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Benzoin Business Opportunity Analysis in Conservation Areas: Case Study of Bukit Tiga Puluh National Park

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ABSTRACT

This study analyzes the business opportunities of benzoin (Styrax benzoin) within conservation areas, focusing on Bukit Tiga Puluh National Park (TNBT) as a case study. Benzoin is an important non-timber forest product with high economic value, widely used in cosmetics and pharmaceuticals. Using a mixed-methods approach combining ethnographic interviews, field observation, and economic analysis involving local communities, this research examines the current production system, market dynamics, and sustainability challenges. Findings indicate that benzoin farming provides substantial income to local farmers, with profit margins reaching 66%, yet market benefits are unevenly distributed due to middlemen's dominance. Quality constraints and limited processing infrastructure hinder value addition and market expansion. Additionally, benzoin forest areas have declined by 32%, posing sustainability concerns. To leverage benzoin business potential within conservation frameworks, this study recommends strengthening local capacity, improving product quality, and integrating benzoin cultivation with conservation and community-based management initiatives. The results contribute to policy discussions on balancing economic development and forest conservation in tropical protected areas).

Key words: Benzoin, business oportunity, conservation area, Bukit Tiga Puluh National Park, sustainable livelihood

ABSTRAK

Studi ini menganalisis peluang bisnis kemenyan (Styrax benzoin) di dalam kawasan konservasi, dengan fokus pada Taman Nasional Bukit Tiga Puluh (TNBT) sebagai studi kasus. Kemenyan merupakan hasil hutan non-kayu yang penting dan bernilai ekonomi tinggi, yang banyak digunakan untuk kosmetik dan farmasi. Dengan menggunakan pendekatan metode campuran yang menggabungkan wawancara etnografi, observasi lapangan, dan analisis ekonomi yang melibatkan masyarakat lokal, penelitian ini mengkaji sistem produksi saat ini, dinamika pasar, dan tantangan keberlanjutan. Temuan menunjukkan bahwa pertanian kemenyan memberikan pendapatan yang cukup besar bagi petani lokal, dengan margin keuntungan mencapai 66%, namun manfaat pasar tidak terdistribusi secara merata karena dominasi tengkulak. Kendala kualitas dan infrastruktur pengolahan yang terbatas menghambat penambahan nilai dan perluasan pasar. Selain itu, kawasan hutan kemenyan telah menurun sebesar 32%, sehingga menimbulkan kekhawatiran akan keberlanjutan. Untuk meningkatkan potensi bisnis kemenyan dalam kerangka konservasi, studi ini merekomendasikan penguatan kapasitas lokal, peningkatan kualitas produk, dan mengintegrasikan budidaya kemenyan dengan konservasi dan inisiatif pengelolaan berbasis masyarakat. Hasil penelitian ini berkontribusi pada diskusi kebijakan untuk menyeimbangkan pembangunan ekonomi dan konservasi hutan di kawasan lindung tropis).

Kata kunci: Kemenyan, peluang bisnis, kawasan konservasi, Taman Nasional Bukit Tiga Puluh, mata pencaharian berkelanjutan

INTRODUCTION

Benzoin trees (Styrax benzoin), native to Southeast Asia, are notable for producing aromatic resins that hold significant value in various industrial sectors. These resins are processed into essential raw materials for cosmetic formulations—including skin-brightening creams, moisturizing lotions, and sunscreens—as well as components for perfume fixatives (Burger et al 2016). Recent innovations in product development, such as the Tobarium Styrax perfume patented by researchers at the LHK Aek Nauli Research and Development Center, underscore benzoin's potential as a high-value commodity (Aswandi, 2019; Kholibrina & Aswandi, 2020). Moreover, benzoin derivatives have gained international recognition, exemplified by the patented French fragrance "Lite Virginal" (Jayusman, 2014a).

Benzoin's market extends across both domestic and international domains. Within Indonesia, key

consumer regions span Sumatra and Java islands, with concentrations in Central Java provinces including Purworejo, Kebumen, Banyumas, Cilacap, Probolinggo, and Magelang, as well as East Java regions such as Bojonegoro, Temanggung, and Wonosobo. Transmigration areas also constitute important markets. Internationally, Indonesia exports benzoin resin to countries including Singapore, Switzerland, Japan, the United Arab Emirates, Taiwan, and France (Jayusman, 2014). Despite this robust market presence and the resin's high economic potential, benzoin farmers frequently receive disproportionately low returns relative to middlemen and collectors, leading to limited financial incentives for sustainable cultivation and harvesting (Gaol & Simangunsong, 2017).

