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Bibliometric Analysis of Agribusiness Innovation in Scopus Publications 2010–2024

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ABSTRACT

Agribusiness innovation has emerged as a critical driver of agricultural transformation, sustainability, and economic development in response to global challenges such as food insecurity, climate change, resource constraints, and technological disruption. The growing volume of scholarly publications in this field necessitates a systematic assessment of its intellectual structure and research evolution. Therefore, this study aims to analyze global research trends in agribusiness innovation through a bibliometric approach using publications indexed in the Scopus database from 2010 to 2024. Bibliographic data were collected from Scopus and analyzed using bibliometric performance indicators and science mapping techniques. VOSviewer was employed to visualize co-authorship networks, organizational collaborations, country collaborations, citation structures, keyword co-occurrences, overlay visualization, and density visualization. The results reveal a significant increase in publication output over the study period, indicating growing academic interest in agribusiness innovation. India emerged as the most influential country in terms of collaboration and research productivity, while several authors and institutions played important roles in shaping the field's intellectual development. Citation analysis highlights the importance of digital agriculture, sustainability, artificial intelligence, corporate social responsibility, and green innovation as major research foundations. Keyword mapping identifies agribusiness, agriculture, innovation, and sustainable development as the core themes, while smart agriculture, precision agriculture, machine learning, Internet of Things, and digital transformation represent emerging research directions. The findings demonstrate that agribusiness innovation research has evolved from a focus on competitiveness and entrepreneurship toward a broader integration of sustainability and advanced digital technologies. This study contributes to the literature by providing a comprehensive overview of the development, collaboration patterns, and thematic evolution of agribusiness innovation research and offers valuable insights for researchers, policymakers, and practitioners seeking to advance innovation-driven and sustainable agricultural systems.

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1. INTRODUCTION

Agribusiness has emerged as one of the most critical sectors that can significantly help achieve food security goals and support economic development across the globe. In today's era, when agriculture is increasingly facing many challenges associated with rising population levels, climate change, resource scarcity, and changing consumer demands, innovation in agribusiness has become even more important [1]. The scope of innovation in agribusiness is quite wide-ranging, which includes the use of technological innovations for agriculture, digital technology in farming operations, sustainable production practices, the development of value-added products, logistics improvements, and other business model innovations. Innovations are important not only because of their positive contribution towards agricultural productivity, but also due to their role in increasing efficiencies and making agribusiness systems competitive and sustainable [2], [3]. Over the last few years, agribusiness innovation has increasingly attracted attention among scholars and policy makers, as well as industry professionals who seek ways to address the challenges associated with agricultural production and development. Hence, there has been a substantial increase in the number of academic papers that discuss innovation in agribusiness sector during the last decade [4].

Moreover, rapid advancements in digital technologies have spurred innovations in agribusiness. Digital technologies like artificial intelligence (AI), Internet of Things (IoT), big data analytics, blockchain technology, remote sensing, drones, and precision agriculture techniques have revolutionized conventional agricultural practices through data and efficiency [5]. These technological advancements have helped farms and agribusiness companies maximize resource allocation, enhance their decision-making procedures, minimize production costs, and elevate the quality of their products. At the same time, the rise in environmental consciousness and concerns about sustainable development has led to the adoption of climate-smart agriculture practices and eco-friendly production methods. Thus, agribusiness innovation research has become a multidisciplinary area that combines technological, economic, environmental, and sociological dimensions. Consequently, a wide range of literature is available on the topic including agricultural sciences, business administration, economics, sustainable development, information technology, and innovation management. Although multidisciplinarity is a strength in the current context, it presents some challenges in analyzing the field's development, structure, and future direction [5].

