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Agri-Startup Trend Analysis Based on Thematic Map Clustering

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Abstract

This study employs thematic map clustering and social network analysis (SNA) to analyze global Agri-startup trends, utilizing bibliometric data from the Scopus database. The research identifies key contributors, collaboration networks, and key thematic clusters that drive innovation in the agricultural sector. Findings reveal a significant upward trend in Agri-startup research, with sustainability, entrepreneurship, and technology integration emerging as central themes. The study highlights the critical roles of prominent regions, institutions, and journals in shaping the field, underscoring the importance of precision agriculture and digital technologies in advancing agriculture. These insights offer actionable recommendations for stakeholders to foster innovation, promote sustainable development, and address global agricultural challenges and enhance food security, bridging academic research with practical applications in innovation ecosystems.

Keywords: Entrepreneurial Ecosystems; Sustainable Development; Rural Development; Smart Farming; Agri-entrepreneurship.

1. Introduction

In multiple industries, including the agricultural industry, the emergence of startups has become more prominent (Suresh et al., 2024). The growth of agricultural startups is a reflection of the rising need for innovative methods that boost productivity and sustainability, among other factors in agriculture (Runck et al., 2022). These startups, often termed 'Agripreneurs' or 'Agri-startups', use information technology to solve industry-specific social, environmental, and economic issues, emphasizing the growing significance of entrepreneurship in agriculture for sustainable development (Arumugam & Manida, 2023).

Agri-startups are being recognized worldwide as innovators and agents of change, that advocate for the challenges affecting farmers and the agriculture industry (Anjali, 2023). They facilitate a transition from subsistence farming to agribusiness, which leads to improved income levels among the farmers (Reddy, 2023). Agri-startups contributed to building a sustainable future for

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agriculture, a stable food supply, and the development of culture within the industry (Nemade et al., 2023).

Despite the growing interest in Agri-startups, there are notable gaps in the existing literature. Judijanto et al. (2023) used bibliometric tools to explore trends in Agricultural Technologies and agribusiness, identifying key authors and emerging themes within the academic discourse. While this study effectively maps academic influence, it lacks a direct connection to the practical challenges and thematic clusters relevant to the startup environment, particularly in understanding how these themes translate into real-world startup success. Bethi and Deshmukh (2023) offer a broad overview of the challenges and opportunities for Agri-startups in developing economies, focusing on general trends and issues. However, their study lacks specificity in identifying the key thematic drivers and network structures that are crucial for understanding startup success in these diverse contexts. This limitation is echoed in recent works such as Guerrero-Ocampo and Díaz-Puente (2023), and Dias et al. (2019), which highlight innovation, responsibility, and sustainability but lack integration across themes. These gaps underscore the currently fragmented research on this expanding industry (Barrett et al., 2020; Klerkx & Rose, 2020). Therefore, scholars and professionals are left to negotiate a complex network of studies without clear guidance (Rose & Chilvers, 2018). Prior research studies have been performed on too many aspects of Agri-startups, and this article provides an academic landscape of Agri-startups (Bhagat et al., 2022; Chalgynbayeva et al., 2023; de Souza et al., 2022; Mendes et al., 2022; Yousaf et al., 2023).

Despite growing attention to Agri-startups, few studies provide a systematic thematic and network-based view of the field. The necessity of this research lies in addressing the fragmented understanding of Agri-startups and their role in addressing global agricultural challenges. While Agri-startups are increasingly recognized as key drivers of innovation and sustainability, there is a lack of systematic analysis that connects academic research with practical applications. This study aims to bridge this gap by identifying the key thematic drivers, collaboration networks, and emerging trends that shape the Agri-startup ecosystem. By doing so, it provides a foundation for stakeholders to make informed decisions and foster innovation in agriculture.

To address these gaps, this study utilizes Thematic map clustering and Social Network Analysis (SNA) to offer insights across several domains, significantly impacting academic and scientific stakeholders. Key contributions include:

(1) This study provides an in-depth examination of the growth trajectory of Agri-startup research over time.

(2) The analysis identifies leading contributors, including prolific authors, key academic institutions, countries, and journals that have made significant impacts in the field.

(3) Highlighting the most cited works in the field, the study sheds light on influential studies that have shaped the current landscape of Agri-startup research.

(4) The study examines the emergence and popularity of specific research topics, tracking the evolution of interests and technological advancements in the field. It uses tools like word clouds, thematic maps, and cluster analysis to reveal the dynamic nature of research themes and analyze trends over time.

(5) Drawing on previous findings, the study proposes future research avenues that address identified gaps and capitalize on emerging trends. This forward-looking perspective aims to inspire Agri-startups to address agricultural challenges, suggesting innovative approaches and methodologies.

The following sections begin with an explanation of the methodology, Next, the findings section presents the outcomes of data analysis, including the examination of key contributors and their relations, and the clustering of papers based on a thematic map analysis. Finally, in the Conclusion and Discussion, a comprehensive analysis of clusters focusing on various periods is carried out using trend analysis.

2. Methodology

2.1. Data collection

This study analyzes the trends of Agri-startups using a combined methodology of social network analysis and thematic mapping, guided by the logic of coupling clustering. To understand and track the evolution of trends over time, the data collection was structured around four distinct time periods. Each period was selected to represent a significant phase in the development of Agri-startups, thereby providing a comprehensive view of the dynamic landscape (Figure 1).

Figure 1. Methodological Framework.

