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Community-Based Ecotourism for Sustainable Rural Development and Biodiversity Conservation: A Case Study of Kaziranga National Park

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Abstract

Community-based ecotourism has increasingly been promoted as a mechanism for linking biodiversity conservation with rural development in and around protected areas. Its significance is particularly evident where local communities bear both the opportunity costs of conservation and the environmental risks associated with human–wildlife interactions. This study examines the contribution of community-based ecotourism to rural development and biodiversity conservation around Kaziranga National Park (KNP), Assam, India. The analysis is based primarily on a household survey of 400 households from 15 fringe villages, supplemented by stakeholder interviews, field observations and secondary information. Of the sampled households, 95 (23.75%) were directly engaged in tourism-related activities, while 305 (76.25%) were primarily dependent on agriculture, wage labour, business and other non-tourism activities. The findings indicate a substantial difference in household income: tourism-engaged households reported an average monthly income of Rs. 24,474 compared with Rs. 10,675 among non-tourism households, representing a difference of Rs. 13,799 and an income ratio of approximately 2.29:1. Tourism has also contributed to livelihood diversification through safari services, accommodation, transport, guiding, handicrafts, handloom, food services and cultural activities. The estimated tourism income mul-

tiplier of 2.63 suggests considerable indirect and induced economic effects, with direct, indirect and induced effects accounting for 38.09%, 19.05% and 42.86%, respectively. Approximately 73% of households reported improvement in quality of life. At the same time, the study identifies unequal distribution of tourism benefits, seasonal income fluctuations, environmental pressure, waste, habitat disturbance and human–wildlife conflict. Approximately 74% of respondents perceived tourism benefits to be concentrated among economically stronger households, while the estimated Gini coefficient was about 0.347. The study argues that ecotourism cannot be considered automatically sustainable. Its contribution to rural development and conservation depends upon equitable benefit sharing, local ownership, community participation, women's empowerment, local procurement, carrying-capacity management and effective mechanisms for addressing conservation-related livelihood costs. The paper concludes that community-based ecotourism can create a virtuous relationship between biodiversity, tourism, local income and conservation when supported by inclusive governance.

Keywords: Community-based ecotourism; rural development; biodiversity conservation; livelihood diversification; Kaziranga National Park; local communities; tourism multiplier; sustainable tourism; income generation; conservation

1. INTRODUCTION

Tourism has become an important component of rural economic development, particularly in areas endowed with wildlife, forests, wetlands and other natural resources. Tourism activity in Kaziranga National Park promotes local-level self-employment and generates livelihood opportunities for local communities through activities such as guiding, transportation, accommodation, farming, handicrafts, and other tourism-related services, thereby supporting entire families [1]. These activities create backward and forward linkages within local economies. The significance of these linkages is particularly high in protected-area destinations, where the natural environment itself constitutes the principal tourism asset [1, 2].

The rules and regulations of protected areas, however, create a development dilemma. Local communities living around national parks may face restrictions on the use of natural resources, while simultaneously bearing costs arising from crop damage, livestock losses, property damage and human–wildlife conflict. When conservation generates limited economic benefits for surrounding communities, support for conservation may weaken. Community-based ecotourism attempts to address this problem by connecting local livelihoods with the economic value of biodiversity.

Kaziranga National Park (KNP), situated in Assam, provides an important setting for examining this relationship. The park's wildlife and biodiversity attract domestic and international visitors, while communities surrounding the park participate in tourism through safari operations, transport, accommodation, guiding, food services, handicrafts and cultural activities. The resulting socio-economic system can be conceptualized as:

Biodiversity → Tourism attraction → Tourist expenditure → Local income → Livelihood diversification → Community support → Conservation

At the same time, an opposite pathway may emerge:

Tourism growth → Visitor pressure → Waste and congestion → Habitat disturbance → Environmental pressure → Reduced sustainability.

The coexistence of these two pathways means that tourism growth by itself cannot be regarded as synonymous with sustainable development. The crucial issues are who receives tourism income, how much income remains within the local economy, whether local people participate in decision-making and whether tourism creates sufficient incentives to support biodiversity conservation. The study identifies the central challenge as converting the economic benefits of tourism into equitable development and stronger conservation incentives.

The central problem addressed in this paper is the apparent contradiction between the developmental and conservation objectives of ecotourism. On one hand, tourism creates employment, income, livelihood diversification, entrepreneurship, community participation and conservation awareness. On the other hand, tourism expansion can generate unequal benefit distribution, seasonal income instability, waste, habitat disturbance, infrastructure pressure, human–wildlife conflict and concentration of tourism assets among relatively wealthier households.

