



Strengthening Indonesia's sustainable palm oil policy: Addressing climate change and enhancing global market integration

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ABSTRACT

Background: This study investigates the strengthening of sustainable palm oil plantation policies in Indonesia as a strategic response to global climate change challenges and growing international market pressures. The study emphasizes the importance of simplifying certification processes, strengthening local institutional capacity, and promoting participatory governance. Multi-stakeholder collaboration, technological support, and policy adaptation to local contexts are identified as critical enablers of an inclusive and effective sustainability framework. **Methods:** Using a qualitative approach through in-depth interviews with diverse stakeholder government officials, smallholder farmers, corporations, NGOs, and academics the research uncovers the varying perceptions, capacities, and experiences that shape the current sustainability landscape. **Findings:** The findings reveal a significant disconnect between policy formulation and field-level implementation, especially among smallholders who face barriers such as inadequate access to information, technology, and finance. Certification schemes like ISPO and RSPO, while central to sustainability efforts, are often perceived by smallholders as complex and costly. Additionally, limited supervisory capacity, inconsistent intergovernmental coordination, and unresolved land conflicts further impede policy effectiveness. Importantly, the findings underscore the need to enhance transparency across the supply chain and foster innovation through public-private-academic partnerships. Increased investment in smallholder training, digital monitoring systems, and conflict resolution mechanisms is vital to closing the gap between policy and practice. **Conclusion:** Ultimately, this research highlights the need for an integrated policy approach that harmonizes regulations, empowers smallholders, enhances transparency, and supports innovation paving the way for a resilient and competitive palm oil industry that contributes to both national development and global climate goals. **Novelty/Originality of this article:** This study offers a novel contribution by bridging the gap between sustainability policy formulation and field-level implementation in Indonesia's palm oil sector, with a particular focus on smallholder realities.

KEYWORDS: sustainable palm oil; smallholders; certification; policy implementation; multi-stakeholder collaboration; climate change.

1. Introduction

The oil palm plantation industry (*Elaeis guineensis*) in Indonesia has a strategic role in the world and national economy. Indonesia is the largest country contributing to the world's palm oil production up to 59% to production and the largest palm oil exporter in the world, which is 54%, both of which are according to Figure 1 (a).

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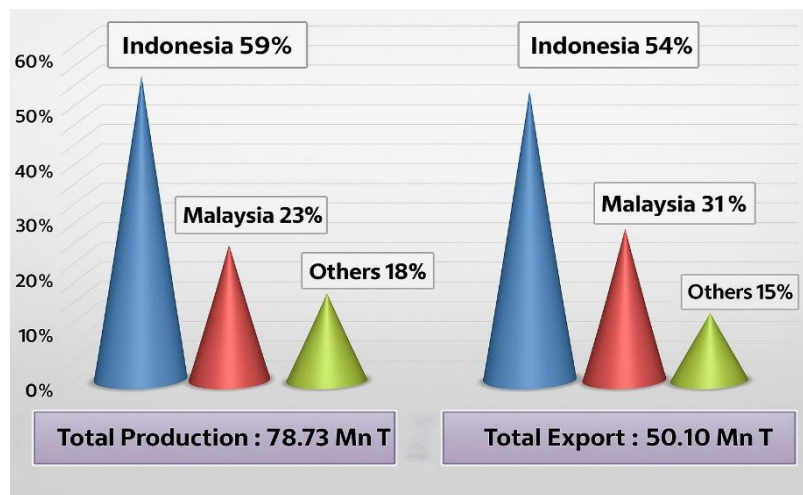


Fig. 1. Contribution of Indonesian Palm Oil (CPO) to the world's palm oil production and exports (Sulaiman et al., 2024)

That is the potential of Indonesia as a producer and supplier Crude Palm Oil (CPO) is the largest in the world (Siallagan & Ishak, 2023). Indonesia occupies the top position as a palm oil exporting country, with an export value of USD 25 billion in 2023. Next is Malaysia's position with an export value of USD 14 billion, followed by the Netherlands of USD 1.22 billion, and Thailand of USD 710 million (Sulaiman et al., 2024; Observatory of Economic Complexity, 2025). The national oil palm plantation industry contributes to national economic growth by the significance of its contribution to the increase in Gross Domestic Product (GDP) of the plantation sector in the second quarter of 2024 at 3.25%, state revenue through export foreign exchange amounted to USD 31 billion, job creation for millions of people, especially in rural areas as well as increasing the production of goods or services and increasing income (Sulaiman et al., 2024).

The palm oil industry is a strategic economic sector in Indonesia, with plantation land area that continues to increase every year and has reached approximately 16 million hectares in 2023 (Ministry of Agriculture Indonesia, 2023). Moreover, the broader plantation subsector contributed 3.9 % to national GDP and almost 31 % of Indonesia's agricultural sector in 2023 (Ministry of Agriculture Indonesia, 2024). The study found that the employment opportunity coefficient for all economic sectors during the analysis period was inelastic, where the elasticity figure was less than one. The higher the elasticity of job opportunities, the greater the ability of the economic sector to create employment due to economic growth (Maryam et al., 2025). Oil palm plantations, which are considered to be able to contribute to absorbing labor and growing the national economy, have helped to increase the sector's products not only absorbed by the local market, but also exported to various countries.

In addition to its substantial economic contributions, the palm oil industry in Indonesia also plays a vital role in supporting rural livelihoods and poverty alleviation. A recent Scientific Reports study found that oil palm cultivation has significantly improved living standards and reduced poverty among many smallholder farmers across Indonesia, despite ongoing challenges related to climate change and infrastructure limitations (Hendrawan et al., 2024). Furthermore, research published in Sustainable Food Systems synthesizes global literature and confirms that palm oil expansion stimulates rural economies, contributes to poverty reduction, and enhances food security among smallholder communities (Sibhatu, 2023). However, the industry continues to face persistent sustainability challenges, including environmental concerns such as deforestation, biodiversity loss, and greenhouse gas emissions, as well as social issues affecting smallholder farmers. A study in *Frontiers in Sustainable Food Systems* shows that while certification schemes like RSPO and ISPO have helped curb deforestation and fire occurrences within plantations, they can also have unintended trade-offs such as reduced yield efficiency that may pressure producers to expand into surrounding forests (Ostfeld & Reiner, 2024). Efforts to improve sustainable

practices are steadily progressing, with recent research in Science of the Total Environment identifying crucial barriers particularly among smallholders to adopting ISPO certification, such as lack of technical knowledge, financial constraints, and limited market access (Revi, 2025).

