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Trends in Palm Oil Supply Chain and Trade: A Bibliometric Approach

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ABSTRACT

This study explores the global research landscape on palm oil supply chains and trade through a bibliometric analysis using data exclusively sourced from the Scopus database and visualized via VOSviewer. The analysis spans publications from 2000 to 2024, identifying patterns in authorship, institutional affiliations, country collaborations, keyword co-occurrence, and thematic evolution. Results indicate a sharp increase in scholarly output beginning in 2015, with Indonesia and Malaysia emerging as the most prolific contributors. The research themes have shifted from early focuses on bioenergy and environmental emissions to more recent concerns such as deforestation, certification, governance, and sustainability. Co-authorship networks reveal disciplinary fragmentation between environmental and technical research communities, while international collaboration is strongest between Southeast Asian producers and Western academic institutions. The study highlights the need for more interdisciplinary integration and identifies emerging research gaps related to commerce, biodiversity, and land-use change. These findings offer strategic insight for researchers, practitioners, and policymakers seeking to navigate and contribute to the evolving discourse on sustainable palm oil supply chains.

Keywords: *Palm Oil, Supply Chain, Trade, Bibliometric Analysis, Scopus*.

1. INTRODUCTION

Palm oil has become one of the most significant commodities in the global agricultural and food sectors due to its versatility, productivity, and wide-ranging applications. Derived from the fruit of the oil palm tree (Elaeis guineensis), this oil is widely used in food products, cosmetics, biofuels, and industrial lubricants [1]. Over the past few decades, demand for palm oil has surged, particularly in emerging economies and industrialized nations. This increase has prompted both producing and consuming countries to pay closer attention to its supply chain mechanisms and trade patterns, thus making it a critical subject in sustainability debates and global trade discussions [2]. The unique nature of the palm oil supply chain requires an integrated and systematic approach to understand how the industry evolves.

The global palm oil market is dominated by countries in Southeast Asia, especially Indonesia and Malaysia, which account for more than 80% of total global production [3]. These countries have developed comprehensive infrastructures and regulatory frameworks to manage the palm oil industry, from plantations and smallholder systems to export-oriented processing. However, the expansion of oil palm plantations has led to increasing concerns about environmental degradation, land-use changes, and socio-economic issues, including indigenous land rights and labor conditions [4]. As a result, understanding the evolution of palm oil supply chains is not merely an economic issue but also intersects with environmental, social, and political domains. This complexity calls for interdisciplinary analysis to discern trends and inform future policymaking.

At the heart of the palm oil industry lies a dynamic and rapidly evolving supply chain that encompasses upstream agricultural activities, midstream processing, and downstream distribution. The interconnected nature of these elements has become even more pronounced in light of globalization, digital transformation, and the emergence of sustainability certification systems such

as RSPO (Roundtable on Sustainable Palm Oil) and ISPO (Indonesian Sustainable Palm Oil). These certifications are not only mechanisms for promoting sustainable practices but also strategic tools for maintaining market access, particularly in Europe and North America, where sustainability concerns are pivotal [5]. Recent studies suggest that the integration of traceability technologies and digital logistics is gradually reshaping palm oil trade flows and supply chain strategies [6], thereby marking an important shift in the industry landscape.

Trade in palm oil has also undergone notable changes due to shifts in international regulations, geopolitical tensions, and consumer preferences. For instance, trade agreements, tariffs, and bans related to deforestation-linked commodities have impacted the flow of palm oil exports and imports. The European Union's legislative initiative on deforestation-free supply chains is a prime example of a regulatory movement that significantly influences palm oil trade policies. Consequently, palm oil exporting countries have had to adjust their trade strategies to remain competitive while addressing sustainability concerns. This intersection between supply chain dynamics and trade policies is a fertile ground for academic exploration, especially to understand how macro-level trends influence micro-level operations and vice versa.

In light of the vast amount of research produced on palm oil there is a growing need to map the intellectual landscape of this field systematically. A bibliometric approach provides a quantitative method to analyze academic literature, identify research trends, collaboration networks, and key thematic areas [7]. Through bibliometric analysis, it becomes possible to uncover dominant discourses, research gaps, and the evolution of scholarly interest over time. By applying this method to the study of palm oil supply chain and trade, researchers can not only synthesize the existing body of knowledge but also generate strategic insights for future studies and policy development.

Despite the strategic importance and complex nature of the palm oil supply chain and its global trade implications, there is limited systematic mapping of the existing academic discourse in this area. Most studies tend to focus on specific aspects such as environmental impact, market trends, or certification without providing an integrated overview of how research themes have developed, which countries and institutions are leading the discourse, and what gaps remain in the literature. As the industry continues to evolve in response to technological, regulatory, and consumer-driven changes, there is a pressing need to comprehensively analyze and visualize the trends, patterns, and structures within the body of research using robust bibliometric methods. This study aims to explore and analyze the trends in the palm oil supply chain and trade through a bibliometric approach.

