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Global Research Trends in Organic Farming: A Bibliometric Analysis (2014–2024)

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ABSTRACT

Organic farming has gained increasing global attention as a sustainable alternative to conventional agriculture, addressing pressing concerns related to environmental degradation, food safety, and long-term food security. However, the rapidly expanding body of research in this field has created fragmentation and lacks a comprehensive understanding of thematic developments, geographic distribution, and methodological trends. To address this gap, a holistic analysis was needed to map the global research landscape on organic farming. This study conducted a bibliometric and visualization analysis to systematically evaluate research trends, thematic clusters, and emerging topics in organic farming from 2014 to 2024. The contribution of this research lies in providing a strategic overview that supports future research, policy formulation, and interdisciplinary collaboration. Data were retrieved from the Scopus database and analyzed using the PRISMA protocol. A total of 884 relevant publications were selected for performance analysis, co-authorship mapping, keyword co-occurrence, and thematic trend visualization using VOS viewer and Bibliophagy. The results revealed that organic farming research has shifted from a narrow agronomic focus to include broader interdisciplinary themes such as sustainable development, policy, certification, animal welfare, and food safety. Four main clusters emerged: sustainable development and agricultural policy, agronomic practices and soil health, animal husbandry, and food quality and microbiology. Research output peaked in 2021, dominated by journals focused on sustainability. Keyword overlay analysis showed a temporal evolution toward topics related to certification, spatiotemporal analysis, and sustainability frameworks, indicating increased alignment with global development goals. This study concluded that organic farming research is becoming increasingly interdisciplinary, with strong policy and sustainability orientations. Future research should explore technological integration and regional studies to enhance the global impact of organic agriculture.

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1. INTRODUCTION

Organic farming is increasingly recognized as a key strategy for sustainable food production, addressing both immediate food demands and long-term agricultural sustainability. Research in this field has expanded

significantly over the past two decades, reflecting growing policy support and consumer demand for safe and healthy food [1]. Organic farming, characterized by environmentally friendly and sustainable agricultural practices, has gained significant attention due to its potential to address critical issues such as food security, environmental sustainability, and public health [2], [3]. The adoption of organic farming methods is seen as a way to contribute to multiple Sustainable Development Goals (SDGs), promoting the wellbeing of all living organisms [4]. Despite its benefits, organic farming is knowledge intensive and requires substantial investments in research and innovation to develop effective practices and policies [5], [6], [7], [8].

Previous research has extensively explored various aspects of organic farming. Studies have focused on the scientific productivity, collaboration, and impact of research in this field, highlighting the importance of international cooperation and the role of small countries in advancing organic agriculture [9], [10], [11], [12]. Bibliometric analyses have identified key themes such as biotechnology, soil restoration, environmental sustainability, and consumer behavior [13], [14], [15]. Additionally, research has examined the role of voluntary certification systems in ensuring the integrity and quality of organic products. Other studies have mapped the scholarly landscape of sustainable finance models for smallholder farmers, emphasizing the need for innovative financial instruments to support agricultural innovation [16].

Despite the extensive body of research, several gaps remain in the literature. There is a notable lack of comprehensive studies on the integration of Industry 4.0 technologies in agriculture, which limits the understanding of their potential impact on sustainable practices [17]. Additionally, research on organic farming in specific regions, such as West Africa and Southern Africa, is limited, indicating a need for more localized studies to address regional challenges and opportunities 4 [18]. Furthermore, there is a scarcity of interdisciplinary efforts that combine multiple diversification practices and consider the entire value chain from producers to consumers [19].

The conceptual map in Fig. 1, which are grouped into three interconnected streams: ecological impact, economic aspects, and sustainable practices. Research on ecological impact emphasizes the role of organic farming in reducing greenhouse gas emissions and improving soil quality, while the economic aspects focus on themes such as food security, international economics, and economic returns that highlight the contribution of organic farming to rural livelihoods and global markets. Meanwhile, sustainable practices represent the technological and agronomic innovations supporting organic farming, including the application of green manures, biopesticides, and organic fertilizers. This thematic structure demonstrates that recent studies in organic farming integrate environmental, economic, and sustainability dimensions to address complex global agricultural challenges.

