Inland Fisheries in Telangana, India: Current Status and Perspectives

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Inland fisheries refer to the practice of harvesting fish from freshwater ecosystems such as lakes, rivers, and wetlands. These fisheries play a vital role in providing food security and livelihood opportunities for millions of people. The inland fisheries sector in Telangana is an essential component of the state's socio-economic framework, contributing to livelihoods, food security, and overall economic development. Telangana, blessed with vast inland water resources, holds considerable potential for enhancing fisheries production through reservoirs, tanks, and rivers. This research provides a comprehensive review of the current status of inland fisheries in Telangana, emphasizing its contribution to the state's Gross State Domestic Product (GSDP) and the well-being

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of fishing communities. The study explores government initiatives, fish production trends, and the challenges faced by the sector. The findings underscore the need for sustainable management and enhanced aquaculture practices to bridge the gap between supply and demand.

1. INTRODUCTION

India is endowed with vast and varied aquatic resources for capture fisheries and culture fisheries. This sector plays an important role in socioeconomic development by providing employment for a large population (Sedhuraman et al., 2014). The marine water bodies are used mainly for capture fisheries, whereas inland water bodies are used for both culture and capture fisheries. Most of the inland water bodies are captive ecosystems where intensive processes can be possible and thereby hold enormous potential for manifold increases in fish production (Gupta, 2016). Empirical evidence indicates that India's fisheries sector contributes approximately 1.24% to the national Gross Value Added (GVA) and 7.28% to the agricultural GVA, highlighting its pivotal role in the economy (Government of India, Department of Fisheries, 2021).

Telangana, the youngest state in India, boasts vast water resources that make it ideal for fisheries development. With approximately 77 large, medium, and minor reservoirs and over 24,000 tanks, Telangana offers vast potential for inland fisheries development (Fisheries Department of Telangana, 2022). The introduction of advanced aquaculture practices, such as biofloc technology and Recirculatory Aquaculture Systems (RAS), has significantly enhanced fish production in the region (Indian Council of Agricultural Research [ICAR], 2020). Such systems reduce environmental impacts and allow for sustainable aquaculture growth (FAO, 2014).

The state is home to a significant population of fishing communities, with an estimated 5 lakh families depending on fisheries for their livelihoods. The state's fisheries sector contributes approximately 0.6% to its Gross State Domestic Product (GSDP), with a compound growth rate of fish production exceeding 200% over the past two decades (Ministry of Fisheries, Animal Husbandry & Dairying, 2023). Reports indicate that in 2022 alone, Telangana produced approximately 4 lakh metric tons of fish, reflecting the sector's dynamic growth trajectory (Fisheries Department of Telangana, 2022). Despite this progress, Telangana faces a considerable gap between fish production and demand, with consumption exceeding local production by nearly 20%. This necessitates a focus on sustainable fisheries management and aquaculture expansion.

Challenges such as overfishing, habitat destruction, and the limited availability of quality fish seed continue to hinder the sector's growth (Sedhuraman et al., 2014). To address these challenges, the government has implemented several initiatives, such as the Pradhan Mantri Matsya Sampada Yojana (PMMSY), aiming to double fishers' incomes and promote sustainable aquaculture practices (Government of India, Department of Fisheries, 2021). Research highlights the need for community-based fisheries management systems to improve resource utilization and enhance fishers' livelihoods (Gupta, 2016).

This research article provides a detailed analysis of the current status of the inland fisheries sector in Telangana, including an examination of fish production trends, aquaculture practices, government interventions, and the challenges hindering the sector's growth. It also explores strategies for improving the sector's productivity and sustainability, emphasizing the importance of technological adoption, skill development, and market integration.

2. METHODOLOGY

The methodology employed in this research involves both primary and secondary data collection. Data were collected from various governmental and non-governmental sources, including:

i. **Government Reports**: Annual reports and statistical data from the Fisheries Department of Telangana and the Department of Fisheries, Government of India were analyzed to understand fish production trends and resource management.

ii. **Surveys and Interviews**: Structured interviews and surveys were conducted with key stakeholders, including fishermen, government officials, and representatives from fishery cooperatives, to gather insights into the socio-economic impact of fisheries on rural livelihoods.

iii. **Field Visits**: Field visits to selected reservoirs and tanks were conducted to observe current practices and challenges in fish stocking, harvesting, and marketing.

iv. **Literature Review**: Existing literature on inland fisheries in India and Telangana was reviewed to contextualize the findings and identify gaps in research.

The data were analyzed using both quantitative and qualitative methods. Fish production trends were examined using time-series analysis, while the socio-economic impacts were evaluated through case studies and thematic analysis.

