International Journal of Economics, Business and Innovation Research
https://e-journal.citakonsultindo.or.id/index.php/IJEBIR
E-ISSN : 2964-0865
IJEBIR

Recommendation for Research on Sustainable Coffee Production and Consumption to Promote Sustainable Business

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Abstract

The advancement of sustainable consumption and production (SCP) to foster a circular economy is essential for long-term sustainable development. Nevertheless, successfully implementing SCP necessitates robust backing from the relevant literature. There is a growing interest among scholars and practitioners in sustainable consumption and production behaviors. This article adds to the existing SCP literature through a bibliometric analysis, a widely used research method that enables researchers to analyze the historical and prospective growth of scientific works. This study reviewed 586 publications from the Scopus database, covering the period from 1994 to 2022. Several bibliometric indicators, such as the number of publications, h-index, and citation metrics, were utilized as evaluation methods. Moreover, a relational technique was implemented using graphical maps and VOSviewer. The results indicate an upward trajectory in the quantity of publications and citations pertaining to sustainable consumption and production. To enhance future study, it is recommended to investigate many contexts of agricultural land research, encompassing coffee farming communities.

Keywords: Sustainable Consumption, Sustainable Production, Bibliometrics, VOS Viewer, Sustainable Business.

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INTRODUCTION

Coffee is among the most extensively traded agricultural commodities globally, providing a livelihood for nearly 100 million people worldwide (Rhiney et al., 2021). The crop is grown in more than 60 tropical nations, covering an area of about 11 million hectares of land. This agricultural activity engages almost 25 million farmers, the majority of whom are small-scale landowners (Läderach et al., 2017). Coffee's importance extends to the economies of producing countries, as its export earnings have a major impact on gross domestic product and provide employment for a significant portion of the rural population (Byrareddy et al., 2019). Given its status as a highly traded agricultural commodity, coffee is of considerable importance to the global economy and serves as a vital source of foreign exchange earnings for many impoverished nations (Samper & Quiñones-Ruiz, 2017). Coffee has been a popular beverage since the mid-16th century and continues to play an important part in consumer culture worldwide. In recent decades, coffee has transitioned from being viewed as a generic commodity to being regarded as a specialized and niche product. It is currently considered an artisanal, high-quality drink like wine. Coffee is now a symbol of enjoyment, experience, lifestyle, and social standing. Pleasure, health, and sustainability define coffee consumer products, driving this revolution in consumer behaviour (Samoggia & Riedel, 2018).

The history of coffee consumption starts in Ethiopia, where locals have enjoyed coffee for centuries. From Ethiopia, coffee reached Yemen around the 6th century and subsequently spread to Cairo, Damascus, and Istanbul, giving rise to coffee shops (Krishnan, 2017). These coffee businesses started providing specialty coffees to meet the increasing consumer demand for high-quality coffee (Samoggia & Riedel, 2018). Coffee has transitioned from being a commodity to becoming a luxury item. It is a truly global commodity, with the value chain consisting of many participants, from producers to intermediaries to final consumers (Rahn et al., 2014). Coffee farmers face significant challenges to their livelihood as they hold only a small portion of the value chain and face volatile market prices, exacerbated by climate change. Climate change has a particular impact on coffee farming, affecting both productivity and quality. Increases in unpredictable rainfall, prolonged droughts, and extreme weather events are increasingly being observed in coffee growing areas around the world. Additionally, future climate change will cause changes in the prevalence of pests and diseases, which pose a threat to coffee crop yields. In the coming decades, climate change is expected to significantly affect coffee production, particularly for the C. arabica species, which is known for its vulnerability to climate variability. Observable effects of climate change, such as

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increased temperatures and erratic rainfall patterns, have been recorded in coffee-growing regions. These shifts in temperature and precipitation are expected to reduce the areas suitable for coffee cultivation, push the crop to higher elevations, increase the incidence of pests and diseases, and expand the altitudinal range where these problems persist. The imminent threat of climate change underscores the importance of preserving the coffee ecosystem by mitigating deforestation and forest degradation (Krishnan, 2017).

