PROBLEMY EKOROZWOJU/ PROBLEMS OF SUSTAINABLE DEVELOPMENT

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Realizing Sustainability: An Analysis of Agroforestry Policy Coherence in Indonesia in the Forestry, Agriculture and Environment Sectors

Realizacja zrównoważonego rozwoju: analiza spójności polityki rolno-leśnej w Indonezji w sektorach leśnictwa, rolnictwa i środowiska

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Abstract

Indonesia, which has the third most tropical forests in the world, is at the forefront of finding and fighting for a balance between climate change and food security. Agroforestry is a land use practice that has great potential to carry out this nature-based role, but its maximum benefits can be limited by uncoordinated policies in the forestry, agriculture, and environmental sectors. This paper examines policy inconsistencies and suggests structural improvements for sustainable governance. Analyzing nine key regulations (1999-2021) using the Policy Coherence for Sustainable Development (PCSD) framework, content analysis, and coherence matrix, complemented by empirical deforestation trend analysis, reveals significant vertical, horizontal, and internal misalignments. Critical findings include the absence of a clear agroforestry definition in regulations and lack of cooperation between forestry and agricultural sectors, particularly between Forestry Law No. 41/1999 and Agriculture Law No. 22/2019. This authority overlap complicates bureaucracy, obscures law, and perpetuates deforestation, hindering agroforestry's contribution to Sustainable Development Goals (SDGs) 1, 2, 13, and 15. The study contributes to literature by applying a policy coherence approach to agroforestry governance, shifting focus from previously emphasized technical and economic aspects to governance integration, while linking policy incoherence directly to tangible deforestation outcomes. This research has significance not only for Indonesia, but also for other countries facing similar governance challenges, as it offers a methodological framework for policy coherence analysis that can be applied to other contexts. The report emphasizes that regulatory harmonization and inter-ministerial institutional cooperation are essential to enhance agroforestry's contribution to sustainable development. The study proposes the implementation of integrated strategies to strengthen environmental sustainability, food security, and resilience to climate change by ensuring policy alignment and institutional reforms.

Keywords: agroforestry, policy coherence, policy fragmentation, policy harmonization, sustainable development

Streszczenie
Indonezja, która ma trzecie co do wielkości lasy tropikalne na świecie, przoduje w poszukiwaniu i walce o równowagę między zmianami klimatycznymi a bezpieczeństwem żywnościowym. Agroleśnictwo to praktyka użytkowania gruntów, która ma ogromny potencjał do pełnienia tej roli opartej na zasobach przyrody, ale jej maksymalne korzyści mogą być ograniczone przez nieskoordynowane polityki w sektorach leśnictwa, rolnictwa i środowiska. W niniejszym dokumencie przeanalizowano niespójności polityczne i zaproponowano ulepszenia strukturalne na rzecz zrównoważonego zarządzania. Badanie dziewięciu głównych regulacji wydanych w latach 1999–2021 z wykorzystaniem *ram Spójności Polityki na rzecz Zrównoważonego Rozwoju* (PCSD), analizy treści i macierzy spójności wyposażonej w dane empiryczne dotyczące trendów wylesiania pokazuje niespójności polityczne na poziomie pionowym, poziomym i wewnętrznym. Jednym z ważnych ustaleń jest brak jasnej definicji agroleśnictwa w przepisach, a także brak koordynacji między sektorem leśnym a rolnym – zwłaszcza między ustawą o leśnictwie nr 41/1999 a ustawą o rolnictwie nr 22/2019. To nakładanie się uprawnień komplikuje biurokrację, powoduje niepewność prawną i zwiększa tempo wylesiania, ostatecznie ograniczając rolę agroleśnictwa we wspieraniu Celów zrównoważonego rozwoju nr 1, 2, 13 i 15. Badania te wzbogacają literaturę poprzez przyjęcie podejścia opartego na spójności polityki w zarządzaniu agroleśnictwem, przenosząc punkt ciężkości z kwestii technicznych i ekonomicznych na integrację zarządzania. W związku z tym badanie to pokazuje, w jaki sposób niespójność polityki może bezpośrednio przyczyniać się do wylesiania. Podejście to jest również istotne do zastosowania w innych krajach, w których występują podobne wyzwania związane z zarządzaniem międzysektorowym, ponieważ zapewnia ono adaptacyjne i skalowalne ramy analizy polityki.. W sprawozdaniu podkreślono, że harmonizacja przepisów i międzyresortowa współpraca instytucjonalna mają zasadnicze znaczenie dla zwiększenia wkładu agroleśnictwa w zrównoważony rozwój. Badania te opowiadają się za holistycznym podejściem, które wspiera zrównoważenie środowiskowe, bezpieczeństwo żywnościowe i odporność na zmianę klimatu poprzez spójność między politykami i usuwanie barier instytucjonalnych.

