From Monoculture to Multifunctionality: A Review on Transforming Oil Palm Plantations into Eco-Tourism Landscapes Through Agroforestry Integration and High Conservation Value Protection

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Abstract

The global oil palm industry is undergoing a paradigm shift from monoculture-dominated production toward multifunctional landscape management that integrates ecological restoration, livelihood diversification, and conservation objectives. This paper presents a qualitative literature review examining how oil palm plantations can be transformed into eco-tourism landscapes through the integration of agroforestry and the protection of High Conservation Value (HCV) areas. Drawing upon peer-reviewed journal articles, institutional reports, and policy documents published since 2020, this study employs thematic content analysis to synthesize findings across four interrelated domains: (1) ecological restoration through agroforestry in oil palm landscapes, (2) HCV protection as a foundation for conservation-based tourism, (3) eco-tourism development models within transformed plantation settings, and (4) governance, policy, and institutional frameworks enabling transformation. The findings reveal that agroforestry systems within oil palm landscapes significantly enhance biodiversity, improve carbon sequestration, and create aesthetically and ecologically valuable environments conducive to eco-tourism. HCV areas serve as biodiversity reservoirs that anchor conservation tourism activities while providing critical ecosystem services. Community-based ecotourism models embedded within transformed oil palm landscapes offer promising pathways for livelihood diversification, environmental education, and rural economic empowerment. However, persistent challenges, including institutional fragmentation, financing constraints, certification costs, and smallholder capacity gaps, require coordinated multi-stakeholder governance and supportive policy frameworks. This review provides a conceptual synthesis that bridges the eco-tourism, agroforestry, and HCV conservation literature within the specific context of oil palm landscapes, offering evidence-based policy recommendations for sustainable landscape transformation.

Keywords: oil palm plantation, eco-tourism, agroforestry, High Conservation Value, biodiversity conservation, sustainable landscape, community-based tourism, rural livelihood, narrative review, multifunctional land use

JEL Classification: Q01, Q15, Q26, Q56, Q57, O13, R14, Z32.

Keywords: Eco-tourism; Landscapes; Agroforestry; Ecological restoration; Rural economic empowerment; Biodiversity; Rural livelihood

Abbreviations: RSPO: Roundtable on Sustainable Palm Oil; ISPO: Indonesian Sustainable Palm Oil; CBET: Community-Based Ecotourism; PES: Payment for Ecosystem Services

Introduction

Background

The oil palm (Elaeis guineensis) industry is one of the most significant agricultural sectors in the tropics, making vital contributions to national economies, rural livelihoods, and global food supply chains. Indonesia and Malaysia collectively account for approximately 85% of global palm oil production, with the commodity supporting over four million direct jobs and generating substantial export revenues. Oil palm's superior yield efficiency-producing more oil per hectare than any other oilseed crop-positions it as an indispensable component of global food security and bioenergy strategies [1].

However, the rapid expansion of oil palm monocultures across tropical regions has attracted international scrutiny regarding their environmental footprint. Conversion of forests and peatlands to plantation estates has been associated with biodiversity loss, habitat fragmentation, and greenhouse gas emissions. While these concerns are legitimate, it is important to recognize that the oil palm sector has made significant strides in sustainability, with certification schemes such as the Roundtable on Sustainable Palm Oil (RSPO) and the Indonesian Sustainable Palm Oil (ISPO) driving improvements in environmental and social practices. As of 2023, RSPO certification has protected over 466,600 hectares of valuable HCV and High Carbon Stock forests [2].

Against this backdrop, the concept of transforming oil palm plantations from monoculture production systems into multifunctional eco-tourism landscapes has emerged as an innovative sustainability pathway. This transformation envisions oil palm estates as dynamic landscapes that simultaneously sustain commodity production, restore ecological functions through agroforestry, protect biodiversity in HCV areas, and generate alternative income streams through nature-based tourism. Such a paradigm shift aligns with the growing global emphasis on landscape approaches that reconcile agriculture, conservation, and other competing land uses within integrated spatial frameworks [3].

Urgency of the study

The urgency of exploring this transformation is multidimensional. Ecologically, even well-managed oil palm monocultures harbor significantly lower biodiversity compared to native forests, necessitating complementary conservation strategies within plantation landscapes. The strategic management of HCV areas, riparian zones, and wildlife corridors within plantations can substantially enhance landscape-level biodiversity outcomes. Agroforestry, which integrates tree species within oil palm stands, offers a proven mechanism to improve ecosystem services, including carbon sequestration, soil health, and microclimate regulation [4].

Socioeconomically, rural communities dependent on oil palm cultivation face vulnerabilities stemming from commodity price volatility, aging plantations, and limited options for income diversification. Eco-tourism represents a promising avenue for livelihood diversification, particularly in regions endowed with natural beauty and cultural heritage. Community-based ecotourism models have demonstrated success in enhancing local incomes, fostering entrepreneurship, and promoting environmental stewardship across tropical developing countries [5].

From a policy standpoint, the European Union Deforestation Regulation (EUDR), which sets a deforestation cut-off date of December 31, 2020, has intensified pressure on palm oil producers to demonstrate deforestation-free and sustainability-compliant supply chains. This regulatory environment creates both challenges and opportunities, incentivizing producers to adopt landscape management practices that visibly integrate conservation and sustainability objectives. Simultaneously, the alignment with Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 8 (Decent Work), SDG 12 (Responsible Consumption), SDG 13 (Climate Action), and SDG 15 (Life on Land), provides a compelling rationale for transformative approaches [6,7].

Research objectives and questions

This qualitative literature review aims to explore how oil palm plantations can be transformed, conceptually and practically, into eco-tourism landscapes through the dual strategies of agroforestry integration and HCV area protection. The specific research questions are:

i.   How can agroforestry practices facilitate the ecological transformation of oil palm monocultures into landscapes suitable for eco-tourism?

ii.   In what ways can HCV area protection serve as a foundational component for conservation-based tourism within oil palm landscapes?

iii.   What governance, policy, and institutional frameworks enable or hinder this transformation?

iv.   What are the socioeconomic implications, including community benefits and livelihood diversification outcomes, of this landscape transformation?

