

**ECONOMIC VALUATION AND PAYMENT FOR ECOSYSTEM
SERVICES (PES) IN SMALLHOLDER FARMERS: A CASE STUDY IN
THE BATANG TORU FOREST, NORTH SUMATRA**

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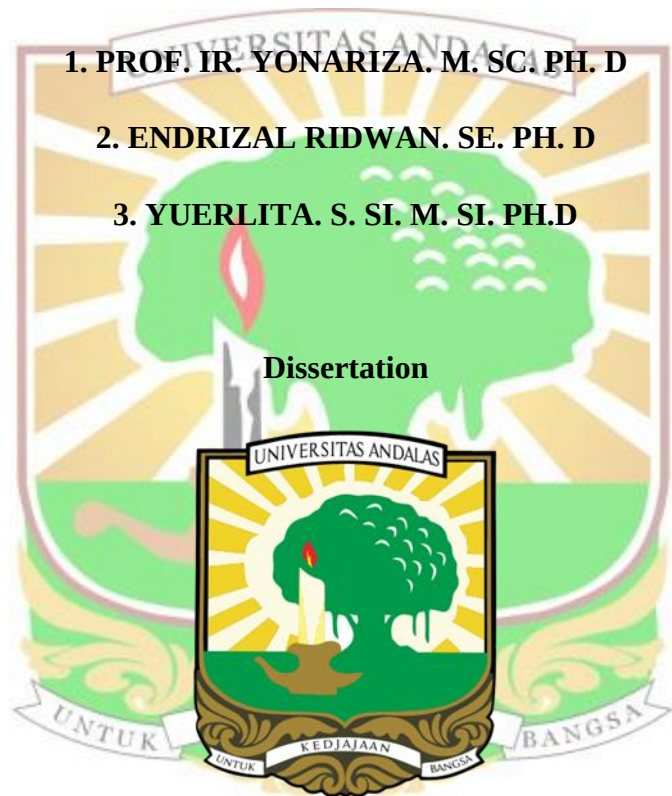
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CERTIFICATION

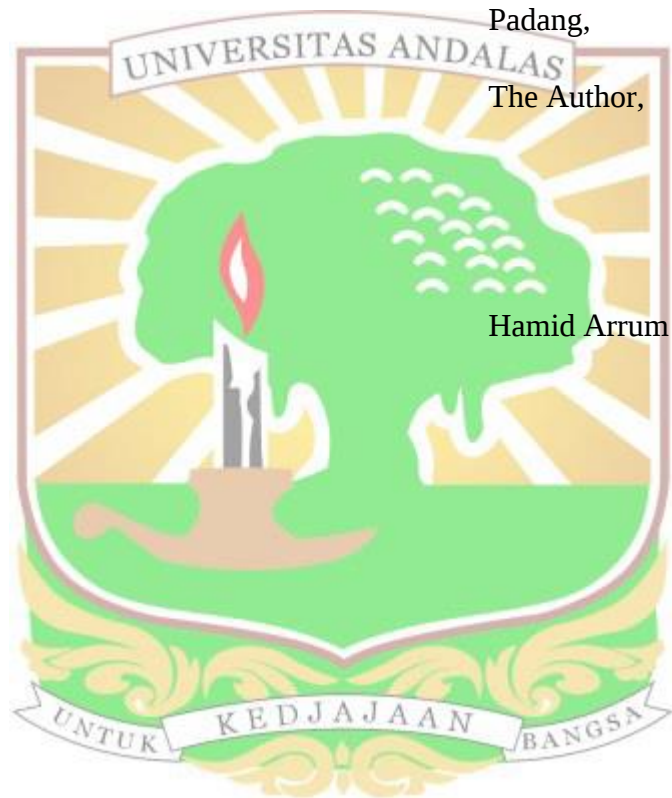
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SUMMARY

Hamid Arrum Harahap. Economic Valuation and Payment For Ecosystem Services (PES) In Smallholder Farmers, A Case Study In The Batang Toru Forest, North Sumatra. Supervised by Yonariza, Endrizal Ridwan, and Yuerlita.

The Batang Toru forest in North Sumatra plays a crucial role in providing ecosystem services (ES) that support the livelihoods of smallholder farmers. However, these services are often undervalued, leading to inadequate investment in conservation and land management. This study evaluates the economic value of ES in the Batang Toru forest, examines smallholder farmers' perspectives on Payment for Ecosystem Services (PES), and explores Indigenous Payment for Ecosystem Services (IPES) as a sustainable conservation strategy.

The research involved 125 household surveys and 30 workshop participants across five villages in the Batang Toru forest area, incorporating both quantitative economic valuation and qualitative assessments of local perspectives. The study applied the Total Economic Value (TEV) framework to estimate the economic contributions of provisioning and regulating services. The findings indicate that the Batang Toru forest generates an annual TEV of IDR 11,775,167,000 at the household level, highlighting its significant role in sustaining local economies and environmental stability. However, it is important to note that this TEV does not capture or fully reflect the entire value of the ecosystem. The estimate is limited to household-level economic benefits and does not account for broader ecological, cultural, or supporting services that contribute to the overall ecosystem's functionality.