Słowa kluczowe: agroleśnictwo, spójność polityki, fragmentacja polityki, harmonizacja polityki, zrównoważony rozwój

Introduction

Climate change continues to escalate on a global scale. Ecosystems are suffering due to increased rainfall variability, global temperatures, and frequent weather disturbances. Faced with increasingly complex global challenges, agroforestry is increasingly recognized as an effective nature-based approach to support sustainable development. These practices not only help address climate change, but also strengthen food security and restore damaged ecosystems (Garrity et al., 2010; Roy et al., 2025). In Indonesia, known for its rich tropical forests, agroforestry is seen as an important strategy to balance environmental sustainability and economic growth. This is especially true for mixed plantations and resin repong systems (Alviya & Suryandari, 2006; Purba, 2023). Additionally, agroforestry aids in natural carbon sequestration and enhances food and income diversification among farmers, which reduces carbon emissions (Duffy et al., 2021; Henke et al., 2023; Sheppard et al., 2020). Although agroforestry offers a wide range of benefits to Indonesia, the absence of clear and coordinated regulations in the forestry, agriculture, and environmental sectors has limited its potential (Chenyang et al., 2021; Springgay & Pajel, 2024). Overlapping and often conflicting sectoral policies are a major barrier to effective agroforestry implementation. Until now, the national development strategy still lacks to integrate the agroforestry system at large due to the lack of policy and institutional support (Tropenbos Indonesia, 2023). This condition further complicates Indonesia's efforts to achieve the Sustainable Development Goals (SDGs), as a fragmented approach exacerbates ecological problems such as deforestation.

Various studies have confirmed the benefits of agroforestry, especially in climate mitigation, food security, and sustainable land management (Vijay Kumar et al., 2024; Bhol et al., 2024). While the economic and environmental benefits have received attention from scientists (Wendu & Zerfu, 2023; Dhanish et al., 2025), the policy angle, particularly the need for cross-sectoral policy integration, has been relatively unaddressed. The problem of fragmented governance – characterized by policy silos, bureaucratic overlap, and diverse inter-ministerial regulations – has been a focus in research on policy coherence (Zinngrebe et al., 2020; Dombrowsky et al., 2022). Along with these innovative approaches, the coherence of Indonesia's agroforestry policies remains puzzling, particularly in light of recent policy changes like Law No. 22/2019 and Government Regulation No. 23/2021 (Nurrochmat et al., 2021). There is a surprising gap within the literature assessing the impact of these legislative changes on agroforestry policies and the frameworks within which such policies should be evaluated.

Most previous research has focused on agroforestry practices at the local level (Sudomo et al., 2023; Jihad & Lestari, 2021). Nonetheless, few studies have addressed in depth the broader legal and institutional aspects, which are often barriers to inter-sectoral policy coordination.

