

Exploring Recent Trends in Agricultural Economics with a Focus on Agritech and Agribusiness

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ABSTRACT

This research presents a comprehensive bibliometric analysis of current trends in agricultural economics with a specific emphasis on agritech and agribusiness. Leveraging advanced bibliometric tools, the study explores co-authorship networks, citation patterns, and thematic clusters within the scholarly literature. Key findings highlight influential authors, seminal publications, and emerging themes. The analysis sheds light on the evolving landscape of agricultural economics, emphasizing the transformative influences of technology and evolving business models. The results contribute to a nuanced understanding of the interdisciplinary nature of agricultural economics, offering valuable insights for researchers, policymakers, and practitioners navigating the complexities of modern agriculture.

Keywords: Agricultural Economics, Agritech, Agribusiness, Bibliometric Analysis

1. INTRODUCTION

The relationship between agricultural economics and agritech is multifaceted and complex, with various studies exploring different aspects of this relationship. One aspect of this relationship is the impact of technology on the relationship between buyers and sellers of agricultural products [1]–[3]. For instance, the COVID-19 pandemic has led to changes in food distribution, which has impacted the relationship between buyers and sellers of agrifood products. The restrictions on distribution in supermarkets, open markets, and online markets have made it difficult for buyers to measure the quality of products, leading to problems related to information asymmetry and adverse selection [4].

Another aspect of this relationship is the impact of climate change on the agricultural sector. Climate change has been shown to have significant effects on animal production, which is responsible for 18% of greenhouse gas emissions measured in CO₂ equivalents. The effects of climate change on animal production include a decrease in the quantity and quality of production, an increase in sensitivity to diseases and pests, changes in the reproductive cycle, losses at birth, and a decrease in feed efficiency [5].

The relationship between agricultural economics and agritech also extends to the field of education. The teaching approaches employed in secondary school agriculture should be able to develop skills of students on the aspects of food production, its accessibility, food safety, and nutrition as well as production economics. This study investigates the relationship between the agricultural teaching approaches employed in secondary schools and food security in Kenya [6]. Furthermore, the relationship between agricultural economics and agritech is also evident in the field of information economics. Concerned with improving the circulation of information on agricultural markets, agricultural economists analyzed the relationship between agents' information and the behavior of prices on agricultural commodity exchanges, thus anticipating modern debates on informational efficiency [7].

Lastly, the relationship between financial factors, technology adoption, and economic well-being in the agricultural context has also been explored. The study found that financial factors such as financial knowledge and behavior have a direct impact on economic well-being. Moreover, technology adoption was found to have a significant mediating effect between financial factors and economic well-being [8].

Precision farming, characterized by the use of cutting-edge technologies, has been shown to have significant economic implications. For instance, larger farms have been found to have higher resilience to external factors due to economies of scale. The certainty of obtaining additional benefits with GPS guidance systems can explain the higher adoption rates in farming practice, even though the additional benefits per hectare and year are much lower for this technology than for variable-rate technologies [9].

Data-driven decision-making is another critical aspect of agritech. The emergence and widespread adoption of digital technologies have reshaped the landscape of agriculture extension services, fostering increased efficiency, accessibility, and sustainability [2], [10]. These technologies have enabled real-time communication, data-driven decision-making, and access to a vast repository of agricultural information [11]. Social media platforms also play a significant role in disseminating information about agritech and influencing attitudes towards technology adoption in agriculture [12].

The relationship between buyers and sellers of agricultural products is another critical aspect of agricultural economics. Changes in food distribution, such as those caused by COVID-19, can impact this relationship, especially when considering information asymmetry and adverse selection [4]. Climate change also has significant implications for agricultural economics. For instance, animal production is responsible for 18% of greenhouse gas emissions measured in CO₂ equivalents. The effects of climate change on animal production can include a decrease in the quantity and quality of production, an increase in sensitivity to diseases and pests, changes in the reproductive cycle, losses at birth, and a decrease in feed efficiency [5].

