

Bibliometric Review of Research on Green Farming Practices in the Period 2010–2024

Veronica L. Tuhumena¹, Liz Yanti Andriyani², Ivonne Fitri Mariay³, Nandini Ayuningtias⁴,
Syaifullah Rahim⁵

^{1,3}Diploma 3 Budidaya Tanaman Perkebunan Fakultas Pertanian Universitas Papua

²Agroekoteknologi Fakultas Pertanian Universitas Jambi

^{4,5}Agroteknologi Fakultas Pertanian Universitas Papua

Article Info

Article history:

Received February, 2026

Revised February, 2026

Accepted February, 2026

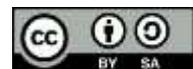
Keywords:

Green farming practices;
Organic farming; Sustainable
agriculture; Climate change;
Food security; Bibliometric
analysis.

ABSTRACT

This study presents a bibliometric review of research on green farming practices published between 2010 and 2024. Using data retrieved from the Scopus database and analyzed through VOSviewer, the study examines publication trends, collaboration networks, and thematic evolution within the field. The findings indicate a significant growth in scholarly output over the last decade, reflecting increasing global concern for sustainable agricultural transformation. Keyword co-occurrence analysis reveals that early research focused primarily on agronomic practices such as soil management, manure application, crop rotation, and yield improvement. Over time, the thematic orientation expanded toward broader sustainability issues, including climate change, biodiversity, food security, and environmental protection. Co-authorship and country collaboration networks highlight the central role of countries such as India, the United States, China, and several European nations in shaping the global research agenda. Overlay and density visualizations further demonstrate a shift from technical input management toward integrated sustainability and resilience frameworks. Overall, the study confirms that green farming research has matured into an interdisciplinary and policy-relevant domain that integrates agronomic innovation with global sustainability challenges.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Name: Veronica L. Tuhumena

Institution: Diploma 3 Budidaya Tanaman Perkebunan Fakultas Pertanian Universitas Papua

Email: v.tuhumena@unipa.ac.id

1. INTRODUCTION

Green farming practices have become increasingly important in the global pursuit of sustainable agriculture. With the accelerating impacts of climate change, environmental degradation, and the growing global demand for food, there is an urgent need to adopt agricultural techniques that minimize harm to the environment [1]. Green farming, which includes practices such as organic farming,

agroforestry, conservation tillage, and integrated pest management, focuses on enhancing the sustainability of agricultural systems while reducing their ecological footprint. These methods aim to improve soil health, conserve water, promote biodiversity, and decrease dependence on chemical inputs like pesticides and synthetic fertilizers. As a result, green farming has become a central

theme within both scientific research and practical agricultural development [2].

From an economic standpoint, the demand for eco-friendly food products is growing, driven by consumers who are increasingly concerned about the environmental and health impacts of traditional farming practices. In response to this shift, the agricultural industry has started to embrace more sustainable farming methods. As a result, green farming practices are gaining traction among farmers, policymakers, and researchers alike [3]. The adoption of these practices is seen not only as a solution to mitigate the negative effects of conventional farming but also as a means to create more resilient food systems. As environmental pressures continue to mount, the need for further research into these practices is paramount to ensure that they are both effective and scalable [4].

Research on green farming has evolved over the past few decades, with increasing attention being paid to the environmental, social, and economic benefits of sustainable agriculture [1], [3]. The academic literature in this field has explored a range of topics, from the scientific principles behind various green farming practices to the policy implications of encouraging their adoption at the local, national, and global levels. Studies have shown that green farming practices can not only reduce the carbon footprint of agriculture but also improve the long-term viability of farming systems. As the body of literature expands, it becomes increasingly important to synthesize these studies to better understand the progress made in the field and identify areas for future research [1], [5].

The development of green farming practices is influenced by various factors, including technological innovations, government policies, economic incentives, and cultural attitudes toward environmental sustainability. Governments around the world have started to implement policies that

encourage the adoption of green farming techniques, such as subsidies for organic farmers, funding for research on sustainable agricultural technologies, and regulations that limit the use of harmful chemicals. Similarly, international organizations like the United Nations and the World Bank have prioritized sustainable agriculture in their development agendas, underscoring the global importance of green farming in combating food insecurity and environmental degradation. However, the success of these efforts varies across regions and countries, making it important to consider the contextual factors that shape the implementation of green farming practices.