Sustainability in the coffee sector has grown in recent years. Water management, land capacity and exploitation, biodiversity, energy, soil quality, agricultural production and efficiency, and socio-economic factors must be considered to create a sustainable agricultural production system. Coffee production must prioritize eco-friendly and sustainable practices. The coffee business in major producing nations is expected to grow due to increased consumer and trade engagement from domestic and international actors. Due to the notable economic and environmental risks and vulnerabilities involved in its production, the coffee business necessitates specific focus and consideration (Byrareddy et al., 2019). In the late 1980s, the market method for sustainable coffee production was first used in Europe. It involved the introduction of a labeling system for branded coffee goods, aimed at emphasizing their distinct value for farmers. This program originated from innovative endeavors by religious groups and philanthropic organizations to market coffee and other goods obtained from well-structured smallholder collectives, aiming to uplift the impoverished through honorable employment rather than relying on charitable assistance. This idea has grown into standards and certification programs. A group of different stakeholders sets the rules for sustainable practices, and an independent expert group makes sure that coffee farms follow them. Companies that buy coffee can use the label to show their customers and consumers that they support farmers. By 2013, various certification and verification methods have arisen, accounting for 40% of global coffee production (Millard, 2017).

However, the impact of sustainable standards and certification is still unclear and therefore still widely debated. Several studies have shown that sustainable standards and certification have positive direct impacts on smallholders, such as increased market access, higher prices and improved livelihoods. Sustainable standards and certification also have positive spillover effects, including increased yields and quality of coffee production for communities around certified plantations. The economic benefits for smallholders, while statistically significant, are very small and may not be sufficient for farmers to improve their livelihoods (Ibnu & Marlina, 2019). Exploring the topic of

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sustainable coffee use and production is undeniably intriguing, given the worldwide appeal of coffee. To understand more about sustainable coffee production and consumption trends, use the Scopus database. Using bibliometrics, this study has attempeted to answer the following questions:

a)How has the distribution of publications evolved over time?
b)Which journals publish the majority of these papers each year?
c Which countries/territories dominate the publications?
d What topics/trends are being studied in the field?
e Who is the most prolific author on sustainable consumption?
f)What are the types of publications that are dominant?

LITERATURE REVIEW

Bibliometrics

Bibliometric analysis is a method that offers a broad overview of extensive academic literature. It allows for the mapping of features and the evolution of scientific output within certain research topics by statistically evaluating publication history data (Van Nunen et al., 2018). Bibliometrics can be used to a wide range of documents, including books, websites, monographs, conference proceedings, policy statements, and patents. In the healthcare business, it is commonly used to evaluate and forecast the influence or impact of research articles on subsequent research. Typically, this entails tracking the amount of citations a piece receives after it has been published (Diane Cooper, 2015). Bibliometrics consists of three major components: a) Bibliometrics for bibliometricians, which is the primary area of bibliometric research and represents a traditional research methodology. b) Bibliometrics for scientific disciplines (scientific information) is based on quantitative study in information retrieval. This feature demonstrates that researchers have a scientific attitude and a great interest in their respective fields. c) Bibliometrics for science policy and management (science policy), which refers to the field of research appraisal across several scientific fields (Tupan et al., 2018).

Scopus Database

Scopus stands as the largest repository of literature abstracts globally, offering citations that encapsulate a wide array of scientific literature and thoroughly reviewed studies (Khiste & Paithankar, 2017). Scopus aids researchers in efficiently monitoring, examining, and illustrating research endeavors. The database has over 22,000 top-tier

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abstracts drawn from 5,000 publishers throughout the world, including varied subjects such as science, technology, medical, social sciences, arts, and literature (Tupan et al., 2018).

Research Methods

To perform a bibliometric analysis, the first step is to select an accessible database based on the suitability and importance of one or another use. After extracting research publication information, it is necessary to design a bibliometric analysis style based on topic suitability. This study used data from international papers in the instrumentation sector obtained from the Scopus database website. The data collection involved searching for publications in Scopus using the keywords "sustainable production and consumption" for the period spanning 1994 to 2022. The collected data, including the annual publication count, journals featuring instrumentation articles, authors, authors' affiliations, and subjects, were analyzed using Microsoft Excel 2019.

Database Selection

The findings of this systematic analysis were derived from the Scopus database, chosen primarily for its ability to offer a comprehensive overview of extensive research publications and citation analysis dating back to 1996. The analysis conducted in this study incorporated scientific, multidisciplinary databases and international literature developed by Elsevier. The bibliographic information of the articles was directly focused on the parameters analyzed, which were filtered by document type, distribution by subject category, publication language, publication volume, authorship, publication pattern, and most frequently cited articles. The keywords used for the analysis were developed from the meaning of sustainable consumption.