Several factors contribute to the economic disparities observed in the benzoin resin sector. Suboptimal national management and production practices have led to declining productivity and economic value over recent decades. Harada et al. (2022) highlight that traditional benzoin cultivation in North Sumatra faces challenges such as limited market access, inadequate processing infrastructure, and competition from more profitable cash crops, which collectively diminish the economic viability of benzoin production. Compounding this trend, benzoin forest areas have experienced significant contraction, shrinking from approximately 33,917 hectares in 1985 to 23,119 hectares by 2019—a reduction of nearly 32% (Hutapea et al., 2022). This decline is primarily driven by land conversion to more economically lucrative plantation crops such as oil palm and rubber. Concurrently, escalating global demand for benzoin imposes additional pressure on remaining natural stands, which face encroachment from industrial plantations and residential development. This juxtaposition of increasing demand and shrinking habitat presents a critical challenge for the sustainable supply of benzoin resin and the livelihoods dependent upon it.

Within this broader environmental and economic context, Bukit Tigapuluh National Park (TNBT) represents a key site where benzoin trees coexist with indigenous communities, notably the Talang Mamak tribe. The Talang Mamak have inhabited the region prior to its designation as a conservation area, developing a deep cultural and ecological relationship with the forest. Their subsistence and cultural practices are intimately tied to forest resources, including the utilization of benzoin resin as incense in traditional medicine and ceremonial rituals. This indigenous knowledge reflects an intricate system of forest management and resource use that contributes to both biodiversity conservation and cultural preservation.

However, rapid socio-economic changes including population growth, land-use conversion, and increasing interaction with external communities have instigated profound shifts within the Talang Mamak society (Aritonang, 2001). These changes have altered traditional land-use patterns, social structures, and cultural practices, often leading to the diminished use of indigenous medicinal plants and increased reliance on modern chemical pharmaceuticals (Harnov, 2017). The transition from a nomadic or semi-nomadic lifestyle to permanent settlement has facilitated greater access to education and markets but has also exposed the community to cultural erosion and shifts in forest dependency.

Such socio-cultural transformations present complex implications. On the one hand, changes in attitudes and behaviors may disrupt established value systems and forest stewardship, potentially undermining sustainable resource management. On the other hand, these shifts reflect an exercise of human rights and adaptation to contemporary realities. It is therefore critical that changes occur in a measured and deliberate manner, aligned with conservation goals and supported by efforts to enhance local capacities through education, skill development, and diversification of economic opportunities beyond forest resources.

This study aims to identify and analyze the economic potential of benzoin (Styrax benzoin) as a non-timber forest product (NTFP) within the Bukit Tiga Puluh National Park (TNBT). The research focuses on a comprehensive examination of the benzoin value chain, including market structure, production costs, profit margins, and farmer share. Particular attention is given to the Talang Mamak indigenous community, for whom benzoin cultivation constitutes a significant component of their forest-based livelihood system. By situating benzoin within the broader socio-economic context of the Talang Mamak tribe, this study seeks to uncover critical constraints and opportunities that can inform strategies for sustainable development and the enhancement of local welfare.

METHODS

Study area

Research on Ethnobioprospection and conservation of benzoin (Styrax benzoin) in Bukit Tiga Puluh National Park was conducted from January to March 2024. The research location is in Rantau Langsat Village which consists of five selected hamlets namely Lemang hamlet (Buffer

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Zone), Bengayoan hamlet, Nunusan hamlet, Air Bomban hamlet, and Sadan hamlet (Traditional Zone), Bukit Tiga Puluh National Park, Indragiri Hulu Regency, Riau Province. Based on the Slovin formula equation with an error tolerance level of 10%, it resulted in 82 respondents consisting of traditional leaders or community leaders, talang mamak tribal people, farmers and benzoin (Styrax benzoin) collectors.

