Bibliometric Analysis of the Impact of Government Policies on Sustainable Agriculture Business in the Context of Sustainability

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ABSTRACT

This paper conducts a comprehensive bibliometric analysis to explore the evolving landscape of sustainable agriculture business in the context of government policies. The study delves into the multifaceted realm of agribusiness, examining its global significance, economic impacts, and the challenges it faces, particularly in the transition to Agriculture 4.0. The paper highlights the intricate relationship between government policies and the sustainability of agriculture businesses, addressing barriers, technological advancements, and the growing complexity of global agri-food systems. Notably, the implications for practitioners, policymakers, and researchers are elucidated, offering strategic insights for each stakeholder group. The research aims to answer three fundamental questions: the classification of existing research, identification of research trends, and the exploration of potential future research opportunities. Employing bibliometric techniques, the study presents a mapping of terms, overlay visualizations, and density visualizations to unravel the interconnectedness of research clusters and their temporal evolution. Additionally, the paper identifies the most highly cited articles and explores the thematic priorities within the discourse on sustainable agriculture and farm-related issues. Comparative analyses with previous studies in related domains contribute to a deeper understanding of the current research landscape. The findings provide actionable insights for practitioners, inform evidence-based policymaking, and guide future research endeavors in the dynamic field of sustainable agriculture business.

Keywords: Sustainable Agriculture Business, Agribusiness, Bibliometric Analysis

1. INTRODUCTION

Agriculture business, also known as agribusiness, refers to the entire sector that engages in the production, processing, and distribution of food and agricultural products [1]. It encompasses a wide range of organizations, including large corporations, small farmers, and non-profit organizations, all of which contribute to the agricultural economy. Agriculture is a crucial sector for economic growth, accounting for 4% of global GDP and more than 25% of GDP in some least developing countries [2]. Value-added agriculture can have a significant impact on income levels, where agriculture is often a major source of employment and income [3]. Among the world's very poor, subsistence farmers are especially vulnerable to the effects of weather and other supply shocks that affect both their individual and national economies [4]. Positive economic impacts caused by investments in the Brazilian national agribusiness sectors could have greater benefits for developing countries [5].

The challenge of agribusiness involves various barriers and obstacles, particularly in the transition to Agriculture 4.0. One of the main barriers is the need for knowledge and skilled operators, which requires significant investment in human resources [6]. Additionally, the agri-food sector is facing new and important challenges due to profound changes, leading to the need for the development of organizational and technological knowledge to ensure the rational use of natural resources and the protection of biodiversity [7]. Furthermore, the interconnectivity of the current

global agricultural market and unprecedented events such as droughts, supply chain disruptions, and geopolitical factors add to the strain on the agribusiness sector [8]. The entire agri-food sector is also facing grave sustainability challenges, especially with the growing global population, poverty, and hunger [9]. Sustainability poses a significant challenge for agribusiness, as the sector grapples with the need to meet the growing demand for food while minimizing its environmental impact.

The complexity of agribusiness makes it an interesting topic to research for several reasons such as it's e-commerce capability and business agility, global food systems, and the complex systems of agribusiness chains. Agribusinesses have to adapt to the rapidly changing environment, and e-commerce capability plays a pivotal role in their success [10]. The global food system has experienced significant growth in complexity since the mid-twentieth century, with innovations such as mechanization and genetic engineering. Understanding the indicators of complexity and over-complexification in these systems is crucial for ensuring sustainable food production [11]. Agribusiness chains encompass various biological, economic, social, health, and political variables at different scales, making them complex systems to analyze. The role of informality in their sustainability in small-scale societies is an area of interest for research [12].

The complexity and importance of this sector has also attracted the attention of governments both locally and globally. Agricultural support policies provide over $800 billion per year in transfers worldwide, encompassing a broad range of government instruments to support the agriculture sector. These policies are typically funded from taxpayers and consumers and include coupled subsidies, decoupled subsidies, and market-price support measures such as tariff and non-tariff barriers [13]. Governments have long been involved in supporting and influencing agricultural production, mainly to support farmer livelihoods and food security [14]. National-level policies and programs are an essential piece of the puzzle, as they interact with international agencies, local environmental conditions, and national and sub-national institutions [14].