The inclusion and exclusion criteria for the data selection were determined based on relevance to the Agri-startup research landscape and the methodological rigor of the sources. Only peer-reviewed journal articles and conference papers from the Scopus database were included to ensure the quality and credibility of the data. Studies that focused on broader agricultural trends without a clear connection to startups or entrepreneurial activities were excluded. Additionally, papers lacking sufficient bibliometric information or not written in English were omitted to maintain consistency in the analysis. **Error! Not a valid bookmark self-reference.** illustrates the PRISMA process, which was followed to achieve these objectives.

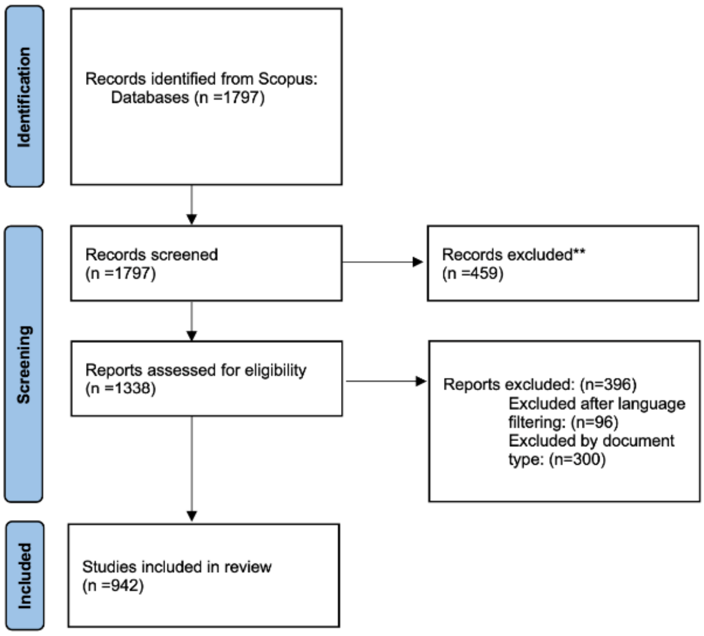

Figure 2. PRISMA.

2.2. Social Network Analysis

To elucidate the collaborative dynamics within the research field of Agri-startups, an SNA was conducted using Gephi. The primary objective of this analysis was to identify key contributors, central figures, and the overall structure of the research community (Guerrero-Ocampo & Díaz-Puente, 2023). A co-authorship network was constructed where nodes represented authors, and edges denoted co-authorship links, with the strength of each link determined by the number of co-authored publications between any two authors (Kumar, 2024). To pinpoint the most influential authors within the network, centrality measures such as Degree Centrality, Betweenness Centrality, and Closeness Centrality were calculated. (Saqr et al., 2022; Si, 2022). This network analysis provided crucial insights into the key contributors and the collaborative structure of research in the Agri-startup field.

2.3. Thematic Map

To provide a comprehensive understanding of the research themes within the Agri-startup field, Thematic mapping is utilized.

The foundation of thematic mapping is based on coupling and clustering techniques. Specifically, bibliographic coupling is used to group related documents based on shared references, which helps in forming clusters of documents that share common research themes. These clusters are then analyzed and positioned on the thematic map according to their centrality and density, two key metrics in thematic mapping (Rojas-Lamorena et al., 2022).

Centrality measures how connected a theme is to other themes, indicating its importance within the research field, while density reflects the internal cohesion of the theme, showing how well-developed the theme is (Karakose et al., 2024). Using these metrics, a thematic map is constructed with four quadrants (Zhu et al., 2024):

Motor Themes (high centrality and high density): These represent well-developed and influential topics that drive the research field.

Basic Themes (high centrality but low density): These are essential themes that are widely connected but still underdeveloped.

Niche Themes (low centrality but high density): These are specialized, well-developed areas that are not widely connected to other themes.

Emerging or Declining Themes (low centrality and low density): These indicate topics that are either gaining traction or losing relevance.

By positioning the research clusters within these quadrants, the thematic map provides a clear visualization of the research landscape, highlighting the core areas of focus, as well as emerging and declining trends within the Agri-startup field.

3. Results

3.1. Analysis of annual publications

The analysis of annual publications reveals key growth trends in Agri-startups research, as shown in Figure 3. Among the 942 documents published, we have identified three dominant trends that have shaped the field: sustainability, technology integration, and entrepreneurship. These trends were selected for further analysis due to their consistent prominence across all phases of research and their critical role in addressing global agricultural challenges. The evolution of research activity can be divided into three main phases, each marked by a growing emphasis on these key themes:

Initial Phase (2000-2010): This period was foundational, with the field being relatively underexplored and an average of 10 publications per year.

Growth Phase (2011-2016): A marked increase in publications began around 2011, with an average of 30-40 publications annually, driven by growing awareness of sustainable agriculture and technological advancements.

Peak and Stabilization (2017-2023): The most significant surge occurred between 2017 and 2020, with annual publications exceeding 100. This peak reflects heightened interest, supported by policy and investment. Post-2021, the publication rate stabilized, indicating the field's maturation.

This upward trend underscores the critical role of Agri-startups in addressing global agricultural challenges, particularly through sustainability in AgTech and the promotion of resilient farming systems.