The last decade and a half has seen the emergence of a considerable number of scientific papers published on topics related to innovations in the agribusiness sector in international periodicals indexed in relevant databases. Scholars from many countries have been focusing on issues including entrepreneurship in agriculture, digital agriculture, sustainability in food production, value chains in agriculture, innovation diffusion, smart farming, agricultural technology start-ups, and rural development [6], [7]. The growing number of scientific investigations in the area creates a complicated and fragmented body of knowledge that might be hard to consolidate via conventional review procedures. Traditional review techniques tend to use arbitrary selection criteria, making it challenging to grasp large-scale patterns of publication activities, collaborations between researchers, prominent authors, emergent trends, and intellectual structure in the field under investigation. Bibliometric analysis represents an objective method for analyzing scientific literature based on an assessment of publication activities, citations, collaborations between scholars, and thematic dynamics. Through bibliometrics, it is possible to determine the authors with the greatest productivity in the area, influential institutions, leading countries, reputable journals, and predominant research areas in a certain sphere of knowledge.

Although the increasing interest of researchers into innovations in agribusiness cannot be denied, bibliometric analysis

related exclusively to this field seems to be still quite rare. The majority of previous studies have rather been devoted to particular areas of innovation within agribusiness like precision agriculture, innovation of technology adoption in the agriculture sector, innovation in food supply chain management, sustainable agriculture practices, and innovation in digital farming systems. While these studies present valuable information and results, it should be noted that they do not give a general overview of agribusiness innovation as a separate research field. In addition, owing to the fact that numerous innovations related to sustainability practices and technologies emerge constantly, it becomes increasingly essential to analyze how the intellectual structure of research in agribusiness innovation has changed over the years. Bibliometric analysis conducted within the timeframe of 2010–2024 is especially relevant in view of current developments related to digitalization and Industry 4.0 technologies, sustainability goals, smart agriculture, and innovation-oriented agriculture policies.

Thus, this paper is intended to carry out a bibliometric analysis of the research on agribusiness innovation published in the Scopus database for the period from 2010 to 2024. First and foremost, this paper seeks to analyze the trends in publications' dynamics, find the most productive researchers, institutions, countries, and journals, study patterns of scientific cooperation, and analyze how the themes of research on agribusiness innovation have evolved. Through the use of bibliometric analysis and science mapping, this paper will provide an exhaustive assessment of the intellectual structure of research and its knowledge generation. Moreover, this research will add to the literature on agribusiness innovation by providing a detailed analysis of trends in global research as well as highlighting themes that can be studied further. Finally, the results of this paper could become an informative resource for academic scholars, policymakers, industry representatives, and development agencies in their efforts to foster innovative growth and sustainability in the area of agribusiness.

2. METHODS

The present study utilized bibliometric analysis as an analytical technique to examine the evolution of literature on agribusiness innovation during the period from 2010 to 2024. Bibliometric analysis refers to a systematic quantitative approach to evaluate the scientific literature in relation to bibliographic information about the publications as well as citations, thus facilitating the identification of patterns, trends, and structures inherent in the area of study. Scopus database was chosen as the source of bibliometric data because of its comprehensive content of scholarly peer-reviewed journals and common usage in bibliometrics. Retrieval of relevant records was performed in January 2025 by means of searching for a combination of keywords associated with the topic of interest such as "agribusiness innovation," "agricultural innovation," "innovation in agribusiness," and other variations. Publications from 2010 to 2024 only were included into the dataset.

The bibliographic data contained such information as the titles of publications, authors, affiliations, abstracts, keywords, journal titles, references, citation numbers, and dates of publications. The extracted data was exported into the CSV format from Scopus and then used for further analysis. In the process, we made use of descriptive bibliometric indicators in order to study annual growth trends, types of documents, citations, leading authors, prolific organizations, key journals, and the contributions of countries. We also applied indicators based on citations to measure the scientific impact of publications and determine the most influential papers within the field.

In order to portray the structural framework and development of the theme, the science mapping method has been applied with the use of the tool VOSviewer. The network analysis methods employed include co-authorship analysis for studying researcher collaboration trends, co-citation

analysis for discovering the key sources of knowledge, and keyword co-occurrence analysis for finding out dominant themes. Furthermore, the overlay visualization has been used for detecting shifts in the themes studied over time, and the density visualization has helped uncover highly studied areas. The application of both bibliometric performance assessment and science mapping methods has facilitated a holistic perception of agribusiness innovation research evolution during the period from 2010 to 2024.

