

A GEOGRAPHICAL ANALYSIS OF TEMPORAL DYNAMICS IN UJANI RESERVOIR FISHERIES: ANNUAL TRENDS, SEASONAL PATTERNS, AND ECONOMIC GROWTH IN INDAPUR TEHSIL, MAHARASHTRA.

Mr. Dhanaji Vyawahare¹

Dr. Asaram Jadhav²

Department of Geography

Post Graduate Teaching and Research Centre Sir Parashurambhau College (Empowered

Autonomous), Pune – 411 030

dhanajivyawahare@gmail.com

Abstract:

This research investigates the multi-year trends and seasonal patterns of fish sales in Indapur Tehsil, Maharashtra, focusing on the Ujani Reservoir fishery. Analyzing data from the Indapur and Bhigwan landing centers between 2020-21 and 2024-25, the study identifies total revenue of ₹ 2,680.67 million. The fishery demonstrated a robust compound annual growth rate (CAGR) of 16.04%, peaking in 2023-24 before experiencing a 10.65% decline in the final year.

Seasonal analysis reveals that the post-monsoon and winter months (October–February) are the most productive, contributing 48.8% of annual revenue. In contrast, monsoon sales (26.6%) are suppressed by fishing bans and hydrological conditions. These fluctuations are deeply rooted in the region's semi-arid geography and reservoir morphology. While the fishery supports approximately 15,000 households, the high seasonal concentration creates significant income instability. The study recommends implementing seasonal income-smoothing mechanisms, expanding cage culture in deeper zones, and utilizing GIS-based monitoring to enhance the socio-economic resilience of the inland fishing community.

Keywords: *Ujani Reservoir, fish sales trends, Indapur Tehsil, seasonal variation, cumulative growth and inland fisheries*

1. Introduction:

The Ujani Reservoir, located in Indapur Tehsil, Maharashtra, is one of the state's largest inland water bodies. Formed by the Ujjani Dam on the Bhima River, it serves as a vital resource for irrigation and hydropower. Beyond these uses, the reservoir supports a major fishery sector that provides a livelihood for approximately 15,000 fisher households.

This fishery operates through a network of over 52 cooperative societies that supply fresh fish to major markets like Pune, Solapur, and Mumbai. The two primary hubs for these activities are the Indapur and Bhigwan landing centers. While Bhigwan benefits from deeper waters and better transport links, both centers are essential to the local economy.

The productivity of the reservoir is closely tied to the local climate and geography. Factors such as the southwest monsoon, water level fluctuations, and seasonal temperature changes significantly impact how many fish are caught and sold throughout the year. This research paper examines fish sales over a five-year period (2020–21 to 2024–25) to understand growth trends and seasonal patterns. By identifying when and why sales fluctuate, this study aims to suggest

strategies that can make the fishery more stable and sustainable for the families who depend on it.

1.2 Key Objectives:

1. To analyze annual sales trends, growth rates, and cumulative totals from 2020-21 to 2024-25.
2. To examine seasonal distribution of sales and its influence on annual performance.
3. To identify geographical and external factors driving variations and propose management strategies.

1.3 Materials and Methods:

Data Source: Annual and seasonal sales records from Indapur and Bhigwan Fish Market Committees (combined for Indapur Tehsil).

Method of Analysis:

- Year-over-year growth rates and CAGR calculation
- Cumulative sales summation
- Seasonal percentage breakdown (based on aggregated monthly patterns representative of the period)
- Graphical visualization of trends and seasonal shares

2. Study Area:

The Ujjani Reservoir, one of Maharashtra's largest inland water bodies, was created by the Ujjani Dam on the Bhima River (a Krishna tributary) in 1980, primarily for irrigation and hydropower. Located near Ujjani village, Solapur District (18°04'26"N, 75°07'12"E), it covers ~337 km² at full capacity across Pune, Solapur, and Ahmednagar districts, mainly in Indapur and Madha taluka. The semi-arid region features hot summers (March–May), heavy southwest monsoon rains (June–September) causing water level fluctuations, and mild winters (October–February). These variations drive reservoir hydrology, nutrient dynamics, turbidity, and fish productivity. The fishery, managed by over 52 cooperative societies, sustains ~15,000 fisher households. Marketing centers on two main landing sites: Indapur and Bhigwan, the latter favored for deeper waters, superior infrastructure, and better transport links to Pune, Solapur, and Mumbai markets.

