

Eco-friendly Inland Fisheries in Uttar Pradesh: Policies, Challenges, and Livelihood Opportunities

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Abstract

Inland fisheries are important for livelihood generation, food security, and rural development in Uttar Pradesh. The state has rich inland water resources such as rivers, ponds, lakes, reservoirs, and wetlands, which provide strong potential for sustainable fisheries development. However, the sector faces several challenges, including water pollution, habitat degradation, encroachment, invasive species, and climate change. These issues affect fish production as well as the well-being of fishing communities. Inland fisheries also have strong socio-economic value by creating employment and supporting household income, especially in rural areas. Government policies and fisheries governance play an important role in managing these resources, but implementation gaps and local-level constraints remain. In this context, eco-friendly approaches such as community-based fisheries, sustainable cage culture, integrated aquaculture, wetland conservation, and green technology adoption can support both environmental protection and livelihood improvement. The present study concludes that sustainable inland fisheries in Uttar Pradesh require balanced policies, effective governance, and environmentally responsible practices for long-term development.

Keywords

Inland fisheries; Sustainability; Uttar Pradesh; Fisheries governance; Rural livelihoods; Eco-friendly aquaculture

1. Introduction

Inland fisheries refer to fish production and related activities carried out in freshwater resources such as rivers, ponds, lakes, reservoirs, wetlands, and floodplain areas. In the context of Uttar Pradesh, inland fisheries hold special importance because the state possesses abundant freshwater resources that support fish production, livelihood generation, and rural economic development. Sustainable fisheries mean the

planned and balanced use of fishery resources in a way that meets present needs without damaging aquatic ecosystems or reducing the ability of future generations to benefit from them. Sustainability in inland fisheries includes ecological protection, responsible harvesting, conservation of biodiversity, efficient resource use, and support for fishing communities (Verma, 2019; Das et al., 2022).

The relevance of sustainable inland fisheries in Uttar Pradesh is very high because the state has a large rural population, increasing nutritional needs, and considerable dependence on agriculture and allied sectors. Fisheries can serve as an alternative and supplementary livelihood source for small and marginal households. At the same time, the sustainability concept becomes essential because increasing pressure on freshwater ecosystems, pollution, and unscientific fishing practices may reduce long-term productivity. A sustainable approach therefore seeks to improve production while maintaining ecological balance and social equity (Katiha, 2020; Department of Fisheries, Uttar Pradesh, 2024).

The major research objectives in this area are to understand the significance of inland fisheries in Uttar Pradesh, identify environmental and developmental challenges, examine the socio-economic contribution of fisheries, assess fisheries policies and governance mechanisms, and explore eco-friendly pathways for sustainable fishery development in the state.

2. Environmental and Developmental Challenges

Inland fisheries in Uttar Pradesh face several environmental and developmental challenges that affect both fish productivity and ecosystem health. One of the major issues is habitat degradation. Freshwater habitats are increasingly under pressure due to siltation, destruction of breeding grounds, overexploitation of water bodies, and changes in river flow patterns. Biodiversity-rich systems such as the Ganga and its associated aquatic environments have experienced ecological stress, which has affected fish diversity and the stability of fisheries resources (Borah et al., 2020; Jha et al., 2021).

Declining water quality is another serious challenge. Industrial discharge, untreated sewage, agricultural runoff, and chemical contamination have reduced the quality of freshwater systems in many parts of Uttar Pradesh. Studies on the Yamuna and Gomti rivers indicate that deteriorating water conditions have negatively influenced fish diversity, health, and survival. Toxic pollutants and heavy metals not only threaten aquatic life but also raise concerns for human health through fish consumption (Dubey et al., 2021; Mishra et al., 2022). Similarly, industrial effluents have also been reported to affect the reproductive health of wild carp species, showing the deeper ecological consequences of pollution in riverine systems (Srivastava, 2023).