3. RESULT AND DISCUSSION

3.1 Co-Author Analysis

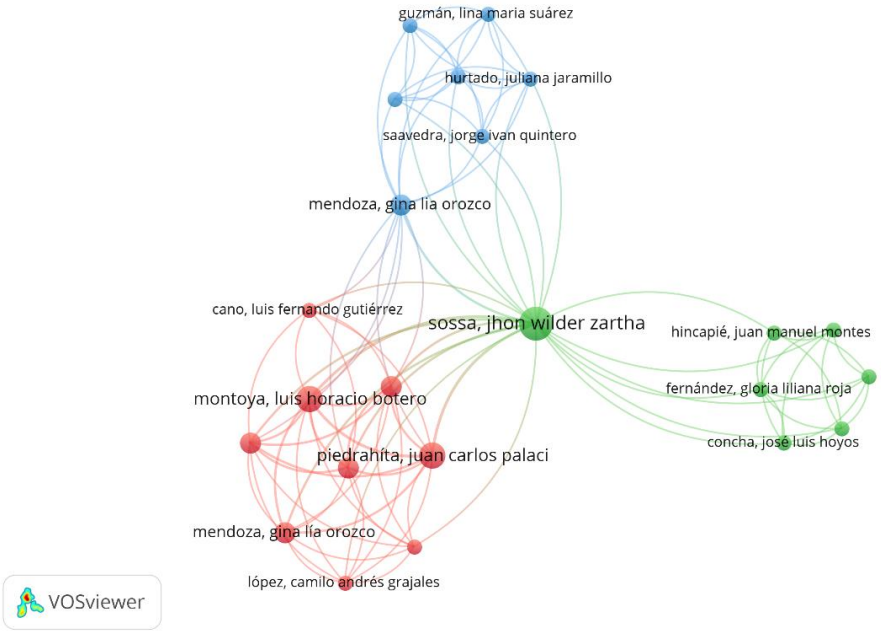

Figure 1. Author Visualization

Source: Data Analysis

The author co-authorship network visualization reveals a collaborative research structure in agribusiness innovation characterized by three major author clusters. The green cluster is centered on Sossa, Jhon Wilder Zartha, who appears as the most influential and highly connected author in the network. This author serves as a bridge connecting researchers from different clusters, indicating a central role in knowledge dissemination and interdisciplinary collaboration. The red cluster consists of authors such as Montoya, Luis Horacio Botero, Piedrahita, Juan Carlos Palaci, and López, Camilo Andrés Grajales, who demonstrate strong internal collaboration and frequent co-authorship relationships. Meanwhile, the blue cluster includes researchers such as Guzmán, Lina María Suárez, Hurtado, Juliana Jaramillo, Saavedra, Jorge Iván Quintero, and Mendoza, Gina Lía Orozco, who form another closely connected research group. The presence of distinct clusters indicates the existence of specialized research communities within the agribusiness innovation field, while the links between clusters suggest active knowledge exchange across research groups.

