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Transforming Agricultural Policy Into Practice: Oil Palm Ecotourism As A Catalyst For Agricultural Sustainability Learning In Malaysia

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***Abstract*—** *Malaysia's oil palm industry has long supported national economic growth and is internationally recognized as one of the top palm oil producers and exporters. As the country's agricultural and commodity policies increasingly emphasize sustainability, food security, and innovation, there is a growing opportunity to transform oil palm landscapes into dynamic platforms for environmental education, youth empowerment, and responsible consumption practices. This paper explores how oil palm ecotourism can serve as a catalyst for shared agriculture sustainability learning, helping translate national policy into real practice. Rather than serving only as a tourism attraction, ecotourism in oil palm plantations can provide interactive experiences that connect people to sustainability principles. These experiences foster environmental awareness, biodiversity appreciation, and knowledge of sustainable agriculture among diverse audiences, especially youth. By positioning plantations as learning environments, ecotourism can empower students, communities, and smallholders to co-create and adopt responsible practices. This approach aligns with national goals under the Sustainable Development Goals and Environmental Social and Governance frameworks. The paper presents a conceptual model for integrating ecotourism with sustainability education through three strategic phases: (1) policy alignment, stakeholder engagement, and site readiness (2) sustainable land management and ecotourism implementation, and (3) certification, monetization, and global positioning. By expanding oil palm ecotourism across both industrial estates and smallholder farms, Malaysia can foster a culture of sustainability learning while enhancing the image and transparency of the industry. Ecotourism offers a practical and inclusive tool to activate sustainability policy on the ground, strengthen inter-ministerial collaboration, and cultivate future generations who are informed, engaged, and empowered to shape a greener palm oil future.*

Index Terms— *Ecotourism, Oil palm, Public engagement, Sustainability education*

INTRODUCTION

Malaysia is globally recognized as one of the leading producers and exporters of palm oil, with the industry serving as a longstanding pillar of national economic growth. Over the past decade, national frameworks such as the National Agrofood Policy 2.0 (NAP 2021–2030) and the National Agricommodity Policy (DAKN 2030) have increasingly emphasized sustainability, innovation, food security, and inclusive economic participation. Despite meaningful policy progress and the adoption of the Malaysian Sustainable Palm Oil (MSPO) certification, public perception of the palm oil sector remains challenged by global concerns related to deforestation, biodiversity loss, and monoculture expansion [1][2]. To address these concerns while aligning with national goals, innovative and transparent approaches are needed to bridge the policy–practice gap. One such approach is oil palm ecotourism. By integrating education, sustainability outreach, and community engagement within plantation landscapes, ecotourism

offers a platform to translate national policies into visible, inclusive, and participatory action[3][4]. This paper explores how oil palm ecotourism can serve as a catalyst for shared sustainability learning and introduces a three-phase conceptual framework for its development and scaling in Malaysia.