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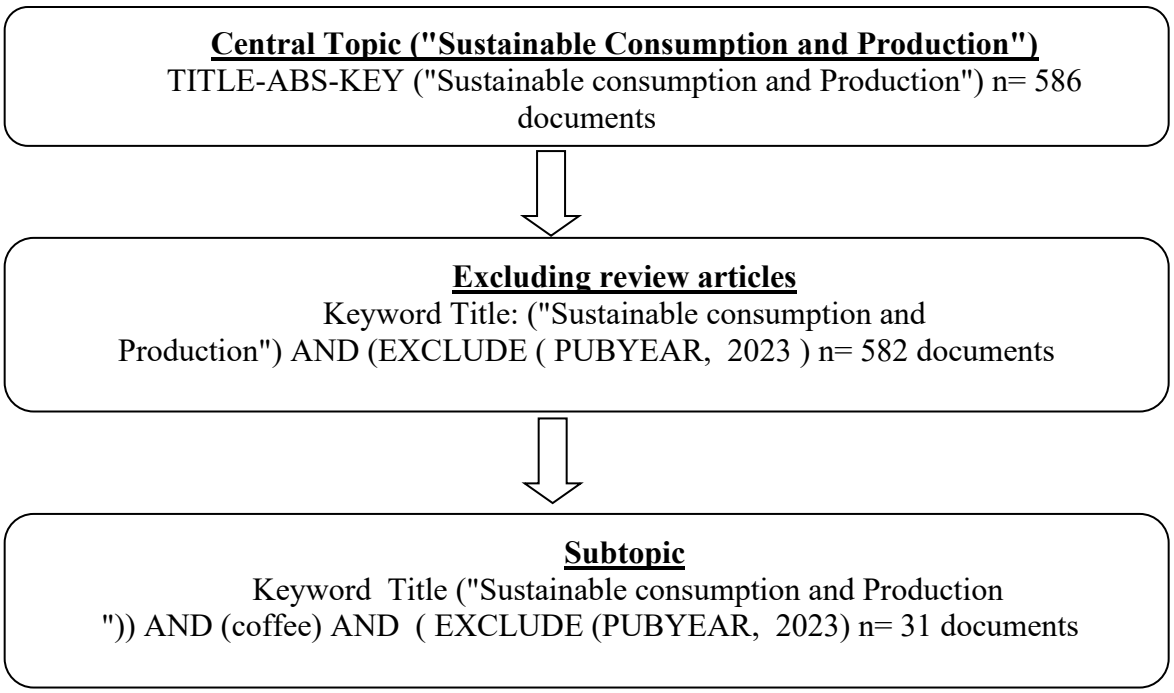


Figure 1. Procedure in Data Selection

Bibliometric Analysis

The bibliometric analysis employs methods to offer a broad perspective of extensive academic literature. By quantitatively analyzing publication history data, it becomes feasible to outline the traits and development of scientific output within the field being examined (Van Nunen et al., 2018).

RESULT AND DISCUSSION

This section provides a comprehensive performance analysis that specifically examines various aspects of publications on sustainable production and consumption. These aspects include the trends in publication over time, the journals that have published the most, the primary sources of publication each year, the authors and affiliations that have published the most, the countries that have contributed the most publications, the dominant type of publication, the most frequently discussed topics, and the funders that have provided the most funding for these publications.

Next comes a discourse on sustainable coffee production and consumption, encompassing the most prolific year, the primary sources of productivity and citation, as

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well as the predominant publication types. In essence, this study scrutinizes a network of extensively cited and published articles within the realm of sustainable consumption, thereby laying the groundwork for a suggested future research agenda outlined in subsequent sections.

a). Sustainable Production and Consumption
Evolution of Publications

Following the advancement of the Scopus database, research on sustainable consumption in general has grown rapidly in recent years, with a massive acceleration in the output and citation of articles (see Figure 2). To help understand and summarize the evolution of sustainable consumption, publication trends have been divided into four stages. The introduction and the growth stages were the periods 1994-2011 and 2012-2022, respectively.

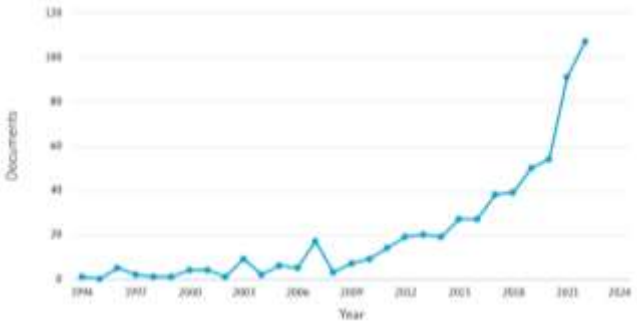


Figure 2. Revolution in sustainable consumption research

This systematic analysis covered publications over a period of 28 years, including the oldest accessible paper in the Scopus data set, published in 1994. In terms of year, in the period 1994-2011, the number of published scientific papers did not exceed 20, while in 2007, the number of publications was close to 20, but decreased in the following year. In 2020, the number of publications increased continuously until 2022, reaching more than 100 publications in 2022.