3. RESULTS AND DISCUSSION

3.1 Fish Production Trends in Telangana

Fisheries in Telangana are growing rapidly. Over the last two decades, fish production has increased substantially. In 2000-01, the state produced 1.28 lakh tons of fish, which has grown to 3.90 lakh tons in 2021-22. The annual growth rate of fish production in Telangana has fluctuated over the years, with a compound growth rate of 204.69% since 2000. In comparison, India's total inland fish production has risen from 28.45 lakh tons in 2000-01 to 121.21 lakh tons in 2021-22, reflecting a national compound growth rate of 326.05%.

The production growth in Telangana, despite some fluctuations, shows promising trends for the future, especially given the state's emphasis on enhancing fisheries through aquaculture and improved infrastructure.
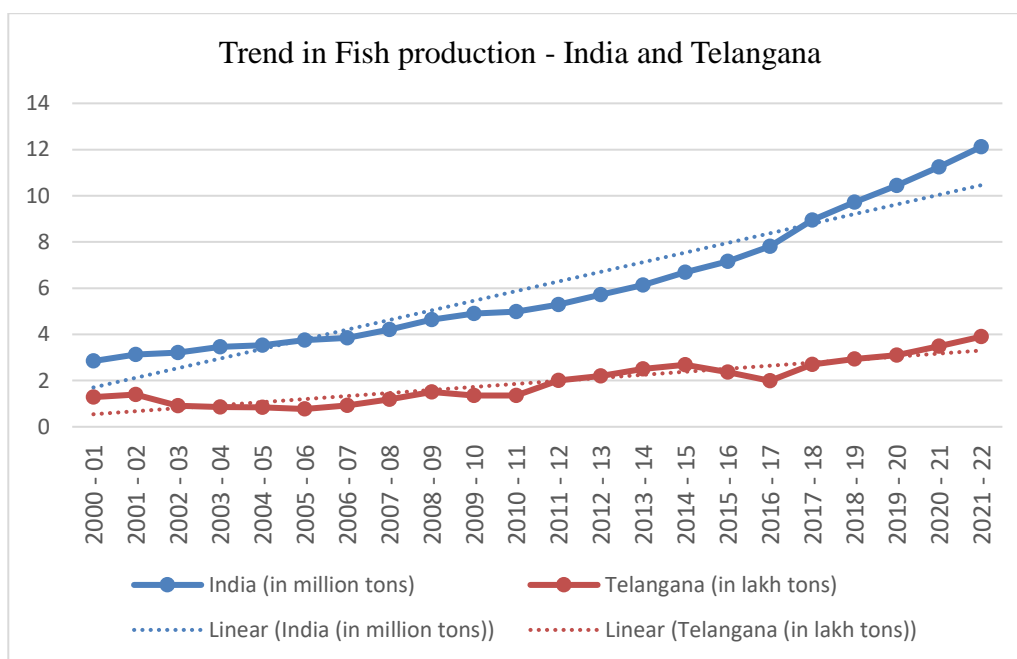

Fig. 1. Highlighting the differences in trends between fish production in India and Telangana

Table 1. Shows the fish production growth in Telangana over selected years

Year	India (in lakh tons)	Annual Growth Rate (%)	Telangana (in lakh tons)	Annual Growth Rate (%)
2000-01	28.45	-	1.28	-
2010-11	49.81	1.78	1.36	0
2020-21	112.49	7.78	3.49	12.58
2021-22	121.21	7.75	3.9	11.75

Table 2. Fish production and consumption in Telangana and India

Parameter	Telangana	India
Fish-eating population	90%	30-35%
Per capita fish availability (kg)	7.88	5.5
Fish production (2021-22, lakh tons)	3.9	121.21

The rapid increase in production is attributed to improved stocking, government support, and the expansion of aquaculture practices. Telangana's current annual fish production meets about 70-80% of the local demand, with the remaining shortfall being supplemented by neighbouring states, mainly Andhra Pradesh.

3.2 Scope for Fisheries Development in Telangana

The potential for inland fisheries development in Telangana is vast due to the state's extensive water resources. The state government has implemented several initiatives to boost fisheries production. For instance, the Kaleshwaram Project and Mission Kakatiya aim to improve irrigation infrastructure, which, in turn, supports fisheries by ensuring consistent water availability in tanks and reservoirs.

Moreover, the government's focus on Aquaculture Development is pivotal. The state currently has 1,755 aquaculture ponds spread over 2,538 hectares. However, aquaculture is still underdeveloped, limited to specific regions. Encouraging integrated fish farming and adopting modern fish culture techniques could enhance production and efficiency.

The species composition in Telangana's water bodies mainly consists of Indian Major Carps (IMCs), including Catla, Rohu, and Mrigal, as well as common carp and freshwater prawns. The stocking size of fish seeds is crucial for maintaining production levels, with most fish stocking being done in the range of 70-100 mm. Despite double stocking in some cases, the average stocking density indicates a need for better management and understanding of field realities.