Recently, the idea of policy coherence related to sustainable development has attracted more and more attention. Researchers emphasized the need for cross-sectoral coordination through an integrated approach to achieve common development goals (Mackie, 2020; Brand et al., 2021). Several international contexts have employed policy coherence for sustainable development (PCSD) to assess how well national policies align with the SDGs and other global sustainability goals (Nilsson et al., 2012; Shawoo et al., 2022). Cooperative forestry, agriculture, and environmental policies are essential in supporting agroforestry and the Sustainable Development Goals (SDGs) 1, 2, 13, and 15 (Vijay Kumar et al., 2024; Bhol et al., 2024). There is a considerable gap in the application of policy coherence frameworks in Indonesian agroforestry governance, despite their successful implementation in other regions. Few studies have examined the policy aspects of agroforestry (Zinngrebe et al., 2020; Dhanish et al., 2025), while the majority have examined the technical benefits of agroforestry (Garrity et al., 2010). Due to the lack of a clear operational definition of agroforestry in regulatory documents and the division of policies among the various sectors (forestry, agriculture, and environment), there are significant issues that have not yet been fully addressed in the literature.

The absence of coherent definitions of agroforestry within the Indonesian policy frameworks gives rise to a legal and operational vacuum (Santos-Paulino, 2010; Springgay & Pajel, 2024). Due to this policy gap, there are differing sector and regional uses of resources which, in turn, leads to resource misallocation, as well as resource and sustainability opportunity cost. The lack of policy coherence, particularly between the production-oriented agriculture and forestry sectors, deepens gaps and creates conflicting goals, thus hampering cross-sector coordination (Singh & Dhyani, 2014; Zingerli et al., 2004). Significant changes, like the adoption of Government Regulation No. 23/2021, are accompanied by still insufficient policies. Such policies fail to embrace agroforestry's potential in sectoral multifunctional integration and national development. Due to legal overlaps and competing sectoral interests, large-scale implementation of agroforestry practices is challenging (Widiyanto et al., 2025). Consequently, there is a profound lack of understanding on how to ensure consistency in policy formulation as well as the integration of policy shift frameworks to incentivise sustainable agroforestry.

In an effort to address these gaps, this study applies an approach that reviews three dimensions of policy coherence – vertical, horizontal, and internal – to evaluate how existing policies work together in support of agroforestry practices (Nilsson et al., 2012; Shawoo et al., 2022). This study differs from others due to its emphasis on how governance and policy integration enable sustainable agroforestry practices in Indonesia. The agroforestry-related technical issues have been studied previously (Jihad & Lestari, 2021). This study is new in examining Indonesia's agroforestry policy through the lens of the PCSD (Policy Coherence for Sustainable Development) framework In addition to describing governance and policy barriers in agroforestry development, this study also presents applicative recommendations to improve institutional and policy coherence. The findings should aid in the development of more effective and integrated policies that support the role of agroforestry in Indonesia's sustainable development.

This study's primary objective is to examine how agroforestry policies vary across Indonesian sectors and offer solutions for improving their consistency. In order to identify significant policy inconsistencies and offer solutions for improving policy consistency, this study examines the forestry, agriculture, and environmental sectorsThe project further seeks to explore how coherence of policies might aid in the implementation of agroforestry with the aim of achieving the Sustainable Development Goals (SDGs), specifically goals 1 (no poverty), 2 (zero hunger), 13 (climate action), and 15 (life on land). The significance of this research lies in its contribution in strengthening the process of formulation and implementation of policies at the national and local levels. This study has the potential to increase the role of agroforestry in Indonesia's socio-economic development through the elimination of policy barriers and strengthening cross-sectoral cooperation. In addition to playing a role in strengthening food security, this research is also expected to contribute to efforts to mitigate climate change and preserve the environment.

To provide a strong empirical basis and directly examine the real impact of policy fragmentation, this study utilizes temporal analysis of deforestation data in Indonesia during the period 2001–2024. Through this approach, the study seeks to measure the impact of policy inconsistencies found and answer an important question: *what are the actual conditions on the ground?* By linking abstract policy conflicts to concrete trends in forest cover loss, this research strengthens its argument for urgent policy harmonization and provides a more comprehensive understanding of the challenges at the intersection of forestry, agriculture, and environmental governance in Indonesia.

The study is organized as follows: A thorough examination of the findings follows a discussion of the research methodologies used. The results are presented concerning policy coherence with regard to conflicts and overlaps between policy frameworks, as well as conflicts and overlaps between policy frameworks and on-the-ground realities. In the conclusions, the implications of the results regarding policy and governance frameworks are integrated with constructive proposals on improving institutional frameworks and coherence of the policies on agroforestry. The need for better alignment of policies for sustainable agroforestry in Indonesia will be underscored in the conclusions. It will also be underscored that for agroforestry to be fully effective in helping develop the SDGs, there is need for inter-sectoral collaboration.