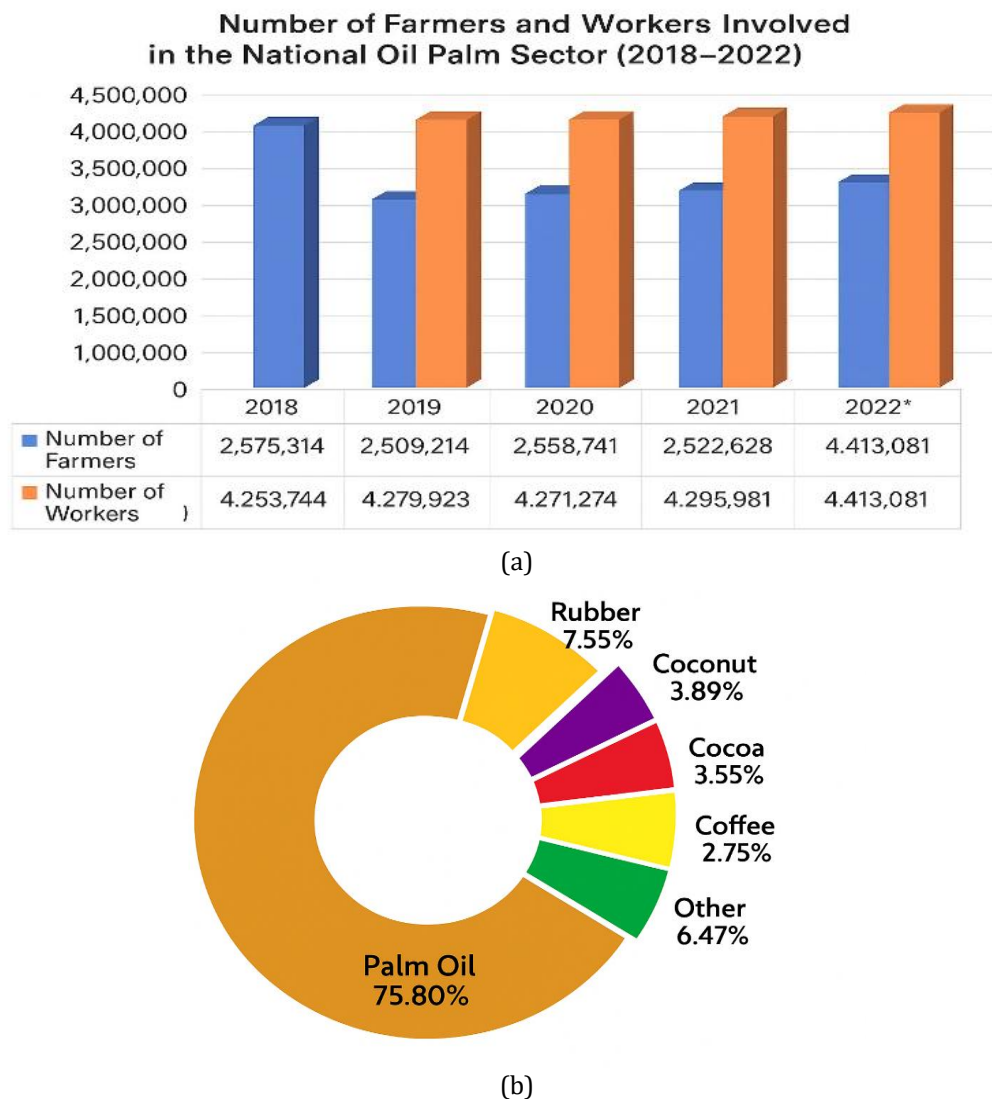


Fig. 2. (a) Data on the number of smallholders and the number of workers involved in the national palm oil development sector in 2018–2022; (b) Major export commodities of the plantation sub-sector 2023

(Ministry of Agriculture Indonesia, 2024)

The domestic palm oil industry plays a crucial role in Indonesia's national economic structure, especially within the agribusiness sector. Not only is it a leading export commodity, but it also creates broad socio-economic impacts. Currently, the industry involves approximately 2.4 million independent smallholders and supports employment for nearly 16 million workers across various stages of production and distribution. Since the early 2000s, the sector has significantly contributed to poverty alleviation, helping an estimated 10 million Indonesians escape poverty, including 1.3 million rural households who were lifted directly across the poverty line due to economic activities related to palm oil (Supriatna et al., 2024; Alamsyah et al., 2023).

Beyond its social benefits, palm oil remains the largest contributor to Indonesia's trade surplus in the plantation sub-sector. In 2023, palm oil accounted for approximately 75.8% of total plantation commodity exports, far exceeding other key commodities such as rubber (7.6%), coconut (3.9%), cocoa (3.6%), and coffee (2.8%) (Alamsyah et al., 2023). This

dominance underscores palm oil's strategic importance not only socially, but also in maintaining Indonesia's competitiveness in global trade.

However, despite these contributions, the industry faces pressing sustainability challenges. Environmental issues such as deforestation, peatland degradation, and greenhouse gas emissions have brought increasing global scrutiny and demands for responsible production. Smallholder-dominated plantations are often less sustainable due to aging crop stock, limited institutional support, and restricted access to sustainable financing and replanting programs (Eggen et al., 2024; Supriatna et al., 2024). These limitations highlight the urgent need for systemic improvements in governance, certification mechanisms, and sustainable agricultural practices to ensure the palm oil sector continues to grow while safeguarding Indonesia's environmental and social integrity. Moreover, smallholders often struggle with limited access to financing, technology, land tenure security, and market information, which hinders productivity and income growth. Research indicates that these barriers significantly limit smallholder participation in zero-deforestation supply chain initiatives and broader sustainability programs (Eggen et al., 2024). Therefore, empowering smallholder farmers through capacity building, financial support, and better integration into certified supply chains remains a key priority to enhance their livelihoods and contribute further to rural development. Looking forward, sustained innovation in sustainable agriculture, increased supply chain transparency, and stronger public-private collaboration will be essential to maintain Indonesia's leadership in the global palm oil market while ensuring that economic growth is balanced with environmental integrity and social equity (Eggen et al., 2024; Supriatna et al., 2024).

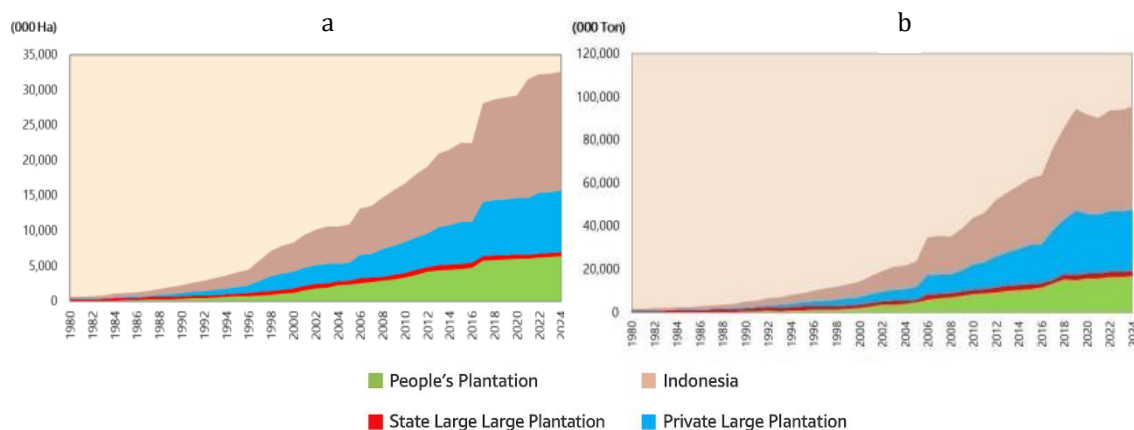


Fig. 3. (a) Development of palm oil production according to status of exploitation in Indonesia, 1980-2024; (b) Development of oil palm area according to status of exploitation in Indonesia. (Ministry of Agriculture Indonesia, 2024)