This review contributes to the academic literature by providing an integrative conceptual synthesis that bridges three traditionally separate research domains-ecotourism, agroforestry, and HCV conservation-within the specific context of oil palm landscapes [8].

Literature Review

Ecotourism: concepts, principles, and applications in agricultural landscapes

Ecotourism is defined as responsible travel to natural areas that conserves the environment, sustains the well-being of local people, and involves interpretation and education. The concept has evolved from purely nature-based tourism to encompass agricultural settings, giving rise to Agri-ecotourism models that leverage farm landscapes as educational and recreational platforms. In the context of tropical plantation crops, ecotourism offers a means to diversify economic activities while promoting environmental awareness and cultural preservation [9].

The development of community-based ecotourism (CBET) in developing countries has gained substantial research attention. A revised sustainable livelihood framework incorporating socio-cultural capital for CBET development has been proposed, emphasizing that community empowerment and equitable benefit sharing are critical success factors. In plantation settings

specifically, ecotourism can serve as a platform for learning about sustainability, connecting visitors to environmental principles through experiential interactions within managed agricultural landscapes. Malaysia's oil palm ecotourism model, for instance, envisions plantations as dynamic educational environments where students, communities, and consumers engage firsthand with sustainable agricultural practices [5].

Agroforestry in oil palm landscapes

Agroforestry-the intentional integration of trees with crops and/or livestock-represents one of the most promising strategies for enhancing the ecological value of oil palm landscapes. Oil palm agroforestry systems encompass various configurations, including Agri silviculture (combining oil palm with timber or fruit trees), alley cropping, and the establishment of tree islands or biodiversity enrichment plantings within plantation matrices [10].

The ecological benefits of oil palm agroforestry are well-documented. Research from Sumatra demonstrates that agroforestry systems significantly enhance biodiversity, with tree diversification supporting a greater abundance and diversity of bird species, arthropods, and understory vegetation than in monoculture stands. A study in the Harapan Rainforest landscape found that oil palm agroforestry could improve ecological conditions by restoring habitat complexity and supporting species movement across fragmented landscapes. Oil palm agroforestry has also been shown to enhance carbon sequestration, with agroforestry plots storing significantly more aboveground and belowground carbon than conventional monoculture blocks [11].

Beyond its ecological benefits, agroforestry provides substantial socioeconomic benefits. Diversified cropping systems buffer smallholder farmers against price volatility by generating supplementary income from fruit, timber, and non-timber forest products. In Brazil's Tomé-Açu region, oil palm agroforestry has demonstrated that integrating cocoa, pepper, and native trees can create productive and environmentally sustainable farming systems. Research synthesized evidence demonstrating that agroforestry within oil palm landscapes improves microclimates, diversifies income sources, and strengthens community governance in tourism ventures [10].

High conservation value (HCV) in oil palm plantations

The HCV framework, widely adopted by the RSPO and other certification bodies, identifies six categories of conservation value: HCV 1 (concentrations of biodiversity), HCV 2 (landscape-level ecosystems), HCV 3 (rare or threatened ecosystems), HCV 4 (critical ecosystem services), HCV 5 (community livelihood needs), and HCV 6 (cultural values). Oil palm companies seeking RSPO certification are required to identify, manage, and monitor HCV areas within their concessions [12].

Research on HCV management in oil palm landscapes reveals both achievements and persistent challenges. Nasution et al. (2024) analyzed vegetation and plant diversity in HCV areas of oil palm plantations in Central Kalimantan, identifying 25 plant species across 17 families and a total of 355 individual plants, although the overall diversity index remained in the low category. A more comprehensive study of plant diversity in Gorontalo, Indonesia, identified 111 species across HCV forest and plantation sites, including eight Sulawesi endemics and 64 medicinal species, underscoring the conservation value of remnant habitats within monoculture landscapes [13].

Judijanto et al. (2024) demonstrated that applying adaptive management principles in HCV areas of oil palm plantations in Seruyan District, Central Kalimantan, achieved a 75% reduction in HCV area encroachment, confirming that proactive management can effectively maintain conservation values within production landscapes. The RSPO-HCVN partnership, formalized through a 2024 Memorandum of Understanding, further strengthens the institutional framework for embedding HCV protections within sustainable palm oil standards [13].

However, corporate commitments to biodiversity protection remain difficult to achieve due to limited knowledge of effective conservation strategies and insufficient attention to social challenges. Challenges include variability in the quality of HCV assessments across companies, inadequate monitoring capacity, and the need for stronger community engagement in conservation governance [11].

Theoretical frameworks

This review draws upon three interconnected theoretical frameworks. First, the Sustainable Livelihood Framework provides a lens for understanding how ecotourism and agroforestry jointly contribute to livelihood diversification by expanding the asset base (natural, human, social, financial, and physical capitals) available to rural communities. Second, the Landscape Approach, which emphasizes integrated management of land and resources across spatial scales, offers conceptual grounding for reconciling agricultural production, conservation, and tourism within a single landscape unit. Third, Payment for Ecosystem Services (PES) and green economy concepts provide the economic rationale for compensating conservation actions, linking environmental stewardship with financial sustainability [14].

Methodology

Research design: qualitative literature review

This study adopts a qualitative (narrative) literature review approach, which differs from systematic literature reviews (SLRs) in its flexibility, interpretive depth, and capacity for conceptual synthesis. Narrative reviews are particularly appropriate when the research objective is to provide a readable, thoughtful, and practical synthesis of a topic rather than to answer a highly focused clinical question. A well-conducted narrative review allows authors to advance new ideas while describing and interpreting literature in the field, making them suitable for emerging and interdisciplinary research domains [15,16].

The rationale for choosing a narrative review over a systematic review lies in the interdisciplinary and exploratory nature of this study, which spans three distinct but intersecting fields-ecotourism, agroforestry, and HCV conservation-within the specific context of oil palm landscapes. A systematic review's rigid methodological protocol, while appropriate for narrowly defined research questions, would be less suitable for the broad conceptual integration sought in this paper [17].