2. LITERATURE REVIEW

2.1 Palm Oil Supply Chain Structures and Governance

The supply chain for palm oil is a complex, multi-tiered system that involves numerous stakeholders, including smallholder farmers, plantation companies, processors, traders, refiners, exporters, and regulatory bodies. Early studies on palm oil supply chains primarily focused on describing the flow of products from plantations to consumers, with emphasis on logistical and operational efficiency [8]. More recent research has expanded the focus to include governance mechanisms, stakeholder power dynamics, and supply chain coordination. Scholars such as [9] emphasize the role of multi-stakeholder initiatives and public-private partnerships in shaping governance structures within the palm oil value chain. Their work shows that transparency, accountability, and inclusive participation are critical for improving

supply chain performance and equity. In parallel, [10] highlight the asymmetry in bargaining power between large agribusinesses and smallholders, arguing that inclusive business models and contract farming schemes can help rebalance this disparity. Moreover, recent frameworks propose the application of supply chain resilience and circular economy principles to the palm oil industry. For instance, [11] explore how lean and green supply chain practices can improve both environmental performance and business sustainability in palm oil operations. These studies underline the increasing complexity and strategic orientation of supply chain management in this sector.

2.2 Trade and Market Dynamics in Palm Oil

Palm oil trade has been deeply influenced by changing global demand, trade policies, and economic partnerships. As global consumption of edible oils rises, palm oil has emerged as a leading commodity due to its cost-effectiveness and high yield per hectare [12]. However, trade in palm oil is also subject to geopolitical shifts and protectionist measures. For example, discriminatory tariffs, import restrictions, and consumer boycotts—particularly in the European Union—have been the focus of several empirical studies [13]. An important body of work also addresses the market structure and pricing volatility of palm oil. [14] analyze the integration of palm oil markets across regions and find significant price linkages between futures and spot markets in Malaysia, Indonesia, and international trade hubs. This has important implications for supply chain actors who are exposed to price risks and global financial markets. Moreover, several studies have explored the effects of bilateral and multilateral trade agreements on palm oil exports. For instance, [15] examine how the ASEAN Free Trade Area (AFTA) and other trade pacts affect market access for Indonesian palm oil. They emphasize the dual challenges faced by producers: meeting trade requirements while aligning with increasingly stringent environmental and social standards.

2.3 Sustainability and Certification

One of the most prominent themes in the palm oil literature is sustainability. The industry is often scrutinized for its contribution to deforestation, biodiversity loss, greenhouse gas emissions, and land conflicts [16]. Consequently, a significant body of research has examined sustainability certification schemes such as RSPO, ISPO, and MSPO. RSPO-certified palm oil has become a benchmark for sustainable production, yet it is not without criticism. Some researchers argue that certification does not always lead to improved outcomes on the ground, particularly for smallholders who face technical and financial barriers to compliance [17]. Others, like [18], argue that certification can lead to environmental benefits, especially when combined with strong monitoring and community engagement. Several comparative studies have also evaluated the effectiveness of national vs. international certification schemes. For example, the ISPO (Indonesian Sustainable Palm Oil) scheme, which is mandatory for Indonesian producers, has been critiqued for weak enforcement and limited credibility compared to RSPO [19]. These findings underscore the need for harmonization and stronger governance mechanisms to enhance the credibility and impact of sustainability initiatives.

2.4 Technological and Digital Transformation

As the palm oil supply chain modernizes, digital transformation has emerged as a key enabler of efficiency, traceability, and compliance. Recent studies highlight the role of blockchain, IoT (Internet of Things), and data analytics in improving transparency and traceability across the supply chain [20]. These technologies allow companies to track palm oil from plantations to end consumers, thereby ensuring compliance with sustainability standards and mitigating reputational risks. Digital tools are also being used for precision agriculture, yield optimization, and smallholder inclusion. For example, mobile apps and remote sensing technologies are being deployed to improve data collection, land-use monitoring, and fertilizer application [21]. The integration of digital systems into supply chain operations not only enhances performance but also strengthens resilience against shocks such as pandemics, climate change, and policy disruptions.

3. METHODS

This study utilized a bibliometric analysis approach to explore research trends in the field of palm oil supply chain and trade. All bibliographic data were exclusively retrieved from the Scopus database, which offers a broad and high-quality collection of peer-reviewed scientific publications. The search strategy involved using specific keywords such as "palm oil," "supply chain," "logistics," and "trade" within article titles, abstracts, and keywords, covering publications from the year 2000 to 2024. Only journal articles and review papers written in English were included, while book chapters, editorials, and non-English publications were excluded to maintain consistency and scholarly rigor. The metadata extracted from Scopus were exported in RIS format and analyzed using VOSviewer, a specialized software tool for constructing and visualizing bibliometric networks. The analysis focused on co-authorship patterns, citation networks, and keyword co-occurrence to identify major research themes, influential authors, and the intellectual structure of the field.