Based on this complex complexity, this paper aims to be able to answer three main questions, namely (1) how is research related to the Impact of Government Policies on Sustainable Agriculture Business in the Context of Sustainability classified? (2) What are the research trends related to this topic? and What are the potential for future research related to this topic? By being able to answer these three research questions, this paper is able to contribute to complementing the existing literature related to the topic of government policies and agribusiness and is also able to serve as a guide for future researchers to research and fill the empty gaps between scientific mapping and research on this topic.

2. LITERATURE REVIEW

2.1 Sustainable Agriculture Business

Sustainability in agriculture refers to the ability of agricultural practices to meet the needs of the present without compromising the ability of future generations to meet their own needs [15]. It involves the integration of environmental, social, and economic factors in agricultural production systems [16]. Sustainable agriculture business focuses on practices that are environmentally friendly, socially responsible, and economically viable. It encompasses a range of strategies, tools, and technologies aimed at promoting the long-term health of ecosystems and communities. Research in this field covers topics such as controlled-environment food production, agribusiness sustainability, and the integration of

sustainable practices into agricultural management. For example, the study conducted by [17] discusses innovation systems for controlled-environment food production in urban contexts. while the study conducted by [18] explores private and public strategies for success in modern agri-food markets. The concept of sustainability is increasingly being incorporated into the agri-food sector, presenting new challenges and opportunities for agricultural businesses [7], [19].

Sustainable agricultural operations and farming practices can yield positive impacts on the environment, animals, and people, such as preserving and restoring critical habitats, protecting watersheds, improving soil health and water quality, and providing a viable livelihood option for a significant portion of the global population [20]. Government policies on sustainable agriculture business vary across the world, but they generally aim to promote sustainable food and agriculture (SFA) practices, conserve natural resources and biodiversity, and foster resilient livelihoods [21]. Government policies towards sustainable agribusiness have been explored through various studies and have produced many implicative suggestions. According to [21] Countries should adopt SFA approaches that promote resource conservation, natural resource and biodiversity conservation, and foster resilient livelihoods. Governments and regional entities should strengthen or establish evidence-based policies, investment plans, programs, and governance mechanisms for promoting productive and sustainable agriculture in a cross-integrated and participatory manner [21]. Many countries also are pledging significant funding to tackle greenhouse gas emissions and build resilience through more sustainable agriculture [22].

3. RESEARCH METHOD

This study's research technique entails a methodical collection of pertinent financial risk management literature. Large academic databases like Web of Science and Scopus will be searched in order to provide a thorough overview of current trends and significant contributions. To guarantee an emphasis on current advancements in the discipline, the search parameters were set to encompass the previous ten years. We will utilize keywords like "government policies", "agriculture business", "agribusiness", and "sustainable agribusiness" to find papers that are pertinent to our study goals. Scholarly publications, reviews, and conference papers that particularly deal with impact of government policies on sustainable agriculture business that were published within the allotted time frame with the aid of Publish or Perish (PoP) and Mendeley Desktop viewed on December 5, 2023 are included in the inclusion criteria.

