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Ecological and cultural sustainability through indigenous knowledge in Malda District, West Bengal

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Abstract

Indigenous knowledge systems (IKS) represent a valuable repository of ecological wisdom and cultural practices that have evolved through generations of close interaction with nature. In the context of Malda district, West Bengal, such knowledge not only shapes the cultural identity of indigenous communities but also contributes significantly to sustainable resource management and ecological balance. The district, known for its diverse agro-ecological environment and rich cultural heritage, reflects how traditional practices—ranging from indigenous farming methods, water conservation techniques, and herbal medicine, to rituals and folklore—embody a harmonious relationship between humans and the environment.

This study explores the role of indigenous knowledge in promoting both ecological and cultural sustainability in Malda. It highlights how traditional agricultural practices, such as multi-cropping and organic inputs, support soil fertility and biodiversity, while community-based forest use and water-sharing systems ensure resource equity. Simultaneously, cultural traditions, oral narratives, and festivals reinforce values of conservation and collective responsibility. However, these systems face challenges due to modernization, climate change, and the gradual erosion of intergenerational transmission of knowledge.

By documenting and analyzing indigenous practices in Malda, the paper argues that strengthening these knowledge systems is crucial for achieving sustainable development goals at the local level. Furthermore, it emphasizes the need to integrate indigenous perspectives into contemporary policy frameworks, educational curricula, and development programs to ensure ecological resilience and cultural continuity. The findings reaffirm that indigenous knowledge is not a relic of the past but a living, adaptive system that offers practical pathways for sustainability.

Thus, indigenous communities of Malda, through their wisdom and practices, exemplify how traditional knowledge can contribute meaningfully to both ecological preservation and cultural sustainability in the 21st century.

Keywords: Indigenous knowledge systems, ecological sustainability, cultural sustainability, Malda district

1. Introduction

Sustainable development debates often overlook the lived experiences and wisdom of indigenous communities. In India, groups like the Santhals, Toras, and Rajbanshis embody adaptive strategies that ensure ecological balance and cultural survival. Malda district, particularly Habibpur and Bamongola, provides a fertile ground for examining such practices due to its unique socio-ecological setting. This paper investigates how indigenous wisdom contributes to sustainability and the implications for future policy frameworks.

2. Literature Review

Indigenous Knowledge & Sustainability

Scholars such as Madhav Gadgil, Fikret Berkes, and Vandana Shiva have consistently emphasized that indigenous knowledge systems are grounded in an eco-centric worldview that places harmony with nature at the core of survival and development. Unlike modern growth-driven models, these systems value reciprocity, restraint, and sustainability in the use of natural resources. Gadgil's work underscores the intricate link between biodiversity conservation and indigenous practices, while Berkes highlights the community-based management of commons as an essential principle of ecological resilience. Vandana Shiva, in particular, argues that indigenous women's knowledge of seeds, soil, and medicinal plants

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represents not only cultural heritage but also an alternative paradigm of sustainability in the face of environmental degradation. Collectively, these perspectives provide a theoretical foundation to understand how indigenous communities perceive nature not as a resource to be exploited, but as a partner in ensuring long-term survival.

West Bengal Context

In West Bengal, earlier studies on indigenous communities such as the Santhals and Rajbanshis have demonstrated how traditional subsistence strategies ensure resilience in ecologically vulnerable areas. Practices like mixed farming, seasonal crop rotation, and the use of organic manure safeguard soil fertility while minimizing ecological risks. The reliance on forest produce—fuelwood, wild fruits, medicinal herbs—supplements household nutrition and health, reducing dependence on external markets. Community rituals, festivals, and oral traditions further embed values of reciprocity and collective responsibility towards nature. For example, Santhal festivals often celebrate harvest cycles, reinforcing the link between cultural identity and ecological sustainability. Similarly, the Rajbanshi reliance on water-sharing systems and cooperative labor in agriculture reflects a long-standing tradition of resource-sharing that strengthens community bonds and adaptive capacity in times of stress.

Research Gap

Despite the rich scholarship on indigenous communities in India, localized studies focusing on Malda district remain scarce. While macro-level studies shed light on Santhal and Rajbanshi practices in other regions of West Bengal, little is known about how these knowledge systems are specifically adapted in Habibpur and Bamongola blocks. These areas, with their unique socio-ecological context, provide fertile ground for understanding the dynamic interplay between indigenous wisdom and sustainability. Moreover, the presence of multiple communities—Santhal, Tora, and Rajbanshi (Polia)—offers a comparative perspective on how cultural diversity shapes ecological resilience. The lack of systematic documentation of these practices represents a significant research gap, and addressing it can contribute to both the academic discourse on indigenous knowledge and the policy agenda for sustainable development in the region.