The movement of oil palm area in Indonesia in the period 1980-2024 tends to continue to increase from year to year. If in 1980 the area of Indonesian oil palm was 294.56 thousand hectares, then in 2020 it will reach 14.59 million hectares according to Figure 3 (b). The huge increase in oil palm area occurred in the period before the monetary crisis (1980-1998) with a growth rate of 15.07% per year. After this period, namely 1998 – 2017, the growth of oil palm area tended to slope, or only increased by 6.34% per year. Similarly, in the last 10-year period (2015-2024), Indonesia's oil palm area has only increased by 4.90% per year (Ministry of Agriculture Indonesia, 2024).

Palm oil, which is the national leading commodity, is not indeed economically profitable. The expansion of oil palm plantations has been a major driver of deforestation in Indonesia over the past 20 years, accounting for one-third of Indonesia's loss of old-growth forest an area of 3 million hectares (7.4 million acres), or half the size of Belgium (Herry, 2025). A number of studies highlight that the conversion of forests to oil palm plantations can increase carbon release into the atmosphere and threaten biodiversity due to deforestation activities for oil palm land clearing, which is the main cause of habitat loss

of endemic wildlife such as orangutans and Sumatran tigers (Wijaya et al., 2023; Lee et al., 2024). Nevertheless, the rapid growth of this sector has drawn mounting criticism and significant challenges, particularly concerning its environmental and social impacts. The large-scale conversion of forests and peatlands into oil palm plantations has led to extensive deforestation, the loss of endemic peatland biodiversity, and increased greenhouse gas emissions (Ostfeld & Reiner, 2024). Moreover, smallholder-dominated plantations particularly older and unproductive ones are frequently less sustainable, failing to adopt best practices and exacerbating social equity concerns (Fosch et al., 2023; (Van Der Heijden & Dhandapani, 2024).

Countries in Europe, North America, and East Asia are beginning to impose strict regulations regarding the origin and environmental footprint of products entering their markets. One of the important policies is European Union Deforestation Regulation (EUDR), which prohibits the import of agricultural products, including palm oil, that come from land that was deforested after 2020. This regulation demands transparency and traceability of the supply chain as a whole. Without meeting the specified sustainability standards, Indonesian palm oil products are in danger of not being able to compete in the global market (Regulation (EU), 2023). Other research has also shown that each hectare of forest converted to oil palm plantations can release up to 165 tons of CO₂ into the atmosphere due to peatland disturbance and land-use change (Viveros Santos et al., 2023).

According to the Intergovernmental Panel on Climate Change (IPCC), the agriculture, forestry, and other land use (AFOLU) sector accounted for roughly 23 % of total global anthropogenic greenhouse gas (GHG) emissions in the 2010–2019 period (Nabuurs & Mrabet, 2023). Within this context, unsustainable management of oil palm plantations especially the conversion of peatlands and forests significantly exacerbates the climate crisis. Recent peer-reviewed studies show that GHG emissions from soil and peat disturbance in oil palm plantations can be substantial, with soil nitrogen oxide (N₂O) alone contributing over 50 % of the plantation's global warming potential Click or tap here to enter text.. Consequently, the expansion of oil palm into high-carbon ecosystems without strict mitigation measures amplifies the sector's climate impact far beyond conventional agricultural emissions, reinforcing the need for improved land-use practices and plantation management standard.

Therefore, there is an urgency to transform the oil palm production system towards a more sustainable direction as part of the climate change solution where the oil palm plantation industry is serious about sustainability. In response to these pressures, the Indonesian government and industry players began to develop various sustainability initiatives. One of them is the implementation of certification Indonesian Sustainable Palm Oil (ISPO) which requires all business actors in the palm oil sector to apply sustainability principles, including environmental conservation, legal compliance, and community empowerment. However, until the end of 2023, only a small percentage of oil palm plantations have managed to obtain ISPO certification, which is around 30% of the total area of national oil palm plantations, indicating that there are still many business actors who have not implemented these sustainability standards comprehensively (Ministry of Agriculture Indonesia, 2024).

In the global context, Indonesia is not the only palm oil producing country. Countries such as Malaysia and Colombia are also major producers that seek to balance productivity with sustainability. Malaysia, for example, implements Malaysian Sustainable Palm Oil (MSPO) which has been integrated into national policies and has been mandatory since 2020. MSPO is focused on aspects of governance, environmental conservation, and the welfare of workers and smallholders (Rahman et al., 2023; Lim & Tan, 2024). Colombia is also known as a relatively environmentally friendly palm oil producer because its plantation development does not encroach much on primary tropical forests, but rather degraded land and savannas, which have the potential to significantly reduce emissions (Gómez-Sal et al., 2024). There are certifications at the global level, namely Roundtable on Sustainable Palm Oil (RSPO) and International Sustainability and Carbon Certification (ISCC) which is used as

an international standard in ensuring that palm oil is produced in an environmentally and socially responsible manner (Reich & Musshoff, 2025).

The research shows that RSPO certification can increase the productivity of independent oil palm smallholders by up to 15–20%, provide credit incentives, strengthen institutions, and improve the implementation of soil and water conservation. However, major challenges remain, especially regarding the capacity gap between large companies and small farmers. Smallholders often struggle to meet the administrative and technical requirements of sustainability certification schemes. Smallholders face a variety of challenges, including a lack of technical knowledge, limited funding support, unstable market access, and suboptimal RSPO audit mechanisms. In addition, recent studies have identified that certification costs, including compliance, transaction, and opportunity fees, often exceed the financial capacity of smallholder farmers, thus hindering their participation in certification schemes (Ayompe et al., 2024).

Furthermore, sustainability issues are not only related to environmental aspects, but also social and economic. In many cases, land conflicts between companies and indigenous peoples or local farmers are in the spotlight, creating prolonged social tensions. Therefore, the sustainability approach must include the dimensions of social justice and economic inclusion. Approaches such as agroforestry, peatland restoration, and strengthening the tenure rights of local communities are considered to be able to create a balance between economic productivity and environmental sustainability. The emphasizes the importance of the agricultural sector, including palm oil, in supporting food security and public health, as long as its management pays attention to the sustainability of the ecosystem. Palm oil as a high-productivity commodity (up to 4-6 tons of oil/ha/year) has advantages over other vegetable oils such as soybeans or sunflowers, which require more land for the same yield (Bakhtary et al., 2021).

