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# Bibliometric analysis of scientific research involving sustainable agriculture and marketing

**Tülay ÖZKAN**
*Orcid: 0000-0002-2411-0218*
*Burdur Mehmet Akif Ersoy Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İşletme Bölümü, 15030 Merkez, Burdur, Türkiye*
**M. Murat NALCI**
*Orcid: 0000-0002-4482-2802*
*Burdur Mehmet Akif Ersoy Üniversitesi, Sosyal Bilimler Enstitüsü, İşletme Anabilim Dalı, Doktora Programı, 15030 Merkez, Burdur, Türkiye*
**Gönül KURŞUNCU**
*Orcid: 0000-0002-8569-7649*
*Burdur Mehmet Akif Ersoy Üniversitesi, Sosyal Bilimler Enstitüsü, İşletme Anabilim Dalı, Doktora Programı, 15030 Merkez, Burdur, Türkiye*

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***SorumluYazar / Corresponding Author***
***Tülay ÖZKAN***
***tulayozkan@mehmetakif.edu.tr***

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## *Abstract*

**Purpose:** The aim of this study is to examine the scientific research published in the fields of sustainable agriculture and marketing through bibliometric analysis. It aims to provide a comprehensive analysis of how agricultural practices with sustainability infrastructure are integrated with marketing strategies and what the research directions of these areas may be in the coming years.

**Design/Methodology/Approach:** The data of the study were taken from the Web of Science (WoS) database and analyzed. The analysis process was carried out through "Bibliometrix" and "Biblioshiny" packages in R Studio software.

**Findings:** According to the research findings, the first study belongs to 1990 and the last study belongs to 2025. In total, 6792 different references were used in 126 publications. Of these, 96 were research articles, 16 were conference proceedings, 16 were literature reviews, 5 were book chapters, 4 were early access, reports and editor's notes. Among the journals in which the studies constituting the sample were predominantly published, the "Sustainability" journal ranked 1st and the "Sustainability and Agriculture" journal ranked 2nd with 5 studies.

**Originality/Value:** This is the first study to systematically analyze the sustainable agriculture and marketing literature between 1990 and 2025 using bibliometric analysis. In addition, the findings obtained in this context contribute to the determination of effective marketing methods both to shed light on academic studies and to draw attention to the interdisciplinary nature of sustainable agricultural policies.

**Anahtar kelimeler:** Bibliometric analysis, marketing, sustainable agriculture, web of science

## *Sürdürülebilir tarım ve pazarlamayı içeren bilimsel araştırmaların bibliyometrik analizi*

## *Özet*

**Amaç:** Bu çalışmanın amacı, sürdürülebilir tarım ve pazarlama alanlarında yayınlanan bilimsel araştırmaları bibliyometrik analiz yoluyla incelemektir. Sürdürülebilirlik altyapısına sahip tarım uygulamalarının pazarlama stratejileriyle nasıl entegre edildiğini ve bu alanların önümüzdeki yıllardaki araştırma yönlerinin neler olabileceğini kapsamlı bir şekilde analiz etmeyi amaçlamaktadır.

**Tasarım/Metodoloji/Yaklaşım:** Çalışmanın verileri Web of Science (WoS) veritabanından alınmış ve analiz edilmiştir. Analiz süreci, R Studio yazılımındaki "Bibliometrix" ve "Biblioshiny" paketleri aracılığıyla gerçekleştirilmiştir.

**Bulgular:** Araştırma bulgularına göre, ilk çalışma 1990 yılına, son çalışma ise 2025 yılına aittir. Toplamda 126 yayında 6792 farklı referans kullanılmıştır. Bunlardan 96'sı araştırma makalesi, 16'sı konferans bildirisi, 16'sı literatür incelemesi, 5'i kitap bölümü, 4'ü ise erken erişim, rapor ve editör notudur. Örneklemde yer alan çalışmaların ağırlıklı olarak yayınlandığı dergiler arasında "Sürdürülebilirlik" dergisi 1. sırada, "Sürdürülebilirlik ve Tarım" dergisi ise 5 çalışma ile 2. sırada yer almaktadır.