3. Objectives

1. To document the indigenous ecological practices of Santhal, Tora, and Rajbanshi communities in Malda.
2. To analyze their role in ecological and cultural sustainability.
3. To examine the challenges of preserving indigenous knowledge in a globalized context.
4. To suggest policy frameworks integrating indigenous wisdom with modern sustainability agendas.

4. Methodology

The present study adopts a qualitative, exploratory research approach in order to capture the nuanced and community-specific dimensions of indigenous knowledge and sustainability practices. Both primary and secondary data sources have been utilized to ensure a comprehensive understanding of the subject. Primary data was collected through extensive field visits, in-depth interviews, and focus group discussions with local households, enabling the

documentation of lived experiences and oral traditions. Complementing this, secondary data was drawn from census reports, government publications, and available ethnographic studies, which provide valuable contextual and demographic insights.

The study area is confined to the Habibpur and Bamongola blocks of Malda district, West Bengal, which are characterized by a significant concentration of tribal populations and an agriculture-based local economy. These blocks were selected for their socio-economic relevance and their rich repository of traditional knowledge systems. The focus groups in the study include Santhal, Tora, and Rajbanshi households, communities that are deeply rooted in the region's agrarian and cultural life. Their practices, rituals, and strategies of survival form the central analytical frame of this research.

5. Study area

The study area comprises the Habibpur and Bamongola blocks of northern Malda district, West Bengal. Geographically, the region is marked by an undulating terrain and a semi-forested landscape, which not only influences its agricultural practices but also shapes the socio-cultural life of its inhabitants. The demographic composition of these blocks is notable for the significant presence of tribal groups, particularly the Santhals and Toras, alongside the Rajbanshi community. These groups contribute to the cultural diversity of the area while maintaining distinct traditional practices and indigenous knowledge systems. The local economy is primarily agrarian in nature, with the majority of households engaged in cultivation. Paddy and maize serve as staple crops, while mango orchards add to the commercial agricultural output. Additionally, in the forest fringes, communities practice jhum-type shifting cultivation, reflecting a strong dependence on natural resources and traditional ecological knowledge for livelihood sustenance.⁶ Indigenous Knowledge and Ecological Practices

Agricultural Practices

The agricultural practices of the indigenous communities in Habibpur and Bamongola reflect a deep-rooted ecological wisdom that ensures both livelihood security and environmental sustainability. Among the Santhals, the practice of mixed cropping—combining paddy with pulses and oilseeds—serves multiple purposes. It not only maintains soil fertility through natural nutrient recycling but also minimizes the risks of complete crop failure, thereby strengthening household food security. The Tora community, on the other hand, retains extensive knowledge of shifting cultivation and crop rotation, practices that allow fallow lands to regain fertility over time. Their indigenous methods of pest control, such as the application of neem leaves, wood ash, and cow dung, illustrate the use of bio-friendly alternatives that reduce dependence on chemical inputs. The Rajbanshi (Polia) households are distinguished by their expertise in traditional irrigation systems, including small-scale canal and channel networks, often supported by bamboo-based tools and implements. They also cultivate indigenous rice varieties well adapted to local climatic conditions, demonstrating the resilience of traditional agrobiodiversity against changing weather patterns.

Biodiversity and Forest Use

The communities maintain a symbiotic relationship with

their surrounding ecosystems through practices of collective forest management. Sacred groves and community-managed forests are preserved not only as ecological reserves but also as cultural sites of spiritual significance, where exploitation is regulated through customary norms. Forests also play a vital role in household nutrition, as communities regularly collect wild edible plants, tubers, fruits, and mushrooms that supplement their diets, particularly during lean agricultural seasons. These practices highlight the communities' reliance on biodiversity for both sustenance and cultural identity.

Water Conservation

Water management in the region is equally rooted in indigenous traditions. Traditional ponds (pukur) serve as critical sources of irrigation and drinking water for both humans and livestock. In the hilly and semi-forested terrain, the use of bamboo drip irrigation systems and localized rainwater harvesting techniques ensures efficient use of scarce resources. The communities also link water use with cultural practices, where seasonal rituals associated with the monsoons not only express gratitude for rainfall but also reinforce collective responsibility in safeguarding water resources. Such practices integrate ecological stewardship with spiritual life, making water conservation an integral part of cultural continuity.

Medicinal Knowledge

Indigenous health systems in these blocks draw extensively on local herbal remedies derived from plants like tulsi, neem, haritaki, turmeric, and various forest herbs. These natural resources are applied in treating common ailments ranging from colds and fevers to skin infections and digestive disorders. The knowledge is preserved and transmitted through traditional healers such as the ojha and kabiraj, who continue to play a significant role in providing primary healthcare in areas where modern medical facilities are limited. Their practices combine empirical observation with spiritual rituals, offering holistic treatment that addresses both the physical and psychological dimensions of illness.