The increasing body of literature on green farming reflects not only the growing importance of sustainability in agriculture but also the multidisciplinary nature of the research. Scholars from a range of disciplines, including agricultural science, economics, environmental studies, and sociology, are contributing to the understanding of green farming practices. This diversity of perspectives enriches the field and ensures that green farming practices are studied not only in terms of their technical feasibility but also in relation to their economic viability and social acceptance. As the body of research on green farming continues to grow, it is essential to conduct a comprehensive bibliometric review to assess the current state of the field and identify key trends and gaps.

Despite the growing body of research on green farming practices, the landscape of this field remains fragmented, with limited efforts to synthesize findings across different regions and disciplines. As a result, there is a need for a comprehensive bibliometric review to assess the trends in green farming research, identify key areas of focus, and examine the evolution of this field over time. Furthermore, the gap between scientific research and practical implementation remains a challenge, as many farmers are still hesitant to adopt green farming practices due to perceived economic or technical barriers.

Understanding the factors that influence the adoption of these practices, as well as the role of policy and technology in overcoming these barriers, remains an important area of research. By addressing these gaps, this study aims to provide valuable insights into the development of green farming practices and their potential for contributing to sustainable agriculture worldwide. The objective of this study is to conduct a bibliometric review of the research on green farming practices published between 2010 and 2024.

2. METHOD

This study employs a bibliometric analysis to review the research on green farming practices published between 2010 and 2024. The analysis is based on a comprehensive dataset sourced from Scopus, one of the largest and most reputable databases for academic publications. Scopus provides access to a wide range of peer-reviewed journals, conference proceedings, and other scholarly resources, making it an ideal source for bibliometric research. The search query was designed to identify relevant publications related to green farming practices, focusing on keywords such as "sustainable agriculture," "green farming,"

"organic farming," "agroforestry," and other related terms. The search results were filtered by publication date to ensure that only articles published within the specified time frame (2010–2024) were included in the analysis.

To analyze and visualize the bibliometric data, the study utilizes VOSviewer, a powerful tool for constructing and visualizing bibliometric networks. VOSviewer allows for the analysis of citation analysis, co-authorship networks, keyword co-occurrence, and other types of bibliometric data, providing insights into the structure and development of research in a specific field. The data extracted from Scopus was imported into VOSviewer for further processing, which included mapping and visualizing trends in research themes, the evolution of key topics over time, and identifying the most influential authors and journals in the field of green farming. The combination of Scopus and VOSviewer enables a detailed examination of the literature, offering a robust and comprehensive approach to understanding the state of research on green farming practices.

3. RESULT AND DISCUSSION

Table 1. Citation Analysis

Citations	Authors and Year	Title
1,589	[6]	Green Grabbing: A new appropriation of nature?
717	[7]	Soil enzyme activities, microbial communities, and carbon and nitrogen availability in organic agroecosystems across an intensively-managed agricultural landscape
494	[8]	Integrated soil fertility management: Operational definition and consequences for implementation and dissemination
475	[9]	Fertilizer management practices and greenhouse gas emissions from rice systems: A quantitative review and analysis
406	[10]	Can't Buy Me Green? A Review of Consumer Perceptions of and Behavior Toward the Price of Organic Food
382	[11]	Urban gardens, Agriculture, And water management: Sources of resilience for long-term food security in cities
341	[12]	Agroecological responses of heavy metal pollution with special emphasis on soil health and plant performances
335	[13]	First dairying in green Saharan Africa in the fifth millennium BC
319	[14]	The impact of farm size on agricultural sustainability
260	[15]	Systemic perspectives on scaling agricultural innovations: A review