The determination of respondents uses the Slovin formula technique with a tolerance limit of 10%.

$$\mathbf{n = \frac{N}{1+(N\,x\,e^2)}}$$

n = 81,48 rounded up to 82

Description:

n = Number of respondents

N = Total population

e = Limit of error tolerance

The method of determining respondents using purposive sampling and snowball towards people who are directly involved in the management and utilization of benzoin (Styrax benzoin) known based on information from previous respondents. Purposive sampling is a sampling that is done intentionally based on certain considerations (Nur et al. 2023). Snowball is a sampling method where the sample is obtained through a rolling process from one respondent to another, usually this method is used to explain the social or communication patterns of a particular community (Nurdiani 2014). These two methods are used to determine the socio-culture, processing, utilization, and cultivation of benzoin (Styrax benzoin). The characteristics of the community used as respondents are based on the following criteria:

1. Informants are traditional leaders or community leaders, making it easier for researchers to explore research locations, conduct interviews and observe social situations.
2. Informants are people who are suspected of knowing many things about the socio-culture in the tradition of using incense (Styrax benzoin).
3. Informants are farmers and collectors of benzoin (Styrax benzoin).

Data collection

The types of data used in this research are primary data and secondary data. Primary data is data obtained directly in the field or research location. Primary data is also in the form of observation data. Primary data referred to in this study are data on the tradition of using benzoin (Styrax benzoin) at traditional events (knowledge, ownership, customary rules, how to harvest, processing, utilization, cultivation and trade of benzoin) and socio-cultural data (religious system, livelihood, social organization, knowledge system, and material equipment used).

Secondary data refers to information that has been collected by others for different purposes and is reused for further analysis. In this study, secondary data includes various pre-existing sources such as academic publications, government reports, and statistical data from relevant agencies. Utilizing secondary data allows researchers to access a wide range of comprehensive information without the need to collect new data directly. However, it is essential to ensure that the data used is relevant and valid for the research objectives. (Martins et al 2018). Secondary data can also be obtained from related agencies such as the forestry service, the TNBT headquarters, and the statistics center.

Data analysis

Ethnographic data obtained through documentation studies and interviews with informants were analyzed qualitatively through the stages of data collection, data transcripts, data categorization, interim conclusions, triangulation, and final conclusions which were then presented in descriptive narrative form. In qualitative research, data analysis constitutes a systematic process of identifying recurring patterns, themes, and categories derived from field data. This process involves the interpretative examination of behavioral expressions, events, and social interactions within the contextual framework in which the data were collected, thereby facilitating a deeper understanding of the underlying phenomena (Creswell & Poth, 2018).

Analysis of Business Opportunities and Commercial Benefits of Benzoin (Styrax benzoin)

This study employs a quantitative descriptive approach to assess the business opportunities of benzoin (Styrax benzoin) by conducting an economic microanalysis at the farmer level. Primary data were collected through in-depth interviews with benzoin farmers in the Bukit Tiga Puluh National Park area, complemented by direct observation of production and marketing processes (Bernard 2017). To see the business opportunities and commercial benefits of benzoin is to analyze the production potential, namely by obtaining data related to how much cost is produced

Production Costs

The cost of benzoin production incurred by farmers is the sum of fixed costs and variable costs

following equations (2) and (3). Production costs are calculated from the cost of production/unit in rupiah (Rp) and kilograms (kg), fixed costs consist of depreciation costs (benzoin tapping tools). Depreciation costs are calculated using the straight-line method in equation (1).

$$\mathbf{D}i\frac{(\boldsymbol{Pi}-\boldsymbol{Ri})}{\boldsymbol{Ni}}$$

Explanation:

Di : Depreciation value of work equipment (Rp/year);
Pi : Purchase price of work equipment i (Rp/year);
Ni : Economic life of work equipment i (Rp/year);
Ri : Residual value (scrap) of work equipment i (Rp/year);

$$\text{Total Production Cost} = \text{Fixed Costs (Depreciation)} + \text{Variable Costs (Consumption, Transportation}$$

$$\text{Production Cost per Kilogram} = \frac{Total\ Production\ Cost\ (IDR)}{Total\ Output\ (Kg) Total\ Output\ (Kg)}$$

Variable costs in the form of activity costs, these costs are known from the results of the interview. The costs that farmers incur to go to take benzoin, and how much benzoin is produced and until farmers sell benzoin to the market and incur production costs.

