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Artículo de revisión

Competitiveness in the agricultural sector: a literature review

Competitividad en el sector agrícola. una revisión de la literatura

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ABSTRACT

The issue of competitiveness within the agricultural sector has become increasingly significant within the global economic landscape. This literature review article aimed to analyze existing research on competitiveness in the agricultural sector, providing an updated insight into the factors, trends, and challenges that influence it. Researchers conducted a scientometric analysis using Scopus and Web of Science, applying bibliometric techniques such as network analysis, scientific mapping, and the Tree of Science (ToS) methodology. The results include an analysis of the evolution of scientific production, collaboration among countries and authors, prominent journals, and the identification of seminal, structural, and contemporary documents. The conclusions highlight the contribution to existing knowledge, the partial challenge to previous theories, the need to study the role of circular economy and artificial intelligence, the importance of adopting a global perspective, and the use of a multidisciplinary approach and innovative bibliometric tools.

Keywords: Agricultural Competitiveness; Circular Economy; Artificial Intelligence; Literature review; Scientometrics.

RESUMEN

El tema de la competitividad en el sector agrícola se vuelve cada vez más importante en el contexto económico global. Este artículo de revisión de literatura tuvo como objetivo analizar la investigación existente sobre la competitividad en el sector agrícola, proporcionando una visión actualizada de los factores, tendencias y desafíos que la influyen. Se realizó un análisis cienciométrico utilizando Scopus y Web of Science, aplicando técnicas bibliométricas como análisis de redes, mapeo científico y la metodología del Árbol de la Ciencia. Los resultados incluyen un análisis de la evolución de la producción científica, la colaboración entre países y autores, las revistas más destacadas, y la identificación de documentos semillas, estructurales y contemporáneos. Las conclusiones resaltan la contribución al conocimiento existente, el desafío parcial a teorías previas, la necesidad de estudiar el papel de la economía circular y la inteligencia artificial, la importancia de adoptar una perspectiva global, y el suso de un enfoque multidisciplinario e innovadoras herramientas bibliométricas.

Palabras clave: competitividad agrícola; economía circular; inteligencia artificial; revisión de literatura; cienciometría.

JEL: Q170; Q130

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INTRODUCTION

Competitiveness in agriculture is now a central concern in the global economy. In a world where food and agricultural production plays a vital role in food security, economic stability, and the well-being of nations, understanding and enhancing agricultural competitiveness is crucial. Agricultural competitiveness involves the ability of a country, region, or enterprise to efficiently, sustainably, and profitably produce food and agricultural products while meeting the demands of a continually evolving market. This capacity dictates the economic success of those involved in the sector and directly impacts the quality of life for populations and the stability of the global food supply chain. Factors such as competitiveness and production costs determine the comparative advantages of one country over another (Thomé et al., 2023); furthermore, competitiveness extends beyond national borders. Global collaboration among research networks to advance science and technology has gained prominence in recent decades, thanks to mechanisms for sharing information and data. Therefore, it is crucial to examine these processes to acquire knowledge for future research and the implementation of science and technology policies (Vázquez-de Castro et al., 2023).

In this literature review, researchers comprehensively analyze existing research on agricultural competitiveness to provide an up-to-date overview of the factors, trends, and challenges influencing competitiveness in the present era (Buitrago et al., 2022), exploring the roles of technology, environmental sustainability, governmental policies, value chains, climate change, and education in determining competitiveness in agriculture. Additionally, researchers examine how these factors are interconnected and their impact on the ability of agricultural stakeholders to compete in local and international markets. It is important to note that competitiveness extends beyond economics; it encompasses social, environmental, and political dimensions. By better understanding the factors that drive or hinder competitiveness in the agricultural sector, we can identify effective strategies and policies to promote sustainable and equitable agricultural development, benefiting local and global communities.

In this era of rapid changes and unprecedented challenges, the study of agricultural competitiveness has gained renewed importance. This article aims to enrich the existing knowledge in this field, providing a robust foundation for future research and policies for bolstering the resilience and prosperity of the global agricultural sector. The remainder of this article follows a structured format, including the methodological section outlining the paper selection process, the results section presenting the core documents, and finally, the conclusions.

METHODOLOGY

Given that Scopus and WoS are databases containing significant and relevant research across various fields of knowledge, they were employed to procure information (Marín-Velásquez & Arrojas-Tocuyo, 2021). These databases rank among the most substantial in the world. WoS records exceed 90 million, whereas Scopus surpasses 60 million (Moral-Muñoz et al., 2020). The amalgamation of these two databases is deemed sufficient for the scientometric analysis undertaken in this study. Table 1 presents the parameters employed for conducting the searches.

Table 1. Parameters used in the competitiveness of the agricultural sector.

Parameters	**Web of Science**	**Scopus**
Range	2 000-2 023	
Date	July 9, 2 023	
Document types	Papers, books, chapters, and conference proceedings.	
Search field	Title, abstract, and keywords	
Words	“Competitiveness” AND “agricultural” AND “sector”	
Results	531	1 161

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Total (Wos+Scopus)	1 403

Source: Own elaboration.