The study, therefore, moves beyond the simple question of whether tourism produces economic benefits. It examines whether those benefits contribute to inclusive rural development and conservation and what institutional conditions are necessary for achieving such an outcome.

The study has three principal objectives: (a) to examine the role of ecotourism in employment generation and livelihood diversification around KNP; (b) to assess the contribution of ecotourism to community welfare, empowerment, and quality of life; and (c) to examine whether ecotourism strengthens biodiversity conservation and environmental awareness while identifying its principal sustainability challenges.

The empirical analysis considers the following hypotheses:

H1: Tourism-engaged households have higher average monthly income than non-tourism households.

H2: Tourism promotes livelihood diversification among local households.

H3: Tourism generates significant direct, indirect and induced economic effects in the local economy.

H4: Tourism contributes to improvement in household living standards.

H5: Tourism promotes community empowerment and participation.

H6: Ecotourism strengthens environmental awareness and conservation support.

H7: Tourism benefits are unevenly distributed among households.

H8: Greater local ownership and stronger local supply-chain linkages increase the local economic multiplier effect.

2. REVIEW OF LITERATURE

A substantial body of literature has been produced worldwide; however, many studies remain concentrated in specific regions and protected-area contexts. Nguyen Dinh Tien et al. [3] examined community-based ecotourism for sustainability in Binh Son district, Quang Ngai province, Vietnam, and discussed CBET as a strategy linking rural development with ecosystem conservation. Chaturvedi et al. [4] explored community-based ecotourism in Katarniaghat Wildlife Sanctuary, India. Thakur et al. [5] focused on community-based ecotourism in Chhattisgarh, India, and identified service deficiencies

and conflicts over resource use despite the importance of ecotourism for local livelihoods, indigenous communities, women, and equitable benefit sharing. Sahu et al. [6] also examined its potential benefits for indigenous livelihoods and conservation. Governance arrangements and capacity-building mechanisms strongly influence communities' ability to participate effectively in ecotourism development [7].

Community participation has long been considered an important component of sustainable tourism. Murphy [8] emphasized the incorporation of local communities into tourism planning and management. Tosun [9] subsequently highlighted the institutional and structural constraints that often prevent effective participation in developing-country tourism. Ashley and Roe [10] linked tourism with pro-poor development and argued that tourism can contribute to local development when local communities participate in planning, management and benefit sharing rather than merely supplying low-paid labour. Scheyvens' empowerment framework provides an especially relevant perspective and identifies economic, social, psychological, and political dimensions of empowerment [11]. Thus, an increase in tourism income alone is insufficient to establish successful community-based tourism. Local people should also gain confidence, organizational capacity, social status and influence over tourism-related decisions.

The KNP evidence is consistent with this approach. Local participation occurs through homestays, guiding, cultural activities, handicrafts, self-help groups and Eco-Development Committees (EDCs). However, the evidence also indicates that economically stronger stakeholders and external investors can exert greater influence in some tourism activities.

The sustainable-livelihood perspective emphasizes diversification as a means of reducing household vulnerability. Ellis [12] argues that rural households commonly combine agriculture, wage employment, self-employment and other activities in response to risk and changing economic opportunities. This perspective is particularly appropriate for KNP because agriculture and animal husbandry remain important livelihood activities, while tourism provides new non-farm opportunities. The household survey shows that agriculture and animal husbandry account for 47.25% of households, whereas direct tourism-related activities account for 23.75%. Tourism therefore appears to function primarily as a complementary livelihood strategy.

Tourism-related activities include safari driving, guiding, accommodation, homestays, transport, handicrafts, handloom, food services, cultural performances and small-scale trade. Such diversification may reduce dependence on agriculture and casual wage labour and provide additional income resilience.

Tourism can stimulate rural development through direct employment and through indirect linkages. Accommodation providers purchase food and other supplies; restaurants purchase agricultural products; transport services purchase fuel and maintenance services; tourists purchase handicrafts and souvenirs and tourism households spend their income on locally available goods.

The literature consequently distinguishes between direct, indirect and induced effects. The KNP study applies this framework through an empirical tourism income multiplier. This is important because the contribution of tourism to rural development cannot be measured only through the wages or profits generated by tourism enterprises.

