

Assessing the Socio-Economic Impact, Sustainability and Market Trends of Rudraksha and Its Role in Rural Livelihoods in Arun Valley

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ABSTRACT

This study investigates the socio-economic impact, sustainability, and market trends of *Elaeocarpus ganitrus* (Rudraksha) cultivation and trade in the Arun Valley of Nepal, highlighting its transformative role in enhancing rural livelihoods. The research adopts a mixed-method approach, combining quantitative surveys with qualitative interviews, field observations, and focus group discussions to evaluate how Rudraksha farming contributes to income generation, employment creation, and improved living standards in rural communities. Findings indicate that Rudraksha cultivation has transitioned from a traditional to a semi-commercial enterprise, with farmers investing in high-value grafted saplings and input-intensive farming techniques. This shift has significantly increased household incomes and created seasonal employment, helping to curb migration and elevate rural living conditions. However, the intensification of farming practices, particularly the heavy reliance on chemical supplements, has raised sustainability concerns, including ecological degradation, pollinator loss, and unpredictable crop cycles. Despite its profitability, the sector remains vulnerable to market fluctuations, largely driven by demand from China and India. The lack of institutional support, policy clarity, and infrastructure limits farmers' capacity to add value, directly access markets, or manage risks effectively. The study highlights the urgent need for a robust policy framework that recognizes Rudraksha as a unique agricultural-forest hybrid commodity, backed by institutional mechanisms that provide subsidies, technical training, and marketing infrastructure. The findings also reveal opportunities for market diversification, especially with growing interest from Europe, which could stabilize incomes and reduce dependency on traditional markets. The research underscores the potential of Rudraksha farming as a model for inclusive and sustainable rural development, provided that ecological, economic, and institutional challenges are addressed collaboratively. Recommendations include cooperative formation, environmental education, infrastructure development, and strategic policy interventions to support long-term viability. Overall, Rudraksha cultivation, if managed sustainably, can serve as a catalyst for economic empowerment and ecological stewardship in rural Nepal.

Keywords: *rudraksha cultivation, rural livelihoods, sustainable agriculture, market trends, inclusive development, Arun Valley*

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CHAPTER I INTRODUCTION

1.1 Background of the Study

The socio-economic impact, sustainability, and market trends of Rudraksha (*Elaeocarpus ganitrus*) cultivation present a multifaceted study that encompasses various dimensions including rural livelihoods in the Arun Valley. Current academic discourse highlights the importance of agricultural diversification for rural development, where Rudraksha serves as a significant component due to its medicinal and economic value. Rudraksha is highly valued not only for its religious significance in various cultures but also for its potential as a sustainable crop that can enhance income levels among rural populations. As indicated by Irawan et al. (Irawan et al., 2024), the chemical composition and variations in Rudraksha seeds can increase its value for applications in sustainable materials, suggesting economic opportunities in emerging markets. This reflects the broader trend in rural livelihoods where diversification into non-traditional crops like Rudraksha can promote income resilience amidst fluctuating agricultural sectors, as discussed by Borodina and Prokopa Borodina & Prokopa (2019). The cultivation of medicinal plants supports rural incomes by tapping into growing markets for traditional and modern healthcare products, with Rudraksha positioned as a potential player in both markets (Mofokeng et al., 2022). Moreover, the role of microfinance in enhancing agricultural productivity has been substantiated by studies by Shamim and Hossain Shamim & Hossain (2019) and Labani et al. (Labani et al., 2016), which reveal that access to credit can significantly uplift farmer households in rural areas by facilitating investment in diverse crops including Rudraksha. This microfinance model is crucial as it enhances the economic welfare of rural communities, paving the path for sustainable practices that address poverty while supporting market-driven agricultural strategies.

The integration of digital economy principles is another important aspect. As observed in the analysis by Liu et al. (Liu et al., 2024), digital applications can empower rural industries, improve productivity, and enhance governance. The transition toward a more digital economy allows for better market access for Rudraksha farmers, facilitating e-commerce and increasing competitiveness in the global market. Consequently, this increased connectivity can foster agglomeration economies, generating local employment and improving sustainable practices through collective farmer initiatives (Mazya et al., 2022). Considering the sustainability aspect, the framework for inclusive rural development discussed by Borodina and Prokopa Borodina & Prokopa (2019) underlines the importance of combining business strategies with community engagement. This entails adapting production methods that prioritize environmental sustainability alongside economic viability, resonating with the cultivation of Rudraksha. As communities engage in handicrafts and other forms of local production related to Rudraksha,

there is a significant opportunity to create value chains that enhance local economies while strengthening social ties and cultural identity (Chandra et al., 2018; Podgorskaya et al., 2019).