With an emphasis on agribusiness and agritech, this study undertakes a thorough investigation of current trends in agricultural economics in light of these advancements. The main goal is to carry out a thorough bibliometric analysis that characterizes the academic environment in this ever-changing topic in quantitative terms. In order to give scholars, decision-makers, and practitioners a more nuanced understanding of the development of agricultural economics, this study aims to identify important themes, significant writers, and developing fields.

The research holds significance as it has the ability to clarify the complex interactions of technology, commercial tactics, and agricultural economics. In order to design resilient and sustainable agricultural systems, it is critical to comprehend the characteristics of agritech and agribusiness as global concerns like climate change, resource scarcity, and food security become more pressing. This study intends to make a contribution to the policy and practical areas of agricultural practices by using a bibliometric lens in addition to the academic discourse.

2. LITERATURE REVIEW

2.1 The Landscape of Agricultural Economics

Agricultural economics is a complex field that intersects with various aspects such as technology adoption, financial factors, business strategies, and regional trade agreements. One

aspect of agricultural economics is the relationship between financial factors and technology adoption in agriculture. A study conducted among Sri Lankan coconut growers found that financial knowledge and behavior directly influenced economic well-being. Moreover, the adoption of agricultural technology was found to mediate the relationship between financial factors and economic well-being. This study suggests that improving financial knowledge and behavior can enhance technology adoption and, consequently, economic well-being in the agricultural sector [8].

Another aspect is the role of effective communication strategies in promoting profitable agribusiness. For instance, the communication of technologies needs to be timely and accurate for farmers to adopt them and achieve the desired yield. This involves coordinating the functions of research, extension, media, and local farmers to ensure the correct and understandable transmission of information [13]. Regional trade agreements also have implications for agricultural technology and productivity. These agreements can induce adjustments in agricultural technology and productivity in both importing and exporting countries, leading to changes and redistributions in the benefits and losses from the agreements [14].

Access to credit is another crucial factor in agricultural economics. It has been found to boost the adoption of technologies to improve agricultural production. A study in Kenya revealed a moderate, positive correlation between access to credit and the use of Information and Communication Technology (ICT) tools in agricultural extension services [15]. Lastly, the development of competent youths in integrated agriculture through local wisdom is another strategy being explored. This involves training and mentoring young people in efficient technologies developed by professional agricultural experts, such as organic cultivation, diversified farming, and post-harvest processing [16].

2.2 Technological Trends in Agriculture

The fusion of technology with agriculture, often encapsulated by the term agritech, has been a subject of growing interest in the literature. Scholars have examined the impacts of precision agriculture, the integration of sensors and data analytics, and the role of digital technologies in shaping modern farming practices [17]. The literature reflects a consensus that technology has the potential not only to enhance productivity but also to address sustainability challenges by optimizing resource use and mitigating environmental impacts [18],[19],[20].

2.3 Evolving Agribusiness Models

The domain of agribusiness, representing the business of agricultural production from farm to fork, has experienced significant evolution. Previous research has delved into the restructuring of supply chains, the rise of sustainable and organic farming practices, and the implications of changing consumer preferences on agribusiness models. Understanding these shifts is crucial for stakeholders across the agricultural value chain, as they navigate market dynamics, risk factors, and opportunities [21], [22], [23], [24].

2.4 Knowledge Gaps and Emerging Research Themes

Despite the richness of existing literature, there are discernible knowledge gaps that necessitate further exploration. Rapid advancements in technology and evolving business models in agriculture suggest that emerging themes may not be fully captured by earlier studies. This research

aims to bridge these gaps by offering a contemporary analysis of the latest trends and developments in agricultural economics, focusing on the transformative influences of agritech and agribusiness.

3. METHODS

The methodology used in this research involved a systematic and comprehensive approach to collecting data from reputable databases known for their wide coverage of agricultural economics literature. The selected databases include Google Scholar. To obtain relevant articles, a well-constructed search string was developed, which included keywords and phrases related to agricultural economics, agritech, and agribusiness. The search string was designed to be broad enough to capture the diverse literature in these fields while being specific enough to filter out unrelated content. Boolean operators and truncation were strategically used to refine the search and improve precision. This process involved the assistance of the Publish or Perish (PoP) software accessed on August 12, 2023, table 1 describes how the data metrics of this study.