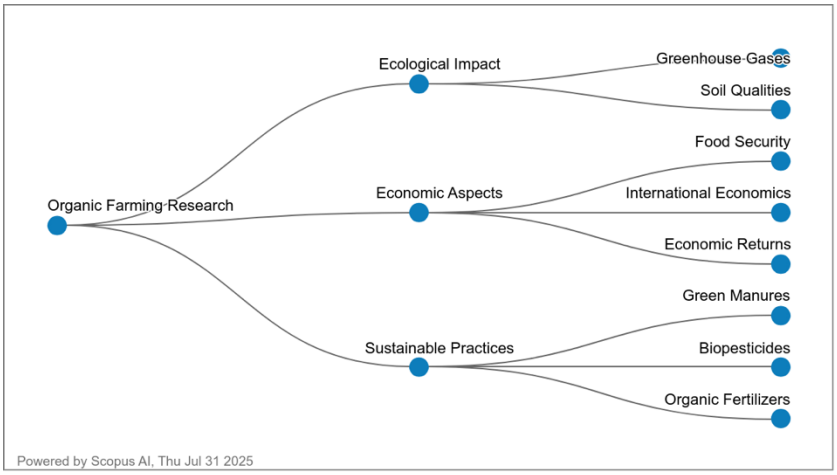

Fig. 1. Illustrates the major thematic directions of organic farming research between 2014 and 2024 (Source: Scopus Data Based, 2025)

This research aims to fill these gaps by providing a holistic bibliometric analysis of the integration of advanced technologies in organic farming and exploring the regional dynamics of organic agriculture in under-researched areas. By identifying key research trends, gaps, and emerging themes, this study will offer valuable insights for academics, policymakers, and industry stakeholders. The anticipated outcomes include the development of tailored financial models, innovative agricultural practices, and comprehensive strategies to enhance the sustainability and productivity of organic farming globally [20], [21]. This research will contribute to advancing the field of organic agriculture and promoting informed consumer choices, ultimately supporting the broader goals of sustainable development [22], [23].

Organic farming is increasingly recognized as a key strategy for sustainable food production, addressing both immediate food demands and long-term agricultural sustainability. Research in this field has expanded significantly over the past two decades, reflecting growing policy support and consumer demand for safe and healthy food. Organic farming, characterized by environmentally friendly and sustainable agricultural practices, has gained significant attention due to its potential to address critical issues such as food security, environmental sustainability, and public health. The adoption of organic methods contributes to multiple Sustainable Development Goals (SDGs), promoting ecological balance and human well-being.

Prior studies have examined various aspects of organic agriculture, including soil restoration, biotechnology, consumer perception, and certification systems. Bibliometric research has contributed to understanding scientific productivity, collaboration patterns, and emerging themes. However, most existing analyses tend to focus on general trends without exploring in depth the integration of Industry 4.0 technologies such as precision farming, AI, and blockchain or region-specific dynamics in underrepresented areas like West and Southern Africa.

This study offers a novel contribution by presenting a comprehensive bibliometric analysis that combines performance metrics, co-authorship mapping, keyword evolution, and thematic trends with a special focus on technological integration and geographic distribution. Unlike earlier works, it captures the temporal shift in research from agronomic practices toward sustainability governance, certification systems, and interdisciplinary policy frameworks. The remainder of this paper is structured as follows: The Methods section explains the bibliometric approach, database selection, and analytical tools used. The Results and Discussion section presents trends, clusters, and thematic shifts in organic farming research over the past decade. Finally, the Conclusion offers insights for future studies and outlines practical implications for researchers, educators, and policymakers.

2. METHODS

The bibliometric analysis in this study was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol to ensure methodological rigor. Data were extracted from the Scopus database on documents published between 2014 and 2024, focusing on global research related to organic farming. The process consisted of four key stages: identification, screening, eligibility, and inclusion. The research flowchart method is shown in Fig. 2.

2.1. Identification

The initial search in Scopus using the keywords TITLE-ABS-KEY("organic farming") AND TITLE-ABS-KEY(agriculture)* and publication year filters (2014–2024) retrieved 4,252 records. This dataset represented all available global research on organic farming within the specified period.

