
Defying the Ghost of Commodities Past: A Review of Indonesian Palm Oil Governance and the Risk of Historical Repetition

Loso Judijanto
IPOSS Jakarta
Jakarta 10220, Indonesia

doi.org/10.51505/IJEBMR.2026.10614 URL: <https://doi.org/10.51505/IJEBMR.2026.10614>

Received: May 29, 2026

Accepted: Jun 08, 2026

Online Published: Jun 18, 2026

Abstract

Indonesia's palm oil industry currently stands as the cornerstone of the national economy, reminiscent of the historical dominance of the sugar and rubber industries. However, historical precedents suggest that global commodity booms are often followed by precipitous declines due to governance problems and the inability to adapt to external pressures. This study employs a qualitative literature review to analyse the trajectory of the palm oil sector through the lens of institutional economics and historical comparative analysis. Specifically, it investigates whether the current regulatory landscape — characterized by the external pressure of the European Union Deforestation Regulation (EUDR), the internal challenges of the Indonesian Sustainable Palm Oil (ISPO) certification, and the landmark May 2026 Government Regulation (Peraturan Pemerintah) establishing PT Danantara Sumberdaya Indonesia (DSI) as the country's sole exporter of strategic commodities including crude palm oil — supports long-term sustainability or inadvertently triggers the sector's demise, mirroring the fate of the sugar and rubber industries. The review synthesises data from reputable sources (2020–2026) to identify thematic risks: the exclusion of smallholders due to high compliance costs, regulatory fragmentation, stagnating productivity, and the new monopsony risk created by a centralised state export monopoly. The study finds that while downstreaming provides a temporary economic buffer, the exclusion of smallholders from the formal supply chain creates a structural vulnerability similar to the neglect that destroyed the rubber sector. The DSI policy, while designed to curb under-invoicing, mis-invoicing, transfer pricing, and increase state revenues, risks introducing transactional bottlenecks, market dualism, and a monopsony dynamic that could further marginalise independent smallholders. The paper concludes that without a radical shift toward "inclusive regulatory architecture" that prioritises smallholder legality, harmonises national standards with global demands, and ensures the DSI operates as a transparent exporting facilitator, palm oil risks becoming a "sunset commodity." Recommendations include shifting from defensive diplomacy to adaptive compliance, improving subsidies toward upstream revitalisation, and ensuring DSI's governance architecture is designed to strengthen market-driven export networks.

Keywords: palm oil governance, commodity history, EUDR, ISPO, PT Danantara Sumberdaya Indonesia, smallholder inclusion, sustainable agriculture, Indonesia, institutional economics, agricultural policy, export monopoly, supply chain resilience.

JEL Classification:

Q13 (Agricultural Markets and Marketing; Cooperatives; Agribusiness) **Q18** (Agricultural Policy; Food Policy) **N55** (Agriculture, Natural Resources, Environment, and Extractive Industries: Asia) **F13** (Trade Policy; International Trade Organisations) **L12** (Monopoly; Monopolisation Strategies)

1. Introduction

1.1 Background: The Hegemony and Vulnerability of the "Golden Crop"

The Indonesian palm oil industry has evolved into a colossal economic engine, contributing significantly to the nation's Gross Domestic Product (GDP), foreign exchange reserves, and poverty alleviation efforts. As the world's largest producer, Indonesia supplies over half of global palm oil, positioning it as a strategic national asset. The sector employs approximately 16 million people, both directly and indirectly, creating a dependency network that permeates the socio-economic fabric of rural Indonesia. However, this hegemony is not unprecedented in the archipelago's economic history. The narrative of a "golden commodity" driving the economy is a recurring motif, previously held by sugar during the colonial era and rubber in the mid-20th century [1], [2], [3], [4], [5].

Economists and historians have long observed the "commodity boom-bust cycle," in which nations reliant on raw-material exports often face eventual stagnation or decline. This phenomenon, often linked to the "Dutch Disease" or institutional complacency, suggests that periods of high profitability can mask underlying structural weaknesses. Today, the palm oil sector faces a convergence of existential threats that are less about market demand and more about regulatory governance. The introduction of the European Union Deforestation Regulation (EUDR) and the rigorous demands of global sustainability standards have created a bifurcation in the market, threatening to alienate the very base of the production pyramid: the independent smallholders [6].

Most recently, a landmark policy intervention has fundamentally altered Indonesia's palm oil export architecture. On 20 May 2026, President Prabowo Subianto announced, in a parliamentary plenary session (*Rapat Paripurna DPR RI*), the issuance of a Government Regulation (*Peraturan Pemerintah*) on the Governance of Natural Resource Commodity Exports (*Tata Kelola Ekspor Komoditas Sumber Daya Alam*), which mandates that all exports of crude palm oil (CPO), coal, and ferro alloys be channelled exclusively through a state-owned enterprise designated by the government as the *sole exporter* ("*pengekspor tunggal*"). The designated entity is PT Danantara Sumberdaya Indonesia (DSI), a newly established BUMN operating under the aegis of the Daya Anagata Nusantara (Danantara) sovereign wealth fund, which reports directly to the President. DSI was formally incorporated on 19 May 2026, with

99% ownership held by Danantara and 1% by the State-Owned Enterprise Management Agency (*BP BUMN*). Implementation follows a phased timeline: from 1 June to 31 December 2026, DSI functions as a watchdog and intermediary, monitoring export documentation, pricing, and volumes; from January 2027, DSI is mandated to transform into a trading company that directly purchases commodities from domestic exporters before selling them to international buyers. This policy represents the most significant intervention in Indonesia's commodity export governance since the nationalisation of the sugar industry in the post-independence era — and its ramifications for the palm oil sector are both immediate and far-reaching [7], [8], [9], [10].

1.2 Problem Statement: The Historical Warning

The urgency of this research stems from a provocative historical parallel: the risk that palm oil will suffer the same "tragic fate" as the sugar and rubber industries. The current trajectory of the palm oil sector shows alarming symptoms of the "institutional sclerosis" that once plagued the sugar industry—inefficiency, lack of innovation, and resistance to necessary reform—and the "structural neglect" that decimated the rubber sector, where smallholders were left behind in the race for modernisation [11].

Despite the existential nature of this threat, the existing academic literature remains fragmented. The majority of recent studies focus either on the technicalities of agronomy, the specifics of certification compliance (ISPO/RSPO), or the environmental impact of deforestation. There is a conspicuous scarcity of comprehensive qualitative reviews that connect these contemporary regulatory challenges with the historical lessons of Indonesia's failed commodities. This gap is critical because understanding the *mechanism of decline* in sugar and rubber is essential to diagnosing the potential regulatory failures in the modern palm oil sector. If the current regulatory architecture—intended to save the industry—inadvertently raises barriers to entry too high, it may destroy the sector's competitiveness and inclusivity, effectively fulfilling the prophecy of decline [12].

1.3 Research Objectives

This article aims to bridge the gap between historical economic lessons and contemporary policy analysis. Specifically, the objectives are:

1. To evaluate the institutional and governance factors that precipitated the collapse of the Indonesian sugar and rubber industries.
2. To map the contemporary regulatory challenges, specifically the EUDR and ISPO implementation, and analyse whether they mirror the historical precursors of decline.
3. To formulate a framework of "adaptive governance" that ensures the palm oil sector defies historical determinism and remains sustainable.

2. Literature Review

2.1 Theoretical Framework: Institutional Economics and Commodity Dependence

The theoretical foundation of this study lies in Institutional Economics, particularly the concept of "Path Dependence" and "Institutional Lock-in." Institutions—defined as the rules of the game, both formal (regulations) and informal (norms)—are the primary determinants of long-term economic performance. The literature on Commodity Dependence argues that resource-rich developing nations often suffer from poor institutional quality because the easy rents from commodities discourage the development of complex regulatory capacities [13], [14], [15], [16].

Furthermore, the concept of Polycentric Governance is relevant to the palm oil sector, where authority is dispersed across transnational bodies (EU, RSPO), national governments (ISPO), and local actors. The friction between these centres of authority often leads to "regulatory fragmentation," where compliance becomes a cost burden rather than a value-add, particularly for actors with limited capital [17], [18], [19], [20], [21].

2.2 Historical Reflection: The Anatomy of Decline

2.2.1 The Sugar Industry: From Global Leader to Net Importer

In the 1930s, Java was one of the world's largest sugar exporters. However, the literature reveals that the industry's collapse was not merely a result of the Great Depression, but of deep-seated governance failures. Following nationalisation in the post-independence era, the industry suffered from a lack of investment in research and development (R&D) and factory modernisation. The "cultivation system" legacy left a rigid, exploitative structure that failed to adapt to free-market efficiencies. Recent historical analyses indicate that the protectionist policies intended to shield the sugar industry actually stifled innovation, leading to a long-term decline in productivity until Indonesia became a major sugar importer [22], [23], [24], [25], [26], [27].

2.2.2 The Rubber Industry: The Tragedy of Neglect

The decline of the rubber industry offers a more direct parallel to the current challenges of palm oil smallholders. During the rubber boom, smallholders contributed significantly to production. However, as synthetic rubber emerged and global prices became volatile, the state failed to provide adequate support for replanting and technology transfer. Unlike the palm oil sector, which has received massive state support (historically), the rubber sector was largely left to "fend for itself." The literature highlights that the failure to organise smallholders into efficient cooperatives and the lack of access to high-yielding clones led to a collapse in productivity. When prices fell, farmers abandoned their trees—a phenomenon known as the "exit option" in institutional theory—resulting in the sector's stagnation [28], [29], [30], [31], [32], [33], [34].

2.3 The Contemporary Regulatory Landscape

2.3.1 The Transnational Regime: EUDR as a Market Barrier

The European Union Deforestation Regulation (EUDR) represents the most significant shift in global commodity governance in decades. Unlike previous voluntary standards (like RSPO), EUDR is mandatory and extraterritorial. Academic discourse on EUDR is polarised. One strand of literature views it as a necessary instrument to halt global deforestation and force supply chain transparency. Another strand, however, criticises it as a form of "green protectionism" or "eco-imperialism" that disproportionately burdens smallholders who lack the technological capacity for geolocation and traceability. The "exclusion risk" is a dominant theme in recent literature, suggesting that stringent regulations might cleanse the supply chain of deforestation but also cleanse it of small farmers [35], [36], [37], [38].

2.3.2 The National Regime: The ISPO Struggle

Indonesia's response through the Indonesian Sustainable Palm Oil (ISPO) certification aims to assert national sovereignty over sustainability standards. However, studies indicate that ISPO struggles with credibility in the international market and implementation challenges domestically. While ISPO has been made mandatory, the compliance rate among independent smallholders remains negligible due to land legality issues (forest estate encroachment) and bureaucratic complexity. This creates a "legality trap" where regulations intended to formalise the sector end up alienating the most vulnerable actors [39], [40], [41], [42], [43], [44], [45], [46].

2.3.3 The New National Regime: The DSI Single-Export Gateway

The most recent and structurally transformative development in Indonesia's palm oil governance is the establishment of PT Danantara Sumberdaya Indonesia (DSI) as the state's designated single export gateway for palm oil products, coal, and ferro alloys, effective June 2026. The government's stated rationale for the policy is the elimination of systemic under-invoicing, mis-invoicing, and transfer pricing practices. DSI is tasked with operating as a price watchdog in the first phase: it will verify all export transactions against global market benchmarks and require exporters to report trade data on volume, pricing, and delivery conditions through a centralised digital platform [7], [8], [47], [48], [49].

Danantara's Chief Investment Officer emphasised that DSI is conceived as a profit-oriented enterprise that will "maximise revenue for the country" by strengthening Indonesia's bargaining position with international buyers, given the country's dominant market share in global CPO. President Prabowo anchored the policy constitutionally in Article 33 of the 1945 Constitution, which places the nation's natural wealth under state control for the maximum benefit of the people, framing DSI not as a commercial experiment but as a constitutional imperative. Nevertheless, the literature on polycentric governance would caution that concentrating export authority in a single, newly established entity — with no operational track record, no published fee structure, and no disclosed performance benchmarks — risks transforming a legitimate anti-

corruption objective into a structural bottleneck that undermines the sector's global competitiveness [8], [10], [48], [50], [51], [52].

3. Method

3.1 Research Design

This study adopts a **Qualitative Literature Review (QLR)** methodology. Unlike a Systematic Literature Review (SLR), which often focuses on quantitative metrics of publication trends, a QLR allows for a narrative and interpretive synthesis of complex, multidisciplinary concepts. This approach is chosen because the research problem requires weaving together historical economic narratives, political economy analysis, and contemporary policy studies to identify deep structural patterns. The goal is not to count how many papers discuss palm oil, but to interpret *how* scholars understand the relationship between regulation and industry survival [17].

3.2 Data Collection

The review draws upon a purposive sampling of literature published mainly between 2020 and 2026. Sources were selected from journals indexed in Scopus or Google Scholar, as well as authoritative news and reports from reputable sources and international organisations (such as World Bank, OECD, UNCTAD).

- **Keywords:** The search strategy utilised Boolean operators combining terms such as: "*Palm oil governance*" AND "*Indonesia*", "*EUDR impact*" AND "*Smallholders*", "*Commodity history*" AND "*Sugar/Rubber decline*", "*ISPO effectiveness*", and "*Agricultural policy failure*".
- **Inclusion Criteria:** Articles were selected based on their relevance to governance, policy analysis, historical comparison, and sustainability certification. Purely technical agronomy papers were excluded unless they directly addressed regulatory implications.

To respond to concerns about rigour and replicability, the review applied five explicit screening criteria. First, priority was given to peer-reviewed journal articles published from 2020 onward, especially in journals indexed by Scopus or Google Scholar, or major academic publishers. Second, older sources were retained only where they supplied essential historical baselines for sugar, rubber, commodity dependence, or institutional economics. Third, each contemporary source was coded for its relevance to at least one of four analytical domains: smallholder inclusion, certification and traceability, commodity-state intervention, or historical commodity decline. Fourth, non-journal sources were used only for time-sensitive policy developments, official statistics, or statements not yet covered in peer-reviewed literature, and these were triangulated against multiple reputable outlets where possible. Fifth, articles with DOI numbers and stable internet access links were prioritised to improve auditability and future accessibility of the reference list [59], [62], [63].