Source: Scopus, 2026

Co-Authorship Network

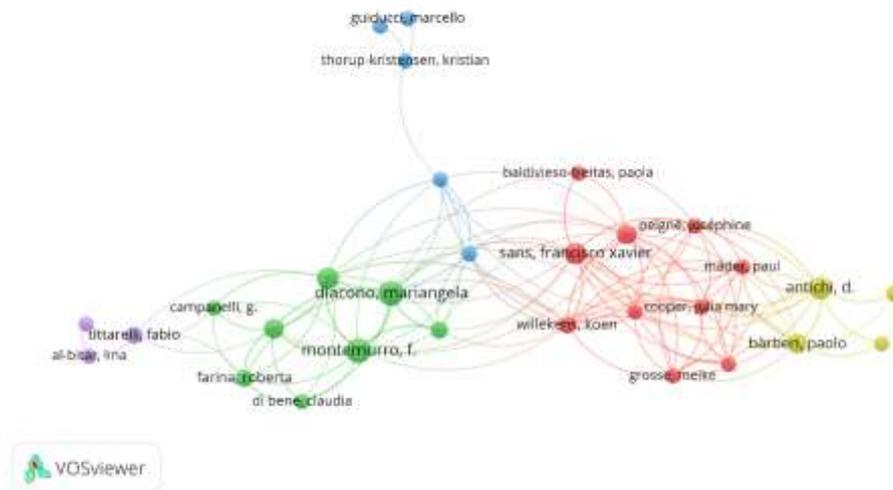


Figure 1. Network Visualization
Source: Data Analysis

Figure 1 illustrates the collaborative structure among key researchers in green farming practices research from 2010–2024. The visualization reveals several distinct clusters, each represented by different colors, indicating research groups with strong internal collaboration. The red cluster appears highly interconnected, with authors such as Peigné Joséphine, Cooper Julia Mary, and Mäder Paul forming a dense collaborative core, suggesting an established research community focused on related themes. The green cluster, centered around Diacono

Mariangela and Montemurro F., also demonstrates strong intra-group collaboration, likely reflecting a thematic concentration on soil management and organic farming practices. The blue cluster, although smaller, connects scholars such as Sans Francisco Xavier and Baldovieso-Freitas Paola, acting as a bridge between larger groups, indicating cross-cluster collaboration. Meanwhile, smaller peripheral clusters (e.g., purple and yellow groups) show limited but focused collaborations, suggesting niche or emerging research areas.

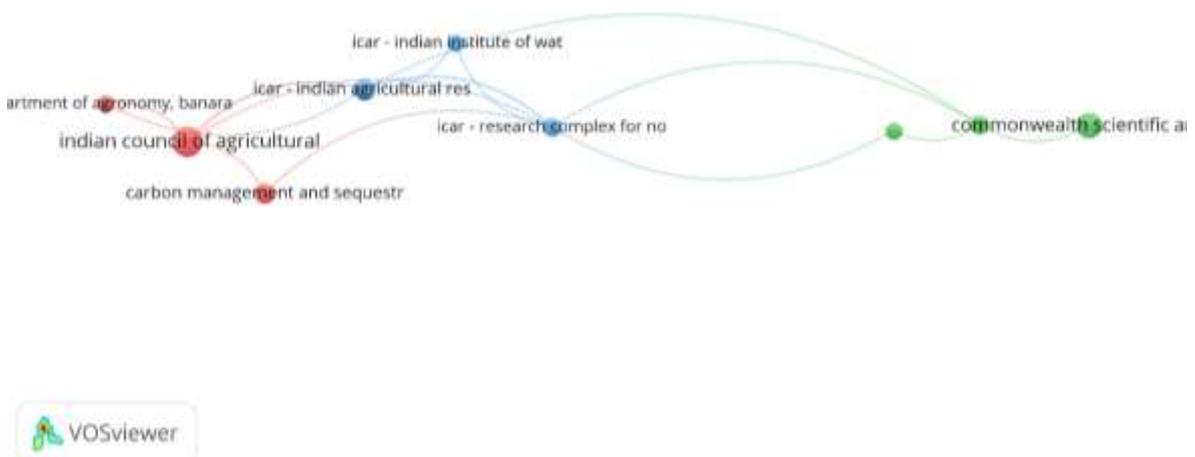


Figure 2. Institution Visualization
Source: Data Analysis

Figure 2 highlights the collaborative landscape of green farming practices research, showing three primary clusters. The blue cluster is dominated by ICAR-related institutions (e.g., ICAR–Indian Agricultural Research, ICAR–Indian Institute of Water, and ICAR–Research Complex), indicating a strong, centralized research network within India focused on agricultural innovation and sustainability. The red cluster, anchored by the Indian Council of Agricultural Research and related agronomy departments, appears

closely connected to themes such as carbon management and sequestration, suggesting an emphasis on climate-related sustainable farming strategies. Meanwhile, the green cluster, represented by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), stands somewhat distinct but connected through bridging ties, reflecting international collaboration beyond the Indian institutional core.