2.2. Screening

After removing duplicates and conducting preliminary filtering, the same 4,252 documents were screened for relevance. Records were then restricted to the subject areas “Agricultural and Biological Sciences” and “Social Sciences”, resulting in the exclusion of 2,281 documents that did not fit the scope of this study. This step reduced the dataset to 1,971 documents.

2.3. Eligibility

The remaining 1,971 documents underwent full-text eligibility assessment. Articles that did not meet the inclusion criteria (for example, non-research articles, non-English publications, or documents irrelevant to organic farming within the agricultural context) were excluded. This step led to the removal of 1,087 documents.

2.4. Inclusion

A total of 884 documents were identified as relevant and subsequently included in the bibliometric analysis. These documents formed the basis for further performance analysis, co-authorship network mapping, co-occurrence analysis, and thematic evolution visualization using VOS viewer and Bibliophagy.

The inclusion criteria were:

(1) Articles published in peer-reviewed journals.
(2) Documents written in English.
(3) Subject areas limited to "Agricultural and Biological Sciences" and "Social Sciences".
(4) Thematic relevance to organic farming, determined via keyword filtering (e.g., "Organic Farming", "Sustainability", "Soil Health").

The exclusion criteria eliminated:
(1) Non-article types (reviews, conference papers, book chapters)
(2) Non-English documents
(3) Irrelevant publications outside the specified scope.

