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Mapping the Research Landscape of Sustainable Palm Oil: A Bibliometric Analysis

Pemetaan Lanskap Penelitian Minyak Sawit Berkelanjutan: Analisis Bibliometrik

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ABSTRACT

The palm oil plantation sectors play essential role in Indonesia's economy, supporting livelihoods and significantly contributing to national growth. Indonesia is also one of the world's leading producers of palm oil. As global attention to sustainability issues of palm oil industry continue to rise, research in this area has grown as well. This study aims to map the landscape of research on sustainable palm oil using a bibliometric approach, with data sourced from Google Scholar and collected by Publish or Perish. The selected data were analysed using VOSviewer. The findings show that most studies on sustainable palm oil in Indonesia focus on certification and broader sustainability concerns. In particular, schemes such as Indonesia Sustainable Palm Oil (ISPO) and Roundtable on Sustainable Palm Oil (RSPO) emerge as a main themes in the literature, with many studies highlighting how certification is implemented, how it shapes industry sustainability, and how it connects to global policies and standards.

Keywords — *Bibliometric, Indonesia, palm oil, sustainablity*

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1. Introduction

The palm oil business is one of the most important parts of Indonesia's economy. As the world's leading producer of palm oil [1], Indonesia contributes significantly to global trade and supplies raw materials to various businesses, including food, cosmetics, and renewable energy. The palm oil sector is a key driver of economic growth in producing countries, as it creates jobs and generates revenue for governments [2]. However, the development of the palm oil business presents several obstacles, particularly in terms of environmental and social issues. The rapid expansion of the palm oil industry has significantly contributed to deforestation, biodiversity loss, and increased carbon emissions [3]. As a result, the concept of sustainability becomes increasingly relevant in the administration of this sector.

Several certification schemes have been created to promote sustainable palm oil practices. Indonesia's government implements both the Indonesian Sustainable Palm Oil (ISPO) and the Roundtable on Sustainable Palm Oil (RSPO). ISPO is a mandatory certification for palm oil production aimed at minimising environmental impacts and promoting the adoption of sustainable practices by palm oil companies operating in Indonesia [4]. Sustainability certification for smallholders has the potential to promote a more environmentally sustainable and equitable palm oil sector [5].

As attention to sustainability issues increases, the number of scientific publications related to sustainable palm oil has also seen a significant rise in recent years. The existing research covers various aspects, ranging from environmental impact and policies to certification and supply chains. However, these studies are still scattered and have not been systematically mapped, particularly in the context of Indonesia. The bibliometric approach has become an effective method for analysing the development of scientific literature quantitatively and visually. This approach allows academics to detect patterns and research gaps [6].

Based on background above, the purpose of this study is to map the growth of sustainable palm oil studies in Indonesia using a bibliometric approach, highlighting publishing patterns, keyword relationships, and research gaps as potential paths for future research.

2. Methodology

The database used in this study is Google Scholar (GS). GS was used as the data source for this bibliometric study due to its extensive coverage and its ability to more comprehensively represent publications in the social sciences compared to other databases [7]. Another advantage is that GS is available for free.

GS data is collected using the Publish or Perish (POP) program. POP is an application that tracks and analyses academic citations from diverse sources, producing several citation metrics. Keyword formulation was used to ensure a more targeted and efficient data search. The keywords used in the title of this study are "sustainability" (or "*keberlanjutan*"), "palm oil" (or "*minyak kelapa sawit*"), "ISPO," and "RSPO," covering a publishing period from 2015 to 2025.

The data search using POP returned 200 items. This data was then exported and selected using the Mendeley Reference Manager application. Document screening was carried out using the following criteria: irrelevant documents, rejected websites, duplicate documents, editorial/book reviews, and unavailable publishing years. Following the screening, 168 documents satisfied the qualification criteria. The selected papers were then analyzed with VOSViewer to map and visualize the bibliometric network, which included author collaboration, keyword co-occurrence, citation, co-citation, and bibliographic coupling, as well as to detect research trends and gaps [6].