I. DRIVING SUSTAINABILITY THROUGH OIL PALM ECOTOURISM

Ecotourism is broadly defined by The International Ecotourism Society (TIES) as "responsible travel to natural areas that conserves the environment, sustains the well-being of local people, and involves interpretation and education". Unlike conventional tourism, ecotourism emphasizes sustainability, learning, and low-impact engagement with natural and semi-natural environments [5][6][7].In the Malaysian context, where palm oil remains a core export commodity and sustainability has become a national policy imperative, ecotourism offers a timely and practical pathway for bridging environmental education with agricultural innovation. While the sector is administered separately under the Ministry of Plantation and Commodities and the Ministry of Agriculture and Food Security, the growing interdependence between food, land, and climate calls for more integrated and cross-sectoral learning platforms. Although the oil palm industry is often perceived through the lens of monoculture and environmental degradation [8], these views frequently overlook its high productivity, zero-waste potential, and growing commitment to sustainability. Among all major oilseed crops, oil palm produces the highest yield per hectare up to 3.3 metric tons of oil, compared to 0.7 for sunflower, 0.7 for rapeseed, and 0.4 for soybean while using significantly less land and fewer inputs [9]. Furthermore, the sector has evolved into a zero-waste model, repurposing by-products such as palm trunks [10], empty fruit bunches (EFB) [11], kernel shells [12], and palm oil mill effluent (POME) [13] into valuable resources including organic fertilizers, biomass energy, animal feed, and construction materials. At the policy level, Malaysia has reinforced its commitment to sustainable palm oil production by implementing the mandatory Malaysian Sustainable Palm Oil (MSPO) certification scheme. The updated MSPO 2.0 framework sets a higher standard for ethical and inclusive practices in the industry, including stricter environmental safeguards. One of its key provisions is the introduction of a deforestation cut-off date restricting certification to areas that have not been cleared after December 31, 2019. Effective from January 1, 2025, this measure aligns with global sustainability benchmarks by prohibiting new developments on peatlands and promoting responsible land management [14]. Major plantation players like SD Guthrie Bhd, Wilmar International, Cargill, and Louis Dreyfus Company (LDC) have adopted NDPE (No Deforestation, No Peat, No Exploitation) commitments and supply chain monitoring tools. However, the situation is less clear for smallholders, many of whom lack access to knowledge, funding, and global market expectations [15]. Ecotourism can address this gap by positioning plantations as platforms for shared sustainability learning, where smallholders, students, and even public visitors can gain firsthand exposure to good agricultural practices, certification standards, biodiversity management, and circular resource use. In this way, oil palm ecotourism functions not only as an outreach tool to improve global perception but also as a rural education strategy that empowers communities with practical skills. For example, within ecotourism spaces, smallholders could diversify with cash crops planted along buffer zones or within underutilized plantation areas, thereby building resilience during low palm oil price seasons—observable through price fluctuations in FCPO (Futures Crude Palm Oil). These strategies align with DAKN 2030 goals to modernize and future-proof the commodity sector by creating self-reliant producers prepared to adapt to global market volatility and climate challenges [16]. Ultimately, ecotourism offers more than a tourism product. It is a social innovation that brings together environmental education, policy translation, and grassroots empowerment. It creates inclusive access to knowledge and sustainability practices, helping to rebrand Malaysia's oil palm sector as transparent, community-oriented, and future-ready.

II. CONCEPTUAL FRAMEWORK FOR SUSTAINABLE OIL PALM ECOTOURISM

To effectively position ecotourism as a national sustainability lever, this paper proposes a three-phase conceptual framework for integrating ecotourism within the oil palm sector (Fig. 1). This framework is designed to support the transition from policy intention to practical, on-ground impact by aligning

environmental, social, and economic objectives with the operational realities of plantations, smallholders, and local communities.

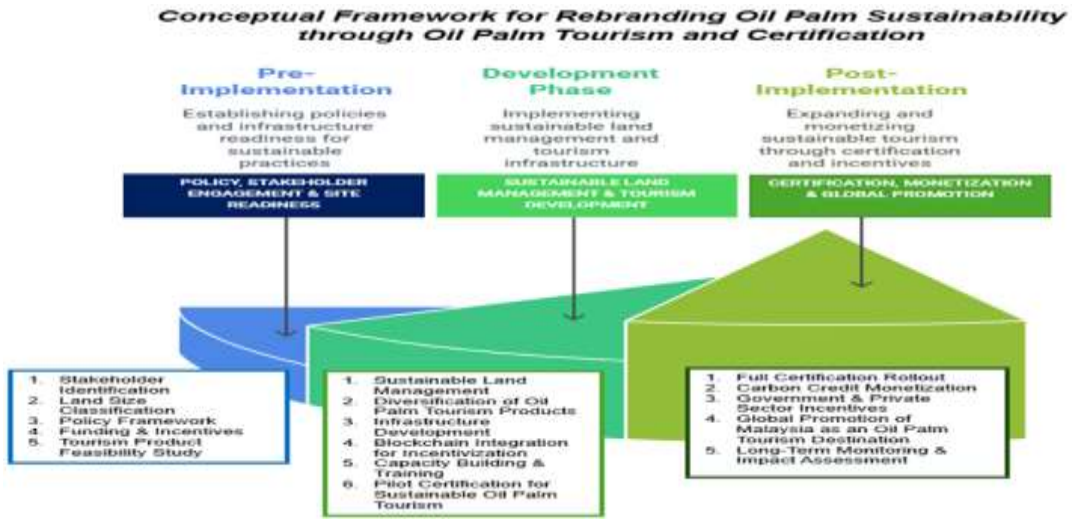

Fig. 1 Author-Proposed Framework for Sustainable Oil Palm Tourism Development.

A. Phase 1: Policy Alignment, Stakeholder Engagement, and Site Readiness

The first phase lays the foundation for scaling oil palm ecotourism by aligning its implementation with national frameworks such as the National Agrofood Policy 2.0 (NAP 2021–2030) and the National Agricommodity Policy (DAKN 2030). Both policies underscore the need for inclusive participation, knowledge-based agriculture, and sustainability-led innovation but yet, practical pathways for ecotourism integration remain underdeveloped. This phase proposes specific policy refinement to incorporate ecotourism as a recognized tool for sustainability education and agro-innovation under both ministries.