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Sources With the Most Publications per Year

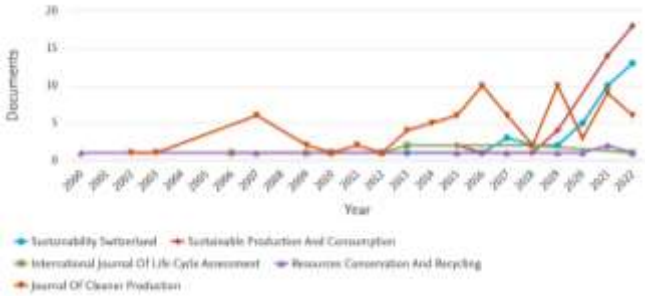


Figure 3. Revolution in sustainable consumption by sources

There were sources that published scientific papers every year. Figure 3 shows that five sources released research papers on "Sustainable Consumption and Production". In the period 2003-2007, the Journal of Cleaner Production saw a continual rise in the volume of published articles, which peaked in 2007. The Journal of Cleaner Production had the most publications compared to other sources that also published related scientific works, However, in the subsequent year, there was a decline in the number of publications, which eventually rebounded in the period from 2012 to 2016, reaching a peak in 2022, the source that published the most was Sustainable Production and Consumption, which published more than 15 publications.

Authors of Scientific Papers on Sustainable Consumption

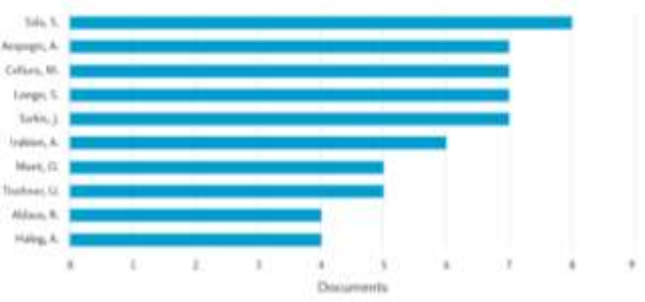


Figure 4. The most prolific authors

In the top 10 most prolific authors, each author published less than 10 articles. Sala, S. was the author with the most published articles related to "sustainable production

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and consumption", where he has eight publications. In the second position of the authors with the most published scientific works on sustainable production and consumption were four authors, named Azapagic, A., Cellura, M., L., Longo, S,. and Sarkis, J., each with seven publications. The authors with the fewest publications in the top 10 were Aldaco, R. and Halog, A. with four publications each.

The Most Productive Affiliation for Scientific Articles on Sustainable Consumption

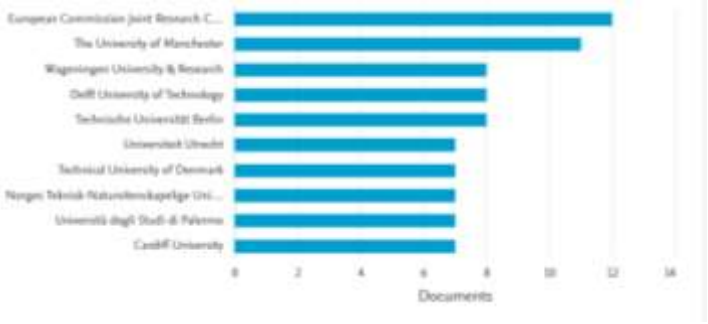


Figure 5. Most Productive Affiliation

The Joint Research Center of the European Commission was the most productive affiliation with 12 publications on sustainable production and consumption. The second most productive affiliation was the University of Manchester with 11 publications.

Distribution of Publications by Country or Region

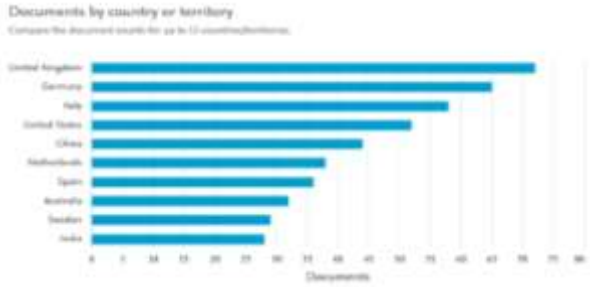


Figure 6. Most productive countries or regions

A search for publications using the keywords "sustainable production and consumption", excluding publications in the year 2023, showed that the United Kingdom was the country that published the most with these keywords. There are 10 countries and regions with the most publications, with each country and region publishing less than 100

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articles. Even though the Americas and Europe took the top three positions, China and India, as countries in the Asian region, were also in the top 10. Sweden and India were ranked 9th and 10th and had almost the same number of publications, both with less than 30 papers.