In summary, the socio-economic impact of Rudraksha cultivation is profound, fostering rural livelihoods through enhanced income-generating capacities, sustainable agricultural practices, and the integration of modern digital solutions. This holistic approach necessitates further research to optimize production methods, market strategies, and socio-economic frameworks that can sustain rural development in regions like the Arun Valley.

1.2 Objectives of the Study

To analyze the socio-economic impact of Rudraksha cultivation and trade on rural communities in Arun Valley, focusing on income generation, employment opportunities, and livelihood improvement.

To assess the sustainability of Rudraksha farming by examining environmental factors, cultivation practices, and long-term viability in the context of climate change and biodiversity conservation.

To explore the market trends, trade dynamics, and challenges associated with Rudraksha production, including pricing mechanisms, value chain analysis, and export potential in national and international markets.

1.3 Research Questions

How has Rudraksha cultivation and trade contributed to the income generation of rural households in Arun Valley?

What employment opportunities have emerged from Rudraksha farming and trade, and how have they influenced local economic development?

In what ways has the cultivation and trade of Rudraksha improved the overall livelihood and living standards of rural communities in Arun Valley?

What are the key environmental factors affecting the sustainability of Rudraksha farming in Arun Valley?

How do current Rudraksha cultivation practices impact soil health, water resources, and biodiversity conservation in the region?

What are the potential long-term challenges and opportunities for Rudraksha farming in the face of climate change and ecological changes in Arun Valley?

What are the current market trends and pricing mechanisms influencing the trade of Rudraksha in local, national, and international markets?

How does the Rudraksha value chain function, and what are the key roles of farmers, traders, and exporters in the supply chain? What challenges do Rudraksha producers and traders face in accessing larger markets, and what strategies can enhance its export potential?

1.4 Significance of the Study

This study is significant for policymakers, researchers, and stakeholders involved in Rudraksha farming and trade. By assessing the socio-economic benefits and sustainability challenges, the findings will help develop strategies for improving farmers' livelihoods, promoting sustainable agricultural practices, and enhancing market access for Rudraksha products. Additionally, the study will contribute to the existing literature on non-timber forest products (NTFPs) and their role in rural economies.

1.5 Scope and Limitations

The study focuses on Rudraksha production and trade in Arun Valley, examining its economic, environmental, and market aspects. It will involve primary data collection from farmers, traders, and stakeholders, as well as secondary data from existing literature. However, limitations may include constraints in data availability, seasonal variations in Rudraksha production, and access to international trade information.

1.6 Organization of the Study

The research is structured into five chapters. Chapter 1 introduces the study, including background, problem statement, objectives, research question, significance, scope, and limitations. Chapter 2 Literatures review Chapter 3 outlines the research methodology, including data collection methods and analysis techniques. Chapter 4 presents findings and discussions, while Chapter 5 provides conclusions and recommendations for future research and policy interventions.

CHAPTER II LITERATURE REVIEW

The article by **Borodina and Prokopa (2019)** presents inclusive rural development (IRD) as a comprehensive and multi-dimensional process that combines economic progress with active social and political involvement in rural areas. The authors stress the importance of tailoring development strategies to specific local conditions, enabling rural populations to access and manage resources effectively while engaging in meaningful decision-making. Central to their argument is the idea that inclusivity is key to alleviating poverty and combating marginalization, with state intervention and regulation playing a crucial supportive role. Key aspects of IRD include a multi-vector approach, addressing economic, social, and political needs simultaneously, and promoting bottom-up initiatives that emerge from community efforts but are strengthened by supportive governmental policies. The authors also emphasize

the need for a strong legal framework to institutionalize inclusive and sustainable development practices, particularly in agriculture. However, challenges persist. Scholars like Tyshchenko (2022) advocate for decentralization, enabling local governments to take a more active role in implementing inclusive strategies. Additionally, effective monitoring and evaluation mechanisms are necessary to track development and mitigate disparities. While the article underscores the necessity of inclusive strategies, Popa et al. (2024) caution that economic growth alone, without robust social frameworks, may fall short in achieving sustainable development highlighting the need for a balanced approach that values both economic efficiency and social equity.