Data collection

Literature was searched across multiple academic databases, including Scopus, Web of Science, Google Scholar, and ScienceDirect. Search terms included combinations of keywords such as "oil palm agroforestry," "ecotourism plantation," "High Conservation Value oil palm," "biodiversity conservation palm oil," "community-based ecotourism tropical," and "landscape approach palm oil." Additional sources were identified through citation tracking and scanning of reference lists in key articles.

Inclusion criteria comprised: (a) peer-reviewed journal articles and credible institutional reports published since 2020; (b) Indonesian or English-language publications; (c) thematic relevance to at least one of the three core domains (ecotourism, agroforestry, or HCV conservation) within oil palm or comparable tropical plantation contexts. Exclusion criteria included non-peer-reviewed opinion pieces, publications outside the specified timeframe, and studies focused exclusively on non-tropical agricultural systems without transferable relevance.

Data analysis

Following the principles outlined by Sukhera, the analysis proceeded through iterative cycles of reading, coding, and theme development. Initial open coding identified recurring concepts, which were subsequently organized into thematic categories aligned with the research questions. The five foundational elements of narrative review rigor-clear research question framing, transparent documentation of search strategies, justification of inclusion criteria, reflexivity and saturation statements, and detailed descriptions of analyses-were systematically addressed [15].

Thematic synthesis was employed to identify patterns, convergences, and tensions across the reviewed literature. Findings were organized into four major themes: ecological restoration, HCV protection, ecotourism development models, and governance frameworks. The positive and constructive orientation of the analysis reflects the aim of identifying viable pathways for transformation rather than cataloguing problems.

Result

Theme 1: Ecological restoration through agroforestry in oil palm landscapes

Biodiversity enhancement through tree diversification

The literature consistently demonstrates that incorporating tree diversity within oil palm landscapes yields significant biodiversity gains. It has been found that understory vegetation in oil palm plantations supports more abundant and diverse butterfly communities, particularly when non-crop vegetation is maintained. In Papua's oil palm landscape, substantial diurnal bird diversity has been recorded, and their ecological roles in pest control and pollination have been documented, confirming that biodiversity within plantations can deliver functional ecosystem services [18,19].

Agroforestry enrichment experiments in Sumatra have shown that tree performance in biodiversity-enriched oil palm plots is promising, with native species establishing successfully alongside oil palms when appropriate management practices are applied. The integration of fruit trees, timber species, and nitrogen-fixing trees creates structural complexity that mimics natural forest habitats and provides resources for a wider range of taxa [20-22].

Carbon sequestration and microclimate improvement

Oil palm agroforestry systems exhibit greater carbon storage capacity than monocultures. Research indicates that agroforestry plots can store significantly more carbon in aboveground biomass due to additional tree canopy layers. It has been documented that agrosilviculture and agroforestry systems provide carbon sequestration benefits, with multi-strata tree arrangements substantially increasing total ecosystem carbon relative to single-species stands [23].

Microclimate improvements associated with agroforestry include reduced soil surface temperatures, increased canopy relative humidity, and enhanced water-retention capacity. These microclimatic benefits not only support biodiversity but also create more comfortable environments for ecotourism activities, such as walking trails, birdwatching, and nature photography [24].

Soil health rehabilitation

Regenerative agriculture pilots in Indonesia's oil palm smallholdings have shown encouraging results in improving soil health. In Central Kalimantan, a regenerative agriculture program involving 96 farmers demonstrated increases in soil organic matter content, enhanced soil biological health, and signs of more active earthworm and beneficial bacterial populations. These findings suggest that combining agroforestry with regenerative practices can reverse soil degradation patterns associated with intensive monoculture management, building a healthier landscape foundation for eco-tourism destinations [25].

Theme 2: HCV protection as a foundation for eco-tourism landscape

HCV areas as biodiversity hotspots and tourism assets

HCV areas within oil palm plantations serve as refugia for species that cannot persist in monoculture environments. Research from Central Kalimantan documented 25 plant species across HCV areas, including species with high ethnobotanical

value. In Gorontalo, forest plots within the plantation matrix supported 79 species compared to 56 in plantation areas, including endemic and IUCN-listed species. These findings indicate that HCV areas, though embedded within production landscapes, retain significant conservation value that can be leveraged as eco-tourism attractions [26,27].

The tourism potential of HCV areas is considerable [28,29]. Wildlife observation opportunities, botanical diversity, and intact riparian ecosystems within plantation concessions can serve as the basis for specialized nature tourism products. It has been shown that successful HCV management, including a 75% reduction in area encroachment, creates conditions in which natural vegetation recovers, and wildlife populations stabilize-essential prerequisites for nature-based tourism.

Wildlife corridors and landscape connectivity

The establishment of wildlife corridors within oil palm landscapes represents a critical strategy for both biodiversity conservation and eco-tourism development. In Sabah, Malaysian Borneo, conservation efforts have converted former oil palm plantations into rainforest corridors connecting the Tabin and Kulamba Wildlife Reserves, with approximately 8,000 native trees planted on 50 hectares. This corridor restoration enables the movement of endangered species, including Bornean pygmy elephants and proboscis monkeys, creating high-value wildlife tourism opportunities [30-32].

Sabah Softwoods Berhad's experience demonstrates that allocating land for wildlife corridors can yield economic co-benefits: after establishing a 1,067-hectare corridor, crop damage caused by elephants declined by over 90%, from RM500,000 annually to approximately RM5,000. This evidence challenges the assumption that conservation within plantations necessarily conflicts with profitability and supports the business case for landscape-level conservation investments [33-35].

Challenges in HCV management and monitoring

Despite these promising developments, HCV management remains a persistent challenge. Surveys and interviews with plantation managers from 12 palm oil companies in Malaysia and Indonesia revealed difficulties, including limited capacity for biodiversity monitoring, unclear metrics for measuring conservation success, and inadequate community engagement. The need for standardized biodiversity metrics and guidance on data analysis is a key recommendation to improve HCV management outcomes [36-38]. naturebasedsolutionsinitiative+1 Financial constraints also pose barriers, particularly for smallholders who lack the resources to conduct formal HCV assessments. The RSPO's Research Agenda 2025 highlights the need for simplified and cost-effective HCV monitoring approaches suitable for small-scale operations [39].