Profitability

The profitability of benzoin business was calculated by using equation (4).

$$\boldsymbol{\pi = TR - BP}$$

Explanation:
π : Benzoin business profit (Rp)
TR : Revenue of benzoin farmers (Rp)
BP : Production costs (Rp)

Farmer's Share Analysis

This analysis is used to compare the price received by farmers with the price paid by processors or end buyers. The calculation of the farmer's share in the final product price is a common method in agricultural economics to assess the distribution of value along the supply chain (Mitra & Joshi, 2017). The farmer's share can be quantified using an equation that relates farmgate price to consumer or processor price (Ghosh, 2020).

$$\mathbf{Farmer's\ Share} = \frac{\boldsymbol{Pf}}{\boldsymbol{Pr}}\ \mathbf{x\ 100\%}$$

Notes:
Pf : Price at the farmer level
Pr : The price paid by the collector

RESULTS AND DISCUSSION

Business Opportunities and Commercial Benefits of Benzoin (*Styrax benzoin*)

Benzoin (Styrax benzoin) harvested from Bukit Tiga Puluh National Park (TNBT) presents several promising business opportunities due to its versatile applications and stable market demand. The following key opportunities were identified based on this study: business opportunities.

Raw Material for Perfume and Cosmetic Industries

Benzoin's unique aromatic properties make it a valuable ingredient in perfume and cosmetic formulations. Increasing global demand for natural and sustainable fragrance components supports export potential for Indonesian benzoin, positioning TNBT as a strategic source in this growing market (Burger *et al*. 2016).

Pharmaceutical Raw Material

The presence of bioactive compounds such as cinnamic and benzoic acids in benzoin offers potential for pharmaceutical applications. Its anti-inflammatory and antimicrobial effects, as noted by recent pharmacological studies (Sianipar, 2023), can be developed further to supply the pharmaceutical sector

Development of Derivative Products

Processing benzoin into value-added products such as essential oils and powders can significantly increase economic returns for farmers and local entrepreneurs. This diversification aligns with market trends favoring processed natural products with multiple uses.

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Integration with Ecotourism and Educational Programs

Benzoin cultivation can be linked with agroforestry tourism, educational tours, and conservation awareness activities. Such integration can attract visitors, promote sustainable land use, and create additional income streams for local communities around TNBT.

Stable Market Prices and Income Source for Farmers

The benzoin trade from TNBT demonstrates relatively stable pricing in the international market, contributing to consistent farmer income. As indicated by this study, benzoin farming is a major livelihood activity with a substantial contribution to household income (Siregar, 2023).

Marketing System and Profit Margins

The marketing network involves farmers selling raw benzoin primarily to village collectors, who then distribute to larger markets. Despite profit margins being higher for middlemen, the relatively high profitability at the farmer level (66%) confirms benzoin's viability as a business commodity in TNBT. In the Styrax trade in the international market, Styrax itself is one of the commodities that has a fairly stable price. This consistency is the key to business opportunities in Benzoin cultivation. This is in line with the results of Siregar research (2023) based on this research it can be seen that the level of contribution of benzoin farming is large to farmers' income so that benzoin farming becomes the main source of income for farmers.

Marketing patterns in villages around the TNBT area involve several marketing institutions, namely benzoin farmers to village collectors with the quality of benzoin purchased is quality VI (ash-flakes) in granular form. The marketing pattern in the TNBT area, farmers sell through village collectors and then to sub-district collectors. Many benzoin farmers sell benzoin products to village collectors because the transportation costs incurred are cheaper than selling to sub-district collectors. The village collectors then market to the sub-district collectors. The profit margin can be seen in Table 1.

Table 1 Market Analysis

Market Participants	Price Distribution	Price /kg (Rp)	Percent (%)
Benzoin Farmer	Selling Price	100.000	
	Production Cost	34.000	
	Profit Margin	66.000	
	Percent Profit Margin		66
Village Collector	Purchase Price	100.000	
	Selling Price	200.000	
	Transportation Cost	10.000	
	Profit Margin	90.000	
	Percent Profit Margin		90

Source: Data Processing Results

The production cost is calculated based on the expenses incurred by farmers during the collection of benzoin resin. The components of the production cost include fixed costs and variable costs, which are calculated according to equations 1,2 and 3. The fixed cost consists of the depreciation of tapping equipment, which is estimated to last for one year, while the variable costs include food and transportation

Farmers collect benzoin resin twice a month with a distance of 1-4 km from their residence to the sap collection location. The journey to the benzoin garden is done in two ways, namely by motorbike and on foot. In one collection of benzoin resin, farmers spend components of costs in the form of consumption costs of IDR 70,000 for farmers who go back and forth, while for farmers who stay overnight in the garden it is IDR 140,000, transportation costs of IDR 18,000 and depreciation

costs of tapping tools of IDR 7,500. While the results obtained are 2-4.5 kg with a total production cost of IDR 35,000/kg.