An important criticism of ecotourism is that aggregate economic growth does not necessarily translate into equitable development. Households with capital to purchase safari vehicles, construct accommodation facilities or establish businesses may capture considerably more tourism income than households participating only as wage workers.

The literature, therefore, suggests a paradox: ecotourism can reduce poverty while simultaneously creating or reinforcing inequality. The KNP findings provide evidence of precisely this duality. Tourism-engaged households have considerably higher average income, but tourism assets are not equally distributed.

One of the strongest arguments for ecotourism is that it can transform biodiversity from an under-valued environmental resource into an economic asset. Tourist expenditure, entry fees, safari charges and related tourism activities generate financial resources, while local tourism income creates an economic incentive to preserve the wildlife upon which the tourism economy depends.

The conservation pathway can therefore be expressed as:

Biodiversity → Tourism attraction → Tourist expenditure → Local income → Conservation incentive → Biodiversity protection.

The KNP evidence indicates greater environmental awareness, recognition of the economic importance of wildlife and participation in conservation-related activities. However, tourism may also produce noise, visitor pressure, waste and habitat disturbance, particularly in tourism-intensive areas such as Kohora and Bagori.

The existing literature provides substantial conceptual and empirical evidence concerning ecotourism, conservation and community development. However, three gaps remain important.

First, many studies focus either on tourism's economic benefits or its ecological consequences rather than examining them simultaneously. Second, relatively less attention is given to the distribution of tourism benefits among tourism-engaged and non-tourism households at the fringe-village level. Third, the relationship between tourism participation, livelihood diversification, local economic multiplier effects and conservation support requires integrated household-level analysis.

The present study addresses these gaps by combining household income analysis, occupational structure, livelihood diversification, inequality, multiplier effects, community welfare and conservation perceptions within a single analytical framework. This integrated household-level approach constitutes one of the principal research contributions of the present study.

3. RESEARCH METHODS AND PROCEDURES

The empirical investigation was conducted in and around Kaziranga National Park, Assam, focusing on selected fringe villages associated with major tourism zones. The location of the study area is presented in Figure 1.

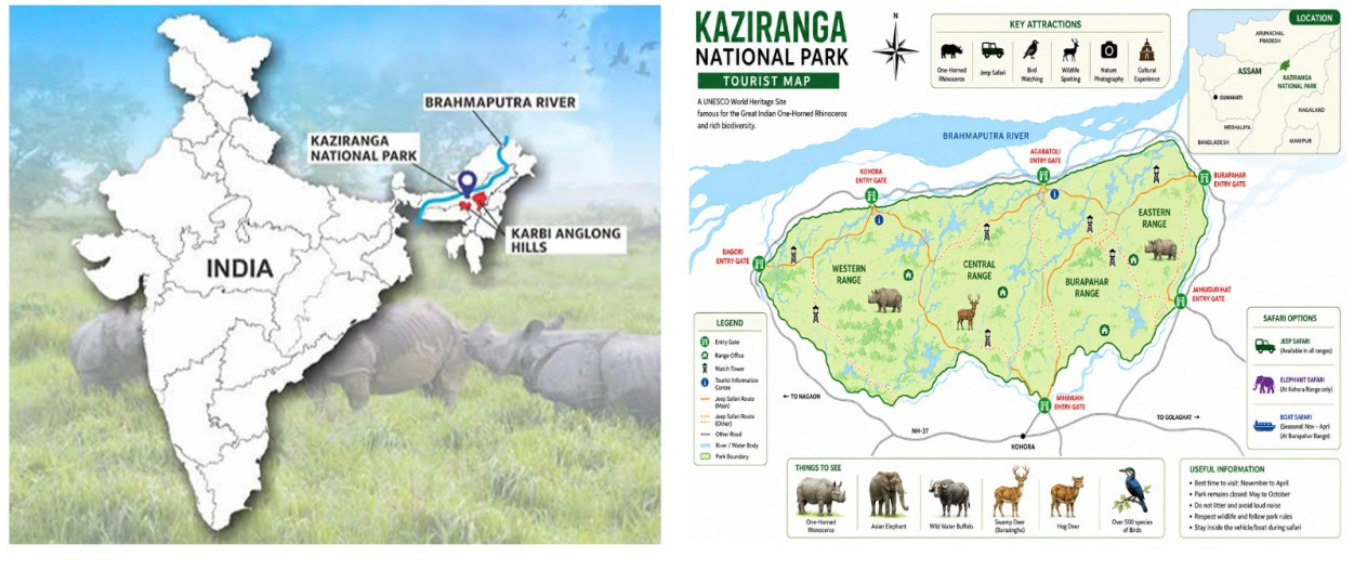


Figure 1. Map of Kaziranga National Park

The selected locations represented communities associated with the Kohora, Agoratoli, Bagori and Burapahar areas. KNP is particularly suitable for this study because tourism and biodiversity conservation coexist within the same socio-ecological system. Local communities participate in tourism while simultaneously experiencing the opportunities and costs associated with conservation.