Researchers integrated the results from Scopus and WoS using the bibliometrix R package for primary information and ToSR for references (Aria & Cuccurullo, 2017). The final dataset comprises 1403 documents, including 289 duplicate documents. More publications were recorded in Scopus, totaling 840 documents (59.87 %). Among the total documents, articles represent 74.63 %. This statistic bears significance since competition in the agricultural sector is reflected predominantly in articles rather than conference proceedings. All variables from Scopus and WoS were included in this study, ensuring a comprehensive analysis grasping the principal contributions to competitiveness in the agricultural sector. The PRISMA method that describes the article selection process was a reference in this study.

The preprocessing stage plays a pivotal role in enhancing the rigor and reproducibility of data analysis, so researchers executed preprocessing utilizing custom R scripts provided by the Core of Science https://github.com/coreofscience/scientometric_templates, accessed on 24 November 2023, facilitating the extraction of essential information from references while eliminating any missing values; this methodological approach ensures a robust foundation for a more sophisticated analysis. Subsequently, a dataset comprising 22 spreadsheets was generated, subject to comprehensive examination through a diverse array of Python and R packages.

The analyses occurred in two stages. The first is Scientometric mapping, a technique that analyzes academic literature using bibliometric indicators, focusing on scientific output, country, journal, and authorship (López Belmonte et al., 2020). It offers a comprehensive view of a research topic, starting with an overview and progressing to collaboration network analysis. This study employs Marín-Hurtado's method for citation analysis (Hurtado-Marín et al., 2021), constructing a collaboration network through references for precise identification of scientometric data structures. The statistical software RStudio (version 2023.06.1) and Bibliometrix were used (Aria & Cuccurullo, 2017), with visualizations created using R package ggraph (version 2.1.0) (Si et al., 2022)and Gephi (version 0.10) (Bastian et al., 2009).

The second stage used is the Tree of Science (ToS). The theme's development relies on analyzing reference citations in research journals. These citations form an extensive network, with each node representing an article and citations as edges connecting the nodes. The ToS algorithm refines the network by removing articles with only one citation (in degree) and zero references to other articles. To eliminate small, isolated parts within the research theme, ToS extracts the most connected subnetwork (giant component); offering a detailed explanation (Valencia-Hernandez et al., 2020). Using the citation network (Blondel et al., 2008), the algorithm identifies densely connected node subcommunities (clusters). Groups with the highest cohesion indicator are selected. The SAP algorithm pinpoints work at the root, trunk, and branches (Valencia-Hernandez et al., 2020).

The Core of Science corporation has implemented two platforms recently for creating ToS using WoS (Zuluaga et al., 2022) and Scopus (Robledo et al., 2022). However, this study employed the ToSr package and a new code for data preprocessing. ToS is a well-established methodology utilized for identifying the primary contributions in various research domains such as entrepreneurship (Robledo et al., 2023), management (Vivares et al., 2018), education (Duque & Cervantes-Cervantes, 2019), and marketing (Duque-Hurtado et al., 2020). The dissemination process is accounted comprehensively by Eggers et al., 2022.

RESULTS

Scientometric Analysis

This section presents a descriptive analysis of agricultural competitiveness by examining scientific, national, journal, and author production.

Scientific Production

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Researchers depicted the evolution of academic production related to this topic in Figure 1; in this graph, research in this field has significantly increased since 2017, showing a substantial number of articles generated in the Scopus database.

WoS and Scopus experienced a growth rate of 21 % between 2000 and 2012. However, between 2013 and 2022, WoS grew at a rate of 7 %, while Scopus grew at 28 %.