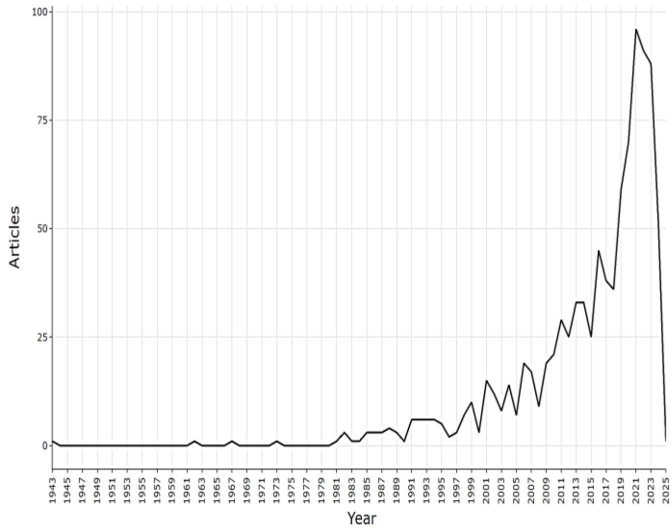

Figure 3. Annual publications of research on Agri-startups.

3.2. Key contributors of Agri-startups

As depicted in Table 1, Lans and Modaffari lead the Agri-startup research field, each with five publications, indicating their central roles and leadership within their research groups. They are closely followed by Blok, Lindsay, and Verstegen, each contributing four articles, reflecting their sustained expertise and focus in the field. The collective contributions of these authors are crucial for advancing theoretical frameworks, methodological approaches, and practical applications in Agri-startups. Their work also plays a significant role in mentoring future researchers and shaping the research agenda.

Table 1. Top 10 productive authors.

Author	Count
Lans, Thomas	5
Modaffari, Giuseppe	5
Blok, Vincent	4
Lindsay, Bruse R	4
Verestegen, Jos	4
Bertucci Ramos	3
Paulo, Henrique	3
Bickley, James M	3
Cornelissen, Gerard	3
Fafchams, Marcel	3
Frare, Anderson Betti	3

Figure 4, illustrating the authors' collaboration network, offers valuable insights into the collaborative dynamics within the academic scene of Agri-startups. The connections among these authors have been analyzed in the co-authorship network, where each line represents a co-authorship relationship, and the size of each box indicates the author's influence in the network, measured by the degree centrality (Alnajem et al., 2021). Figure 4 is vital for identifying key players and collaborative hubs within the agri-startup research field. It reveals the structure of existing collaborations and potential opportunities for new ones. Understanding these dynamics is crucial for fostering a cohesive, interdisciplinary research environment in this rapidly evolving field. By highlighting central figures and collaboration networks, Figure 4 serves as a roadmap for nurturing future collaborations to enhance innovation and tackle challenges in the agricultural startup ecosystem.

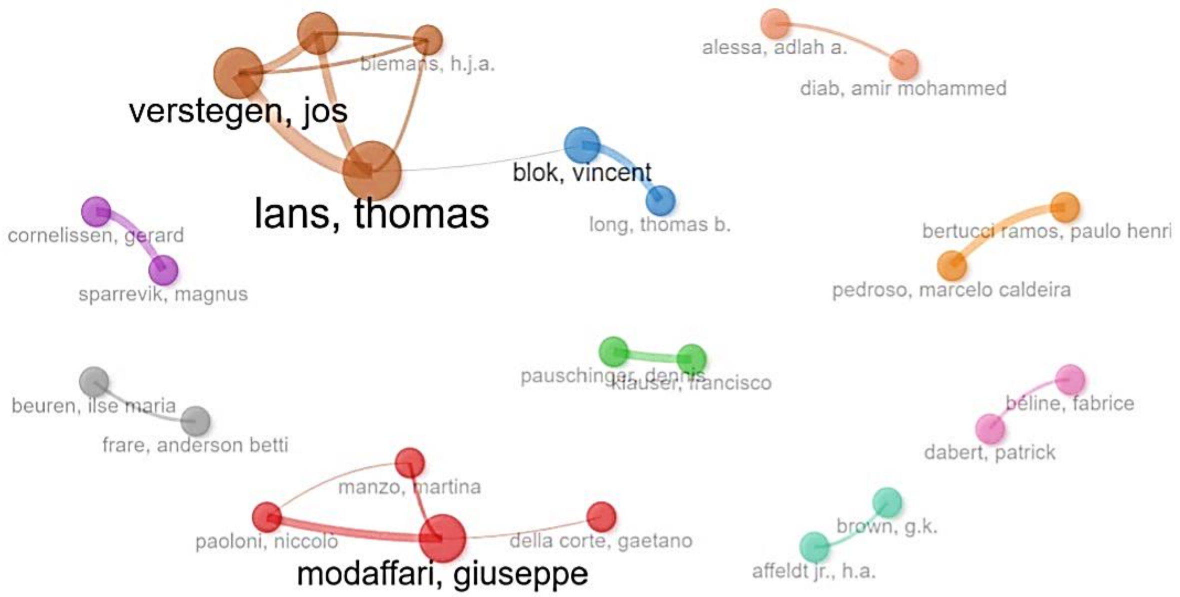

Figure 4. Authors' collaboration network.

To identify key universities and research institutions in the field of Agri-startups, as Table 2 shows, we analyzed the number of publications produced by each institution. The UoC emerged as the leader with 19 articles, followed by Wageningen University with 17 publications. ICA - Indian Institute ranks third, contributing 13 articles. This analysis highlights the major players driving research and innovation in Agri-startups.