The study adopts a descriptive, analytical and explanatory research design. The principal empirical evidence is derived from a household survey, supported by stakeholder interviews, field observations and secondary information. The broader research involved 400 tourists, 400 households and 25 key informants; however, the present paper focuses principally on the 400-household dataset because its objective is to examine rural development and conservation outcomes. A structured questionnaire containing closed-ended and Likert-scale questions was used. Personal interviews were conducted with local residents, tourism operators, government officials, community representatives and other stakeholders.

Primary data were collected during October 2024–May 2025. A multistage sampling approach was adopted. Households were selected purposively and stratified according to their proximity and relationship to tourism activities. Table 1 summarizes the resulting sample structure.

Table 1. Sample Structure

Respondent category	Sample	Sampling approach
Households	400	Stratified/purposive
Tourism-engaged households	95	Identified through tourism participation
Non-tourism households	305	Primarily non-tourism livelihoods
Key informants	25	Purposive
Total household sample	400	

Source: Author's field survey; methodology documented in the underlying study

A household was classified as tourism-engaged when it derived income directly from tourism-related activities. Thus:

$$TE_i = \begin{cases} 1 & \text{if household } i \text{ is directly engaged in tourism,} \\ 0 & \text{otherwise.} \end{cases}$$

The resulting groups were 95 tourism households and 305 non-tourism households.

The principal analytical techniques included frequency and percentage analysis; comparative mean and median income analysis; income-distribution analysis; calculation of the Gini coefficient; livelihood-diversification analysis; tourism-dependency analysis; Keynesian direct, indirect, and induced multiplier analysis; and Likert-scale analysis of community and conservation perceptions.

$$\text{Tourism dependency is expressed as: } TD_i = \frac{\text{Tourism Income}_i}{\text{Total Household Income}_i} \times 100.$$

The income difference between tourism and non-tourism households is: $D = \bar{Y}_T - \bar{Y}_{NT}$

where $\bar{Y}_T$ and $\bar{Y}_{NT}$ represent mean monthly income of tourism and non-tourism households respectively.

Income inequality was examined using the Gini coefficient where zero indicates perfect equality and one represents extreme inequality. The estimated Gini coefficient for the household sample is approximately **0.347**.

4. RESULTS AND DISCUSSION

The occupational structure indicates that the rural economy surrounding KNP continues to depend heavily on agriculture while simultaneously incorporating tourism-based activities, as shown in Table 2.

Table 2. Occupational Distribution of Sample Households

Occupational category	Frequency	Percentage
Agriculture & animal husbandry/farming	189	47.25
Wage labour	68	17.00
Non-tourism business/trade	32	8.00
Government/private employment	16	4.00
Direct tourism-related activities	95	23.75
Total	400	100.00

Source: Author's calculation from household survey

Agriculture and animal husbandry constitute the largest livelihood category, accounting for 47.25% of households. Wage labour accounts for another 17%. Direct tourism employment accounts for 23.75%.

The finding suggests that tourism has not displaced agriculture. Instead, it has created an additional non-farm livelihood opportunity. This is particularly relevant because agriculture around KNP is exposed to flooding, wildlife damage and seasonal uncertainty. Tourism can therefore contribute to livelihood resilience by expanding the range of household income sources.

One of the most important findings is the substantial difference between tourism-engaged and non-tourism households, summarized in Table 3.

Table 3. Income Comparison between Tourism and Non-tourism Households

Indicator	Tourism households	Non-tourism households
Number of households	95	305
Average monthly income	Rs. 24,474	Rs. 10,675
Median monthly income	Rs. 25,000	Rs. 8,500
Income ratio	2.29	1.00
Absolute difference	Rs. 13,799	—

Source: Author's calculation based on household field survey

The average monthly income of tourism-engaged households is Rs. 24,474, compared with Rs. 10,675 among non-tourism households. The absolute difference is therefore:

$$\text{Rs.}24,474 - \text{Rs.}10,675 = \text{Rs.}13,799.$$

Tourism households earn approximately 2.29 times the income of non-tourism households. The median income difference is also substantial: Rs. 25,000 compared with Rs. 8,500.