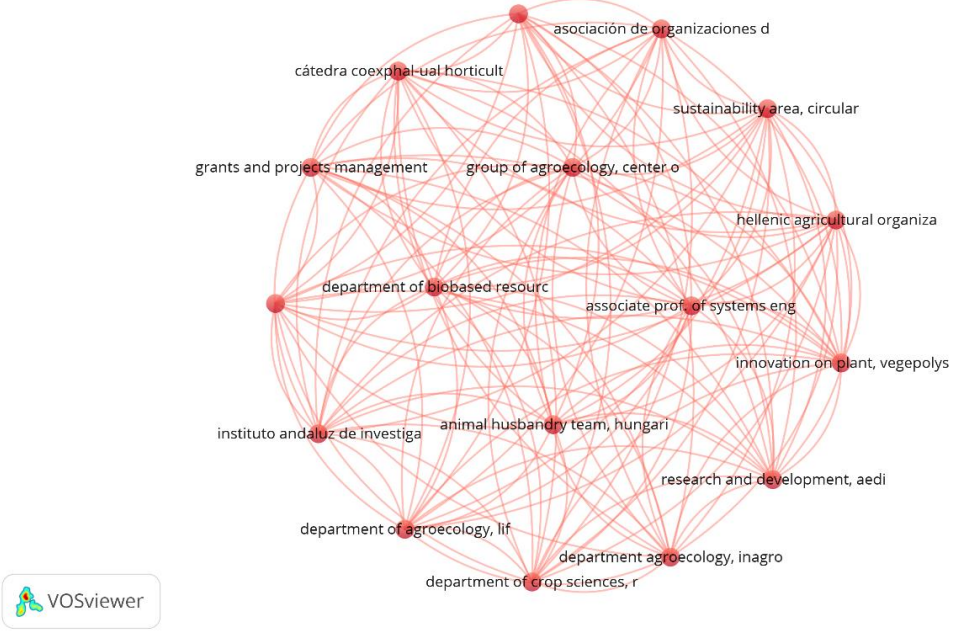

Figure 2. Institution Visualization
Source: Data Analysis

The organizational collaboration network illustrates a highly interconnected research community within the field of agribusiness innovation. Unlike fragmented collaboration structures, this visualization shows a single dominant cluster in which nearly all institutions are linked through extensive cooperative relationships. Organizations such as Department of Agroecology, Department of Crop Sciences, Department of Biobased Resources, Group of Agroecology, Innovation in Plant (Vegepolys), and the Hellenic Agricultural Organization occupy prominent positions within the network, indicating their significant contribution to research production and collaboration activities. The dense web of connections suggests frequent joint research projects, co-authored publications, and knowledge exchange among universities, research centers, agricultural organizations, and innovation agencies. Furthermore, the absence of isolated clusters indicates that agribusiness innovation research is characterized by strong institutional integration and multidisciplinary cooperation. This collaborative structure reflects the complex nature of agribusiness challenges, which require expertise from agricultural science, sustainability, innovation management, agroecology, and rural development.

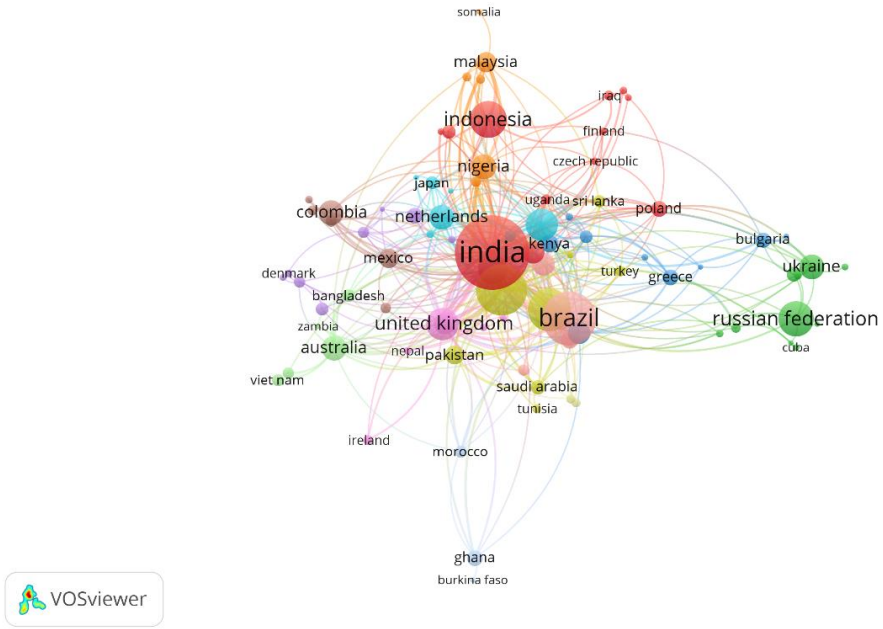

Figure 3. Country Visualization

Source: Data Analysis

This country collaboration network shows that agribusiness innovation research is conducted by an internationally connected community of scientists. In particular, it can be noticed that India is the most important country in terms of conducting research and establishing collaborations in agribusiness innovation. This can be seen from its biggest node size and from its linkages with many other countries through many clusters. This means that India takes an essential role in global knowledge creation and international research cooperation in this field. Apart from India, there are other developed and developing nations that have been actively involved in conducting research on agribusiness innovation and have acted as major hubs within their corresponding clusters. These nations include Brazil, Indonesia, the United Kingdom, the Russian Federation, and the Netherlands. It can be seen from the network that there is great participation from both developed and developing countries in research in agribusiness innovation. It is due to the fact that this research topic has become very relevant in today's world because of issues of food security, productivity, and sustainability among others.