Dominant Types of Publications

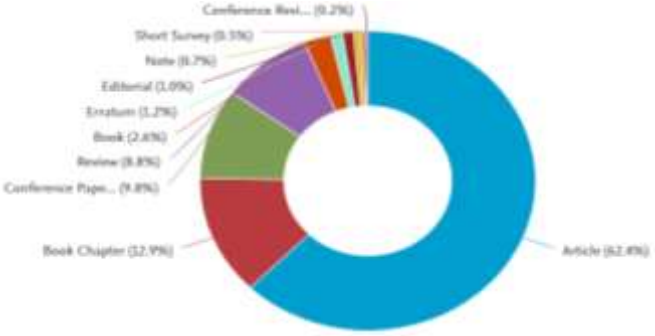


Figure 7. Most common types of publications

There were 10 types of scientific artciles most frequently published with the keywords "sustainable production and consumption", excluding those published in 2023. The most common type was the original article, which accounted for 62.4% of the overall count of articles published containing the specified keywords. The second most common type was book chapters, with a total of 12.9% of the total types of publications. The last position in the top 10 most published types of publications was occupied by conference reviews, which amounted to 0.2% of the total publications.

Most Common Subjects of the Publications

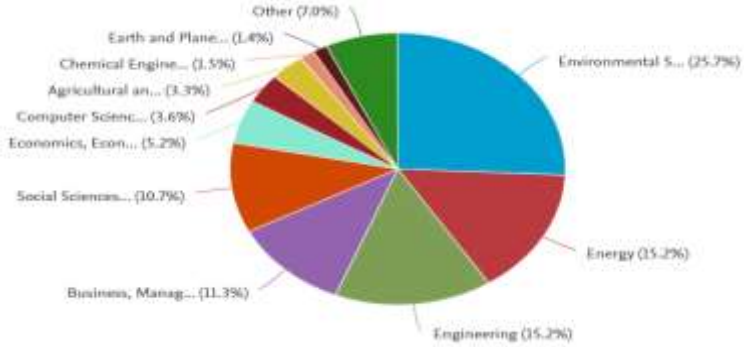


Figure 8. Most common subjects of the publications

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In the topic of sustainable production and consumption, the subject of environmental science had the most publications, accounting for 25.7% of the total number of publications. In second place was energy and engineering, with 15.2% of the total publications. Earth and planet subject had the least number of publications, with 1.4% of the total publications.

Most Productive Funders of Scientific Articles on Sustainable Consumption

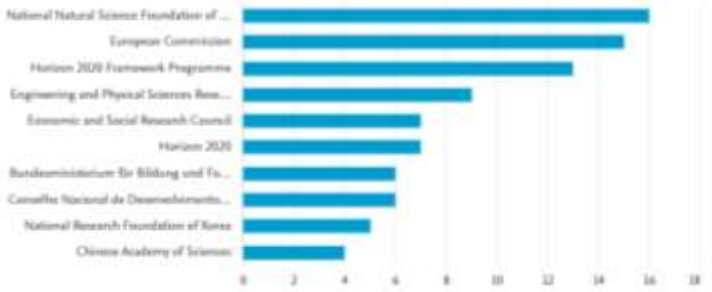


Figure 9. Most productive funders

The National Natural Science Foundation of China was the primary source of financing, supporting sixteen publications. In second place was the European Commission, which had funded 15 publications, and in the third place was the Horizon 2020 Framework Program, which had funded 13 publications on this topic. Other funders had funded less than 10 publications.

b). Sustainable Coffee Production and Consumption

There were 31 documents published on this topic, the data of which are presented in Table 1.