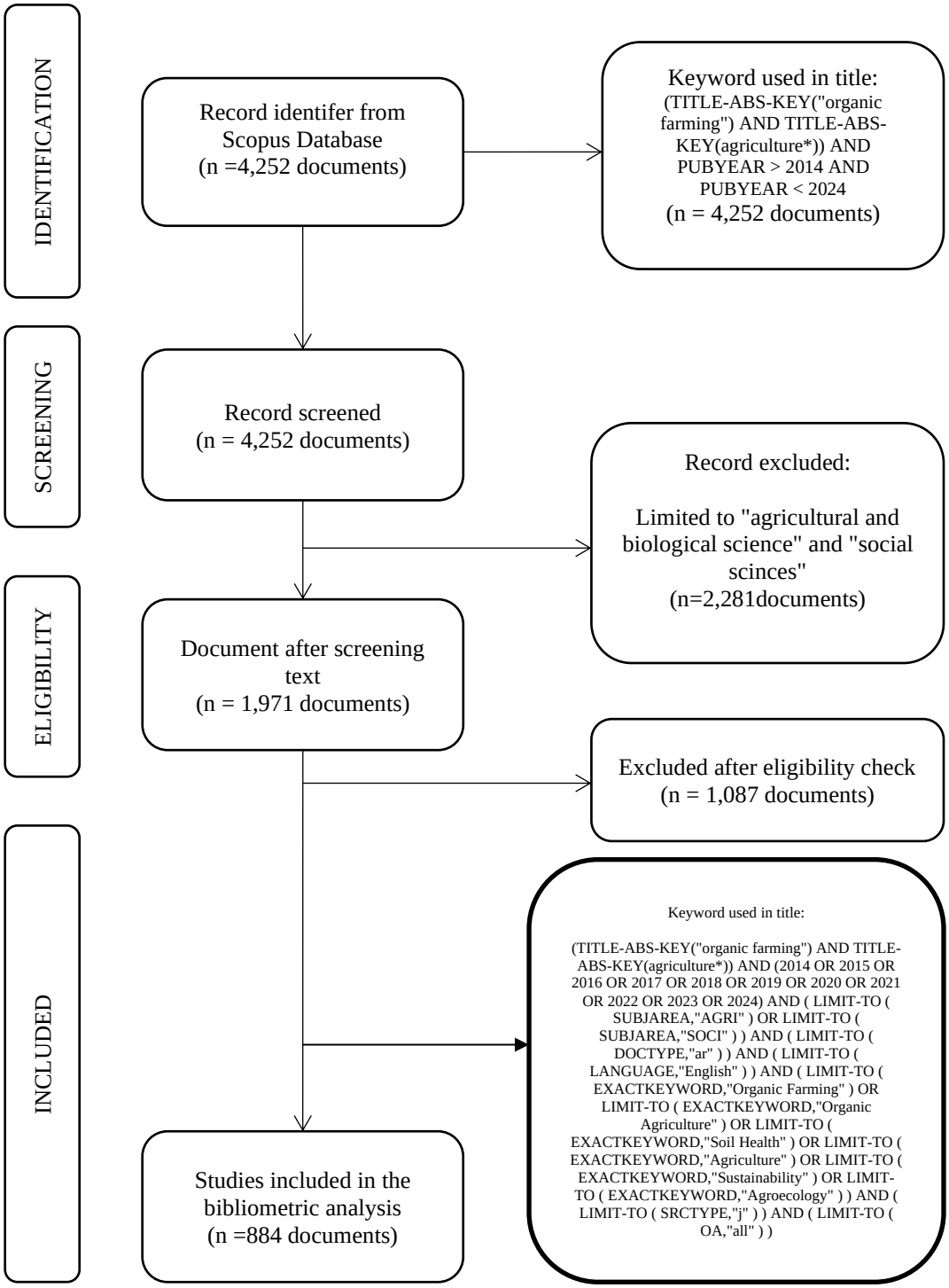

Fig. 2. Methodology research

3. RESULTS AND DISCUSSION

The annual distribution of documents by source, as shown in Fig. 3, highlights the dominant role of Sustainability (Switzerland) in publishing research on organic farming between 2013 and 2025. This journal shows a consistent upward trend beginning in 2016, peaking in 2021 with 27 documents, before gradually declining in subsequent years. In contrast, Agronomy and Agriculture (Switzerland) exhibit a moderate increase in output, with Agriculture (Switzerland) reaching its highest point in 2021 (11 documents) and Agronomy peaking in 2021–2023 with around 7 documents per year. Meanwhile, the Journal of Dairy Science shows sporadic contributions early in the period (2014–2016) but becomes almost absent after 2020.

Overall, the data indicate that the research landscape on organic farming has shifted towards sustainability-oriented journals in recent years, reflecting the growing interdisciplinary interest in the environmental and social dimensions of agriculture. The steady increase in publications from 2016 to 2021 across these key sources suggests an expansion of the topic's visibility and scientific impact, particularly within journals that focus on sustainability, agronomy, and agricultural innovation. However, the post-2021 decline, especially in Sustainability (Switzerland), may indicate saturation of the topic or a transition toward more specialized thematic outlets.

Fig. 3 shows that the highest number of organic farming publications occurred in 2021, dominated by journals such as Sustainability (Switzerland). This peak may be attributed to increased global awareness of sustainability, especially following the COVID-19 pandemic, which intensified concern over food security and ecological resilience. These findings align with the bibliometric results of Chowdhuri I [24] , who also observed a surge in sustainability-focused agricultural research between 2020–2022. However, unlike previous analyses that focused mainly on production methods, our study highlights the growing integration of certification systems and policy-oriented approaches.