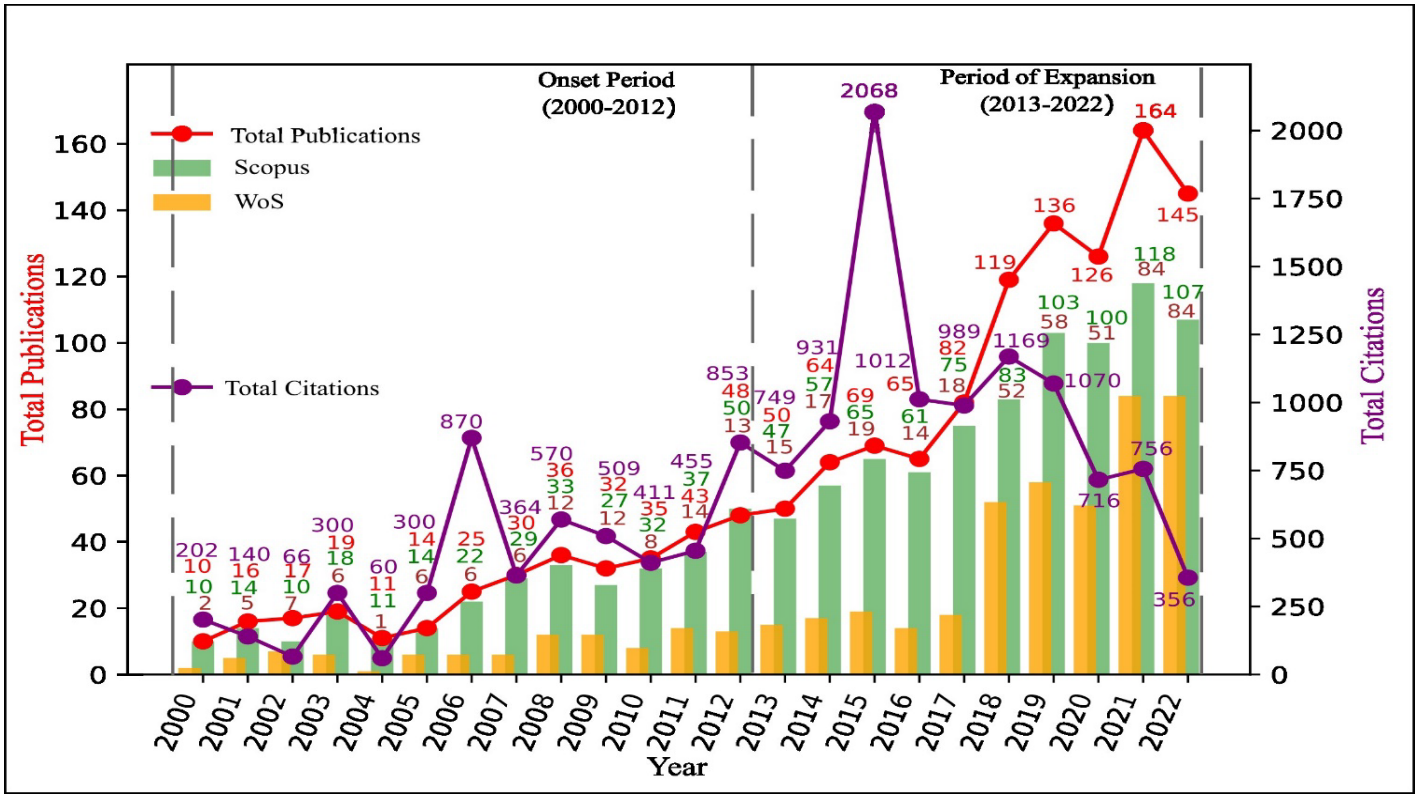

Figure 1. Annual Evolution of Scientific Production
Source: Own elaboration based on data from the WoS and Scopus.

The annual scientific production of a specific topic is employed to comprehend changes within a research field, and article citations reflect their relative significance within the academic community. A comparison of production between WoS and Scopus is also crucial as it enables us to understand the advantages and disadvantages of each selection. Therefore, to gauge the topic's impact, this study analyzed publications on agricultural competitiveness from 2000 to 2022, with the total number of citations received each year (Figure 1). Furthermore, researchers used the overall production from both datasets to identify similarities and differences between agricultural competitiveness production in Scopus and WoS. Lastly, researchers delineate the evolution of competitiveness production within Scopus and WoS and structure production evolution into two phases, initial development and expansion. These phases aid in comprehending the distinct stages of agricultural competitiveness over time (Sun et al., 2020).

Between 2000 and 2012, there was a growth phase with 336 publications, accounting for 23.95 % of the total. WoS and Scopus published 122 and 214 articles, respectively. The citations received during this period represent 35.79 % (3 550) of the total citations; these citations exhibit a delayed effect as they accumulate after article publication. Throughout this stage, the metrics increased annually. One of the most cited studies in this period combines an economic model (Global Trade Analysis Project - GTAP) and a biophysical model. The methodology innovates by integrating cutting-edge knowledge from biophysics and economics (van Meijl et al., 2006).

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Growth Phase (2013-2022). The total number of publications and citations increased significantly each year during this stage. This phase represents 72.70 % (1 020) of the total publications and 64.08 % (6 357) of the total citations. In 2015, citations peaked, with an average publication growth rate of 13 %. The most cited article in 2015 is at (Srbinovska et al., 2015).

Country Analysis

Country analysis is becoming a common scientometric technique for identifying the most productive locations worldwide in a specific research domain (Chen, 2023). Government investments in science to boost industry innovation reflect a nation's productivity (Zanardello, 2023). Consequently, it is essential to understand the dynamics of scientific production, quality, and research influence in each nation. This study elucidates the impact (received citations), production (number of articles), and quality (according to Scimago metrics) of a country's research, constructing a collaboration network to comprehend the communities formed by researchers.

Table 2 displays the top ten countries in agricultural competitiveness research organized based on each country's production percentage related to the total records obtained in this search. These ten countries account for 44.26 % of the total articles, with the top five contributing 28.56 %. It is significant to clarify researchers considered all author affiliations and eliminated duplicate affiliations within each article. These results may differ from Bibliometrix's, which only considers the first author.

Table 2. Top 10 most productive countries

Country	Production		Citation		Q1	Q2	Q3	Q4
Ukraine	94	6.87 %	280	2.49 %	2	7	13	11
Italy	86	6.28 %	954	8.49 %	23	14	16	5
Spain	79	5.77 %	884	7.87 %	15	12	16	10
USA	75	5.48 %	1 025	9.12 %	20	16	7	0
Germany	57	4.16 %	646	5.75 %	18	9	12	4
Czech Republic	49	3.58 %	261	2.32 %	1	11	21	1
Kazakhstan	43	3.14 %	81	0.72 %	0	10	15	6
Romania	43	3.14 %	99	0.88 %	4	3	11	2
United Kingdom	41	2.99 %	725	6.45 %	14	10	3	2
India	39	2.85 %	226	2.01 %	3	6	11	8

Source: Own elaboration.

The citation column displays the total citations in WoS and Scopus by nation. The top five countries account for 33.72 % of the total citations, comparable to the production results. Despite the United Kingdom's low article production, it exhibits a high impact. Kazakhstan and Romania, on the other hand, represent the opposite scenario. Quality of production was another significant variable in the analysis. The four quartiles of the Scimago dataset are in Table 2. Production quality in Ukraine stands at a mere 35 %. Romania boasts a 47 % quality production, while the other countries on the list hover around the 70 % mark.