Table 2. Top 10 productive affiliations.

Affiliations	Count
University of California	19
Wageningen University	17
ICAR-Indian Institute of Farming Systems Research	13
Italian National Institute for Health	13
Université Evangélique en Afrique	13
Ghent University	11
Sapienza University of Rome	11
Swedish University of Agricultural Sciences	11
Aristotle University of Thessaloniki	10
Max Planck Institute for Evolutionary Anthropology	10

The institution collaboration network in Agri-startups research, as illustrated in Figure 5, reveals a dynamic and interconnected web of academic and research institutions worldwide, composed of several distinct communities that vary in influence and collaboration intensity among their members. Each line represents a co-authorship link, and the size of the box indicates the strength of that affiliation's position in the network, based on the degree centrality metric (Albuquerque et al., 2022). Within this network, Wageningen University emerges as a leading institution, playing a central role in multiple communities due to its extensive contributions to agricultural research and innovation. The relationships between these affiliations or organizations were examined using a co-authorship network. The rest can be observed in Figure 5. These partnerships enhance knowledge exchange but also facilitate the development of innovative solutions to global agricultural challenges, showcasing the essential role of collaborative efforts in driving progress within this evolving field.

Figure 5. Institution collaboration network.

The bibliometric data concerning the contributions of various countries to the field of Agri-startups, as depicted in Figure 6, provides a detailed overview of global research efforts and collaboration patterns, differentiating between single-country publications (SCP) and multi-country publications (MCP) to offer insights into both the volume of research output and the nature of authorship (Musa et al., 2021). The United States leads with 99 articles, comprising 85 SCPs and 14 MCPs, reflecting strong internal collaboration and a robust research infrastructure. The significant number of MCPs highlights the USA's role in international collaborations. China follows with 43 articles, including 29 SCPs and 14 MCPs, indicating a balanced approach between internal and international collaboration, underscoring China's growing influence in the global research community. Overall, the high volume of SCPs shows strong national research capabilities, while MCPs emphasize the importance of global collaboration for advancing the field through diverse perspectives and shared resources.

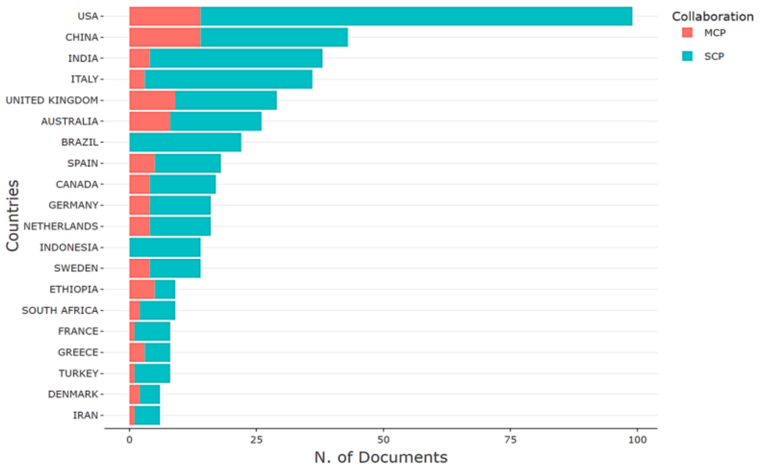

Figure 6. Top 10 productive countries.

Figure 7 illustrates the collaboration network among countries in the academic scene, highlighting the central roles of the USA and the UK. The USA, in particular, plays a pivotal role with strong connections to various countries, especially with the UK. New Zealand is part of a distinct cluster along with Canada and South Africa, emphasizing its involvement in regional collaborations. The rest of the network dynamics are also evident in the visualization of Figure 7.

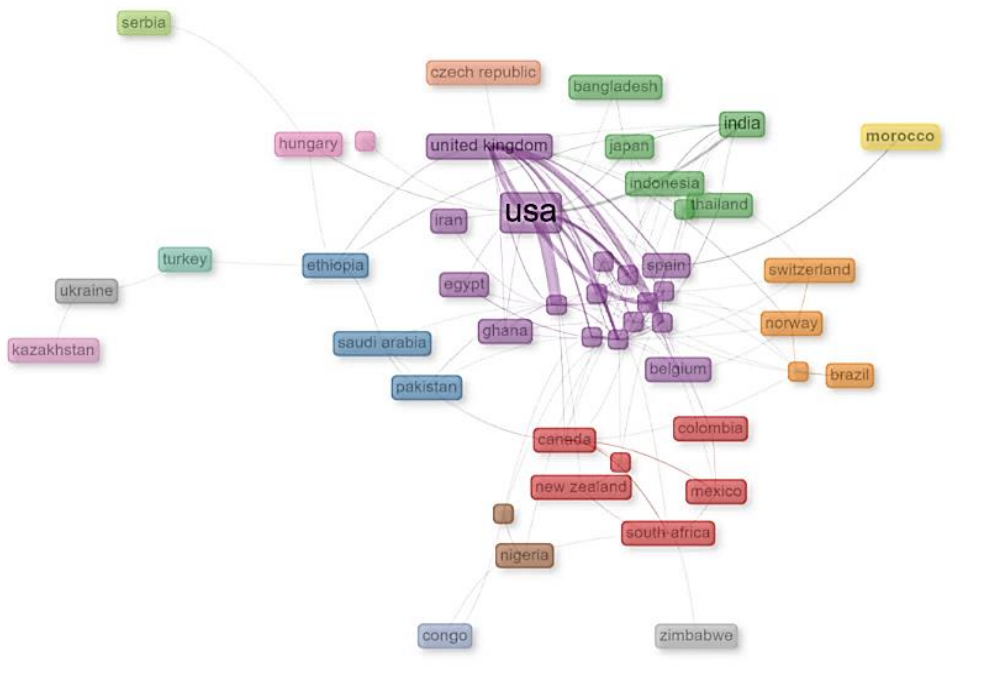

Figure 7. Country collaboration network.