4. RESULTS AND DISCUSSION

4.1 Yearly Publication

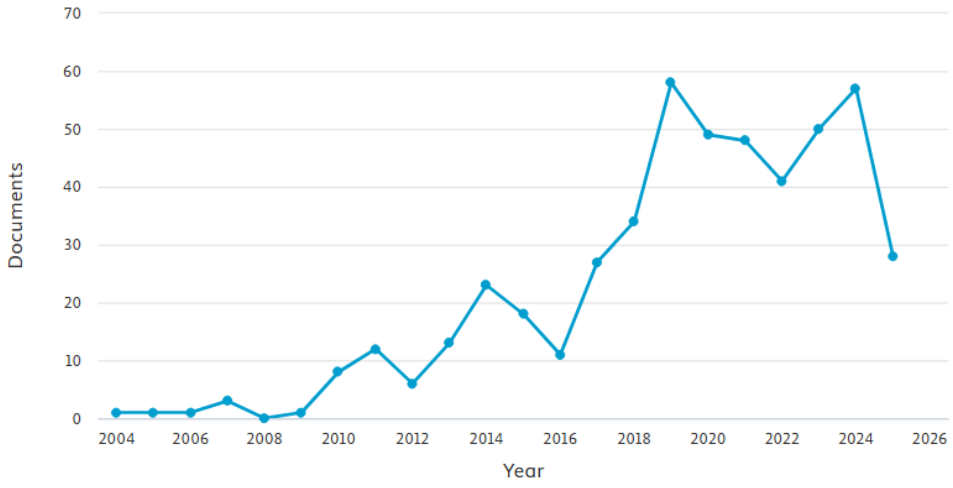

Figure 1. Documents by Year
Source: Scopus Database, 2025

The chart illustrates the annual publication trend related to palm oil supply chain and trade from 2004 to 2025. The data reveals a clear upward trajectory in scholarly output over the years,

especially after 2010. From 2004 to 2009, publication volume remained minimal, typically below 5 documents per year. A noticeable increase began around 2010, followed by a consistent growth trend, peaking sharply in 2018 with nearly 60 documents published. Although there was a slight decline in 2019 and 2020, the number of publications remained relatively stable through 2021 to 2024, hovering around 45 to 55 documents annually. Interestingly, there is a visible drop in 2025, which may be attributed to the fact that the data for that year is still incomplete at the time of analysis. Overall, the chart indicates growing academic interest and research activity in this domain, particularly from 2015 onwards, reflecting the increasing relevance of palm oil-related supply chain and trade issues in global discourse.

4.2 Documents by Affiliation

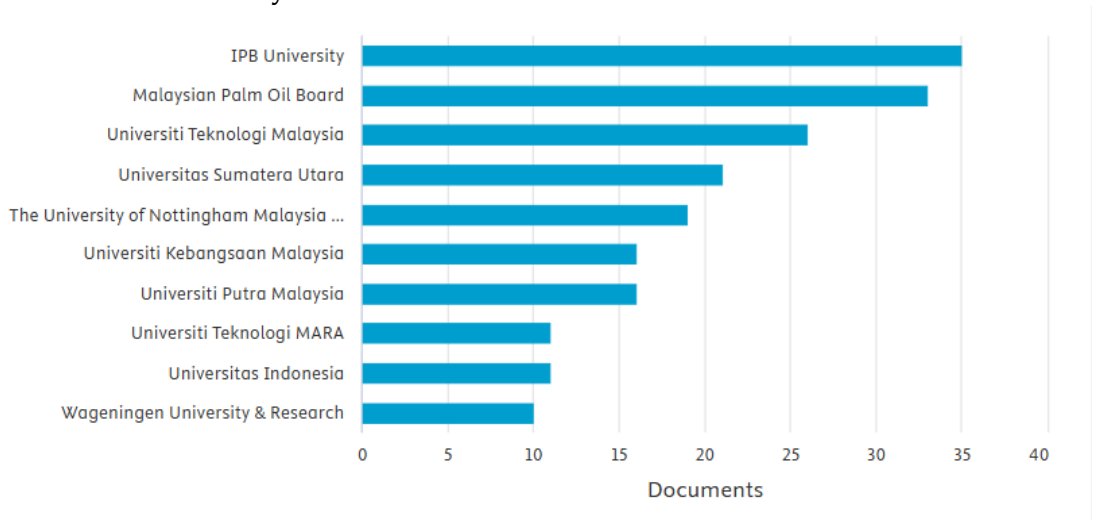

Figure 2. Documents by Affiliation
Source: Scopus Database, 2025

The chart presents the top contributing institutions in the field of palm oil supply chain and trade research based on the number of published documents. IPB University leads with the highest number of publications, contributing over 35 documents, followed closely by the Malaysian Palm Oil Board, which has published just under 35 documents. Other major contributors include Universiti Teknologi Malaysia and Universitas Sumatera Utara, with approximately 25 and 20 publications respectively. Notably, Malaysian institutions dominate the chart, reflecting the country's central role in palm oil research and industry. International representation is evident with institutions like the University of Nottingham Malaysia and Wageningen University & Research, the latter being the only non-Asian university on the list.