3. Discussion

3.1 Publication Data Metrics

The data search using POP returned 200 items. This data was then exported and selected using the Mendeley Reference Manager application. Document screening was carried out using the following criteria: irrelevant documents, rejected websites, duplicate documents, editorial/book reviews, and unavailable publishing years. Following the screening, 168 documents satisfied the qualification criteria. The selected papers were then analyzed with VOSviewer to map and

visualize the bibliometric network, which included author collaboration, keyword co-occurrence, citation, and bibliographic coupling, as well as to detect research trends and gaps.

Table 1. Comparison of Selected Data

Data Metrics	Initial Search	Screening Results
Publication years	2015-2025	2015-2025
Source	Google Scholar	Google Scholar
Papers	200	168
Citations	1168	1155
Cites/year	106,18	105,00
Cites/paper	5,84	6,88
Cites/author	626,62	618,17
Papers/author	119,92	97,15
Author/paper	2,26	2,28
H-index	17	17
g-index	28	28
hI_norm	12	12
hI_annual	1,09	1,09
hA-index	6	6

Source: Primary data, 2026

3.2 Publication Trends

Studies related to the sustainability of palm oil over the past ten years have shown a continuously increasing trend. Although the number of publications has fluctuated from year to year, there has generally been a significant growth. The development of publication trends on palm oil sustainability research during the period 2015–2025 is presented in Figure 1.

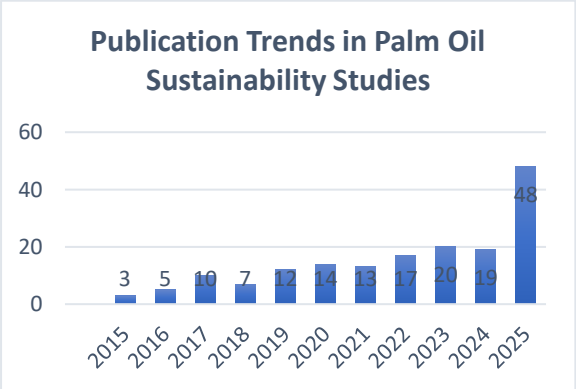


Figure 1. Publication Trends in Palm Oil Sustainability Studies

Figure 1 shows the number of publications increased from 3 articles in 2015 to a peak of 48 articles in 2025. Although there were some fluctuations, such as a decline in 2018 and 2021, the overall pattern still shows a consistent increase, especially after 2019. A significant surge occurred during the period from 2024 to 2025, indicating an increasing interest in research in recent years.

This increasing trend reflects the growing attention to sustainability issues in the palm oil industry. The rise in the number of publications can be influenced by various factors. The rapid expansion of the palm oil industry has significantly contributed to deforestation, biodiversity loss, and increased carbon emissions [3] The palm oil sector is a key driver of economic growth in producing countries, as it creates jobs and generates revenue for governments [2].

Tabel 2. The Top Ten Articles Identified Using POP

No	Writer	Number of Citation	Publication Title
1.	[8]	82	The Oil Palm Governance: Challenges of Sustainability Policy In Indonesia
2.	[9]	78	Perubahan Tutupan Lahan Akibat Ekspansi Perkebunan Kelapa Sawit: Dampak Sosial, Ekonomi dan Ekologi
3.	[10]	73	Kesiapan Petani Kelapa Sawit Swadaya dalam Implementasi ISPO: Persoalan Lingkungan Hidup, Legalitas dan Keberlanjutan
4.	[11]	55	Tantangan Keberlanjutan Pekebun Kelapa Sawit Rakyat di Kabupaten Pelalawan, Riau dalam Perubahan Perdagangan Global
5.	[12]	45	The Role of Farmers Readiness in the Sustainable Palm Oil Industry
6.	[13]	36	Konsep Perkebunan Kelapa Sawit Berkelanjutan