3.2 Citation Analysis

Table 1. Top Cited Literature

Citations	Authors and Year	Title
233	[8]	Who drives the digital revolution in agriculture? A review of supply-side trends, players and challenges
187	[9]	The ethics of big data in big agriculture
157	[10]	The digital divide: Implications for agribusiness and entrepreneurship. Lessons from Wales
156	[11]	Analysis of Corporate Social Responsibility in Spanish Agribusiness and Its Influence on Innovation and Performance
150	[12]	Mechanization in Ghana: Emerging demand, and the search for alternative supply models
138	[13]	Intellectual capital and firm performance in the global agribusiness industry: The moderating role of human capital

134	[14]	How does artificial intelligence affect the environmental performance of organizations? The role of green innovation and green culture
104	[15]	The role of green process innovation translating green entrepreneurial orientation and proactive sustainability strategy into environmental performance
102	[16]	A bibliometric and thematic approach to agriculture 4.0
99	[17]	Cleaner production and eco-efficiency initiatives in Western Australia 1996-2004

Source: Scopus 2026

Table 1 shows that the most cited literature on agribusiness innovation is strongly dominated by digital transformation, sustainability, and technology adoption themes. The highest-cited work by, [8] indicates that the digital revolution in agriculture has become a central research concern, particularly regarding supply-side actors, innovation drivers, and implementation challenges. This focus is reinforced by studies on big data ethics, the digital divide, agriculture 4.0, and artificial intelligence, showing that agribusiness innovation is increasingly shaped by digital technologies. At the same time, several highly cited works address sustainability-related innovation, including corporate social responsibility, green innovation, environmental performance, cleaner production, and eco-efficiency. Other influential studies highlight mechanization, intellectual capital, entrepreneurship, and firm performance, suggesting that agribusiness innovation is not limited to technology but also involves organizational capability, human capital, and business strategy.

3.3 Keyword Co-Occurrence

The keyword co-occurrence network reveals the intellectual structure of agribusiness innovation research and highlights the major themes that have shaped the field during the 2010–2024 period. The largest and most central keywords are “agribusiness,” “innovation,” “agriculture,” and “sustainable development,” indicating that these concepts form the core foundation of the research domain. Their central position and extensive connections with other keywords suggest that agribusiness innovation is a highly interdisciplinary field that integrates technological advancement, economic performance, sustainability objectives, and agricultural development. The dense interconnections among keywords further demonstrate the maturity of the research area, where multiple topics are increasingly examined within integrated conceptual frameworks rather than as isolated issues.