4.3 Documents by Country

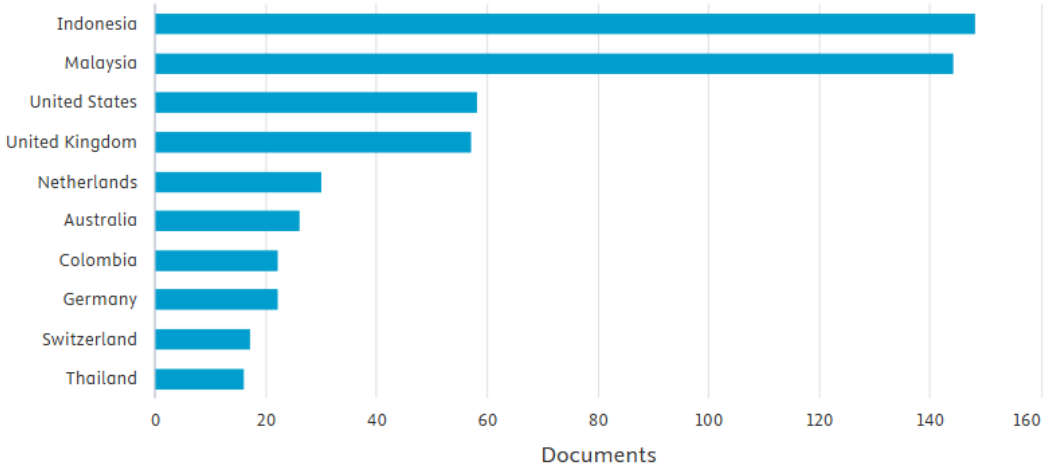

Figure 3. Documents by Country
Source: Scopus Database, 2025

The chart displays the top contributing countries in the research field of palm oil supply chain and trade, based on the number of published documents. Indonesia ranks as the leading contributor with around 155 publications, closely followed by Malaysia, which has also produced over 150 documents. These figures reinforce the dominant roles both countries play as the world's primary palm oil producers and exporters. The United States and United Kingdom follow at a distance, each contributing approximately 60 publications, indicating significant academic interest despite not being major producers. The Netherlands, Australia, and Colombia represent mid-level contributors with 20 to 30 documents, while Germany, Switzerland, and Thailand contribute smaller but notable shares.

4.4 Keyword Co-Occurrence Network Visualization

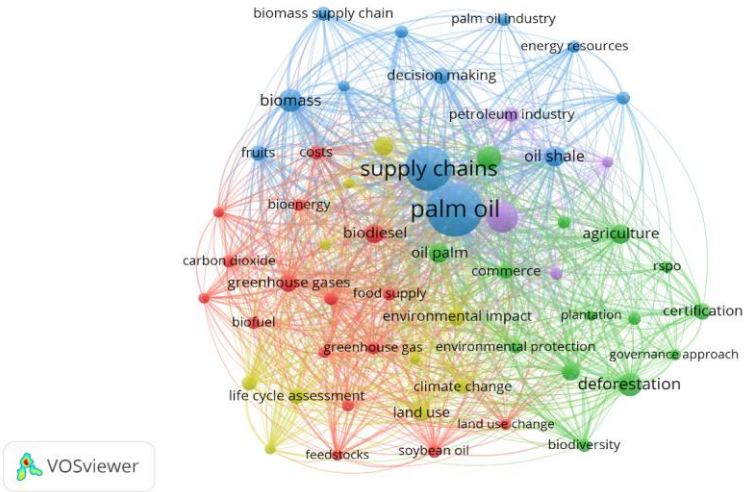

Figure 4. Network Visualization
Source: Data Analysis, 2025

The visualization presented is a keyword co-occurrence map generated from bibliometric data related to palm oil supply chain and trade. Each node represents a keyword, with its size corresponding to the frequency of occurrence across the analyzed publications. The connections (lines) between nodes signify the co-occurrence relationships—how often two keywords appear together in the same document. Clusters are color-coded, revealing thematic groupings within the

literature. At the center of the map, the largest and most frequently used keywords are "palm oil" and "supply chains", indicating their central role in this research field. The green cluster on the right highlights themes related to sustainability, governance, and environmental impact. Keywords such as "deforestation," "biodiversity," "certification," "RSPO," and "governance approach" reflect growing academic concern with sustainable practices in palm oil production. This cluster shows strong interlinkages between environmental issues and institutional responses like certification schemes (e.g., RSPO) and policies aimed at reducing land-use change and conserving biodiversity. The presence of terms like "environmental protection" and "plantation" further suggests a policy-oriented and conservation-focused subfield.