Theme 3: Eco-tourism development in transformed oil palm landscapes

Models of plantation-based ecotourism

The literature identifies several ecotourism models applicable to transformed oil palm landscapes. It has been synthesized that agroforestry-based oil palm systems can serve as viable ecotourism destinations, offering educational tours, biodiversity observation, and experiential farm activities. In Malaysia, a conceptual model proposes three strategic phases for oil palm ecotourism development: (1) policy alignment, stakeholder engagement, and site readiness; (2) sustainable land management and ecotourism implementation; and (3) certification, monetization, and global positioning [3].

It has been demonstrated the success of agroforestry-based eco-tourism in Indonesia's Batur UNESCO Global Geopark in Bali, where integration of conservation, agriculture, and tourism generated economic, environmental, and climate resilience benefits. The agri-ecotourism model developed in Tigbauan, Philippines, further illustrates how organic farming, community involvement, and eco-friendly infrastructure can be combined to create sustainable tourism destinations [40].

Community participation and benefit sharing

Meaningful community participation is consistently identified as a critical success factor for plantation-based ecotourism. Community-based ecotourism models that incorporate local governance structures, equitable benefit-sharing, and capacity building have demonstrated superior sustainability outcomes compared to externally imposed tourism ventures [34,41,42].

It has been documented that sustainable palm oil initiatives that involve inclusive business models and multi-stakeholder collaboration have improved smallholder incomes, reduced environmental impacts, and strengthened social capital. The Creating Shared Value (CSV) framework, applied in the palm oil sector, offers a strategic pathway to align corporate tourism investments with community development outcomes, ensuring that the economic value generated through ecotourism is equitably distributed [1].

Environmental education and sustainability learning

Eco-tourism within transformed oil palm landscapes serves a dual purpose: generating income and fostering environmental awareness. Oil palm ecotourism can provide interactive experiences connecting visitors to sustainability principles, including biodiversity appreciation, responsible consumption, and climate-conscious agriculture. This sustainability learning function is particularly valuable for youth engagement, with plantation-based educational programs offering hands-on exposure to agroforestry practices, wildlife conservation, and

ecosystem management [7,43].

Environmental education programs integrated into ecotourism sites have been shown to enhance participants' environmental knowledge and pro-conservation attitudes significantly. By positioning transformed plantations as living laboratories for sustainability, the oil palm sector can contribute to broader societal shifts toward environmental responsibility [44,45].

Theme 4: Governance, policy, and institutional frameworks

RSPO, ISPO, and voluntary sustainability standards

Sustainability certification schemes provide the institutional backbone for landscape transformation. RSPO certification, which requires HCV identification, management, and monitoring, has created measurable conservation outcomes, with certified areas exhibiting lower deforestation rates than uncertified regions. The 2024 RSPO Standards reinforce the use of the Integrated HCV-HCS approach as the primary mechanism for ecosystem protection within palm oil landscapes [39].

Indonesia's ISPO certification, made mandatory for all oil palm growers, including smallholders, establishes minimum sustainability criteria aligned with national regulations. Research indicates that ISPO-certified smallholders achieve 82% higher land productivity than conventional farmers, demonstrating that certification compliance and productivity gains are mutually reinforcing. However, independent smallholder certification rates remain low, with fewer than 15% certified, underscoring the need for accelerated support mechanisms [46-49].

EU Deforestation regulation and international regulatory pressure

The EUDR represents a transformative shift from voluntary sustainability standards to mandatory legal requirements for products linked to deforestation. Under the regulation, palm oil entering the EU market must be traceable to its exact cultivation site and demonstrated to be deforestation-free relative to the December 31, 2020, cutoff date. Companies that fail to comply face penalties of up to 4% of their total EU turnover [50-52].

While the EUDR creates compliance challenges, particularly for smallholders with limited traceability infrastructure, it also incentivizes the adoption of landscape management practices that visibly integrate conservation objectives. Producers who can demonstrate not only deforestation-free sourcing but also positive conservation outcomes-such as HCV protection and agroforestry integration-may gain competitive advantages in increasingly sustainability-conscious markets [53-55].

multi-stakeholder governance and landscape approaches

Effective landscape transformation requires coordinated governance involving governments, companies, NGOs, smallholder organizations, and research institutions. Research on landscape approaches demonstrates that longer-term, multisectoral initiatives involving diverse stakeholders from early design stages produce better conservation and development outcomes. However, governance fragmentation, conflicting interests, and financial instability remain significant obstacles. Research [49,56-58].

It has been documented the structural challenges facing independent smallholders in participating in certified palm oil markets, including uneven bargaining power, limited access to institutional support, and information asymmetries. Addressing these governance gaps requires strengthened cooperation, mainstreamed biodiversity considerations across policy sectors, and diversified funding sources [59,60-62].

Discussion and Analysis

Synthesis: integrating agroforestry, HCV protection, and ecotourism

Conceptual integration of the three pillars

The review reveals that agroforestry, HCV protection, and ecotourism function as synergistic components of a multifunctional landscape model. Agroforestry provides the ecological foundation by enhancing biodiversity, sequestering carbon, and creating aesthetically diverse environments. HCV areas serve as conservation anchors that maintain landscape-level ecological integrity and provide unique tourism assets, including intact habitats and wildlife populations. Ecotourism generates the economic returns and social incentives that sustain conservation investments and diversify rural livelihoods [13].

This three-pillar model aligns with the landscape multifunctionality concept, which emphasizes the simultaneous delivery of multiple ecosystem services-provisioning, regulating, cultural, and supporting-within integrated land management frameworks. By reconceptualizing oil palm landscapes as multifunctional systems rather than as single-commodity production zones, stakeholders can unlock opportunities to create value that benefits both nature and people [1].