3.3. Analysis of top journals

Table 3 shows the distribution of articles published across several journals in the field of Agri-startups research. The most prominent journal is "Sustainability (Switzerland)" with 25 articles, indicating its central role in this research area. "Bioresource Technology" follows with 16 articles, and "Journal of Rural Studies" has 13 articles. These journals are highlighted in Table 3, reflecting their importance in the dissemination of Agri-startups research.

Table 3. Top 10 productive journals.

Journal	Count
Sustainability	25
Bioresource Technology	16
Journal of Rural Studies	13
Emerald Emerging Market Case Studies	10
Water Science and Technology	10
Chemosphere	9
Ecological Engineering	8
Agricultural and Human Values	7
Journal of Small Business and Enterprise Development	7
Agricultural Systems	6

3.4. Analysis of top-cited articles

Table 4 summarizes ten highly cited articles in Agri-startups, detailing their focus, citation count, and authors.

Table 4. Highly cited articles.

Reference	Title	Citations
(Angenent et al., 2002)	Methanogenic population dynamics during startup of a full-scale anaerobic sequencing batch reactor treating swine waste	228
(Barbieri & Mshenga, 2008)	The Role of the Firm and Owner Characteristics on the Performance of Agritourism Farms	189
(Vik & McElwee, 2011)	Diversification and the Entrepreneurial Motivations of Farmers in Norway	155
(Lovell et al., 2010)	Integrating agroecology and landscape multifunctionality in Vermont	151
(Fafchamps & Minten, 1999)	Relationships and traders in Madagascar	136
(Debata et al., 2020))	COVID-19 pandemic! It's impact on people, economy, and environment	135
(Hansson et al., 2013)	Farmers' motives for diversifying their farm business – The influence of family	127
(Birner et al., 2021)	Who drives the digital revolution in agriculture?	124
(Pant & Reddy, 2003)	Potential internal loading of phosphorus in a wetland constructed in agricultural land	123
(Cornelissen et al., 2016)	Emissions and Char Quality of Flame-Curtain "Kon Tiki" Kilns for Farmer-Scale Charcoal/Biochar Production	121

3.5. Thematic map analysis

The word cloud shown in Figure 8 highlights key themes in Agri-startup research, showing a strong focus on agriculture (49), entrepreneurship in agriculture (46), and sustainability (33). These themes were selected for in-depth analysis due to their centrality in the literature and their potential to drive future innovation in the sector. While other topics like renewable energy and rural development are also important, this study will focus on the three dominant themes, as they represent the most critical areas for addressing global agricultural challenges and fostering sustainable development.

Figure 8. Word cloud based on keywords.

Figure 9 presents a thematic map of keywords in the Agri-startups academic scene, dividing them into four quadrants: Motor Themes, Niche Themes, Basic Themes, and Emerging or Declining Themes. Motor Themes, including keywords like nitrogen and bioreactor, are central and well-developed, highlighting their importance in sustainability and environmental impact in agriculture. Niche Themes, such as land use and regional focuses like India and the UK, are highly developed but more region-specific. Basic Themes, including agriculture and the US, are essential but less explored, representing foundational aspects of the field. Emerging or Declining Themes, like agricultural technology and economic development, are either in early stages of research or losing relevance, indicating potential areas for growth or rethinking.

Overall, the map illustrates a dynamic academic landscape with established areas of research and opportunities for further exploration, especially in technology integration and regional challenges in agriculture. This thematic structure reflects a growing cross-disciplinary convergence in Agri-tech, echoing findings by Chalgynbayeva et al. (2023) in the context of agrivoltaic system research.

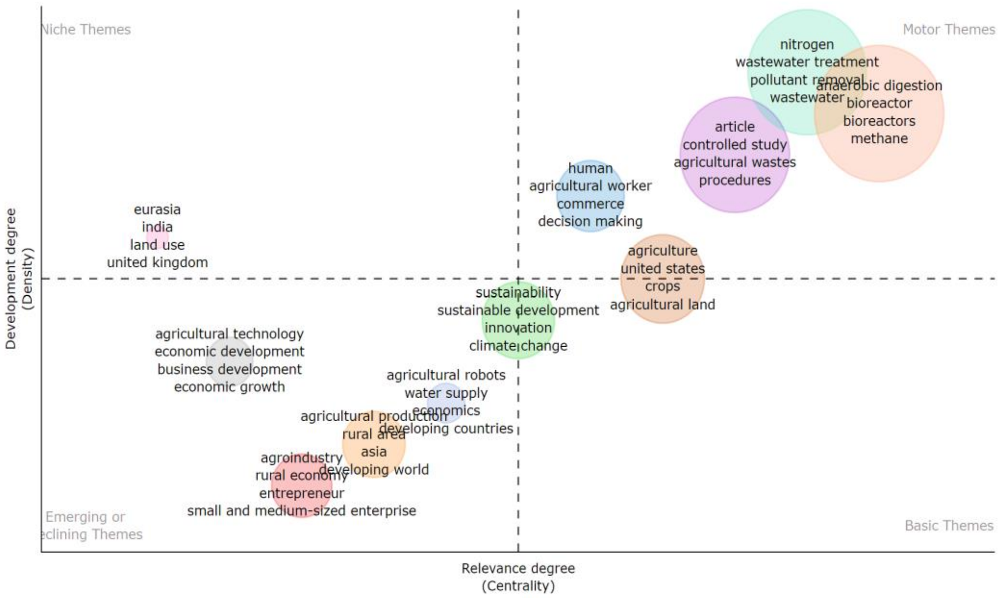

Figure 9. Thematic map of keywords.

