



Sustainable tea agriculture and ecotourism: integrating organic farming, eco-processing, and community-based tourism for resilient livelihoods

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Abstract

The paper is a critical analysis of the synergetic association amid the elements of sustainable tea farming and ecotourism as a means of environmental protection, socio-economic, and cultural sustainability in tea producing areas. It discusses organic and biodynamic farming practices, innovative processes and packaging that are eco-friendly and the new paradigm of tea tourism as an instrument of sustainable livelihoods. The paper relies on interdisciplinary literature on agroecology, environmental economics, and sustainable tourism to depict the concept of ecological integrity and community empowerment in a conceptual framework. Empirical studies are summarized in a systematic review which focuses on the best practices, challenges and gaps in policy. The paper ends by giving ten evidence-based recommendations that should be taken into consideration by policymakers, industry stakeholders, and local communities to build a regenerative tea economy that is consistent with the United Nations Sustainable Development Goals (SDGs), namely Goal 8 (Decent Work), Goal 12 (Responsible Consumption), and Goal 15 (Life on Land).

Keywords: Biodynamic production, community lives, organic tea production, sustainable packaging, tea tourism

Introduction

The shift to the sustainable tea systems is also becoming more widely accepted as the necessary step toward overcoming environmental and socio-economic issues of the traditional tea production. The given shift incorporates such practices as organic and biodynamic farming that contribute to soil well-being and minimize the impact of agrochemicals, as well as eco-friendly processing and packaging that can limit waste and carbon footprint (Roxas *et al.* 2020). Moreover, the use of local-focused tea tourism not just diversifies the income of local manufacturers but also encourages the education of the consumer on the issues of sustainability, which enhances the conservation ethics. The socio-technical nature of tourism dictates a holistic view of tourism in the context of both structural and agentic factors that determine sustainable behaviors of tourists (Ioannides and Stoffelen 2023). The sustainable tea paradigm can improve the level of ecological stewardship by the introduction of fair economic models, thereby improving the range of ecosystem services and contributing to the well-being of

humanity (Niewiadomski and Brouder 2024). Traditional tea production has been linked with various serious environmental externalities whose main participants are deforestation, the use of pesticides, as well as the depletion of water resources. Bangladesh is the world's tenth largest tea producer. Generally, tea is grown in the northern and eastern part of the country include Sylhet, Maulvibazar, Habiganj, Brahmanbaria, Rangamati, Chattogram and Panchagar districts (Abdullah *et al.* 2024) where local and foreign tourists visit the tea gardens. However, tea farming usually causes timbering of forests which destabilizes the local ecology and adds to the loss of biodiversity (Alonso *et al.* 2025). Moreover, using chemical pesticides and fertilizers in traditional modes of production is dangerous to soil health and water quality as it can make the surrounding water bodies contaminated (Liu *et al.* 2025). Moreover, tea fields also tend to demand a large amount of water resources, making the problem of water shortage even more serious in areas with already scarce water resources (Velikova *et al.* 2025). These

environmental factors claim an immediate necessity of having sustainable practices in the production of tea in order to reduce the negative impacts and enhance ecological stability (Zhao *et al.* 2025).

Ecotourism contributes greatly to the conservation ethics and the improvement of the ecosystem services within the tea estates through environmental awareness creation and promotion of sustainable land use. In Bangladesh the National Tourism Policy was declared in 1992 with the objectives to create interest in tourism among the people, to preserve, protect, develop, and maintain tourism resources, to take steps for poverty-alleviation through creating employment, and to open up a recognized sector for private capital investment (NTO 2009; Rahman *et al.* 2013). However, the environmental concern may increase among the local residents with the idea of ecotourism, especially when the concept is combined with the idea of community-based tourism (CBT) initiatives, which is demonstrated by the fact that the designation of the National Ecotourism Demonstration Area in China positively affects the ecological value and environmental cognitions of the local residents, but only in the short run (Tong and Pang 2023). Moreover, ecotourism may prompt shifts in land use as demonstrated by the case of Corbett Tiger Reserve in India where land owners have shifted their land use no longer using farming methods shifting to tourism, thus disrupting the conventional land use and, consequently, potentially leading to an improvement in the availability of ecosystem services as a result of diversified land management (Pandya *et al.* 2022). Nevertheless, the change also brings about the danger of commodifying nature and depriving communities of their land, which means that ecotourism should be carefully managed in order to avoid affecting conservation outcomes negatively. Moreover, the decommodification of nature by means of commoning, considered in the framework of privately protected areas, implies that the joint accountability and discretion would make tourism more aligned with convivial conservation, which would facilitate a more ethical and sustainable relationship with nature (Muller 2024). On the whole, although ecotourism can contribute to the improvement of conservation ethics

and environmental services, it needs a balance-based approach that would take into account socio-economic impacts as well as ecological integrity of the territories.