This phase begins with identifying and classifying suitable and interesting sites for ecotourism activities across smallholder plots and industrial plantations. In addition to technical criteria such as land size, biodiversity value, existing infrastructure, and environmental sensitivity, the willingness of stakeholders and their level of preparedness also play a crucial role. This includes assessing the willingness of landowners, cooperatives, or community groups to participate in ecotourism activities, adopt sustainability practices, and open their spaces for public engagement. Early-stage efforts should prioritize areas where stakeholders demonstrate not only potential but also motivation and openness to collaborate on pilot projects. Effective ecotourism development requires strong involvement, trust, and commitment from key stakeholders, including local communities and oil palm industry players. A lack of willingness or support from these groups, particularly estate managers, smallholders, or local authorities, can significantly hinder progress and long-term success. Early-stage initiatives should prioritize communities and large estates that demonstrate both ecological potential and a strong willingness to collaborate. Stakeholder mapping should extend beyond conventional actors to include youth groups, student organizations, and academic institutions, recognizing their vital role in shaping the future of sustainable agriculture and environmental stewardship. Other key stakeholders include smallholders, plantation companies, certification bodies (e.g., MSPO, Roundtable Sustainable Oil Palm (RSPO)), tourism boards, local governments, and NGOs. Inclusive planning ensures shared ownership, intergenerational knowledge transfer, and greater policy impact. Feasibility assessments should evaluate both the environmental and social readiness of each site, including the suitability of ecotourism models such as biodiversity trails, cultural heritage circuits, or agroforestry integration. Involving youth from the outset allows for capacity building and practical exposure to sustainable land management, aligning with NAP 2.0's emphasis on youth empowerment and DAKN 2030's call for a next-generation agricommodity workforce. To encourage adoption, especially among smallholders, financial support mechanisms such as green innovation grants, carbon offset incentives, and blockchain-verified sustainability credits should be

introduced. These instruments can help lower initial barriers while creating value from sustainable land stewardship. Effective ecotourism development hinges on trust, shared vision, and long-term commitment from all involved parties. Without genuine buy-in particularly from those managing, the land initiatives may remain fragmented or fail to scale [17].

Phase 2: Sustainable Land Management and Ecotourism Implementation

The second phase focuses on the development of sustainable ecotourism infrastructure within oil palm landscapes while embedding best practices in land management, environmental conservation, and community engagement. Strategic ecological zoning within plantations can be used to designate specific areas for biodiversity corridors, cultural heritage interpretation, and agroecological demonstration plots. These zones serve as outdoor classrooms and living laboratories especially for youth empowerment programs, school visits, vocational traineeships, and community-based environmental education. Studies have shown that outdoor classrooms offer valuable opportunities for learners to engage directly with their surroundings, making learning more practical and memorable. Such environments encourage exploration, hands-on experimentation, and the application of theoretical knowledge to real-world contexts, which is especially beneficial for understanding agricultural practices [18]. Infrastructure investments should prioritize inclusive, low-impact designs, including interpretive trails, nature towers, bamboo gazebos, eco-lodges, and interactive digital tools. These spaces allow for real-time learning about palm oil's land efficiency, NDPE and MSPO compliance, zero-waste practices, and the evolving socio-economic role of smallholders. Educational modules can also address responsible consumerism, green technology, and palm-based circular economy innovations. Equally important is fostering cross-learning ecosystems between smallholder groups and industrial estates to promote mutual knowledge exchange. This includes field dialogues, shared nursery trials, sustainable crop diversification (e.g., vegetables, herbs, or short-term cash crops), and seasonal risk mapping using tools like FCPO price trend analysis. Local universities and polytechnic colleges should be included as implementation partners to support R&D, capacity-building, and internship placements, creating a long-term sustainability talent pipeline.