**Özgünlük/Değer:** Bu, 1990 ile 2025 yılları arasında sürdürülebilir tarım ve pazarlama literatürünü bibliyometrik analiz kullanarak sistematik olarak analiz eden ilk çalışmadır. Ayrıca, bu bağlamda elde edilen bulgular, hem akademik çalışmalara ışık tutmak hem de sürdürülebilir tarım politikalarının disiplinlerarası doğasına dikkat çekmek için etkili pazarlama yöntemlerinin belirlenmesine katkıda bulunmaktadır.

**Anahtar kelimeler:** Bibliyometrik analiz, pazarlama, sürdürülebilir tarım, web of science

## INTRODUCTION

Agriculture and animal husbandry activities, which are carried out to meet the basic needs of humans and other living things, have maintained their importance in every period. With the increase in industrialization in the execution of activities such as soil cultivation, plant and animal breeding, the protection of biodiversity and ecological balance has become more important. Agricultural activities not only meet the need for nutrition by producing food, but are also important in terms of sustainability and management of the natural environment (Turhan, 2005). In agricultural terms, monoculture agricultural areas tried for economic efficiency in various parts of the world have led to other problems (Rifkin, 2023). Water resources in various provinces are drying up due to dams and irrigation systems built around them (Sargın, 2012). Post-World War II developments in industry such as mechanization, chemical use and specialization have increased productivity, but have also led to soil depletion, groundwater pollution, air pollution, climate change, greenhouse gas emissions, and the spread of new pathogens (Brodt et al., 2011). In the face of these challenges, the concept of sustainability has gained importance. Approximately 22% of total greenhouse gas emissions are directly or indirectly caused by agriculture and forestry activities (IPCC, 2021). According to TÜİK (2023), the agriculture sector causes 13% of total greenhouse gas emissions. In addition, there may be problems in qualified employment in agriculture due to reasons such as the unwillingness of young people to live in rural areas and migration from rural to urban areas. There are decreases in the production of some strategically important agricultural products and the sector is shifting to large companies (Nalcı & Türk, 2023).

In the face of all these challenges, with the publication of the Brundtland Report in 1987, the idea of sustainable agriculture came together with the concept of sustainable development and gained importance (WCED, 1987; Pretty, 2008). According to the US Farm Bill published in 1990 in response to the misuse of traditional agricultural activities, Sustainable Agriculture is defined as "a system of plant and animal production practices with site-specific activities that will meet the food needs of people in the long term, improve the quality of the environment, use non-renewable resources and farm resources efficiently, integrate natural biological cycles, ensure the economic viability of farm activities, and improve the quality of life for farmers and society" (Velten et al., 2015).

At the same time, agriculture has historically been an economic practice developed to meet people's food needs and therefore constitutes the basic starting point of marketing. Today, the transformation process has started with the replacement of traditional agriculture with sustainable agriculture. With this transition, some changes in marketing strategies are taking place (Pretty, 2008). As a result of activities such as promoting sustainable agricultural practices and delivering them to consumers, new concepts such as green marketing and organic marketing have emerged in relation to environmentally friendly products. In green marketing, consumers take into account not only the functionality of a product but also the environmental impacts of its production processes (Peattie, 2001; Ottman, 2017). In this context, sustainable agricultural products are positioned as a differentiating factor within marketing strategies and are integrated with consumers' ethical values. Thus, the chain extending from agricultural production to consumer purchasing evolves into a process that generates not only economic but also social and environmental value. Considering the carbon emissions caused by agricultural activities and the long-term effective and efficient use of resources, it is important that producers and consumers act consciously together. Such awareness can be achieved through effective marketing activities (Hamşıoğlu & Nalcı, 2021). Sustainable agriculture and marketing activities not only emphasize environmental benefits but also increase the demand for environmentally friendly products, increasing the market share of producers and raising the awareness of consumers.

The relationship between sustainable agriculture and marketing is not limited to production and sales processes; it also plays a critical role in shaping consumer behavior. Today, consumers' preference for environmentally friendly products is closely linked to purchasing decision-making processes that are based on their values, beliefs, and norms (Megha, 2024). For instance, the Theory of Planned Behavior explains environmentally conscious purchasing behavior through attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). Similarly, the Value–Belief–Norm Theory demonstrates that demand for sustainable products is reinforced by a heightened sense of environmental responsibility (Stern, 2000).