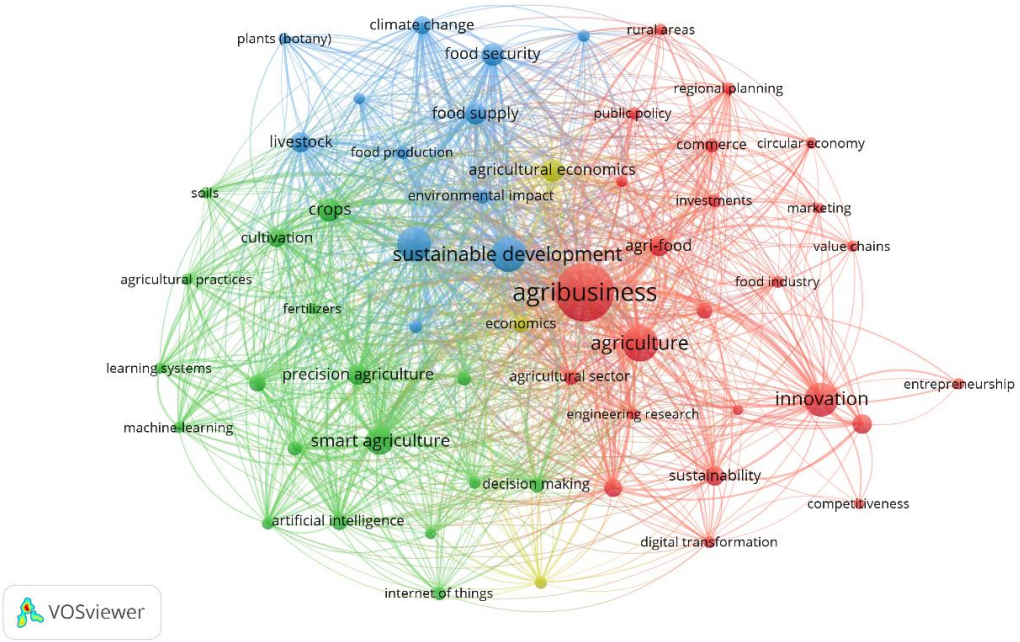

Figure 4. Network Visualization
Source: Data Analysis

For the red cluster, innovation management, agribusiness performance, entrepreneurship, and value chain formation can be said to be the areas of research most represented in this cluster of articles. Innovation, entrepreneurship, competitiveness, digital transformation, sustainability, food sector, value chains, marketing, investments, and circular economy are keywords, suggesting that scholars have invested a lot of effort studying how innovation helps boost business competitiveness and performance in the field of agribusiness. This cluster shows the trend that agribusiness innovations do not only relate to production but also involve management strategies, marketing efforts, and sustainable practices.

For the green cluster, it can be observed that technological and precision agriculture aspects are prominent in the set. Key words for this cluster include smart agriculture, precision agriculture, artificial intelligence, machine learning, Internet of things, decision-making, fertilizers, soils, and cultivation. It is quite clear from this cluster that there is an evident use of Industry 4.0 technologies within agricultural systems, as is implied in this cluster. There is a strong correlation between the key words identified in this cluster, thereby indicating that there is a lot of work being done by researchers to improve productivity and effectiveness in the agricultural system through modern technology.

Blue cluster deals with sustainability and food security issues. Key terms like sustainable development, food security, food supply, food production, climate change, environmental effects, livestock, and plants (botany) point to the relationship between innovations in agriculture and the problems of global sustainability. Scientific works from the blue cluster discuss approaches to using innovations in agriculture in order to promote food availability and environmental preservation in conditions of climate change. The link between climate change and food security confirms the significance of sustainability issues as the driving force behind innovations in the field of agribusiness. Moreover, the presence of environmental and production subjects indicates an increased interest in innovation as a tool of sustainable development.

The keyword network indicates that agribusiness innovation research has evolved into a multidisciplinary field characterized by

the convergence of three dominant themes: technological innovation, sustainable development, and business competitiveness. Traditional agricultural topics such as crops, livestock, and food production remain important, but they are increasingly interconnected with emerging concepts such as artificial intelligence, smart agriculture, digital transformation, circular economy, and entrepreneurship. The network suggests that future research is likely to continue exploring the intersection between advanced technologies and sustainability-oriented innovations, particularly in addressing global challenges related to food security, climate change, resource efficiency, and the long-term resilience of agribusiness systems.

Overlay visualization helps understand the dynamics of the development of the research area of agribusiness innovation through an example of the development of topics researched in the area, where older topics (represented in blue and purple colors) have evolved into new areas (topics shown in green and yellow colors). The visualization clearly shows that agribusiness, agriculture, and sustainable development have been the dominant concepts in this research, and they form the basis for new research topics emerging from the same. This can be seen through their central positioning and numerous connections.