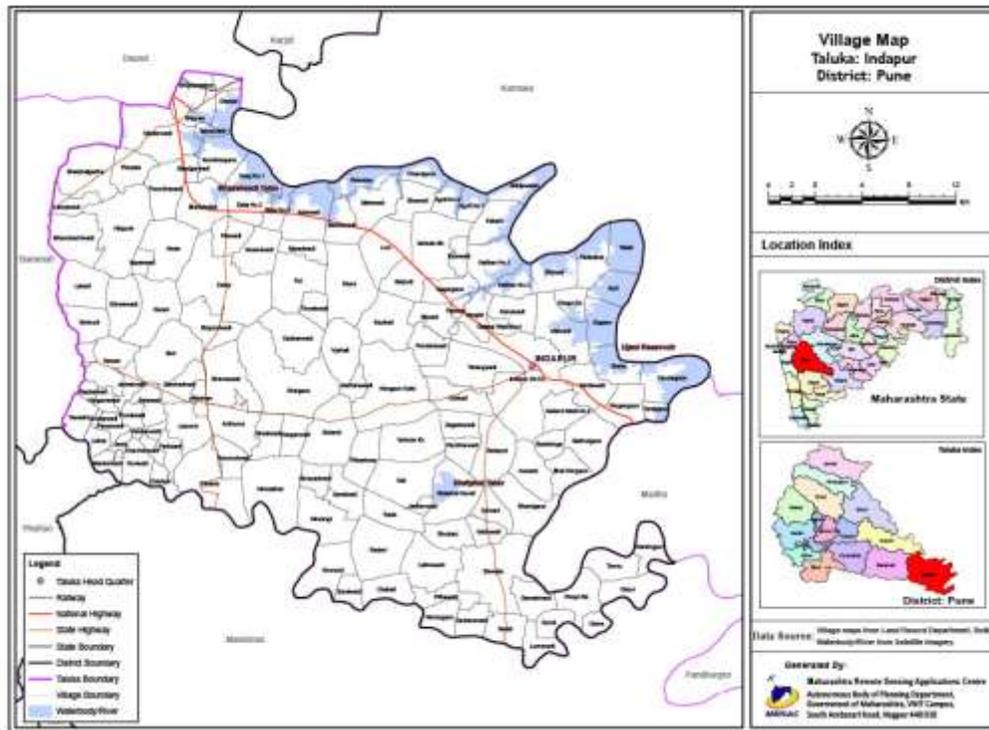
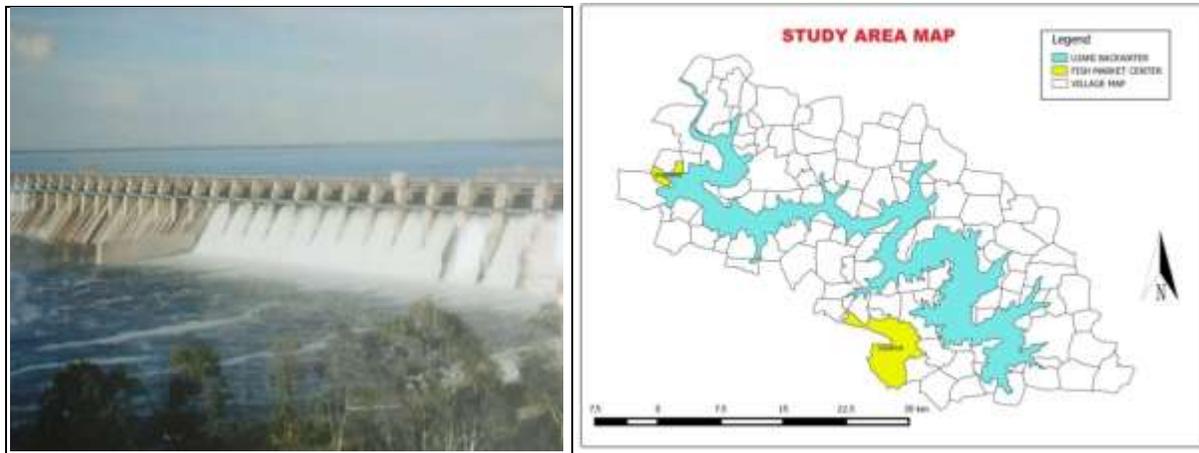