The trade-offs between tea production and ecotourism are complex with special regards to land use, water use and the allocation of resources. Ecotourism usually implies the conservation of unbuilt environments, which may be opposed to the space occupied by tea fields, resulting in loss of biodiversity and disturbed ecosystems caused by agriculturalization. Also, the production of tea usually requires a lot of water resources, which may contribute to the increase of water shortage in the areas where the ecotourism is widely developed because both industries are competing with water resources (Permana *et al.* 2024). Although ecotourism can result in the creation of significant local economic benefits, it can also have the environmental costs that are not necessarily captured in the conventional cost-benefit analyses, which show that the smaller-scale tourism projects might have better overall welfare in terms of the greater ecological effects (Iversen *et al.* 2024). Moreover, the image of pristine nature in ecotourism may reinforce unstable operations, making it difficult to reconcile between the economic development and environmental management (Smith 2022). Therefore, these conflicting interests should be handled with great care to avoid any kind of interference. In ecotourism and tea production areas, proper management strategies in the regions are needed to minimize land, water, and labor associated conflicts but maximize the economic gains of the local people. One of them is to apply the community-based tourism frameworks that increase social capital and fair distribution of benefits as evidenced in the research on the Tibetan pastoral region of China where cooperative institutions have enhanced the process of tourism involvement and the distribution of its benefits among community members. Moreover, incorporating agricultural heritage tourism will be able to bring visitors on board and support conservation, but it is critical to represent the local voices so that it does not overlook them and should be sustainable to maintain (Zhang 2022). In addition, the rebalancing of interests can be achieved by changing planning processes to minimize the adverse effects of intensive agricultural activities on tourism, which can be emphasized following the UK setting in such area. Finally, eco-taxes on tourism waste would

motivate sustainable tourism and create environmental awareness, which would improve the overall performance of tourism destinations (Banos-Pino *et al.* 2024). Although community-based ecotourism centered on organic tea farming has not yet developed substantially in South Asia, the sector holds considerable potential in the context of the region's expanding economy, particularly in densely populated Bangladesh. This review attempts to emphasize and highlight tea agriculture-based ecotourism as a strategy for enhancing community livelihoods.

Conceptual framework

The proposed framework illustrates the feedback loops between sustainable agriculture, eco-processing, and community-based tourism. The integrated framework for sustainable tea agriculture and ecotourism is presented in Figure 1.