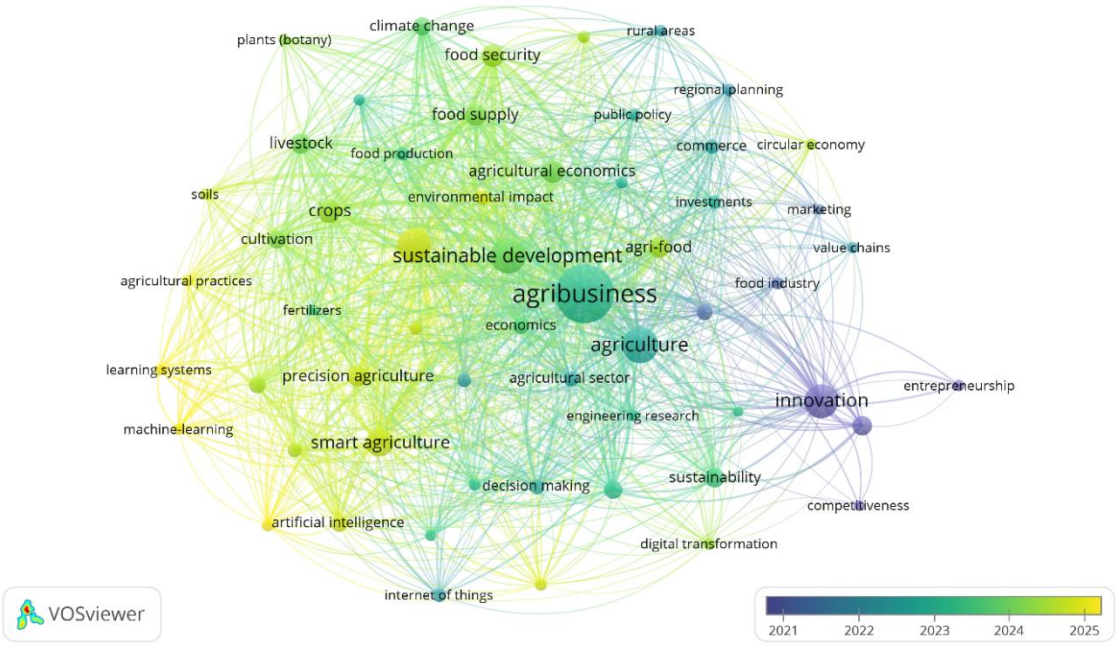

Figure 5. Overlay Visualization
Source: Data Analysis

The previous research themes denoted by blue and purple nodes centered around issues of innovation, entrepreneurship, competitiveness, value chains, marketing, and food sector related concepts. The above mentioned themes indicate the initial research concerns which involved improvement of agribusiness organizations by using organizational innovation, market competitiveness, and entrepreneurship. In this regard, researchers focused on exploring issues associated with improving agribusinesses using innovation to enhance their competitiveness in order to foster development in agriculture sectors. It appears that agribusiness innovation studies have started from business and management perspectives.

With the evolution of the domain, focus was placed on issues pertaining to sustainability more broadly. Sustainable development, food security, food production,

environmental effects, agriculture economics, and climate change are among the keywords highlighted in green, signifying their significance during the period from 2023 to 2024. This evolution is consistent with the notion that innovations within the agribusiness industry need to tackle global issues besides increased productivity and profitability. It is becoming common practice to investigate the impact of innovations within the agricultural industry on food security, environment sustainability, climate change, and economic profitability.

The latest and fastest-growing areas are highlighted by yellow nodes and include artificial intelligence, machine learning, precision agriculture, smart agriculture, learning systems, and agricultural technology. As these nodes reflect the emergence of new themes, they demonstrate that the industry is going through a major technological revolution with Industry 4.0 technologies. It can be said that experts have begun to research the potential use of intelligent systems, automation processes, prediction models, and other approaches that can increase agricultural efficiency and productivity. Finally, another interesting point here is that these technologies seem to be closely related to sustainable agriculture keywords.

The density visualization highlights the most intensively researched topics within the agribusiness innovation literature. Areas displayed in bright yellow and green indicate keywords with the highest frequency of occurrence and strongest connections to other topics. The keywords "agribusiness," "agriculture," "sustainable development," and "innovation" appear as the most prominent hotspots, demonstrating that these themes constitute the intellectual core of the field. Their central positions indicate that a large proportion of studies focus on understanding how innovation contributes to agricultural development while simultaneously addressing sustainability challenges. Closely related topics such as agri-food, agricultural economics, food security, and food supply also exhibit relatively high densities, suggesting that food system resilience and sustainable agricultural growth remain major priorities in contemporary agribusiness research.