3.3 Role of Aquaculture in Inland Fisheries

Aquaculture, although still underdeveloped in Telangana, has immense potential for boosting fish production. The state has about 2,538 hectares dedicated to aquaculture, mostly concentrated in the districts of Khammam, Warangal, and Nalgonda. However, this accounts for a small portion of the total inland water resources available for fisheries.

The key species cultured in Telangana's aquaculture systems are Indian Major Carps (IMCs), including Catla, Rohu, and Mrigal, along with common carp and freshwater prawns. The state government has been actively promoting aquaculture by providing subsidies for fish seed, fish feed, and infrastructure development. The introduction of integrated fish farming practices, which combine fish farming with crop and livestock production, has also begun to gain traction among farmers, offering a sustainable way to increase fish yields while enhancing overall farm productivity.

However, several challenges impede the growth of aquaculture in Telangana. These include:

- **Lack of infrastructure**: Many tanks and ponds lack proper embankments, sluice gates, and desilting mechanisms, which limits their use for fish farming.
- **Inadequate training**: Many fishermen are not well-versed in modern aquaculture techniques, leading to inefficient practices and lower yields.
- **Limited availability of quality fish seed**: Although the state has several fish hatcheries, there is a shortage of high-quality fish seed, which affects fish growth and productivity.

3.4 Fish Consumption and Demand in Telangana

Telangana has the highest proportion of non-vegetarian population in India, with 98.8% of men and 98.6% of women consuming fish, meat, or fowl. This far exceeds the national average of 71.4%, emphasizing the state's unique dietary preference for non-vegetarian food. The estimated fish-eating population of the state stands at 3.15 crore, or 90% of the total population (Fisheries Department of Telangana, 2022). The annual per capita fish availability for the fish-eating population is estimated at 7.88 kg, significantly below the Indian Council of Medical

Research (ICMR) recommendation of 12 kg per person per year (ICAR, 2020).

Telangana's demand for fish exceeds its local production, creating a supply-demand gap of 20–30%. Fish imports from Andhra Pradesh are crucial to meet this deficit. For example, in 2022, Andhra Pradesh supplied over 1 lakh metric tons of fish to Telangana to bridge this gap (National Fisheries Development Board [NFDB], 2021). Telangana's expanding economy and rising urban population are expected to further increase the demand for fish, creating a pressing need for enhanced fish production strategies. Studies have shown that urbanization typically correlates with higher per capita fish consumption, necessitating investments in aquaculture and capture fisheries to sustain growing demands (FAO, 2014).

The state's fisheries sector can address this challenge by adopting innovative aquaculture practices, including biofloc technology, intensive polyculture systems, and cage culture, which have demonstrated high productivity in similar resource-constrained scenarios (ICAR, 2020). Additionally, targeted government initiatives, such as the Pradhan Mantri Matsya Sampada Yojana (PMMSY), aim to increase fish production and address nutritional deficits by enhancing infrastructure and resource utilization (Government of India, Department of Fisheries, 2021). Telangana's strong policy framework and abundant water resources position it to achieve self-sufficiency in fish production while promoting sustainable fisheries management.

Challenges and opportunities: Although Telangana has made significant strides in fisheries development, several challenges remain:

Supply-Demand Gap: The gap between fish production and consumption is substantial, with a supply-demand deficit of 20–30% (Fisheries Department of Telangana, 2022). This calls for scaling up aquaculture practices to meet the growing demand. Innovative techniques like cage culture and biofloc technology have shown promise in increasing production while maintaining sustainability (ICAR, 2020).

Infrastructure Development: Despite abundant water resources, Telangana faces challenges in developing essential infrastructure. The lack of adequate cold storage, modern fish markets, and

transportation facilities results in post-harvest losses of up to 15% annually (NFDB, 2021). Investing in robust logistics and supply chain infrastructure can mitigate these losses and ensure better market access for fishers.

Species Diversity: Over-reliance on a few commercially viable species, such as rohu (Labeo rohita) and catla (Catla catla), limits the sector's growth potential. Diversifying fish species, including high-value species like seabass (Lates calcarifer) and ornamental fish, can reduce risks and improve resilience to market fluctuations (FAO, 2014).

Awareness and Training: Many fishermen in Telangana continue to rely on traditional practices, limiting productivity and increasing vulnerabilities to environmental changes. Training programs on advanced aquaculture techniques, water quality management, and disease control can significantly enhance yields. Under the Pradhan Mantri Matsya Sampada Yojana (PMMSY), several skill development initiatives have been introduced, but there is a need for broader implementation at the grassroots level (Government of India, Department of Fisheries, 2021).