This research emphasizes the urgency of developing integrated strategies in agroforestry governance, which in turn brings significant policy implications. It demonstrates the ways in which Indonesia's agroforestry policies can be made more effective by resolving the predicaments created by overcomplicated and illogical policies. Additionally, it offers other countries struggling with governance the opportunity to benefit from its experience integrating forestry and agriculture strategies for sustained growth.

2. Research methods

To analyse the gaps in Indonesia's agroforestry policies and formulate recommendations towards resolving their incoherence, this study applied qualitative descriptive methods. Because of the multifaceted nature of policy coherence and its context, we decided to take a qualitative approach. Analysis of institutional structures, legal policies, and regulatory documents requires thorough scrutiny and supervision (Creswell, 2014). For this reason, this study adopts the *Policy Coherence for Sustainable Development* (PCSD) framework to assess the extent to which policies are strategically integrated in governance systems involving various levels and actors, both national and international (Nilsson et al., 2012; Shawoo et al., 2022).

2.1. Data collection

2.1.1. Policy document collection

The data was obtained through a rigorous selection of regulatory documents from the agriculture, forestry, and environmental sectors in Indonesia. The selection was conducted based on four criteria: (1) legal position, (2) thematic relevance, (3) sector representation, and (4) validity period. The following documents have been examined:

- Forestry Sector Regulations: Government Regulation No. 23/2021, Minister of Environment and Forestry Regulation No. 9/2021, Law No. 41/1999, and Minister of Environment and Forestry Regulation No. 23/2021.
- Law No. 22/2019, Government Regulation No. 26/2021, and Minister of Agriculture Regulation No. 47/2006 are relevant to the agricultural sector.
- Law No. 32/2009 and Government Regulation No. 22/2021 pertain to the environmental sector. We selected these documents to demonstrate the effectiveness of collaboration between various sectors and governmental levels.

2.1.2. Deforestation data collection

To address the practical dimension of policy incoherence and respond to the reviewers' comments, we analyzed secondary data on Indonesia's forest cover change from 2001 to 2024. The data was taken from Mongabay, a reputable environmental journalism media that verifies deforestation figures through official government data and global monitoring agencies. The resulting dataset includes annual deforestation figures (in thousand hectares), providing a clear time-series view of forest cover dynamics over the 24-year period that aligns with the implementation of the reviewed policies.

2.2. Data analysis

There were two key parts to the data analysis: content analysis and policy coherence analysis.

2.2.1. Content analysis

We performed content analysis and collected relevant information from existing policies through a qualitative-systematic approach (Krippendorff, 2018). The analysis process was carried out through three main stages: (1) identification of text units, (2) thematic coding based on *the Policy Coherence for Sustainable Development* (PCSD) framework (Nilsson et al., 2012), and (3) evaluation of policy alignment through gap analysis focusing on sustainable agroforestry practices (Sheppard et al., 2020).

2.2.3. Policy coherence analysis

Brand et al. (2021) and Nilsson et al. (2012) defined a policy coherence analysis as the assessment of the degree of alignment policies hold across different domains, or policy areas. In the case of the analysed texts, a policy coherence analysis was conducted following the content analysis. To determine where overlap or inconsistency prevents agroforestry implementation, three steps were taken: (1) creating an analysis matrix; (2) identifying policy relationships; and (3) mapping interdependence relationships.

2.3 Data and analysis of deforestation trends

Analysis of deforestation data was conducted to identify long-term patterns, peak periods, and significant changes in the rate of forest loss. The stages of analysis include:

- Trend Analysis: Data are presented in a time series graph to show the development and pattern of deforestation from 2001 to 2024.
- Critical Point Identification: Annotating the chart to correlate significant peaks and troughs with key policy interventions (e.g., the 2011 moratorium) and major climatic events (e.g., the 2015 and 2019 El Niño fires).