The final corpus was therefore not treated as a complete bibliometric universe, but as a purposive evidence base designed to support causal-pattern comparison. This clarification is important

because the paper's central claim depends less on publication frequency than on whether multiple strands of evidence converge on the same institutional mechanisms: exclusion, fragmentation, productivity stagnation, and state-induced transaction costs.

3.3 Data Analysis

The collected literature was analysed using **Thematic Analysis**. The documents were coded to identify recurring motifs and arguments. These codes were then grouped into three primary themes: (1) The Exclusion Risk (regulatory barriers), (2) Institutional Fragmentation (policy incoherence), and (3) Structural Stagnation (productivity issues). These themes structure the Results section. The analysis employs a "pattern matching" technique to compare the identified themes in the palm oil sector with the historical records of the sugar and rubber industries [53].

4. Results

4.1 Theme 1: Regulation as an Instrument of Exclusion (The "Clean" Supply Chain Paradox)

A dominant theme in the recent literature is the paradox of "clean" supply chains. While regulations like EUDR aim to eliminate deforestation from the value chain, they inadvertently risk alienating smallholders as well [54], [55], [56], [57], [58].

4.1.1 The Prohibitive Cost of Compliance

Research indicates that the cost of meeting geo-location and traceability requirements is prohibitive for independent oil palm smallholders. It has been argued that without significant external support, the EUDR will function as a high entry barrier, effectively creating a cartel of large corporations that have the capital to segregate their supply chains [6], [59], [60].

The transition from voluntary sustainability standards to mandatory due diligence frameworks, specifically the EUDR, has introduced a "compliance shock" that disproportionately impacts the upstream sector. Literature from 2020–2026 consistently argues that the administrative burden of geo-location mapping and deforestation-free verification functions as a regressive tax on the smallest actors. While large conglomerates benefit from economies of scale and integrated digital supply chains, independent smallholders—who manage approximately 41% of Indonesia's palm oil plantations—face insurmountable financial hurdles. It has been estimated that the cost of full compliance, including polygon mapping and legal verification, can erode up to 30% of a smallholder's net income if not subsidised. Without financial and technical assistance, the requirement for precise geolocation data effectively renders the "informal" nature of smallholder agriculture a market liability [6], [59], [60].

Furthermore, the empirical evidence points to a widening "digital divide." The EUDR mandates not just legality, but *traceability to the plot level*, requiring sophisticated data management systems that are alien to the average Indonesian smallholder, many of whom are ageing and lack digital literacy. The scholarship indicates that intermediaries (middlemen) often lack the incentive or capacity to facilitate this data transfer, leading to a breakdown in the chain of

custody. Consequently, European buyers, seeking to minimise risk, are increasingly simplifying their supply chains by cutting out independent smallholders entirely. This phenomenon has been described as "supply chain cleaning" rather than "cleaning up the supply chain," which results in corporations sourcing exclusively from their own nuclear estates or large-scale plasma cooperatives, thereby structurally excluding independent farmers [35], [61], [62], [63].

The long-term implication of this cost barrier is a potential reversal of the socio-economic gains achieved over the past three decades. Historically, the inclusion of smallholders in the global supply chain was the primary driver of poverty alleviation in rural Sumatra and Kalimantan. However, current findings suggest that the regulatory landscape is shifting toward an "industrial enclosure" model. By imposing first-world compliance costs on third-world agrarian structures without a corresponding price premium, the regulatory regime is inadvertently creating an elite market that is accessible only to capitalised firms. This mirrors the colonial sugar dynamics where capital-intensive mills dominated, and peasant cane growers were marginalised, eventually leading to the atrophy of the peasant production base [64], [65], [66], [67].

4.1.2 The Bifurcation of the Market (Dualism)

The literature identifies a trend toward market dualism. Large, compliant companies export to the "premium" European market, while smallholders and non-compliant actors are diverted to "leakage markets" (India, China, Domestic) with lower sustainability standards. This dualism mirrors the colonial sugar structure, where high-quality production was for export while the domestic market was served by inefficient producers, preventing holistic industry upgrading [20], [58], [68], [69].

The pressure to meet rigorous environmental standards for the European market, while simultaneously satisfying domestic and non-traditional demand, is creating a distinct market dualism. The literature identifies the emergence of a "two-tier system": a premium, certified, and traceable market destined for Europe and the US, and a secondary, opaque market serving domestic biodiesel mandates (B35/B40) and export destinations like India, China, and Pakistan. This bifurcation undermines the holistic transformation of the sector. Studies show that non-compliant Fresh Fruit Bunches (FFB) rejected by EU-exporting mills are simply diverted to local refineries or leakage markets, where sustainability checks are lax or non-existent [58], [70], [71]. Empirically, this dualism creates a perverse incentive structure that perpetuates unsustainable practices. Because the "leakage market" is vast—absorbing nearly 70% of Indonesia's exports and 100% of domestic consumption—there is little economic pressure for smallholders to upgrade their practices. A recent analysis suggests that the domestic biodiesel program, while successfully stabilising CPO prices, acts as a "shelter" for non-compliant producers [53]. By providing a guaranteed market that does not require stringent deforestation-free verification, the state inadvertently reduces the urgency for smallholders to pursue certification. This parallels the decline of the rubber industry, where low-quality slab rubber continued to be produced for low-value markets because there was no compelling economic signal to upgrade quality [12], [53].

Ultimately, this market segmentation threatens the long-term viability of the Indonesian brand. While "Sustainable Palm Oil" becomes a niche product for the West, the bulk of Indonesian production remains stigmatised as "dirty" in the global discourse. This reputational damage affects financing and investment. International financial institutions and ESG-driven investors are increasingly reluctant to fund sectors perceived as high-risk. If the "dirty" tier of the market continues to dominate due to the exclusion of smallholders from the "clean" tier, Indonesia risks losing access to green capital, stalling the technological modernisation required to keep the sector competitive against other vegetable oils [53], [72].

4.2 Theme 2: Fragmented Governance and the "Legality Trap"

The review finds that the governance of the palm oil sector is severely fragmented.

4.2.1 The Credibility Gap: ISPO vs. Global Standards

There is a persistent gap between ISPO standards and global market expectations. It has been highlighted that while ISPO has improved, it is still perceived by global buyers as a "minimum legality" standard rather than a "sustainability" standard. This lack of mutual recognition forces producers to undergo multiple audits, increasing transaction costs without necessarily improving environmental outcomes [39], [40], [45], [73].

A central finding in the governance literature is the persistent "credibility gap" between the mandatory Indonesian Sustainable Palm Oil (ISPO) standard and voluntary global schemes such as RSPO and regulatory demands such as EUDR. Despite the Indonesian government's efforts to revamp ISPO (via Presidential Regulation No. 44/2020) to be more inclusive and rigorous, the international market continues to view it as a baseline compliance checklist rather than a gold standard of sustainability. It has been argued that this lack of mutual recognition forces producers into a "multiple audit trap." Producers must bear the cost of ISPO compliance to satisfy national law, yet must also pay for RSPO or ISCC certification to access global markets, doubling the administrative and financial burden without necessarily doubling the environmental benefit [39], [74], [75], [76].

The friction is not merely administrative but deeply political. The literature describes a clash between "sovereignty vs. globality," in which Indonesia asserts ISPO as an instrument of national sovereignty, while the EU uses its market power to impose extraterritorial standards. This geopolitical standoff has practical consequences on the ground. For instance, the metrics for "deforestation" differ between ISPO (which relies on national legal definitions of forest areas) and EUDR (which uses satellite-based cut-off dates regardless of legal status). This misalignment creates confusion for smallholders who may be legally compliant under Indonesian law (ISPO) but are deemed "deforesters" by European satellites, rendering their produce stranded assets [77], [78], [79], [80].

Moreover, ISPO's effectiveness as a governance tool is undermined by its weak enforcement mechanisms, particularly in the upstream sector. While certification is mandatory, the capacity of

certification bodies and local plantation offices to audit millions of independent smallholders is severely limited. Empirical studies highlight that the "stick" of mandatory certification is ineffective because the government lacks the political will to penalise non-compliant smallholders, fearing social unrest. Consequently, ISPO remains largely a paper tiger for the smallholder segment, failing to drive the genuine behavioural change needed to secure the industry's future, much like the ineffective colonial regulations that failed to modernise peasant rubber cultivation [11], [81].

4.2.2 The Land Legality Crisis and the Forest Estate

A critical finding is the entrapment of smallholders in the "Forest Estate" (*Kawasan Hutan*). Recent regulations (UUCK) attempt to resolve this, but the administrative process is slow. The literature suggests that the government's focus on "legalising" land often overlooks the socio-historical context of land occupation, leaving millions of hectares in a legal limbo. This uncertainty deters investment in replanting and modernisation, echoing the neglect that doomed the rubber smallholders [20], [21], [82], [83], [84].

The most critical governance failure identified in the review is the entrapment of smallholders within the "Forest Estate" (**Kawasan Hutan**). It is estimated that 2.5 to 3.4 million hectares of oil palm are located within areas designated as forest zones, rendering them illegal under statutory law despite having been cultivated for decades. Recent policy attempts to resolve this via the Job Creation Law (UUCK) have been sluggish. The literature emphasises that obtaining the Cultivation Registration Certificate (STDB)—a prerequisite for both ISPO and replanting funds—is virtually impossible for farmers in these zones. This creates a "legality trap" where the state demands sustainability certification, but simultaneously withholds the legal recognition required to obtain it [17], [66], [85].

This legal limbo has catastrophic consequences for investment and productivity. Because their land is technically illegal or lacks a freehold title (**Sertifikat Hak Milik**), smallholders cannot access formal banking credit. Without credit, they cannot finance the purchase of high-quality fertiliser or certified seeds for replanting. Evidence has been provided that this lack of legal certainty is the primary bottleneck for the Smallholder Replanting Program (PSR) [86]. Funds allocated by the Palm Oil Fund Management Agency (formerly BDPKS, now BPDP) remain unabsorbed because the target recipients cannot clear the "clean and clear" land legality hurdles. This mirrors the historical neglect of the rubber sector, where unresolved land tenure issues prevented the recapitalisation of ageing rubber gardens [82], [87], [88], [89].

The comparison to the rubber industry's decline is stark. In the rubber sector, the lack of state intervention to formalise land titles left farmers vulnerable to land grabbing and disincentivised long-term crop maintenance. Similarly, in the palm oil sector, the "illegal" status of smallholders forces them to operate in the shadows, relying on informal networks and predatory lenders. This structural informality makes it impossible to implement the kind of modern, data-driven governance required by the EUDR. Unless the "Forest Estate" definition is rationalised to reflect

the reality on the ground, millions of smallholders will remain permanent outlaws, dragging the entire industry's average productivity down [36], [90], [91].

4.2.3 The Centralisation Paradox: DSI and the New Risk of State Monopoly

The recent establishment of PT Danantara Sumberdaya Indonesia (DSI) as the state's single palm oil export gateway introduces an additional and novel layer of governance complexity that has already demonstrated destabilising effects on the sector. Within days of President Prabowo's 20 May 2026 announcement, domestic CPO tender prices plunged from Rp 15,300 to Rp 12,150 per kilogram, while farmgate fresh fruit bunch (FFB) prices in key production hubs collapsed to as low as Rp 1,000–1,500 per kilogram in areas such as Mamuju, as commercial traders froze operations and international buyers adopted a "wait-and-see" posture. The Indonesian Palm Oil Smallholders' Union (SPKS) confirmed that the immediate consequence was a dangerous monopsony dynamic: with DSI as the single buyer and private traders pausing purchases, independent smallholders found themselves with no viable market for their FFB, triggering a cash flow crisis at the farm level [92].

The response from the industry association GAPKI was measured but urgent. GAPKI Chairman noted that palm oil is a uniquely price-volatile commodity — prices can shift within hours — and that any delay in export decisions caused by a centralised bureaucratic process directly damages exporters, processors, and farmers alike. GAPKI Chairman warned that Indonesia's export network spans more than 160 countries, with approximately 90% of exports now in processed downstream forms, each with highly specific buyer specifications that a single state entity may lack the operational capacity to manage. "Exporters already have their own markets. We hope exports don't actually end up falling," the Chairman stated. International market analysts at Fastmarkets similarly noted that the DSI policy risks "concentrating pricing power" in a way that could benefit rival producer Malaysia, as buyers seek alternative, more reliable supply chains [8], [48], [93], [94].

The structural concern echoes findings from the governance literature on policy coherence. The DSI policy, while targeting financial transparency at the export stage, creates a new form of regulatory fragmentation: it introduces a powerful state actor into the export transaction chain without resolving the upstream governance failures — land legality, ISPO compliance, and yield stagnation — that are the root causes of the sector's vulnerability. The Oil Palm Smallholders Organisation Association (POPSI) articulated this diagnostic clearly: rather than granting DSI full trading monopoly functions, the state entity should be restricted to an administrative and data-monitoring role to restore global market confidence, while leaving commercial transactions to the established private sector networks. This recommendation aligns with the "smart regulation" literature, which argues that state capacity should be directed at reducing transaction costs and enforcing price transparency, not substituting market mechanisms entirely [8], [92].

4.3 Theme 3: Symptoms of "Commodity Sclerosis"

The literature reveals early warning signs of the structural stagnation that plagued sugar and rubber.

4.3.1 Stagnating Productivity and the Yield Gap

Despite advancements in genetic material, the national average yield of palm oil has plateaued, particularly among smallholders. It has been noted that the gap between potential and actual yields is widening. This stagnation is attributed to the ageing profile of trees and the slow pace of the Smallholder Replanting Program (PSR) [11], [95], [96], [97].

Quantitative data synthesised from recent studies reveal a worrying stagnation in palm oil productivity, a symptom of what institutional economists call "commodity sclerosis." The national average yield has hovered around 3–3.6 tons of CPO/hectare/year for the past decade, significantly below the genetic potential of 7–8 tons. The gap is most pronounced among independent smallholders, whose yields often languish at 2–2.5 tons. It has been attributed to this not to a lack of effort, but to "genetic lock-in." A significant portion of smallholder plantations were established using uncertified, illicit seeds (fake seeds) during the early 2000s boom years. These trees are now reaching peak age but producing sub-optimal fruit, locking farmers into a cycle of low productivity for the 25-year lifespan of the palm [11], [98].