Chandra, Sharma, and Kant (2018) explore the potential of country of origin (COO) branding for Indian medicinal and aromatic plants (MAPs), emphasizing the transition from commodity to brand. The paper highlights the importance of leveraging India's rich heritage and unique properties of MAPs to create a distinct brand identity that can enhance market value and empower local suppliers. This approach aligns with the broader discourse on ingredient branding and COO effects, which suggest that strategic branding, can differentiate products in global markets and provide competitive advantages.

The literature on medicinal plant cultivation emphasizes its potential for sustainable economic development and healthcare enhancement. **Mofokeng et al. (2022)** highlight the increasing global demand for medicinal plants, which, despite being minor crops, hold significant economic value and contribute to rural livelihoods, particularly for women. The cultivation of these plants can mitigate the unsustainable wild harvesting practices that threaten biodiversity and supply.

The study by **Irawan et al. (2024)** explores the incorporation of *Elaeocarpus ganitrus* (rudraksha) seed filler (RSF) into polymer matrix composites (PMCs), aiming to develop sustainable and eco-friendly materials. The research demonstrates that RSF significantly enhances both mechanical and thermal properties of the composites. At an optimal loading of 10 wt%, the composites achieved a tensile strength of 42.30 MPa and a flexural strength of 87.4 MPa, while increasing the RSF content to 20 wt% improved impact resistance to 0.436 J. Additionally, the RSF composites showed improved thermal stability, with decomposition temperatures surpassing those of the pure epoxy matrix. These findings suggest that rudraksha seed filler offers promising potential as a natural reinforcement material in the development of environmentally sustainable composites.

CHAPTER III RESEARCH METHODOLOGY

- 3.1 Research Design:** Mixed-method approach combining quantitative surveys for income, employment, and trade analysis, and qualitative interviews, FGDs, and field observations to explore sustainability, practices, and challenges.
- 3.2 Study Area:** Focused on key Rudraksha-producing areas of Arun Valley, including Khandbari, Shadananda, Panchkhapan/Sabhapokhari, and Tumlingtar.

- 3.3 Target Population & Sampling: Involves diverse stakeholders (farmers, traders, exporters, officials, NGOs, and consumers) with a stratified random sampling of 70 participants.
- 3.4 Data Collection Methods
 - a. Household surveys on farming practices, income, and market access.
 - b. Key Informant Interviews (KIIs) with traders, officials, and NGOs for qualitative insights.
 - c. Focus Group Discussions (FGDs) on benefits, challenges, and strategies.
 - d. Field observations to validate data and document farming and market practices.
- 3.5 Data Analysis
 - a. Quantitative: Statistical tools for demographic and market trend analysis.
 - b. Qualitative: Thematic and content analysis for challenges and opportunities.
- 3.6 Ethical Considerations: Ensures informed consent, confidentiality, voluntary participation, and data accuracy.
- 3.7 Study Limitations: Restricted access to remote areas, market fluctuations, and potential response biases.

CHAPTER IV RESULTS AND DISCUSSION

This chapter presents a theme-wise analysis of the findings obtained through household surveys and field observations. It reflects the patterns of Rudraksha cultivation, its socio-economic contribution, market dynamics, sustainability concerns, and policy gaps in the Arun Valley region.

4.1 Rudraksha Cultivation Practices

Rudraksha cultivation in the Arun Valley has become increasingly structured and market-responsive in recent years. Farmers across the region are managing plantations ranging from 150 to as many as 2,000 trees, with annual yields generally falling between 500 to 3,500 kilograms depending on the maturity and health of the trees. Most of the cultivated Rudraksha plants are aged between 5 to 10 years, which is considered a productive phase in their lifecycle. While the 5 Mukhi Rudraksha remains the most widely grown due to its consistent demand in both Indian and Chinese markets, farmers are now diversifying their plantations by incorporating species such as Samyadan (which produces 7 to 9 Mukhi beads), *Hushing* (known for its large, flat, and shiny appearance), square-shaped beads, and the increasingly sought-after 2 Mukhi variety.