3. Results And discussion

3.1. Key findings: gap in definition and recognition of agroforestry

The study discovered significant differences in the definition and recognition of agroforestry in Indonesian policy. Despite the fact that many policies align with agroforestry practices, none of the regulations provide a clear definition of agroforestry in terms of its operation. For example, the social forestry regulation of Minister of Environment and Forestry Regulation No. 9/2021 considers agroforestry a crucial land restoration technique, albeit without providing a definition. It is also mentioned in Minister of Environment and Forestry Regulation No. 23/2021 as a restoration approach, without any further guidance on how to legally or practically advance. The absence of action and in this case guidance, creates a gap in the legal framework that stifles the action of policy frameworks at both the central and state levels. Consequently, there is no single legal framework for the action or advocacy for agroforestry systems, which in turn poses the other problem of multi-sectoral and multi-disciplinary collaboration and cooperation and consistency.

3.2. Horizontal incoherence and conflicting priorities

The research revealed further contradictions concerning the policies for the environment, agriculture, and forestry sectors. Due to conflicts between each sector's policies and priorities, this was bound to occur. Sustainable forest management, governed by Law No. 41/1999, conflicts with self-sufficiency and food production priorities set by Law No. 22/2019 on sustainable agricultural systems. Land-use issues are a major source of inter-sector tensions: forestry policy places more emphasis on conservation, while agricultural policy is oriented towards increasing production and food security. The existence of several regulatory agencies, such as the Ministry of Agriculture and the Ministry of Forestry, exacerbates this situation, causing overlap in land management and administrative barriers. For example, the regulation of land ownership and use rights has become complex due to the intersection between Article 27 of the Forestry Law and Article 38 of the Agriculture Law. This weakens the government's ability to effectively govern and the robustness of the law, a weakness that has manifestly contributed to the complex and persistent deforestation trends explored later in this paper.

3.3. Vertical coherence and policy implementation gaps

Concerning vertical coherence, the research concluded that while there are national policy frameworks to support sustainable agroforestry, implementation at the local level often lacks guidance and support. Regulation No. 23/2021, for instance, supports the establishment of multi-forestry enterprises but does not provide detailed instructions for local government implementation.

Policies are not adequately localised because there are no effective mechanisms to align local government policies with the national policy frameworks. Because of this lack of coordination between the national government's objectives and local conditions, it is more challenging to incorporate agroforestry into broader sustainable development initiatives. Furthermore, this suggests that the autonomous uptake of agroforestry is often insufficient, a fact reflected in the spatially uneven patterns of deforestation seen across the archipelago, as will be detailed in Section 3.6.

3.4. Implications for achieving Sustainable Development Goals (SDGs)

Several Sustainable Development Goals (SDGs) are directly hampered by the fragmented and inconsistent nature of agroforestry policy. For example, achieving SDGs 1 (poverty alleviation) and SDGs 2 (food security) becomes increasingly challenging when inter-sectoral policies are not integrated. Agroforestry systems actually have great potential to strengthen food security and provide a sustainable source of livelihood. However, this potential has not been fully realized due to the lack of support from a consistent and comprehensive policy framework (Wendu & Zerfu, 2023; Bhol et al., 2024). In addition, SDGs 13 (action on climate change) and SDGs 15 (life on land) are also hampered by conflicts between forestry and agricultural policies, which ultimately hinder agroforestry systems from optimally contributing to carbon sequestration and biodiversity conservation (Vijay Kumar et al., 2024; Dhanish et al., 2025). The ongoing loss of forest cover, detailed in the following section, is a direct metric of this failure. The legal quagmire hinders agroforestry's ability to combat climate change and preserve biodiversity, two crucial SDG objectives for Indonesia.