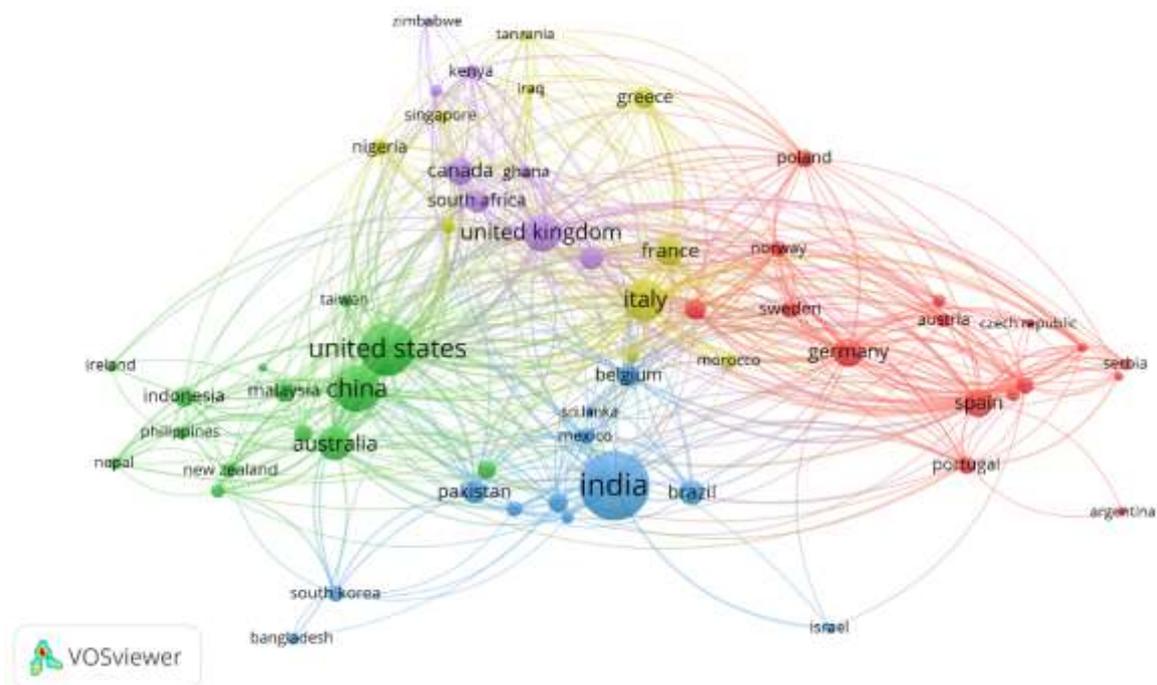


Figure 3. Country Visualization
Source: Data Analysis

Figure 3 reveals a highly interconnected global structure in green farming practices research from 2010–2024. The map shows several major collaboration clusters, with India and the United States appearing as central and highly influential nodes due to their large size and numerous linkages. The green cluster, dominated by the United States and China, reflects strong trans-Pacific collaboration, including connections with Australia, Malaysia, and other Asia-Pacific countries. The blue cluster centers around India, which maintains extensive ties

with Brazil, Pakistan, South Korea, and other developing nations, indicating its prominent role in sustainability and agricultural innovation research. Meanwhile, the red cluster highlights European collaboration networks, particularly Spain, Germany, Poland, and other EU countries, suggesting a cohesive regional research agenda. The United Kingdom and Italy appear as bridging nodes, connecting European, African, and North American partners.