Encroachment on ponds, wetlands, and other inland water bodies is also reducing the area available for fish production. Many traditional water bodies in rural and peri-urban areas are being converted for agriculture, construction, or other non-fishery uses. Such encroachment weakens the ecological function of these systems and restricts the growth of inland fisheries. Verma (2019) emphasized that the sustainable management of freshwater bodies is necessary to protect ecological balance and ensure long-term fishery productivity.

Another challenge is the spread of invasive and non-native species, which may disturb the natural balance of aquatic ecosystems. These species can compete with indigenous fish for food and habitat and may reduce the survival of local biodiversity. In sensitive river and wetland ecosystems, such imbalances can weaken traditional fisheries and affect ecological resilience (Borah et al., 2020).

Climate change has further intensified these pressures. Changes in rainfall patterns, rising temperatures, irregular water availability, drought-like conditions, and extreme weather events affect fish breeding, migration, feeding behavior, and overall aquatic productivity. In such a situation, climate-smart aquaculture and adaptive management become increasingly necessary. Small-scale fish farmers in western Uttar Pradesh have already started showing interest in climate-smart aquaculture technologies, though adoption remains uneven due to limited awareness, finance, and technical support (Kumar et al., 2024).

3. Socio-economic Importance of Inland Fisheries

Inland fisheries have significant socio-economic importance in Uttar Pradesh. They support employment generation for fish farmers, fishers, traders, transporters, processors, and market intermediaries. In many rural areas, fisheries function as an important subsidiary occupation, particularly for low-income families who depend on multiple livelihood sources for survival. The inland fisheries sector contributes not only to direct employment but also to broader local economic activity through input supply, seed distribution, feed, storage, transport, and fish marketing systems (Katiha, 2020; Department of Fisheries, Uttar Pradesh, 2024).

The sector also provides income support to rural households. Fish farming in ponds, reservoirs, floodplains, and integrated farming systems can improve household earnings and reduce dependence on uncertain crop-based income alone. For smallholders, fisheries offer a relatively quick-return activity that can supplement agriculture. Models such as integrated fish-duck farming have demonstrated strong promise as eco-friendly and income-generating systems for rural households in eastern Uttar Pradesh (Singh, 2024).

Food and nutritional security is another major contribution of inland fisheries. Fish is a valuable source of high-quality protein, essential fatty acids, vitamins, and minerals. In states like Uttar Pradesh, where nutritional challenges remain in many rural and low-income communities, increased fish availability can play a useful role in improving dietary diversity. Breeding and culture initiatives for species such as Magur have shown potential for livelihood security as well as nutritional enhancement in rural areas (Sahoo et al., 2021).

Inland fisheries are also important for rural development because they create productive use of underutilized water bodies, strengthen local enterprise, and improve community participation in economic activities. Community-based fisheries management in floodplain areas of Uttar Pradesh has shown positive socio-economic outcomes, especially in terms of local participation, collective benefit, and livelihood improvement (Chandra et al., 2023). The role of women in inland fisheries is equally important, though often under-recognized. Women participate in fish processing, net making, feeding, pond management, and marketing-related work. Strengthening their involvement can improve both household welfare and sectoral productivity (Nandeesh, 2019).

4. Policy Interventions and Fisheries Governance

Policy interventions and fisheries governance play a crucial role in shaping the growth and sustainability of inland fisheries in Uttar Pradesh. At the national and state levels, fisheries development has been promoted through various schemes, institutional measures, infrastructure development efforts, and technical assistance programs. The broader goal of these interventions has been to improve fish production, modernize fish farming, increase seed availability, strengthen extension services, and support livelihoods dependent on fisheries (Das et al., 2022; Sinha et al., 2022).

In Uttar Pradesh, fisheries governance involves the Department of Fisheries, local administrative bodies, and community-level institutions. The state government has supported fish seed distribution, pond leasing, reservoir development, training, subsidies, and implementation of fishery development programs. The annual report of the Department of Fisheries, Uttar Pradesh (2024) reflects the government's emphasis on inland fish production growth and policy implementation. However, while policy intention may be strong, implementation at the ground level often faces several practical difficulties.