Table 1. Agroforestry policy coherence in the forestry, agriculture, and environment sectors, source: researcher analysis (2025)

Sector	Regulation	Main Purpose/ Substance	Recognition of Agroforestry (Explicit/ Implicit)	Alignment with Agroforestry Principles	Koherensi Horizontal & Vertikal
Forestry	Law No. 41 of 1999	Sustainable forest management	Non-explicit, conceptually relevant	Deeply aligned with sustainability principles	Conflict with the agricultural sector, especially in terms of land definition and use (Article 27 of the Forestry Law and Article 38 of the Agriculture Law)
	Government Regulation No. 23 of 2021	Forestry implementation for sustainability and multi-business	Not explicit, but it opens up space for integration practices	Supporting the integration of forestry and agriculture businesses	It is vertically synergistic, but horizontally neutral because it lacks specific operational guidance
	Minister of Environment and Forestry Regulation No. 9 of 2021	Community empowerment through social forestry	Not explicit, the practice often applies agroforestry	Very relevant, agroforestry is a key strategy	It is complementary to social goals, but fragmented by production-oriented agricultural policies
	Minister of Environment and Forestry Regulation No. 23 of 2021	Planned and participatory forest and land rehabilitation	Not explicit, but agroforestry can be a method of rehabilitation	Aligned as an ecologically-based rehabilitation strategy	Complementarly vertically in the forestry and environmental sectors; neutral to the agricultural sector
Agriculture	Law No. 22 of 2019	Sustainable agriculture based on conservation and self-reliance	Not explicit	In line with agroforestry principles	Conflict with the forestry sector because of its focus on food production, which can ignore ecological functions (Article 1 of the Agriculture Law and Article 1 of the Forestry Law)
	Government Regulation No. 26 of 2021	Sustainable cultivation of food crops and horticulture	Not explicit	It can be integrated synergistically with agroforestry practices in forest buffer areas.	It has a horizontally neutral sectoral orientation, focusing on food production without synchronization with forestry sustainability principles.
	Minister of Agricultural Regulation No. 47 of 2006	Agricultural cultivation in mountainous land	Not explicit	Relevant for the application of agroforestry in the highlands	Conflict with forestry conservation policies, as it has the potential to encourage forest land conversion
Environment	Law No. 32 of 2009	Sustainable environmental management	Not explicit	Agroforestry is in line with the principles of environmental conservation	It is conceptually complementary; yet it is horizontally neutral because it lacks policy instruments for cross-sectoral integration
	Government Regulation No. 22 of 2021	Implementation of environmental protection and management	Not explicit	Agroforestry is relevant in supporting environmental action plans	Horizontally neutral; this policy is general without specifically targeting agroforestry

3.5 Policy harmonization: need for regulatory integration

The most important findings of the study underscored the gaps in policy harmonization in line with the agroforestry practices. The Policy Coherence for Sustainable Development (PCSD) Framework emphasizes the importance of policy coherence in cross-sectoral policy integration. This study highlights the importance of policy coherence in increasing program effectiveness, fostering the integration of SDGs achievements, and minimizing inter-sectoral

conflicts (Browne et al., 2023; Brand et al., 2021). The contribution of agroforestry to various sustainable development goals can only be realized through integrated and harmonized policies in the forestry, agriculture, and environmental sectors. To address the agroforestry gaps uncovered in this study, it is suggested that a Presidential Regulation be issued that comprehensively designates agroforestry as a national agenda with defined inter-sectoral collaboration mechanisms. The critical necessity of such harmonization becomes undeniably clear when viewed through the lens of Indonesia's historical and ongoing deforestation, which we analyze next.

3.6. The on-the-ground reality: tracing deforestation trends in Indonesia (2000-2024)

Nugroho et al. (2022) and Indrajaya et al. (2022) indicate that Indonesia's forest cover was approximately 120–120.5 million hectares in 2000. Analysis of annual deforestation from 2001 to 2024 (Jong, 2025), presented in Figure 1, shows a complex, fluctuating trend that closely corresponds with major policy shifts and climatic events.