The study revealed that monoculture farming reduces regulating services such as water retention, soil fertility, and pest control, whereas agroforestry systems enhance these services and contribute to long-term sustainability. Farmers' willingness to pay (WTP) for conservation efforts varied, with collective group-based schemes demonstrating higher participation rates and greater financial

commitment than individual contributions. Socioeconomic factors, such as education level, age, and frequency visit to forest, were found to influence WTP dynamics.

A key contribution of this research is the introduction of Indigenous PES (IPES), which recognizes traditional ecological governance and resource-sharing practices among local communities.

The key recommendations from this study include: Promoting agroforestry as a sustainable agricultural practice to optimize regulating services and mitigate the environmental risks posed by monoculture farming, Strengthening community-based PES frameworks to enhance financial sustainability and incentivize long-term farmer participation in conservation programs, and Integrating IPES into mainstream PES policies to acknowledge the role of traditional ecological knowledge, ensuring culturally inclusive conservation strategies and improving community-led forest governance.

This study contributes to the ongoing discourse on ecosystem service valuation, PES implementation, and indigenous knowledge systems, offering insights into sustainable conservation practices and economic incentives for smallholder farmers in tropical forest landscapes.



RINGKASAN

Hamid Arrum Harahap. Economic Valuation and Payment for Ecosystem Services (PES) In Smallholder Farmers, A Case Study In The Batang Toru Forest, North Sumatra. Dibimbing oleh Yonariza, Endrizal Ridwan, dan Yuerlita.

Hutan Batang Toru di Sumatera Utara memiliki peran krusial dalam menyediakan jasa ekosistem (JE) yang menopang kehidupan petani skala kecil. Namun, nilai jasa ekosistem ini sering kali diremehkan, sehingga menghambat investasi dalam konservasi dan pengelolaan lahan. Penelitian ini bertujuan untuk menilai nilai ekonomi dari jasa ekosistem di Hutan Batang Toru, menganalisis perspektif petani kecil terhadap skema Pembayaran Jasa Ekosistem (PES), serta mengeksplorasi konsep Indigenous Payment for Ecosystem Services (IPES) sebagai strategi konservasi berkelanjutan.

Penelitian ini melibatkan survei terhadap 125 rumah tangga dan partisipasi 30 peserta lokakarya di lima desa yang berada di sekitar Hutan Batang Toru. Metode penelitian mencakup pendekatan kuantitatif melalui penilaian ekonomi serta pendekatan kualitatif untuk memahami perspektif masyarakat setempat. Studi ini menggunakan kerangka Total Economic Value (TEV) untuk mengestimasi kontribusi ekonomi dari jasa penyediaan dan jasa pengaturan. Hasil penelitian menunjukkan bahwa nilai ekonomi total jasa ekosistem di Hutan Batang Toru mencapai IDR 11.775.167.000 per tahun pada tingkat rumah tangga, yang mencerminkan peran pentingnya dalam mendukung ekonomi lokal dan stabilitas lingkungan. Namun, perlu dicatat bahwa angka TEV ini tidak mencerminkan nilai keseluruhan ekosistem secara utuh. Estimasi ini hanya mencakup manfaat ekonomi pada tingkat rumah tangga dan belum memasukkan nilai ekologi, budaya, atau jasa pendukung lain yang berkontribusi terhadap keberlanjutan ekosistem secara menyeluruh.

Penelitian ini juga menemukan bahwa praktik monokultur berdampak negatif terhadap jasa pengaturan, seperti retensi air, kesuburan tanah, dan pengendalian hama, sedangkan sistem agroforestri meningkatkan fungsi-fungsi tersebut dan

mendukung keberlanjutan jangka panjang. Kesiapan membayar (Willingness to Pay/WTP) petani terhadap upaya konservasi bervariasi, di mana skema berbasis kelompok menunjukkan tingkat partisipasi dan komitmen finansial yang lebih tinggi dibandingkan kontribusi individu. Faktor sosial-ekonomi, seperti tingkat pendidikan, usia, dan frekuensi kunjungan ke hutan, ditemukan berpengaruh terhadap dinamika WTP.

Kontribusi utama dari penelitian ini adalah pengenalan konsep Indigenous PES (IPES), yang mengakui sistem tata kelola ekologi tradisional serta praktik berbagi sumber daya dalam komunitas lokal.

Rekomendasi utama dari penelitian ini meliputi: Mempromosikan sistem agroforestri sebagai praktik pertanian berkelanjutan guna mengoptimalkan jasa pengaturan dan mengurangi risiko lingkungan akibat sistem monokultur, Memperkuat kerangka kerja PES berbasis komunitas untuk meningkatkan keberlanjutan finansial serta mendorong partisipasi jangka panjang petani dalam program konservasi, dan mengintegrasikan IPES ke dalam kebijakan PES arus utama guna mengakui peran pengetahuan ekologi tradisional, memastikan strategi konservasi yang inklusif secara budaya, serta meningkatkan tata kelola hutan berbasis komunitas.

Penelitian ini berkontribusi pada kajian yang sedang berkembang terkait valuasi jasa ekosistem, implementasi PES, serta sistem pengetahuan adat. Studi ini memberikan wawasan mengenai praktik konservasi berkelanjutan serta insentif ekonomi bagi petani skala kecil dalam lanskap hutan tropis.

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