Therefore, with sustainable management, palm oil can be an efficient solution in meeting global vegetable oil needs while minimizing pressure on natural resources. Learning from these countries, Indonesia can strengthen the implementation of incentive-based policies for smallholders who implement best practices, including providing access to green credit, training on sustainable cultivation techniques, and integration with digital monitoring systems. The use of technology such as Remote sensing, blockchain for supply chains, and GIS for mapping work areas can also improve the transparency and efficiency of monitoring sustainability practices. The implementation of sustainable palm oil policies not only has an impact on reducing carbon emissions, but also creates economic added value through increased market access and premium prices. Products that are certified as eco-friendly generally have higher appeal in the European and North American markets (Bakhtary et al., 2021).

The adoption of sustainable farming practices can increase smallholder incomes by 10–30% in the medium term due to input efficiency and increased selling prices. However, various challenges at the implementation level still hinder the optimization of this policy. Inequality of access to information, weak coordination between agencies, and limited resources in the regions, especially for independent smallholders who have not been organized in formal institutions. Data shows that more than 40% of oil palm farmers in Indonesia do not have access to adequate sustainability training or technical assistance. In addition, there are also challenges related to the recognition and protection of indigenous peoples' rights, which are often overlooked in the land licensing process. Several cases of agrarian conflicts in the Kalimantan and Sumatra regions show that without the involvement of local communities, the sustainability practices launched will only become an administrative formality (Bakhtary et al., 2021).

Therefore, multi-stakeholder engagement is an important key to the success of the sustainable palm oil agenda. The government, the private sector, NGOs, and local communities need to work together in formulating and overseeing policy implementation. From a global climate perspective, Indonesia's success in implementing sustainable palm oil has great potential in fulfilling its commitments Nationally Determined Contributions (NDCs) within the framework of the Paris Agreement. Indonesia targets emission

reductions of 31.89% (with its own efforts) and up to 43.20% (with international assistance) by 2030, with the forestry and land sectors playing a key role (Ministry of Environment and Forestry of the Republic of Indonesia, 2023). With a large area of oil palm land, the contribution of sustainable palm oil management to emission reduction can be significant.

Furthermore, if this sector is managed holistically, it can transform into a tool for Indonesia's green diplomacy. For example, Indonesia's success in creating an internationally recognized national certification system can be a strong argument in global trade forums and climate change negotiations, balancing negative narratives against palm oil with tangible evidence of its positive contribution to climate mitigation and adaptation. To strengthen the effectiveness of sustainable palm oil policies, it is necessary to formulate strategies that are integrative and adaptive to global dynamics. First, harmonization between ISPO and international standards such as RSPO and EUDR needs to be accelerated so that Indonesian palm oil products do not face technical obstacles in the global market. Second, strengthening data and technology-based transparency systems, such as supply chain tracking through the system Blockchain or Traceability Platform, is essential to meet the demands of consumers and relevant international regulators Zero-deforestation commodities (European Forest Institute, 2024). The central government needs to expand support for smallholders through technical assistance programs, environmental performance-based incentive schemes, and the integration of smallholders into sustainable value chains. An inclusive community-based approach has been proven to increase the adoption of sustainable farming practices up to 35% higher than the top-down. This approach not only ensures environmental sustainability, but also empowers grassroots communities as key actors in industrial transformation.

Strengthening international cooperation in the form of green trade partnerships, clean technology transfer, and climate finance support can accelerate the transition of Indonesia's palm oil industry to a low-carbon economy. Through these strategic steps, sustainable oil palm plantation policies are not only a relevant climate solution, but also a strategic instrument in strengthening Indonesia's position in the midst of fierce international market competition that increasingly prioritizes sustainability.

This research uses a qualitative approach, combining policy analysis and field case studies to understand in depth the dynamics of sustainability in the Indonesian palm oil industry. Through this approach, the research seeks to explore the perspectives of stakeholders, practices on the ground, and responses to policies implemented by the government. By contextually examining the interaction between policies, business actors, and socio-environmental conditions, this research is expected to provide a comprehensive understanding of the challenges and opportunities for the sustainability of the palm oil industry in facing global demands for greener and more responsible business practices.

Therefore, this article is compiled to provide a scientific and practical contribution to environmental policy discourse, especially related to strategic agricultural commodities in the transition era to a low-carbon economy. Through strengthening sustainability policies in the palm oil sector, Indonesia has a great opportunity not only to protect the environment and strengthen climate resilience, but also to improve its bargaining position in international trade, which now increasingly emphasizes the sustainability aspect as a key requirement. It is also important to note that palm oil contributes to the agenda Sustainable Development Goals (SDGs), especially in the 13th (handling climate change), 15th (terrestrial ecosystems), and 8th (economic growth and decent work). The transformation of this industrial policy into a driving force for the green economy can strengthen Indonesia's position in global climate diplomacy while increasing the competitiveness of palm oil products in the international market.

Taking these complexities into account, this study aims to explore how sustainable oil palm plantation policies can play a strategic role in mitigating climate change while strengthening the acceptance of Indonesian palm oil products in the global market. The main focus of this study is to evaluate the effectiveness of sustainability policies that have been implemented, analyze the potential emission reduction of these practices, and

examine their impact on export market access. Therefore, a balanced strategy between economic growth and environmental sustainability is needed to ensure that the industry is sustainable in the long term. The first part presents the background and urgency of sustainable palm oil policy. The second part reviews national policy frameworks and international comparisons. The third part discusses the impact of policies on climate mitigation and export competitiveness. The fourth section summarizes the key findings and provides strategic recommendations for future policy formulation. References are presented at the end as the scientific basis for this paper.

2. Methods

This research uses a qualitative approach that aims to deeply understand the dynamics of Indonesian government policies in encouraging the sustainability of the oil palm plantation sector (Grabs & Garrett, 2023). The qualitative approach was chosen because it was able to explore the perspectives, experiences, and meanings formed by stakeholders in sustainability policy practices in the field (Balaguer et al., 2023). The main focus of this research is on the analysis of policy documents as well as in-depth interviews with key actors involved in policy formulation and implementation, both from the government, private, and civil society sectors (Kiss et al., 2022). This research does not aim to generalize statistically, but rather to understand the context, processes, and challenges of sustainability in the palm oil industry holistically and deeply.