Collaborative projects explain the results for some countries. The six closest relationships were between Germany and the Netherlands (10 articles), Italy and Spain (5 articles), France with Italy and Germany (6 articles), Australia with Botswana, France, Germany, India, and the United Kingdom (2 articles), the United Kingdom with the United States (5 articles), and Spain with the United Kingdom and Venezuela (3 articles). Two studies stand out among the most recent from Germany and the Netherlands: one analyzes the need for new business models assessing agricultural waste and derivatives for transitioning from a linear economy to a circular economy (Donner et al., 2021).

Another study examines the endeavor to attain climate neutrality within the European Union (EU) by 2050, alongside the obstacles encountered by the agricultural industry in advancing towards this objective (Frank et

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al., 2021). Figure 2 portrays eight groups of nations, with the smaller graph showing similar proportions for the five most substantial clusters. The primary graph demonstrates nodes and linkages evolving, indicating the interplay among newly participating countries and burgeoning connections. According to the data in this figure, there has been a noticeable rise in fresh alliances since 2017, indicating an enhanced collaboration among nations in agricultural competitiveness within a thriving scientific community.

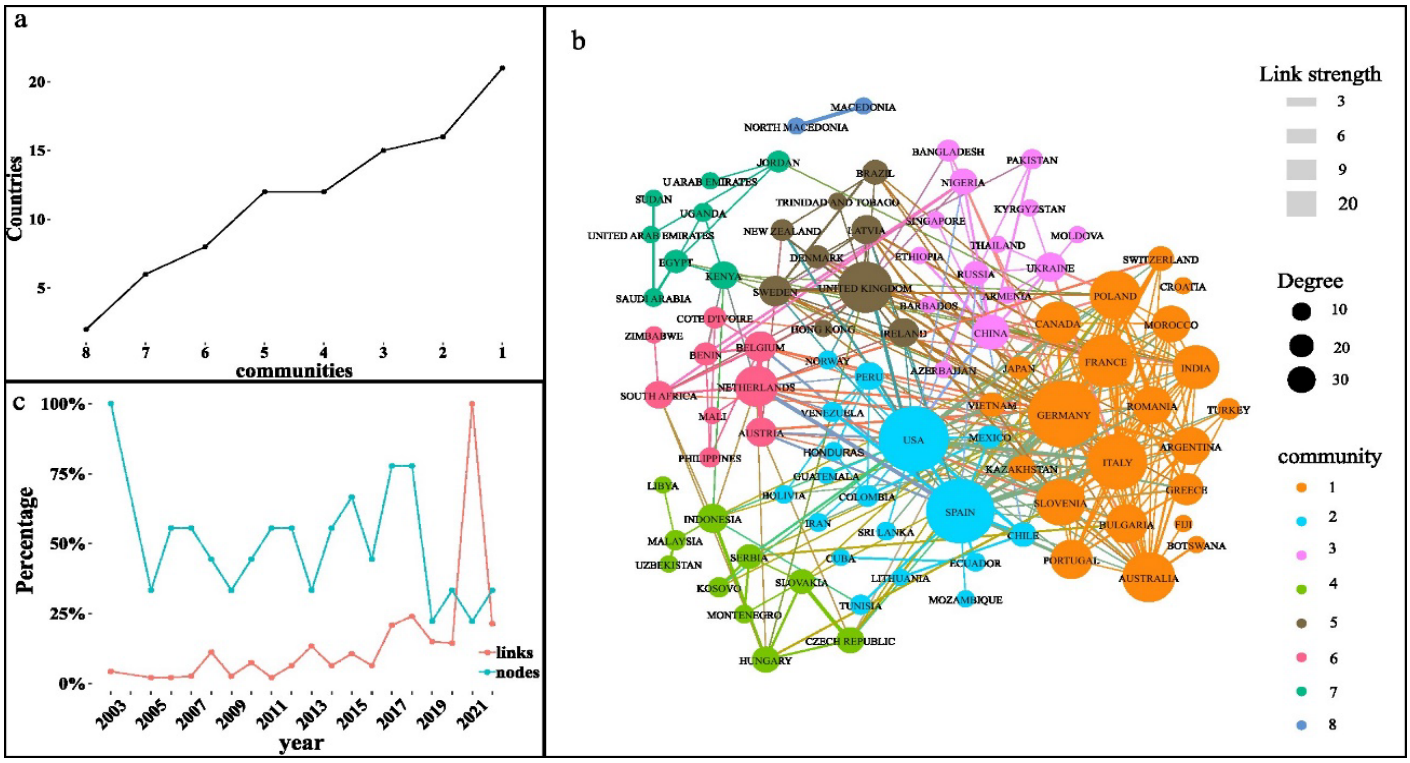

Figure 2. Country collaboration network. 2a. Total Number of Communities by Size 2b. Nodes and Links Over Time. 2c. Scientific Collaboration Network of Countries.
Source: Own elaboration based on data from the WoS and Scopus.

Journal Analysis

The Institute of Physics (IOP) Conference Series boasts the highest number of publications for each journal; other noteworthy journals include Sustainability and Scientific Papers – Series Management Economic Engineering in Agriculture and Rural Development.

