romero, F.(Comp.), La Economía creativa en el Territorio (9-36). Universidad Ecotec. https://doi.org/10.21855/librosecotec.43

Vergara-Romero, A., & Moreno Silva, A. (2019). Soberanía alimentaria en Ecuador: fundamentos teóricos y metodológicos para un modelo de medición. Revista Científica ECOCIENCIA, 6, 1-18. https://doi.org/10.21855/ecociencia.60.256

Vergara-Romero, A., Jimber-del-Río, J-A., & Márquez-Sánchez, F. (2022). Food Autonomy within Food Sovereignty: Evidence from a Structural Model. Agronomy, 12(5), 1141. https://doi.org/10.3390/agronomy12051141

Vergara-Romero, Márquez-Sánchez, F., & Sorhegui-Ortega, R. (2022). One Year after the COVID-19 Pandemic in the city of Guayaquil: Evidence of Municipal Response and the Socio-economic Impact. Revista de la Universidad del Zulia, 13(37), 321-346. http://dx.doi.org/10.46925//rdluz.37.21

Vergara-Romero, A., Márquez Sánchez, F., Sorhegui-Ortega, R., & Macas-Acosta, G. (2020). Diagnóstico del Impacto Socioeconómico de la ayuda humanitaria en la crisis sanitaria por el COVID-19: Validez de un instrumento. Revista Científica ECOCIENCIA, 7(5). https://doi.org/10.21855/ecociencia.75.421

Vergara-Romero, A., Márquez Sánchez, F., Sorhegui-Ortega, R., & Olalla-Hernández, A. (2021). Capital humano: Actor central para la sostenibilidad organizacional. Revista Venezolana de Gerencia (RVG), 26(93), 297-307. https://doi.org/10.37960/rvg.v26i93.34984

Vergara-Romero, A., Menor Campos, A., Arencibia Montero, O., & Jimber del Río, J. A. (2022). Soberanía Alimentaria en Ecuador: Descripción y Análisis Bibliométrico. Revista Venezolana de Gerencia, 27(98), 498-510. https://doi.org/10.52080/rvgluz.27.98.85

Vergara-Romero, A., Morejón-Calixto, S., Márquez-Sánchez, F., & Medina-Burgos, J. (2022). Economía del conocimiento desde la visión del territorio. Revista Científica ECOCIENCIA, 9(3), 37–62. https://doi.org/10.21855/ecociencia.93.680

Vergara-Romero, A., Olalla Hernández, A., Yturralde, J. M., & Sorhegui Ortega, R. (2020). Responsabilidad social corporativa RSC y su impacto en el rendimiento económico de las principales Empresas en Ecuador. Revista ESPACIOS, 41(10). http://w.revistaespacios.com/a20v41n10/20411013.html

Villarreal, F. G. (2005). Elementos teóricos del ajuste estacional de series económicas utilizando X-12-ARIMA y TRAMO-SEATS. En C. D. de E. y P. Económicas (Ed.), Estudios estadísticos y prospectivos. Publicación de las Naciones Unidas.

Villavicencio, J. (2018). Introducción a Series de Tiempo.

Vinajera, A., Marrero-Delgado, F., & Ruiz-Morales, M. (2017). Método para calcular el valor agregado en cadenas de suministro de productos electromecánicos. Ingeniare, 25(3), 535–546. https://doi.org/10.4067/S0718-33052017000300535

World Bank Group. (2020). Trading for development in the age of global values chains. https://doi.org/10.1596/978-1-4648-1494-5

Yaselga, D. (2019). Un indicador de factores dinámicos para la evolución del PIB a corto plazo para el Ecuador. Cuestiones Económicas, 29(1). httpsestudioseconomicos.bce.fin.ecindex.phpRevistaCEarticleview3944.pdf

Yu, Y., Feng, K., & Hubacek, K. (2013). Tele-connecting local consumption to global land use. Global Environmental Change, 23(5), 1178-86. https://doi.org/10.1016/j.gloenvcha.2013.04.006

Zambrano, J., Barrera, V., Murillo, I., & Domínguez, J. (2018). Plan Estratégico de Investigación y Desarrollo Tecnológico del INIAP 2018-2022. Innovando el Agro Ecuatoriano. www.iniap.gob.ec

Zelterman, D. (2015). Applied Multivariate Statistics with R (Springer (ed.); Yale Unive). Springer. https://doi.org/DOI 10.1007/978-3-319-14093-3

Zhao, Z., Xiaodi, T., Xin, M., & Zhao, H. (2020). Bibliometric analysis of the 100 most cited articles on cervical cancer radiotherapy. Medicine, 99 (40): e22623. https://doi.org/10.1097/MD.0000000000022623

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