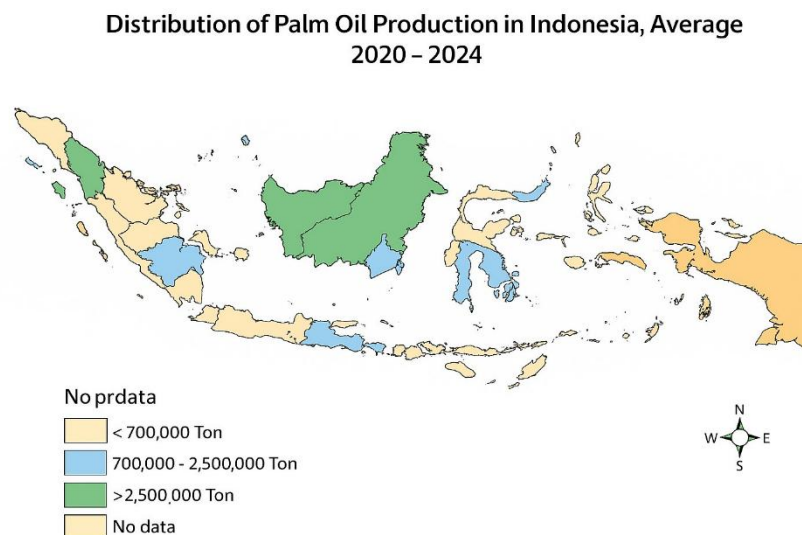


Fig. 4. Map of the Distribution of Palm Oil Production in Indonesia, Average 2020-2024
(Ministry of Agriculture Indonesia, 2024)

The research location was selected purposively based on the main oil palm producing areas in Indonesia which are also central to the dynamics of sustainability policies (Rauf et al., 2024). The three provinces where the research was located were Riau, Central Kalimantan, and South Sumatra. Riau Province was chosen because it is one of the areas with the largest oil palm plantations in Indonesia, both managed by large companies and independent smallholders. Riau is also a region that has experienced various dynamics in the implementation of ISPO certification and the moratorium on new permits. Central Kalimantan was chosen because it has distinctive geographical characteristics, namely the dominance of peatlands and tropical forests, and is an area of concern in the context of conservation and environmental governance. The province is also home to peat restoration programs and sustainability pilot projects. Meanwhile, South Sumatra was chosen because it demonstrated active policy dynamics, including the implementation of the Sustainable Palm Oil Regional Action Plan/*Rencana aksi daerah perkebunan kelapa sawit berkelanjutan* (RAD-KSB) and active participation in the multi-stakeholder platform for palm oil

sustainability. The selection of this location is expected to provide a representative picture of sustainability practices and challenges in regions with different socio-ecological characteristics and policies (Parra-López et al., 2023; Morzillo, 2024).

Data collection was carried out through document studies and in-depth interviews (Rauf et al., 2024). The document study was analyzed with a content analysis approach to examine the substance, objectives, instruments, and implementation of sustainability policies (Putri et al., 2022). The documents analyzed include laws and regulations, such as Presidential Regulation Number 44 of 2020 concerning the Indonesian Sustainable Oil Palm Plantation Certification System (ISPO), the Presidential Instruction on the moratorium on new oil palm plantation permits, as well as strategic documents such as the National Action Plan for Sustainable Oil Palm and the Regional Action Plan. In addition, international documents such as the principles and criteria of the Roundtable on Sustainable Palm Oil, International Sustainability and Carbon Certification (ISCC), as well as reports from international institutions such as UNDP, FAO, and the World Resources Institute (WRI) are also used to see Indonesia's position in the global context. The analysis of this document is carried out with a content analysis approach, which examines the substance, objectives, instruments, and implementation of sustainability policies regulated by these documents.

Table 1. Interviewing Informant

No.	Name (initial)	Job Title/Role	Institution/Group	Location
1	B.S.	Head of the Plantation Service	Central Kalimantan Regional Government	Central Kalimantan
2	S.M.	Smallholder	Independent Oil Palm Farmers Group	South Sumatra
3	A.R.	Manager Sustainability	Large Palm Oil Company	Riau
4	L.W.	Environmental Activist	NGO WALHI	National
5	D.K.	Agribusiness Researcher	Andalas University	West Sumatra

In-depth interviews were conducted in a semi-structured manner with purposively selected key informants. The informants consist of various parties who have an important role in the implementation of sustainability policies in the oil palm sector, including government officials from the Ministry of Environment and Forestry (MoEF), the Ministry of Agriculture, and the Oil Palm Plantation Fund Management Agency (BPDPKS); representatives of large and medium-sized companies that have ISPO or RSPO certification; independent oil palm farmers and farmer cooperatives; representatives of non-governmental organizations (NGOs) who are active in environmental and sustainability issues; Academics; as well as palm oil trade and exports. Interviews were conducted to explore their understanding of sustainability policies, perceptions of the effectiveness of existing policies, challenges in implementation at the local level, as well as proposals for policy improvement. Each interview lasts between 45 to 90 minutes and is recorded and transcribed for data analysis purposes. Interviews are conducted directly on location or through online media if there are geographical constraints or time constraints (Rauf et al., 2024). Data were analyzed using thematic analysis techniques, which include open coding, axial coding, and selective coding to construct a large narrative about policy dynamics. The analysis begins with the open coding process, which identifies key issues arising from the data, such as the effectiveness of ISPO policies, gaps between policy and practice, barriers to access to certification for smallholders, and pressures from international markets. After that, axial coding is carried out, which is grouping these issues into broader themes such as policy governance, economic incentives, market access, and environmental conservation.

The final step is selective coding, which is to assemble these thematic results into a grand narrative that explains the dynamics and complexity of sustainability policies in Indonesia's palm oil sector. This process is supported by the use of qualitative analysis, which makes it easy to group data, search for keywords, and organize excerpts from interviews and documents. To ensure the validity of the data, the study applied source triangulation, member checking, and trail auditing, which are standard practices in

qualitative research to improve the credibility and validity of results (Putri et al., 2022) The reflectivity of the researcher is also maintained to minimize bias in the interpretation of the data. This triangulation allows researchers to identify inconsistencies and strengthen the credibility of the findings. Second, member checking is carried out, which is the process of confirming the results of the interview with several informants to ensure that the researcher's interpretation is in accordance with their intentions and experience. Third, this study also compiles an audit trail or audit trail, which is a record of the process of collecting, processing, and analyzing data in a transparent manner, so that the research process can be traced and replicated by other researchers.

In addition, researchers maintain reflexivity by being aware of positions, assumptions, and potential biases that may affect the interpretation of the data. This research upholds the ethical principles of research by ensuring voluntary consent, informant confidentiality, and data security. All informants were given an explanation of the purpose of the research, the type of data collected, and their right to refuse or terminate the interview at any time. Consent is voluntary, both verbally and in writing. The identity of the informant is disguised in the reporting of the results of the research to maintain their confidentiality and convenience. Interview data is stored securely and is only used for academic purposes (Nowell et al., 2017).

The researcher also avoids practices that can harm informants, and ensures that the results of this research can benefit in the form of policy recommendations that are more inclusive and equitable for all stakeholders. This approach is expected to produce findings that not only provide a formal picture of policies but also social realities and implementation challenges that are often not reflected in official documents. This research supports the literature on natural resource governance and sustainability in developing countries, especially related to the dynamics of oil palm plantation policies in Indonesia. The findings show the need for policy harmonization, simplification of the certification process, and strengthening local capacity to improve implementation effectiveness. In addition, multi-stakeholder collaboration and technology support are important factors to ensure inclusive participation and better sustainability outcomes (Hughes et al., 2020).