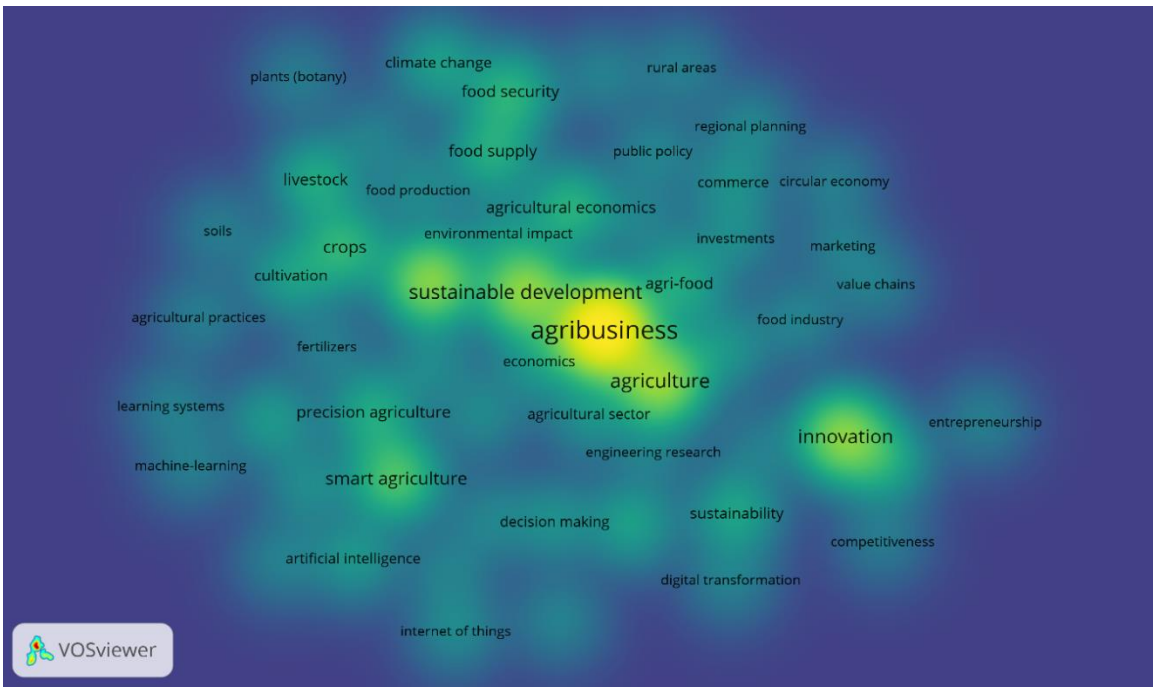

Figure 6. Density Visualization

Source: Data Analysis

In contrast, keywords such as artificial intelligence, machine learning, Internet of Things, digital transformation, smart agriculture, and precision agriculture

appear in lower-density areas, indicating that although these topics are gaining attention, they have not yet reached the same level of research maturity as the core themes. This pattern suggests that digital agriculture and Industry 4.0 technologies represent emerging frontiers within agribusiness innovation research. The visualization therefore reveals a field that remains strongly anchored in sustainability and agricultural development concerns while increasingly incorporating advanced technological solutions. As these digital technologies continue to evolve and become more widely adopted, they are likely to become more central themes in future agribusiness innovation studies.

4. CONCLUSION

This study concludes that agribusiness innovation research in Scopus publications from 2010 to 2024 has developed into a multidisciplinary field shaped by the intersection of agriculture, sustainability, digital transformation, and business competitiveness. The bibliometric findings show that the field is supported by active international collaboration, with several authors, institutions, and countries serving as important knowledge hubs. The most cited literature indicates that digital agriculture, big data, artificial intelligence, corporate social responsibility, green innovation, mechanization, and intellectual capital are central foundations of the research domain. Keyword analysis further reveals that agribusiness, agriculture, innovation, and sustainable development form the core intellectual structure, while emerging themes such as smart agriculture, precision agriculture, machine learning, Internet of Things, and digital transformation represent future research directions.

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