Table 1. Research Data Metrics

Publication years	: 2009-2023
Citation years	: 14 (2009-2023)
Paper	: 980
Citations	: 151897
Cites/year	: 10849.79
Cites/paper	: 155.00
Cites/author	: 53112.69
Papers/author	: 374.02
Author/paper	: 3.26
h-index	: 163
g-index	: 369

hI,norm	: 98
hI,annual	: 7.00
hA-index	: 77
Papers with ACC	: 1,2,5,10,20:975,928,759,527,328

The table presents bibliometric data for a researcher or a scientific entity spanning the years 2009 to 2023. Over this period, a total of 980 papers have been published, accumulating an impressive 151,897 citations, resulting in a remarkable average of 155 citations per paper. The annual citation rate is substantial, with an average of 10,849.79 citations per year. The authorship profile indicates that there are 3.26 authors per paper, and each author has contributed to an average of 374.02 papers. The h-index, a widely recognized metric reflecting both productivity and impact, is notably high at 163. The g-index, another measure of research impact, is 369. The hI,norm value is 98, suggesting a consistently high level of impact over time. The hI,annual value is 7.00, indicating a sustained annual impact. The hA-index, representing the author's impact adjusted for co-authorship, is 77. Furthermore, the table mentions papers with ACC (presumably acceptance) at specific numerical positions, such as 1, 2, 5, 10, and 20, and lists corresponding paper IDs, which could indicate significant contributions or milestones in the researcher's body of work. Overall, these metrics collectively illustrate a prolific and influential research output over the specified period.

Data Analysis

Bibliometric analysis is considered the best way to understand research trends and find research opportunities due to its ability to quantitatively analyze literature information and identify relevant parameters such as core scholars, institutions, countries, and keyword co-occurrences. This method has been widely adopted in diverse research fields to reveal current topic hotspots and research trends over time in specific research areas. It involves analyzing various metrics such as the number of annual publications, output of countries/regions, journals, total citations, citations per publication, and the Hirsch index [23]–[25]. Additionally, it enables the identification of research clusters and offers a comprehensive overview of the research field, thus providing a roadmap for further research. Several studies have utilized bibliometric analysis to understand research trends in various aspects of agriculture, such as climate impact on agriculture, agricultural soil organic carbon mineralization, sustainable agriculture, and technological advancements in agricultural e-commerce [23], [26], [27]. Therefore, bibliometric analysis is a robust approach to gaining a thorough understanding of research trends and finding opportunities in the field of agribusiness.

4. RESULTS AND DISCUSSION

To answer the questions at the beginning of this paper, a software called VOS Viewer was used to carry out analysis of the collected database. With this application, the three questions above can be answered well and comprehensively. From the database collected and synthesized by the software, 4919 terms were found with a minimum of 10 occurrences. Of the more than 4000 terms found, 112 thresholds were successfully established. From this figure, system automation succeeded in reducing as much as 60% to produce terms that are more accurate and relevant. A total of 40 terms became the final number of the most related and relevant terms.
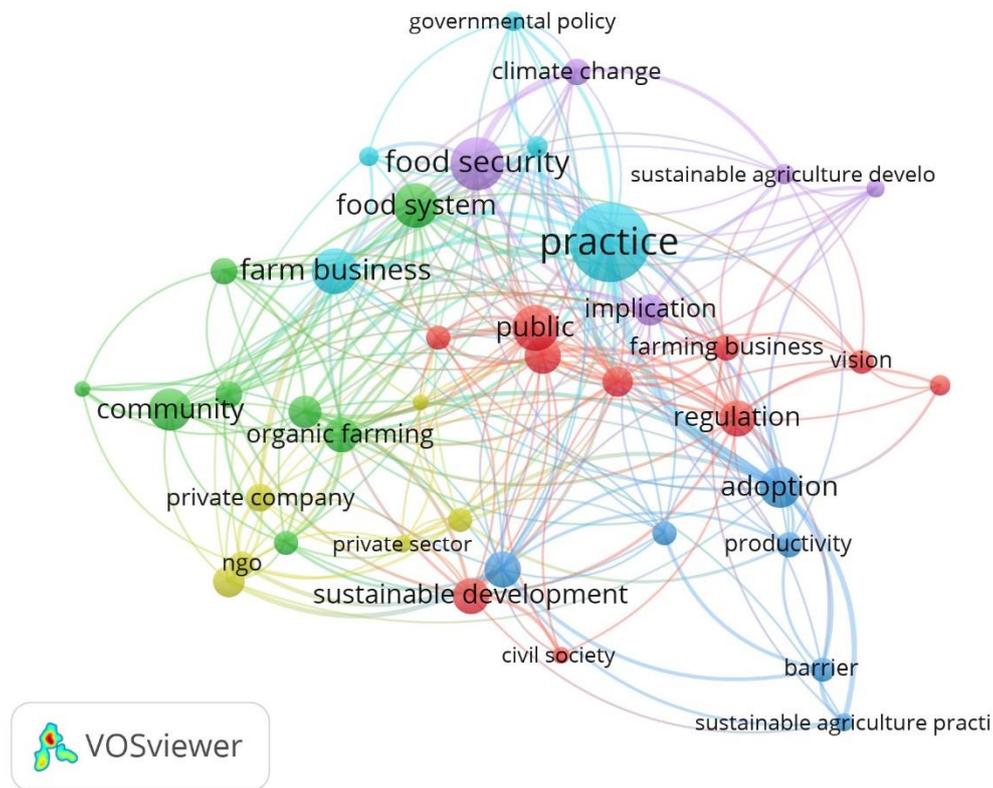
Figure 1. Mapping of Terms