3. Results and Discussion

Results This study examines the dynamics of sustainable oil palm plantation policies in Indonesia through in-depth interviews with key stakeholders representing various groups, namely local governments, smallholders, large companies, environmental NGOs, and academics (Dewi, 2021). Table 1 shows the diverse profiles of informants, which comprehensively covers the spectrum of actors involved in the palm oil value chain from the local to national levels. This diversity is a crucial aspect of the research, given that strengthening sustainable palm oil policies cannot be implemented effectively if it relies only on the perspective of one party. The complexity of the issues at hand includes social, economic, and environmental dimensions that are interrelated and require an inclusive multi-stakeholder approach (Soleha, 2022).

Involving various stakeholders, the research is able to capture differences in perceptions and interests in the field, as well as obstacles and opportunities in policy implementation. Local governments as regulators and policy implementers have different views compared to smallholders who face obstacles to access to information and resources. One local government official stated as follows.

"We have policies from the center, but the implementation cannot always be adjusted to regional conditions. Supervisory resources are also limited" (A.R).

Large companies, on the other hand, are often better prepared technically and financially to meet certification requirements, but also face pressures from global markets and increasingly stringent sustainability issues. A representative from a major palm oil company explained.

"For us, certifications like RSPO are important to maintain market access, but the challenges remain significant in terms of administration and reporting" (B.S).

Environmental NGOs provide critical perspectives on the environmental and social impacts of palm oil expansion, as well as their role in driving policy transparency and accountability. One NGO representative remarked.

"The existing policy is too top-down. There needs to be participation from the local community so that the implementation is not just a formality." (L.W).

Academics contribute with data-driven analysis and theoretical studies to evaluate the effectiveness and impact of policies. An academic noted as follows.

"Research shows that there is still a gap between formal regulation and practice on the ground" (Dewi, 2021).

This diversity of stakeholders is important because the challenges in the palm oil sector are very multidimensional and dynamic. From a social perspective, smallholders often face difficulties in accessing technology, capital, and fair markets, which impacts their well-being and production sustainability. One smallholder expressed frustration:

"We often don't know where to start to take care of certification. The cost is huge, and we don't have a companion" (S.M).

From an economic standpoint, large companies must balance profitability with the expensive and complicated demands of sustainability certification. Meanwhile, in terms of the environment, the issues of deforestation, peatland degradation, and climate change are the main focuses that are urgent to be addressed through effective policies and consistent implementation (Rauf et al., 2024).

Therefore, strengthening sustainable palm oil policies requires the integration of these perspectives so that the resulting policies are not only normative in documents, but also applicable and responsive to real conditions on the ground. With this comprehensive qualitative approach, research can uncover gaps between formal regulation and practice on the ground, as well as identify structural and institutional barriers that hinder policy implementation. Although Indonesia has issued sustainability regulations, such as ISPO (Indonesian Sustainable Palm Oil) and the implementation of RSPO (Roundtable on Sustainable Palm Oil), interviews with government officials and NGOs reveal that the implementation of these policies still varies greatly between regions. A government official and an NGO representative added noted,

"We understand the ISPO policy, but the implementation is not uniform between regions due to the lack of harmonization of rules and resource support" (A.R).

"Often regulations just stop on paper. On the ground, regional supervision and capacity are very limited" (L.W.).

One of the main causes is the lack of harmonization between central regulations and implementation at the regional level, as well as limited human resource (HR) capacity and supervision infrastructure in the field. This gap is exacerbated by policy approaches that still tend to top-down, so they do not take into account local conditions and needs. As a result, policies become formal documents that are difficult to translate into consistent sustainable cultivation practices. This indicates the need to strengthen the capacity of local governments through technical training, additional supervisory human resources, and adequate budget allocation. A bottom-up approach, which actively involves local actors in policy formulation and implementation, can be a solution to bridge the gap. Smallholders are the most

vulnerable group and are often marginalized in the implementation of palm oil sustainability policies. Interviews with smallholders and the NGOs they assist reveal significant obstacles, ranging from limited access to technical information, capital, to the technology needed to meet certification standards. The complex ISPO and RSPO certification processes and relatively high costs are an additional burden that is often unaffordable for smallholders. A farmer and an NGO field officer supporting smallholders mentioned.

"We often hear about ISPO, but there has never been any direct training or mentoring. We feel alone in facing that rule" (S.M.).

"Farmers don't have access to technology or financing. They can't qualify for certification without real support" (L.W.).

The complex ISPO and RSPO certification processes and relatively high costs are an additional burden that is often unaffordable for smallholders. In terms of policy, this requires more concrete support in the form of continuous technical training programs, the provision of subsidies or access to microfinance, and the strengthening of farmer institutions through the formation of farmer groups that are able to negotiate and manage certification collectively. This support will not only increase the capacity of smallholders to adopt sustainable practices, but also strengthen their bargaining position in domestic and international markets. The absence of such support has the potential to lead to economic marginalization of smallholder farmers and unequal distribution of benefits from palm oil sustainability. In the context of climate change, this also risks slowing down the widespread adoption of green practices, as smallholders often make up the largest share of oil palm land and are potential sources of emissions due to suboptimal management.

Sustainability certification is the main instrument relied on to control the environmental and social impact of palm oil production. Large companies see certification as a strategic tool to maintain access to a global market that is increasingly demanding of products with a low carbon footprint and high sustainability. A company executive stated,

"We consider the RSPO important to maintain reputation and market access, but it also takes time and great cost to fulfill" (B.S.).

However, the perspective of smallholders is different. They consider this certification to be a complicated administrative and financial burden. One smallholder commented,

"For farmers like us, the documents and certification fees are burdensome. We don't even know how to take care of it" (S.M.).

The findings of the interviews show the need to simplify certification procedures and harmonize between ISPO and RSPO so as not to confuse business actors, especially smallholders. Policies that integrate standards and certification processes more efficiently can lower costs and technical barriers. This simplification can also accelerate the adoption of certification by smallholders so that they become not only the object of regulation but also the direct beneficiaries. In addition, the government needs to provide financial incentives, such as certification subsidies and ongoing technical support. That way, certification can be an empowerment tool that encourages sustainable cultivation practices, reduces deforestation, and controls greenhouse gas emissions from the palm oil sector.

The implementation of sustainability policies cannot be separated from the supervisory capacity of local governments, which are currently still limited. Interviews with local government officials and NGOs revealed the lack of trained human resources and the budget to conduct intensive field surveillance. One official admitted,

"We only have a few supervisory staff. The territory is large, and our budget is limited" (L.W.).

These limitations lead to low enforcement of violations, such as illegal land clearing and the use of environmentally damaging practices. Resistance from business actors, especially large companies that consider regulation as a business obstacle, is also a challenge. A company representative stated as follows.

"Sometimes regulations feel like they limit our innovation, even though our intention is also to be sustainable" (B.S.).

Therefore, adaptation of policies to local contexts and multi-stakeholder dialogue is critical. Mediation and resolution of land conflicts that often arise between smallholders, companies, and indigenous peoples must be encouraged through fair and transparent dialogue mechanisms. This approach not only reduces the potential for social conflict but also increases policy legitimacy and mutual commitment.