Furthermore, strategic management approaches such as the Resource-Based View (Barney, 1991) and Stakeholder Theory (Freeman, 2010) provide a theoretical foundation for the integration of sustainable agriculture into marketing strategies. The Resource-Based View posits that firms can employ sustainable production techniques as strategic resources, thereby achieving long-term competitive advantage in the marketplace. Stakeholder Theory, on the other hand, emphasizes that the activities of sustainable agriculture should not only generate economic profit for producers but also create value by considering consumers, society, and the environment (Prakash, 2002). These

perspectives highlight that the intersection of sustainable agriculture and marketing entails not only ecological benefits but also strategic and managerial significance, thereby opening new avenues for research.

These theoretical perspectives demonstrate that sustainable agricultural practices not only deliver ecological benefits but also support the formation of a “green consumer” identity within marketing strategies. In this way, sustainable agriculture bridges consumers’ environmental values—shaped through their norms and attitudes—with marketing activities, transforming both individual behaviors and market dynamics (Roberts, 1996). The bibliometric analysis conducted in this study supports this conceptual integration and links the developmental trajectory of the literature to a solid theoretical framework.

The aim of this study is to examine the scientific research published in the fields of "sustainable agriculture" and "marketing" through bibliometric analysis. With this method, various indicators such as development processes in the literature, main research trends, most influential authors, journals, countries, emerging themes, citation analyses, and keyword matches were examined in detail (Aria & Cuccurullo, 2017). It is also aimed to provide a comprehensive analysis of how sustainable agricultural practices are integrated with marketing strategies and what the research directions of these fields may be in the coming years.

Within the framework of these aims and objectives, the study seeks answers to the following research questions:

I. What is the overarching bibliometric data on research that includes the terms sustainable agriculture and marketing together?

II. Among the studies that include the terms sustainable agriculture and marketing at the same time, which ones have the highest number of citations?

III. Which countries are at the forefront of research on sustainable agriculture and marketing?

IV. Which journals have published the most articles using the terms sustainable agriculture and marketing together?

V. What themes emerge in research that uses the terms sustainable agriculture and marketing together?

VI. In which journals were the ten most cited articles containing the terms sustainable agriculture and marketing published and which topics were emphasized?

VII. Does the data obtained comply with Lotka, Price and Pareto laws?

## MATERIAL AND METHODS

### Material

The study's data were acquired on March 26, 2025, via the Web of Science Core Collection. Web of Science (WoS) is a prominent database in bibliometric research, recognized for its high data quality, uniform citation information, and extensive indexing rules, making it a credible reference in the literature (Yan & Zhiping, 2023). The consistent presentation of author, journal, institution, and citation information, which underpins bibliometric analyses, along with the systematic labeling of bibliographic fields (AU, SO, DE, ID, etc.), guarantees the reproducibility and comparability of research outcomes. Moreover, WoS's citation indexing approach provides the benefit of including the discipline's principal journals and high-impact publications, so facilitating the analysis of the most credible and prominent segment of scientific output in the examined field. Due to potential methodological restrictions arising from duplicate entries, indexing discrepancies, and quality control concerns associated with utilizing various databases, we exclusively relied on the WoS database to preserve the study's integrity (Pranckutė, 2021).

### Method

In this study, which is based on descriptive research model, bibliometric method based on literature review was used. Bibliometrics is the numerical analysis of publications produced by individuals or institutions in a specific field, in a specific period and in a specific region, and the relationships between these publications. Bibliometrics systematically examines scientific output, evaluates its characteristics and development, and tracks its trajectory (Herrera-Franco et al., 2021). It includes emerging trends, current issues, academic disciplines, collaboration prospects, important publications and scholars in the field, and international studies are illuminated through word

association (Okubo, 1997). Unlike traditional literature review methods, bibliometric analysis stands out in terms of its ability to identify common themes and trends.

The research was conducted with the Biblioshiny program, which converts the Bibliometrix package program into an interface using Rstudio. The program works in harmony with the obtained data set. Biblioshiny was used to visualize the data (Aria & Cuccurullo, 2017).