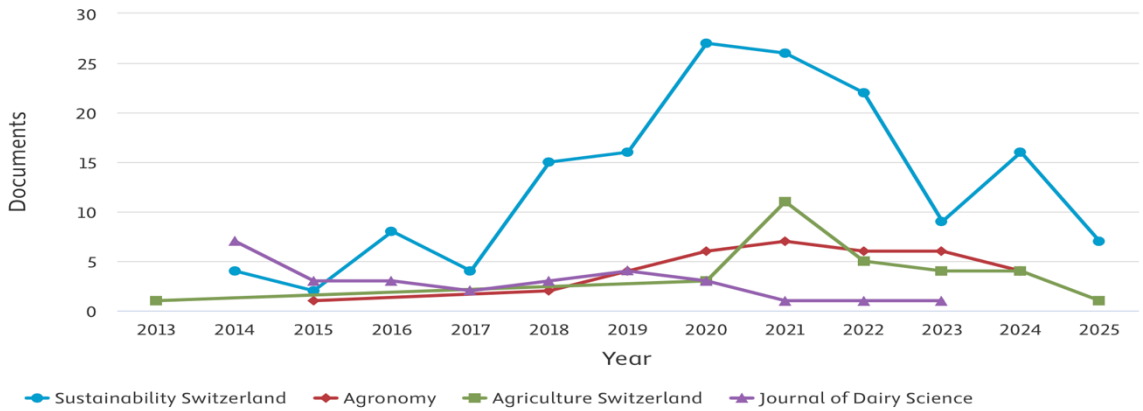

Fig. 3. Annual distribution of documents on organic farming by source (2013–2025), showing the dominance of Sustainability (Switzerland), with additional contributions from Agronomy, Agriculture (Switzerland), and Journal of Dairy Science

The distribution of documents by subject area (Fig. 4) demonstrates that research on organic farming is predominantly concentrated within Agricultural and Biological Sciences (33.4%), reflecting the strong disciplinary foundation of this field. The second largest contribution comes from Environmental Science (18.8%), underscoring the increasing emphasis on environmental sustainability and ecological concerns associated with organic farming. Notably, Social Sciences account for 15.0% of publications, suggesting an interdisciplinary approach that incorporates rural development, policy, and social innovation into the discourse on organic farming systems.

Other subject areas also contribute to the research landscape, though at a smaller scale. Energy (9.2%) and Computer Science (6.7%) indicate growing integration of renewable energy technologies and digital tools into agricultural practices. Similarly, areas such as Biochemistry, Genetics, and Molecular Biology (4.8%) and Economics (2.4%) reflect the inclusion of biotechnological advances and economic analysis. Minor but notable contributions from engineering, immunology, and chemistry indicate that organic farming research is broadening its scope to incorporate technological innovations and scientific methods beyond its traditional disciplinary boundaries.

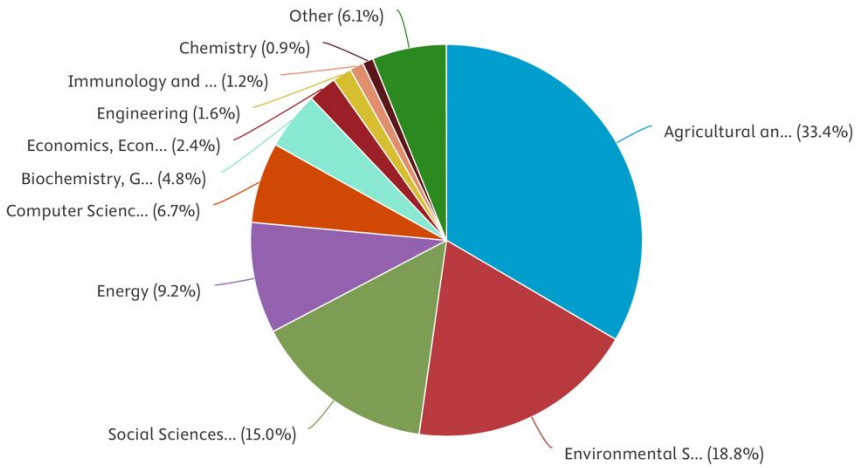

Fig. 4. Distribution of organic farming publications by subject area, showing the dominance of Agricultural and Biological Sciences (33.4%), followed by Environmental Sciences (18.8%) and Social Sciences (15.0%), with additional contributions from Energy, Computer Science, and other fields

3.1. Focus Research

The keyword co-occurrence map (Fig. 5) reveals four main research clusters in organic farming: Cluster 1 (red) – Sustainable Development and Agricultural Policy, focusing on themes such as agricultural policy, certification, environmental protection, and farming systems; Cluster 2 (green) – Agronomic Practices and Soil Health, covering crop rotation, cover crops, composting, soil quality, and microbial activity; Cluster 3 (blue) – Animal Husbandry and Organic Livestock Production, which addresses dairying, animal feeding standards, breeding, and animal welfare; and Cluster 4 (yellow) – Food Quality, Microbiology, and Safety, encompassing food safety, soil microbiology, fertilizer, fungi, and genotype studies. These clusters highlight the multidisciplinary nature of organic farming research, integrating policy, agronomic, livestock, and biological perspectives.