The red cluster on the left revolves around climate change, biofuels, and emissions, including terms like "greenhouse gases," "carbon dioxide," "bioenergy," and "life cycle assessment." This area of research explores the implications of palm oil in the context of global warming and renewable energy production. Scholars in this domain often assess the carbon footprint of palm oil compared to other feedstocks like soybean oil, as seen in terms like "feedstocks" and "soybean oil." The integration of "land use" and "climate change" highlights research that assesses the trade-offs between palm oil expansion and its ecological consequences. The blue cluster at the top of the map is centered around energy, logistics, and decision-making, with keywords such as "biomass," "costs," "energy resources," "decision making," and "petroleum industry." This cluster indicates an intersection between palm oil and industrial or energy-sector research, particularly focusing on bioenergy logistics and the comparative analysis of palm-based energy sources. The keyword "biomass supply chain" also signifies interest in optimizing the flow and conversion of biomass into energy within palm oil systems, linking it back to broader themes in energy efficiency and industrial logistics.

The yellow and purple clusters represent cross-cutting and interdisciplinary themes. Keywords like "commerce," "oil palm," "environmental impact," and "agriculture" point to studies that integrate economic, agricultural, and environmental perspectives. The proximity of these clusters to the core terms “palm oil” and “supply chains” reflects their foundational importance in the field. These areas capture broad issues such as the role of palm oil in global food supply chains, the balancing act between agricultural development and sustainability, and the economic viability of sustainable practices. The interconnections across all clusters show that palm oil research is highly interdisciplinary, requiring collaboration among experts in agriculture, environment, energy, policy, and trade.

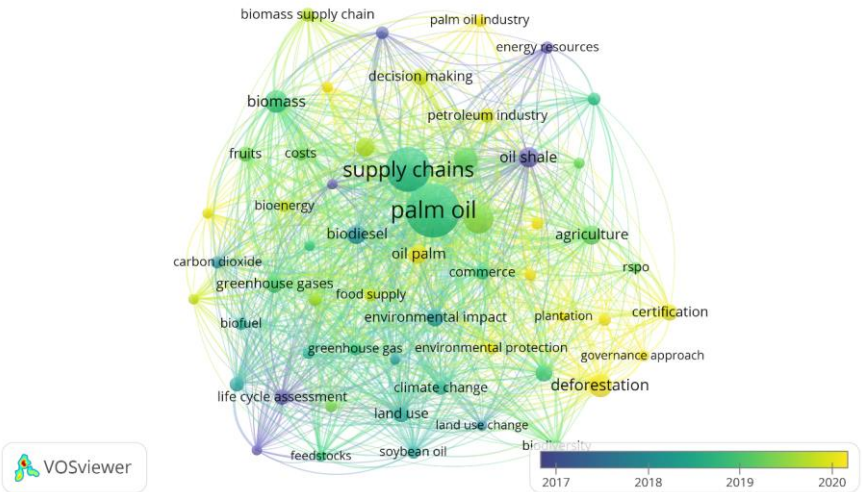

Figure 5. Overlay Visualization
Source: Data Analysis, 2025

This overlay visualization presents a temporal keyword co-occurrence map of research on palm oil supply chain and trade from 2017 to 2020. The color gradient—from blue (older) to yellow (newer)—indicates the average year in which keywords appeared in the dataset, allowing us to trace the evolution of research topics over time. Central keywords such as "palm oil" and "supply chains" are shaded in green, reflecting their consistent and ongoing use throughout the analyzed period. Their central positioning and size suggest they are foundational themes connecting multiple subfields within this research area. On the right side of the map, yellow-colored keywords such as "certification," "deforestation," "governance approach," and "RSPO" have appeared more frequently in more recent studies (closer to 2020). This pattern indicates a rising interest in sustainability, governance, and regulatory frameworks related to palm oil. Keywords such as "plantation," "agriculture," and "biodiversity" are also trending topics, reflecting a contemporary shift toward examining the socio-environmental impacts of palm oil production and the effectiveness of certification schemes in mitigating adverse effects.

In contrast, keywords in purple and blue, such as "life cycle assessment," "feedstocks," "petroleum industry," and "biofuel," suggest earlier research trends focusing on bioenergy, fossil fuel alternatives, and carbon accounting. These topics were more dominant in studies from 2017 and earlier, when the emphasis was largely on palm oil's role in the renewable energy sector. Over time, the literature appears to have shifted focus from technical assessments of bioenergy to broader sustainability governance and policy-oriented inquiries. This evolution underscores the dynamic and multidisciplinary nature of palm oil research, increasingly shaped by environmental regulations and global trade concerns.