The persistence of this yield gap is a direct echo of the sugar industry's trajectory. In the historical case of sugar, the failure to adopt new high-yielding cane varieties and modernise ratooning practices led to a gradual erosion of competitiveness against Thailand and Brazil. Similarly, the Indonesian palm oil sector is currently complacent. The high prices of CPO in recent years have masked the inefficiency of production per unit area. However, as global competition for vegetable oils intensifies (e.g., from soy or sunflower), this low productivity will become fatal. The literature warns that without a massive, coordinated replanting effort, the "demographic cliff" of ageing oil palm trees will lead to a sharp contraction in national supply by 2030 [99], [100], [101], [102], [103].

Furthermore, the productivity stagnation drives expansion into marginal lands, exacerbating environmental conflicts. Because farmers cannot increase income through intensification (higher yields), they resort to extensification (clearing more land), which directly conflicts with zero-deforestation regulations like EUDR. This creates a vicious cycle: low productivity drives deforestation, deforestation triggers stricter regulations, and stricter regulations exclude low-productivity farmers. Breaking this cycle requires a "Green Revolution" style intervention in smallholder agronomy, which is currently absent from the policy landscape [96], [104], [105], [106], [107].

4.3.2 Resistance to Innovation and Technology

Similar to the sugar factories of the 1950s that continued to use outdated Dutch machinery, many palm oil mills and smallholders are resistant to adopting new technologies (such as precision

agriculture or methane capture) due to a lack of financial incentives and regulatory certainty [99], [108], [109].

The final symptom of decline is the industry's sluggish adoption of technological innovations compared to other global agricultural sectors. While the "Industry 4.0" narrative is popular in government rhetoric, the reality on the ground is a low-tech equilibrium. The adoption of precision agriculture, drone monitoring, digital soil sensors, and mechanised harvesting is primarily confined to top-tier corporate estates. Smallholders and medium-sized enterprises continue to rely on manual labour and intuition-based management. It has been noted that the labour-intensive nature of palm oil was once an advantage (cheap labour). Still, as rural wages rise and labour becomes scarce, this becomes a liability. The reluctance to mechanise mirrors the stagnation of the rubber tapping industry, which failed to innovate harvesting techniques, eventually making it economically unviable compared to industrial jobs [110], [111], [112], [113].

Financial barriers are the primary driver of this technological lag. Innovation requires upfront capital and a risk tolerance. For smallholders operating on thin margins and volatile prices, investing in technology is irrational without insurance or guarantees. The state's research and extension services (*Penyuluh Pertanian*), which should act as the bridge for technology transfer, are critically underfunded and understaffed. Historical analysis shows that the sugar industry's collapse was precipitated by the degradation of research institutes (like the famous POJ in Pasuruan) after nationalisation. Similarly, the disconnect between Indonesia's current palm oil research centres (PPKS) and the millions of farmers in the field suggests a breakdown in the "knowledge innovation system" needed to sustain the sector [22], [114].

Finally, the resistance to innovation is reinforced by the "resource curse" mentality. The sheer abundance of land and favourable climate have historically allowed Indonesian planters to be profitable without being efficient. However, as land becomes scarce and climate change alters rainfall patterns (increasing the frequency of El Niño events), the "business as usual" approach is no longer tenable. The literature concludes that unless the governance structure pivots to actively incentivise and subsidise technological upgrading—moving from land-expansion based growth to innovation-based productivity—the palm oil sector will lose its competitive moat, following the tragic path of its commodity predecessors [81], [115], [116], [117], [118].

5. Discussion

5.1 Synthesis: Is History Repeating Itself?

The core question of this study is whether palm oil is destined to follow the trajectory of sugar and rubber. The synthesis of the literature suggests a precarious situation.

5.1.1 The Sugar Parallel: The Trap of Protectionism and Inefficiency

The sugar industry failed because it relied on protectionist policies that shielded it from competition, leading to inefficiency. Currently, the palm oil sector relies heavily on the B35/B40

biodiesel mandate. While this policy stabilises prices, some scholars argue it creates a "domestic shelter" that reduces the pressure to be globally competitive and sustainable. If the domestic market becomes the only viable outlet due to global regulatory barriers, the industry may lose its competitive edge, just as sugar did [98], [119], [120].

The historical collapse of the Javanese sugar industry serves as a haunting institutional mirror for the contemporary palm oil sector, particularly regarding the dangers of protectionist "shelters." In the mid-20th century, the sugar industry was insulated from global market discipline through nationalisation and domestic price controls, which ultimately stifled innovation and bred inefficiency. A similar dynamic is currently unfolding with the Indonesian government's aggressive biodiesel mandates (B35/B40). While it has been acknowledged that the biodiesel program has successfully stabilised CPO prices and reduced diesel imports, it has inadvertently created a "captive market" that shields producers from the necessity of efficiency. By guaranteeing a domestic buyer (Pertamina) regardless of production efficiency or sustainability rigour, the policy creates a disincentive for upstream actors to invest in yield improvement or cost-cutting measures. This mirrors the post-independence sugar factories that continued to operate with obsolete Dutch machinery because they faced no real competition [22], [121], [122], [123].

Furthermore, the reliance on the domestic market creates a vulnerability described in institutional economics as "rent-seeking" behaviour. Instead of competing based on technological innovation or agronomic excellence, industry actors focus their efforts on biodiesel subsidies or favourable blending mandates. The literature has highlighted that the sugar industry's demise was accelerated when it became a political tool rather than an economic engine; similarly, the heavy politicisation of the CPO Fund (formerly BDPKS, now BPDP)—where funds are allocated to biodiesel subsidies and also for smallholder replanting—suggests an allocation of resources that prioritises short-term profits over long-term structural health. This resource allocation pattern leads to "inward-looking" industrialisation that gradually erodes the sector's global competitiveness against other vegetable oils like soybean or sunflower, which are forced to compete in open markets [98], [124], [125], [126].

The "Sugar Parallel" is evident in the degradation of the research ecosystem. The Javanese sugar industry was once the Silicon Valley of sugarcane, boasting the world-renowned POJ (*Proefstation Oost-Java*) research centre. Its decline coincided with the neglect of this intellectual infrastructure. Similarly, current assessments of Indonesia's palm oil R&D capabilities suggest a worrying lag behind Malaysia and emerging competitors in Latin America. The focus on expanding acreage over increasing yield (extensification vs. intensification) is a symptom of an industry that has stopped innovating. If the B35 mandate is the only thing keeping the industry profitable, then palm oil has already entered the "zombie phase" that characterised the final decades of Indonesia's sugar export dominance: alive on paper, but structurally dying [22], [115], [127], [128].

5.1.2 The Rubber Parallel: The Structural Neglect of the Base

The rubber industry collapsed because smallholders were left behind. The current regulatory landscape for palm oil risks repeating this by imposing high standards (EUDR/ISPO) without providing the necessary "public goods" (infrastructure, extension services, financing) to meet them. If smallholders exit the sector because they cannot cope with regulations, supply will contract, and the industry's socio-economic dividend will vanish [129].

The tragedy of the Indonesian rubber industry offers a clear cautionary tale about the treatment of smallholders. The rubber sector collapsed not because demand disappeared, but because the primary producers—the smallholders—were structurally neglected. They were left with ageing trees, no access to capital, and no technological support, leading to a collapse in supply. The palm oil sector currently exhibits identical symptoms. It has been reported that despite the high export value of palm oil, the socio-economic mobility of independent smallholders has stalled [28]. Due to volatility in fertiliser prices and a lack of legal collateral to access bank loans, many smallholders are unable to replant ageing trees. This "replanting gap" is widening annually, threatening a future supply shock exactly like the one that decimated rubber exports in the 1990s [28], [130].

Crucially, the "exit option" for smallholders is now more viable than before, posing a greater risk of industry contraction. In the rubber era, farmers often had few alternatives. Today, with rapid urbanisation and the high value of land in Sumatra and Kalimantan, smallholders facing high regulatory barriers (such as EUDR) and low productivity are increasingly tempted to sell their land to real estate developers or switch to less regulated crops, such as corn or horticulture. This phenomenon has been described as "de-agrarianization," where the younger generation of farmers abandons the sector entirely [131]. If the governance regime makes palm oil farming too bureaucratically burdensome and legally risky (due to the Forest Estate issues), the labour force required to sustain the industry will evaporate, repeating the labour shortages that plagued the late-stage rubber plantations [86], [132], [133].

The parallel extends to the failure of collective action. The rubber sector failed to organise smallholders into effective cooperatives capable of negotiating prices or accessing bulk inputs. Similarly, the cooperative ("*Koperasi*") system in the palm oil sector remains weak and often co-opted by local elites. Without strong institutions to aggregate their interests, smallholders remain "price takers" at the mercy of middlemen and mills. The literature emphasises that unless there is a radical institutional intervention to organise these millions of fragmented producers into professional entities capable of meeting global standards, they will be purged from the supply chain. This exclusion will not only cause social unrest but also hollow out the industry's production volume, leaving downstream refineries without sufficient raw material [81], [129], [134], [135], [136].

5.1.3 Empirical Markers of Historical Repetition

The historical analogy becomes stronger when it is expressed as a set of observable warning indicators rather than as a metaphor. In sugar, the key markers were declining factory efficiency, excessive state protection, weak R&D renewal, and the gradual shift from export leadership to

import dependence. In rubber, the markers were ageing trees, low-quality planting material, underfinanced replanting, weak smallholder organisation, and the loss of farmer confidence when prices fell. The palm oil sector now exhibits early versions of these same indicators: independent smallholder yields remain far below estate potential; replanting is constrained by eligibility, finance, and seed-quality problems; certification favours better-organised growers; and the domestic biodiesel mandate can shelter inefficient production from global sustainability discipline [59], [60], [61].

The point is not that palm oil must repeat sugar and rubber mechanically, but that the causal chain is already visible: policy protection reduces pressure to modernise; weak legality blocks finance and replanting; compliance costs shift buyers toward larger suppliers; and state trading centralisation may add transaction delays at precisely the moment when EUDR requires faster, more granular traceability. These are the institutional precursors of decline that the article identifies as avoidable but urgent [137], [138].

5.2 The Divergence: The Role of Downstreaming (Hilirisasi)

However, the literature also identifies a crucial difference: *Hilirisasi* (Downstreaming). Unlike the raw rubber exports of the past, Indonesia has successfully built a massive domestic processing industry (refineries, oleochemicals, biodiesel). This industrial base provides a buffer against external shocks that sugar and rubber never had. It has been argued that this vertical integration creates "stickiness" in the economy—it is harder to abandon an industry with billions of dollars in fixed downstream assets. Yet, downstream strength cannot compensate for upstream weakness indefinitely. If the supply of Fresh Fruit Bunches (FFB) falters due to ageing trees and smallholder exclusion, the downstream giants will starve [115], [139], [140].

5.2.1 Industrial "Stickiness" and Asset Specificity

While the historical parallels are alarming, the palm oil sector possesses a unique resilience factor that sugar and rubber lacked: a massive, capital-intensive downstream infrastructure. Unlike the colonial rubber economy, which was primarily an extractive "enclave" exporting raw coagulum, the modern palm oil industry has undergone significant downstreaming. Indonesia now boasts a multi-billion-dollar complex of refineries, oleochemical plants, and biodiesel facilities. It has been argued that this high degree of "asset specificity"—investments that cannot easily be converted to other uses—creates a powerful economic "stickiness." Corporations and the state are deeply leveraged in these assets, creating a compelling imperative to prevent the industry's failure that did not exist for the low-tech rubber smokehouses of the past [77], [110], [115].

This industrial depth acts as a shock absorber against global volatility. When crude palm oil (CPO) prices fall, integrated firms can pivot to higher-margin downstream products such as surfactants, cosmetic ingredients, or specialised fats. Empirical evidence shows that during the recent price corrections, integrated firms maintained profitability while pure upstream planters suffered. This vertical integration suggests that the palm oil industry is less likely to experience a

sudden, total collapse [141], [142], [143]. Instead, it has a financial buffer to weather regulatory storms, provided the core feedstock supply remains intact. This structural maturity is the primary reason some economists argue that palm oil can defy the "commodity curse" that befell its predecessors [110].

However, this "stickiness" also creates a dangerous dependency known as "lock-in." The massive capacity of Indonesia's refineries (which now exceeds national CPO production) creates a desperate hunger for raw materials. This overcapacity drives political pressure to expand plantations into new frontiers (such as Papua) to feed the industrial beast, directly contradicting sustainability commitments. The literature warns that while downstreaming provides economic resilience, it creates a "technological momentum" that is difficult to steer toward sustainability. The industry is so heavily invested in CPO processing that shifting to alternative, less land-intensive economic models becomes politically difficult, potentially locking Indonesia into a high-volume, high-conflict development path [17].

5.2.2 The "Giant with Clay Feet" Vulnerability

Despite the impressive downstream fortifications, the industry effectively stands on "clay feet." The entire multi-billion-dollar industrial superstructure rests on the agronomic performance of the oil palm trees, 40% of which are managed by vulnerable smallholders. A critical theme in recent supply chain literature is the fragility of this upstream base. If the smallholder sector collapses due to the "regulatory exclusion" discussed in Section 4.1, the downstream refineries will face a chronic shortage of fresh fruit bunches (FFB). World Bank and GAPKI data suggest that without a successful replanting program, Indonesia's CPO production will peak by 2026 and then begin a secular decline, precisely at the moment when domestic biodiesel demand is skyrocketing [127], [128], [144].

This scenario creates the absurdity of Indonesia potentially becoming a net importer of palm oil or oilseed substitutes to feed its own refineries and energy mandates—a fate exactly mirroring the sugar industry, which went from top exporter to top importer. The sheer volume of feedstock required to sustain the B35 mandate implies that any contraction in smallholder output will be catastrophic. The literature describes this as a "supply-demand scissor": rising domestic consumption crosses the line of falling production. Unlike a factory that can just buy raw materials from elsewhere, oil palm is geographically constrained. If the local trees are old and the farmers are legally barred from replanting (due to forest zone issues), the refineries will starve [98].