7.	[14]	35	Model Green Scor Untuk Pengukuran Kinerja Green Supply Chain Management (Gsscm) Industri Kelapa Sawit di Indonesia
8.	[15]	34	Dibalik Keberlanjutan Sawit: Aktor, Aliansi dalam Ekonomi Politik Sertifikasi Uni Eropa
9.	[16]	28	Analisis Kesiapan Petani Swadaya dalam Menghadapi Rancangan Peraturan Presiden No. 44 Tahun 2020 Tentang Pengelolaan Kelapa Sawit Berkelanjutan Ditinjau Dari Aspek Status Lahan, Legalitas Dan Sumber Bibit di Kabupaten Indragiri Hilir
10.	[17]	27	Studi Komparatif Perkebunan Kelapa Sawit Rakyat Pola Plasma dan Pola Swadaya dalam Menghadapi Sertifikasi RSPO

Based on Table 2, the articles with the highest citation counts are dominated by the topics of governance and sustainability in the palm oil industry, with [8] being the most cited, followed by [9] who discuss land cover changes and their impacts on social, economic, and ecological aspects. Additionally, the research by [10] highlights the readiness of independent farmers in implementing ISPO, particularly concerning environmental, legality, and sustainability aspects. In general, other studies also address similar issues, such as the challenges faced by smallholder farmers, farmer readiness, and the implementation of sustainability concepts in the supply chain, indicating that the focus of the research is not only on production but also on governance and sustainability aspects of the palm oil industry.

3.3 Visualization of Trends in Palm Oil Sustainability Research Publications Based on Keywords

The results of the network visualization based on the keywords used are presented in Figure 2. Figure 2 shows the network visualization divided into 4 clusters, indicated by the different colors in each cluster. Cluster (1) is shown in red, consisting of keywords “CPO”, “crude palm oil”, “dan RSPO”, “data’, “*implementasi*”, “Indonesia”, “Indonesia Sustainable palm oil”, “*industri kelapa sawit*”, ISPO RSPO”, “Literature review”, “MSPO”, “palm oil industry”, “*perkebunan kelapa sawit*”, “roundtable sustainable palm oil”. Cluster (2 is shown in green, focusing on keywords “certification”, “ISPO certification”, “*kelapa sawit berkelanjutan*”, “palm oil”, “*perkebunan kelapa sawit*”, “study”, “sustainability”, “sustainable development”. Cluster (3) is shown in blue, focusing on keywords “Indonesia sustainable palm oil”, “ISPO”, “*kelapa sawit*”, “*minyak kelapa sawit berkelanjutan*”, “sertifikasi”, “studi kasus”. Cluster (4) is shown in yellow, focusing on keywords “*minyak sawit*”, “roundtable”, “RSPO”, “*sawit berkelanjuan*”, “sustainable palm oil”.

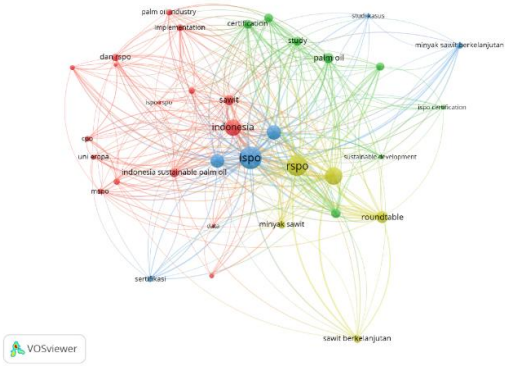


Figure 2. Keyword Co-occurrence Network

Figure 2 shows that the keywords ISPO and RSPO are positioned at the center of the cluster, indicating that these two terms are the most frequently discussed and used in sustainable palm oil research. The strong connections with keywords such as “Indonesia”, “palm oil”, and ”crude palm oil” suggest that the focus of the studies is largely linked to the context of the palm oil industry in Indonesia, particularly regarding the implementation and comparison of certification standards.

In addition, keywords such as “certification”, “sustainability”, and “sustainable development” are closely related to “ISPO” and “RSPO”, which emphasizes that sustainability and certification aspects are important elements in research. The emergence of the keywords “implementation” and “study” also indicates that some research has evolved toward empirical studies on the application of sustainability principles in the field.

On the other hand, the presence of keywords such as “roundtable” and “sustainable palm oil” reflects the connection to a global perspective, particularly the role of RSPO as an international initiative in promoting sustainability practices. Meanwhile, the emergence of keywords such as “*perkebunan kelapa sawit”* and *“industri kelapa sawit*” indicates that research attention also encompasses the production sector and the industrial chain.