Table 1. Metrics Data

Publication years	: 1919-2023
Citation years	: 104 (1919-2023)
Paper	: 930
Citations	: 166567
Cites/year	: 1601.61
Cites/paper	: 197.10
Cites/author	: 92074.17
Papers/author	: 481.02
Author/paper	: 2.43
h-index	: 221
g-index	: 336
hI,norm	: 146
hI,annual	: 1.40
hA-index	: 39
Papers with ACC	: 1,2,5,10,20:928,906,708,367,116

Source: PoP (2023)

Data Analysis Technique:

VOSviewer, a widely used bibliometric analysis tool, was used to visualize and analyze co-authorship networks, citation patterns, and keyword associations in the selected literature. The tool generates a visual representation of the collaboration network, highlighting influential authors, institutions, and thematic groups. Keyword co-occurrence is depicted to reveal themes and relationships prevalent in the literature.

4. RESULTS AND DISCUSSION

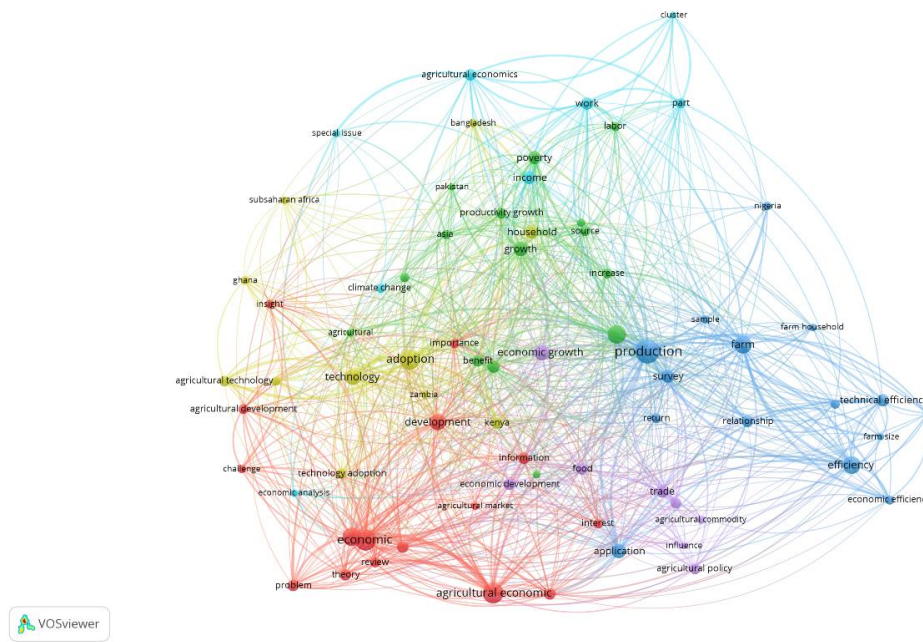


Figure 1. Mapping Results by Vosviewers

The juxtaposition of agritechnology and agribusiness in the bibliometric analysis suggests a rich intersection between these two domains as seen in figure 1 collectively illustrating the dynamic synergy between technological advances and evolving business strategies within the agricultural sector.