B. Phase 3: Certification, Monetization, and Global Positioning

The final phase aims to institutionalize ecotourism within Malaysia's broader sustainability landscape by embedding it into national certification systems, expanding its economic potential, and leveraging digital innovation. A comprehensive ecotourism certification scheme should be developed to complement the Malaysian Sustainable Palm Oil (MSPO) standard, incorporating additional indicators such as biodiversity conservation, educational outreach, community inclusion, and transparent management of visitor impacts. In this phase, digital technologies play a critical role in enhancing trust and enabling monetization. Blockchain can be employed to authenticate ecotourism experiences and trace palm-derived products back to certified sustainable sources. Through smart contracts, environmental services such as carbon sequestration, soil health restoration, and biodiversity protection can be tokenized and traded as crypto-based assets, offering financial incentives to smallholders, local communities, and youth-led sustainability programs. This creates opportunities for decentralized finance (DeFi) and climate-positive investments to flow into rural landscapes. For example, Unilever and SAP's GreenToken pilot project demonstrated how blockchain can track and verify the origins of palm oil in near real-time, ensuring transparency and sustainability throughout the supply chain [19]. This model can be replicated in the context of ecotourism and carbon markets. A blockchain-based carbon credit ecosystem allows for the tokenization of carbon sequestration activities, enabling communities to generate income by selling verified carbon credits. This not only rewards sustainable practices but also channels investment into rural development. DeFi platforms leverage blockchain and smart contracts to deliver financial services without traditional intermediaries. In agriculture, this can provide smallholders with access to loans, insurance, and investment tools [20]. By integrating DeFi into ecotourism and sustainable palm oil initiatives, communities can secure funding for conservation projects, ecotourism infrastructure, and capacity-building programs. Such financial inclusion empowers local stakeholders and strengthens long-term

sustainability outcomes. One study demonstrates how DeFi can be applied in real-world agricultural finance, focusing on asset tokenization and crop insurance [21]. This includes raising funds through global capital markets, executing atomic swaps, and engaging in peer-to-peer trading under standardized regulations. The research explores the evolving boundaries of DeFi, emphasizing how asset tokenization is reshaping modern finance. By issuing digital tokens through smart contracts, agricultural producers can secure their crops, raise capital for micro-insurance, and engage in future crop contracts—all while enhancing efficiency across the agribusiness finance ecosystem. Blockchain technologies also support trading in both primary and secondary markets and open access to new global markets without the need for intermediaries. As such, asset tokenization is becoming a key tool for transforming agriculture and ecotourism into digitally connected, financially empowered, and globally recognized sustainability sectors [22]. Oil palm ecotourism sites have the potential to generate diversified revenue through mechanisms such as participation in voluntary carbon markets by implementing activities like reforestation, methane recovery, or soil carbon enhancement. These sites can also leverage sustainable product branding, for example by producing traceable palm-based wellness goods, and tap into green tourism incentives supported by both domestic and international sustainability-linked financing schemes [23]. With a compelling promotion and storytelling strategy, Malaysia holds the opportunity to rebrand itself as a global leader in sustainability-driven agritourism. Aligning ecotourism efforts with international platforms such as the Sustainable Development Goals (SDGs), Environmental, Social, and Governance (ESG) disclosure frameworks, regenerative agriculture partnerships, and global eco-certification networks will further strengthen the country's visibility and attractiveness for investment. To ensure these efforts lead to measurable outcomes, robust monitoring and evaluation systems must be embedded from the beginning. These systems should capture data on environmental performance, visitor engagement, reductions in carbon emissions, and socio-economic benefits to local communities. Through this institutionalized approach, oil palm ecotourism moves beyond being a conceptual initiative and becomes a powerful instrument for transforming the narrative around Malaysia's agricommodity sector, promoting a future defined by responsible production, inclusive growth, and global sustainability leadership.

III. CONCLUSION

Oil palm ecotourism offers more than an additional income stream. It serves as a strategic platform to reshape public narratives, expand inclusive opportunities, and connect sustainability goals with ground realities. By embedding ecotourism into national agricultural and commodity policy frameworks, Malaysia can transform fragmented initiatives into a coordinated movement that benefits both communities and the environment.

The three-phase framework presented in this paper—from aligning policies and engaging stakeholders to implementing sustainable land management and embracing digital finance—demonstrates a practical and inclusive roadmap. Smallholders, youth, and rural communities should be empowered as co-creators of this transformation, rather than passive recipients.

With strong policy integration, innovation in certification, and the use of digital technologies such as blockchain and decentralized finance, Malaysia can reposition itself as a global leader in sustainability-oriented agritourism. This vision is aligned with national goals including the Malaysian Sustainable Palm Oil certification and international frameworks such as the Sustainable Development Goals, environmental social and governance standards, and regenerative agriculture principles. Ultimately, oil palm ecotourism is not simply about conserving biodiversity or promoting tourism. It is about cultivating a culture of environmental responsibility, entrepreneurial resilience, and long-term stewardship. When policies are translated into real-world action and landscapes become spaces for learning, innovation, and empowerment, Malaysia's oil palm sector can lead the way toward a regenerative and inclusive future.

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CONFLICT OF INTEREST

Authors declare that there is no conflict of interest regarding the publication of the paper.

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