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The Role of the Palm Oil Industry in Supporting Indonesia's Economic Resilience and Defense Logistics

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ABSTRACT

This study aims to examine the strategic contribution of the palm oil industry to Indonesia's economic resilience and defense logistics system. Employing a qualitative approach based on literature review, the analysis draws upon academic sources, policy documents, and institutional reports. As a leading sector in export and alternative energy supply, the palm oil industry plays a vital role in supporting national fiscal stability through state revenue generation and employment creation. Furthermore, the geographic distribution of palm oil plantations across border regions and remote areas has the potential to strengthen defense logistics infrastructure, particularly in resource mobilization and operational support. This study also highlights the opportunity to utilize palm-based bioenergy as an alternative fuel to sustain military operations. The findings indicate that synergy among industrial, fiscal, and defense policies is essential to optimize the strategic role of palm oil in enhancing national resilience. The study recommends reinforcing cross-sectoral regulations and increasing investment in downstream palm oil development aligned with strategic national interests.

Keywords: *Bioenergy, Defense Logistic, Exonomic Resilience, Palm Oil, Strategic Industry*

INTRODUCTION

Defense studies is an interdisciplinary field that explores the strategic management of national resources and capabilities across peacetime, wartime, and post-conflict phases (Sarjito, 2024; Soares et al., 2024). It addresses the formulation and implementation of policies aimed at countering both external and internal threats -military and non-military- to the integrity of national territory, the sovereignty of the state, and the safety of the population. By integrating elements

of security, governance, and strategic planning, Defense Studies contributes to the realization of comprehensive national security and resilience (Supriyatno, 2014). Defense budgeting serves as a vital instrument in safeguarding national sovereignty, strengthening military posture, and ensuring national stability amid an increasingly dynamic geopolitical landscape (Evantino et al., 2024). In Indonesia, defense expenditure has witnessed a significant upward trend over the past two decades, reflecting the government's commitment to modernizing principal weapon systems (alutsista), enhancing personnel capacity, and reinforcing defense logistics and technological infrastructure (Prasetiyo et al., 2024). Nonetheless, fiscal constraints, reliance on imported strategic components, and the imperative of cross-sectoral development demand greater efficiency and integration in defense budget management.

Defense expenditure serves as a critical indicator of a nation's commitment to national security, military modernization, and preparedness against multidimensional threats. Each country possesses its own ideal framework for how its defense industry should operate. Ideally, according to NATO's Rules of Thumb, every country should allocate 2% of its Gross Domestic Product (GDP) to defense spending—a benchmark commonly observed among advanced economies with substantial defense budgets. Of this allocation, approximately 20–30% is typically directed toward the domestic defense industry (Karim, 2020).

In Indonesia, defense budget allocations have fluctuated over the years, shaped by global economic dynamics, shifting fiscal priorities, and evolving regional geopolitical conditions. Although a general upward trend in defense spending has been observed over the past two decades, its proportion relative to Gross Domestic Product (GDP) remains comparatively low by international standards (Seftiana et al., 2024; Yulivan et al., 2024). Since the early 2000s, the Indonesian government has directed defense expenditures toward supporting the Minimum Essential Force (MEF) program—an initiative aimed at developing a military force sufficient to safeguard territorial integrity and protect national interests. However, the realization of defense budgets continues to face structural challenges, including reliance on imported weapon systems (alutsista), limited capacity within the domestic defense industry, and suboptimal integration between military spending and the development of reserve components (Andalus & Djuyandi, 2023).

Data from the Ministry of Finance indicates that Indonesia's defense budget has ranged between 0.7% and 0.9% of Gross Domestic Product (GDP) over the past five years (Aulia Fitri, 2024). This figure remains well below the threshold set by NATO, which recommends allocating 2% of GDP to defense spending. Such a gap presents significant challenges in building a resilient military posture, particularly amid the growing complexity of threats in the Indo-Pacific region. Consequently, a systematic review of Indonesia's defense budget trends over time is essential to evaluate policy effectiveness, identify strategic gaps, and formulate

recommendations that support the sustainable development of national defense capabilities.