Furthermore, the "clay feet" vulnerability is exacerbated by climate change, specifically the intensifying El Niño Southern Oscillation (ENSO) cycles. Smallholders, lacking irrigation and proper agronomic inputs, are the first to suffer yield collapses during droughts. Downstream industries, relying on consistent throughput, are exposed to this upstream volatility. The lack of resilience at the farm level transmits shockwaves up the value chain. Thus, the impressive downstream statistics mask a fundamental fragility: the industry has built a Ferrari engine

(refineries) but put it on a bicycle chassis (low-productivity smallholders). Without strengthening the chassis, the engine will eventually tear the vehicle apart [116], [145].

5.2.3 The DSI Intervention: A New Historical Parallel or a Strategic Pivot?

The establishment of DSI introduces a critical new analytical dimension to the historical comparison at the heart of this study. The policy of routing all CPO exports through a single state-owned enterprise bears a striking institutional resemblance to the centralised state trading model that characterised Indonesia's sugar industry in the post-independence decades — a model that, as documented in Section 2.2.1, ultimately bred inefficiency, suppressed innovation, and isolated Indonesian sugar from the disciplines of global market competition. The sugar industry's nationalisation was predicated on similar nationalist arguments: that private actors were capturing rents that rightfully belonged to the state and the people. The outcome — Indonesia's transformation from the world's largest sugar exporter to one of its largest importers — stands as a sobering precedent [9], [47].

Proponents of the DSI model, however, argue that the analogy is imperfect. Unlike the sugar nationalisation, DSI is designed not as a production-controlling entity but as a transaction oversight and marketing facility (*marketing facility*), with the government explicitly guaranteeing that all proceeds from export sales will be channelled back to the producing companies. Danantara CEO emphasised that "the sanctity of the contract remains protected" and that DSI will function as a price verification mechanism rather than a rent-extracting intermediary. In this optimistic interpretation, DSI could strengthen Indonesia's collective bargaining power in global markets, functioning analogously to a commodity marketing board in the tradition of successful state-supported export institutions in other resource-exporting economies [9], [48], [49].

The critical variable, then, is implementation quality. The existing literature on institutional economics warns that the transition from a "monitoring body" to a "trading company" — as explicitly planned for January 2027 — is a politically and operationally treacherous path. The risk of rent-seeking behaviour, bureaucratic capture, and the erosion of market responsiveness is well-documented in the scholarship on state trading enterprises in commodity-dependent economies. Unless DSI is equipped with a professional, market-experienced management team, operates under transparent governance with independent board oversight, and is bound by clear performance metrics and sunset clauses, it carries the potential to evolve into precisely the kind of institutional sclerosis that caused the demise of the sugar and rubber sectors. The literature from Danantara itself acknowledges this tension: CIO Danantara's statement that DSI must "focus on business as usual" and ensure exports proceed "without any obstacles" reflects an awareness of the execution risk, even as the policy architecture itself creates structural uncertainty [10].

5.3 Interaction of EUDR, ISPO, and DSI: Cumulative Pressure Rather Than Separate Rules

EUDR, ISPO, and DSI do not operate as isolated governance instruments. Their combined effect is cumulative. EUDR raises the external threshold for traceability and deforestation-free proof; ISPO establishes the domestic legality and sustainability baseline; and DSI changes the export transaction gate through which compliant or non-compliant products enter global markets. The risk is that a smallholder who fails one layer will be excluded by all three: land illegality prevents STDB and ISPO certification; lack of polygon data prevents EUDR due diligence; and lack of standardised transaction documentation may prevent mills or exporters from passing DSI verification [36], [146], [147].

The three-layer interaction among EUDR, ISPO, and DSI is summarised in Table 1. This three-layer interaction can also be constructive if sequenced correctly. ISPO can become the domestic passport for legality; EUDR data requirements can become the technical trigger for plot mapping and risk classification; and DSI can become the transparent data node that verifies price and volume without replacing the commercial functions of mills, traders, and exporters. The governance question is therefore not whether Indonesia should comply with external demands or defend sovereignty, but how to align national legality, international due diligence, and export supervision so that the same data collected once can satisfy all three regimes [59], [148], [149].

Table 1. Interaction logic among EUDR, ISPO, and DSI

Instrument	Primary Governance Function	(Smallholder) Risk if Uncoordinated	Coordination Solution
EUDR	External due diligence: deforestation-free proof, geolocation, legality	Independent farmers without polygon data or legal documents are treated as high-risk suppliers	Use publicly funded polygon mapping and make the data interoperable with ISPO and DSI systems
ISPO	National legality and sustainability baseline	Mandatory certification becomes a barrier when STDB, land legality, and audit costs are unresolved	Bundle ISPO with legal amnesty, STDB issuance, cooperative strengthening, and certification subsidies
DSI	Export price/volume verification and anti-under-invoicing control/watchdog	A single export gate may create payment delays, monopsony pressure, or unclear contract risk	Limit DSI to transparent verification until service-level performance targets are met; keep

Instrument	Primary Governance Function	(Smallholder) Risk if Uncoordinated	Coordination Solution
			commercial contracting decentralised

5.4 Analytical Perspective: The Need for "Smart Regulation"

The analysis suggests that the "regulatory tsunami" is not inherently destructive; rather, the *design* of the response is critical. The current defensive posture (fighting EUDR via WTO, delaying ISPO enforcement) is a delaying tactic, not a strategy. A "smart regulation" approach would view compliance not as a burden but as a modernisation tool. By using technology to map smallholders for EUDR compliance, the state could simultaneously solve land tenure issues and improve productivity—turning a threat into an opportunity for structural reform [110].

5.4.1 From Defensive Nationalism to Adaptive Strategy

The prevailing Indonesian response to global sustainability regulations (particularly EUDR) has been characterised by "defensive nationalism"—framing these rules as neo-colonial trade barriers and challenging them at the WTO. However, the analysis suggests this strategy is increasingly untenable. The "Brussels Effect"—where EU standards become the de facto global norm—means that fighting compliance is a losing battle. It has been argued that a "smart regulation" approach would involve pivoting from rejection to strategic adaptation. Instead of viewing traceability as a concession to Europe, Indonesia should view it as a tool for "informational sovereignty." By building its own robust, state-controlled data clearinghouse for palm oil production, Indonesia can dictate the terms of transparency rather than having them imposed by foreign NGOs or buyers [19], [70], [146], [150], [151], [152].

Smart regulation means using the external pressure of EUDR as a lever to force necessary internal reforms that would otherwise be politically difficult. For example, the requirement for geolocation can be the impetus to finally resolve the chaotic overlapping of land tenure in Sumatra and Kalimantan. It has been suggested that the government can use the "threat" of lost market access to compel local governments and forestry agencies to accelerate the regularisation of smallholder lands [53]. In this view, EUDR is not the enemy, but a "Trojan Horse" for modernisation. A defensive posture preserves the status quo of informality and illegality, while an adaptive posture uses the crisis to formalise the sector, thereby securing its long-term legitimacy [12].

Moreover, the defensive narrative risks isolating Indonesia from the premium market. While Indonesia can sell CPO to India or China, the value-added products (oleochemicals, bio-jet fuel) are largely destined for markets that demand high sustainability standards. Continued resistance to global standards risks limiting Indonesia to being a supplier of cheap, raw commodity oil, while Malaysia or other competitors capture the high-value green market. Smart regulation

recognises that sustainability is no longer a niche preference but a "license to operate" in the 21st-century global economy. Embracing this reality allows Indonesia to position ISPO not as an alternative to the EUDR, but as a sovereign pathway *to* compliance [153].

5.4.2 Compliance as a Modernisation Vehicle

The concept of "Smart Regulation" shifts the perspective of compliance from a cost centre to a modernisation vehicle. Historically, the vagueness of land ownership and the lack of farmer databases have been the primary obstacles to efficiently distributing credit and fertiliser subsidies. The rigorous data collection required for ISPO and EUDR compliance creates the first comprehensive "Big Data" set for Indonesian agriculture. It has been demonstrated that when smallholders are mapped and possess proper legality documentation, their access to formal banking credit increases by over 40% [154], [155]. This access to finance is the silver bullet for the productivity stagnation discussed earlier. Therefore, the regulatory burden, if managed correctly by the state, acts as a catalyst for financial inclusion [90].

Furthermore, smart regulation entails "bundling" compliance with benefits. Currently, certification is seen by farmers as all stick and no carrot. A smart regulatory framework would automatically link ISPO certification with access to subsidised replanting funds (PSR), subsidised fertiliser, and guaranteed offtake agreements. It has been argued that certification should be the "passport" to a suite of state services [156]. This approach changes the incentive structure: farmers seek certification not because they care about European deforestation politics, but because it is the gateway to economic survival and state support. This alignment of incentives was missing in the rubber era, where government schemes were disjointed and often corrupt [11].

Modernisation through compliance requires a shift in the state's role from "regulator" to "facilitator." Smart regulation acknowledges that smallholders cannot bear the costs of transition alone. It implies a massive investment in public goods—specifically, a digital infrastructure that allows for free, easy registration and verification. Just as the government invests in physical toll roads to facilitate logistics, it must invest in "digital toll roads" (data platforms) to facilitate market access. If the state can reduce the transaction costs of compliance to near zero for the smallholder, it removes the risk of exclusion. This active-state capacity-building is what differentiated successful agricultural transitions (like Malaysia's FELDA) from failures (like Indonesia's rubber sector), and it is the prerequisite for the survival of the palm oil industry [35].

5.5 Counter-Arguments and Mitigating Factors: Why the Sunset Outcome Is Not Inevitable

The "sunset commodity" thesis should be read as a warning scenario, not a deterministic forecast. Several mitigating factors could prevent palm oil from repeating the fate of sugar and rubber. First, palm oil remains more land-efficient than most competing vegetable oils, which gives it a structural advantage if productivity can be raised without further deforestation. Second, the downstream base in oleochemicals, food ingredients, and bioenergy creates asset specificity and industrial stickiness that sugar and rubber lacked. Third, the emergence of higher-resolution

satellite monitoring, mill-level sourcing data, and digital farmer registries makes it technically possible to solve problems of traceability that were impossible in previous commodity eras [128], [157], [158].

However, these mitigating factors are conditional. They reduce the probability of decline only if the state converts them into an inclusion strategy. Without legal recognition, finance, cooperative aggregation, and transparent export governance, the same technologies that could include smallholders may instead enable buyers to exclude them more efficiently. The sunset risk is therefore not a prediction of market disappearance, but a diagnosis of institutional failure: palm oil will remain globally demanded, yet Indonesia's comparative advantage could erode if the production base becomes older, less productive, and less legitimate [159], [160], [161], [162].

6. Conclusion and Policy Recommendations

6.1 Substantive Conclusion

The Indonesian palm oil industry stands at a critical juncture. The narrative that "palm oil is too big to fail" is a dangerous fallacy, contradicted by the ghosts of the sugar and rubber industries. This review concludes that the primary threat to the future of palm oil is not merely market competition or environmental campaigning, but maladaptive governance. The current regulatory environment risks creating an exclusive industry that marginalises smallholders, mirroring the neglect that destroyed the rubber sector, while relying on domestic protectionism that mimics the inefficiencies of the sugar sector's decline. If the regulatory architecture remains rigid, fragmented, and exclusionary, the "golden commodity" will likely fade into a sunset industry within the next two decades.

This study further underscores that the "commodity curse" is not inevitable but institutional. The decline of the Javanese sugar industry was not preordained by geography. Still, it was the result of specific policy choices—namely, the decision to prioritise state control over market efficiency and the neglect of research and development. Similarly, the stagnation of the rubber sector was a direct consequence of failing to solve the "collective action problem" among dispersed smallholders. For palm oil, the writing is on the wall: the "business as usual" approach of expanding land area to compensate for low productivity is no longer viable in a carbon-constrained world. The industry's survival depends on a fundamental shift from an extractive model that relies on cheap land and labour to an inclusive, innovation-driven model. Without this shift, the industry will suffer a "hollowing out," in which downstream capacity remains while the upstream supply base collapses, turning Indonesia into a mere processor of imported oils rather than a global agricultural powerhouse.

Finally, the geopolitical dimension of sustainability cannot be ignored. The conclusion drawn from the literature is that the "sustainability wars" (EUDR vs. ISPO) are a distraction from the real crisis: the internal structural weakness of the smallholder sector. Even if the EU market were to disappear tomorrow, the problems of aging trees, low yields, and legal informality would remain. Therefore, the "historical fate" of becoming the next sugar or rubber will be sealed not in

Brussels, but in Jakarta. If the government continues to treat sustainability compliance as a diplomatic burden rather than a domestic modernisation imperative, it will fail to secure the legal and financial infrastructure necessary for the sector's longevity. The future of palm oil, therefore, rests on the courage to implement painful but necessary internal reforms that integrate the "little people" (*wong cilik*) into the modern economy, preventing them from becoming history's casualties once again.

A further and most recent institutional development has intensified the historical stakes considerably. The 2026 Government Regulation establishing PT Danantara Sumberdaya Indonesia (DSI) as the sole exporter of crude palm oil represents a decisive test of whether the Indonesian state has learned from the institutional issues of the sugar and rubber eras. On one hand, the policy's objective — eliminating the systemic under-invoicing and transfer pricing — addresses a genuine and longstanding governance risk. On the other hand, the immediate market response — farmgate FFB prices collapsing to Rp 1,000 per kilogram in some localities, CPO tender prices falling 20% within days, and international buyers freezing purchase orders — demonstrates that even well-intentioned state interventions can produce acute short-term harm to the most vulnerable actors in the supply chain: the independent smallholders. The commodity history reviewed in this paper suggests a sobering principle: governance failures in Indonesia's resource commodities have rarely been caused by a lack of state ambition, but by the state's inability to manage the second-order consequences of its interventions. Whether the DSI policy becomes a modernising force or a new form of "institutional sclerosis" depends entirely on the quality of its implementation architecture, the transparency of its governance, and the speed with which it develops the operational capacity to manage a market that spans more than 160 countries and moves at the pace of global financial markets.