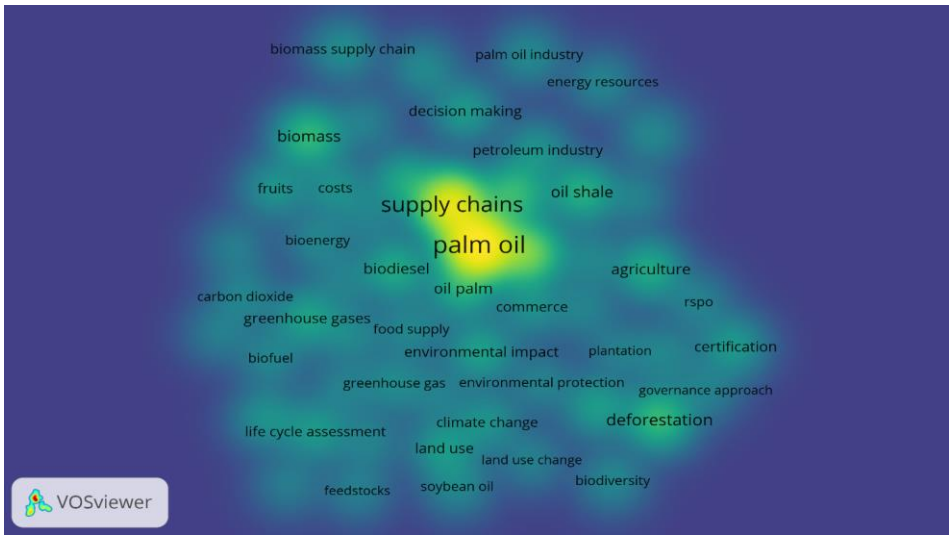

Figure 6. Density Visualization
Source: Data Analysis

This heatmap visualization illustrates the density of keyword co-occurrence in literature related to palm oil supply chain and trade. The colors range from dark blue (low density) to bright yellow (high density), where brighter areas indicate a higher frequency of keyword appearances and co-occurrences in the dataset. The keywords "palm oil" and "supply chains" are located at the center of the map and appear in bright yellow, confirming their dominant role as the most discussed topics in the field. These central terms serve as thematic anchors, around which various subtopics are interconnected, highlighting their foundational importance in the body of scholarly work. Surrounding the core, several moderately dense areas appear in green and light yellow, representing important but slightly less central themes such as "oil palm," "biodiesel," "deforestation," "environmental impact," and "certification." These terms suggest key research concerns related to sustainability, land use, and the environmental footprint of palm oil. In contrast, peripheral topics

such as "costs," "fruits," "governance approach," and "soybean oil" appear in darker blue shades, indicating lower citation density and potentially emerging or niche research areas.

4.5 Co-Authorship Network

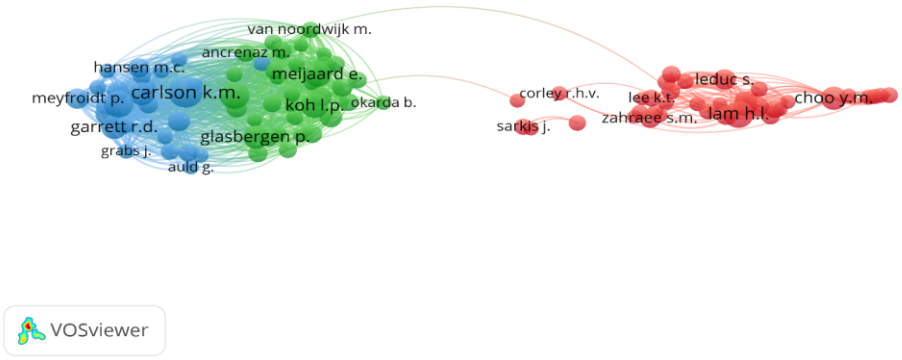

Figure 7. Author Visualization
Source: Data Analysis, 2025

This network visualization depicts co-authorship clusters in the field of palm oil supply chain and trade research. Each node represents an author, and the links indicate co-authorship connections. The colors signify different clusters of closely collaborating researchers. The green and blue clusters on the left form a dense, interconnected network comprising authors such as Meijaard E., Carlson K.M., Koh L.P., and Glasbergen P., who are known for their work on environmental sustainability, land-use change, and governance in palm oil contexts. The red cluster on the right, including authors like Lam H.L., Choo Y.M., and Zahraee S.M., appears to focus more on engineering, supply chain optimization, and energy-related aspects of palm oil. Notably, there are only a few linking nodes (e.g., Corley R.H.V.) connecting the two major author communities, suggesting limited collaboration between environmental governance scholars and those working on technical or logistical dimensions.