The thematic evolution of keywords in agricultural research, as shown in Figure 10, highlights shift in focus over four periods. The selected time periods were determined based on significant shifts in research output and thematic evolution within the field of Agri-startups. Each period reflects a distinct phase in the volume, focus, and development of research, allowing for a structured longitudinal analysis. These divisions enable the identification of emerging trends, key technological advancements, and shifts in scholarly attention over time, providing a clearer understanding of how the field has progressed:

1. **1943-2011**: Research was diverse and foundational, covering topics like drainage, water treatment, and economic development, with an emphasis on agricultural workers, forestry, and the rural economy. This period laid the groundwork with a broad focus on agricultural practices and regional studies.
2. **2012-2018**: The focus shifted to more specialized themes such as anaerobic digestion, agroindustry, smallholder farming, and sustainable development, while still addressing general themes like agriculture and the rural economy. This period marks a deeper engagement with the behavioral and production aspects of agriculture.

3. **2019-2021**: Sustainability became a central theme, with continued emphasis on agroindustry, livelihood, and agricultural production. The emergence of crop research indicates a more detailed exploration of specific agricultural outputs, reflecting growing concerns about environmental stewardship and socio-economic well-being.
4. **2022-2024**: The research focus evolved to include entrepreneurial activities and business aspects, with new themes like China, agricultural technology, and climate change. Traditional themes like agriculture and sustainability remained important, while newer advancements like agricultural robots and supply chain management emerged, signaling a forward-looking approach in agricultural research.

This thematic evolution shows a shift from foundational agricultural practices to a focus on sustainability, technology, and the economic dimensions of agriculture.

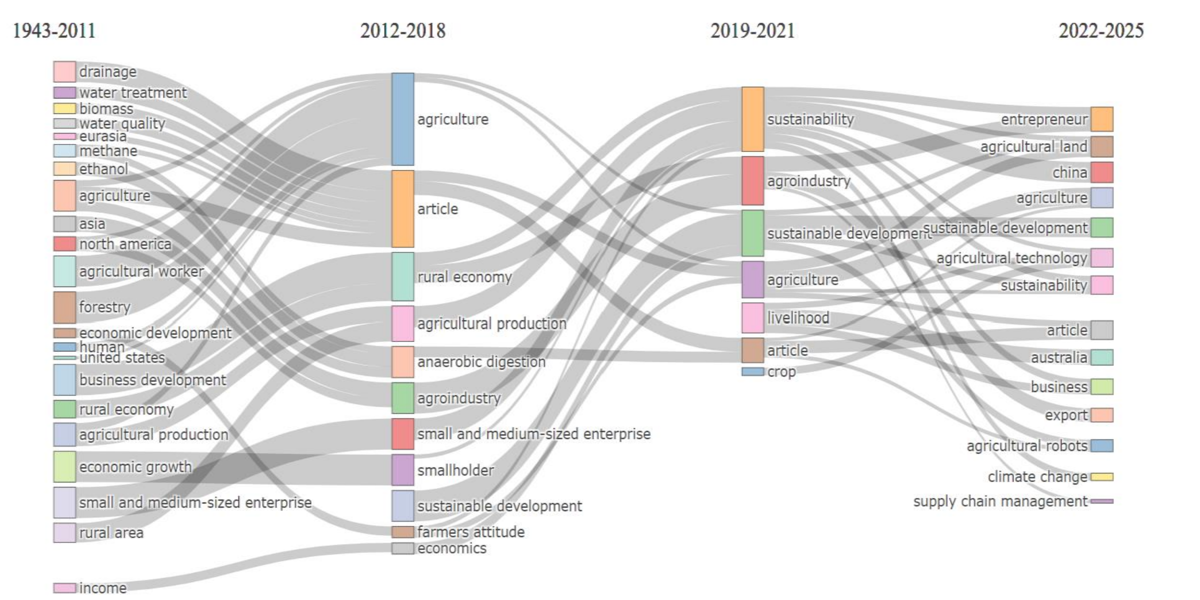

Figure 10. Thematic evolution of keywords.

4. Discussion

This research aimed to analyze the research trends in the Agri-startup scene. We extracted relevant articles from the Scopus database and utilized a combination of SNA and thematic analysis techniques. Our objective was to identify key contributors within the field and analyze their networking patterns. Moreover, through thematic analysis and creating various time-slice views, we sought to examine the progression of research themes and the clusters associated with each period. This resulted in various key findings, the most important ones were:

The predominant keywords identified were "agriculture," "entrepreneurship," and "sustainability," with "Sustainability (Switzerland)" being the most cited journal in the field.