This information is presented in Table 3, which reveals that the most prominent journals in terms of impact factor were Eurochoices with 0.74 and Sustainability with 0.66.

Tabla 3. Top 10 most productive journals.

Journal	WoS	Scopus	Impact Factor	H Index	Quantile
IOP Conference Series: Earth And Environmental Science	0	49	0.2	41	-
Sustainability	28	0	0.66	136	Q1
Scientific Papers-Series Management Economic Engineering In Agriculture And Rural Development	26	0	-	-	-

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Agris On-Line Papers In Economics And Informatics	0	22	0.31	18	Q2
Berichte Uber Landwirtschaft	10	11	0.14	13	Q4
Eurochoices	3	18	0.74	19	Q1
E3s Web Of Conferences	0	18	0.18	33	-
Lecture Notes In Networks And Systems	0	18	0.15	27	Q4
Economic Annals-Xxi	4	14	0.19	19	Q3
Management Decision	0	15	0.18	24	Q4

Source: Own elaboration based on data from the WoS and Scopus.

Researchers illustrated the citation analysis utilizing references from WoS and Scopus searches in Figure 3; the citation network reveals various themes within a collection of articles. Each node represents a journal and links connecting these journals. The three largest communities are in this figure. The inset in the figure highlights the inflection point following group four (Hurtado-Marín et al., 2021).

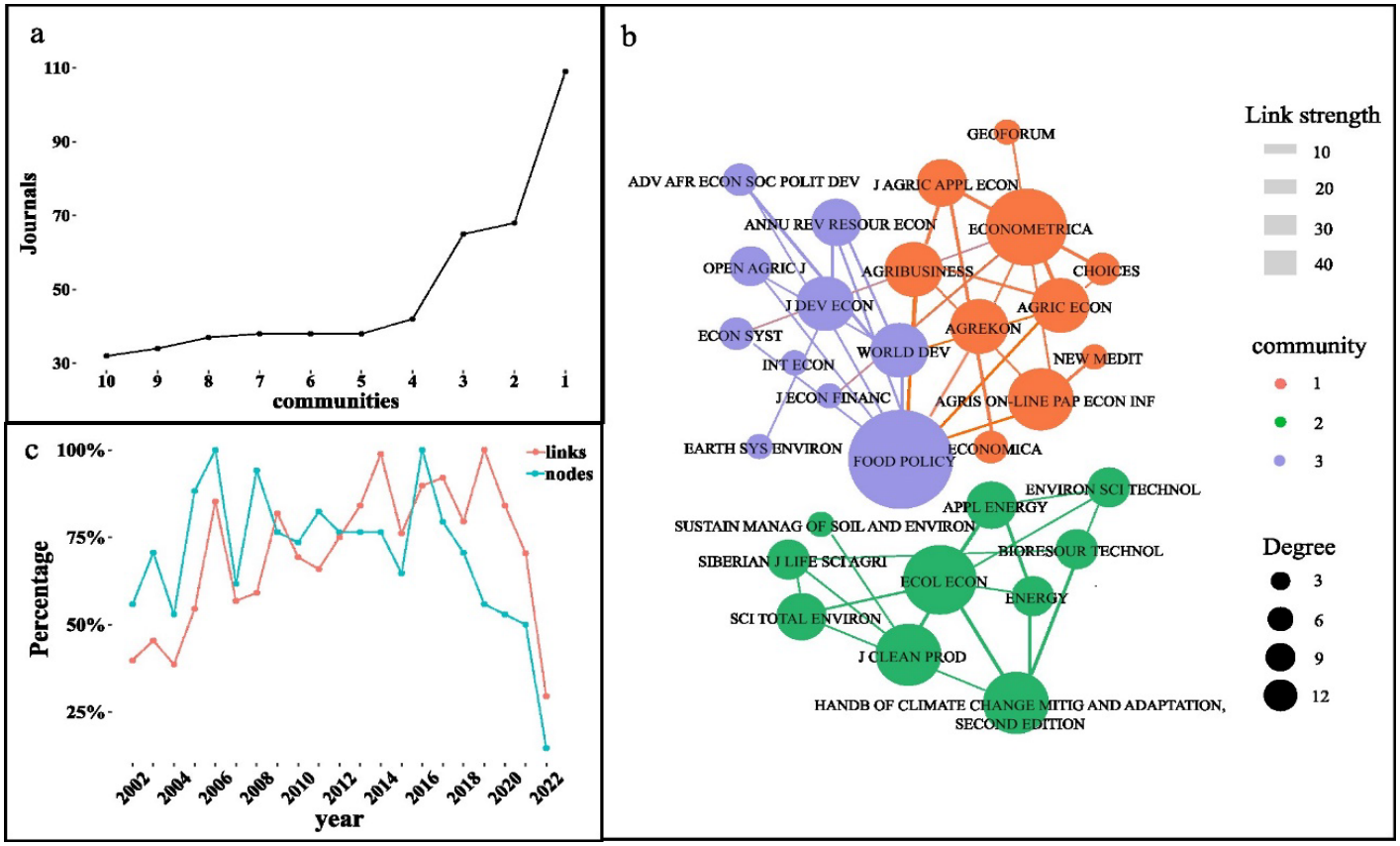

Figure 3. Global Network of Collaboration and Dynamics of Journals. 3a. Total Number of Communities by Size. 3b. Nodes and Connections Over Time. 3c. Scientific Collaboration Network among Journals.
Source: Own elaboration based on data from the WoS and Scopus.