To answer the first question of this paper, namely how existing research related to the impact of government policies on sustainability of agricultural business is classified, we can see it from the first mapping of the VOS Viewer itself. The results of mapping the previously collected terms are as shown in Figure 1 above. The image illustrates the relationship between terms that exist and the clusters that are formed, each represented by different colors. There are a total of 6 clusters represented by the colors red, green, purple, yellow, blue lights, and blue. The first cluster is represented in red and consists of 10 items, the second cluster is depicted in green and consists of 8 items, while the third cluster consists of 6 items which are represented in blue, the fourth cluster is depicted in yellow with 6 items, the fifth cluster is colored purple with 5 items, and the last cluster consists of five items in light blue. Specifically, Table 2 below explains the composition of the items in each cluster.

Table 1. Cluster Specification

| Cluster	Items
1	Agricultural company (17), agricultural sector (14), civil society (11), farming business (41), industry (29), public (40), regulation (30), sustainable development (30), sustainable farming (23)
2	Community (36), food system (39), health (20), initiative (26), local government (12), organic agriculture (17), organic farming (28)
3	Adoption (35), agribusiness (17), barrier (17), productivity (18), state (29), sustainable agriculture practice (12)
4	NGO (18), private company (21), private sector (11), sustainable agricultural development (24), sustainable agriculture (17), sustainable agricultural product (10)
5	Climate change (19), food security (50), risk (12)
6	Farm business (41), governmental policy (13), sustainable farming system (14)
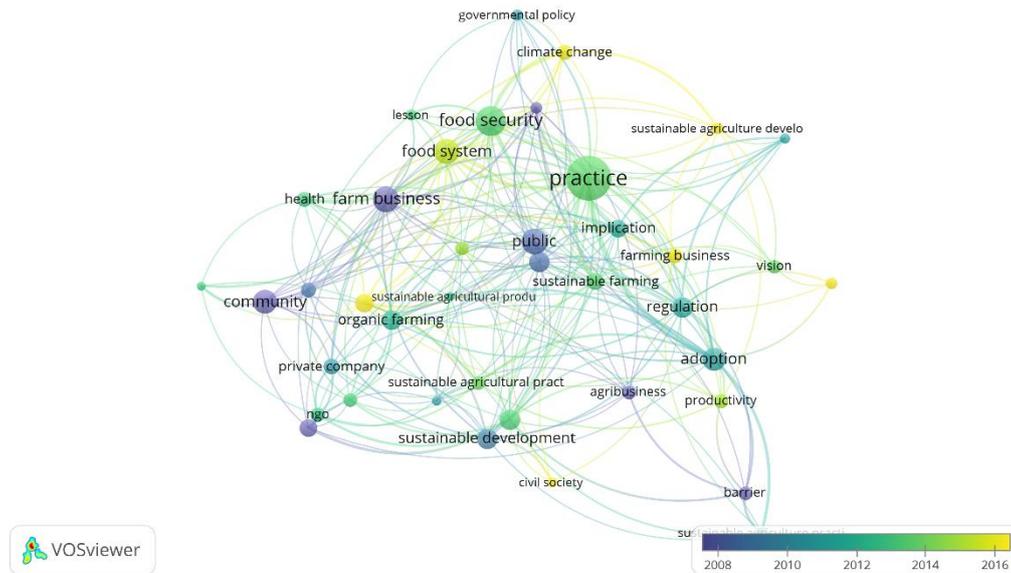
Figure 2. Overlay Visualization