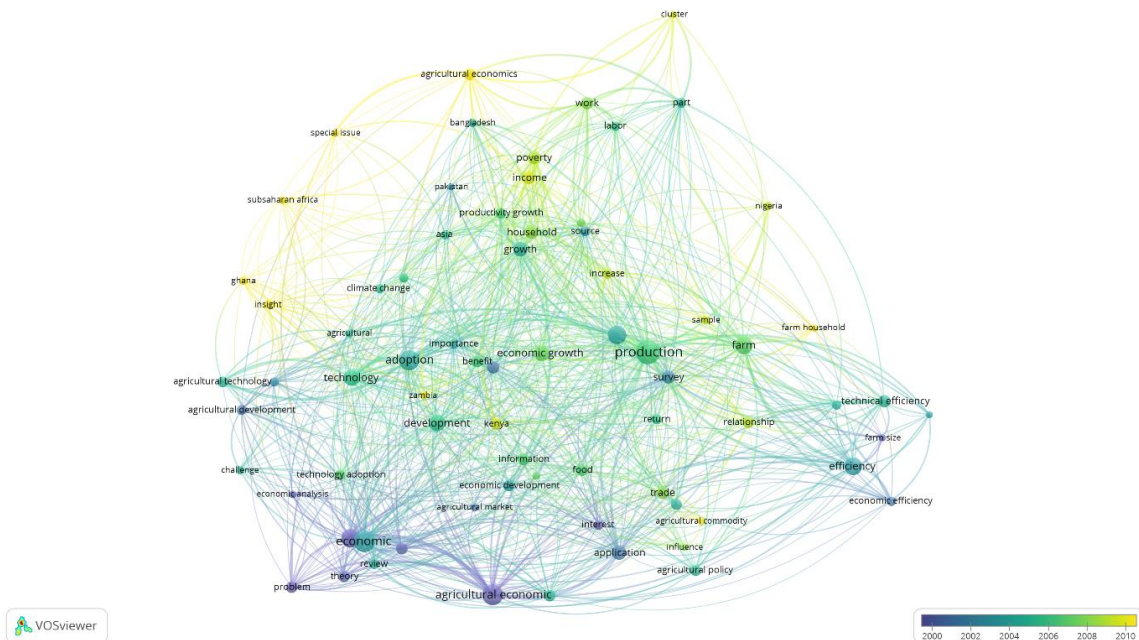


Figure 2. Trend Research

The results of the bibliometric analysis contribute a multifaceted understanding of the current trends in agricultural economics, agritech, and agribusiness. These insights offer a valuable

resource for researchers, policymakers, and practitioners seeking to navigate the complexities of modern agriculture and inform strategic decisions in the pursuit of sustainable and technologically advanced agricultural systems.

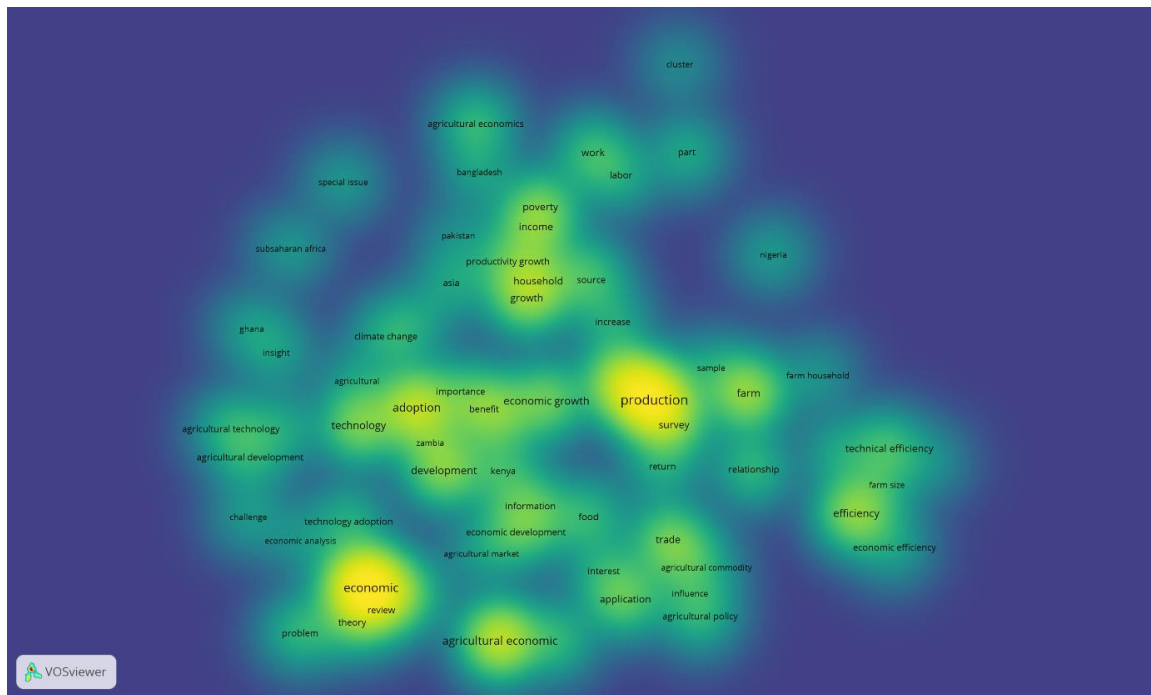


Figure 3. Clusters Mapping

Figure 3 above shows how the cluster mapping is formed and more details in table 2.