This shift reflects an emerging trend of demand-driven agriculture where the choice of species is guided more by market preferences than by traditional practices. Supporting this change is the growing adoption of grafted high-value saplings, with some individual plants reportedly costing up to NPR 1.2 million. These grafted varieties are believed to yield premium quality beads that fetch significantly higher prices in international markets. However, this

intensification of farming is accompanied by increased reliance on agricultural inputs, including compost manure, Chinese vitamin and chemical treatments, and Indian “Kala Sona” organic manure, used to enhance growth and fruit quality. A small number of farmers have also introduced intercropping techniques, using available land resources more efficiently, though such practices remain limited and have not yet scaled across the region.

The overall trend indicates that Rudraksha farming in the Arun Valley is shifting toward a **semi-commercial**, input-intensive model, requiring both capital investment and technical know-how. This evolution opens new opportunities for rural livelihoods but also underscores the need for proper agricultural extension services to mitigate risks associated with chemical overuse and to improve productivity.

Table 4.1: Summary of Rudraksha Cultivation Practices

Indicator	Description
Number of Trees per Farmer	150 to 2,000
Annual Yield	500 to 3,500 kg
Age of Trees	Mostly 5 to 10 years
Common Species	5 Mukhi, Samyadan (7–9 Mukhi), Hushing, Square-sized, 2 Mukhi
Grafted Sapling Cost	Up to NPR 1.2 million per plant
Types of Manure Used	Compost, Chinese vitamins/chemicals, Indian Kala Sona
Use of Intercropping	Practiced in a few land patches; limited adoption

Source: Survey, 2025

Discussion

The current trend in Rudraksha cultivation indicates a clear transition from traditional to commercial, input-intensive farming. Farmers are increasingly adopting grafted high-value varieties, which promise better yields and higher market prices. This shift reflects the growing commercialization of Rudraksha as a cash crop. However, the use of advanced inputs such as chemical vitamins and specialized fertilizers requires technical knowledge and proper handling. In the absence of adequate training and guidance, many farmers have experienced negative outcomes, including plant stress and even tree mortality, often caused by the overuse or misapplication of supplements. This highlights the urgent need for agricultural extension services and farmer education programs to ensure that modernization leads to sustainable productivity rather than unintended losses.

4.2 Socio-Economic Impact on Rural Livelihoods

Rudraksha cultivation in the Arun Valley has made a significant contribution to the rural economy by improving household income and creating seasonal employment opportunities. On average, each farm employs more than six laborers during the harvesting season, primarily for activities such as plucking, washing, compost preparation, and spraying vitamins or medicines. These tasks, which typically span about three months per year, have helped generate short-term

rural employment, especially for unskilled workers and family members. This seasonal labor demand has proven particularly important in preventing outward migration and promoting local livelihood retention. From an income perspective, some Rudraksha farms reported an annual economic turnover exceeding NPR 2 million, a notable sum in the context of rural Nepal. Though net profits vary depending on market price fluctuations and input costs, farmers consistently report significant financial gains. These gains have translated into measurable improvements in household living standards. According to survey responses, 78% of the farmers noted improved access to education, 65% reported better healthcare services, and 70% observed enhanced household amenities. Importantly, 85% of the respondents indicated that Rudraksha farming has led to an increase in employment opportunities, especially during peak agricultural seasons.

The following table summarizes the key areas of livelihood improvement as reported by the Rudraksha farming community:

Table 4.2: Livelihood Improvements Reported by Farmers

Improvement Area	Percentage of Respondents (%)
Education Access	78%
Healthcare Services	65%
Household Amenities	70%
Employment Creation	85%

Source: Survey, 2025

These findings reflect the important role of Rudraksha farming as not just a commercial crop but also a catalyst for social upliftment and rural empowerment. However, sustaining this impact requires policy recognition, market stability, and continued access to agricultural knowledge and infrastructure.