The co-occurrence map of keywords in Fig. 5 visualizes the intellectual structure of organic farming research between 2014 and 2024. Four major clusters emerged from the analysis. The first cluster (red) focuses on sustainable development and agricultural policy, encompassing concepts such as sustainable agriculture, certification, food production systems, and environmental protection. These keywords indicate a strong interest in policy-driven strategies and certification schemes that support organic farming practices worldwide.

The second cluster (green) reflects agronomic practices and soil health, where terms such as cropping practices, crop rotation, cover crops, compost, biomass, soil quality, and microbial activity dominate. This cluster highlights the technical aspects of organic farming aimed at enhancing soil fertility and biodiversity, aligning with the ecological principles of sustainability. Meanwhile, the third cluster (blue) concentrates on animal husbandry and organic livestock management, with keywords like animals, dairying, animal feed, housing, swine, breeding, and welfare, showing the growing focus on livestock standards within organic farming systems.

The fourth cluster (yellow) emphasizes food quality, microbiology, and safety, with frequent keywords such as food safety, soil microbiology, metabolism, fertilizer, and fungi. This research stream indicates a multidisciplinary approach, integrating biological and chemical sciences with agronomy to ensure the safety and quality of organic food products. Collectively, these clusters demonstrate that organic farming research is no longer confined to crop management but extends to policy, livestock, and food systems, showing the broadening scope of the field over the last decade.

These findings are consistent with previous bibliometric analyses such as those by Beg M, Laxman L, Akerfeldt, Brito and Bruma I [25], [26], [27], [28], [29], which also reported that organic farming research has progressively diversified from a narrow focus on crop production towards broader areas, including sustainability policies, soil microbiology, and food safety. However, compared to earlier studies, the current map reveals a more pronounced integration of animal welfare and certification issues as distinct research themes. This indicates that the field is evolving in line with global agendas on sustainability and the circular bioeconomy, supporting the argument that organic farming research is becoming increasingly interdisciplinary.