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Collaborative research endeavors impact the results from journals. Noteworthy among these are investigations involving authors from multiple countries. For instance, one study involves researchers from Austria, Belgium, Germany, the Netherlands, and Spain. The paper examines the effectiveness of unilateral agricultural mitigation efforts globally, focusing on the European Union's (EU) target of achieving climate neutrality by 2050 and its potential impact on the EU's agricultural sector (Frank et al., 2021).

In an article by researchers from Nigeria, Bangladesh, and China, they calculated three different indices and developed a relatively symmetric export competitiveness index for assessing comparative advantages. A study found that Nigeria's cocoa exports maintained their competitive edge, with a boost in per capita income showing a favorable effect. Nevertheless, the nation's economic situation suffered drawbacks due to rising local prices and the enforcement of the African Growth and Opportunity Act (Abdullahi et al., 2022).

Furthermore, a paper by researchers from the United Kingdom, Greece, and Ireland utilizes farm-level data from 2008 to 2017 and employs a stochastic frontier model with random coefficients to estimate total factor productivity (TFP) growth. The results indicate that technical change and increased efficiency were the primary drivers of TFP growth, while the negative scale effect was offset by the positive contribution of Farm Advisory Services (FAS) to productivity growth (Lokko et al., 2018; Parikoglou et al., 2022).

Author Collaboration Network

In Table 4, you'll find a roundup of the authors who've been most productive in both WoS and Scopus. Each author's details, including their h-index, the number of records, and notable publications, are outlined, emphasizing the citations they've received within the databases.

Table 4. Production By Author

No	Researcher	Total Articles*	Scopus H-Index	Affiliation
1	Erjavec E	8	10	Univerza V Ljubljani, Ljubljana, Slovenia
2	Smutka L	7	16	Czech University Of Life Sciences Prague, Prague, Czech Republic
3	Pawlak K	6	5	Uniwersytet Przyrodniczy W Poznaniu, Poznan, Poland
4	Poczta W	5	5	Uniwersytet Przyrodniczy W Poznaniu, Poznan, Poland
5	Crole-Rees A	4	-	-
6	Grote U	4	-	-
7	Jeangros B	4	-	-
8	Kumar A	4	1	Indian Institute Of Management Ahmedabad, Ahmedabad, India
9	Maslova V	4	2	Federal Research Center Of Agrarian Economy And Social Development Of Rural Areas - All Russian Research Institute Of Agricultural Economics, Moscow, Russian Federation
10	Nassar V	4	1	Universidade Federal De Santa Catarina, Florianopolis, Brazil

Source: Own elaboration based on data from the WoS and Scopus.

These studies conducted a literature review and analyzed the techniques employed in this task using topic modeling. It is important to note that most of the authors mentioned in this table were European.

Researchers generated an Academic Social Network (ASN) with references and search data (Durán-Aranguren et al., 2021) (Figure 4), where each node in the ASN represents an author, and a link occurs when authors co-

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publish an article together; the final ASN consists of nodes and links, divided into clusters based on size (Blondel et al., 2008).

The top 10 most connected authors from each of the three largest clusters appear in descending order.