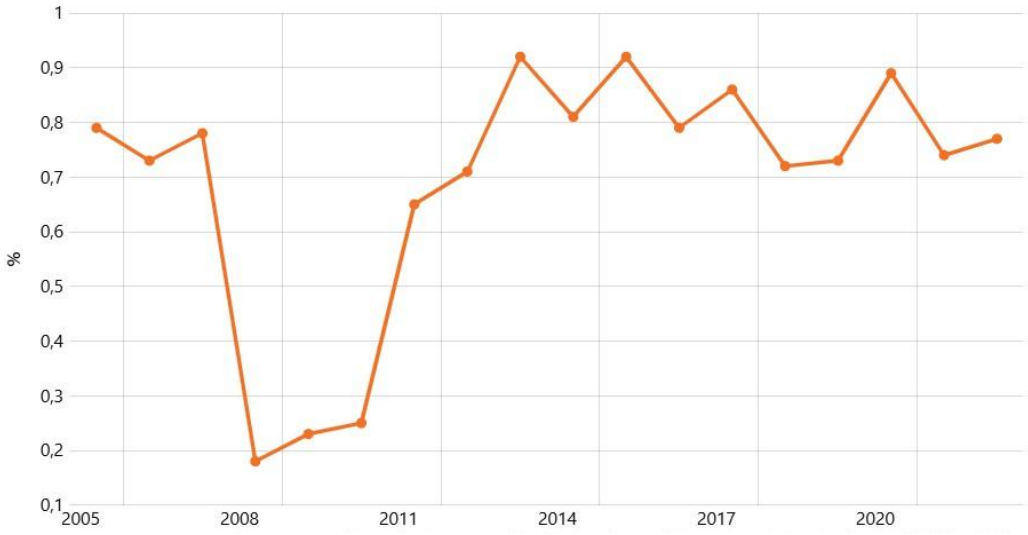

Figure 1 Percentage of Indonesia's Defense Budget Relative to GDP
Source: Databooks, 2024

As an archipelagic nation with a vast and strategically situated territory, Indonesia faces a complex array of multidimensional threats—ranging from border disputes and violations of maritime and airspace sovereignty to non-traditional challenges such as terrorism, natural disasters, and cyber disruptions. Accordingly, the defense budget functions not merely as a military expenditure allocation, but as a strategic instrument for developing an adaptive and sustainable defense system. Strengthening logistical capacity, advancing the domestic defense industry, and investing in military research and technology constitute integral components of an effective budget utilization strategy (Kemhan, 2019).

Within the framework of national policy, Indonesia's defense budget is strategically directed to support the vision of the Minimum Essential Force (MEF), which entails the development of a defense capability sufficient to safeguard territorial integrity and protect national interests (Zahara & Rizky, 2020). Moreover, synergy between defense spending and other strategic sectors—such as energy, infrastructure, and education—is essential for cultivating a resilient and self-reliant defense ecosystem.

Indonesia is known as an agrarian country that has abundant natural resources and vast agricultural land. One of Indonesia's leading commodities is widely recognized as an agrarian country endowed with abundant natural resources and extensive agricultural land. Among its leading commodities, palm oil plays a pivotal role in the national economy. This industry contributes not only to export revenues and state income, but also serves as a source of alternative energy and employment generation across various regions. With plantations spread across

more than twenty provinces, palm oil has become the economic backbone of many areas, including border zones and remote regions.

Table 1 Distribution of Palm Oil Plantations in Indonesia

Category of Enterprise	Area (Ha)	Production (Tons)	Productivity (Kg/Ha)	Special Notes
Smallholder Plantations (PR)	± 6,000,000	± 25,000,000	± 4,200	Dominant in Sumatra and Kalimantan; largest contributor to national output
State-Owned Large Plantations (PBN)	± 700,000	± 3,500,000	± 5,000	Managed by PTPN; high productivity
Private Large Plantations (PBS)	± 5,300,000	± 23,000,000	± 4,300	Operated by national and foreign private companies

Source: Ministry of Agriculture and Statistics Indonesia

Additional Notes (Kementrian Pertanian RI, 2023)

1. Smallholder Plantations (PR): Managed by small-scale farmers, often organized through cooperatives or plasma schemes. Despite lower productivity levels, PR contributes over 40% of national palm oil production.
2. State-Owned Large Plantations (PBN): Operated by state-owned enterprises such as PTPN III, IV, V, and VII. These plantations emphasize operational efficiency and modernization.
3. Private Large Plantations (PBS): Managed by major corporations including Wilmar, Astra Agro, and Sinar Mas. These entities benefit from advanced technologies and direct access to export markets.

The palm oil industry serves as the backbone of Indonesia's non-oil and gas exports and plays a critical role in sustaining the national trade surplus. Between 2019 and 2023, palm oil exports contributed an average of over USD 28 billion annually, accounting for up to 18% of total non-oil and gas exports. Key products such as Crude Palm Oil (CPO), Refined Bleached Deodorized (RBD) palm olein, and biodiesel not only generate substantial foreign exchange earnings but also support energy import substitution through the national biodiesel program. In the absence of palm oil's contribution, Indonesia's trade balance would be at risk of deficit, particularly due to pressures from the oil and gas sector and capital goods imports. The following section outlines palm oil's fiscal contribution to Indonesia.