The objective in formulating search terms was to identify articles that encapsulate the topic's core from the most comprehensive viewpoint. Upon examining the current literature, several terms and phrases (sustainable marketing, agriculture, sustainability, marketing, sustainable agriculture) were evaluated against the data source. The terms "sustainable agriculture" and "marketing," which produced the most pertinent results, were chosen. Research words were first searched by selecting all fields in the relevant database. As a result of this search, 384 studies were reached, but when a visual examination was made through the database, many studies that could distract from the focus of the subject were encountered. After this stage, the same search was conducted by selecting "title, abstract and keywords". After this search, 126 studies were reached. The abstracts of these 126 studies were examined one by one by the researchers, and all of them were found to be suitable for the research questions and were included in the research data.

## RESEARCH FINDINGS

In this section, a discussion is made after the findings of the study.

### Overarching Bibliometric Information on the Research

The first study in the database dates back to 1990 and the last study dates back to 2025. 126 studies were accessed from 100 different sources. These 126 studies utilized 6792 different references. Of these, 96 are research articles, 16 are conference proceedings, 16 are literature reviews, 5 are book chapters and the other four are early access, reports, editor's notes (the total number may differ because there are repetitions in various categories). The annual publication growth rate is 3.19%. International co-authorship rate is 27.78%. 24 studies are single authored. Co-authorship per study is 4.42. The average study age is close to 10 years. 19.44 citations per study.

### Highest citation counts

To address the second research topic, the most frequently mentioned papers are shown in Table 1. De Roest et al. (2017) was the most cited study, with 224 citations. The paper by Newton et al. (2009) was the second most cited, with 199 citations. Subsequently, they are succeeded by Hustvedt and Dickson (2009), Grillo et al. (2020), (Lazaroiu et al., 2019), Zhang et al. (2014), Starr et al. (2003), Goldberger (2011), Ostrom (2006) and Vlek (1990).

**Table 1.** Most Cited Studies

| Study | Citation Count |
|---|---|
| De Roest et al. (2017) | 224 |
| Newton et al. (2009) | 199 |
| Hustvedt and Dickson (2009) | 160 |
| Grillo et al. (2020) | 119 |
| Lazaroiu et al., (2019) | 105 |
| Zhang et al. (2014) | 99 |
| Starr et al. (2003) | 78 |
| Goldberger (2011) | 75 |
| Ostrom (2006) | 68 |
| Vlek (1990) | 58 |

### Countries lead in research

With 116 studies, the USA ranks first. China ranks second with 32 studies. They are followed by India with 30 studies, Italy with 21 studies and Indonesia with 19 studies in the Top 5. These and other studies in the top 10 are shown in Table 2.

### Journals have published the most papers

To address the fourth research question, Table 3 illustrates the publications that predominantly published the research comprising the sample. The majority of the research was published in the journal " Sustainability," as indicated by this table. "Journal of Sustainable Agriculture " secured 2nd place, while " Agriculture and Human Values " earned 3rd place. Subsequently, "Agroecology and Sustainable Food Systems " and "Foods" follow in that order.

**Table 2.** Countries Have the highest publication count

| Country | Study Count |
|---|---|
| USA | 116 |
| China | 32 |
| India | 30 |
| Italy | 21 |
| Indonesia | 19 |
| UK | 16 |
| Portugal | 15 |
| Poland | 13 |
| Thailand | 13 |
| Germany | 10 |

**Table 3.** Journals in which the studies constituting the sample were published

| Country | Study Count |
|---|---|
| Sustainability | 10 |
| Journal Of Sustainable Agriculture | 5 |
| Agriculture And Human Values | 4 |
| Agroecology And Sustainable Food Systems | 2 |
| Foods | 2 |

### Emerging themes

To address the fifth issue, the analysis of co-occurring terms revealed themes that were further developed based on the study summaries presented in Figure 1. The terms organic, farmers, agricultural, farming, production, food, development, consumers, environmental and sustainability emerged prominently following sustainable, agriculture, and marketing, which are the research words of the research. Additional developing terms are illustrated in the picture.


**Figure 1.** Word cloud according to the words in the abstracts of the studies.

### Keywords

The results of the analysis of the fifth research question were continued with keywords. Sustainable agriculture was observed as a keyword with a rate of 20% and marketing with a rate of 6% which are one of the research words of the studies. Agriculture 9%, organic agriculture 6%, sustainable 5%, organic 4%, sustainability 4%, agroecology 3%, climate change 3% and organic farming 3% were the keywords of the studies. These results are shown in Figure 2.