6.2 Recommendations

To make the recommendations more operational, the proposed inclusive regulatory architecture should be understood as a four-pillar implementation system: legal inclusion, data inclusion, market inclusion, and accountability inclusion. Each pillar assigns a concrete institutional responsibility and a measurable output, so that the concept does not remain abstract.

Table 2. Implementation framework for inclusive regulatory architecture

Pillar	Lead Institution	Practical Mechanism	Smallholder Benefit	Performance Indicator
Legal Inclusion	Ministry of Agriculture, ATR/BPN, Ministry of Forestry, and local governments	Village-level STDB and land-status clinics integrated with ISPO registration	Farmers move from informal suppliers to legally recognised producers	Number of smallholder plots mapped, STDB issued, and forest-estate conflicts resolved
Data Inclusion	BIG, Customs, ISPO Commission, DSI	One farmer, one plot, one transaction ID linked to polygons and mill deliveries	Traceability is supplied as a public good, not a private compliance cost	Share of independent smallholder FFB traceable to the plot level
Market Inclusion	DSI, GAPKI, APKASINDO, cooperatives	DSI verifies export data but does not monopolise commercial buying until service levels are proven	FFB sales continue during transition; monopsony risk is reduced	Payment time, export clearance time, FFB price spread, and complaint resolution rate
Accountability Inclusion	Independent oversight board and public dashboard	Regular publication of DSI fees, benchmark prices, delays, and audit findings	Export governance becomes transparent and contestable	Public reporting compliance and independent audit completion

To defy this historical fate, the following policy shifts are recommended:

1. From Defence to Compliance-as-Strategy

Instead of viewing EUDR solely as a diplomatic threat, the government should utilise the momentum of traceability requirements to accelerate the national "One Map Policy." Establishing a centralised, state-funded clearinghouse for smallholder data can reduce compliance costs and prevent exclusion. This implies a shift in diplomatic posture from "rejection" to "negotiated adaptation."

Actionable Strategy: The Ministry of Agriculture, in collaboration with the Geospatial Information Agency (BIG), must launch a "National Palm Oil Data Guardian" initiative. Instead of leaving traceability to private firms (which creates proprietary silos), the state should provide a free, public-access digital platform where every smallholder's polygon data is stored and verified. This platform should be interoperable with EU information systems. By treating data as a public utility, the government effectively subsidises the highest barrier to entry for smallholders. Furthermore, this data should be used to issue a "Single ID" for farmers that serves as their legal tender for selling fruit, buying subsidised fertiliser, and accessing replanting funds, thereby eliminating the grey market.

2. Affirmative Action for Smallholders

The usage of CPO Fund (formerly BPDPKS, now BPDP) funds must be improved. Funds must also be directed toward financing ISPO certification and replanting for smallholders. Certification for smallholders should be free, bundled with land legalisation.

Actionable Strategy: The BPDP disbursement must also be mandated for upstream smallholder support. This funding should finance a "Certification Task Force" that deploys mobile clinics to villages to process STDB (cultivation letters), environmental permits (SPPL), and ISPO audits in a single visit. Crucially, the government must waive the retrospective fines for smallholders operating in "grey areas" of the forest estate (under the UUCK amnesty provisions), provided they register for ISPO. This "amnesty for compliance" swap solves the legality deadlock that currently paralyses the replanting program, turning illegal farmers into legal, traceable, and productive economic actors.

3. Governing DSI for Market Functionality, Not State Monopoly

Operationally, DSI should be governed through a clear separation between verification, price benchmarking, dispute resolution, and trading. The verification unit should check customs data and benchmark prices; the market-support unit should publish reference prices and contract templates; the dispute-resolution unit should hear complaints from mills, exporters, and smallholder cooperatives; and any trading function should be ring-fenced with audited accounts so that it cannot use privileged regulatory information to crowd out private exporters. This design directly addresses the monopsony concern by preventing DSI from serving as both referee and player in the same transaction chain.

The establishment of PT Danantara Sumberdaya Indonesia represents both a risk and an opportunity. The government must ensure that DSI's operational architecture is designed to correct market failures — specifically, under-invoicing, mis-invoicing, and transfer pricing — without introducing state-controlled market distortions that could devastate the industry's competitiveness and smallholders' livelihoods.

Actionable Strategy: The government must immediately publish a detailed *Technical Guideline (Petunjuk Teknis)* clarifying DSI's pricing methodology, payment processing timelines, contract management procedures, and risk allocation framework. The absence of this clarity was the

direct cause of the market panic following the policy announcement. In Phase 1 (June–December 2026), DSI must be restricted to a transparent monitoring and price verification role, with private exporters retaining full transaction authority. The transition to DSI's trading company function (Phase 2, from January 2027) must be contingent on a demonstrated track record of operational competence and measurable market stability — not an administrative calendar. Furthermore, DSI must establish a dedicated smallholder desk that guarantees FFB price for independent farmers during any regulatory transition, preventing a recurrence of the farmgate price collapse that inflicted immediate damage on smallholders who had no mechanism to respond to sudden institutional change. The DSI governance framework must also include an independent oversight board with representatives from stakeholders, including smallholder association representation, and independent market experts to ensure that the entity's profit-orientation does not supersede its public interest mandate.

4. Harmonisation of Standards

The government must actively pursue "mutual recognition" agreements that upgrade ISPO to meet global benchmarks, reducing the friction of double certification. This requires rigour and transparency to build trust in the international market.

Actionable Strategy: The ISPO Commission should establish a "Joint Technical Committee" with the EU and RSPO to map the specific gaps between the standards. Instead of creating a new standard from scratch, Indonesia should introduce an "ISPO Plus" module specifically designed for export markets that includes the strict deforestation and traceability requirements buyers require. This module would be voluntary for domestic producers but streamlined for exporters. Simultaneously, the government should lobby for ISPO certificates to be recognised as "due diligence proof" in European courts. To achieve this, independent third-party monitors (NGOs or auditors) must be allowed to verify ISPO audits to restore international credibility, moving away from the current state-centric audit model that is viewed with scepticism abroad.

5. Strengthening the Upstream

Learning from the sugar industry, avoiding the trap of neglecting upstream productivity. R&D investment must focus on accessible technologies for smallholders to increase yields without expanding land, thereby decoupling growth from deforestation.

Actionable Strategy: The government should revitalise the Indonesian Oil Palm Research Institute (PPKS) by establishing a direct link between research and village unit cooperatives (KUDs). A "Technology Voucher" scheme could be introduced, where smallholders use vouchers funded by the export levy to purchase high-yielding, drought-resistant seedlings and slow-release fertilisers directly from certified nurseries. Furthermore, the agricultural extension service (Penyuluh) needs to be modernised with digital tools; extension workers should be equipped with tablets to monitor crop health and yield data in real time. By digitising the extension service, the state can identify productivity hotspots and bottlenecks, ensuring that the "intensification" rhetoric translates into actual tons of fresh fruit bunches per hectare.

Acknowledgments

The opinions expressed in this article are solely those of the author and do not necessarily reflect the views or positions of the author's affiliation.

References

- L. Judijanto, "Bridging the Gap - The Role of Palm Oil in Shaping Global Trade and International Relations: A Review," *J. Polit. Sci. Int. Relations*, pp. 1–13, Apr. 2025, doi: 10.47363/JPSIR/2025(3)124.
- A. W. Hidayat, Sutarto, Andrianto, R. Saputra, D. N. Zahra, and I. Fajar, "Contribution of Indonesian Palm Oil Plantations to Sustainable Development," *Int. J. Creat. Futur. Herit.*, vol. 11, no. 1, pp. 113–123, Mar. 2023, doi: 10.47252/teniat.v11i1.1053.
- GAPKI, "Palm Oil Plays Key Economic Role In Developing Countries," GAPKI Publication Recent News. Accessed: May 28, 2026. [Online]. Available: <https://gapki.id/en/news/2026/01/14/palm-oil-plays-key-economic-role-in-developing-countries/>
- I. Jo Anastasya and T. Angelica, "Striking a Balance: Navigating Economic Growth and Sustainability in Indonesia's Palm Oil Sector," *Law Rev.*, Oct. 2025, doi: 10.19166/lr.v24i1.9673.
- R. T. S. Hutagalung, M. Tumanggor, and S. Iswati, "The Role of the Palm Oil Industry in Supporting Indonesia's Economic Resilience and Defense Logistics," *J. Multidiscip. Res.*, vol. 4, no. 3, pp. 53–64, Sep. 2025, doi: 10.56943/jmr.v4i3.863.
- L. Judijanto, "Smallholders at the Crossroads: Barriers to EUDR Compliance and Equity in Palm Oil Supply Chains," *ARACÉ*, vol. 7, no. 7, pp. 38202–38223, Jul. 2025, doi: 10.56238/arev7n7-178.
- A. Indrainsi, "Prabowo Bentuk Danantara Sumberdaya Indonesia, Ekspor SDA Jadi Satu Pintu," *Detik Finance*. Accessed: May 28, 2026. [Online]. Available: <https://finance.detik.com/energi/d-8497589/prabowo-bentuk-danantara-sumberdaya-indonesia-ekspor-sda-jadi-satu-pintu>
- M. J. Yaw and R. Koh, "Indonesia announces state body to oversee palm oil exports; market seeks clarity on implementation," *Fastmarkets*. Accessed: May 28, 2026. [Online]. Available: <https://www.fastmarkets.com/insights/indonesia-announces-state-body-to-oversee-palm-oil-exports-market-seeks-clarity-on-implementation/>
- BPMI Setpres, "Presiden Prabowo Terbitkan PP Tata Kelola Ekspor SDA, Tegaskan Kekayaan Alam Harus untuk Kemakmuran Rakyat," Sekretariat Kabinet Republik Indonesia. Accessed: May 28, 2026. [Online]. Available: <https://setkab.go.id/presiden-prabowo-terbitkan-pp-tata-kelola-ekspor-sda-tegaskan-kekayaan-alam-harus-untuk-kemakmuran-rakyat/>
- A. Novarina, "DSI runs profit-oriented business: Danantara," *Antara News: Business & Investment*. Accessed: May 28, 2026. [Online]. Available: <https://en.antaranews.com/amp/news/417051/dsi-runs-profit-oriented-business-danantara>
- A. B. Rahutomo, M. Karuniasa, and E. Frimawaty, "Enhancing farmers' land productivity through sustainable oil certification: Strategies for promoting environmental and economic

- benefits in agricultural practices,” *JASSU J. Agrosociology Sustain.*, vol. 2, no. 2, pp. 97–112, 2025, doi: 10.61511/jassu.v2i2.2025.1131.
- P. Pollak, “Palm Oil: Prospects and Issues,” Washington DC, 1976. [Online]. Available: <https://thedocs.worldbank.org/en/doc/088011224509465922-0560011976/original/WorldBankGroupArchivesfolder30124865.pdf>
- F. Bonaglia and K. Fukasaku, “Export Diversification in Low-Income Countries: An International Challenge after Dhoha,” 209, 2003. [Online]. Available: https://www.oecd.org/content/dam/oecd/en/publications/reports/2003/06/export-diversification-in-low-income-countries_g17a1645/043266813306.pdf
- M. Alssadek and J. Benhin, “Natural resource curse: A literature survey and comparative assessment of regional groupings of oil-rich countries,” *Resour. Policy*, vol. 84, p. 103741, Jul. 2023, doi: 10.1016/j.resourpol.2023.103741.
- X. Huur, S. M. Murshed, and E. Papyrakis, “A financial resource curse in the context of a small developing resource-based economy: The case of Suriname,” *Miner. Econ.*, May 2026, doi: 10.1007/s13563-026-00626-x.
- N. Farih, L. Anggraeni, and T. Novianti, “Do Natural Resources Abundance and Institutional Quality Promote Economic Growth? A Study on the Resource Curse Hypothesis in Countries with Different Income Groups,” *Econ. Res. Guard.*, vol. 15, no. 2, pp. 199–218, 2025, [Online]. Available: https://www.researchgate.net/publication/395542865_Do_Natural_Resources_Abundance_and_Institutional_Quality_Promote_Economic_Growth_A_Study_on_the_Resource_Curse_Hypothesis_in_Countries_with_Different_Income_Groups
- L. Judijanto, “Governance reform in the palm oil sector from upstream to downstream: a review,” *Rev. Caribeña Ciencias Soc.*, vol. 14, no. 7, p. e4703, Jul. 2025, doi: 10.55905/rcssv14n7-018.
- E. I. K. Putri *et al.*, “The Oil Palm Governance: Challenges of Sustainability Policy in Indonesia,” *Sustainability*, vol. 14, no. 3, p. 1820, Feb. 2022, doi: 10.3390/su14031820.
- S. I. Zainuddin, A. Mappatunru, M. S. Yatusman, and L. L. A. Karman, “Contesting, Negotiating, or Enforcing? How Local Actors in Indonesia’s Palm Oil Value Chain Respond to the EU Deforestation Regulation (EUDR),” *J. Glob. Strateg. - Airlangga University*, vol. 20, no. 1, pp. 95–124, 2025.
- C. Brandi, “The Interaction of Private and Public Governance: The Case of Sustainability Standards for Palm Oil,” *Eur. J. Dev. Res.*, vol. 33, no. 6, pp. 1574–1595, Dec. 2021, doi: 10.1057/s41287-020-00306-8.
- D. Y. Muldiana, A. H. Dharmawan, D. R. Nurrochmat, and R. Boer, “Decoupling and Resistance: Local Responses to Global Environmental Norms in Indonesia’s Palm Oil Sector,” *Sustainability*, vol. 18, no. 8, p. 3999, Apr. 2026, doi: 10.3390/su18083999.
- D. A. Tegegn and F. Dhont, “The downhill journey of the Java sugar economy in the Netherlands Indies (Later Indonesia) from the late 19 th century to the mid-20 th century,” *Cogent Arts Humanit.*, vol. 10, no. 1, Dec. 2023, doi: 10.1080/23311983.2023.2220213.
- W. A. Dewi, “The Political History of Sugar Law in Indonesia from Colonial to Contemporary Times,” *J. Sipakatau*, vol. 3, no. 1, pp. 463–469, 2025, [Online]. Available: <http://journal.globresco.com/index.php/Sipakatau/article/download/602/495>