Keyword Co-Occurrence Network

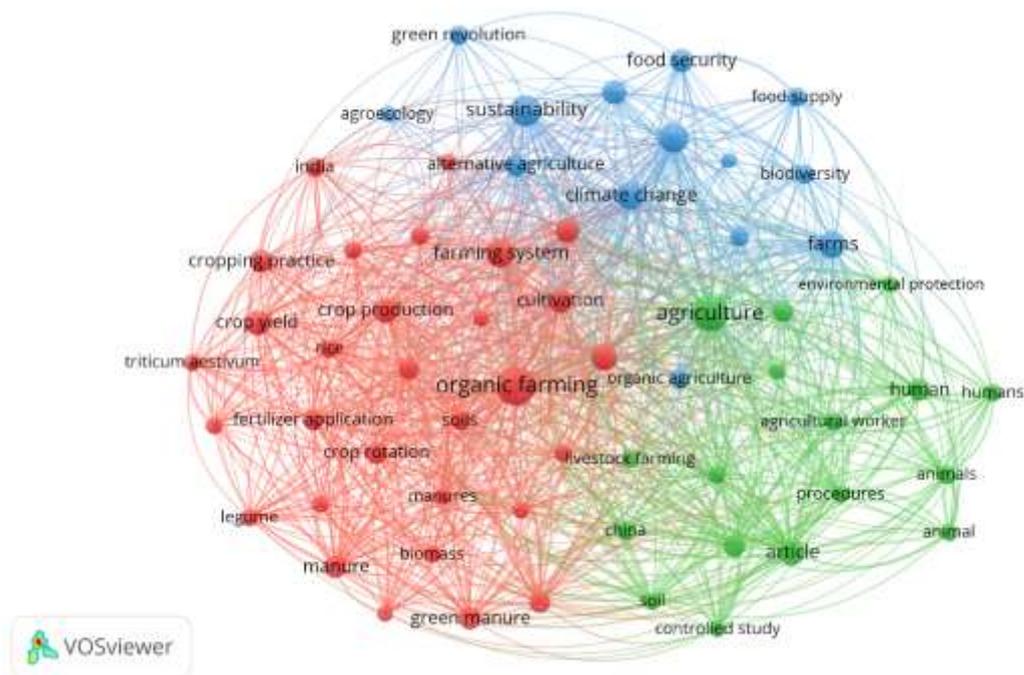


Figure 4. Network Visualization

Source: Data Analysis

Figure 4 illustrates the intellectual structure of green farming practices research between 2010 and 2024, revealing several dominant thematic clusters. The red cluster is heavily centered on organic farming, soils, crop production, and nutrient management practices such as manure application, green manure, fertilizer application, crop rotation, and rice cultivation. This suggests that a substantial portion of the literature focuses on agronomic techniques aimed at improving soil fertility and crop productivity through environmentally friendly inputs and sustainable cultivation systems. The density of links within this cluster indicates a mature and technically grounded research stream emphasizing practical field-level implementation. The blue cluster represents a broader sustainability discourse, anchored by keywords such as sustainability, climate change, food security, biodiversity, and food supply. This cluster reflects the strategic and systemic dimension of green farming, where agricultural practices are examined within the context of global environmental challenges and long-term resilience. The presence of

terms like green revolution and alternative agriculture suggests an ongoing dialogue between conventional intensification paradigms and emerging sustainable transformation models.

The green cluster appears to focus on agricultural systems and socio-environmental interactions, with terms such as agriculture, humans, animals, agricultural worker, environmental protection, and procedures. This indicates interdisciplinary research linking farming practices with human health, labor dynamics, livestock systems, and environmental governance. The inclusion of article and controlled study also suggests methodological diversity, including experimental and empirical assessments of green farming outcomes. A strong interconnection between clusters demonstrates that agronomic practices (red cluster) are not isolated from broader sustainability debates (blue cluster) or socio-environmental dimensions (green cluster). For instance, organic agriculture connects directly with sustainability and climate change, while agriculture bridges