Table 2 Contribution of Palm Oil to Indonesia's Trade Balance (2019–2023)

Year	Palm Oil Export Value (USD Billion)	Share of Non-Oil & Gas Exports (%)	Trade Balance Surplus (USD Billion)
2019	± 20.2	± 13%	3.4
2020	± 22.3	± 15%	21.7
2021	± 28.0	± 17%	35.3
2022	± 39.1	± 18%	54.5
2023	± 33.0	± 16%	36.9

Source: Ministry of Agriculture and Statistics Indonesia (BPS) (BPS Indonesia, 2024)(Pertanian, 2024)(PASPI, 2024b)

In the context of national resilience, Indonesia's palm oil industry holds untapped strategic potential. The geographic distribution of palm oil plantations can support defense logistics systems, particularly in the areas of fuel distribution, food supply, and resource mobilization. Furthermore, palm oil derivatives such as biodiesel and bioenergy offer viable alternative fuels that can sustain military operations while reducing dependence on fossil energy sources (Kusumayuda, 2021). This initiative aligns with national policies aimed at strengthening resource-based industries, skilled labor-intensive sectors, technology-driven enterprises, and export-oriented production. Specifically within labor-intensive industries, smallholder-managed community plantations contribute over 40% of national production. This underscores the imperative for government policies to prioritize the welfare and economic empowerment of small-scale farmers.

Farmers' welfare has an impact on: Food Security: When farmers feel safe and secure in their lives, they will have the motivation and ability to produce enough food. This will contribute positively to a country's food security. Economic Growth: If farmers have access to fair markets and get fair prices for their crops, they can increase their income and reinvest it into the agricultural system. This will drive economic growth in the agricultural sector and surrounding areas. Food Sovereignty: By increasing the welfare of farmers, they can be more independent in meeting their own food needs and contribute to increasing the country's food sovereignty (Sholihah, 2025). Palm oil plays a significant role in supporting national food security, notably through the Palm Oil–Cattle Integration System (SISKA). This model enables synergy between palm oil plantations and cattle farming, resulting in enhanced productivity, increased farmer income, and improved environmental sustainability (Ilham et al., 2021). In addition, palm oil has emerged as a primary source of renewable energy through the development of

biodiesel. The mandatory biodiesel policy, which reached the B35 blend level in 2023, is set to be further strengthened, with a target of B40 implementation by 2025. Concurrently, the development of bioethanol is being pursued to reduce dependence on imported fossil fuels (Kementerian PPN/Bappenas, 2025).

Table 3 Fossil Fuel Consumption (2019-2023)

Year	Total Fuel Consumption (Million Barrels)	Transportation	Industry	Electricity	Aviation
2019	≈ 470	≈ 160	≈ 130	≈ 120	≈ 25
2020	≈ 450 *(pandemic impact)*	≈ 210	≈ 150	≈ 70	≈ 20
2021	≈ 480	≈ 235	≈ 135	≈ 85	≈ 25
2022	≈ 495	≈ 240	≈ 140	≈ 88	≈ 27
2023	505	248 *(49%)*	171 *(34%)*	38.5 *(8%)*	28.5 *(6%)*

Source: Ministry of Energy and Mineral Resources Republic of Indonesia (2024)

As illustrated in the preceding table, Indonesia's dependence on fossil fuels presents a strategic challenge to maintaining national energy security. Imports of diesel and global oil price fluctuations exert pressure on the trade balance and heighten fiscal risks. Amid the urgency of energy transition, the Indonesian government launched the mandatory B30 biodiesel policy—a progressive step integrating palm oil–based renewable energy into the national fuel system. Biodiesel B30, a blend of 30% vegetable oil (FAME) and 70% diesel, has proven effective not only in reducing fossil fuel consumption but also in enhancing the value-added of the plantation sector and downstream palm oil industries. This policy has had a positive impact on Indonesia's real GDP, stimulating economic growth, household income, and the competitiveness of the oleochemical industry (Sahara et al., 2022).

Over the past five years, Indonesia has recorded a substantial increase in foreign exchange savings from reduced fossil diesel imports, driven by the progressive rise in palm oil–based biodiesel blending rates (see Figure 5). According to data from the Palm Oil Plantation Fund Management Agency (BPDPKS, 2024b), savings from diesel import substitution rose from approximately IDR 3.7 trillion in 2015 to IDR 26.7 trillion in 2018, and continued to surge to IDR 121.5 trillion by 2023. (PASPI, 2024a).