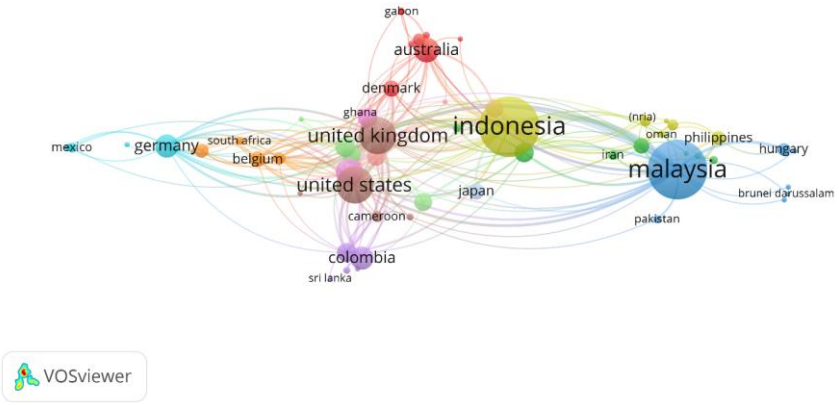

Figure 8. Country Visualization
Source: Data Analysis, 2025

This VOSviewer network visualization illustrates international collaboration among countries in palm oil supply chain and trade research. Each node represents a country, with node size reflecting the number of publications and link thickness indicating the strength of co-authorship or research collaboration. Indonesia and Malaysia emerge as the most prominent contributors, indicated by their large node sizes and extensive network connections. These two countries collaborate frequently with the United Kingdom, United States, Australia, and several Asian neighbors such as Japan, Philippines, and Pakistan, forming a dense core network. Meanwhile, European countries like Germany, Belgium, and Denmark also show strong links, though generally at the periphery of the map. The visualization highlights a globally interconnected research community, with Southeast Asia acting as the epicenter, and Western countries providing key scientific support, especially in areas related to sustainability, governance, and trade.

Discussion

This study aimed to explore the scholarly landscape surrounding palm oil supply chains and trade using a bibliometric approach with data sourced from Scopus and visualized through VOSviewer. The discussion focuses on the evolution of publication trends, the dominance of key institutions and countries, emerging research themes, collaboration patterns, and structural insights into the scientific community. Through these findings, we can better understand the academic response to the economic, environmental, and geopolitical challenges associated with the palm oil industry.

1. Growing Scholarly Interest and Publication Trends

The temporal analysis of publication trends reveals a significant increase in academic output related to palm oil supply chain and trade, particularly from 2015 onward. While the years before 2010 showed limited research activity, the subsequent decade witnessed a dramatic rise, peaking in 2018 and sustaining high levels through to 2024. This surge correlates with the intensification of global debates on sustainability, deforestation, and the environmental impact of palm oil. The increasing visibility of sustainability certification schemes such as RSPO and ISPO, as well as regulatory pressures from consumer markets in Europe and North America, likely contributed to the heightened academic interest. The slight decline observed in 2025 likely reflects incomplete indexing at the time of data collection rather than a genuine drop in scholarly activity.

2. Institutional Leadership and Regional Dominance

Institutional contributions are notably concentrated in Southeast Asia, with IPB University and the Malaysian Palm Oil Board leading the field in terms of research output. Other prominent institutions include Universiti Teknologi Malaysia, Universitas Sumatera Utara, and The University of Nottingham Malaysia Campus, further emphasizing the regional centrality of Indonesia and Malaysia in palm oil research. These institutions have played a pivotal role in advancing both applied and theoretical studies on palm oil, often working closely with governmental bodies and industry stakeholders. Their dominance reflects not only their geographic proximity to oil palm plantations but also their long-standing involvement in shaping palm oil policies, trade frameworks, and sustainable practices. Interestingly, the presence of Wageningen University & Research among the top 10 institutions illustrates the involvement of European academic institutions in palm oil discourse, often with a focus on sustainability assessment, policy development, and environmental impacts. This highlights the global relevance of the topic and the growing intercontinental dialogue on palm oil's implications for global food systems and environmental governance.

3. Country-Level Contributions and Global Collaboration

At the national level, Indonesia and Malaysia are the most prolific contributors, each with more than 150 publications, underscoring their central role in both production and academic research. These countries are followed by the United States, United Kingdom, and Netherlands,

suggesting strong academic engagement from both producing and consuming nations. Countries such as Germany, Australia, and Colombia also feature prominently, reflecting diverse interests ranging from sustainability and policy to energy and trade. The international collaboration network shows dense interconnectedness, with Southeast Asian nations at the core and countries like the United Kingdom, Australia, and the United States forming strong research alliances. These partnerships may reflect joint efforts to address environmental and trade-related challenges, supported by funding from development agencies and transnational research programs. The collaboration map also reveals emerging partnerships with countries like Colombia, Cameroon, and Ghana, where oil palm cultivation is expanding and local researchers are increasingly contributing to global discourse.