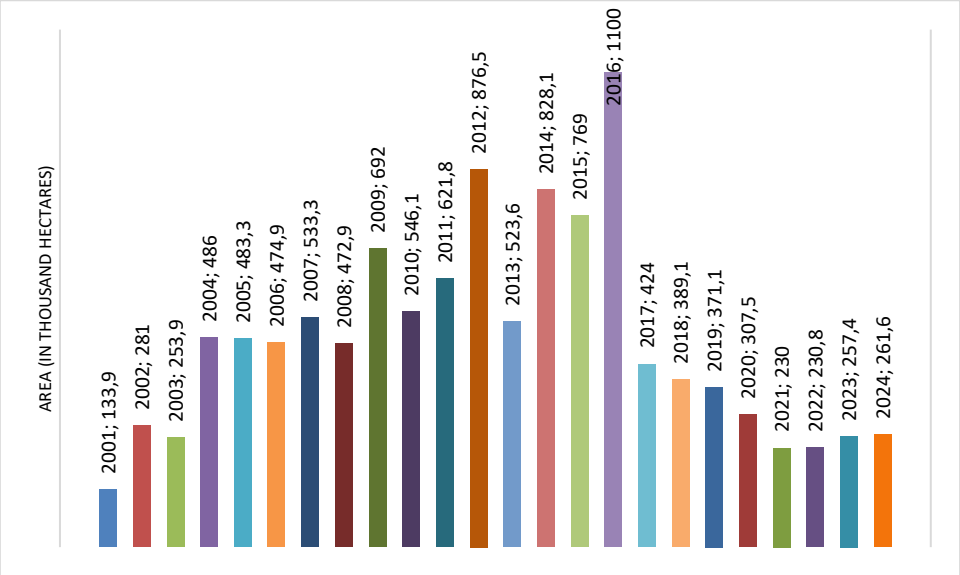

Figure 1. Annual deforestation in Indonesia (2001-2024), data sourced from (Jong, 2025)

The data findings indicate several critical periods in Indonesia's deforestation patterns. The early 2000s recorded very high rates of deforestation, along with the implementation of regional autonomy which often led to the massive issuance of logging and plantation permits (Casson & Obidzinski, 2002; Sakti et al., 2022; Austin et al., 2019). As a remedial measure, the government imposed a Moratorium on New Permits in Primary Forests and Peatlands (*Presidential Instruction No. 10/2011*). The impact varies – deforestation remained high in 2012 and 2015 – but these policies demonstrate a strong political commitment and are associated with a long-term reduction in deforestation (Amri & Ningrum, 2025). Large spikes in 2015 and 2019 were closely linked to forest and land fires exacerbated by El Niño, showing how land governance failures can exacerbate environmental disasters.

The post-2020 period showed a promising decline in deforestation, with the rate of forest loss in 2023–2024 falling to less than half of the mid-2010s peak. This trend is in line with the implementation of the FOLU Net Sink 2030 policy, which targets a positive balance between carbon sequestration and emissions in the forestry sector (MoEF, 2022). This confirms the effectiveness of consistent and integrated policies in achieving sustainable environmental outcomes.

Although the rate of deforestation is declining, its sustainability indicates that the strategies currently implemented are not fully effective. The fact that hundreds of thousands of hectares of forest are still being lost every year shows that the root causes of deforestation remain strong and have not been thoroughly addressed. This ongoing loss is the practical manifestation of the policy incoherence we have identified. On the one hand, the Ministry of Environment and Forestry (MoEF) seeks to strengthen conservation and restoration through the FOLU Net Sink 2030 policy and social forestry programs. But on the other hand, policies and economic incentives from the agricultural sector – especially the national *food estate* program and the expansion of sustainable commodity plantations – still often have implications for forest conversion (Purnomo et al., 2020; Purwanto et al., 2020; Gaveau et al., 2021). This conflict creates a *two-steps-forward, one-step-back* dynamic, preventing the more drastic reduction in deforestation that is critically needed.

The empirical findings of deforestation reinforce the results of the policy coherence analysis in this study. The continuing pattern of forest loss reflects the impact of conflicting policy priorities and institutional fragmentation. The recent decline is an indication that targeted policy leadership can lead to positive change, but the sustainability of deforestation confirms that the level of policy harmonization is still inadequate. Therefore, the achievement of

SDG 13 and SDG 15 depends on cross-sectoral policy alignment. Agroforestry, as an approach that blends production and conservation, has great potential to be a solution – as long as it is supported by consistent and coherent policies.