Figure 1: Study area map



Source: <https://www.google.com>

Source: Map by GIS Software

Figure 2: Ujani Dam and Fish Market Centers in Indapur

This combination of vast area, seasonal climate rhythms, and spatial differences in depth and access makes Ujani Reservoir ideal for studying spatial and temporal patterns in reservoir fisheries

3. Results and Discussion:

Table No. 1: Annual Fish Sales and Cumulative Sales (2020-21 to 2024-25)

Financial Year	Total Sales (₹)	Growth Rate (%)	Cumulative Sales (₹)
2020-21	354,440,313	—	354,440,313
2021-22	439,615,143	24.03	794,055,456
2022-23	524,789,974	19.37	1,318,845,430
2023-24	719,194,578	37.04	2,038,040,008
2024-25	642,627,948	-10.65	2,680,667,956

Source: Indapur and Bhigwan Fish Market Committees (2020-25).

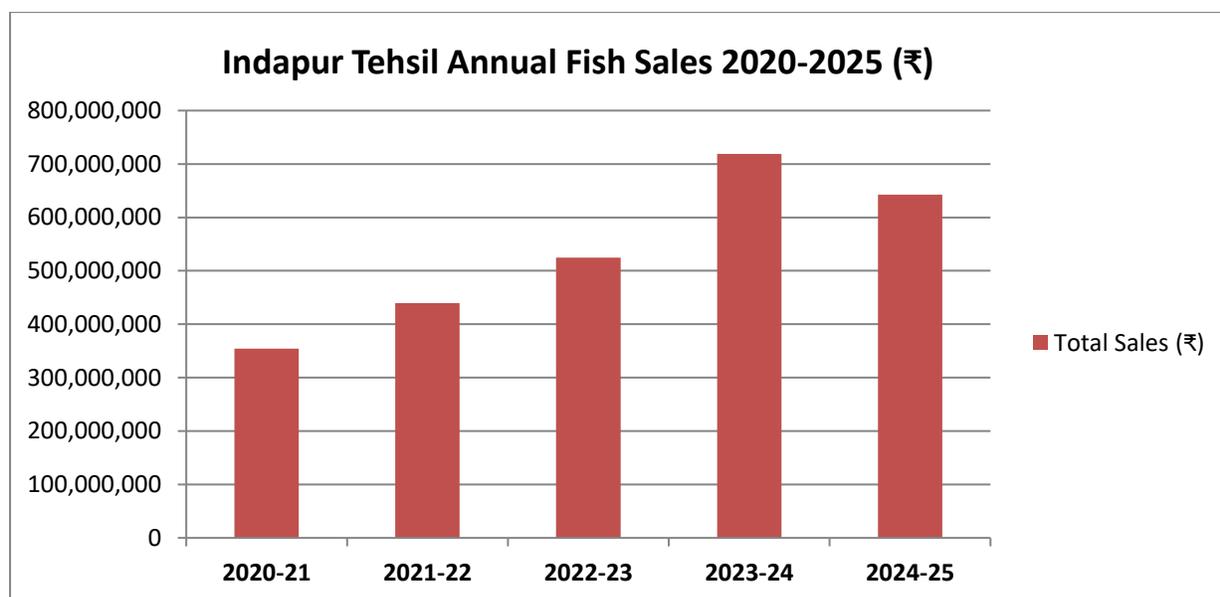


Figure 3: Annual Fish Sales 2020-2025

3.1 Annual Sales Trends and Economic Growth:

Between the financial years 2020-21 and 2024-25, the Indapur Tehsil fisheries demonstrated robust economic performance:

- **Cumulative Revenue:** The total sales over the five-year period reached ₹ 2,680.67 million.
- **Growth Rate:** The sector maintained a **Compound Annual Growth Rate (CAGR) of 16.04%**.

- **Peak Performance:** Sales grew consistently until **2023-24**, reaching a peak of ₹ 719.19 million.

Recent Decline: In the **2024-25** period, sales dropped by **10.65%** to ₹ 642.63 million. This decline is likely attributed to hydrological stress or specific regulatory factors

3.2 Seasonal Contribution Analyses:

The seasonal breakdown provides the clearest insight into the operational cycle and explains much of the annual volatility observed over the five-year period.