After knowing how research discussing this topic is classified, the next step is to look for how research trends on this topic develop over time. We can find out this trend by utilizing a feature called overlay visualization. Through this feature, you can see how existing terms appeared in what time period. Terms such as farm business, community, industry and barrier have the darkest color (dark purple) which indicates that these terms appeared first. The timeline bar at the bottom of Figure 2 below shows that these terms appeared in 2008, indicating that research trends at that time focused on communities with much research attempting to identify barriers in implementing sustainable agribusiness. Meanwhile, terms such as civil society and climate change have the brightest color (bright yellow) which indicates that these terms are used and have become a trend in more recent times. The timeline bar shows this term has become a research trend for researchers from around 2016 to the present. This indicates that civil society and climate change are topics that are still very interesting.

In addition, we also identified the 10 most highly cited articles that demonstrate the credibility of the results and the significant impact they have had on scholarship in this field. These articles can also be identified as backward research trends and can be used as a basis for future research considering the impact they bring. This also shows that some of the authors are key authors in this field as depicted in Table 3 below.

Table 3 Top Cited Articles

Citations	Authors and year	Title
5570	J Elkington (1994)	Toward the sustainable corporation: Win-win-win business strategies for sustainable development
4609	TL Wheelen (2011)	Concepts in strategic management and business policy
4443	MA Altieri (2018)	Agroecology: the science of sustainable agriculture
3561	SL Hart (1997)	Beyond greening: strategies for a sustainable world
1925	S Schimidheiny (1992)	Changing course: A global business perspective on development and the environment
1781	L Horrigan, RS Lawrence (2002)	How sustainable agriculture can address the environmental and human health harms of industrial agriculture

| Citations	Authors and year	Title
1550	JN Pretty, S Williams, C Toulmin (2012)	Sustainable intensification: increasing productivity in African food and agricultural systems
1433	JD Sachs, G Schmidt-Traub, M Mazzucato (2019)	Six transformations to achieve the sustainable development goals
1242	D Nepstad, D McGrath, C Stickler, A Alencar (2014)	Slowing Amazon deforestation through public policy and interventions in beef and soy supply chains
1152	AR Edwards (	The sustainability revolution: Portrait of a paradigm shift
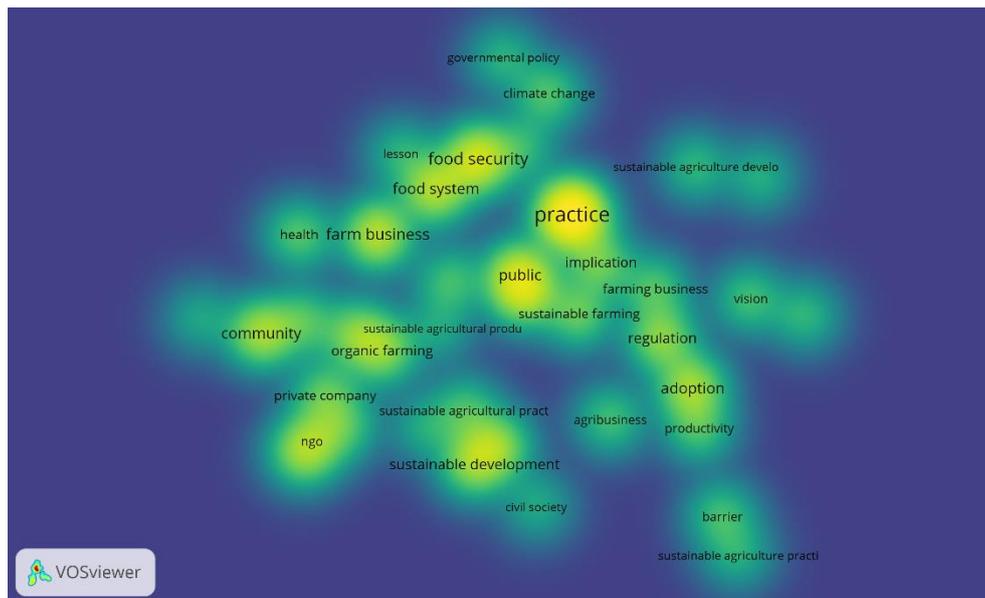
Figure 3. Density Visualization