Analysis revealed significant contributions from the USA and the UK within the academic network of agri-startups. We categorized major thematic clusters as Motor Themes (characterized by high centrality and density), Basic Themes (noted for high centrality but low density), Niche Themes (marked by low centrality but high density), and Emerging or Declining Themes (distinguished by low centrality and density). Insights from Figure 10 allowed for detailed identification of clusters within each thematic map, enhancing our understanding of niche areas that propel the domain, such as ecosystems and sustainability. Mendes et al. (2022) similarly noted that AgTech research is driven by the intersection of digital innovation and sustainability concerns, which aligns with the dominant clusters in this study. Based on the time periods illustrated in Figure 11 and so on, we distinguished each thematic map cluster separately to discover if they are in Motor, Basic, Niche, or Emerging or Declining themes.

As illustrated by Figure 11, in the period until 2011, key themes indicated an early emphasis on environmental sustainability and resource management, with a focus on technological advancements like bioreactors and constructed wetlands. Additionally, economic development was underscored by themes related to small and medium-sized enterprises, reflecting the importance of supporting smaller agricultural enterprises. The prominence of themes around water quality and biomass highlights an early recognition of the need for sustainable resource management in agriculture.

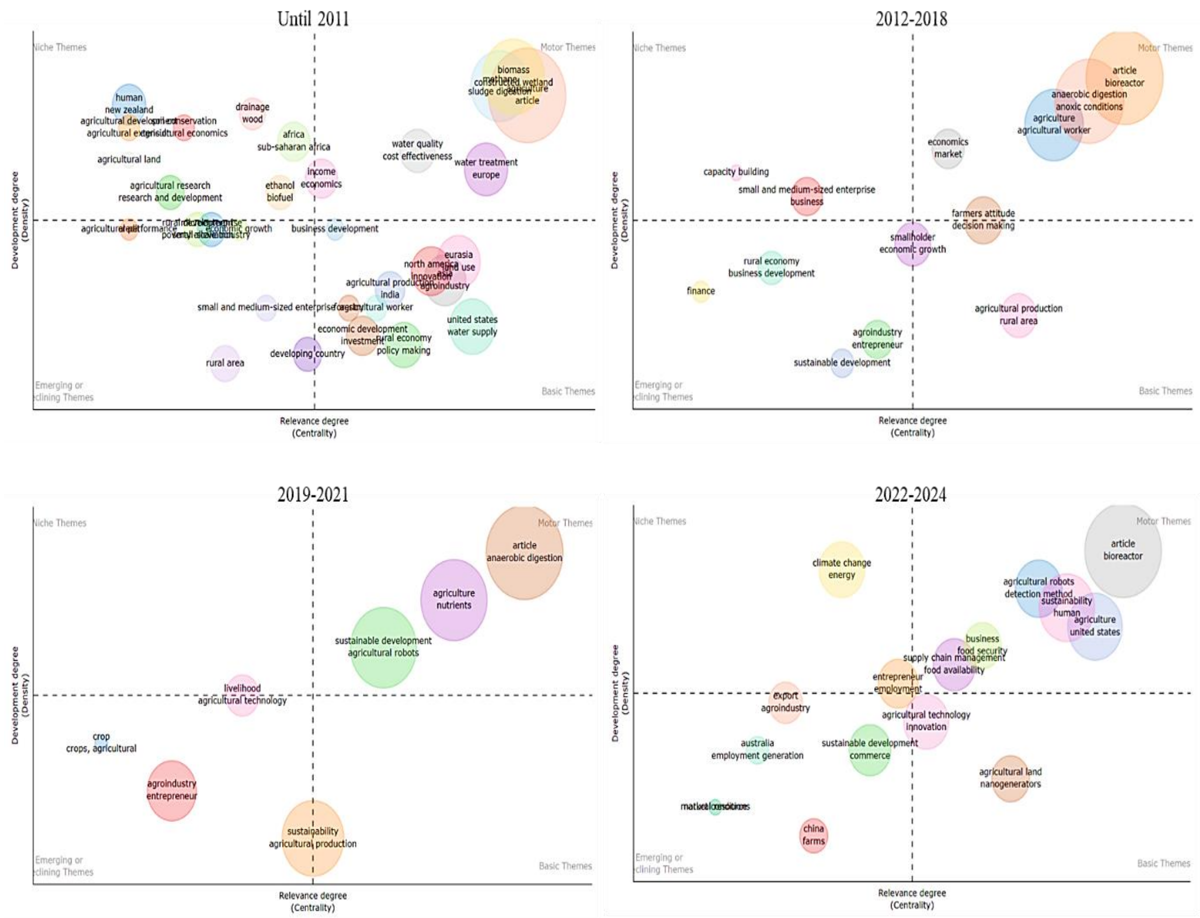

Figure 11. Thematic map of keywords.