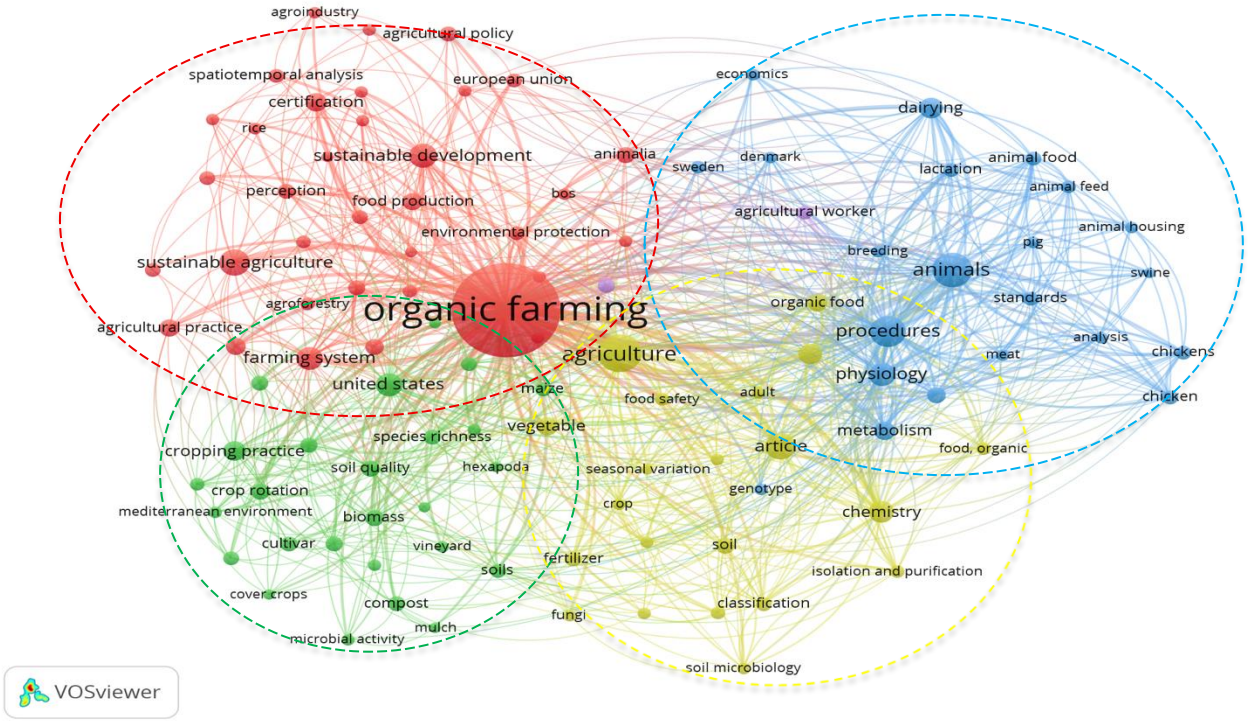

Fig. 5. Keyword co-occurrence network of organic farming research (2014–2024) visualized using VOSviewer, showing four main clusters: (1) Sustainable Development and Agricultural Policy (red), (2) Agronomic Practices and Soil Health (green), (3) Animal Husbandry and Organic Livestock Production (blue), and (4) Food Quality, Microbiology, and Safety (yellow)

3.2. Keyword Novelty

The overlay visualization of keywords in Fig. 6 highlights the temporal evolution of organic farming research from 2017 to 2021, where the color gradient from blue to yellow indicates the novelty and recency of topics. Earlier studies (blue to green shades) concentrated on traditional themes such as soil quality, compost, cropping practice, animal welfare, and physiology, while more recent research trends (yellow shades) are emerging around sustainable agriculture, agricultural policy, certification, spatiotemporal analysis, and food production systems. This shift demonstrates that current research is moving toward policy integration, certification frameworks, and sustainability assessment beyond purely agronomic or biological approaches.

This temporal trend aligns with the increasing global emphasis on sustainability frameworks in agriculture. Similar findings were reported by Karlsson M [30], Merino-Gaibor E [31], Puteri M [32], Usman S [33] and Garrido-Garza F [34] who noted that early organic farming studies focused primarily on soil management and crop diversity, whereas later research incorporated broader sustainability metrics, including environmental policy and certification systems. The presence of yellow-highlighted keywords such as agricultural policy, sustainable development, and certification in the present map confirms that these areas are now becoming novel research frontiers within organic farming scholarship.

The emergence of themes like spatiotemporal analysis and food production systems indicates a methodological shift towards data-driven approaches for assessing the performance and environmental impact of organic farming. This is in line with the work of Sponagel C [35],who emphasized the increasing use of geospatial and systems-based approaches to analyze how organic farming interacts with climate, land use, and global supply chains. Such methods are contributing to a more nuanced understanding of the ecological and socio-economic impacts of organic agriculture.

The overlay visualization underscores a transition from traditional livestock and crop focused research (dominated by blue clusters on dairying, animals, and physiology) to multidisciplinary studies that integrate policy, certification, and sustainability assessment. This evolution of research themes suggests that organic farming scholarship is responding to global agendas such as the United Nations Sustainable Development Goals (SDGs). Compared with previous bibliometric maps from earlier periods, the inclusion of certification and sustainable development as recent focus areas reflects a growing consensus that organic farming must be framed within broader socio-political contexts.

Fig. 6 presents an overlay visualization showing the emergence of novel keywords between 2017 and 2021. Earlier research focused on agronomic concepts such as compost and crop rotation, whereas newer studies emphasize "certification," "agricultural policy," and "spatiotemporal analysis. “This shift mirrors findings by Ares-Sainz J [36], who documented increasing policy-oriented research in response to global certification demands. The growing use of “spatiotemporal analysis” suggests rising interest in precision agriculture technologies, in line with Industry 4.0 integration. These trends reflect the broader influence of the United Nations Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).