The next question relates to what topics will be the next research opportunities in the future. The density visualization feature is used to identify this with the addition of an occurrence table that identifies the most frequently appearing and least frequently appearing topics.

Table 4. Most Frequent and Few Occurrence

Most Frequented Occurrence		Most Few Occurrence	
Keywords	Occurrence	Keywords	Occurrence
Practice	86	Sustainable agricultural production	10
Food security	50	Civil society	11
Farm business	41	Private sector	11
public	40	Sustainable agricultural practice	12
Food system	39	risk	12
Community	36	Local government	12

The presented table outlines the frequency of occurrence of various keywords in a discourse related to sustainable agricultural production and farm business. Notably, the term "Practice" takes the lead with 86 occurrences, suggesting a strong focus on practical aspects or methods. "Food security" and "Farm business" follow closely, emphasizing the importance of ensuring food access and the economic dimensions of agriculture. The term "Public" is mentioned 40 times, indicating a potential emphasis on public involvement in sustainable agriculture discussions. Conversely, keywords with fewer occurrences include "Sustainable agricultural production," "Civil society," and "Private sector," suggesting that specific sustainable practices and discussions around societal

organizations and private businesses are less central. The presence of terms like "Risk" and "Local government" at 12 occurrences each suggests a consideration of associated challenges and governance at the local level but not as prominently as other topics. Overall, the table provides insights into the thematic priorities within the discourse on sustainable agriculture and farm-related issues.

The results presented in the table offer valuable insights that can inform and guide future studies in the realm of sustainable agriculture and farm business. The lower occurrences of terms like "Sustainable agricultural production," "Civil society," and "Private sector" suggest potential research gaps or areas that merit deeper exploration. A future study could delve into understanding the factors influencing sustainable agricultural production and how civil society and the private sector contribute to or hinder sustainability initiatives. Moreover, the presence of terms such as "Risk" and "Local government" at 12 occurrences each indicates a recognition of challenges and governance aspects. A future study could focus on assessing and mitigating risks in sustainable agriculture or exploring the role of local government in supporting sustainable farming practices. In essence, the results of the current analysis serve as a foundation for shaping future research directions. Researchers may consider further investigating the identified keywords, exploring their interconnections, and addressing potential gaps to contribute meaningfully to the advancement of knowledge and practices in sustainable agriculture and farm business.

Comparing with Previous Study

Research related to this topic has also been carried out by several previous researchers, with different specifications and criteria. A bibliometric analysis of research on climate impacts on agriculture found that researchers with expertise in various fields, including atmospheric, oceanic, environmental sciences, hydrology, geoscience, agriculture, economy, public health, and policy, have published their findings and recommended solutions in response to the changing impacts. The study used the Web of Science Core Collection database and retrieved 3,154 documents from 1996 to 2022 [28]. This study also analyzed the publication trends, most productive authors, most influential institutions, most influential journals, subject classification, most cited articles, country analysis, cited author and cited journal analysis, research hotspots, and temporal evolution. A comprehensive review and bibliometric analysis of sustainable agricultural development found that the evaluation of sustainable agricultural development is a complex project based on econometrics and statistics, closely related to society, economy, and the environment [29]. A bibliometric analysis of short supply chains in the agri-food sector found that the adoption of sustainable agricultural practices into our food consumption paradigm poses difficulties on the social, economic, and ecological fronts [30].