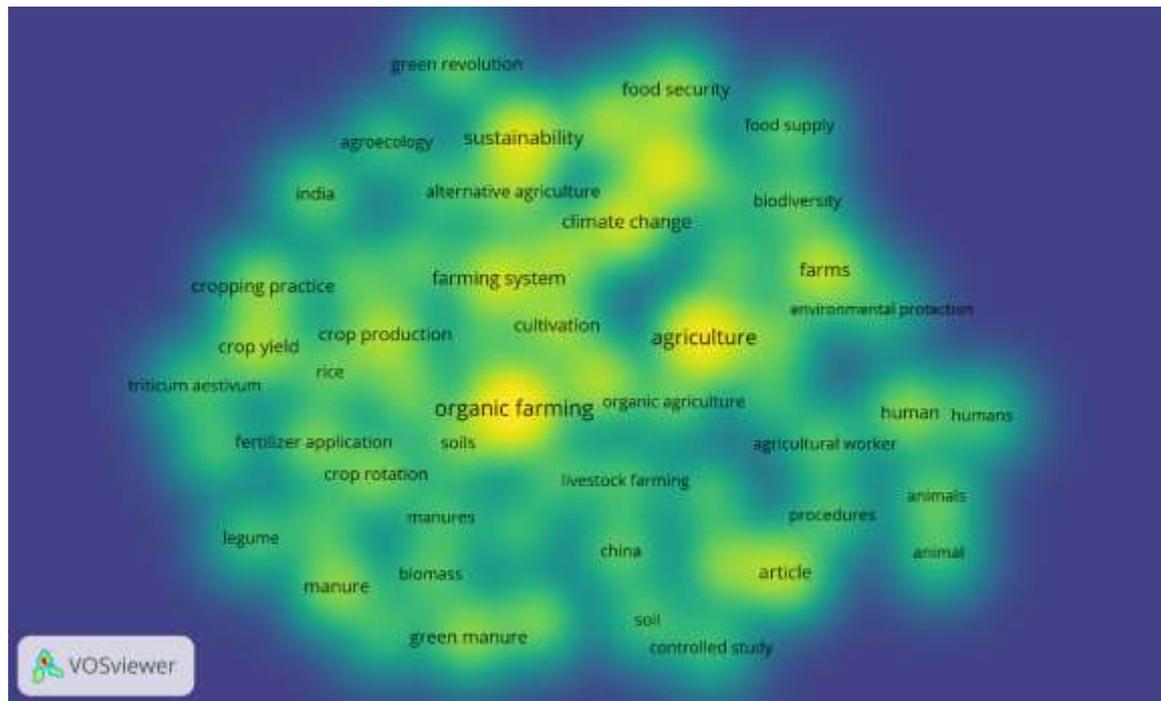


Figure 6. Density Visualization

Source: Data Analysis

Figure 6 highlights the most intensively studied themes in green farming practices research. The brightest (yellow) areas cluster around organic farming, agriculture, sustainability, food security, and climate change, indicating that these topics form the intellectual core of the field. This suggests that green farming research is strongly anchored in sustainability-oriented agricultural transformation, linking production systems with environmental resilience and global food system stability. The prominence of “farming system,” “crop production,” and “soils” further confirms that agronomic foundations remain central within this sustainability discourse. Moderately dense areas (green tones) include themes such as biodiversity, environmental protection, livestock farming, agricultural workers, and manure management, reflecting expanding interdisciplinary attention. These topics show that research has broadened beyond crop-based technical practices to include ecological balance, human dimensions, and integrated farm systems.

Discussion

This bibliometric review reveals that research on green farming practices between 2010 and 2024 has evolved from predominantly agronomic and input-oriented studies toward a more integrated sustainability framework. Early research trends were strongly centered on soil fertility management, manure and green manure application, fertilizer optimization, crop rotation, and crop yield improvement. These themes reflect the foundational concern of green farming: reducing chemical dependency while maintaining productivity. The strong co-occurrence of keywords such as organic farming, soils, crop production, and manure management suggests that the field initially developed through experimental and field-based agronomic studies designed to validate environmentally friendly alternatives to conventional agriculture.

Over time, the thematic focus expanded beyond field-level techniques to broader system-level perspectives. The clustering of sustainability, climate change, biodiversity, food security, and food supply

indicates that green farming research has increasingly been positioned within global environmental and food system debates. This shift reflects the growing recognition that agricultural sustainability cannot be separated from climate resilience, ecosystem protection, and long-term resource management. The overlay visualization confirms this transition, showing that more recent publications emphasize climate change adaptation, biodiversity conservation, and food security more prominently than earlier technical agronomic themes.

The co-authorship and country collaboration networks further demonstrate that green farming research is globally interconnected but regionally anchored. Countries such as India, the United States, China, Spain, and Germany serve as major hubs of knowledge production and international collaboration. India appears particularly central in linking agronomic research with sustainability discourse, while European countries form strong collaborative clusters around organic agriculture and environmental protection. This indicates that green farming is not a localized research field but a globally shared agenda shaped by both developed and developing agricultural economies. Institutional networks, especially those linked to national agricultural research systems, also play a critical role in driving structured collaboration and thematic continuity.

The density map confirms that organic farming, agriculture, sustainability,

and food security form the intellectual core of the field. This suggests that green farming practices are increasingly conceptualized not merely as technical innovations but as strategic components of sustainable food systems. The integration of livestock farming, human dimensions, agricultural workers, and environmental protection shows a gradual expansion toward socio-ecological systems thinking. In other words, green farming research has moved from isolated soil and crop experiments toward interdisciplinary frameworks combining environmental science, agronomy, climate studies, and rural development.