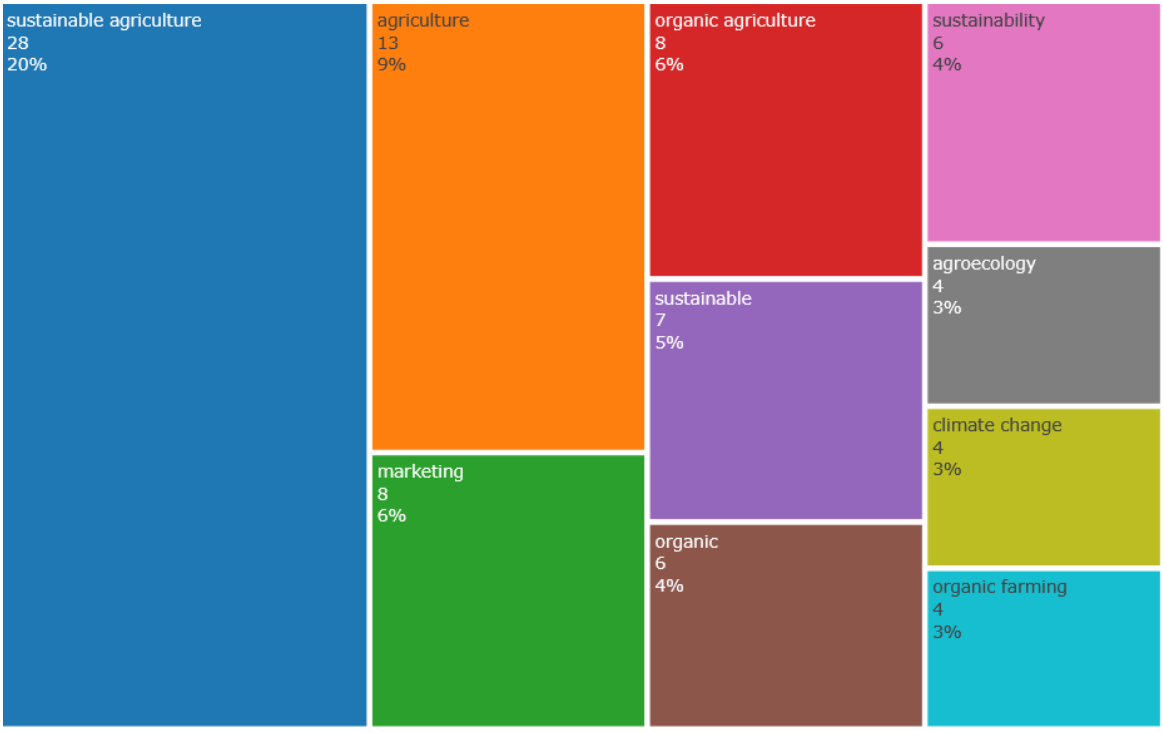


**Figure 2.** Emerging themes of the keywords of the studies.

### Word frequency on titles by years

After the results on the keywords of the studies were given, the frequency of words in the titles of the studies according to years in the last 10 years was continued. The study's research words sustainable was repeated 41 times, agriculture 39 times and marketing 10 times in the titles. After them, the word organic was used 22 times, farming 21 times, food 18 times, farmers 15 times, development 12 times, sustainability 11 times and agricultural 10 times in the titles of the studies. These words are the ones that were repeated at least 10 times within the same year. These results are shown in Figure 3.