Table No. 2: Seasonal Contribution to Annual Fish Sales

Season	Months	Percentage of Annual Sales	Interpretation
Post-Monsoon & Winter	Oct–Feb	48.8%	Peak Season. Nearly half of the annual revenue is generated in just five months.
Monsoon	Jun–Sep	26.6%	Lean Period. Revenue remains suppressed, likely due to fishing bans or difficult conditions.
Summer	Mar–May	24.6%	Transition/Second Peak. Sales remain strong but dip slightly below the Monsoon period's cumulative value.

Source: Indapur and Bhigwan Fish Market Committee

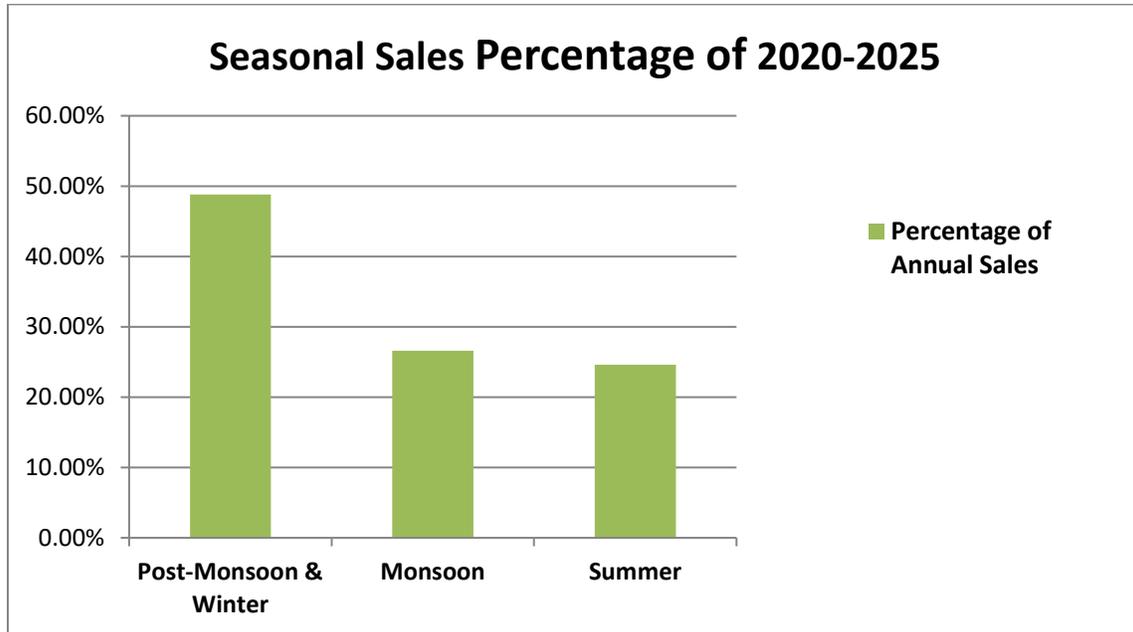


Figure 4: Seasonal Sales Percentage

3.3 Seasonal Patterns and Link to Multi-Year Trends:

The strong dominance of the post-monsoon and winter season (48.8% of annual sales) reflects favorable conditions: stable water levels, lower turbidity, post-spawning fish abundance, and easier access to deeper zones (especially at Bhigwan). This peak period drives the majority of yearly revenue and cushions annual totals even in lower-growth years.

Conversely, the monsoon lean period (26.6%) is consistently constrained by the annual fishing ban (typically June–August), high turbidity from inflows, and safety/access issues—explaining why even strong growth years show suppressed mid-year performance.

Summer acts as a transitional period with moderate-to-good catches, benefiting from warming waters and pre-monsoon stability.

Over the 2020–2025 periods, the consistent seasonal structure likely amplified the post-pandemic recovery (2021–24), as peak seasons capitalized on rebounding demand and infrastructure improvements. The 2024-25 declines may partly stem from weaker peak-season performance due to hydrological stress or regulatory factors, though the seasonal pattern remains a reliable predictor of annual outcomes.