4. CONCLUSION

This bibliometric review demonstrates that research on green farming practices from 2010 to 2024 has evolved from a predominantly agronomic focus on soil management and organic inputs toward a broader, sustainability-driven framework integrating climate change, biodiversity, and food security concerns. The intellectual structure of the field is anchored by core themes such as organic farming, agriculture, and sustainability, while recent trends increasingly emphasize resilience and global food system challenges. Collaboration networks reveal strong contributions from key countries and institutions, indicating that green farming research is globally interconnected yet regionally specialized.

References

- [1] S. Vara, B. K. Dwarapureddi, and S. Dash, "Sustainable Agriculture and Organic Farming," in *Handbook of Research on Green Technologies for Sustainable Management of Agricultural Resources*, IGI Global, 2022, pp. 108–128.
- [2] A. Dewi, M. I. F. Rahayu, and A. Wibisana, "Green tourism in sustainable tourism development in Bali based on local wisdom," *J. Din. Huk.*, vol. 23, no. 1, pp. 111–130, 2023.
- [3] C. Boix-Fayos and J. De Vente, "Challenges and potential pathways towards sustainable agriculture within the European Green Deal," *Agric. Syst.*, vol. 207, p. 103634, 2023.
- [4] D. T. Armanda, J. B. Guinée, and A. Tukker, "The second green revolution: Innovative urban agriculture's contribution to food security and sustainability—A review," *Glob. Food Sec.*, vol. 22, pp. 13–24, 2019.
- [5] T.-H. Chang, Y.-C. Lu, M.-J. Yang, J.-W. Huang, P.-F. L. Chang, and H.-Y. Hsueh, "Multibranching

- flower-like ZnO particles from eco-friendly hydrothermal synthesis as green antimicrobials in agriculture," *J. Clean. Prod.*, vol. 262, p. 121342, 2020.
- [6] J. Fairhead, M. Leach, and I. Scoones, "Green grabbing: a new appropriation of nature?," *J. Peasant Stud.*, vol. 39, no. 2, pp. 237–261, 2012.
- [7] T. M. Bowles, V. Acosta-Martínez, F. Calderón, and L. E. Jackson, "Soil enzyme activities, microbial communities, and carbon and nitrogen availability in organic agroecosystems across an intensively-managed agricultural landscape," *Soil Biol. Biochem.*, vol. 68, pp. 252–262, 2014.
- [8] B. Vanlauwe *et al.*, "Integrated soil fertility management: operational definition and consequences for implementation and dissemination," *Outlook Agric.*, vol. 39, no. 1, pp. 17–24, 2010.
- [9] B. A. Linqvist, M. A. Adviento-Borbe, C. M. Pittelkow, C. van Kessel, and K. J. van Groenigen, "Fertilizer management practices and greenhouse gas emissions from rice systems: a quantitative review and analysis," *F. Crop. Res.*, vol. 135, pp. 10–21, 2012.
- [10] J. Aschemann-Witzel and S. Zielke, "Can't buy me green? A review of consumer perceptions of and behavior toward the price of organic food," *J. Consum. Aff.*, vol. 51, no. 1, pp. 211–251, 2017.
- [11] S. Barthel and C. Isendahl, "Urban gardens, agriculture, and water management: Sources of resilience for long-term food security in cities," *Ecol. Econ.*, vol. 86, pp. 224–234, 2013.
- [12] V. Srivastava, A. Sarkar, S. Singh, P. Singh, A. S. F. De Araujo, and R. P. Singh, "Agroecological responses of heavy metal pollution with special emphasis on soil health and plant performances," *Front. Environ. Sci.*, vol. 5, p. 64, 2017.
- [13] J. Dunne *et al.*, "First dairying in green Saharan Africa in the fifth millennium BC," *Nature*, vol. 486, no. 7403, pp. 390–394, 2012.
- [14] C. Ren *et al.*, "The impact of farm size on agricultural sustainability," *J. Clean. Prod.*, vol. 220, pp. 357–367, 2019.
- [15] S. Wigboldus, L. Klerkx, C. Leeuwis, M. Schut, S. Muilerman, and H. Jochemsen, "Systemic perspectives on scaling agricultural innovations. A review: Systemic perspectives on scaling agricultural innovations," *Agron. Sustain. Dev.*, vol. 36, no. 3, p. 46, 2016.