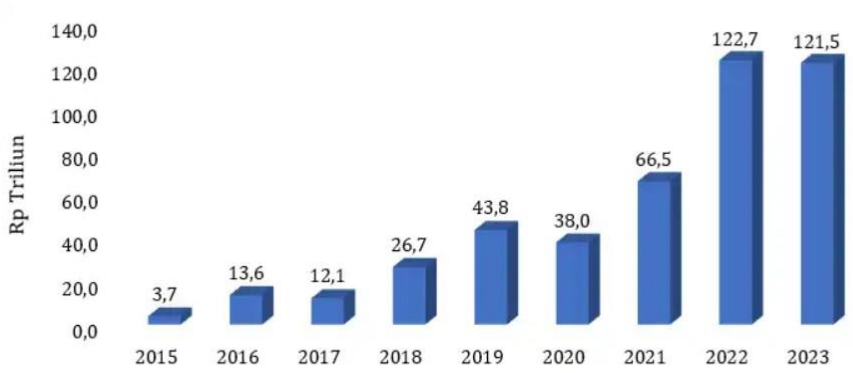

Figure 2 Fiscal Impact of Biodiesel Policy: Savings from Reduced Fossil Diesel Imports
Source: PASPI (2024a)(Ministry of Energy and Mineral Resources Republic of Indonesia, 2024)

Despite its strategic relevance, academic research that integrates the palm oil industry with dimensions of economic resilience and defense logistics remains limited. Existing literature predominantly focuses on economic and environmental aspects, without explicitly linking them to national defense strategies. This study aims to address this gap by examining the role of the palm oil industry in supporting Indonesia's economic resilience and defense logistics through a qualitative, literature-based approach.

The findings are expected to contribute to the development of cross-sectoral policies that integrate strategic industries with national defense agendas. By strengthening synergies among the agricultural, energy, and defense sectors, Indonesia can build a more robust and sustainable national resilience framework.

RESEARCH METHODOLOGY

This study employs a qualitative approach using library research methods to examine the strategic contribution of the palm oil industry to Indonesia's economic resilience and defense logistics (Creswell & Creswell, 2023). This approach was selected as it enables the researcher to systematically review a wide range of relevant information sources without conducting primary field data collection (Sugiyono, 2022).

The data utilized in this research are drawn from credible secondary sources, including nationally and internationally indexed academic journals, government policy reports, research institute publications, and strategic documents from key institutions such as Statistics Indonesia (BPS), the Ministry of Finance, the Ministry of Defense, the Ministry of Agriculture, and the Palm Oil Plantation Fund Management Agency (BPDPKS). Source selection was conducted purposively, based on relevance, currency, and content validity in relation to the research focus.

Data analysis was carried out using content analysis techniques, involving the identification of key themes, categorization of information into substantive domains, and interpretation of conceptual relationships emerging from the

literature. The study focuses on three core dimensions: (1) the economic contribution of the palm oil industry to national fiscal stability, (2) the logistical potential of palm oil in supporting defense operations, and (3) the prospects for utilizing palm-based bioenergy as an alternative military fuel.

To ensure academic objectivity and analytical integrity, the process was conducted iteratively, with source triangulation applied to validate the consistency of findings. The results are presented in the form of a scholarly narrative that integrates theoretical perspectives, empirical data, and policy reflections, thereby offering a comprehensive understanding of the strategic role of the palm oil industry in strengthening Indonesia's national resilience.

RESULT AND DISCUSSION

Contribution to Food and Energy Security

The concept of strategic industries refers to economic sectors that play a vital role in supporting national stability and security. A country's competitive advantage can be strengthened through the development of industries with high value-added potential and strong alignment with national interests (Porter, 1998). Indonesia's palm oil industry has demonstrably played a critical role in supporting national food and energy security. In 2023, Indonesia's total palm oil production reached 54.8 million metric tons, comprising 50 million tons of crude palm oil (CPO) and 4.8 million tons of palm kernel oil (PKO) (BPS Indonesia, 2023). Downstream palm oil products such as cooking oil, margarine, and shortening have reached nearly the entire Indonesian population, ensuring year-round food availability and affordability.

On the energy front, the mandatory B30 biodiesel program demonstrates that palm-based biofuel can effectively reduce dependence on imported fossil fuels while supporting the transition to clean energy. This aligns with the emerging paradigm of national resilience, which places energy self-sufficiency as a central pillar, as stipulated in presidential regulations (*Presidential Regulation No. 12 of 2025 concerning the National Medium-Term Development Plan*). In the Indonesian context, strategic industries encompass the energy, food, and defense sectors, within which palm oil serves as a multifunctional commodity that intersects all three domains.