One major issue is the uneven reach of government support. Small-scale fishers and marginal communities may not always receive equal access to institutional credit, training, quality seed, market infrastructure, or modern technology. In some areas, bureaucratic procedures, poor coordination, and weak extension networks reduce the effectiveness of programs. Similarly, scientific fish farming practices are not always

widely adopted because of lack of awareness, technical guidance, or affordability, especially in regions like the Terai belt of Uttar Pradesh (Yadav et al., 2020).

Fisheries governance also requires legal and ecological sensitivity. Effective management of rivers, wetlands, and ponds must ensure that production-oriented policies do not damage biodiversity or ecological health. The conservation perspective is particularly relevant in the Ganga river system and other freshwater ecosystems where fisheries development must go together with habitat protection and biodiversity conservation (Borah et al., 2020). Therefore, fisheries governance needs to move beyond output-focused policies and adopt integrated, participatory, and ecosystem-based approaches.

5. Eco-friendly Pathways and Innovative Approaches

The long-term future of inland fisheries in Uttar Pradesh depends on eco-friendly pathways and innovative approaches that promote both productivity and ecological sustainability. One important pathway is community-based fisheries management. This approach emphasizes shared responsibility, local participation, collective monitoring, and equitable resource use. It strengthens ownership among local communities and often results in better conservation and more socially inclusive outcomes. Evidence from floodplain fisheries in Uttar Pradesh suggests that community-based fisheries management can improve both livelihoods and local governance of fishery resources (Chandra et al., 2023).

Sustainable cage culture is another promising approach, particularly in reservoirs and larger water bodies. When properly designed and regulated, cage culture can enhance fish production without requiring extensive land resources. In the Bundelkhand region, cage culture has been discussed as a viable and sustainable strategy, although its success depends on scientific stocking, water quality management, feed control, and ecological safeguards to prevent overloading of aquatic systems (Tewari et al., 2025).

Integrated aquaculture systems also offer strong potential for eco-friendly fishery development. These systems combine fisheries with other farm activities such as poultry, duck rearing, or crop production, thereby improving resource efficiency and reducing waste. Integrated fish-duck farming is one such model that supports nutrient recycling, lowers production costs, and increases farm income while remaining environmentally compatible for smallholders (Singh, 2024). In a broader sense, sustainable aquaculture in the Indo-Gangetic region requires balancing intensification with ecological responsibility, so that productivity gains do not come at the cost of environmental degradation (Gopal et al., 2025).

Wetland conservation is another critical pathway. Wetlands are productive fish habitats and also provide ecosystem services such as water purification, flood buffering, and biodiversity support. Their restoration and conservation can strengthen inland fisheries while preserving ecological balance. Likewise, green

technology adoption, including climate-smart aquaculture, water quality monitoring, low-impact feeding strategies, improved seed quality, and digital tools in fish supply chain management, can improve efficiency and reduce waste. Digital interventions in the fish market system of Uttar Pradesh have also shown potential for improving linkages between producers and markets, thereby supporting more organized and transparent fish trade systems (Raghuvanshi, 2025).

Conclusion

Inland fisheries in Uttar Pradesh hold immense potential for promoting livelihood security, employment generation, food supply, and rural development. The state's extensive freshwater resources provide a strong base for fishery expansion, but this potential can only be fully realized through sustainable and eco-friendly management. Environmental degradation, poor water quality, habitat loss, pollution, climate change, and weak implementation of scientific practices remain major barriers to long-term growth. At the same time, fisheries continue to support economically weaker sections and rural households through income generation and nutritional benefits.

A sustainable future for inland fisheries in Uttar Pradesh requires an integrated approach that combines ecological conservation, community participation, effective governance, and technological innovation. Policies must be implemented more equitably, with stronger attention to local conditions, environmental protection, and the needs of small-scale fishers. Eco-friendly models such as community-based fisheries, integrated aquaculture, sustainable cage culture, wetland conservation, and climate-smart technologies offer practical pathways for balancing productivity with ecological responsibility. Therefore, inland fisheries should be viewed not only as an economic activity but also as an important instrument for inclusive and sustainable rural development in Uttar Pradesh.

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