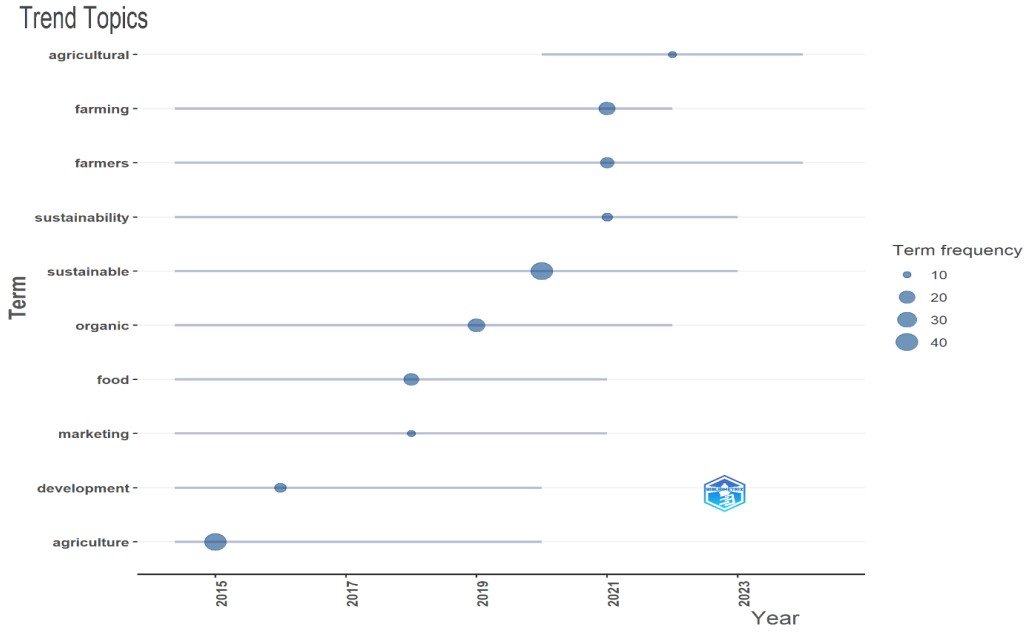


**Figure 3.** Word frequency on titles by years.

### Words of titles emerging together

The answer to the fifth research question was continued with the results of being included together in the titles. The research words of the study, sustainable, agriculture and marketing, are seen in the purple network map in Figure 4. These words are together with the words food, traditional, consumption, system, consumers, Africa and change in the titles. In addition, the word farming came first in the green network map and was together with the words sustainability, farmers, technologies, challenges and India. Apart from these, the words rural, environmental, plant, biological, control, farmers and local come to the fore in the blue, red and yellow title network maps.


**Figure 4**. Words of titles emerging together.

### Emerging themes of keywords plus

For the fifth question, the themes that emerged through KeyWords Plus were finally examined. KeyWords Plus are index terms automatically generated from the titles of cited articles. KeyWords Plus terms must appear more than once in the bibliography and are ordered from multi-word phrases to single terms. KeyWords Plus augments traditional keyword or title retrieval (Web of Science, 2025). Accordingly, farming and food came to the forefront in the engine themes. The three keywords of the research (sustainable, agricultural, marketing) came to the forefront in both the engine and basic themes. In merging and declining themes, the words nutrient, cultivars, breeding are in the foreground. The words traits, landraces, germplasm are in the foreground in niche themes. Crop, strategies, and future words are in both emerging and declining themes and basic themes. These Results are shown in Figure 5.

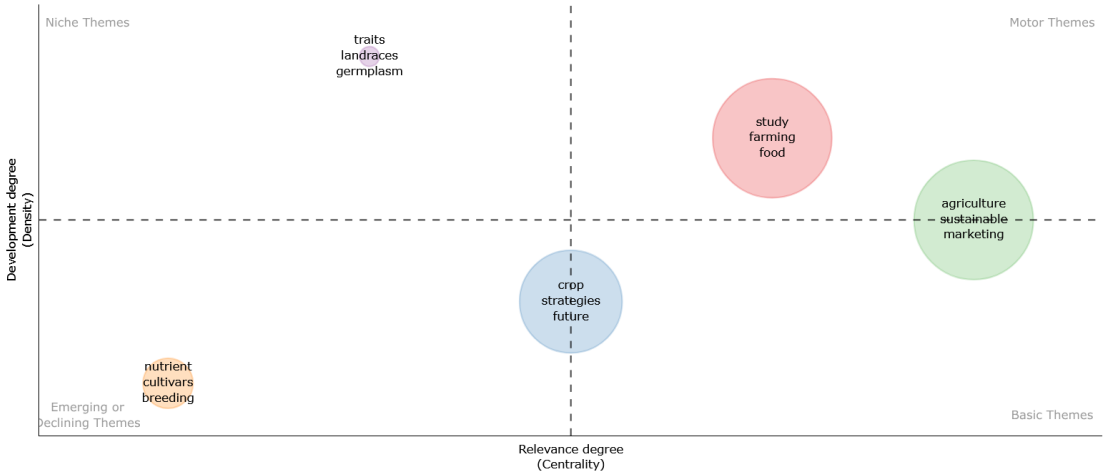


**Figure 5**. Emerging themes of keywords plus (web of science, 2025).

**Emerging themes and journals of most cited articles**

The journals in which the most cited publications were published and the subject headings that emerged in these publications are shown in Table 4. Rural studies, sustainable agriculture, public health, fashion marketing and hazardous materials are prominent in journal titles. The prominent topics in the titles of the 10 most cited studies are given in Table 4.