4. Thematic Structure and Emerging Trends

The keyword co-occurrence analysis offers deep insights into the thematic landscape of palm oil research. Core keywords such as "palm oil" and "supply chains" are the most frequently used, acting as anchors for various subtopics. A dense cluster of keywords—"oil palm," "biodiesel," "commerce," "deforestation," "certification," and "climate change"—indicates the multifaceted nature of the field, which intersects agriculture, energy, trade, and sustainability science. The overlay visualization reveals a temporal shift in research themes. Earlier studies (pre-2018) were more focused on biofuel, biomass, life cycle assessment, and greenhouse gases, reflecting interest in palm oil as an alternative energy source and in its carbon footprint. More recent work has shifted toward themes like deforestation, certification, governance approaches, and supply chain transparency, indicating a growing concern for social and environmental responsibility in the palm oil industry. This shift aligns with increasing global scrutiny on deforestation-linked commodities, particularly by the European Union, which has introduced deforestation-free product legislation. Academic research appears to be responding to these regulatory and consumer pressures by exploring how supply chains can be made more transparent, traceable, and sustainable. The emergence of keywords such as "RSPO", "environmental protection", and "plantation" further emphasizes this orientation toward governance and sustainability.

5. Disciplinary Fragmentation and Author Collaboration

The co-authorship network reveals two major, relatively separated research communities. On one side are scholars such as Meijaard E., Koh L.P., and Carlson K.M., who focus primarily on ecological, social, and policy dimensions of palm oil production. On the other side, authors like Lam H.L., Choo Y.M., and Zahraee S.M. lead work related to engineering, supply chain modeling, and energy efficiency. The limited collaboration between these groups suggests a degree of disciplinary fragmentation, with environmental scientists and engineers working in parallel rather than in partnership. This division presents both a challenge and an opportunity. While each community offers deep expertise, closer interdisciplinary collaboration could generate more holistic solutions to the complex issues facing the palm oil sector. For instance, integrating environmental modeling with logistics optimization could help balance economic viability with ecological responsibility. Bridging these communities through joint projects, interdisciplinary journals, and international conferences may lead to richer, more actionable research outcomes.

6. Density and Research Gaps

The keyword density visualization further reinforces the centrality of topics like "palm oil," "supply chains," and "oil palm," which appear in the highest-intensity areas of the map. Meanwhile, topics such as "governance approach," "soybean oil," and "costs" are located in low-density regions, signaling underexplored or niche areas. These peripheral keywords could represent valuable research opportunities, especially as palm oil becomes more entwined with broader commodity debates and global supply chain disruptions. The relatively low density around terms like "commerce," "fruits," "land-use change," and "biodiversity" suggests that there is room for further

empirical exploration into market dynamics, smallholder involvement, ecosystem services, and agricultural biodiversity. Additionally, the intersection of palm oil with food security and rural livelihoods appears underrepresented, which is concerning given the importance of these issues in development discourse.

7. Implications for Policy and Future Research

The findings of this bibliometric study have several implications for researchers, practitioners, and policymakers. First, the clear shift toward sustainability-related topics suggests that future research will need to go beyond technical optimization and engage more deeply with social equity, community engagement, and transparent governance. Second, the presence of disciplinary silos calls for a more integrated research agenda that combines technological innovation with socio-environmental assessments. Policymakers, particularly in producer countries, can benefit from the evolving academic consensus around traceability, deforestation, and certification. Meanwhile, consuming countries and international regulators should recognize the research-led evidence pointing to both the benefits and limitations of existing certification systems. Enhancing mutual learning and research partnerships between North and South, and between academia and industry, will be essential in creating sustainable and inclusive palm oil supply chains.

CONCLUSION

This study has provided a comprehensive bibliometric analysis of global research trends related to palm oil supply chains and trade, revealing significant growth in scholarly interest, especially in the past decade. The findings highlight the dominance of Southeast Asian countries in both production and academic output, while also underscoring increasing international collaboration with institutions in Europe, the Americas, and beyond. Thematic mapping showed a clear shift from early research focused on bioenergy and environmental emissions toward contemporary issues such as sustainability governance, certification schemes, and deforestation. Despite progress, disciplinary fragmentation remains evident, with limited integration between environmental and engineering-focused research communities. The study underscores the importance of interdisciplinary collaboration and identifies underexplored areas such as commerce, biodiversity, and land-use change, which warrant greater scholarly attention. Overall, this bibliometric insight offers valuable direction for future research, policy development, and multi-stakeholder engagement in the pursuit of more transparent, resilient, and sustainable palm oil supply chains.

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