Discussion

Rudraksha farming has rapidly emerged as a vital source of livelihood in the Arun Valley, offering seasonal employment to local laborers and contributing significantly to household incomes. It engages farmers in various tasks such as planting, plucking, cleaning, and maintenance, particularly during peak harvesting months. However, despite its growing economic role, profit margins remain unstable. This is largely due to fluctuating market prices, which are influenced by external demand—especially from China and India and the rising cost of agricultural inputs like grafted saplings, fertilizers, and chemical supplements. As a result, while the sector holds strong potential, farmers face financial uncertainty unless supported by stable pricing mechanisms and affordable input supply.

4.3 Environmental and Sustainability Concerns

While Rudraksha farming has become increasingly commercialized and profitable in the Arun Valley, it has also raised significant environmental and sustainability concerns. One of the most pressing issues is the overdependence on external agricultural inputs particularly Chinese vitamins and chemical medicines. Farmers reported spending between NPR 6 to 9 million per

season on these chemical enhancers in an effort to boost growth and fruit yield. However, this high-input farming model has begun to show unintended ecological consequences.

A notable and alarming trend is the decline in pollinator populations, especially honey bees, which are critical for the successful pollination of Rudraksha flowers. Farmers expressed concern that excessive and unregulated use of chemical supplements may be directly contributing to the disappearance of these natural pollinators. The loss of bees not only threatens current yields but could jeopardize the long-term sustainability of Rudraksha cultivation itself, as natural pollination is essential for fruit development.

Moreover, the overuse and sometimes inappropriate application of these chemicals have led to unpredictable flowering and fruit ripening patterns. This erratic behavior in plant cycles has made it increasingly difficult for farmers to anticipate harvesting times, plan labor, or meet market demands effectively. Additionally, respondents shared multiple cases of whole-plant **mortality**, where trees dried up completely. Many farmers attributed this to improper dosages or combinations of chemical inputs, though some also acknowledged that climate change may be compounding the problem.

These findings point to a critical need for technical training, agronomic guidance, and environmentally sustainable practices in Rudraksha farming. Without such interventions, the short-term gains from chemical-intensive agriculture could give way to long-term ecological degradation, threatening both productivity and farmer livelihoods. Balancing profitability with ecological responsibility must now become a central focus for the future of Rudraksha cultivation in the Arun Valley.

Discussion

While profitability drives chemical usage, sustainability is at risk. The declining bee population and plant health issues suggest an urgent need for organic practices, integrated pest/nutrient management, and climate adaptation strategies.

4.4 Market Trends and Trade Patterns

The trade and market dynamics of Rudraksha beads in the Arun Valley reveal a rapidly expanding yet fluctuating economic landscape. Annual transaction estimates indicate a robust market size, with approximately NPR 100–120 billion worth of Rudraksha traded with China and another NPR 60–70 billion with India. These figures underscore the crop's immense economic potential and its significance as a high-value export commodity for Nepal. The pricing of Rudraksha is highly dependent on several key factors, including the species type, physical size, and particularly the number of Mukhis, the natural clefts or faces on the surface of the beads that determine their spiritual and commercial value. Among the different quality categories, Grade A Rudraksha beads command exceptionally high prices in the international market, with income reaching as high as NPR 200,000 per kilogram for premium-quality, rare Mukhi varieties. However, the value chain is segmented by buyer preferences. The Chinese market tends to favor chemically treated or polished Rudraksha beads, often enhanced with

vitamins and other visual enhancements, whereas the Indian market prefers more natural, untreated beads. This distinction has led to the development of two parallel marketing and treatment strategies among farmers and traders.

Recently, a new and promising market has started to emerge in Europe, with a growing interest in spiritually significant Mukhi Rudraksha varieties. This expanding global demand indicates new possibilities for Nepalese farmers and traders, provided that quality, authenticity, and certification standards are maintained.

Despite these opportunities, the market is not without its challenges. A notable price decline in the Chinese market occurred after Fiscal Year 2076/77, where the same quality of chemically treated beads that previously fetched NPR 200,000 per kilogram began selling for only NPR 20,000. This drop in value is attributed to changing consumer preferences and possibly oversupply or saturation. Such fluctuations highlight the vulnerability of Rudraksha farming to external market forces and underscore the need for strategic diversification, value addition, and direct market access to ensure price stability and profitability for local producers.