Table 1. Sustainable Coffee Production and Consumption

No.	Title	Year	Source Title	Citation Counts	Document Type
1	Exploring consumer support for tea standards in China and the UK: An analysis of voluntary sustainability governance	2022	Cleaner and Responsible Consumption		Original Article
2	Promoting Organic Agriculture and Sustainable Value Chain Development for Tea	2022	Sustainable Consumption and Production		Original Article

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	Smallholders: Insights from Assam, India				
3	Assessing the significance of ecologically sustainable agriculture: Insights from food and water concerns, production literacy, and consumer behaviours in rural and regional Australia	2022	Future of Food: Journal on Food, Agriculture and Society		Original Article
4	Examining the obstacles to sustainable consumer behavior: A benchmarking study	2022	Social Responsibility Journal	9	Original Article
5	Investigating sustainability in public procurement of food: A comprehensive literature review	2021	Sustainability (Switzerland)	4	Original Article
6	Understanding the effects of the COVID-19 pandemic on sustainable agri-food systems and the nexus of agroecosystem decarbonization: An extensive review	2021	Journal of Cleaner Production	18	Original Article
7	Analyzing hurdles in circular food supply chains and suggesting Industry 4.0 solutions	2021	Sustainability (Switzerland)	21	Reviews
8	Assessing the water footprint of handwoven silk production	2021	Water and Environment Journal		Original Article
9	Evaluating Costco's meat supply chain and its environmental justice implications in California	2021	Journal of Cleaner Production	2	Original Article
10	Investigating green supply chain management in Latin America: A systematic study and future directions.	2020	Managing Environmental Quality	9	Original Article
11	Promoting circular economy behavior change: A thorough EU electronic waste management evaluation	2020	Recycling, Conservation, and Resources: X	72	Reviews

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12	Analyzing the promotion of environmental product declarations in Brazil: SWOT analysis and strategic approaches	2019	Journal of Cleaner Production	10	Original Article
13	Assessing the environmental sustainability of biscuits at both product and sectoral levels	2019	Journal of Cleaner Production	10	Original Article
14	Understanding India's shade coffee production systems' carbon stocks: A coffee, climate, and biodiversity research	2019	Climate Change Management	5	Book Chapter
15	The carbon stocks of shade coffee production systems in India: A coffee, climate, and biodiversity research	2018	International Food Research	34	Original Article
16	Eco-labeling's future: Improving environmental product information systems	2017	The Future of Eco-labeling: Effective Environmental Product Information Systems	8	Original Article
17	Addressing resource scarcity and waste overload through waste resource recovery efforts	2017	Sustainability (Switzerland)	44	Original Article
18	Grassroots innovations and the journey towards sustainability: Addressing the issue of food waste	2017	Sustainability and Policy Analysis of Food Waste Reduction and Valorization	5	Book Chapter
19	Utilizing recovered compounds in food products: Applications and implications	2017	Sustainable Uses of Coffee Processing Byproducts	12	Book Chapter
20	Life cycle assessment's role in sustainable agri-food systems: Challenges	2017	Journal of Cleaner Production	330	Original Article
21	Are current sustainability assessment methods effective in promoting sustainable consumption? An examination of information dissemination approaches	2016	Sustainable Production and Consumption	16	Original Article

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22	The state of research on cleaner production practices in Brazil	2016	RAE Revista de Administracao de Empresas	8	Original Article
23	Globalization and Sustainable Development: A case study on international transport and its impact on sustainable development	2014	Journal of Environment and Development	28	Original Article
24	Promoting fair trade mainstreaming: Exploring the role of retailers	2014	Sustainability: Science, Practice, and Policy	7	Original Article
25	Comercio Justo México: Lessons and insights for Fairtrade initiatives	2013	Business Regulations and Non-State Actors: Whose Standards? Whose Development?		Book Chapter
26	Evaluating the impact of certification networks on sustainable production and consumption: A comparative analysis of FLO and FSC cases	2011	Journal of Consumer Policy	28	Original Article
27	Life cycle assessment of spray-dried soluble coffee vs. drip filter and capsule espresso	2009	Cleaner Production Journal	80	Original Article
28	Water foot printing at the product brand level: Case studies and future considerations	2009	Journal of Cleaner Production	93	Original Article
29	Assessing flexible packaging in coffee and butter life cycles	2009	International Life Cycle Assessment Journal	71	Original Article
30	Progress toward sustainable production and consumption in North America	2007	Cleaner Production Journal	62	Original Article
31	Exploring banana trade alternatives: Global economy challenges and potential for progressive social change	2000	Human Values and Agriculture	92	Original Article

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Number of Publications by Year