During 2012 to 2018, as shown in Figure 11, research themes expanded to emphasize sustainable energy solutions and the role of agricultural labor, signaling a more applied focus in the field. The emergence of themes such as anaerobic digestion and agricultural workers points to a deeper exploration of how to integrate sustainable practices into agricultural operations. Themes related to capacity building and smallholder economic growth reflect ongoing efforts to empower small agricultural enterprises and improve workforce development, indicating a shift towards enhancing human capital and economic resilience within the agricultural sector. In the 2019–2021 period, scholarly focus shifted notably toward the integration of technology and sustainability, particularly in relation to production efficiency and resource optimization. Figure 11 shows the focus on themes like sustainable development and agricultural robots highlighting an increasing reliance on technological innovation to drive agricultural efficiency and productivity. The continued importance of themes related to agricultural technology and livelihood improvement suggests an ongoing effort to enhance living standards and advance technological applications in agriculture. This period marks a significant turning point where the intersection of technology, sustainability, and economic development became more pronounced. In the most recent period from 2022 to the present (Figure 11), advanced technological integration and human-centric approaches have become prominent. The emphasis on detection methods, sustainability, and the broader impacts of agriculture on global environmental issues reflects a sophisticated approach to modern agricultural challenges. These trends also reflect the focus identified by Nemade et al. (2023),who emphasize advanced agronomic practices as a foundation for sustainable crop production. The importance of themes related to food security, supply chain management, and innovation underscores the evolving challenges and innovative solutions in the field. Yousaf et al. (2023) also emphasized the growing relevance of AI-based decision support systems in agriculture, reinforcing this study's identification of technology-driven emerging themes. This period highlights a comprehensive approach to addressing both technological and human aspects of agriculture, including smart farming systems and innovations.

This research findings suggest numerous potential avenues for future research:

1. **Impact on Sustainability and Food Security**

Investigate how Agri-startups influence sustainability in AgTech, sustainable practices, and global food security, including economic and societal impacts.

2. **Climate-Smart Agriculture**

Explore adaptive strategies for climate change mitigation, focusing on technologies that enhance resilience and reduce emissions.

3. **Ethical Technology Integration**

Examine ethical considerations in agricultural technology, ensuring equitable access and fair distribution of benefits.

4. **Precision Agriculture Efficiency**

Study the efficacy of precision agriculture technologies in diverse environments, focusing on productivity and resource use.

5. **Advanced Frameworks**

Develop interdisciplinary frameworks to assess the societal impact of Agri-startups, promoting inclusive growth.

6. **Longitudinal Studies**

Conduct long-term studies to track Agri-startup evolution and adaptation to market and environmental changes.

While this study provides valuable insights into Agri-startup trends, it is important to acknowledge certain limitations. The reliance on the Scopus database, while comprehensive, may introduce biases due to its selective indexing of journals, potentially overlooking relevant studies from non-indexed or regional publications. Additionally, bibliometric analysis, though useful for identifying patterns and trends, is inherently limited by its reliance on metadata such as citations and keywords, which may not fully capture the depth and context of individual studies, thereby affecting the interpretative richness of the findings.

5. Conclusion

To achieve an inclusive, fair, and adaptable agricultural landscape, it is necessary for stakeholders to work together in order to address the difficulties and take advantage of the potential given by Agri-startups. These observations together emphasize the field's ever-changing development and its substantial contributions to improving agricultural practices and results. Furthermore, they emphasize the importance of a deliberate strategy in incorporating cutting-edge technologies in agriculture, guaranteeing that progress is based on ethical principles and has widespread advantages. As Klerkx and Rose (2020) suggest, managing diversity and responsibility in the adoption of Agriculture 4.0 technologies is crucial to ensure inclusive innovation pathways. For policymakers, the findings suggest creating targeted funding mechanisms, such as grants or low-interest loans, to support Agri-startups focusing on sustainability, climate resilience, and food security. Regulatory frameworks should facilitate the integration of technologies like precision agriculture, smart farming, and IoT while ensuring data privacy. Establishing innovation hubs or incubators can foster collaboration between startups, researchers, and farmers, enabling co-creation of context-specific solutions. For practitioners, adopting a multi-stakeholder approach is crucial. Agri-startups should collaborate with farmers and local communities to develop affordable, scalable technologies through inclusive models of Agri-entrepreneurship. Capacity-building initiatives, such as training programs, can ensure innovations are accessible to all, including marginalized groups. Leveraging data analytics and social network analysis can help identify emerging trends and potential collaborators, enhancing innovation and scalability.

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تحلیل روند استارتاپ‌های کشاورزی بر اساس خوشه‌بندی نقشه موضوعی

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چکیده

این مطالعه از خوشه‌بندی نقشه‌های موضوعی و تحلیل شبکه‌های اجتماعی برای تحلیل روندهای جهانی استارت‌آپ‌های کشاورزی استفاده می‌کند و از داده‌های کتاب‌سنجی پایگاه داده اسکوپوس بهره می‌برد. این پژوهش مشارکت‌کنندگان کلیدی، شبکه‌های همکاری و خوشه‌های موضوعی که محرک نوآوری در بخش کشاورزی هستند را شناسایی می‌کند. یافته‌ها نشان‌دهنده روند صعودی قابل توجه در تحقیقات مربوط به استارت‌آپ‌های کشاورزی است که در آن موضوعاتی مانند پایداری، کارآفرینی و ادغام فناوری به عنوان موضوعات محوری مطرح شده‌اند. این مطالعه نقش مناطق، مؤسسات و مجلات برجسته در شکل‌دهی به این حوزه را برجسته می‌کند و اهمیت فناوری‌های دیجیتال در پیشرفت کشاورزی را تأکید می‌نماید. این بینش‌ها توصیه‌های عملی برای ذینفعان ارائه می‌دهد تا نوآوری را تقویت کنند، توسعه پایدار را ترویج دهند و چالش‌های جهانی کشاورزی را برطرف نمایند و در نتیجه پلی میان تحقیقات دانشگاهی و کاربردهای عملی ایجاد کنند.