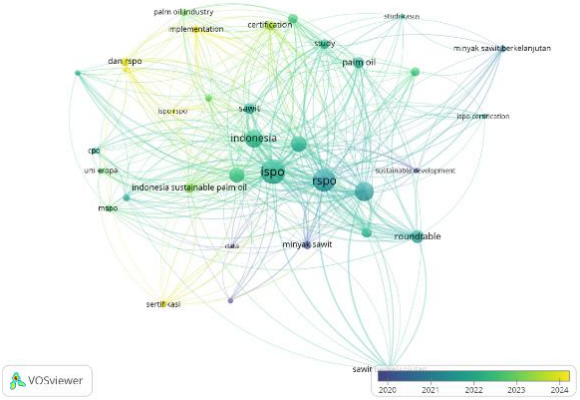


Figure 3. Overlay Visualization

Figure 3 shows the development of research topics based on publication time. The colour differences on the nodes indicate the period of keyword emergence; blue represents older topics, while yellow indicates relatively new ones. Keywords such as ”ISPO”, “RSPO”, “Indonesia”, and “palm oil” are located in the bluish-green color spectrum, indicating that these topics have long been a primary focus and continue to evolve in the literature. This indicates that the issues of certification and sustainability in the palm oil industry are consistently studied by researchers.

Meanwhile, keywords with newer colors (yellow), such as “implementation” and “certification” and the connection to “RSPO”, indicate a shift in research focus toward the implementation and evaluation of sustainability practices in the field. The emergence of terms like “*Uni Eropa*” also indicates an increasing focus on external factors, particularly regulatory pressures and the global market, which are influencing sustainability practices in the palm oil industry. Overall, this visualization reflects a shift from conceptual studies toward a more applicative approach, thereby opening up opportunities for further research focused on implementation and its impact at the business operator level.

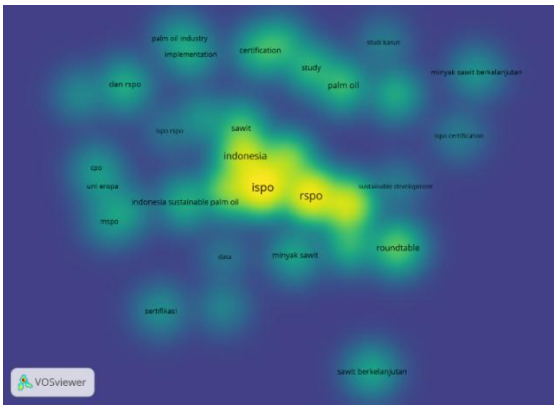


Figure 4. Density Visualization

Figure 4 illustrates the density and interconnection levels of keywords in sustainable palm oil research. The yellow color indicates areas with high density, while the green to blue colors indicate lower density. Based on the visualization, keywords such as "ISPO," "RSPO," and "Indonesia" are in the brightest areas, indicating that these topics are the main focus and are most frequently studied in the literature.

On the other hand, keywords such as "certification," "implementation," "roundtable," and "sustainable development" are in the medium-density area, indicating that these topics are quite researched but not as intensely as the main keywords. Meanwhile, some other keywords like "*Uni Eropa*," "MSPO," and "*studi kasus*" are in the low density area, indicating a limited amount of research on these topics. Overall, this visualization shows that research is still centered on the issues of ISPO and RSPO certification, while other more specific or contextual topics still have opportunities for further development**.**

4. Conclusion

Based on the analysis results, research on sustainable palm oil in Indonesia predominantly focuses on certification and sustainability issues, particularly related to ISPO and RSPO as the main topics in the literature, with studies highlighting the implementation of certification, industry sustainability, and its connection to global policies and standards. Additionally, the research also shows the interconnection between national and global contexts, such as Indonesia's role as a major producer and the influence of international regulations, including roundtables and the European Union. Nevertheless, studies focusing on the implementation aspects at the operational level, the performance of business actors, and the microeconomic impacts are still relatively limited, thus opening up opportunities for further research, especially on topics with low density such as field implementation evaluations, analyses at the farmer or MSME level, and the sustainability impacts on economic and social aspects.

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