**Table 4**. Journals and Research Subjects of the Top 10 Most Cited Studies

| Study | Citation Count | Journal Name | Main Topics of the Study |
|---|---|---|---|
| De Roest et al. (2017) | 224 | Journal of Rural Studies | Specialisation, economies of scale, diversification, economies of scope |
| Newton et al. (2009) | 199 | Agronomy for Sustainable Development | Cereal landraces, sustainable agriculture |
| Hustvedt and Dickson (2009) | 160 | Journal of Fashion Marketing and Management | Consumer likelihood, purchasing organic cotton apparel, attitudes and self-identity |
| Grillo et al. (2020) | 119 | Journal of Hazardous Materials | Ecotoxicological and regulatory aspects, environmental sustainability, nano pesticides |
| Lazaroiu et al., (2019) | 105 | Frontiers in Public Health | Trust Management, Organic Agriculture, Sustainable Consumption Behavior, Environmentally Conscious Purchase Intention, Healthy Food Choices |
| Zhang et al. (2014) | 99 | Sustainability | Edible Mushroom Cultivation, Food Security, Rural Development, China, Bio-Innovation, Technological Dissemination, Marketing |
| Starr et al. (2003) | 78 | Agriculture and Human Values | Sustaining local agriculture Barriers, opportunities to direct marketing, farms and restaurants, Colorado |
| Goldberger (2011) | 75 | Journal of Rural Studies | Conventionalization, civic engagement, sustainability of organic agriculture |
| Ostrom (2006) | 68 | Community Development, | Everyday Meanings, Local Food, Views from Home and Field |
| Vlek (1990) | 58 | Fertilizer Research | Fertilizers, sustaining agriculture in sub-Saharan Africa |

**Compliance with lotka's law, price's law and pareto principle**

The laws in this section establish the importance of authors and publications through various formulas. 126 publications were made by 537 authors. Among 537 authors, 20 authors have 2 publications each and the other authors have 1 publication each. When evaluated in terms of Lotka's Law, it is seen that the numbers do not comply with this law. According to Price's law, 23 authors should make 50% of the publications. In this sense, there is no compliance with Price's law. In line with these results, it was also observed that the number of single-author publications was 24. At the same time, the number of co-authors per publication was 4.42. The top 20% of publishers do not own 80% of the publications. There is also no compliance with the Pareto principle.

## CONCLUSION AND POLICY RECOMMENDATIONS

This study examined 126 academic publications published in the Web of Science Core Collection database between 1990 and 2025 and containing the concepts of "sustainable agriculture" and "marketing" in their titles, abstracts or keywords through bibliometric analysis. In line with the findings, the following conclusions were reached:

- The annual publication increase rate was found to be 3.19%. This increase demonstrates the growing academic interest in the field of sustainable agriculture and marketing. This finding supports the notion that the significance of the topic is progressively rising both from an academic and a practical perspective.

- The most cited study was published by De Roest et al. (2017).

- The highest number of publications, with 116 studies, belongs to the USA, indicating its leading position in scientific production on the subject. The United States is followed by China with 32 publications, India with 21, and Italy with 19. Overall, it can be observed that both developed and developing countries have made significant contributions to this field.

- Most of the studies have been published in the journal Sustainability. This situation indicates that the topic is concentrated in environmental and sustainability-focused journals.

• Concepts such as "organic", "farmer", "agriculture", "farming", "production", "food", "development", "consumer", "environment" and "sustainability" emerged as key themes. The findings reveal that sustainable agriculture and marketing must be addressed holistically within an interdisciplinary framework, encompassing environmental, social, and economic dimensions.

• The co-word analysis reveals that the concepts of 'sustainability' and 'agriculture' occupy a central position, indicating that sustainable agriculture constitutes the main axis in the literature. In addition, the prominence of concepts such as 'farming' and 'organic' highlights the emphasis on environmental awareness and organic production.