Synergies and co-benefits

The synergistic relationships among the three pillars generate compounding positive outcomes. Agroforestry increases biodiversity within the plantation matrix, thereby enhancing wildlife observation and botanical diversity in HCV areas and increasing the attractiveness of eco-tourism. Tourism revenues provide financial resources for continued agroforestry investment and HCV management, creating a positive feedback loop. Community engagement in ecotourism activities strengthens local stewardship motivations, reducing encroachment pressures on HCV areas [4].

Economic co-benefits include income diversification for plantation operators and surrounding communities, reduced

dependence on palm oil commodity prices, and potential price premiums for sustainability-certified products. Environmental co-benefits encompass enhanced ecosystem resilience, improved climate regulation, and strengthened ecological connectivity across landscapes [61].

Trade-offs and tensions

Despite these synergies, trade-offs exist that must be acknowledged and managed. Short-term productivity reductions may occur when converting monoculture areas to agroforestry systems, particularly during establishment phases when tree crops have not yet reached productive maturity [62]. The allocation of land for HCV protection and wildlife corridors represents an opportunity cost in terms of foregone palm oil production. However, evidence from Sabah suggests the net economic impact may be neutral or positive when reduced crop damage and ecosystem service values are accounted for [63].

Market challenges also present tensions. While eco-tourism demand is growing, many oil palm regions lack the tourism infrastructure, marketing capacity, and visitor access necessary to support viable tourism enterprises. Bridging this gap requires targeted infrastructure investment, human capital development, and market linkage support from governments and development partners [64-67].

Critical Analysis of enabling conditions and barriers

Enabling conditions

Several factors enable successful landscape transformation. Supportive policy frameworks-including the integration of HCV data into spatial planning, fiscal incentives for agroforestry adoption, and streamlined ecotourism licensing-create an enabling environment for transformation. Payment for Ecosystem Services (PES) mechanisms offer financial instruments to compensate for conservation actions, with research demonstrating that well-designed PES programs can significantly reduce deforestation and improve cost-effectiveness [14].

Access to green financing, including climate funds, impact investments, and sustainability-linked loans, provides critical capital for transformation investments. Knowledge transfer through extension services, farmer field schools, and research partnerships ensures that technical know-how reaches practitioners on the ground [68,69].

Barriers and constraints

Persistent barriers include institutional fragmentation among government agencies responsible for agriculture, forestry, conservation, and tourism, hindering integrated landscape planning. Smallholder capacity constraints-limited education, financial resources, and organizational capacity-restrict participation in both certification schemes and ecotourism ventures. High upfront investment costs for agroforestry establishment, HCV management infrastructure, and tourism

facilities deter adoption, particularly among resource-constrained actors [1].

Market uncertainty regarding ecotourism demand, combined with the long-time horizons required for agroforestry systems to reach maturity, creates investment risk that may discourage early adopters. Addressing these barriers requires bundled support packages that combine technical assistance, financial subsidies, land tenure security, and market access support [1,70].

Lessons from case studies

International case studies provide valuable lessons for landscape transformation. In Borneo, the Rhino and Forest Fund's initiative to convert oil palm plantations into rainforest corridors demonstrates the feasibility and conservation value of plantation-to-forest restoration, with 8,000 native trees planted on former plantation land connecting protected areas. In Brazil, the Tomé-Açu community's oil palm agroforestry system has been recognized as a model of sustainable tropical agriculture, integrating oil palm with cocoa, açaí, and native trees to create a productive, biodiverse farming system [71,72].

Indonesia's regenerative agriculture pilot in North Sumatra, involving 96 smallholders across four villages, provides evidence that regenerative practices, integrated with agroforestry principles, can improve soil health, reduce reliance on chemical inputs, and enhance harvest consistency in oil palm systems. These case studies collectively suggest that transformation is technically feasible and can generate meaningful ecological and economic outcomes when supported by appropriate institutional arrangements [24].

Toward a transformative model

Proposed framework for transformation

Based on the synthesized evidence, this review proposes a three-phase transformation framework.

Phase 1: Readiness and Assessment involve conducting HCV and land-suitability assessments, engaging stakeholders through participatory planning processes, and developing landscape-transformation master plans that delineate production zones, conservation areas, and tourism-development sites [73].

Phase 2: Implementation and Integration encompass the establishment of agroforestry systems within production areas, the strengthening of HCV management and monitoring protocols, the development of ecotourism infrastructure and programs, and the building of community capacity for tourism enterprise management [8].

Phase 3: Certification, Monetization, and Scaling focus on achieving sustainability certification (RSPO, ISPO) for the transformed landscape, developing market linkages for ecotourism products and services, establishing PES mechanisms to generate ongoing revenue for conservation, and scaling successful models across additional landscapes [14].

Alignment with SDGs and Global sustainability agendas

The proposed transformation model aligns with multiple SDGs. SDG 1 (No Poverty) is addressed through livelihood diversification and income enhancement from ecotourism and diversified agroforestry products. SDG 8 (Decent Work and Economic Growth) is supported by the creation of new employment opportunities in tourism and landscape management. SDG 12 (Responsible Consumption and Production) is advanced by promoting sustainably produced palm oil and environmentally conscious tourism practices. SDG 13 (Climate Action) benefits from enhanced carbon sequestration in agroforestry systems. SDG 15 (Life on Land) is directly supported through HCV protection, biodiversity conservation, and habitat restoration within the oil palm landscape [7,74].

Conclusion

Substantive conclusion

This qualitative literature review demonstrates that the transformation of oil palm plantations into eco-tourism landscapes through agroforestry integration and HCV protection is conceptually sound and supported by a growing body of empirical evidence. The three-pillar model-combining agroforestry's ecological restoration functions, HCV areas' anchoring role in conservation, and ecotourism's economic and educational contributions-offers a viable pathway to reconcile production, conservation, and livelihood objectives within oil palm landscapes.

Key findings indicate that agroforestry within oil palm systems significantly enhances biodiversity, carbon sequestration, and soil health while creating environments conducive to nature-based tourism. HCV areas, when effectively managed, serve as biodiversity reservoirs and tourism assets that justify their protection from both economic and ecological standpoints. Community-based ecotourism models offer promising pathways for livelihood diversification, particularly when supported by equitable benefit-sharing arrangements and capacity-building.