3.7. Novelty and contribution to the literature

This study contributes to the literature by applying a policy coherence approach to the governance of agroforestry in Indonesia. There have been studies focused on the technical and economic aspects of agroforestry (Garrity et al., 2010), but in applying agroforestry, systemic policy conceits have received less focus. In order to analyze the fragmentation of Indonesia's agroforestry governance, and its unique effects on the sustainable development initiatives, this study employs the PCSD paradigm. The study has significance not only for Indonesia, but for other countries grappling with the same challenge of agroforestry governance, since it offers a methodological framework for analyzing policy coherence to other settings.

3.8. Implications for policy and future research

This study offers notable insights regarding policy matters. In order to fully integrate agroforestry within the nation's growth strategies, the government has to first focus on policy alignment. To streamline the three domains of forestry, agriculture, and the environment within the SDGs, it will likely need to form inter-ministerial task force teams. To foster agroforestry, which is currently absent due to a lack of financing and support, lower-tier governments should implement financial subsidies alongside green financing strategies.

Numerous critical issues need to be addressed in further research. To comprehend the local implementation of agroforestry policies and local actions to deal with the regulatory challenges, local-level research must precede. In addition, the study of agroforestry governance in different regions of Indonesia or other tropic countries may help in understanding the impact of local attributes on its effectiveness. Last but not least, there is a need to study more the socio-economic impact of agroforestry, especially how it improves the income and food security of smallholder farmers. In order to appreciate the import of agroforestry as an environmental tool, research must be done in these vital areas first.

This study illustrates the need to resolve the issues arising from Indonesia's agroforestry governance which is characterized by policy fragmentation and lack of cohesiveness. The results underscore the importance of having a concise and operational definition of agroforestry within the scope of national legislation as well as uniform policy frameworks. Filling these voids would enable agroforestry to help Indonesia meet the SDGs and its sustainability goals. We recommend further research on the problems caused by the implementation of agroforestry policy and its economic and sociological impacts. That would bolster the call for comprehensive policy integration.

Conclusions and policy impliction

The application of the policy coherence approach in this study contributes to the scientific literature by analyzing agroforestry governance in Indonesia. In contrast to previous studies that focused on technical and economic aspects, this study highlights how systemic policy ideas affect the implementation of agroforestry. Through a study of governance fragmentation, this study emphasizes the importance of strengthening inter-institutional collaboration and synergizing cross-sectoral policies to achieve more effective and sustainable resource management. This research is relevant not only for Indonesia, but also as a methodological framework for other countries facing similar challenges.

In this study, we found several crucial gaps in agroforestry governance in Indonesia caused by the lack of a clear operational definition and misalignment between forestry and agricultural sector policies. This fragmentation of regulations not only complicates the implementation of agroforestry practices, but also hinders the achievement of the Sustainable Development Goals (SDGs), especially SDGs 1, 2, 13, and 15.

This research makes an important contribution to the development of the literature by applying a policy coherence approach to analyzing agroforestry governance—a different perspective from previous research that has generally focused on technical and economic aspects. We argue that systemic policy approaches have a crucial role to play in determining the success of agroforestry implementation. By examining forms of governance fragmentation, this study highlights the importance of strengthening inter-agency coordination and policy alignment across sectors.

Considering the great potential of agroforestry for sustainable development and empirical findings showing that deforestation is persisting despite declining, we urge governments to take concrete steps to immediately strengthen policy synergies that support sustainable forest management. The establishment of an inter-ministerial task force and the issuance of a Presidential Regulation that explicitly defines agroforestry and mandates cross-sectoral collaboration are no longer merely academic suggestions but urgent necessities. This research, by linking policy incoherence directly to tangible deforestation trends, underscores that the stakes are immensely practical. The implications of this study go beyond the Indonesian context, providing an analytical and policy framework that can be applied in other tropical countries that face similar challenges in balancing short-term economic interests with long-term ecological stability. The findings here are a definitive step forward towards crafting more effective, integrated, and *grounded* policies that can secure a sustainable future.

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