- F. F. Adli, S. R. Qatrunnada, and Y. C. Satmoko, "Sweet Success or Sour Struggles? Efficiency of the East Java Sugar Industry," *East Java Econ. J.*, vol. 9, no. 1, pp. 55–81, Mar. 2025, doi: 10.53572/ejavec.v9i1.150.
- A. Gordon, "The Collapse of Java's Colonial Sugar System and the Breakdown of Independent Indonesia's Economy," in *Between People and Statistics*, Dordrecht: Springer Netherlands, 1979, pp. 251–265. doi: 10.1007/978-94-009-8846-0_17.
- W. Wasino, "From A Colonial to A National Company: The Nationalization of Western Private Plantation in Indonesia," *Lembaran Sej.*, vol. 13, no. 1, p. 109, Feb. 2018, doi: 10.22146/lembaran-sejarah.33525.
- M. Dell and B. A. Olken, "The Development Effects of the Extractive Colonial Economy: The Dutch Cultivation System in Java," *Rev. Econ. Stud.*, vol. 87, no. 1, pp. 164–203, Jan. 2020, doi: 10.1093/restud/rdz017.
- Springfield Centre, "Case Study: Rubber in Indonesia," Singapore, 2020. [Online]. Available: https://www.pisagro.org/pdf/GA_Rubber_Report_Digital.pdf
- L. S. Woittiez, M. Slingerland, M. van Noordwijk, A. J. Silalahi, J. van Heerwaarden, and K. E. Giller, "People, Palms, and Productivity: Testing Better Management Practices in Indonesian Smallholder Oil Palm Plantations," *Agriculture*, vol. 14, no. 9, p. 1626, 2024, doi: 10.3390/agriculture14091626.
- M. S. A. Sinulingga, S. Hutabarat, and Novian, "Participation of Smallholders in Rubber to Oil Palm Conversion Activities at Wisma Tani KUD, Rokan Hulu Regency," *J. Ilm. Sosio Ekon. Bisnis*, vol. 26, no. 1, pp. 1–20, 2023, [Online]. Available: <https://online-journal.unja.ac.id/jseb/article/download/24117/16583>
- S. Syamsafitri, I. Gunawan, R. D. H. Rambe, M. Dalimunthe, and N. Nurhayati, "Conversion of Rubber Land Into Palm Oil and Its Effect on Production in North Sumatra," *J. Penelit. Pendidik. IPA*, vol. 9, no. 3, pp. 1503–1511, Mar. 2023, doi: 10.29303/jppipa.v9i3.3349.
- V. Gitz *et al.*, *Sustainable development of rubber plantations in a context of climate change: Challenges and opportunities*. Center for International Forestry Research (CIFOR), 2020. doi: 10.17528/cifor/007860.
- Suriansyah, Nurliza, E. Dolorosa, Rosyadi, and D. Suswati, "Intention to Transition: Natural Rubber Smallholders Navigating the Risks of Farming," *Sustainability*, vol. 16, no. 5, p. 1765, Feb. 2024, doi: 10.3390/su16051765.
- GPSNR, "Indonesia's rubber industry shrinking but smallholders keep tapping," European Rubber Journal News. Accessed: Jun. 09, 2026. [Online]. Available: <https://www.european-rubber-journal.com/article/2098297/indonesia-s-rubber-industry-is-shrinking-but-smallholders-still-tapping>
- M. Gregory and S. Ozinga, "Indonesian Palm Oil Smallholders and the EUDR: Impacts and Ways Forward," FERN: Making Europe Work for People and Forest. Accessed: Dec. 26, 2025. [Online]. Available: https://www.fern.org/fileadmin/uploads/fern/Documents/2025/Fern_Indonesian_palm_oil_smallholders_and_the_EUDR_impacts_and_ways_forward.pdf
- A. K. Wening and J. Setiyono, "Analysis of the Impact of the EU Deforestation Regulation (EUDR) on Indonesia's Palm Oil Export Commodities," *Int. J. Soc. Sci. Hum. Res.*, vol. 09, no. 02, Feb. 2026, doi: 10.47191/ijsshr/v9-i2-88.

- D. Maharani, "EU Deforestation Regulation and Palm Oil: Environmental Protection or Non-Tariff Barrier?," *J. Paradig. Huk. Pembang.*, vol. 10, no. 2, pp. 112–154, 2025, [Online]. Available: <https://ejournal.atmajaya.ac.id/index.php/paradigma/article/download/7264/3305/31633>
- Nissa Nur Awaliyah, D. Iranto, and S. Mukhtar, "Policy Analysis of European Union Deforestation Regulation (EUDR) on Indonesian Palm Oil Exports," *Int. Student Conf. Business, Educ. Econ. Accounting, Manag.*, vol. 1, no. 1, pp. 501–510, Feb. 2024, doi: 10.21009/ISC-BEAM.011.34.
- E. Michida, "Effectiveness of Self-Regulating Sustainability Standards for the Palm Oil Industry," No. 476, 2023. [Online]. Available: <https://www.eria.org/uploads/Effectiveness-of-Self-Regulating-Sustainability-Standards-for-the-Palm-Oil-Industry.pdf>
- M. A. Rifai, C. Depoorter, N. Nuryartono, M. Maertens, and A. Marx, "National and voluntary sustainability standards: Convergence or divergence? Insights from Indonesian agri-food export sectors," *Earth Syst. Gov.*, vol. 27, p. 100311, Mar. 2026, doi: 10.1016/j.esg.2026.100311.
- S. Hutabarat, "IsPO Certification and Indonesian Oil Palm Competitiveness in Global Market: Smallholder Challenges Toward ISPO Certification," *Agro Ekon.*, vol. 28, no. 2, 2018, doi: 10.22146/jae.27789.
- A. J. Astari, J. C. Lovett, and M. Wasesa, "Sustainable pathways in Indonesia's palm oil industry through historical institutionalism," *World Dev. Sustain.*, vol. 6, p. 100200, Jun. 2025, doi: 10.1016/j.wds.2024.100200.
- V. Y. Ningsih, B. Setiawan, R. Asmara, and R. Dwi Andriani, "ISPO Certification and the Sustainable Development Goals: Readiness of Independent Smallholders in Indonesia (South Sumatra)," *Trans. Chinese Soc. Agric. Mach.*, vol. 56, no. 6, pp. 37–55, 2025, doi: 10.62321/issn.1000-1298.2025.6.4.
- A. P. Pasaribu, "Strengthening Indonesia's sustainable palm oil policy: Addressing climate change and enhancing global market integration," *JSSEW J. Sustain. Soc. Eco-Welfare*, vol. 3, no. 1, pp. 64–84, 2025, doi: <https://doi.org/10.61511/jssew.v3i1.2025.2278>.
- L. Judijanto, "From Voluntary to Mandatory: A Review of Prospects and Challenges in Implementing Palm Oil Sustainability Certifications in Indonesia," *ERR01*, vol. 10, no. 2, pp. 232–254, Jul. 2025, doi: 10.56238/ERR01v10n2-013.
- Palm Oil (ISPO) Certification and the Factors that Influence Crude Palm Oil (CPO) Exports Volume," *IJSSR Int. J. Soc. Sci. Res.*, vol. 4, no. 10, pp. 1–11, 2024, [Online]. Available: <https://ijssr.ridwaninstitute.co.id/index.php/ijssr/article/download/1085/1480/9281>
- R. Mudassir, "Respons Pengusaha Sawit saat Ekspor Komoditas Wajib Satu Pintu via Danantara," *Bisnis.com: Ekonomi*. Accessed: May 28, 2026. [Online]. Available: <https://ekonomi.bisnis.com/read/20260520/12/1975171/respons-pengusaha-sawit-saat-ekspor-komoditas-wajib-satu-pintu-via-danantara>
- P. Dorimulu, "Jakarta Seizes Control of Its \$150 Billion Commodity Leak — Here's What Investors Need to Know," *Investor Trust Macro*. Accessed: May 28, 2026. [Online]. Available: <https://investortrust.id/macro/103968/jakarta-seizes-control-of-its-150-billion-commodity-leak-heres-what-investors-need-to-know>

- H. Kurniawan, S. Hutagaol, and F. Nugraha, "Indonesia's Bold Export Crackdown Won't Breach Existing Commodity Contracts," *Investor Trust Business*. Accessed: May 28, 2026. [Online]. Available: <https://investortrust.id/business/104096/indonesias-bold-export-crackdown-wont-breach-existing-commodity-contracts?page=english-edition>
- T. Iqbal, "The governance of global supply chains: empirical insights from the ready-made garment industry in Bangladesh a decade after Rana Plaza," *J. Law Soc.*, vol. 53, no. 1, pp. 100–123, Mar. 2026, doi: 10.1111/jols.70049.
- M. Farah and A. Sabani, "Rethinking Governance Effectiveness: Sustainable Development in an Unrecognised State," Oct. 28, 2025. doi: 10.21203/rs.3.rs-7296005/v1.
- A. O. Amoakoh, J. Boafu, J. Obodai, and S. Dotsey, "Rethinking environment, social and governance (ESG) in critical minerals extraction in the Democratic Republic of Congo," *Extr. Ind. Soc.*, vol. 27, p. 101938, Sep. 2026, doi: 10.1016/j.exis.2026.101938.
- H. Purnomo *et al.*, "Advancing palm oil sustainability to address the climate crisis: Leveraging theory of change and system dynamics model at the jurisdictional level," *For. Policy Econ.*, vol. 181, p. 103594, Dec. 2025, doi: 10.1016/j.forpol.2025.103594.
- M. Eggen *et al.*, "Smallholder participation in zero-deforestation supply chain initiatives in the Indonesian palm oil sector: Challenges, opportunities, and limitations," *Elem. Sci. Anthr.*, vol. 12, no. 1, 2024, doi: 10.1525/elementa.00099.
- J. D. Watts *et al.*, "Challenges faced by smallholders in achieving sustainable palm oil certification in Indonesia," *World Dev.*, vol. 146, p. 105565, Oct. 2021, doi: 10.1016/j.worlddev.2021.105565.
- J. Grabs and R. D. Garrett, "Goal-Based Private Sustainability Governance and Its Paradoxes in the Indonesian Palm Oil Sector," *J. Bus. Ethics*, 2023, doi: 10.1007/s10551-023-05377-1.
- Z. Ogahara, K. Jespersen, I. Theilade, and M. R. Nielsen, "Review of smallholder palm oil sustainability reveals limited positive impacts and identifies key implementation and knowledge gaps," *Land use policy*, vol. 120, p. 106258, 2022, doi: 10.1016/j.landusepol.2022.106258.
- M. Solihin, K. N. Fitriana, K. L. P. Adrianus, Ratumakin, and Safrida, "The European Union Deforestation-Free Regulation (EUDR) Policy: Resistance, Impact, and Challenges for Palm Oil Producing Countries," *Natapraja*, vol. 12, no. 2, pp. 183–201, Dec. 2024, doi: 10.21831/natapraja.v12i2.85477.
- L. Judijanto, "Who Pays for Climate Action? The Disproportionate Impact of Deforestation-Free Regulations on Smallholder Farmers," *Eur. J. Manag. Econ. Bus.*, vol. 3, no. 1, pp. 3–13, Dec. 2025, doi: 10.59324/ejmeb.2026.3(1).01.
- L. Judijanto, "EUDR Compliance Costs: A Review of Burdens on Oil Palm Smallholders," *Veredas do Direito Direito Ambient. e Desenvolv. Sustentável*, vol. 22, no. 2, p. e3317, Oct. 2025, doi: 10.18623/rvd.v22.n2.3317.
- P. Rietberg and M. Slingerland, "Barriers to smallholder RSPO certification: A science-for-policy paper by the SEnSOR programme," 2016. [Online]. Available: https://www.sensorproject.net/wp-content/uploads/2017/04/Barriers-to-smallholder-RSPO-certification-Sep16_FINAL.pdf

- W. Ben Gunawan, “Elucidating Indonesia’s palm oil supply chain trends: A bibliometric approach,” *J. Sustain. Soc. Eco-Welfare*, vol. 3, no. 1, pp. 1–20, Jul. 2025, doi: 10.61511/jssew.v3i1.2025.1852.
- A. Pramana *et al.*, “The analysis of supply chain of palm oil in PT. Tribakti Sarimas, Riau,” *Agointek J. Teknol. Ind. Pertan.*, vol. 16, no. 3, pp. 337–344, Aug. 2022, doi: 10.21107/agointek.v16i3.13792.
- N. Zachlod, M. Hudecheck, C. Sirén, and G. George, “Sustainable palm oil certification inadvertently affects production efficiency in Malaysia,” *Commun. Earth Environ.*, vol. 6, no. 1, p. 200, Mar. 2025, doi: 10.1038/s43247-025-02150-2.
- J. Wu, M. Zhang, X. Yang, and B. Wu, “Effects of Land and Labor Costs Growth on Agricultural Product Prices and Farmers’ Income,” *Land*, vol. 13, no. 11, p. 1754, Oct. 2024, doi: 10.3390/land13111754.
- H. Petri *et al.*, “Replanting challenges among Indonesian oil palm smallholders: a narrative review,” *Environ. Dev. Sustain.*, vol. 26, no. 8, pp. 19351–19367, 2024, doi: 10.1007/s10668-023-01788-2.
- R. B. Edwards, “Export agriculture and rural poverty: Evidence from Indonesian palm oil,” *J. Int. Econ.*, vol. 159, p. 104209, Jan. 2026, doi: 10.1016/j.jinteco.2025.104209.
- A. H. H. Mohamad and R. Ab-Rahim, “European Union Ban on Palm Oil: The Trend of Palm Oil Competitiveness and the Cointegration on the Soybean and Rapeseed Oil,” *Int. J. Bus. Soc.*, vol. 25, no. 1, 2024, [Online]. Available: <https://repository.unar.ac.id/jspui/handle/123456789/12871>
- R. Knight, “Indonesia’s Colonial Sugar Industry,” in *Oxford Research Encyclopedia of Asian History*, Oxford University Press New York, NY, 2018. doi: 10.1093/acrefore/9780190277727.013.44.
- ESL-IPB, “The Impact of the European Union Anti-Deforestation Regulation (EUDR) on Sustainable Agricultural Development in Indonesia,” IPB University: Resource and Environmental Economics. Accessed: May 08, 2026. [Online]. Available: <https://esl.ipb.ac.id/en/the-impact-of-the-european-union-anti-deforestation-regulation-eudr-on-sustainable-agricultural-development-in-indonesia/>
- GAPKI, “Without Helping Smallholders, EUDR Won’t Be Effective,” GAPKI Publication Recent News. Accessed: Jun. 09, 2026. [Online]. Available: <https://gapki.id/en/news/2023/08/09/without-helping-smallholders-eudr-wont-be-effective/>
- J. Shapiro and J.-A. McNeish, *Our Extractive Age: Expression of violence and resistance*, 1st ed. London: Routledge, 2021. doi: 10.4324/9781003127611.
- B. R. Pratama, A. Pramana, Y. Zamaya, and J. Kim, “Drivers of Indonesian Sustainable Palm Oil Certification Adoption: Evidence from Multi-Group Analysis in Riau Province,” *Agriculture*, vol. 16, no. 11, p. 1229, Jun. 2026, doi: 10.3390/agriculture16111229.
- F. T. Sabrina, “Implementation of Indonesian Sustainable Palm Oil Certification in Realizing Sustainable Business: A Comparative Study with the European Union Deforestation Regulation,” *J. Locus Penelit. dan Pengabd.*, vol. 4, no. 7, pp. 3106–3114, Jul. 2025, doi: 10.58344/locus.v4i7.4461.