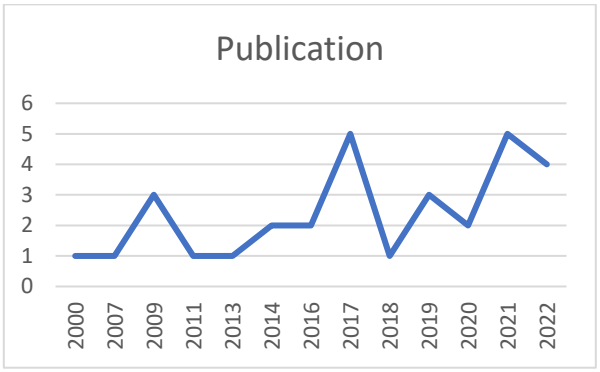


Figure 10. The most productive year

Looking at the year of publication, it can be seen that publications on "Sustainable Coffee Production and Consumption" appeared for the first time in 2000. After 2000, there was a decline in publications on this topic, with no publications on "Sustainable Coffee Production and Consumption" between 2001 and 2006. The topic was back again in 2007, with a one-year hiatus until 2009, when there were three publications on the topic. Publications on this topic had started to be consistent from 2006 to 2022.

Number of Publications by Source

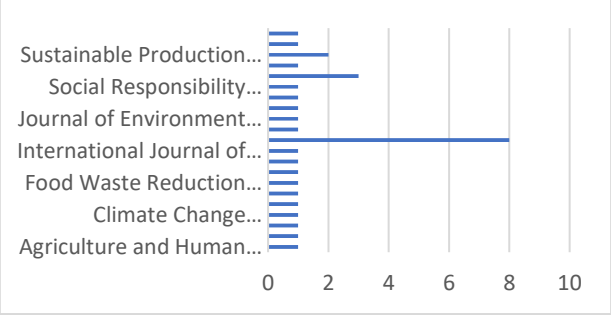


Figure 11. Most productive sources

The Journal of Cleaner Production managed to publish eight publications and took the first position as the source that published the most scientific works on the topic of sustainable coffee production and consumption. Sustainability (Switzerland) had two publications and Sustainable Production and Consumption had three publications. Other sources had an average of one publication.

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Citation Counts

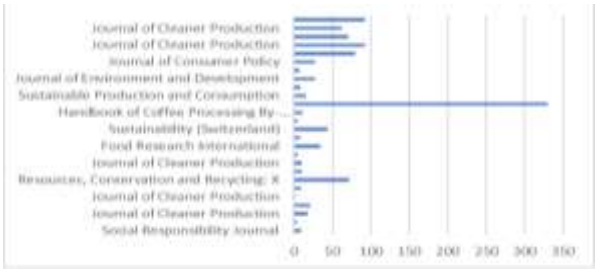


Figure 12. Most cited sources

Publications from the Journal of Cleaner Production were the most cited compared to those from other journals. The journal was cited 330 times, many times more than other journals.

Dominant Types of Publications

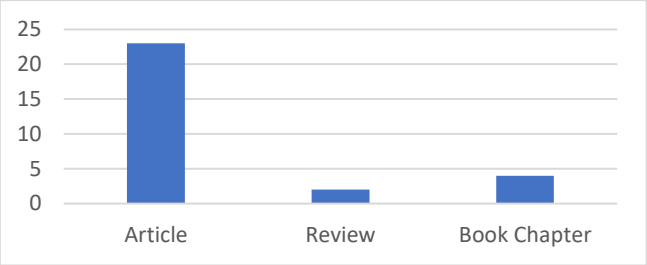


Figure 13. Most dominant publication types

There were three most common types of publications on SCP: original articles, reviews, and book chapters. Original articles dominated with 23 publications, followed by book chapters with four publications and reviews with two publications.

Distribution of Scientific Documents by Country (Based on VOSviewer)



Figure 14. Bibliometric map based on co-authorship with network visualization mode

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The 14 countries or regions that produced studies on sustainable production and consumption were grouped into six world regions (clusters). Of all the countries shown in Figure 14, the United Kingdom had the most published documents on sustainable production and consumption with 71 documents, followed by Germany with 65 documents. The countries with the least number of published documents were Ireland, the Philippines, the United Arab Emirates, the Czech Republic and Colombia, with a total of five documents.

Keyword Distribution

Keyword analysis was used to identify trends and limitations of sustainable coffee production and consumption. The keyword analysis in this study was based on the keywords listed in the article. As shown in Figure 15, the keyword assessment included seven keywords from 31 papers. The results provide detailed guidance for further studies in this area. The seven keywords examined in the 31 papers are life cycle, supply chains, sustainable development, sustainable production, sustainable production and consumption, circular economy, and climate change.