Opportunities:

Policy Support: Telangana benefits from strong government support through schemes like PMMSY, which aims to increase fish production and double fishers' incomes by 2024-25.

Emerging Technologies: Adoption of technologies such as Recirculatory Aquaculture Systems (RAS) and automated feeding systems can improve efficiency and reduce resource dependency.

Export Potential: With its high-quality inland fish production, Telangana has the opportunity to tap into export markets for frozen and processed fish products, enhancing revenue generation.

3.5 Government Initiatives for Fisheries Development

The Government of Telangana has recognized the importance of the fisheries sector and has introduced several programs to support its growth. Key initiatives include:

1. **Integrated Fisheries Development Scheme:** The Integrated Fisheries

Development Scheme focuses on the holistic development of the fisheries sector in Telangana. The scheme includes activities such as the establishment of fish seed farms, construction of fish rearing ponds, promotion of aquaculture practices, training and capacity building, and marketing support for fish products. It aims to enhance fish production, improve livelihoods, and create sustainable employment opportunities in the fisheries sector.

2. **Fish Seed Stocking Program**: The government has been actively promoting the stocking of fingerlings in reservoirs and tanks to increase fish production. In 2021-22, over 46 crore fish seeds were released into water bodies across the state.

3. **Blue Revolution Scheme**: As part of the central government's Blue Revolution initiative, Telangana has received funds to modernize fish markets, promote aquaculture, and establish fish feed mills and cold storage facilities.

4. **Mission Kakatiya**: This flagship program focuses on the restoration of minor irrigation tanks, many of which are used for fish culture. The desilting and rejuvenation of these tanks have improved water retention, benefiting fisheries.

5. **Fishermen Welfare Schemes**: The state has introduced several welfare schemes for fishermen, including accident insurance, savings-cum-relief schemes, and housing assistance. These programs aim to improve the socio-economic conditions of fisher families and ensure a steady income during lean fishing seasons.

3.6 Despite the Progress Made, Telangana's Inland Fisheries Sector Faces Several Challenges

- **Supply-Demand Gap:** The state's fish production meets only about 70–80% of local demand, resulting in a supply deficit of 20–30% (Fisheries Department of Telangana, 2022). This deficit necessitates imports from neighboring states like Andhra Pradesh, which supplied over 1 lakh metric tons of fish to Telangana in 2022 (NFDB, 2021). The heavy dependence on external sources for fish highlights the urgent need to enhance local production capacity through intensive

aquaculture practices and policy interventions.

- **Climate Variability:** Unpredictable rainfall patterns, droughts, and increasing temperatures due to climate change significantly affect the water availability in reservoirs, rivers, and tanks, which are the lifelines of inland fisheries. Studies indicate that in drought-prone areas of Telangana, fish production can drop by as much as 30% during water-scarce years (ICAR, 2020). Developing climate-resilient aquaculture systems and efficient water management practices, such as rainwater harvesting and solar-powered aeration systems, can help mitigate these impacts.

- **Market Infrastructure:** The absence of adequate cold storage facilities and modern fish markets results in post-harvest losses of up to 15% annually, significantly affecting the incomes of fishermen (NFDB, 2021). Poor infrastructure also limits the state's ability to tap into high-value markets for fresh and processed fish. Investments in integrated fish market systems, cold chain logistics, and e-commerce platforms can help bridge these gaps and enhance profitability.

- **Resource Management:** Over-reliance on a narrow range of fish species, such as rohu (*Labeo rohita*) and catla (*Catla catla*), has reduced biodiversity in inland water bodies. This lack of diversity increases the risk of disease outbreaks, which can lead to significant production losses. Expanding the range of stocked species to include disease-resistant and high-yield varieties like pangasius and murrel can improve ecosystem resilience and production efficiency (Gupta, 2016).

Addressing these challenges requires a multi-pronged approach involving government policy support, technological adoption, capacity building, and public-private partnerships to ensure sustainable growth in the inland fisheries sector.

4. CONCLUSION

The inland fisheries sector in Telangana has grown significantly over the past two decades the abundant water resources and proactive government interventions are one of the reasons for such growth of fisheries. The sector plays a vital role in the livelihoods of fishing communities and contributes to food security in the state. However, challenges such as infrastructure

deficits, climate variability, and the supply-demand gap remain significant obstacles to achieving the full potential of the fisheries sector. For sustainable growth, it is essential to focus on expanding aquaculture, modernizing infrastructure, and diversifying fish species. Additionally, improving training and capacity-building programs for fishermen will help enhance productivity and ensure that the inland fisheries sector continues to thrive in Telangana. With the right policy support and investments, Telangana has the potential to emerge as a leader in inland fisheries in India, ensuring both socio-economic development and ecological sustainability.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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