Table 1: Cost-Benefit Analysis of High-Value 5 Mukhi Rudraksha

Particular	Unit/Qty	Rate (NPR)	Total (NPR)
Vitamin/Medicine	3 times	5000	15,000
Compost Manure (12 kg)	12 kg	125	1,500
Bamboo Racks (150 units)	150	25	3,750
Coconut Rope (1000 units)	1000	2	2,000
Construction Wages (8 pax)	8	1200	9,600
Plucking Wages	1	1500	1,500
Cleaning Wages	1	1500	1,500
Total Expenditure			34,850
Total Income			60,900
Net Profit			26,050

Source: Survey, 2025

Discussion

The Rudraksha market is profitable but highly volatile, largely influenced by middlemen and foreign buyers, especially from China and India. Farmers often have limited control over pricing, as middlemen set rates based on fluctuating international demand. To reduce this dependency, promoting direct-to-consumer sales and forming cooperatives can help farmers secure fair prices and improve market access. Additionally, the emerging interest from Europe presents a promising opportunity for market diversification, which could stabilize income and reduce reliance on a few external markets.

4.5 Policy, Institutional Support, and Governance

Despite the growing economic importance of Rudraksha cultivation in the Arun Valley, farmers face significant institutional and policy-related challenges. A major issue is the lack of clear classification, Rudraksha is neither formally categorized as an agricultural product nor as a forest product. This ambiguity causes confusion in administration and prevents the formulation of targeted policies. Farmers also report receiving no financial or technical assistance from the government. This includes the absence of agricultural subsidies, extension services, or training programs, despite the high investment costs associated with grafted saplings, manure, and chemical supplements. Furthermore, many farmers face double taxation from different local government units when transporting or selling their products, adding unnecessary financial strain. Another critical finding is the absence of support infrastructure. There are no designated collection centers, value addition facilities, or organized farmer cooperatives in the region. This limits farmers' ability to process, package, grade, and market their products directly. As a result, they are heavily reliant on middlemen and receive lower prices for their beads, often without proper quality recognition or branding.

Discussion

The findings indicate that although Rudraksha cultivation contributes significantly to the local economy and rural employment, it remains institutionally neglected. There is an urgent need for policy recognition and structured support. First, the government must clearly classify Rudraksha, ideally under a hybrid model that accommodates both its agricultural and forest-linked characteristics. This would enable the development of tailored policies, facilitate access to subsidies, and define regulatory responsibilities. In addition, the establishment of designated Rudraksha cultivation zones in suitable areas such as Yaphu, Silichong, Devitar, and Bhojpur could promote planned expansion. These zones could receive priority access to grafted saplings, organic inputs, and technical assistance, ensuring higher productivity and quality. There is also a need to build infrastructure, such as local collection centers and processing units, where farmers can store, sort, and add value to Rudraksha beads (e.g., through cleaning, stringing into malas, or packaging for export). Such facilities would improve traceability and increase market value. Moreover, the promotion of cooperative models would enable collective bargaining, reduce dependency on middlemen, and facilitate direct access to national and international markets. Lastly, reforming the local taxation system to eliminate double taxation and create a transparent and uniform tax policy would significantly reduce transaction costs and incentivize formal trade.

In conclusion, Rudraksha farming has immense untapped potential, but its growth and sustainability depend on a well-defined policy framework, institutional backing, and farmer-focused governance mechanisms.

CHAPTER V CONCLUSION OF THE DISCUSSION

The study shows that the Rudraksha economy in the Arun Valley is rapidly growing and holds strong potential for improving rural livelihoods, enhancing trade, and strengthening Nepal's

spiritual commodity sector. Rudraksha farming now provides significant income and employment, with increasing adoption of high-value grafted varieties and expanding international demand, including from China, India, and Europe. However, the sector faces key challenges, including environmental degradation due to excessive chemical use, market instability, and lack of government support and institutional infrastructure. To ensure sustainable growth, a multi-stakeholder approach is needed engaging farmers, cooperatives, researchers, and policymakers. Strategic actions should include clear policy classification, investment in processing and collection centers, training in sustainable practices, cooperative formation, and market diversification. With proper support, Rudraksha farming can become a model for sustainable, inclusive, and profitable rural development.

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