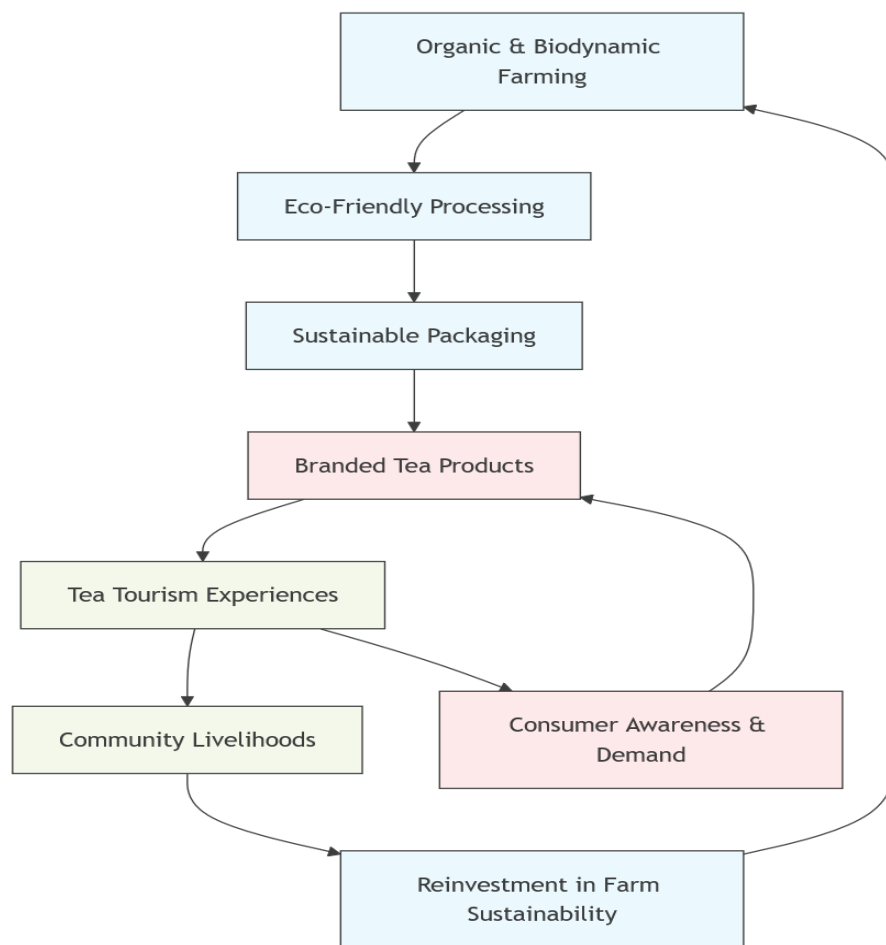


Figure 1. Integrated framework for sustainable tea agriculture and ecotourism.

Results and discussion

Organic and biodynamic farming

Although organic and biodynamic agriculture methods are advantageous in improving ecosystem services, small scale farmers experience a lot of challenges. Organic certification, including USDA and EU Organic, is an easy entry point to the market but also comes with compliance costs which can be too heavy to be adopted in areas such as sub-Saharan Africa where perceived capacity and opportunity is low (Bottazzi *et al.* 2023). The biodynamic approach, whereas comprehensive, does not have standardized measures, which makes it difficult to apply to such an industry as tea production (Bottazzi *et al.* 2023). The two systems have long transition periods of 3-5 years, where yields could fall during the same

period, making the economic feasibility of farmers even more challenging (Bottazzi *et al.*, 2023). Moreover, the cultural factors, including the beliefs in power distance, may influence consumer behaviors and lead them toward choosing organic products, which explains why the special attention should be given to the marketing strategies aimed at attracting different segments of consumers (Gohary *et al.* 2024). Comprehensively, the structural obstacles and support systems associated with the sustainable development of organic and biodynamic farming are important to address (Bottazzi *et al.* 2023).

A standardization of the biodynamic farming techniques, used in tea production, can increase the scale and efficiency of tea production through incorporating sustainable practices that appeal to consumer preference and consumer actions. The consumer attitudes to sustainability have been shown to play a significant role in the purchasing decision-making process, which is reflected in sustainable food consumption and green tourism studies, revealing the necessity to match the production process with the consumer values (Antonschmidt and Heo 2025). The introduction of standardized practices, including organic and fair-trade certification, will appeal to sustainability-oriented consumers, who will boost the market demand of biodynamic tea (Antonschmidt & Heo 2025).

Eco-processing and packaging

The integration of renewable energy in the withering and drying stages of eco-processing and packaging can significantly reduce greenhouse gas emissions, yet fragmented supply chains pose a challenge to widespread adoption. This issue is compounded by the cost-prohibitive nature of sustainable packaging for mid-tier brands, despite a rising consumer willingness to pay for sustainability, as noted by Nielsen in 2022. The hospitality industry, highlights that consumer satisfaction and loyalty are influenced by sustainable supply chain practices, suggesting that addressing supply chain fragmentation could enhance consumer perceptions and adoption of sustainable practices (Modica *et al.* 2020). Antonschmidt and Heo's research on sustainable food consumption indicates that consumer preferences for organic and

fair-trade products are pivotal, implying that similar preferences could drive demand for sustainable packaging if supply chain issues are resolved (Antonschmidt & Heo 2025). Alonso *et al.* (2025) emphasize the importance of sustainable production in wine tourism, which could serve as a model for other industries by demonstrating the benefits of integrating local resources and consumer education into sustainable practices. Velikova *et al.* (2025) further suggest that experiential learning through tourism can promote sustainable behaviors, indicating that consumer engagement and education could mitigate the cost barriers associated with sustainable packaging.

Tea tourism and livelihoods

Through well-planned ecotourism models, livelihoods can be effectively improved due to diversification of income stream, lessening migration, and maintenance of cultural values like tea ceremonies. Nevertheless, without participatory governance, culture may become commodified and more unequal especially to women, who make up 60-80% of tea pluckers yet are mostly uninvolved in the tourism earnings (Santafe-Troncoso & Tanguila-Andy 2023). Studies suggest that community-based models of income distribution are more likely to encourage ethical tourism practices and improve community involvement than those that are led by the government or corporations (Pang *et al.* 2024). Moreover, the leadership of the Indigenous women in the tourism planning is essential to align tourism with the targets of sustainability and gender equality as it empowers Indigenous women and tackles the systemic discrimination issue (Santafe-Troncoso and Tanguila-Andy 2023). Accordingly, embedding social and cultural capitals into tourism governance will have the capacity to instill sustainable livelihoods and equal contribution to tourism benefits (Rahman *et al.* 2021).