This provides strong descriptive evidence supporting **H1**. However, the finding should not be interpreted as proof that tourism alone causes the income difference. Tourism households may differ from non-tourism households in terms of asset ownership, education, entrepreneurial ability, location and access to capital. Therefore, the appropriate interpretation is that tourism participation is strongly associated with higher household income, rather than that a causal effect has been statistically established.

The income distribution presented in Table 4 reveals a marked difference between the two groups.

Table 4. *Selected Household Income Distribution*

Monthly income category	Tourism households	Non-tourism households
Below Rs.10,000	12.6%	65.9%
Rs.10,000–Rs. 20,000	Higher concentration	Large concentration
Rs. 20,001–Rs. 30,000	Significant share	Limited
Rs. 30,001–Rs. 40,000	Significant share	Very limited
Above Rs. 40,000	12.6%	Less than 1%

Source: Household field survey

Approximately 65.9% of non-tourism households earn below Rs.10,000 per month, compared with only 12.6% of tourism households. At the upper end, 12.6% of tourism households earn more than Rs. 40,000 per month, while fewer than 1% of non-tourism households fall in this category. The estimated Gini coefficient of approximately 0.347 indicates moderate inequality within the sample.

This finding supports **H7**. However, inequality should not be interpreted as evidence that tourism itself is necessarily harmful. Rather, it highlights unequal access to productive tourism assets. Households owning safari vehicles, homestays, lodges and transport businesses can capture greater tourism revenue than households participating only as wage workers. The policy implication is therefore clear: community-based ecotourism must mean equitable participation, not simply local participation.

Tourism has created multiple livelihood opportunities, including: safari driving; wildlife guiding; accommodation; homestays; transport; food services; handicrafts; handloom; cultural performances and small-scale trade. These activities provide alternatives to exclusive dependence on agriculture and casual labour. Tourism is consequently better understood as a complementary livelihood strategy rather than a replacement for the traditional rural economy.

The finding supports **H2**. The diversification effect is particularly important because rural livelihoods are often exposed to multiple risks. Tourism allows households to combine agriculture with non-farm income and thereby potentially strengthen economic resilience.

Tourism's economic contribution extends beyond the initial transaction between tourists and tourism enterprises.

The study estimates a tourism income multiplier of: $TIM = 2.63$, i.e., $Rs.1 \rightarrow Rs.2.63$.

Thus, approximately Rs.1 of tourist expenditure is associated with Rs. 2.63 of total economic income through direct, indirect and induced effects.

The study estimates the distribution of total effects as follows: direct effect = 38.09%; indirect effect = 19.05%; and induced effect = 42.86%.

The estimated distribution of direct, indirect, and induced effects is presented in Table 5.

Table 5. *Tourism Income Multiplier Effects*

Effect	Share of total effect
Direct	38.09%
Indirect	19.05%
Induced	42.86%
Total	100.00%
Empirical tourism income multiplier	2.63

Source: Author's calculation based on field-survey multiplier analysis

The direct effect arises from tourism enterprises such as accommodation, safari services and transport. The indirect effect emerges through purchases from local suppliers, while induced effects arise when tourism-generated income is spent by households within the local economy. The relatively large induced component indicates the importance of household consumption and local circulation of tourism income. The multiplier result supports **H3**. However, the empirical value of 2.63 is lower than the theoretical multiplier that would arise under an assumption of no leakages. The difference is explained by savings, external ownership, imported inputs and weak local supply chains. Consequently, strengthening local procurement and local ownership can increase the proportion of tourist expenditure retained within the KNP fringe economy.

Approximately 73% of surveyed households reported improvement in quality of life associated with tourism development. Tourism income has contributed to improvements in housing, education, healthcare, household assets and consumption for many participating households.

These findings support **H4**. However, rural development cannot be equated with income growth alone. The benefits need to reach households that have limited access to tourism assets, credit, training and markets.