Table 1 shows that the profit margin obtained by farmers is 66%, or IDR 66,000/kg. Meanwhile, the profit margin obtained by the village collectors (middlemen) is much higher than that of the farmers, with the middlemen earning a profit margin of up to 90%, or IDR 90,000 per kilogram. This phenomenon aligns with Hutabarat (2021) statement about the dominant role of middlemen in the benzoin trade, particularly in rural areas that are difficult to access. The middlemen act as intermediaries between farmers and the larger market, but this also leads to farmers' dependency on the prices set by the middlemen.

The significant margin difference between farmers and village collectors is related to the marketing system and the limited knowledge farmers have in marketing their products. In the Bukit Tigapuluh National Park region, especially in five villages—Lemang, Bangayauan, Air Bomban, Nunusan, and Sadan, located in Rantau Langsat Village—the benzoin trade generally involves several intermediaries, including village middlemen and collectors. This structure often results in a lower farmer share for the farmers due to the multiple intermediaries taking profits along the supply chain. Farmers usually sell raw benzoin to the middlemen at relatively low prices, and the middlemen then sell it to broader markets at higher prices. The farmer share difference is IDR 100,000/kg, with a percentage of 50%. This percentage indicates an imbalance in pricing and profit margins between the middlemen and the farmers.

The 50% farmer share percentage indicates that there are still issues in improving and distributing profits more equitably between farmers and collectors. The challenges include:

a. Dependency on Middlemen: Farmers are limited in accessing markets and are highly dependent on local middlemen or village collectors to sell their products. This forces farmers to accept lower prices than those received by middlemen in larger markets. This fact is supported by Siregar and Harahap (2020), which states that the benzoin marketing chain is often still traditional, with farmers selling their products through middlemen at prices lower than those in the final market. This situation is caused by the low access farmers have to direct markets and their lack of modern marketing skills.
b. Lack of Facilities for Processing Benzoin into Finished or Semi-Finished Products: If farmers were able to sell processed or semi-processed benzoin, it would add value to the product, as suggested by Siregar and Harahap (2020). Raw benzoin is vulnerable to damage if not stored properly, and the limited processing facilities reduce the product's selling value.

Conservation Strategy for Benzoin (Styrax benzoin) in TNBT

Styrax benzoin cultivation within Bukit Tigapuluh National Park (TNBT) represents a vital economic opportunity for local communities but also poses challenges in balancing sustainable development and environmental conservation. The business potential of benzoin is underscored by its extensive presence in the region—covering 177 hectares and producing approximately 454 tons per month—and its diverse applications ranging from perfumes and pharmaceuticals to agroforestry tourism. However, unlocking these opportunities requires addressing both quality constraints and sustainability concerns.

Quality Assessment and Market Implications

Benzoin (Styrax benzoin) harvested in Bukit Tigapuluh National Park (TNBT) is primarily classified as Grade VI (ash-flakes), which is the lowest quality category according to Kholibrina and Aswandi (2022). This classification significantly limits the product’s marketing potential, particularly in comparison to higher-grade benzoin from other Indonesian regions such as North Tapanuli. Quality differentiation directly affects the price and access to various market segments.

Farmers’ local classification tends to be simplistic, dividing benzoin into two categories: "takkasan" (low quality) and "tahir" (high quality), which contrasts with collectors’ more nuanced seven-grade system (Harada *et al*. 202). This disparity results in inefficient market signaling, where farmers might undervalue their product or fail to meet higher quality standards demanded by premium markets. The inter-island traders adjust and process these grades according to market demands, emphasizing the need for producers to improve initial sorting and quality control to capture better prices. profitability.