This review acknowledges its limitations. As a narrative rather than a systematic review, it does not claim comprehensive coverage of all relevant literature and acknowledges the inherent selection bias of the narrative approach. The proposed transformation framework requires empirical validation through longitudinal field studies and pilot implementations.

Policy recommendations

Based on the synthesized evidence, the following policy recommendations are offered:

i. National and subnational governments should integrate HCV spatial data into formal land-use planning instruments, provide fiscal incentives for agroforestry adoption within oil palm landscapes, and streamline ecotourism licensing and regulation for plantation-based tourism ventures.

ii. Industry actors should adopt agroforestry as a standard landscape management practice, invest in HCV management capacity, and explore ecotourism as a viable business diversification strategy aligned with sustainability certification requirements.

iii. Smallholder support programs should bundle technical training on agroforestry practices, financial assistance for certification costs, land tenure security support, and market access facilitation to enable inclusive participation in landscape transformation.

iv. International development partners should support PES mechanism development, green financing access, and knowledge exchange platforms to accelerate the scaling of successful transformation models across producing regions.

Directions for future research

Future research should prioritize empirical longitudinal studies assessing the long-term ecological, economic, and social outcomes of plantation-to-ecotourism transformation. Comparative analyses across different agro-ecological zones and institutional contexts would help identify context-specific success factors and constraints. Development of standardized indicators for measuring transformation success-encompassing biodiversity metrics, livelihood outcomes, and tourism sustainability-would support evidence-based adaptive management. Interdisciplinary research integrating ecological science, tourism studies, agricultural economics, and governance analysis is essential for advancing this emerging field.

References

1. Judijanto L (2025) Sustainable Palm Oil and Rural Livelihoods: Creating Shared Value to Smallholders and Communities. Int Seven J Multidiscip 4(3): 602-623.

2. S Dhandapani, Yule CM, Drewer J (2024) Editorial: Biogeochemical and biodiversity impacts of oil palm land-use in Southeast Asia. Front for Glob Chang 7.

3. Ruslan N, Kadir MABA, Othman MFB, Rapar EA, Sholihah N, et al. (2025) Transforming Agricultural Policy into Practice: Oil Palm Ecotourism as a Catalyst for Agricultural Sustainability Learning in Malaysia. Int J Environ Sci 11(7): 902-907.

4. Fahad S, Chavan SB, Chichaghare AR, Uthappa AR, Kumar M, et al. (2022) Agroforestry Systems for Soil Health Improvement and Maintenance. Sustainability 14(22): 14877.

5. Kunjuraman V (2024) The development of sustainable livelihood framework for community-based ecotourism in developing countries. Tour Hosp Res 24(1): 48-65.

6. Noordwijk MV, Leimona B, Minang PA (2025) The European deforestation-free trade regulation: collateral damage to agroforesters. Curr Opin Environ Sustain 72: 101505.

7. Ningsih VY, Setiawan B, Asmara R, Andriani RD (2025) ISPO Certification and the Sustainable Development Goals: Readiness of Independent Smallholders in Indonesia (South Sumatra). Trans Chinese Soc Agric 56(6): 37-55.

8. Judijanto L (2025) Synergizing Oil Palm Landscapes, agroforestry, Eco-Tourism, and Rural Economy: A Review on Pathways to Sustainable Development. Int J Eng Sci Inf Technol 5(4): 305-315.

9. Huang CC, Li SP, Chan YK, Hsieh MY, Lai JCM (2023) Empirical Research on the Sustainable Development of Ecotourism with Environmental Education Concepts. Sustainability 15(13): 10307.

10. Judijanto L (2025) Implementation of Agroforestry Concept on Oil Palm Plantation: Prospects and Challenges. Rev Arace.

11. Rahmani TA, Nurrochmat DR, Park MS, Boer R, Ekayani M (2024) The Potential Ecological Impact of Oil Palm Agroforestry as Term of Improvement for Restoring Harapan Rainforest. J Manaj Hutan Trop Journal Trop for Manag 30(3): 376-389.

12. Padmanaba M, Sloan S, Watts JD, Irawan S, Lee JSH, et al. (2023) Jurisdictional approaches to High Conservation Value area designation using regulatory instruments: an Indonesian pilot project. Front Environ Sci 11: 1226070.

13. Nasution ED, Jailani R, Alfiana HU, Dasrial M, Sukarman, et al. (2023) Analysis of Vegetation and Plant Diversity in High Conservation Value Areas in Oil Palm Plantations. Plant Sci Today 11(1).

14. Tort SI, Jayachandran S, Saavedra S (2024) Redesigning payments for ecosystem services to increase cost-effectiveness. Nat Commun 15(1): 9252.

15. Sukhera J (2022) Narrative Reviews: Flexible, Rigorous, and Practical. J Grad Med Educ 14(4): 414-417.

16. Anselmi GD, Barbosa AADO, Ferrari G, Fernandes ACP, Flores JA, et al. (2025) Overview of systematic reviews on behavioral determinants of physical activity and healthy eating in schoolchildren. Sci Rep 15(1).

17. Greenhalgh T, Thorne S, Malterud K (2019) Time to challenge the spurious hierarchy of systematic over narrative reviews. Eur J Clin Invest 48(6): 12931.

18. Affandi RA, Suwarno, Purnama IF, Noor MMM, Permana A, et al. (2025) Sustainable and equitable development through SEZ in Indonesia. IOP Conf Ser Earth Environ Sci 1441(1): 012001.

19. Wenzel A, Westphal C, Ballauff J, Berkelmann D, Brambach F, et al. (2024) Balancing economic and ecological functions in smallholder and industrial oil palm plantations. Proc Natl Acad Sci 121(17): e2307220121.

20. Zemp DC, Ramirez NG, Brambach F, Darras K, Grass I, et al. (2023) Tree islands enhance biodiversity and functioning in oil palm landscapes. Nature 618(7964): 316-321.