Table 6. *Major Socio-economic Effects of Ecotourism*

Dimension	Major finding
Employment	Tourism creates direct and indirect employment
Income	Tourism households earn substantially more
Livelihood diversification	23.75% directly involved in tourism
Quality of life	About 73% report improvement
Entrepreneurship	Homestays, transport, food and tourism businesses
Women	Participation in handicrafts, handloom, food and homestays
Infrastructure	Tourism stimulates local infrastructure and markets
Culture	Tourism provides opportunities for cultural activities
Economic circulation	Tourism income multiplier = 2.63

Source: Household field survey and analysis

Community-based tourism has created opportunities for local participation in homestays, guiding, cultural performances, handicrafts, self-help groups, and EDCs. Such participation represents a movement from being passive recipients of tourism benefits toward becoming active economic participants. The principal dimensions of community empowerment are summarized in Table 7. The evidence also highlights gender differences. Women participate particularly in handicrafts, handloom, homestays, and food-related activities, whereas capital-intensive activities such as safari ownership and transport remain more strongly associated with male ownership.

Table 7. *Community Empowerment through Ecotourism*

Area	Contribution
Economic empowerment	Additional income and employment
Entrepreneurship	Homestays, food, handicrafts and small businesses
Social empowerment	Greater interaction with tourism markets
Women's participation	Handicrafts, handloom, food and accommodation
Institutional participation	SHGs and EDCs
Cultural empowerment	Cultural performances and traditional products
Political/decision-making dimension	Still requires strengthening

The results support **H5**, but also indicate that genuine empowerment requires more than employment. It requires ownership, income and decision-making authority.

KNP's biodiversity is the foundation of its tourism economy. Tourism therefore creates an economic incentive for local communities to recognize wildlife as an asset.

Approximately 96% of respondents regard KNP as important for their future. Tourism has increased recognition of the economic importance of wildlife and has created incentives associated with conservation.

The conservation relationship can be expressed as:

$$\text{Biodiversity} \rightarrow \text{Tourism} \rightarrow \text{Income} \rightarrow \text{Conservation Incentive}.$$

The household and stakeholder evidence also indicates greater environmental awareness, participation in conservation activities and improved understanding of biodiversity. Guided safaris and interpretation activities can communicate the ecological and economic significance of wildlife.

These findings provide conditional support for **H6**.

The qualification is important. Ecotourism does not automatically produce conservation. If tourism benefits are concentrated among a small group while local communities continue to bear the costs of conservation, the conservation incentive may weaken.

The study identifies an important paradox. Wildlife is simultaneously: an economic asset and a livelihood risk. Approximately 88% of respondents reported that wildlife poses a threat to livelihood and safety, while approximately 83.75% of non-tourism households reported financial losses associated with wildlife-related damage. This finding has major policy significance. Conservation policies that emphasize only the benefits of wildlife tourism may not adequately address the costs borne by non-tourism households.

If a household loses crops or livestock because of wildlife but receives little or no tourism income, its economic relationship with conservation may remain negative. This reinforces the need for effective compensation and livelihood-support mechanisms.

Tourism income is strongly seasonal. During the peak tourism season, approximately 85% of tourism-engaged households reported monthly earnings above Rs. 25,000, whereas during the monsoon off-season approximately 84%

experienced a decline to below Rs.10,000. This indicates that tourism participation does not automatically guarantee stable annual income. Community-based tourism should therefore develop complementary products and activities capable of generating income during the off-season. These may include village tourism, cultural tourism, handicrafts, local food experiences, interpretation activities and other community-based products.

The study also identifies several environmental risks associated with tourism growth: waste accumulation; increasing safari traffic; noise; habitat disturbance; infrastructure expansion; carrying-capacity pressure; unregulated construction and land-use pressure.

Tourism-intensive areas such as Kohora and Bagori face greater pressure from increasing visitor and safari activity.

Thus, the relationship can be expressed as:

$$\text{Ecotourism} + \text{Good Governance} \rightarrow \text{Conservation},$$

whereas: **Unregulated Tourism** → **Environmental Pressure**.

This distinction is central to the concept of sustainable ecotourism.