The effectiveness of properly structured ecotourism models in the promotion of diversified income and cultural heritage conservation depends on a number of important factors. To start with, the idea of community empowerment is vital; the models based on the idea of community-led income distribution have been proven to increase tourist involvement and ethical conduct, thus contributing to sustainable ways of doing things (Pang

et al. 2024). Also, local authority in controlling tourism affects the results of empowerment, and the greater the collective governance, the higher the community benefits (Legatzke *et al.* 2025). Moreover, cultural preservation implementation into the process of tourism experience is crucial; successful heritage tourism interpretation that focuses on emotional experience can make a substantial

contribution to the dedication of tourists to the cultural preservation (Li *et al.* 2024). Finally, flexibility of local land use (both agricultural and tourism) is indicative of the socio-economic process that is capable of diversifying the sources of income and requires the careful management to prevent reliance on external market (Pandya *et al.* 2022). All these factors in combination highlight the significance

Table 1. Solution/recommendations for sustainable tea agriculture and ecotourism

No.	Recommendation	Key Actions/Components	Supporting Evidence Examples	Alignment Outcomes
1	Establish Integrated Certification Schemes	Combine organic/biodynamic agriculture with sustainable tourism principles (e.g., GSTC); align with SDGs	Indonesian integrated touristic villages; Cave & Dredge (2020)	Enhances rural economic resilience, especially post-pandemic; supports coherent policy implementation.
2	Develop Farmer Cooperatives for Collective Investment	Promote community resourcefulness through cooperatives investing in renewable energy and composting infrastructure		Strengthens local capacity for sustainable tourism and agriculture.
3	Subsidize Transition Costs	Use public-private partnerships to subsidize smallholders' shift to organic farming	Paniccia & Baiocco (2021)	Makes agritourism economically viable and socially beneficial for local populations.
4	Mandate Extended Producer Responsibility (EPR)	Require tea brands to adopt EPR; integrate inclusive tourism, digital traceability, and Traditional Ecological Knowledge (TEK); incentivize recyclable/compostable packaging	Sorensen <i>et al.</i> (2020)	Aligns with circular economy principles; promotes sustainability in agri-tourism supply chains.
5	Design Inclusive Tourism Models	Implement gender-fair revenue-sharing and hiring policies	Eger <i>et al.</i> (2021)	Reduces gender disparities; fosters inclusive economic participation.
6	Create Digital Traceability Platforms	Deploy QR codes and digital systems linking farm practices to consumer experience	Scheyvens & Laeis (2021)	Increases transparency, builds consumer trust, and deepens engagement with sustainability.
7	Integrate Traditional Ecological Knowledge (TEK)	Incorporate TEK into biodynamic farming practices	Roxas <i>et al.</i> (2020)	Enhances cultural relevance and sustainability; respects and utilizes indigenous knowledge.
8	Promote Agroforestry Systems	Introduce diverse plant species in tea landscapes to support biodiversity and ecosystem services	Obradovic <i>et al.</i> (2025)	Improves climate resilience, conserves biodiversity, and supports socio-economic development
9	Strengthen Vocational Training	Provide eco-hospitality training for rural youth and women	Holland <i>et al.</i> (2021)	Diversifies livelihoods and builds community resilience through skill development
10	Implement Payment for Ecosystem Services (PES)	Tourists contribute financially to watershed/forest conservation	Clark <i>et al.</i> (2024)	Incentivizes conservation; enhances community adaptive capacity

of inclusive and community-based approaches to the development of ecotourism.

Solutions/recommendations

The solutions/recommendations for sustainable tea agriculture and ecotourism are presented in Table 1.

Conclusion

This review paper reflected the importance of sustainable tea agriculture and ecotourism with an emphasis on community based resilient livelihood. Conceptual framework for integrated sustainable tea agriculture and ecotourism has been designed for understanding of the positive impact of tea agriculture and tourism on the society. Several recommendations such as establishment of integrated certification schemes, development of farmers cooperatives for collective investment, subsidize the transition costs, mandate for extended producer responsibility, designing inclusive tourism models, create digital traceability platforms, integrate traditional ecological knowledge, promote agroforestry systems, strengthen vocational training and implement payment for ecosystem services have been presented for consideration by the planners and appropriate stakeholders.

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