Geographical Distribution and Defense Logistics Support

Palm oil plantations are distributed across 26 provinces and more than 250 regencies in Indonesia, including border and remote areas. This spatial distribution presents strategic potential as logistical nodes for defense operations, supporting the supply of fuel, food, and resource mobilization. However, further research is needed to assess land suitability, particularly in areas prone to environmental hazards. For instance, the southwestern slopes of Mount Lawu in Karanganyar Regency are highly susceptible to landslides and are therefore not recommended

for palm cultivation (Priyono et al., 2023). A study by PASPI (Palm Oil Agribusiness Strategic Policy Institute) emphasizes that palm oil plantation infrastructure can be integrated with defense logistics systems to strengthen regional resilience (PASPI, 2024). A study by Elisabeth et al. (2019), underscores the importance of integrating agricultural infrastructure with defense systems to enhance regional resilience.

Cross-Sectoral Policy Synergy

According to Dunn (2018), effective policy must be capable of integrating economic, social, and security interests. The findings highlight the necessity of synergy among the Ministry of Agriculture, the Ministry of Energy and Mineral Resources, and the Ministry of Defense to optimize the strategic role of the palm oil industry. Downstream industrialization policies, bioenergy incentives, and infrastructure development in strategic regions must be designed in an integrated manner. The Prabowonomics paradigm, which emphasizes food and energy self-sufficiency as core components of national resilience, serves as a critical foundation for this policy direction.

Challenges and Recommendations

To advance the national biodiesel program, several strategic challenges must be addressed. The current dependence on imported catalysts and machinery presents a significant bottleneck for the technology's sovereignty, while suboptimal data integration between the agricultural and defense sectors hinders coordinated planning. Furthermore, social resistance to plantation expansion in certain regions poses a critical socio-environmental hurdle. In response, a multi-faceted approach is recommended. This includes strengthening domestic research and development in bioenergy technologies to reduce import reliance, enhancing inter-ministerial coordination through an integrated policy platform to ensure data-driven decision-making, and rigorously applying sustainability principles to guide the expansion of the palm oil industry and mitigate social conflict.

The findings of this study generally support and expand upon prior research discussed in the introduction, particularly regarding the role of strategic industries in strengthening national resilience. As articulated by Supriyatno (2014), the multidisciplinary approach in defense studies underscores the importance of integrating economic and security sectors to achieve comprehensive national resilience. This study extends that framework by demonstrating that the palm oil industry, as a leading agribusiness sector, contributes not only to fiscal stability and energy security but also possesses logistical potential that can be mobilized to support defense operations in border and remote regions.

Furthermore, the findings reinforce the analysis by Andalus and Djuyandi (2023) concerning structural limitations in Indonesia's defense budget, which remains dependent on imported components and lacks full integration with the

development of national reserve forces. By proposing the utilization of palm-based bioenergy as an alternative military fuel, this study offers a domestically sourced solution that can reduce energy dependence and enhance strategic autonomy. This aligns with the perspective of Prasetiyo et al. (2024), who emphasize the importance of modernizing weapon systems and strengthening the domestic defense industry as part of the Minimum Essential Force (MEF) program.

In addition, the study broadens Dunn (2018) policy integration framework by highlighting the necessity of cross-sectoral coordination among the Ministry of Agriculture, the Ministry of Energy and Mineral Resources, and the Ministry of Defense to optimize the strategic role of the palm oil industry. This approach supports the "Prabowonomics" paradigm, which positions food and energy self-sufficiency as foundational pillars of national resilience. Thus, the study not only affirms existing literature but also expands the analytical scope by integrating defense logistics and bioenergy dimensions into the broader discourse on economic and security resilience.

CONCLUSION

This study demonstrates that Indonesia's palm oil industry plays a strategic role in strengthening national resilience, particularly in the domains of economic stability, energy security, and defense logistics. As a flagship commodity, palm oil contributes not only to state revenue and employment generation, but also provides an alternative energy source through biodiesel, supporting the transition toward energy self-sufficiency.

The geographical distribution of palm oil plantations in border and remote regions presents opportunities for integration with defense logistics systems, positioning plantation infrastructure as strategic distribution nodes for military operations and civil support. Furthermore, cross-sectoral policy synergy among agriculture, energy, and defense institutions is essential to fully optimize the strategic potential of the palm oil industry within the national resilience agenda.

To this end, regulatory strengthening, investment in bioenergy downstream development, and enhanced inter-ministerial coordination are required to ensure that the palm oil industry serves not only as an economic pillar, but also as a strategic instrument for safeguarding national sovereignty and stability.

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