5. HYPOTHESIS TESTING

Table 8. *Summary of Hypothesis Testing*

Hypothesis	Empirical evidence	Decision
H1: Tourism households have higher income	Rs. 24,474 vs Rs. 10,675	Supported
H2: Tourism promotes livelihood diversification	23.75% directly engaged; multiple tourism activities	Supported
H3: Tourism generates multiplier effects	TIM = 2.63	Supported
H4: Tourism improves living standards	73% report improvement	Supported
H5: Tourism promotes community empowerment	Homestays, guiding, SHGs, EDCs and cultural activities	Supported
H6: Ecotourism strengthens conservation awareness	96% recognize KNP's future importance	Supported conditionally
H7: Tourism benefits are unevenly distributed	Gini $\approx$ 0.347; 74% perceive concentration	Supported
H8: Local ownership strengthens multiplier effects	Stronger local supply chains retain more income	Supported

Note: "Supported" represents descriptive/empirical support

Table 8 summarizes the descriptive evidence for the eight hypotheses. The evidence provides a consistent picture. Ecotourism generates economic opportunities and improves the income position of participating households, but its benefits are not equally distributed. Similarly, tourism can support conservation but may also produce environmental pressure and livelihood conflicts.

6. DISCUSSION

The empirical findings suggest that community-based ecotourism around KNP operates through four interconnected pathways.

i. Economic pathway

Tourist inflow → Tourist expenditure → Tourism enterprises → Employment + income →
Local supply-chain demand → Indirect + induced income → Household welfare

ii. Livelihood pathway

Tourism participation → Additional occupation → Income diversification → Reduced dependence on agriculture/wage labour → Greater livelihood resilience

iii. Conservation pathway

Biodiversity → Ecotourism attraction → Tourism income → Economic value of conservation → Community conservation incentives → Biodiversity protection

iv. Risk pathway

Tourism growth → Infrastructure + visitor pressure → Waste + congestion + habitat pressure →
Environmental degradation → Reduced sustainability

The policy challenge is therefore to strengthen the first three pathways while controlling the fourth. The findings are broadly consistent with the sustainable-livelihood approach, empowerment theory and community-based tourism literature. They also confirm the importance of local economic linkages. Tourism creates greater developmental benefits when tourist expenditure is retained within the local economy. The multiplier estimate of 2.63 is particularly relevant in this respect.

Local procurement of food, agricultural products, handicrafts, maintenance services and other inputs can strengthen backward linkages. Conversely, external ownership and imported inputs increase leakage.

The results therefore suggest that the quality and distribution of tourism income are as important as the volume of tourism income.

7. POLICY IMPLICATIONS

The findings suggest that KNP's community-based ecotourism policy should move from a narrow emphasis on increasing tourist arrivals toward inclusive, locally retained, and ecologically regulated tourism. The resulting policy priorities are synthesized in Table 9.

- a. Promote local ownership: Local households should be encouraged to own and manage homestays, food outlets, transport services, handicraft enterprises, and other tourism businesses. Credit and technical support should be targeted toward households that currently lack tourism assets.
- b. Strengthen revenue sharing: Tourism-generated revenues should create visible benefits for communities that bear conservation costs. Transparent revenue-sharing mechanisms can strengthen conservation support and reduce perceptions of inequality.
- c. Strengthen local supply chains: Hotels, resorts, and tourism operators should be encouraged to purchase agricultural products, food, handicrafts, maintenance services, and other inputs locally. This would reduce leakages and increase the local multiplier effect.
- d. Promote women's economic empowerment: Women should receive targeted support for tourism entrepreneurship, homestays, handicrafts, handloom, food services, digital marketing, access to credit, and participation in tourism decision-making.
- e. Manage carrying capacity: Tourism-intensive zones should be managed according to ecological carrying capacity. Visitor numbers, safari traffic, construction, and waste should be monitored continuously.
- f. Improve waste management: Integrated waste-management systems should be established in tourism zones and fringe villages. Tourism enterprises should be encouraged to adopt environmentally responsible practices.
- g. Address human–wildlife conflict: Timely compensation, preventive measures and livelihood assistance are necessary for households experiencing wildlife-related losses. Conservation support is more likely to remain strong when local people perceive that conservation-related costs are fairly addressed.
- h. Develop off-season tourism: The severe seasonal decline in tourism income demonstrates the need for alternative tourism products. Community-based cultural tourism, village experiences, handicrafts, food tourism and educational activities could extend the tourism season.
- i. Strengthen EDCs and SHGs: Eco-Development Committees and self-help groups can provide institutional platforms for participation, benefit sharing, and conservation activities. Their role should extend beyond consultation toward meaningful decision-making.