- L. Berning and M. Sotirov, "Hardening corporate accountability in commodity supply chains under the <sc>European Union</sc> Deforestation Regulation," *Regul. Gov.*, vol. 17, no. 4, pp. 870–890, Oct. 2023, doi: 10.1111/rego.12540.
- O. Hospes, C. Kroeze, P. Oosterveer, G. Schouten, and M. Slingerland, "New generation of knowledge: Towards an inter-and transdisciplinary framework for sustainable pathways of palm oil production," *NJAS-Wageningen J. Life Sci.*, vol. 80, pp. 75–84, 2017, doi: 10.1016/j.njas.2017.01.001.
- S. Peteru, H. Komarudin, and M. A. Brady, "Sustainability certifications, approaches, and tools for oil palm in Indonesia and Malaysia," CIFOR-ICRAF. Accessed: Aug. 14, 2025. [Online]. Available: [https://efi.int/sites/default/files/files/flegtredd/KAMI/Resources/Sustainability certifications, approaches, and tools for oil palm in Indonesia and Malaysia report.pdf#page=1&zoom=auto,-76,719](https://efi.int/sites/default/files/files/flegtredd/KAMI/Resources/Sustainability%20certifications,%20approaches,%20and%20tools%20for%20oil%20palm%20in%20Indonesia%20and%20Malaysia%20report.pdf#page=1&zoom=auto,-76,719)
- J. Truby, A. Dahdal, R. Brown, and I. Ibrahim, "Diplomacy in the age of AI: Legal and strategic approaches to techno-nationalism, regulatory soft power and the AI chips race," *Res. Glob.*, vol. 12, p. 100335, Jun. 2026, doi: 10.1016/j.resglo.2026.100335.
- A. Damanhuri, "Projecting Potential Impact of European Union Deforestation Regulation on Indonesian Palm Oil Industry," *Int. J. Sci. Soc.*, vol. 5, no. 5, pp. 748–757, Nov. 2023, doi: 10.54783/ijssoc.v5i5.942.
- A. Nurisa, T. Hidayat, and J. Oktaviani, "Strategi Indonesia Menghadapi Kebijakan European Union Deforestation Regulation (EUDR) oleh Uni Eropa terhadap Ekspor Kopi Indonesia," *Glob. Insights J. Junral Mhs. Hub. Int.*, vol. 1, no. 3, 2025, doi: <https://doi.org/10.36859/gij.v1i3.3290>.
- E. P. Pramudya *et al.*, "Incentives for Palm Oil Smallholders in Mandatory Certification in Indonesia," *Land*, vol. 11, no. 4, p. 576, Apr. 2022, doi: 10.3390/land11040576.
- S. Hadi, Y. Kusumawaty, D. Bakce, and J. Yusri, "Development of an Accelerated Model for ISPO Certification in Independent Palm Oil Plantations," *KnE Soc. Sci.*, no. ASABEC 2023, pp. 276–301, Aug. 2024, doi: 10.18502/kss.v9i25.16974.
- L. Judijanto, "Policy Fragmentation and Its Impact on the Sustainability of the Palm Oil Supply Chain Governance," in *Applied and Social Sciences - 3^o Edição*, 1st ed., Seven Editora, 2025, pp. 314–341. doi: 10.56238/edimpacto2025.084-025.
- D. Suratiningsih, H. Hardilina, A. R. S. Anugrah, S. Safira, and D. Puspita, "Implementation of the Indonesia Sustainable Palm Oil (ISPO) Policy on Oil Palm Plantations in West Kalimantan," *J. Hub. Int.*, vol. 12, no. 2, pp. 10–22, Sep. 2023, doi: 10.18196/jhi.v12i2.15505.
- A. H. Dharmawan *et al.*, "The Agrarian, Structural and Cultural Constraints of Smallholders' Readiness for Sustainability Standards Implementation: The Case of Indonesian Sustainable Palm Oil in East Kalimantan," *Sustainability*, vol. 13, no. 5, p. 2611, Mar. 2021, doi: 10.3390/su13052611.
- A. Hasudungan, D. G. S. Raeskyesa, and I. Fromm, "Analysis of the foreign direct investment, oil palm expansion, and food security in Indonesia: Sumatra and Kalimantan case studies," *Discov. Sustain.*, vol. 5, no. 1, p. 287, 2024, doi: 10.1007/s43621-024-00452-7.

- E. Andoko, "Overview of Indonesian Current Issue and Government Strategy on the Rubber Commodity," *FFTC-AP FFTC Agric. Policy Platf.*, no. December, pp. 1–9, 2019, [Online]. Available: https://www.researchgate.net/publication/346033700_Overview_of_Indonesian_Current_Issue_and_Government_Strategy_on_the_Rubber_Commodity
- S. Suyanto, T. P. Tomich, and K. Otsuka, "Land tenure and farm management efficiency: The case of smallholder rubber production in customary land areas of Sumatra," *Agrofor. Syst.*, vol. 52, no. 2, pp. 145–160, May 2001, doi: 10.1023/A:1010625019030.
- N. Liswanti, S. H. Silviana, A. Dermawan, and S. Peteru, *Complexity of land tenure rights in peatland management in Southeast Asia*. Center for International Forestry Research (CIFOR), 2025. doi: 10.17528/cifor-icraf/009358.
- I. Vansteenkiste, "How Important are Common Factors in Driving Non-Fuel Commodity Prices? A Dynamic Factor Analysis," 1072/July 2009, 2009. [Online]. Available: <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1072.pdf>
- C. Barr, I. A. P. Resosudarmo, A. Dermawan, J. McCarthy, M. Moeliono, and B. Setiono, Eds., *Decentralization of Forest Administration in Indonesia: Implications for Forest Sustainability, Economic Development and Community Livelihoods*. CIFOR, 2006. [Online]. Available: https://www.cifor-icraf.org/publications/pdf_files/Books/Bbarr0601.pdf
- S. Hutagaol, "Palm Oil Panic: New Single-Window Export Policy Flops as Farmgate Prices Collapse," Investor Trust Market. Accessed: May 28, 2026. [Online]. Available: <https://investortrust.id/market/104429/palm-oil-panic-new-single-window-export-policy-flops-as-farmgate-prices-collapse?page=english-edition>
- F. D. Bata and A. F. Noor, "Pengusaha Ingatkan Risiko Hambatan Ekspor Sawit Lewat Skema Satu Pintu," *Republika: Ekonomi Pertanian*. Accessed: May 28, 2026. [Online]. Available: <https://ekonomi.republika.co.id/berita/tfo3je490/pengusaha-ingatkan-risiko-hambatan-ekspor-sawit-lewat-skema-satu-pintu>
- R. Jadhav, B. Christina, and N. Thukral, "Indonesia plan to centralise palm oil exports raises fears of supply disruption," *Reuters World Business*. Accessed: May 28, 2026. [Online]. Available: <https://www.reuters.com/world/asia-pacific/indonesia-plan-centralise-palm-oil-exports-raises-fears-supply-disruption-2026-05-20/>
- L. S. Woittiez, M. T. Van Wijk, M. Slingerland, M. Van Noordwijk, and K. E. Giller, "Yield gaps in oil palm: A quantitative review of contributing factors," *Eur. J. Agron.*, vol. 83, pp. 57–77, 2017, doi: 10.1016/j.eja.2016.10.002.
- J. P. Monzon *et al.*, "Agronomy explains large yield gaps in smallholder oil palm fields," *Agric. Syst.*, vol. 210, p. 103689, 2023.
- D. J. Murphy, K. Goggin, and R. R. M. Paterson, "Oil palm in the 2020s and beyond: challenges and solutions," *CABI Agric. Biosci.*, vol. 2, no. 1, p. 39, Oct. 2021, doi: 10.1186/s43170-021-00058-3.
- A. E. Yustika, "Problems of the Indonesian Sugar Industry: An Institutional Economics Perspective," *J. Indones. Econ. Bus.*, vol. 20, no. 4, 2005, doi: <https://doi.org/10.22146/jieb.6583>.

- R. Ostfeld and D. M. Reiner, "Seeing the forest through the palms: developments in environmentally sustainable palm oil production and zero-deforestation efforts," *Front. Sustain. Food Syst.*, vol. 8, Jun. 2024, doi: 10.3389/fsufs.2024.1398877.
- A. A. Sulaiman, M. Arsyad, A. Amiruddin, T. T. Teshome, and B. Nishanta, "New Trends of Sugarcane Cultivation Systems Toward Sugar Production on the Free Market: A Review," *AGRIVITA J. Agric. Sci.*, vol. 45, no. 2, pp. 395–406, Jun. 2023, doi: 10.17503/agrivita.v45i2.4066.
- N. C. Irawan, Mahananto, T. Supriyadi, and Haryuni, "What are the Major Barriers and Challenges Faced by Independent Oil Palm Smallholder Farmers in RSPO Certification?," *J. Rural Urban Community Stud.*, vol. 2, no. 2, pp. 39–53, Aug. 2024, doi: 10.36728/jrucsv2i2.3917.
- D. Rosyita, I. M. Maharani, P. Astaman, A. Hikmah, and A. A. Rachmadhan, "Assessing the Impact of RED II and EUDR on Indonesia's Palm Oil Export Market Share and Market Concentration in the European Union," *Tarjih Agribus. Dev. J.*, vol. 5, no. 2, pp. 362–370, Dec. 2025, doi: 10.47030/tadj.v5i2.1063.
- B. Okarda, H. Purnomo, L. Juniyantri, S. D. Kusumadewi, and S. Nadhira, "Indonesian palm oil towards sustainability: a system dynamic approach," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 1379, no. 1, p. 012037, Aug. 2024, doi: 10.1088/1755-1315/1379/1/012037.
- UNCTAD, "The State of Commodity Dependence 2025: Technical and Statistical Report," 2025. [Online]. Available: https://unctad.org/system/files/official-document/ditccom2025d3_en.pdf
- J. Sayer, J. Ghazoul, P. Nelson, and A. Klintuni Boedhihartono, "Oil palm expansion transforms tropical landscapes and livelihoods," *Glob. Food Sec.*, vol. 1, no. 2, pp. 114–119, Dec. 2012, doi: 10.1016/j.gfs.2012.10.003.
- L. Nurfalah, A. A. Dwiyahreni, N. L. Winarni, K. Mizuno, and P. Grassini, "Preliminary Results of Relationship between Oil Palm Harvest Losses and Harvest Interval in Riau and West Kalimantan, Indonesia," *J. Penelit. Pendidik. IPA*, vol. 9, no. 12, pp. 10721–10726, Dec. 2023, doi: 10.29303/jppipa.v9i12.6120.
- D. E. Munévar-Martínez, E. Ruiz-Álvarez, M. C. Estupiñán-Villamil, and M. Mosquera-Montoya, "Sustainable intensification of oil palm production through integration with other crops: a review," *OCL*, vol. 32, no. 31, pp. 1–19, Oct. 2025, doi: 10.1051/ocl/2025022.
- C. Reich and O. Musshoff, "Oil palm smallholders and the road to certification: Insights from Indonesia," *J. Environ. Manage.*, vol. 375, p. 124303, 2025, doi: 10.1016/j.jenvman.2025.124303.
- L. Judijanto, "The Importance of Green Financing to Support Palm Oil Circular Economy Initiatives," *J. Bank. Financ. Dyn.*, vol. 10, no. 1, pp. 1–10, Jan. 2026, doi: 10.55220/2576-6821.v10.842.
- TradeImex, "Indonesia's Exports to the USA: 2025-26 Forecast, Key Trends, & Historical Export Data from 2015–2025," TradeImex. Accessed: May 28, 2026. [Online]. Available: <https://www.tradeimex.in/blogs/indonesia-us-trade-relations-2025-indonesia-exports-to-us-historical-data>
- GAPKI, "Stagnant Production, B50 May Cut RI's Palm Exports In 2026," GAPKI Publication Recent News. Accessed: May 28, 2026. [Online]. Available:

<https://gapki.id/en/news/2026/01/08/stagnant-production-b50-may-cut-ris-palm-exports-in-2026/>