Cultural Traditions and Festivals

The cultural fabric of these communities is deeply intertwined with their ecological surroundings. The Santhals celebrate festivals such as Baha Parab and Sohrai, which are closely tied to agricultural cycles, marking the flowering of trees and the worship of cattle respectively. These rituals symbolize harmony between humans, animals, and nature, reinforcing the cyclical rhythm of agrarian life. The Rajbanshi community's Tusu festival, observed in the post-harvest period, similarly celebrates agricultural prosperity and expresses gratitude towards the earth. Importantly, cultural norms and ritual taboos also function as traditional mechanisms of ecological regulation, restricting excessive exploitation of forests, rivers, and other natural resources. By embedding environmental ethics within cultural traditions, these communities sustain a balance between livelihood needs and ecological conservation.

Challenges to Indigenous Knowledge

Despite its resilience and ecological value, indigenous knowledge systems in Habibpur and Bamongola face several critical challenges. One major concern is the decline in oral transmission of knowledge, as younger generations

become more engaged with formal education and migrate to urban areas in search of employment. This has weakened the traditional channels through which ecological wisdom, rituals, and farming techniques were passed down. The growing impact of climate change further disrupts established agricultural cycles and alters forest biodiversity, thereby threatening the ecological foundations upon which indigenous practices depend. In addition, the marginalization of indigenous voices within policy frameworks often results in their exclusion from formal decision-making processes, reducing the visibility and legitimacy of their contributions to sustainable development. The spread of modern technologies and market-driven agricultural methods has also led to the gradual erosion of traditional practices, as many households shift towards chemical fertilizers, hybrid seeds, and mechanized tools, often at the cost of ecological balance and long-term sustainability.

6. Policy Implications and Recommendations

In light of these challenges, there is a pressing need for thoughtful policy interventions that safeguard and revitalize indigenous knowledge systems. First, documentation and preservation must be prioritized through the systematic recording of oral traditions, agricultural practices, and medicinal knowledge, ensuring that these are not lost to future generations. Equally important is the integration of indigenous methods with modern science, where practices such as organic farming, soil conservation, and herbal medicine can complement scientific innovations to create context-specific solutions. Educational reforms should incorporate indigenous knowledge into school curricula, thereby instilling respect for local traditions among younger generations while promoting cultural continuity. Strengthening community participation in local governance is also crucial, empowering village councils and tribal institutions to integrate traditional wisdom into environmental and development planning. Finally, indigenous practices should be actively harnessed for climate adaptation, as they provide locally grounded strategies for managing water, conserving biodiversity, and sustaining agriculture under changing climatic conditions. Collectively, these measures can help bridge the gap between traditional wisdom and modern development, ensuring a more inclusive and resilient future.

7. Conclusion

The lived experiences of the Santhal, Tora, and Rajbanshi (Polia) communities in the Habibpur and Bamongola blocks demonstrate that indigenous wisdom is not merely a relic of the past but a living system of knowledge that continues to sustain both ecology and culture. Their agricultural practices, rooted in principles of mixed cropping, shifting cultivation, and the preservation of indigenous crop varieties, highlight an inherent understanding of ecological balance and risk minimization. Similarly, their forest use, water conservation methods, and medicinal knowledge reflect a holistic approach to resource management where livelihood security is intrinsically linked with environmental stewardship. Beyond the material dimension, cultural traditions and festivals reinforce community bonds and ensure that ecological ethics are embedded within everyday life.

In the context of global sustainability challenges,

particularly those arising from climate change, biodiversity loss, and resource depletion, the practices of these communities offer valuable lessons in resilience, adaptability, and reciprocity with nature. Unlike dominant development paradigms that often prioritize short-term economic gain, indigenous systems are inherently future-oriented, emphasizing continuity, regeneration, and collective welfare. Recognizing and mainstreaming this wisdom is, therefore, not just a matter of cultural preservation but a strategic necessity for building inclusive, equitable, and ecologically sound futures. Policies that document, integrate, and empower indigenous knowledge alongside scientific innovation can bridge the gap between tradition and modernity, ensuring sustainable pathways of development.

Ultimately, the Santhal, Tora, and Rajbanshi communities remind us that sustainability is not a novel concept imposed from outside but a way of life that has long been practiced at the grassroots. Their example calls for a rethinking of development models to place indigenous knowledge at the center of environmental planning, social justice, and climate adaptation strategies. In doing so, societies at large can move toward a more harmonious and balanced relationship with nature.

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