Increasingly stringent global sustainability regulations and standards, especially from the European market, have put significant pressure on Indonesia's palm oil industry. The regulation demands supply chain transparency and a reduction in the carbon footprint in the production process, in line with global efforts to tackle climate change (Putri et al., 2022). However, at the same time, it raises concerns among industry players and the Indonesian government that this policy has the potential to be used as a non-tariff barrier that harms national palm oil producers, especially smallholders who are less able to meet complex and expensive international standards. A representative from the Ministry of Agriculture stated as follows.

"We support transparency, but we are also concerned that these global standards are becoming a hidden barrier to trade" (A.R.).

Meanwhile, a smallholder cooperative leader expressed,

"If everyone has to follow European standards, we small farmers may not be able to afford it. The costs are high and the rules are complicated" (S.M.).

The findings of the interviews underscore the need to strengthen adaptive and responsive domestic institutions in responding to the demands of transparency and accountability of the supply chain as a whole, from the upstream to the downstream level. The Indonesian government needs to actively encourage fair and constructive international dialogue, as well as establish strategic partnerships with palm oil importing countries to reduce the risk of unfair trade barriers and maintain smooth market access. This global pressure, on the other hand, can be used as a strategic momentum to fundamentally reform palm oil governance, improve production standards, and strengthen Indonesia's bargaining position in the global market with palm oil products that have internationally recognized sustainability added value (Reich & Musshoff, 2025). Therefore, national policies must integrate international trade aspects with sustainability priorities and strengthening national capacity so that policies can run effectively and sustainably. Interviews revealed that collaboration between governments, companies, NGOs, academics, and smallholders is still sporadic and not well structured, thus slowing down the process of implementing sustainability policies in the field. A civil society leader shared as follows.

"We have been involved in multi-stakeholder forums, but not regularly. There is a lack of clear institutions for long-term collaboration" (B.S.).

Similarly, a regional development agency official mentioned as follows.

"We need a permanent mechanism so that all parties can sit together and discuss policy on a regular basis" (A.R.).

A participatory and transparent collaborative approach is urgently needed to accelerate policy implementation and ensure all voices, especially from vulnerable groups such as smallholders, can be heard and taken into account. Strengthening collaboration networks and multi-stakeholder governance is expected to increase the effectiveness of supervision, reduce conflicts between actors, and expand technological innovations and best practices in the palm oil sector. For example, partnerships between palm oil companies and academia in developing new technologies that are environmentally friendly and adaptive to climate change can produce practical solutions that directly impact the productivity and sustainability of smallholders.

The role of technology and innovation is also crucial in overcoming various challenges in palm oil sustainability. However, the results of interviews show that smallholder farmers' access to modern technology is still very limited, which has an impact on low productivity and high risk of environmental damage due to suboptimal management practices. A smallholder and an academic who has been involved in technology dissemination programs expressed as follows.

"We still use the traditional method. Don't know where to go to learn a new tool or technique" (S.M.).

"The green technology exists, but it has not reached smallholder farmers because the distribution and training are limited" (D.K.).

Policies need to be formulated to expand access to technology through intensive training programs, subsidies for environmentally friendly production tools, and increased partnerships between large companies, academia, and the government. With the right technology support, smallholders can improve production efficiency while reducing negative impacts on the environment, thereby supporting carbon emission reduction and climate change mitigation goals. Digital innovations in the supply chain, such as the use of blockchain technology for certification transparency and product tracking, have the potential to increase international market confidence while assisting governments in supervision and control of production. A corporate sustainability manager stated.

"We are piloting a blockchain-based tracking system so that the entire production process can be monitored in real-time" (A.R.).

This technology allows for more accurate and transparent tracking from upstream to downstream, thereby minimizing the risk of illegal or unsustainable practices that could damage the reputation of the national palm oil industry. The study reveals seven critical findings that highlight the complexity and challenges in implementing sustainable palm oil policies in Indonesia. First, there is a significant gap between national-level sustainability policies and their local-level implementation. Although regulatory frameworks such as ISPO and RSPO exist, their practical application is hindered by limited institutional capacity and contextual misalignment, particularly in remote regions. Second, smallholder farmers often feel marginalized in the sustainability discourse, as the certification process is perceived as costly, complicated, and inaccessible without adequate support or resources. Third, there exists a stark contrast in perceptions of certification: while large companies view sustainability standards as a means to maintain global market access and corporate reputation, smallholders regard them as burdensome requirements. Fourth, monitoring and enforcement mechanisms remain weak due to limited human resources and financial support, and this gap is further exacerbated by non-compliance and resistance from certain private actors. Fifth, although international sustainability pressures such as regulations from the European Union have pushed for higher environmental and social standards, they are simultaneously viewed with suspicion as potential trade barriers that could disadvantage local producers. Sixth, multi-stakeholder collaboration involving government, NGOs, academia, the private sector, and farmers is still fragmented and lacks

institutionalization, making coordinated and long-term efforts difficult to sustain. Lastly, there is a technological divide between corporate actors and smallholders, where the latter are often excluded from innovations that could help improve productivity and environmental performance. Collectively, these findings underscore the urgent need for more inclusive, context-sensitive, and collaborative approaches to sustainable palm oil governance in Indonesia.

Table 2. Interview results (summary of key findings)

No.	Theme	Informant Group	Summary of Findings	Policy Implications
1	Policy Effectiveness	Government, NGOs	Policies exist but implementation is not even; the gap between regulation and field practice.	It is necessary to strengthen regional capacity, harmonize regulations, and a bottom-up approach
2	The Role of Small Farmers	Smallholders, NGOs	Small farmers have difficulty accessing information, finance, and technology; feeling burdened with certification.	Need for technical support and incentives for smallholders, institutional facilitation
3	ISPO & RSPO Certification	Company, Farmer	The company looks strategic; Small farmers consider the administrative burden and costs high.	Simplification of certification procedures and harmonization of standards
4	Implementation Challenges	Government, Corporations	Limited area supervision capacity; resistance of business actors to regulations.	Adaptation of policies to local contexts, increased surveillance, resolution of land conflicts
5	Global regulatory pressures	Government, Association	Global regulation encourages transparency, but there are concerns of veiled trade barriers.	There is a need for fair international dialogue, strengthening domestic institutions, increasing transparency
6	Multi-Stakeholder Collaboration	NGOs, Governments, Companies	Sporadic and uninstitutionalized collaborations; A participatory and transparent approach is needed.	Strengthening collaboration networks and multi-stakeholder governance
7	Technology and Innovation	Companies, Academics	Technology is important but access is limited for smallholders; It needs training and subsidies.	There is a need for policies to expand access to technology for smallholders with training and subsidies, as well as encourage innovation partnerships between companies, academia, and the government.