Implication of study

The findings from the bibliometric analysis highlight key considerations for practitioners engaged in sustainable agriculture businesses. Firstly, there is a crucial need to align business strategies with government policies promoting sustainability. Practitioners should stay informed about policy developments, ensuring their operations are in harmony with evolving regulatory landscapes. Additionally, the positive correlation between economic incentives and sustainable practices underscores the potential benefits of embracing environmentally conscious approaches. Investing in innovative technologies and staying abreast of global best practices can position practitioners for long-term success. Furthermore, active participation in community engagement initiatives is essential, fostering positive relationships with local stakeholders. Lastly, practitioners should advocate for policy longevity and stability to create a conducive environment for sustainable agriculture businesses to thrive.

The bibliometric analysis offers valuable insights for policymakers crafting and implementing strategies for sustainable agriculture. Policymakers should prioritize the effective implementation of policies, addressing any gaps between intent and execution to facilitate the

growth of sustainable businesses. Collaboration on a global scale is crucial, with policymakers encouraged to learn from international experiences and engage in knowledge exchange. Supporting research and development, incentivizing technological adoption, and fostering innovation should be central components of policies to drive sustainability in agriculture. Designing economic incentives and stable frameworks for monitoring and evaluation can further enhance the impact of policies. Additionally, policies should actively involve and seek input from local communities, farmers, and businesses, fostering a sense of shared responsibility and ownership. Crafting policies with a long-term perspective is essential to provide stability and encourage sustained investment in sustainable agriculture.

Researchers in the field of sustainable agriculture can leverage the bibliometric analysis to guide their investigations and contribute to the knowledge base. The analysis underscores the need for research focusing on the alignment and effectiveness of government policies, providing an avenue for researchers to evaluate policy impacts on sustainable agriculture businesses. Additionally, global collaboration and knowledge exchange present opportunities for comparative studies and the identification of best practices. Research efforts should also prioritize the exploration of innovative technologies and their integration into sustainable agricultural practices. Studying the correlation between economic incentives and sustainable practices can yield valuable insights for designing effective policy measures. Furthermore, researchers can contribute to the development of robust monitoring and evaluation frameworks, offering methodologies to assess the long-term impact of policies. Engaging in interdisciplinary research and collaborating with practitioners can enhance the practical applicability of research findings, ultimately contributing to evidence-based policymaking and the advancement of sustainable agriculture.

CONCLUSION

In conclusion, this comprehensive bibliometric analysis has illuminated the intricate dynamics between government policies and sustainable agriculture businesses. Beginning with a contextualization of the global significance of agribusiness, the study highlighted its economic role and the challenges posed, particularly in the context of Agriculture 4.0. The implications for practitioners emphasized the importance of strategic alignment, innovation adoption, and community engagement, while policymakers were urged to focus on effective implementation, global collaboration, and sustainable practices. Research trends were dissected, revealing an evolving landscape with shifting emphases from community barriers to civil society and climate change. The identification of highly cited articles provided insight into influential contributions and key authors, guiding future research endeavors. Comparative analyses with previous studies enriched the understanding of the research landscape, rendering this study a valuable roadmap for practitioners, policymakers, and researchers navigating the complexities of sustainable agriculture businesses in the context of government policies. As the world seeks solutions for sustainable agriculture, this research aims to foster a balanced approach that integrates economic viability, environmental responsibility, and social inclusivity for a resilient and thriving agribusiness sector.

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