- M. W. Rosegrant and P. B. R. Hazell, *Transforming the Rural Asian Economy: The Unfinished Revolution*, 1st ed. Oxford: Oxford University Press, 2000. [Online]. Available: <https://www.adb.org/sites/default/files/publication/28034/transforming-rural-asian-economy.pdf>
- C. Staritz, G. Gereffi, and O. Cattaneo, Eds., *Shifting End Markets and Upgrading Prospects in Global Value Chains*, 1st ed. Inderscience Enterprises Ltd., 2011. [Online]. Available: https://www.researchgate.net/profile/GaryGereffi/publication/281900635_Shifting_End_Markets_and_Upgrading_Prospects_in_Global_Value_Chains/links/55fd4d7508aeafc8ac5d020e/Shifting-End-Markets-and-Upgrading-Prospects-in-Global-Value-Chains.pdf
- Istriningsih *et al.*, “Farmers’ knowledge and practice regarding good agricultural practices (GAP) on safe pesticide usage in Indonesia,” *Heliyon*, vol. 8, no. 1, p. e08708, Jan. 2022, doi: 10.1016/j.heliyon.2021.e08708.
- S. A. Solarin, C. Lafuente, L. A. Gil-Alana, and M. J. González-Blanch, “Persistence in international prices of agricultural renewable commodities: a fractional integration approach,” *Soc. Sci. Humanit. Open*, vol. 12, p. 102112, 2025, doi: 10.1016/j.ssaho.2025.102112.
- Y. S. Lestari, M. Kresna, N. H. Endah, N. N. Atmaja, E. P. Irwanto, and B. Pratistha, “Policy Strategy to Stimulate Indonesia’s Palm Oil Downstream Industries,” *J. Indones. Sustain. Dev. Plan.*, vol. 6, no. 2, pp. 214–224, Aug. 2025, doi: 10.46456/jisdep.v6i2.726.
- H. Wahyudi and W. A. Palupi, “Natural Resources Curse in Indonesia,” *Int. J. Energy Econ. Policy*, vol. 13, no. 2, pp. 349–356, Mar. 2023, doi: 10.32479/ijeep.14077.
- A. D. Ekaputri, D. L. A. Gaveau, R. Heilmayr, and K. M. Carlson, “Uneven participation of independent and contract smallholders in certified palm oil mill markets in Indonesia,” *Commun. Earth Environ.*, vol. 6, no. 1, p. 721, Aug. 2025, doi: 10.1038/s43247-025-02683-6.
- M. P. Arumdhani, “The impact of biodiesel policy on the availability of cooking oil: An analysis of sustainable food strategies,” *JIPAGI J. Inov. Pangan dan Gizi*, vol. 2, no. 2, pp. 111–126, 2025, doi: 10.61511/jipagi.v2i2.1876.
- L. Judijanto, “Competitiveness of Indonesian CPO, its successful penetration in the European Union vegetable Oils market, and protectionism trade policies in the EU market to stop it grow further,” *Cogent Soc. Sci.*, vol. 11, no. 1, pp. 1-15., 2025, doi: 10.1080/23311886.2025.2501758.
- S. K. Chang, Á. Temesi, and B. Ridoutt, “Editorial: From palm to plate, from awareness to action – toward sustainable palm oil supply chains and consumption,” *Front. Nutr.*, vol. 12, Aug. 2025, doi: 10.3389/fnut.2025.1671825.
- A. Hidayatno *et al.*, “Exploring the food-versus-fuel debate in Indonesia’s palm oil industry toward sustainability: A model-based policymaking approach,” *Energy Nexus*, vol. 19, p. 100511, Sep. 2025, doi: 10.1016/j.nexus.2025.100511.
- W. Shafik, *Textbook of Green Growth and Technology*, vol. 43. in Sustainable Development and Biodiversity, vol. 43. Singapore: Springer Nature Singapore, 2026. doi: 10.1007/978-981-95-3632-0.

- M. I. Syahtaria, "Strengthening National Defense: Dynamics of Mandatory Biodiesel Policy and Renewable Energy Potential in Indonesia's Palm Oil Industry," *J. Manaj. Pelayanan Publik*, vol. 7, no. 2, pp. 391–407, Dec. 2023, doi: 10.24198/jmpp.v7i2.46798.
- E. Baldoni and P. Ciaian, "The capitalization of CAP subsidies into land prices in the EU," *Land use policy*, vol. 134, p. 106900, Nov. 2023, doi: 10.1016/j.landusepol.2023.106900.
- H. Purnomo *et al.*, "A political-economy model to reduce fire and improve livelihoods in Indonesia's lowlands," *For. Policy Econ.*, vol. 130, p. 102533, Sep. 2021, doi: 10.1016/j.forpol.2021.102533.
IPOSS, "2026 Palm Oil Outlook," Jakarta, 2026.
- L. Judijanto, "Navigating Uncertainty: Palm Oil Sector Outlook for 2026 through the Lens of Smallholder Welfare and Sustainability Imperatives," *Rev. Geopolítica*, vol. 17, no. 1, p. e1386, Jan. 2026, doi: 10.56238/revgeov17n1-127.
- A. Fadhilah, A. Fariyanti, and A. K. Adhi, "Potential Competitiveness of Indonesian Rubber Export in International Trade," *SOCA J. Sos. Ekon. Pertan.*, vol. 19, no. 2, p. 94, Jul. 2025, doi: 10.24843/SOCA.2025.v19.i02.p03.
- Hen, "Plant disease threatens thousands of hectares of rubber plantations," *The Jakarta Post: Business Economy*. Accessed: Jun. 09, 2026. [Online]. Available: <https://www.thejakartapost.com/news/2019/07/25/plant-disease-threatens-thousands-of-hectares-of-rubber-plantations>
- L. C. Stringer *et al.*, "Adaptation and development pathways for different types of farmers," *Environ. Sci. Policy*, vol. 104, pp. 174–189, Feb. 2020, doi: 10.1016/j.envsci.2019.10.007.
- A. Zayani and M. Taufiq, "Analysis of Factors Affecting Indonesian Natural Rubber Exports," *Int. J. Econ.*, vol. 3, no. 2, pp. 752–762, Jul. 2024, doi: 10.55299/ijec.v3i2.879.
- Erdi *et al.*, "Acceleration of Smallholder Palm Oil Certification in Riau: Between Rationality and Policy Utopia," *Forest Sci. Technol.*, pp. 1–12, Sep. 2025, doi: 10.1080/21580103.2025.2565629.
- N. K. Hidayat, A. Offermans, and P. Glasbergen, "Sustainable Palm Oil as a Public Responsibility? On the Governance Capacity of Indonesian Standard for Sustainable Palm Oil (ISPO)," *Agric. Human Values*, vol. 35, no. 1, pp. 223–242, 2018.
- N. S. Rahayu, A. A. Nugroho, and R. R. Yusuf, "Exclusion of Smallholders in the Indonesia Palm Oil Industry," *KnE Soc. Sci.*, 2022, doi: 10.18502/kss.v7i9.11010.
- D. Nurjanah and H. Anggrasari, "Role of the Middleman in Supporting of Oil Palm Smallholders' Community Performance: A Case Study in North Sumatra, Indonesia," *AgriHealth J. Agri-food, Nutr. Public Heal.*, vol. 4, no. 1, p. 14, Mar. 2023, doi: 10.20961/agrihealth.v4i1.70619.
- W. Wulandari, Testriono, and M. F. Karim, "Adopting the Palm Oil Moratorium Under External Pressure: Indonesia's Response to the EU's RED II," *For. Policy Econ.*, vol. 182, p. 103692, Jan. 2026, doi: 10.1016/j.forpol.2025.103692.
- S. Fayezi, H. Varkkey, and S. B. Briones, "Implications of the EU Deforestation Regulation on global palm oil supply chains," *Adelaide*, 18, 2024. doi: 10.13140/RG.2.2.12451.67361.
- C. S. Goh and L. Potter, "Bio-economy for sustainable growth in developing countries: The case of oil palm in Malaysia and Indonesia," *Biofuels, Bioprod. Biorefining*, vol. 16, no. 6, pp. 1808–1819, Nov. 2022, doi: 10.1002/bbb.2381.

- V. Blanford, M. Hrabanski, and J. Demenois, Eds., *Climate Impacts and Challenges in Agriculture, Forests and Food Systems*. Cham: Springer Nature Switzerland, 2026. doi: 10.1007/978-3-032-04331-3.
- L. Nesti, F. Tan, E. Ridwan, and R. Ampuh Hadiguna, "Vertical Integration Market Analysis of Palm Oil Fresh Fruit Bunches in West Sumatera, Indonesia," *Int. J. Eng. Technol.*, vol. 7, no. 4.9, 2018, doi: 10.14419/ijet.v7i4.9.21090.
- L. Judijanto, "Integrated Palm Oil Production Systems: Navigating Complexity from Upstream Cultivation to Downstream Value Creation in the Sustainability Era," *IJEBMR Int. J. Econ. Bus. Manag. Res.*, vol. 2, no. 1, pp. 9–26, 2026, doi: 10.64137/31079423/IJEBMR-V2I1P102.
- HDIN Research, "Palm Oil Giant Analysis: Indonesia Biodiesel Mandate Boosts Upstream Profits While Downstream Margins Tighten," HDIN Research News. Accessed: May 28, 2026. [Online]. Available: <https://www.hdinresearch.com/news/765>
- Palm Oil Magazine, "Indonesia Palm Oil Outlook 2026: Reforming for Sustainable Growth," Palm Oil Magazine. Accessed: May 28, 2026. [Online]. Available: <https://www.palmoilmagazine.com/opinion/2025/10/31/indonesia-palm-oil-outlook-2026-reforming-for-sustainable-growth/>
- N. I. Bahtera, M. Khaliqi, and N. Novindra, "The Impact of Crude Palm Oil Downstreaming Policies on the Indonesian Palm Oil Industry," *BIO Web Conf.*, vol. 208, p. 04001, Jan. 2026, doi: 10.1051/bioconf/202620804001.
- R. Mirajiah, "Multi-Track Economic Diplomacy Indonesia Facing EUDR (European Union Deforestation Regulation) Trade Barriers," *J. Soc. Res.*, vol. 5, no. 6, pp. 2296–2307, May 2026, doi: 10.55324/josr.v5i6.3178.
- S. Sabrina, Edmond Wangtri Putra, and M. Irfan Dwi Putra, "Perbandingan Pengaturan Mekanisme Cap-and-Tax di Indonesia dengan Pajak Karbon di Norwegia," *J. Huk. Lingkung. Indones.*, vol. 10, no. 1, pp. 99–122, Jun. 2025, doi: 10.38011/jhli.v10i1.735.
- Live-EO, "A Comprehensive Guide to Mastering Geolocation Data Collection for EUDR," Live-EO Guide. Accessed: Feb. 20, 2025. [Online]. Available: <https://www.live-eo.com/article/guide-to-eudr-geolocation-data-collection>
- R. Zhao and C. Liu, "Mapping 3D design system to digital product passport requirements: a case study of CLO3D and Style3D," *Res. J. Text. Appar.*, pp. 1–17, Feb. 2026, doi: 10.1108/RJTA-08-2025-0187.
- H. N. Jong, "Indonesia raises concerns over EU deforestation law's impact on smallholders," Mongabay Asia. Accessed: Dec. 29, 2025. [Online]. Available: <https://news.mongabay.com/2025/04/indonesia-raises-concerns-over-eu-deforestation-laws-impact-on-smallholders/>
- C. L. Gilbert, "The EU deforestation regulation," *EuroChoices*, vol. 23, no. 3, pp. 64–70, 2024, doi: 10.1111/1746-692X.12436.
- P. G. M. Simbolon, "When the Deforestation Meets the Free Trade: A Critical Analysis of the European Union Deforestation Free Regulation (EU DFR)," *JWTS J. World Trade Stud.*, vol. 8, no. 2, pp. 19–30, Nov. 2024, doi: 10.22146/jwts.v8i2.10059.
- V. Voora, S. Bermúdez, J. J. Farrell, C. Larrea, and E. Luna, "Palm Oil Prices and Sustainability," *IISD Sustain. Commod. Marketpl. Ser.*, 2023.

- A. Ruml *et al.*, “Smallholders in agro-industrial production: Lessons for rural development from a comparative analysis of Ghana’s and Indonesia’s oil palm sectors,” *Land use policy*, vol. 119, p. 106196, Aug. 2022, doi: 10.1016/j.landusepol.2022.106196.
- K. Sukiyono *et al.*, “The Contribution of Oil Palm Smallholders Farms to the Implementation of the Sustainable Development Goals-Measurement Attempt,” *Sustainability*, vol. 14, no. 11, p. 6843, Jun. 2022, doi: 10.3390/su14116843.
- I. Jelsma, F. Gay, J. Ollivier, and B. Rapidel, “Collective action, replanting and resilience; Key lessons from 40 years of smallholder oil palm cultivation in the Ophir plantation, Indonesia,” *Agric. Syst.*, vol. 213, p. 103801, 2024.
- L. Judijanto, “Exploring the Relationship between Palm Oil and Bioenergy,” *West Sci. Soc. Humanit. Stud.*, vol. 3, no. 9, pp. 1307–1316, 2025, [Online]. Available: https://www.researchgate.net/publication/396022607_Exploring_the_Relationship_Between_Palm_Oil_and_Bioenergy
- S. Shehu, “Malaysian response on challenges facing the global economy of palm oil,” *IJOMS Indones. J. Multidiscip. Sci.*, vol. 4, no. 4, pp. 239–245, 2025, [Online]. Available: <https://ijoms.internationaljournalabs.com/index.php/ijoms/article/download/991/1059>
- A. A. Siregar, A. Halimatussadiah, F. R. Moeis, W. A. K. Anky, and D. Nainggolan, “The oil palm replanting imperative: Are smallholder farmers willing to participate?,” *For. Policy Econ.*, vol. 169, p. 103362, Dec. 2024, doi: 10.1016/j.forpol.2024.103362.
- V. Trakem and H. Fan, “Agricultural trade liberalization, governance quality, and technical efficiency in the agricultural sector of Southeast Asia,” *Heliyon*, vol. 10, no. 21, p. e39553, Nov. 2024, doi: 10.1016/j.heliyon.2024.e39553.
- E. Siankwilimba *et al.*, “Green banking innovation for smallholder farmers: a commentary on financial accessibility and sustainability,” *Int. J. Agric. Sustain.*, vol. 23, no. 1, Dec. 2025, doi: 10.1080/14735903.2025.2553957.
- I. Mugwagwa, J. Bijman, and J. Trienekens, “Contract farming through cooperatives and smallholder satisfaction: Evidence from Malawi,” *World Dev. Perspect.*, vol. 43, p. 100799, Sep. 2026, doi: 10.1016/j.wdp.2026.100799.