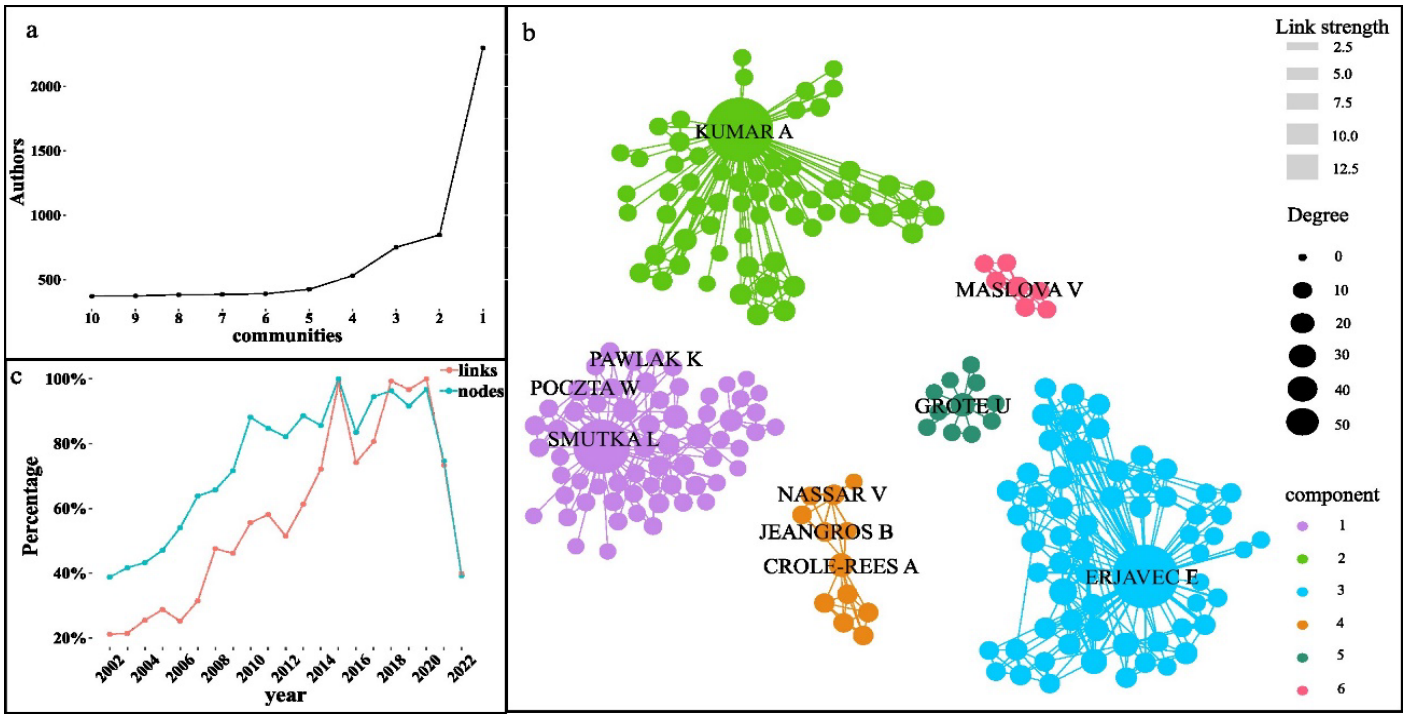

Figure 4. Global Network of Collaboration and Dynamics of Authors Over Time. 4a. Total Number of Communities by Size. 4b. Nodes and Connections Over Time. 4c. Scientific Collaboration Network by Authors.

Source: Own elaboration based on data from the WoS and Scopus.

In the first academic community, notable studies by Erjavec are as follows: one document assesses the economic implications of Slovenia's accession to the European Union (EU), specifically in the agricultural sector (Kavcic et al., 2003); another study examines the evolution and current status of agriculture and agricultural policy in the Western Balkans (WB) countries concerning the EU accession process (Kožar et al., 2012).

In the second academic community, the studies by Smutka, Poczta, and Pawlak stand out; in one article, researchers analyzed the relationship between agricultural production and trade in the Visegrad Group countries, focusing on changes in production, trade, and competitiveness between 1993 and 2010, including the reduction in agricultural production volume in Slovakia, the Czech Republic, and Hungary, which lack comparative advantages compared to Poland (Lubanda et al., 2016); another paper examines the export of agri-food products from Poland in comparison with Germany and France in terms of structure, value, and quality in the markets of the EU-28, China, and the United States (Bajan et al., 2021); another study evaluates the competitiveness of crop production in some European countries compared to the Czech Republic, assessing and identifying sources of competitiveness (Rumankova et al., 2022); another article analyzes the economic situation of dairy farms in EU countries grouped by production potential, using data from the Farm Accountancy Data Network (FADN) (Poczta et al., 2020); in a subsequent investigation, the characteristics of women as agricultural operators in Poland are examined based on national sampling studies conducted in 1994, 1999, and 2007 (Pawlak et al., 2019).

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In the third academic community, Kumar stands out with the following literature; a particular paper examines the Indian livestock industry's trade performance, emphasizing shifts over time and across different regions in exports and imports of various livestock goods, analyzing growth patterns in exporting and importing a range of livestock products, assessing international competitiveness, investigating factors influencing export growth in livestock products, and exploring issues concerning food security within the livestock trade (Kumar et al., 2007)

; in another study, crop diversification is considered a crucial strategy for increasing agricultural income, generating employment, poverty alleviation, and preserving soil and water resources (Kumar et al., 2012); another article examines the impact of dairy cooperatives on farmers' performance in terms of production, productivity, and milk quality in three Indian states (Kumar et al., 2013).

DISCUSSION

The utilization of network analysis facilitated the pinpointing of the most pertinent documents. "Materials with the highest metrics were chosen for examination and categorized using the analogy of the tree of science: foundational (roots), structural (trunk), and contemporary (leaves)." (Valencia-Hernandez et al., 2020). A clustering algorithm (Blondel et al., 2008) "was suggested to establish shared subfields or research domains, helping to recognize four primary clusters evident within the finer details."

Roots

Based on the results of the SAP algorithm, researchers created the Revealed Comparative Advantage Index (RCA) to explain the relative performance of a country's exports of particular goods (Balassa, 1965). The index reveals the advantages of trading nations focused on cost factors, service price, and other non-price-related aspects. A theoretical evaluation of alternative indicators of revealed comparative advantages was also conducted through trade intensity (Vollrath, 1991).

Trunk

Among the structural articles, a study stands out, presenting results on the agricultural sector's competitiveness in EU-27 countries based on a value chain analysis. The authors used RCA to measure the competitiveness of two types of products (cereals and cereal-based products). The results revealed a paradox in resource management. Countries with a surplus in the cereal trade balance had low RCA values for cereal-based products, while countries with a deficit in the cereal trade balance had high RCA values for cereal-based products. The authors argue that the Balassa Index alone is insufficient to capture, characterize, and ultimately define agricultural competitiveness (Istudor et al., 2022)

A different paper utilizes a combination of trade measures and strategic management measures for assessing and identifying the sources of competitiveness in plant production within selected European countries, with a particular emphasis on the Czech Republic's perspective (Rumankova et al., 2022).

A study analyzed changes in the competitiveness of the agricultural sector among 13 European Union countries that have recently become members (EU-13), considering the framework of integration processes (Jarosz-Angowska et al., 2022; Nowak & Różańska-Boczula, 2021).