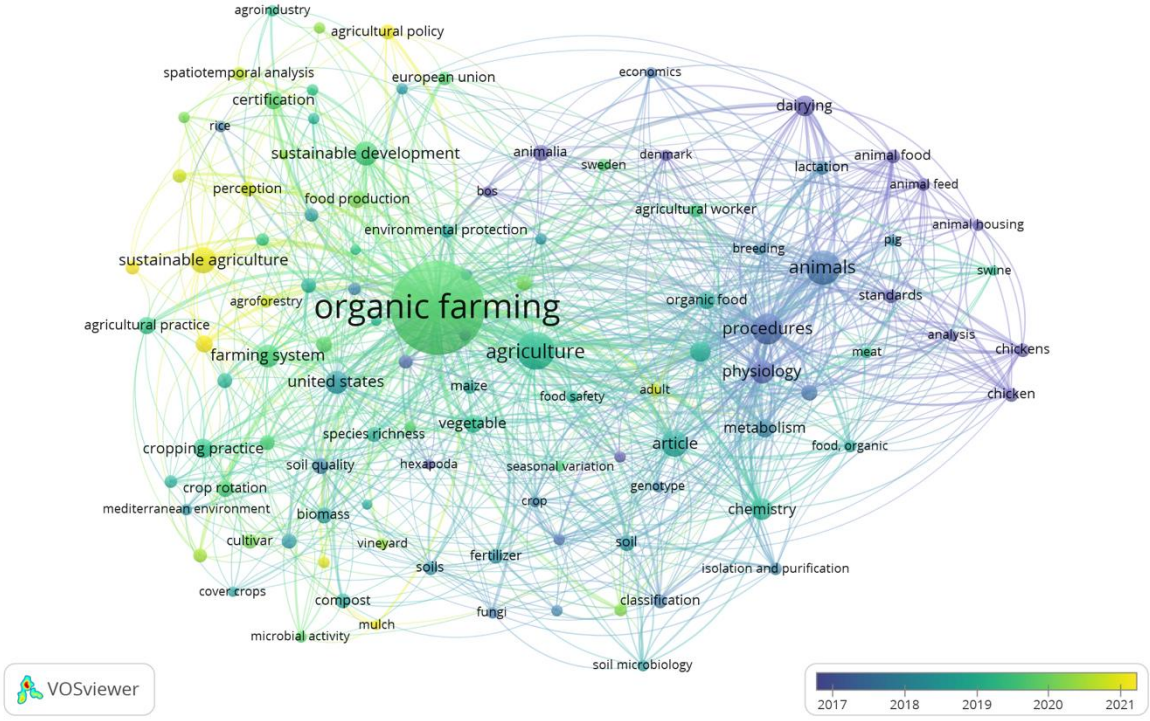

Fig. 6. Overlay visualization of keyword co-occurrence in organic farming research (2017–2021), illustrating the temporal evolution of themes from earlier topics (blue: soil quality, cropping practice, animal physiology) to recent frontiers (yellow: sustainable agriculture, agricultural policy, certification, and spatiotemporal analysis)

4. CONCLUSION

This study presents a comprehensive bibliometric and visualization analysis of organic farming research from 2014 to 2024. The findings reveal an evolving research landscape marked by a transition from traditional agronomic and livestock management practices to more integrated, interdisciplinary approaches. These include themes such as sustainability governance, certification systems, spatiotemporal analysis, and food safety. Four dominant thematic clusters emerged: (1) sustainable development and agricultural policy, (2) agronomic practices and soil health, (3) animal husbandry and organic livestock production, and (4) food quality, microbiology, and safety. Based on these findings, several recommendations can be drawn. Researchers should prioritize cross-disciplinary studies that bridge agricultural science with digital technology, such as the use of AI, blockchain, and IoT in organic systems. This is particularly relevant for improving traceability, soil health monitoring, and data-driven farm management. Future research should also focus on underrepresented regions, including West and Southern Africa, to explore the local applicability of organic methods and address region-specific environmental and socio-economic challenges.

Moreover, longitudinal and comparative studies across different policy contexts are needed to evaluate the effectiveness of organic farming systems in contributing to the Sustainable Development Goals (SDGs). There is also scope for further analysis of the economic viability and social equity impacts of organic agriculture, particularly for smallholder farmers. In conclusion, this study not only maps the current state of global organic farming research but also outlines strategic opportunities for future research. Addressing the

technological, regional, and systemic dimensions of organic agriculture will be key to enhancing its global relevance, resilience, and sustainability.

Author Contribution
All authors contributed.

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