Table 2. Cluster Identity

Cluster	Total Items	Most frequent keywords (occurrences)	Keyword
1	12	Agricultural (20), technology (25), sustainability (15)	Adoption, agricultural, agricultural research, agricultural technology, benefit, consumer, economic impact, information, return, sustainability, technology, technology adoption
2	8	Food (20), household (25), structure (15)	Agricultural commodity, food, household, income, interest, poverty, price, structure
3	6	Agricultural policy (20), efficiency (25), Production (15)	Agricultural policy, economic efficiency, efficiency, farm household, production, technical efficiency
4	5	Agricultural economic (20), Development (15)	Agricultural economic, agricultural economist, development, economic, problem
5	5	Economic growth (20)	Agricultural development, economic development, economic growth, importance, productivity growth
6	5	Climate change (20)	Agricultural economics, agricultural market, climate change, economic analysis, special issue

The identified clusters within the bibliometric analysis provide a nuanced understanding of the diverse themes within agricultural economics, agritech, and agribusiness. These clusters not only reflect the current state of scholarly discourse but also offer a roadmap for researchers, policymakers, and practitioners to navigate key issues in the field. The interplay of technology, sustainability, market structures, policy frameworks, and environmental considerations underscores the multifaceted nature of contemporary agricultural economics. Further research and exploration within these clusters promise to deepen our understanding of these critical issues and contribute to the development of sustainable and resilient agricultural systems

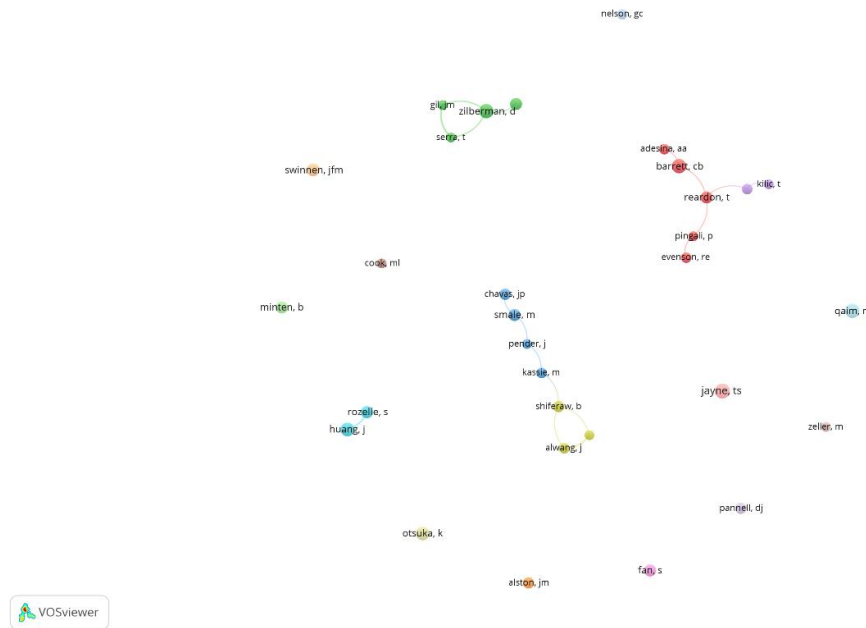


Figure 4. Author’s Collaboration

The co-authorship network analysis reveals the collaborative dynamics within the academic community studying agricultural economics, agritech, and agribusiness. Prolific authors emerge as central nodes, indicative of their significant contributions and collaborative networks. Understanding these networks not only sheds light on the intellectual fabric of the field but also identifies key players driving research in these domains.