21. Kikuchi T, Seidel D, Ehbrecht M, Zemp DC, Brambach F, et al. (2024) Combining planting trees and natural regeneration promotes long-term structural complexity in oil palm landscapes. For Ecol Manage 569: 122182.

22. Pallavi (2025) Land-use trajectories in lowland Sumatra: Impacts on leaf area index and below-canopy temperatures. Georg-August-University Göttingen, Germany.

23. Podong C, Khamfong K, Noinamsai S, Mhoning S (2024) Carbon Sequestration for Agrosilviculture Agroforestry Practices: Preliminary Results from Three Investigated Village sin Uttaradit Province, Northern, Thailand. Bio tropia (Bogor) 31(2): 134-145.

24. Simarmata T, Irwandhi, Khumairah F, Hibatullah F, Ambarita D, et al. (2025) Implementation of Regenerative Technologies for Sustainable and Net-Zero Rice Farming in Adapting to Climate Change in Indonesian Coastal Areas. BIO Web Conf 176: 01007.

25. Earthworm (2026) Regenerative palm oil, a path that's taking shape. Earthworm.

26. Hiola AS, Lihawa F, Mahmud M, Baderan DWK, Baruwadi MH, et al. (2025) Agroforestry-Bioenergy Integration in Industrial Forest Plantation Landscapes: A Systematic Review of Inclusive Business Models and Social-Ecological Innovations Supporting Sustainable Forest Management. Int J Res Rev 12(12): 646.

27. Hamidun MS, Baderan DWK, Dunggio I, Lamangantjo CJ (2025) Plant Diversity with High Conservation Value in Oil Palm Plantation in Pohuwato Regency, Gorontalo, Indonesia. Environ Ecol Res 13(6): 821-837.

28. Santosa Y, Kwatrina RT (2024) The potential of HCV areas as ecotourism destinations: preliminary identification in Sumatra oil palm plantation. IOP Conf Ser Earth Environ Sci 1366(1): 012031.

29. Kabil M, Alayan R, Lakner Z, Dávid LD (2022) Enhancing Regional Tourism Development in the Protected Areas Using the Total Economic Value Approach. Forests 13(5): 727.

30. Peng J, Li J, Peng L, Zhang Y (2025) Forest Ecosystem Conservation Through Rural Tourism and Ecosystem Services: A Systematic Review. Forests 16(10): 1559.

31. Abas A, Yusof AHM, Rahman AHA, Tahtm F (2025) Investigating the Dynamics of Human–Wildlife Conflict in Oil Palm Plantation: Cases from Johor and Sabah, Malaysia. Soc Nat Resour, pp. 1-16.

32. Azlan JM (2019) The Role of Forest Fragments in Small Mammal Conservation in an Oil Palm Plantation in Northern Sarawak, Borneo. J Oil Palm Res 31(3): 422-436.

33. Hanafiah M, Mutalib AHA, Miard P, Goh CS, Sah SAM, et al. (2022) Impact of Malaysian palm oil on sustainable development goals: co-benefits and trade-offs across mitigation strategies. Sustain Sci 17(4): 1639-1661.

34. Tampokong MD, Farizan NH, Yazid AZ, Yaakob SN (2026) Conservation strategies and wildlife assessment for potential ecotourism in Brumas Forest Plantation, Sabah. J Wild Park 40: 73-94.

35. Othman N, Mustapah MAS, Quilter AG, Wan AD (2022) Understanding barriers and benefits to adopting elephant coexistence practices in oil palm plantation landscapes in Lower Kinabatangan Sabah. Front Conserv Sci 3.

36. Scriven SA, Butarbutar RB, Vos RED, Lucey JM, Reynolds G, et al. (2026) Addressing the challenges of managing and monitoring biodiversity in High Conservation Value areas and High Carbon Stock forests within oil palm landscapes. Ecol Solut Evid 7(1).

37. Lucey JM, Tawatao N, Senior MJM, Khen CV, Benedick S, et al. (2014) Tropical Forest fragments contribute to species richness in adjacent oil palm plantations. Biol Conserv 169: 268-276.

38. Lucey J (2026) Pathways to strengthen biodiversity protection in oil palm landscapes. Nature-based Solutions Initiative.

39. RSPO (2025) RSPO Research Agenda 2025.

40. Menoto JD, Jose TSD (2025) Implementation of Community-based Agri-Ecotourism in New Washington, Aklan: Inputs for Tourism Development Plan Enhancement. Int J Hosp Tour Res 3(1): 82-114.

41. Rustiadi E, Pravitasari AE, Priatama RA, Singer J, Junaidi J, et al. (2023) Regional development, rural transformation, and land use/cover changes in a fast-growing oil palm region: the case of Jambi Province, Indonesia. Land 12(5): 1059.

42. Juniyanti L, Purnomo H, Kartodihardjo H, Prasetyo LB (2021) Understanding the Driving Forces and Actors of Land Change Due to Forestry and Agricultural Practices in Sumatra and Kalimantan: A

Systematic Review. Land 10(5): 463.

43. Nasution S, Sembiring WM, Dalimunthe FI, Sumarno E, Saragih MW, et al. (2025) Environmental Education as a Means of Sustainable and Responsible Tourism Development. Sosioedukasi J Ilm ILMU Pendidik DAN Sos 14(2): 1153-1164.

44. Jamaludin NA, Zaki HO, Foong YP (2025) From the Ground Up: Sustainable Palm Oil and Entrepreneurial Opportunities in The Palm Oil Export Market, (1st edn). Routledge Taylor & Francis Group, pp. 1-13.

45. Judijanto L (2025) Significant Contributions of Oil Palm Plantation towards Sustainable Development Goals in Rural Livelihood. Aracê.

46. Irawan NC, Mahananto, Supriyadi T, Haryuni (2024) What are the Major Barriers and Challenges Faced by Independent Oil Palm Smallholder Farmers in RSPO Certification. JRUCS J Rural Urban Community Stud 2(2): 39-53.