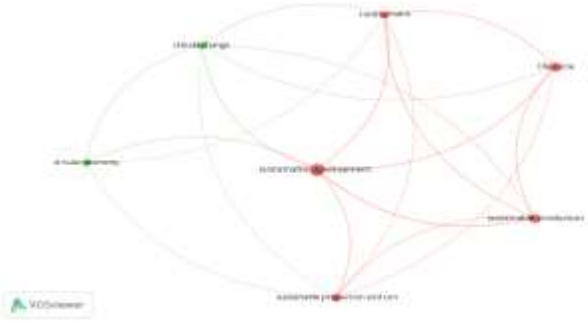


Figure 15. Most frequently used keywords in studies on sustainable coffee production and consumption

CONCLUSION

Based on the bibliometric review, a strong perspective is given on global trends in patterns of study of "sustainable production and consumption" between 1994 and 2022. Publications were sourced from the Scopus database, yielding 582 documents with the keyword "sustainable consumption and production." The following are the outcomes of the bibliometric analysis:

a). The year with the highest publications was 2022.

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b). Sustainable Production and Consumption was the source with the most publications in 2022, which were 15.
c). Sala, S. was the author with the most publications, which were 10.
d). The Joint Research Center of the European Commission was the most productive affiliation, with 12 publications.
e). The United Kingdom was the country with the most publications.
f). The most common type of scientific publication was the original article, which accounted for 62.4% of the total publications observed.
g). The subject of environmental science had the highest number of publications, accounting for 25.7% of the total publications.
h). The National Natural Science Foundation of China was the largest funder, supporting 16 publications.
i). The keywords "sustainable production and consumption" and "coffee" yielded 31 publications. The results of the bibliometric analysis are presented below:
a. Publications on the topic have started to be consistent from 2006-2022.
b. The Journal of Cleaner Production was the most effective source.
c. The Journal of Cleaner Production was the most widely mentioned source.
d. The most common types of publications were original articles.

FUTURE AGENDA

Research on sustainable coffee consumption and production is still open. Beyond the keywords identified in this study's bibliometric analysis, it is also important to connect this research to government policies that support the sustainability of forests and plantations where coffee is cultivated (Suhardjito & Wulandari, 2019) and the involvement and empowerment of coffee farming communities (Wulandari et al., 2019). By integrating government policies and community involvement is critical for sustainable coffee use and production. Effective regulations that encourage forest protection, sustainable agricultural practices, and sustainability incentives, when paired with the empowerment and active engagement of coffee farming communities, can result in more environmentally friendly coffee production systems.

Sustainable coffee consumption and production involve a variety of variables, including environmental, economic, and social considerations. The following are some major points that link the research to relevant government policy and community involvement:

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1. Government Policies Supporting Sustainability

Forest conservation policies:

Governments frequently enact legislation aimed at maintaining forests, which are critical to sustainable coffee production. These regulations could include protected areas, reforestation efforts, and restrictions on land use changes. For example, rules that require agroforestry methods can help to preserve biodiversity and increase coffee yield sustainability. Governments can support sustainable agriculture practices through subsidies, training programs, and certification schemes (such as Rainforest Alliance and Fair Trade). Policies that favor organic cultivation and integrated pest management can help to lessen coffee production's environmental impact.

2. Zoning laws and restrictions help avoid deforestation and promote sustainable land use for coffee plantations.

Governments may develop land tenure regimes that give farmers solid land rights, thereby promoting long-term investment in sustainable practices.

3. Incentives for sustainable practices:

Financial incentives, such as tax rebates or subsidies, might encourage coffee farmers to use sustainable practices. Coffee farmers may profit financially from programs that provide carbon credits for maintaining forest cover.

4. Participation and Empowerment of Coffee Farming Communities

Training programs provide coffee growers with informations and skills in sustainable cultivation, pest management, and climate resilience. Extension services can give farmers with ongoing support and direction, allowing them to effectively implement sustainable practices.

5. Community-Based Organizations and Cooperatives:

Cooperatives can increase smallholder coffee growers' negotiating power, allowing them to obtain higher market prices and resources for sustainable practices. Community-based groups can also help people share best practices and make decisions together.

6. Access to finance and resources:

Giving coffee growers access to microfinance and other financial services will help them invest in environmentally friendly technologies and practices. Access to high-quality seeds, organic fertilizers, and other inputs can help to ensure sustainable coffee production.

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7. Social and Economic Empowerment:

Initiatives that promote gender equality and the inclusion of excluded groups can ensure that sustainable practices benefit all members of the community. Empowering women in coffee farming communities can lead to better livelihoods and long-term development.

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