• There is no compliance with Lotka's Law, Price's Law and Pareto Principle. With an average publication age of nearly 10 years and an annual growth rate above 3%, this domain can be characterized as a collaborative and evolving research area. Notably, only 20 authors have contributed to more than one study, while all other researchers have added just a single work to the literature. In addition, the absence of productivity concentration expected by Lotka's law, the lack of a clearly defined elite group of authors as proposed by Price's law, and the divergence from the traditional 80/20 Pareto distribution indicate that scholarly output in this field is relatively evenly spread. These findings imply that the area has not yet reached full maturity and remains in a developmental phase, open to contributions from scholars across diverse disciplines.

**Policy recommendations**

1. Increasing Interdisciplinary Collaboration: Sustainability should be addressed with the contribution of not only agricultural and environmental sciences but also marketing, economics, psychology and sociology (Karakaş, 2023). Interdisciplinary research projects between universities and research institutions should be supported. Stakeholders in agriculture, marketing, environmental science, and technology can be brought together to establish joint sustainability platforms. Through these platforms, consumers can be provided with reliable and transparent information, while the promotion of products can also be facilitated.

2. Developing Consumer-Focused Strategies: The success of sustainable agriculture practices is directly related to consumer awareness and ethical sensitivity (Sarı & Özkan, 2024). In this context, psychological and social factors affecting consumers' preferences for sustainable products should be investigated and awareness should be raised through public campaigns. For example, marketing activities such as labeling that highlights the environmental and health benefits of products, or providing information via QR codes, can be developed. In this way, consumers can be encouraged to make informed choices.

3. Making Sustainability a Strategic Brand Element: Businesses should see sustainability not only as an environmental responsibility, but also as a competitive advantage and a brand value element (Kotler & Keller, 2016; Çakır, 2025; Tarhan et al., 2019). In this context, practices such as green marketing, carbon footprint labeling and organic certification should be encouraged. In this way, a 'green brand identity' can be established, emphasizing environmentally friendly production processes, transparent reporting, waste reduction practices, and product packaging in advertising and social media content. Consequently, sustainability can evolve from being solely a production activity to becoming a strong brand value in consumers' perception

4. Sustainability in Logistics and Packaging Processes: Environmentally friendly materials and recyclable systems should be adopted not only on a product basis but also in all processes from production to consumption (logistics, packaging, distribution, etc.) (Çevik & Gülcan, 2011; Köse, 2024). For example, product packaging should be made from biodegradable materials, and routing and transportation solutions that reduce the carbon footprint during shipping and distribution should be implemented

5. Institutionalization of Producer Cooperation: The establishment of sustainability-based collaborations between agribusinesses and farmers should be encouraged, cooperatives should be supported and made long-term through government policies (Pretty et al., 2011; Ültanır, 2019; Ekmen, 2022. For instance, to support local producers, a brand themed around 'local sustainable production' can be established under a cooperative structure in the operational area, with products promoted through standardized packaging, labeling, and digital marketing campaigns. This approach can facilitate and strengthen producers' access to the market.

6. Digital Transformation and Artificial Intelligence Based Applications: Transparent sharing of production processes through digital tools such as social media increases consumer confidence, while artificial intelligence-based systems prevent waste and optimize inventory and demand management (Eli-Chukwu, 2019; Viet et al., 2022; Gupta

et al., 2023). Consumer preferences can be analyzed through artificial intelligence programs to identify which sustainable products are in demand. This enables the development of targeted marketing campaigns and personalized product recommendations on digital platforms.

7. Engagement of Policymakers and Incentive Mechanisms: Incentives, subsidies and training programs for sustainable agricultural practices should be developed through government policies, and farmers' access to financing should be facilitated based on agricultural insurances and sustainability criteria (FAO, 2018; Republic of Turkey Ministry of Agriculture, 2021).

8. Expanding Local and National Level Databases: Given the limitations of this study, which is based only on the WoS database, more inclusive and locally focused data analyses should be conducted. Local sources such as TÜBİTAK, ULAKBİM and YÖK National Thesis Center can also be used to develop regional policies.

**Researchers' Contribution Statement Summary**

The authors declare that they have contributed equally to the article and have not committed plagiarism.

**Conflict of Interest Statement**

The authors of the article declare that there is no conflict of interest between them.

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