47. Nupueng S, Oosterveer P, Mol APJ (2023) Global and local sustainable certification systems: Factors influencing RSPO and Thai-GAP adoption by oil palm smallholder farmers in Thailand. Environ Dev Sustain 25: 6337-6362.

48. Judijanto L (2026) Navigating Uncertainty: Palm Oil Sector Outlook for 2026 through the Lens of Smallholder Welfare and Sustainability Imperatives. Rev Geopolítica.

49. Pasaribu AP (2025) Strengthening Indonesia's sustainable palm oil policy: Addressing climate change and enhancing global market integration. JSSEW J Sustain Soc Eco-Welfare 3(1): 64-84.

50. Meridia (2026) EUDR palm oil compliance: A comprehensive guide. Meridia: Regulations.

51. Solar J, Ivanova Y, Oberlack C (2025) Human Rights and Environmental Due Diligence Regulations for Deforestation-Free Value Chains? Exploring the Implementation of the EU Regulation on Deforestation-Free Products in the Cocoa and Coffee Sectors of Peru. Glob Policy 16(4): 602-614.

52. Verhaeghe E, Suominen SR (2024) Transformation or more of the same? The EU's deforestation-free products regulation through a radical transformation lens. Environ Sci Policy 158: 103807.

53. Adhikerana AS (2026) European Union's Deforestation Regulation (EUDR) and its Implications for Oil Palm Plantations. Eco Nusantara.

54. Chandra A (2024) How Can Zero-Deforestation Commitments Meet Conservation Goals Without Compromising the Inclusion of Smallholders in the Indonesian Palm Oil Sector. ETH Zurich.

55. Eggen M, Heilmayr R Anderson P, Armson R, Austin K, et al. (2024) Smallholder participation in zero-deforestation supply chain initiatives in the Indonesian palm oil sector: Challenges, opportunities, and limitations. Elem Sci Anthr 12(1).

56. Judijanto L (2025) Policy Fragmentation and Its Impact on the Sustainability of the Palm Oil Supply Chain Governance. Applied and Social Sciences.

57. Judijanto L (2026) 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 2(1): 9-26.

58. Judijanto L (2025) Governance reform in the palm oil sector from upstream to downstream: a review. Rev Caribeña Ciencias Soc 14(7): e4703.

59. Judijanto L (2025) Empowerment of Oil Palm Smallholders for Sustainable Palm Oil. Veredas do Direito 22(2): e3323.

60. Judijanto L (2025) Who Pays for Climate Action? The Disproportionate Impact of Deforestation-Free Regulations on Smallholder Farmers. Eur J Manag Econ Bus 3(1): 3-13.

61. Judijanto L (2025) Beyond the plantation: Palm oil as a strategic lever for regional development and economic transformation growth in Indonesia. Growth 12(1): 25-32.

62. Jansen LJM, Kalas PP (2024) Customised Methodology to Assess and Measure Effectiveness of Integrated Landscape Management Relevant Multi-Stakeholder Transformative Governance, Incorporating Rights-Based Planning and Tenure Aspects, Applied in Kenya, Nigeria, and Viet Nam. Sustainability 16(21): 9312.

63. Popkin M, Woolever VJR, Turner EC, Luke SH (2022) A systematic map of within-plantation oil palm management practices reveals a rapidly growing but patchy evidence base. PLOS Sustain Transform 1(7): e0000023.

64. Wahyuni V, Rahman A, Apriani H (2024) Evaluating Accommodation and Infrastructure for Sustainable Eco-Tourism Development in Mangrove Forest Destinations. J Econ Educ Entrep Stud 5(4): 685-698.

65. Sulistiowati R, Yulianto Y, Bakri S, Mukhlis M, Puspawati AA (2022) Ecotourism in Era 4.0 for Sustainable Tourism (Case Study in Buffer Village of Way Kambas National Park, Lampung, Indonesia. Neuro Quantology 20(8): 8127-8141.

66. Lawasi A, Kenda N, Yusnikusumah Tr, Pratama Bb, Pratiwi D, et al. (2025) Forest-based Ecotourism in Indonesia: A Comprehensive Review of Policy Challenges, Diverse Practices, Stakeholder Engagement, Conservation Efforts, and Socioeconomic Aspects. Geoj Tour Geosites 60(2): 1041-1056.

67. Hazran MFR, Shari MA, Majid NA, Jusoh AFM, Salleh KM (2024) Developing Ecotourism Community Based Approach: A Sustainable Tourism Development Project on Tanjung Surat Island. J Tech Educ Train 16(2): 328-338.

68. Olajide BT, Mojeed TA, Nzekwe CC, Udo DI, Fawedikimo S, et al. (2025) Financing Sustainable Agribusiness in a Changing Climate: Investment, Incentives, and Levers for Food System Transformation. African J Agric Sci Food Res 19(1): 247-266.

69. Hagos F, Taron A, Agyekumhene C, Gebrezgabher SA (2025) Financing mechanisms for resilient multifunctional landscapes. Colombo, Sri Lanka.

70. Murali KV, Rathod CB, Karthik KC (2025) Policy and Financial Support for Agroforestry Development: Incentives Programs and Market Opportunities. Agroforestry Systems, (1st edn) Research Floor ch 10: 152-177.

71. Runting RK, Mijaard E, Abram NK, Wells JA, Gaveau DLA, et al. (2015) Alternative futures for Borneo show the value of integrating economic and conservation targets across borders. Nat Commun 6(1): 6819.

72. Sheng GC, Potter L (2023) Transforming Borneo: From Land Exploitation to Sustainable Development, (1st edn), ISEAS-Yusof Ishak Institute, Singapore, p. 358.

73. Dildabek D, Aliaskarov D, Kaimuldinova K, Bakanov N, Yegizbayeva A, et al. (2025) Projected land use land cover dynamics and tourism suitability assessment in the selected kazakhstan area. J Geogr Inst Jovan Cvijic SASA 75(3): 461-469.

74. Yusrini L, Sunkar A, Santosa Y, Rachmawati E (2025) Biodiversity Tourism Model for High Conservation Value Area of Oil Palm Plantation. IPB University, Indonesia.

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