Table 3. Citations Analys

Citations	Authors and year	Title
1786	[25]	Under the hood issues in the specification and interpretation of spatial regression models
1681	[26]	The future of US agricultural cooperatives: A neo-institutional approach
1298	[27]	Frontier production functions and technical efficiency: a survey of empirical applications in agricultural economics
1296	[28]	Tecnology characteristics, farmers’ perceptions and adoption decisions: A Tobit model application in Sierra Leone

Citations	Authors and year	Title
1280	[29]	Agricultural production economics
1270	[30]	Implications of higher global food prices for poverty in low-income countries ¹
1268	[31]	Dial "A" for agriculture: a review of information and communication technologies for agricultural extension in developing countries
1261	[32]	How does gender affect the adoption of agricultural innovations? The case of improved maize technology in Ghana
1252	[33]	Farmers' perceptions and adoption of new agricultural technology: evidence from analysis in Burkina Faso and Guinea, West Africa
1240	[34]	The agricultural innovation process: research and technology adoption in a changing agricultural sector

Table 3 presents a citation analysis of seminal works in agricultural economics, highlighting influential authors and their respective publications. These highly cited works have significantly shaped the discourse within the field, reflecting their impact on research, policy, and agricultural practices. The highly cited works in this analysis span a spectrum of topics within agricultural economics, reflecting the interdisciplinary nature of the field. These seminal publications have significantly contributed to shaping research agendas, guiding policy decisions, and informing agricultural practices. The diversity of topics, from spatial regression models to technology adoption and gender dynamics, highlights the multifaceted nature of agricultural economics and the need for a holistic understanding of the factors influencing agricultural systems. Researchers, policymakers, and practitioners can benefit from engaging with these influential works to gain insights into key issues and challenges within the agricultural domain.

Table 4. Keywords Analysis

Most occurrences		Fewer occurrences	
Occurrences	Term	Occurrences	Term
128	Production	23	Technology adoption
94	Economic	20	Agricultural development
90	Agricultural economic	19	Sustainability
83	Adoption	19	Importance
73	Price	18	Climate change
72	Agricultural economist	18	Economic impact
64	Efficiency	17	Economic efficiency
56	Development	17	Interest
54	Technology	14	Special issue
48	Economic growth	14	Agricultural market
38	Income	13	Agricultural commodity
37	Household	13	Farm household
35	Poverty	13	Consumer
33	Agricultural research	13	Agricultural

32	Technical efficiency	12	Economic analysis
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Table 4 provides a comprehensive analysis of keywords in agricultural economics literature, highlighting the most frequently occurring terms and those with fewer occurrences. The distribution of keywords reflects the diversity of topics and themes within the field.

Most Occurrences:

The high frequency of the term "Production" underscores its central role in agricultural economics research. This keyword likely encompasses a broad spectrum, including studies on crop production, livestock management, and overall agricultural output. Understanding production dynamics is fundamental to addressing issues related to food security, resource allocation, and efficiency in agricultural systems. The prominence of the term "Economic" emphasizes the economic underpinnings of agricultural research. This keyword likely encompasses studies exploring the economic aspects of agricultural practices, market dynamics, and policy implications. The economic lens is crucial for assessing the viability and sustainability of agricultural systems.

The term "Agricultural Economic" indicates a focus on the economic dimensions specific to agriculture. This keyword likely includes research on economic theories applied to agriculture, resource allocation in farming, and the economic implications of agricultural policies. Understanding the economic intricacies of agriculture is vital for formulating effective policies and strategies. The high frequency of the term "Adoption" reflects a significant interest in the adoption of technologies, practices, and innovations in agriculture. This keyword likely encompasses studies exploring the factors influencing the adoption of new technologies by farmers, with implications for efficiency, productivity, and sustainability. The term "Price" signifies a focus on market dynamics and pricing mechanisms within agricultural economics. Research under this keyword may explore factors influencing agricultural commodity prices, market structures, and the economic implications of price fluctuations on farmers and consumers.

The term "Agricultural Economist" indicates a specific focus on professionals within the field of agricultural economics. This keyword likely includes studies related to the role, responsibilities, and contributions of agricultural economists in academia, research institutions, and policy organizations. The term "Efficiency" highlights the importance of optimizing resource use and maximizing output within agricultural systems. Research under this keyword may explore technical efficiency, allocative efficiency, and overall efficiency in agricultural production processes.