Economic and Livelihood Opportunities

Benzoin production and trade offer substantial income opportunities for local communities, as indicated by the study’s findings showing a farmer profit margin of 66%. However, marketing chains are dominated by village collectors who earn up to

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90% profit margins, creating an imbalance and dependency that reduce farmers' negotiating power (Hutabarat, 2021; Siregar & Harahap, 2020).

Improving farmers' position in the value chain requires capacity building to enhance marketing skills, quality improvement, and product diversification. Processing benzoin into derivative products such as essential oils, powder, and aromatic candles has been identified as a promising strategy to add economic value and stabilize income (Simanjuntak & Batubara, 2012). Community-based approaches, including cooperative models, can reduce reliance on intermediaries and promote more equitable profit distribution (Septeri, 2022).

Sustainable Development and Conservation Integration

Sustainable benzoin harvesting is crucial for forest conservation in TNBT. Environmentally sound tapping methods that avoid overexploitation and promote tree regeneration ensure the long-term availability of this resource. Engaging local communities in conservation through education and participatory forest management strengthens stewardship and aligns economic interests with ecological sustainability (Shi *et al,* 2022).

The diversification of benzoin products provides economic incentives for conservation, as processed products command higher prices and encourage farmers to preserve benzoin trees rather than clear forests for other uses. Support from government and NGOs in providing subsidies for modern tapping tools, technical training, and enforcement of sustainable harvesting protocols can bolster conservation efforts.

Market Expansion and Supply Chain Enhancement

Expanding benzoin's market reach requires targeting key global consumers—especially in Europe (France, Germany), India, and the Middle East—where demand for natural raw materials in perfumes, cosmetics, and religious uses remains strong (Mauthofer et al., 2018). To penetrate these markets, certification schemes such as Fair Trade, organic, and eco-labels are essential. These certifications increase product value, build consumer trust, and often open doors to premium markets.

Logistical improvements and supply chain integration are critical to maintain product quality and timely delivery. Developing coordinated collection, processing, and shipping networks ensures consistent quality and competitiveness (Pasaribu et al., 2021). Strategic partnerships with large exporters provide access to international marketing channels, facilitate certification processes, and support farmer training to meet stringent export standards (He et al., 2023).

Recommendations for Benzoin Farmers and Stakeholders

Adopt Sustainable Tapping Techniques

Implement environmentally friendly harvesting methods that minimize damage to benzoin trees and promote natural regeneration. This approach is essential to maintain the long-term viability of benzoin resources and support sustainable forest management.

Enhance Quality Control

Provide training to farmers on proper sorting, grading, and post-harvest handling techniques. Improving quality control at the farmer level will increase product competitiveness and enable access to higher-value markets.

Promote Value-Added Processing

Develop local capacities to process benzoin into derivative products such as essential oils, powders, and aromatherapy items. Value-added processing can increase farmers' income, reduce vulnerability to raw product price fluctuations, and diversify market opportunities.

Strengthen Cooperative Structures

Encourage the formation of farmer cooperatives or community-based organizations. These structures can improve farmers' bargaining power, facilitate shared access to processing equipment and marketing channels, and enhance collective negotiation in the value chain.

Facilitate Access to Certification

Collaborate with government agencies and non-governmental organizations to obtain certifications such as Fair Trade, organic, and eco-labels. Certification is critical for entering international markets and enhancing product value and consumer trust.

Improve Supply Chain Logistics

Foster partnerships between farmers, exporters, and intermediaries to streamline collection, processing, and transportation processes. Efficient logistics are vital to maintaining product quality and ensuring timely delivery to both domestic and international markets.

Integrate Conservation with Development

Promote community-based forest management programs that align economic development with environmental sustainability. By linking benzoin production with conservation incentives, local communities are encouraged to preserve benzoin trees and forest ecosystems.

CONCLUSION

The cultivation of benzoin (Styrax benzoin) in Bukit Tigapuluh National Park demonstrates significant economic potential for local communities, supported by stable global demand across various industries. However, value distribution remains uneven, with village collectors earning higher margins than farmers. The prevalence of low-grade resin indicates weaknesses in post-harvest handling and quality control. Enhancing farmers' technical skills, promoting value-added products, and strengthening cooperative institutions are essential to improve income and market competitiveness. Sustainable forest management and strategic partnerships with exporters and certification bodies are also crucial to ensure resource sustainability and broaden market access.

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