3.4 Geographical Insights

- **Reservoir Morphology:** The Ujani Reservoir is one of Maharashtra’s largest inland water bodies, covering approximately 337 km² at full capacity.
- **Spatial Advantage:** The Bhigwan landing center is preferred over Indapur because its deeper waters and superior transport links provide better access to major markets like Pune and Mumbai.
- **Hydrological Rhythms:** Seasonal variations in water levels, turbidity, and nutrient dynamics—driven by the southwest monsoon—directly dictate fish productivity.

- **Vulnerability of Shallow Zones:** While deeper zones at Bhigwan support consistent yields, shallower areas near Indapur are more susceptible to stress during lean periods.

3.5 Economic Insights:

- **Significant Market Value:** The fishery is a major economic engine, generating cumulative revenue of ₹ 2,680.67 million over the five-year study period.
- **Growth Trends:** The sector achieved a strong Compound Annual Growth Rate (CAGR) of 16.04%.
- **Income Instability:** Despite high total revenue, 48.8% of annual income is generated in just five months (October to February), creating significant financial instability for the 15,000 fisher households.
- **External Disruptions:** Economic performance is sensitive to external shocks, such as the COVID-19 pandemic and fluctuations in reservoir hydrology.

4. Conclusion and Recommendations

The research concludes that the Ujani Reservoir fishery is a vital economic pillar for Indapur Tehsil, though it remains highly sensitive to environmental and regulatory cycles.

Conclusion:

- **Economic Growth:** The fishery demonstrated strong resilience with a cumulative revenue of ₹ **2,680.67 million** and a **16.04% CAGR** over the five-year period.
- **Seasonal Dependency:** Nearly half of the annual income (**48.8%**) is concentrated in the post-monsoon and winter months, highlighting a heavy reliance on specific hydrological windows.
- **Vulnerabilities:** Annual performance is susceptible to declines, such as the **10.65% drop** in 2024-25, driven by factors like fishing bans, climate variability, and hydrological stress.
- **Livelihood Impact:** While lucrative, the extreme seasonality leads to income instability for the **15,000 households** depending on these waters.

Recommendations:

To ensure the long-term sustainability and economic security of the fishing community, the following steps are recommended:

- **Income Smoothing:** Implement mechanisms such as cold storage and value-added processing (e.g., fish drying or packaging) to help fishers earn during lean periods.
- **Advanced Fish Culture:** Expand the use of **cage culture** in deeper zones, like those near Bhigwan, to maintain production even when reservoir levels fluctuate.
- **Technological Integration:** Utilize **GIS-based hydrological monitoring** to better forecast fish movements and productivity based on water levels.
- **Infrastructure Upgrades:** Improve landing center facilities at both Indapur and Bhigwan to ensure more equitable access and better handling of catch across all seasons

References:

1. **Kadam, M. S., & Shinde, S. E. (2018).** Impact of seasonal fluctuations on fish productivity in freshwater reservoirs of Western Maharashtra. *Journal of Experimental Zoology, India*, 21(1), 345-350.
2. **Meshram, C. B. (2017).** A study on the relationship between water level fluctuations and fish landings in large reservoirs. *Journal of Fisheries and Life Sciences*, 2(2), 15-22.
3. **Bhalerao, S. N. (2015).** Limnological study of Ujani Reservoir with reference to fish culture. *Indian Journal of Applied Research*, 5(6), 721-723.
4. **Pawar, S. K. (2016).** Status of fish diversity and commercial landings at Ujani Dam, Maharashtra. *International Journal of Researches in Bioscience, Agriculture and Technology*, 4(2), 45-49.
5. **Shinde, S. E., Pathan, T. S., & Sonawane, D. L. (2011).** Seasonal variations and biodiversity of fish fauna from Harsool-Savangi Dam, Aurangabad (M.S.) India. *World Journal of Fish and Marine Sciences*, 3(3), 200-205.
6. **Deshmukh, S. V., & Shinde, S. B. (2021).** Geographical analysis of fish marketing systems in rural Maharashtra: A case study of landing centers. *The Deccan Geographer*, 59(1), 88-102.
7. **Kamble, S. M. (2019).** Socio-economic status of fisherman communities in Indapur Tehsil, Pune District: A geographical perspective. *Review of Research*, 8(9), 12-18.
8. **Pawar, V. B., & Mane, U. H. (2013).** Marketing and economic evaluation of reservoir fisheries: A case study of Ujani backwater. *Journal of Aquatic Biology*, 28(1), 104-109.