The term "Development" suggests a broader focus on the development aspects within agricultural economics. This keyword likely encompasses studies related to economic development, rural development, and the role of agriculture in fostering broader socio-economic development. The term "Technology" reflects the growing importance of technological advancements in agricultural practices. Research under this keyword may cover a wide range of topics, including precision farming, digital agriculture, and the impact of technology on overall agricultural productivity. The term "Economic Growth" underscores the link between agriculture and overall economic development. Research under this keyword may explore how agricultural activities contribute to economic growth, especially in the context of developing regions.

Fewer Occurrences:

"Technology Adoption," while related to the broader term "Adoption," suggests a more specific focus on the adoption of technological innovations in agriculture. This keyword likely includes studies examining the factors influencing farmers' decisions to adopt specific technologies. "Agricultural Development" signifies a focus on the broader developmental aspects within agriculture. Research under this keyword may explore strategies, policies, and interventions aimed at fostering sustainable and inclusive agricultural development. "Sustainability" reflects a growing concern for environmentally sustainable practices within agriculture. Research under this keyword may cover topics such as sustainable farming methods, conservation practices, and the environmental impact of agricultural activities.

"Importance" suggests a broad category that may encompass studies addressing the overall significance of agriculture in various contexts. This keyword may include research on the societal, economic, and environmental importance of agricultural practices. "Climate Change" indicates a specific focus on the impact of climate change on agriculture. Research under this keyword may explore strategies for adapting agriculture to changing climate conditions and mitigating the environmental effects of farming practices. "Economic Impact" suggests a focus on assessing the economic consequences of various factors within agriculture. Research under this keyword may include studies examining the economic impact of policies, technologies, and external shocks on agricultural systems. "Economic Efficiency" highlights a specific focus on efficiency within the economic dimensions of agriculture. Research under this keyword may explore methods for improving economic efficiency in resource allocation.

"Interest" suggests a category related to the motivations and preferences of various stakeholders within agricultural economics. Research under this keyword may explore factors influencing interest in agricultural practices, innovations, or market trends. "Special Issue" likely refers to a specific category of publications within the field of agricultural economics. This keyword may include studies published in special issues of journals, which may focus on particular themes, methodologies, or emerging trends. "Agricultural Market" underscores a focus on market dynamics specific to the agricultural sector. Research under this keyword may explore issues related to market structures, competition, and the functioning of agricultural markets.

The diversity in the occurrences of keywords reflects the multifaceted nature of agricultural economics. While certain terms like "Production" and "Economic" remain central, emerging themes such as "Sustainability" and "Technology Adoption" signal the evolving priorities within the field. This analysis provides valuable insights for researchers, policymakers, and practitioners, guiding them toward critical areas of focus and interdisciplinary collaboration within the ever-evolving landscape of agricultural economics.

Implications

The implications of this bibliometric analysis are manifold. Firstly, the identification of influential authors and collaborative clusters provides a roadmap for researchers, guiding them toward collaborative opportunities and potential mentors. Secondly, the insights into citation patterns offer a curated list of seminal works, guiding scholars in building foundational knowledge. Thirdly, the thematic clusters underscore the diversity of research within agricultural economics, informing the development of interdisciplinary approaches. Policymakers can leverage the identified seminal publications to inform evidence-based policy decisions, while practitioners can

draw on emerging trends to enhance the sustainability and efficiency of agricultural practices. Overall, this analysis serves as a valuable resource for stakeholders across the agricultural value chain, facilitating informed decision-making and strategic planning.

5. CONCLUSION

In conclusion, this bibliometric analysis illuminates the dynamic and interdisciplinary nature of agricultural economics. The co-authorship networks, citation patterns, and thematic clusters collectively depict a vibrant landscape marked by collaboration, influential works, and emerging trends. The fusion of agritech and agribusiness is evident, reflecting the industry's response to technological advancements and evolving market dynamics. The identified influential authors and seminal publications serve as cornerstones for future research endeavors. The study's findings contribute to the ongoing dialogue within agricultural economics, providing a timely and insightful snapshot of the field's current state. As agriculture continues to face unprecedented challenges and opportunities, this analysis offers a valuable compass for navigating the complexities of the modern agricultural landscape.

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