To provide a clearer overview of these seven critical findings, the following table presents a synthesized summary of the key insights derived from in-depth stakeholder interviews. This synthesis captures not only the recurring themes and stakeholder perspectives but also the institutional, socio-economic, and technical challenges that surfaced during the fieldwork. It reflects the complexity of implementing sustainability policies on the ground ranging from gaps in policy coherence to practical barriers faced by local actors. Table 2 illustrates these findings in a structured manner, enabling readers to grasp the multifaceted nature of policy effectiveness in Indonesia's palm oil governance landscape.

This table highlights that sustainability policies in Indonesia's palm oil sector face significant challenges in terms of implementation and inclusivity. Despite the existence of

regulatory frameworks, practical barriers such as limited enforcement capacity, unequal access to resources, and the administrative burden of certification continue to hinder progress, particularly among smallholders. To address both global pressures and local realities, the policy approach must be reoriented toward being more collaborative, adaptive, and inclusive. Emphasizing smallholder empowerment through improved access to finance, information, and technology is crucial. In parallel, multi-stakeholder engagement grounded in transparency and institutional coordination should be strengthened to foster shared ownership of sustainability goals. Ultimately, the effectiveness of Indonesia's sustainable palm oil governance will depend on its ability to balance international demands for environmental compliance with the socio-economic needs of local actors, especially small-scale farmers who are often the most vulnerable yet essential players in the palm oil value chain.

The government tends to see policies as an adequate strategic instrument, even though their implementation is complicated. Smallholders feel less engaged and burdened with various requirements. Companies view certification as key to market access and reputational enhancement, while NGOs and academics have criticized the lack of inclusivity and effectiveness of oversight. The solutions proposed by the informants emphasized the importance of simplifying the certification process, improving training and incentives for smallholders, and a participatory approach to decision-making. In addition, strengthening the capacity of supervision and resolving land conflicts is also considered crucial to create a sustainable palm oil production ecosystem.

Based on the results of the analysis of interviews with various stakeholders, it can be concluded that strengthening sustainable oil palm plantation policies in Indonesia requires a comprehensive and holistic approach. Current policies, despite regulating sustainability standards such as ISPO and RSPO, still face various obstacles in their implementation, especially related to regulatory harmonization between the central and regional governments and limited supervisory capacity in the field. Smallholders as key actors in palm oil production face significant challenges in the form of limited access to information, technology, and financing that impact their low participation in sustainability certification programs. Therefore, policies should be directed to increase the capacity of local governments through adequate training and resources, as well as adopt a bottom-up approach that actively engages smallholders and local communities so that policies can be implemented effectively and equitably.

Simplification and harmonization of the sustainability certification process is essential to reduce administrative and financial burdens, thereby accelerating the adoption of environmentally friendly practices throughout the palm oil production chain. Strengthening governance and supply chain transparency through digital technology as well as resolving social and land conflicts is also the main key in creating a sustainable plantation ecosystem that is able to adapt to increasingly stringent international market demands.

Overall, the integration of social, economic, environmental, and technological aspects in sustainable palm oil policies will not only support climate change mitigation but also strengthen the competitiveness of Indonesian palm oil products in the global market, thus making the palm oil industry one of the strategic solutions in facing sustainable development challenges. This table 3 shows significant differences in understanding and attitudes towards sustainability policies between governments, smallholders, companies, and NGOs/academics. These findings highlight the complex nature of sustainable palm oil policy implementation in Indonesia, marked by diverse stakeholder perceptions and experiences. Variations in how different groups government officials, smallholders, companies, and NGOs/academics engage with issues such as certification, oversight, and institutional support reveal significant governance challenges. To clarify these contrasts, Table 3 summarizes key insights from each group, offering a structured view of their responses to sustainability policies. This comparative perspective helps identify critical gaps, priorities, and opportunities for fostering more inclusive, coordinated, and effective governance.

Table 3. Comparison Table by Informant Group (Summary of Key Findings)

No.	Aspects/Issues	Government	Smallholder	Company	NGOs/ Academics
1	Policy Understanding	Adequate, but complicated implementation	Lack of understanding, feeling burdened	Strategic focus of the market	Criticism of implementation and inclusivity
2	Technical & Financial Support	There are programs but limited	Lack of real support	Have your own capacity	Encourage farmer capacity building
3	Attitude towards Certification	Mandatory and important	Burdensome and expensive	Important for the market	Agree with the note of inclusivity
4	Supervision Capacity	Limited, lack of human resources	Not directly involved	Not involved in supervision	Criticism of the lack of supervision
5	Key Challenges	Policy synchronization, resources	Cost, technology access	Administrative burden of farmers	Regulatory and market inequities
6	Improvement Opportunities	Process simplification	Training, incentives	Standardization	Participatory approach, transparency

This table highlights the diverse levels of understanding and experiences related to sustainable palm oil policy among different stakeholder groups, reflecting the complexity and challenges in developing an inclusive and effective policy framework. The varying perceptions from government officials and companies to smallholders and civil society demonstrate the need for tailored strategies that consider the unique roles, capacities, and constraints of each actor in the governance system. Such diversity underscores the importance of participatory policymaking, cross-sector collaboration, and the harmonization of objectives to ensure both environmental sustainability and social equity.

4. Conclusions

This study clearly finds that while sustainability policies for palm oil in Indonesia such as ISPO and RSPO are in place, their implementation is still inconsistent and ineffective at the local level. Interviews with government officials and NGOs reveal that a lack of coordination between central and regional regulations, limited monitoring capacity, and a top-down policy approach have created a significant gap between regulation and practice. These structural weaknesses hinder the ability of local actors, particularly smallholders, to participate meaningfully in sustainable palm oil initiatives.

The research also identifies that smallholders face substantial challenges, including lack of access to information, finance, and technology, making sustainability certification processes (ISPO/RSPO) feel burdensome and inaccessible. On the other hand, large companies, although technically and financially more capable, still struggle with complex administrative requirements and view sustainability mainly from a market-access standpoint. NGOs and academics emphasize the need for inclusive and participatory approaches, pointing out that current efforts often exclude the very actors most affected by these policies. Additionally, global regulatory pressures especially from the EU are seen as both a driver of transparency and a potential non-tariff barrier that disproportionately affects smallholders.

In response to these findings, the study recommends simplifying and harmonizing certification standards to make them more accessible, particularly for smallholders. Capacity-building initiatives such as ongoing technical training, financial support, and institutional facilitation are essential to empower smallholders and ensure equitable participation. The government must also enhance local oversight capabilities by investing in human resources and infrastructure while creating formal multi-stakeholder collaboration platforms to bridge differences and resolve land conflicts transparently and

fairly. Ultimately, achieving sustainable palm oil governance in Indonesia requires a shift toward inclusive, decentralized, and adaptive policy frameworks. By integrating the social, economic, environmental, and technological dimensions identified in this research, policies can move beyond formal compliance and toward genuine impact. Strengthening national capacity, enabling fair international dialogue, and prioritizing smallholder empowerment are not only necessary to meet global sustainability standards but also crucial to building a resilient and equitable palm oil industry for the long term.

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