Table 9. Policy Priority Matrix

Priority	Problem	Recommended intervention	Expected outcome
Very high	Unequal benefit distribution	Revenue sharing and local ownership	Greater equity
Very high	Human–wildlife conflict	Timely compensation and mitigation	Greater conservation support
Very high	Ecological pressure	Carrying-capacity management	Environmental sustainability
High	Economic leakages	Local procurement	Higher multiplier
High	Limited women's access to high-value tourism	Credit and training	Women's empowerment
High	Weak participation	Stronger EDCs/SHGs	Community empowerment
High	Waste	Integrated waste management	Cleaner destination
Medium	Short tourist stays	Community tourism products	Higher local expenditure
Medium	Skill gaps	Tourism training	Better employment
Medium	Spatial inequality	Infrastructure in remote villages	Balanced development

Source: Policy framework developed from the empirical findings

8. CONCLUSION

This study examined community-based ecotourism as an instrument of rural development and biodiversity conservation around Kaziranga National Park. The analysis demonstrates that ecotourism has become an important component of the local rural economy.

The evidence indicates that 23.75% of surveyed households are directly involved in tourism-related activities. Tourism has diversified livelihood opportunities through safari services, accommodation, transport, guiding, handicrafts, handloom, food services and cultural activities.

The most striking economic result is the difference in household income. Tourism-engaged households report average monthly income of Rs. 24,474 compared with Rs. 10,675 among non-tourism households. The difference of Rs. 13,799 and income ratio of approximately 2.29:1 provide strong descriptive evidence of the economic importance of tourism participation.

The tourism income multiplier of 2.63 further demonstrates that tourism expenditure generates economic effects beyond the initial tourism transaction. Direct, indirect and induced effects account for 38.09%, 19.05% and 42.86%, respectively. These findings emphasize the importance of local supply chains and household consumption in transforming tourist expenditure into broader rural economic activity.

The social effects are also substantial. Approximately 73% of households report improvement in quality of life. Tourism has contributed to entrepreneurship, infrastructure development, women's participation, cultural activities, and community institutions. The major socio-economic effects are summarized in Table 6. At the same time, the benefits are not uniformly distributed.

The estimated Gini coefficient of approximately 0.347 and the finding that about 74% of respondents perceive tourism benefits as concentrated among economically stronger households demonstrate the importance of equity. Tourism growth can therefore simultaneously produce higher income and unequal income distribution.

The conservation findings reveal a similar duality. Wildlife and biodiversity constitute the principal tourism assets of KNP, creating economic incentives for conservation. Approximately 96% of respondents recognize the importance of KNP for their future. However, wildlife also creates livelihood risks, while tourism itself can produce waste, congestion, noise and habitat pressure.

The study, therefore, concludes that ecotourism is neither automatically sustainable nor inherently destructive. Its outcome depends fundamentally on governance.

A sustainable community-based tourism system around KNP should satisfy the following condition:

$$\text{Sustainable Ecotourism} = \text{Economic Benefits} + \text{Social Equity} + \text{Community Participation} + \text{Biodiversity Conservation} - \text{Environmental Pressure}$$

The central policy objective should therefore not be simply to increase tourist arrivals. It should be to increase the local retention, equitable distribution and conservation value of tourism income while controlling ecological pressure.

The ultimate objective is to establish a virtuous cycle:

$$\text{Biodiversity Conservation} \rightarrow \text{Sustainable Tourism} \rightarrow \text{Local Income} \rightarrow \text{Community Empowerment} \rightarrow \text{Conservation Support} \rightarrow \text{Biodiversity Conservation}$$

This conclusion is consistent with the broader evidence of the study: when local communities receive tangible economic benefits from biodiversity, conservation can acquire direct livelihood value. When those benefits are denied or concentrated among a small group, conservation costs may be perceived as unfair. The central message can therefore be expressed as:

“When conservation benefits people, people protect conservation.”

For Kaziranga National Park, the future of ecotourism consequently lies not merely in expanding tourism, but in building an inclusive conservation economy in which local ownership, equitable benefit sharing, women's participation, community institutions, local supply chains and ecological safeguards operate together.

AUTHORS CONTRIBUTION

Both authors contributed to the development of the study, critically reviewed the manuscript, approved the final version, and agreed to be accountable for all aspects of the work.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

FUNDING

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DATA AVAILABILITY

Data supporting the empirical analysis and the findings reported in this study are available from the corresponding author upon reasonable request.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

In the course of preparing this manuscript, the authors employed ChatGPT to improve the linguistic quality and readability of the content. After utilizing this AI tool, the authors conducted comprehensive review and necessary revisions to ensure the accuracy, integrity, and scientific rigor of the manuscript. All authors bear full responsibility for the final content of the published work, including any errors or inconsistencies that may arise.

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