Branch 1

Four studies examined the competitiveness of various agro-industrial and manufacturing sectors across different regions; Guliev & Mehari (2023) focus on East African countries, finding that while employment in light manufacturing industries has increased, export performance remains weak, indicating a necessity for enhancing product quality and export orientation; Long (2021) emphasizes the importance of maintaining farming sustainability while enhancing China's agricultural products' export competitiveness, suggesting the promotion of traditional products with regional characteristics and improving quality and environmental standards;

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Zdráhal et al. (2021) highlight Brazil's evolution into a global agri-food giant with specific sectoral advantages, while Bajan et al. (2021) analyze Poland's agri-food exports, revealing increased competitiveness with Germany but less significant presence in US and China markets due to lower export value and product quality differences.

Although all studies focus on competitiveness in agro-industrial and manufacturing sectors, each offers unique insights tailored to specific regions and aspects such as export performance, sustainability, and comparative advantages; these findings provide vital guidance for policymakers, emphasizing the need for policies promoting economic diversification, infrastructure improvement, and the export of high-quality manufactured goods to enhance competitiveness globally.

Branch 2

The studies reviewed offer diverse perspectives on agricultural sector competitiveness, employing various methodologies and analytical tools; Urba et al. (2023) and Erdem (2020) utilize indices like RCA to assess export capacity and comparative advantages, emphasizing the sector's sensitivity to economic and political factors; in contrast, Konstantinidis et al. (2021) and Hoang (2020) adopt a broader approach, examining market share, profitability, and policies' impact on competitiveness.

While the former studies focus on specific comparative advantages, the latter highlight the complexity of the competitive landscape and the necessity for comprehensive agricultural policies.

The implications of these findings are significant for policymakers and stakeholders; countries like Ukraine and Turkey, with comparative advantages, are urged to bolster export capacity through institutional support and technological advancements.

Moreover, the studies stress the importance of economic resilience and tailored strategies, advocating for product specialization and diversification in competitive nations like Vietnam and Thailand while suggesting alternative approaches for countries with weaker competitiveness; these insights underscore the necessity for holistic agricultural policies promoting innovation, diversification, and regional collaboration to fortify the sector's global standing.

Branch 3

The studies by Yang et al. (2023), Marques-Perez et al. (2022), Borsellino et al. (2020), and Falciola et al. (2020) offer valuable insights into different aspects of competitiveness and business performance across various sectors; Yang et al. (2023) focus on the positive impact of ISO 9001 certification on Chinese agri-food exports, particularly in non-state-owned food companies, highlighting the significance of quality in enhancing competitiveness; Marques-Perez et al. (2022) demonstrate the effectiveness of improving supply chain management in the Ecuadorian flower industry through their SCOR and AHP models, emphasizing operational efficiency's crucial role in competitiveness.

Findings have substantial implications for policymakers and stakeholders; firstly, the promotion of quality certification among agri-food companies, as indicated by Yang et al. (2023), can boost China's competitiveness in the global food market; secondly, enhancing supply chain management, as advocated by Marques-Perez et al. (2022), can lead to significant performance improvements in the agricultural sector, emphasizing the importance of investing in innovative technologies and methodologies to optimize efficiency and product quality.

Overall, these studies stress the importance of quality, efficiency, and innovation in enhancing competitiveness across different sectors and countries.

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CONCLUSION

This literature review on competitiveness in the agricultural sector has the potential to significantly contribute to the existing body of knowledge in several ways:

- It fills gaps by providing a comprehensive and up-to-date insight into the various factors influencing agricultural competitiveness, such as technology, environmental sustainability, government policies, value chains, climate change, and education; this review integrates and synthesizes previously scattered research into a coherent framework

- It partially challenges earlier theories by questioning the sufficiency of the Balassa index as the sole measure to capture the complexity of agricultural competitiveness; it acknowledges the need to explore complementary methodologies and approaches to address this complexity

- ; it raises new questions and research avenues by highlighting the importance of addressing current challenges such as climate change and artificial intelligence to ensure resilience and competitiveness in the agricultural sector in the future; it also advocates for adopting a global perspective and conducting empirical studies to identify gaps and opportunities in the agricultural production chain.
- Circular economy and artificial intelligence (AI) could play a crucial role in assessing the competitiveness of perishable agricultural products. The circular economy emphasizes sustainable practices, such as waste and derivatives utilization, which could enhance the efficiency and competitiveness of operations. On the other hand, AI could help optimize supply chains, predict demand patterns, monitor product quality, and facilitate informed decision-making, thus potentially increasing the competitiveness of perishable products.

Regarding unique findings and methodologies, this document stands out for its comprehensive approach and its use of bibliometric and network analysis tools. Scientometric analysis, science mapping, and collaboration network construction provide a novel and detailed perspective on trends, citation patterns, and interactions among countries, journals, and authors in agricultural competitiveness.

Overall, this literature review contributes to advancing knowledge by synthesizing previous research, identifying gaps and challenges, and suggesting new directions for future research and policies in the agricultural sector. Its multidisciplinary approach and innovative bibliometric methods distinguish it from other works in the field.

Conflict of Interest Statement

The authors assert that they do not possess any conflicting interests.

Author Contribution

Luis Rodríguez-Mañay: Methodology, Formal analysis, Investigation, Writing original draft, Writing review & editing.

Inmaculada Guaita-Pradas: Supervision, Writing, review & editing.

Inmaculada Marques-Pérez: Supervision, review & editing.

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