**An economic analysis of Gill net employed along the Tulmulla stream of district Ganderbal, Kashmir**

**Abstract**

This study investigates the economic viability of gill net fishing operations along the Tulmulla stream in District Ganderbal, Kashmir. Data were collected from 50 licensed fishers across five villages using a pre-tested survey schedule. The economic analysis considered capital, fixed, and variable costs, alongside earnings and profitability indices. The finding conformed that the average annual net income per fisher was ₹75,584.57, with a net operational income of ₹83,073.36 and a high benefit-cost (B:C) ratio of 5.21, affirming the economic profitability of gill net fishing in the region. Family labour represented the largest share of variable costs, while vessels accounted for the majority of fixed capital investment. The report raises issues such declining fish catches as a result of pollution, overfishing, and regulatory infractions despite the high returns.

**Keywords:** Variable cost, fixed cost, BC ratio, gill net, Tulmulla stream

**Introduction**

Primary goal of every business is to fetch profit. Fishing is considered as one of the profit-oriented businesses. Fisheries sector play an important role in the national economy through increased food supply, employment, revenue, and foreign exchange generation. Small, vulnerable, and underdeveloped fishing communities that live close to water resources are associated to artisanal fisheries; their immediate survival is strongly correlated with the advantages that these communities receive from these resources (Schorr, 2005). The year 2022 has been declared the International Year of Artisanal Fisheries and Aquaculture in honour of the critical role that artisanal fisheries play in guaranteeing food security, reducing poverty, and advancing sustainability (FAO, 2023). For most people worldwide, fish is consistently one of the most popular and affordable dietary sources of animal protein (Allam et al., 2020). There are 2.3 crore inland fishermen in India, making up about 1.7% of the country's entire population (DoF GoI, 2020).The extensive inland fisheries resources, including rivers and canals that covers approximately 2.52 lakh km (DoF GoI, 2022).

Economics plays an imperative part in proper fisheries management. In the prior stages, fisheries management focused on controlling and maintaining the fish stocks. It is assumed that if the control measures are strictly executed, the further expansion in effort is prevented, thus, a sustainable harvest can be anticipated. (Wilen, 1979). The economic performance of fishing is a crucial indicator which determines how the fleet is operated. Anybody with a craft and equipment with license can do fishing in Indian waters because the resource is open access, but in the end, the intersection of average cost and revenue per fishing trip aids in determining whether, to continue operations, unlike the equality of marginal cost and marginal revenue (Narayanakumar *et al*., 2009).

The economics of fishing can be a complex interplay between costs and earnings which play an important role in economic analysis and also provide information for sustainable fisheries management. Information on cost and earning of fishing operations in district Ganderbal is scarce. This might be because of lack of proper data collection efforts and also the unwillingness of the fishers to disclose such information. Fishing cost and earning mainly depends on the type of fishery and the gears used. Fishing cost helps to determine social and economic conditions of the fishermen. The data collected can be used to assess the economic status of the sector and drafting of proper welfare policy measures.

The valley of Kashmir, situated in the middle of the Western Himalayas between 33⁰ 01' and 35⁰ 00' N, and 73⁰ 48' and 75⁰ 30' E is located at an average elevation of 5,200 feet above sea level and has a total area of 15948 km2 (Panigrahy *et al*., 2010). The J&K state is known for its freshwater resources. The state has about 3651 water bodies (Panigrahy *et al*., 2010) which covers an area of about 3915 km2. Differences in elevation and topography lead to different sequences of succession of water bodies, ultimately leading in the colonization of these waters by different types of fishes (Bhat *et al.,* 2020). In the Union Territory (UT) of Jammu and Kashmir there are 17,396 fishermen, accounting 0.12% of the UT’s population. The UT is endowed with abundant inland water resources, including lakes (60,000 ha), rivers and canals (22,781 km), reservoirs (7,000 ha) and ponds (17,000 ha) (Gul *et al*., 2024).

The traditional fishermen of Jammu and Kashmir are considered artisanal fishermen in the context of the current study. They use wooden boats for their fishing activities and rely on traditional technical knowledge that has been passed down through the ages (Gul *et al*., 2024).

The Tulmulla stream flows through district Ganderbal. It is locally known as “Nagpov Nallah”. The stream arises from Sindh as well as from vaious springs in Tehsil Lar Ganderbal like Bonipots spring in Doshi Mohalla Lar, Chin Nag at Chantan Lar and Gori Nag at Gulabpora. Many other springs from Lar join the Tulmulla stream but a major quantity of water in the stream is from the springs and from marshy lands of Tulmulla.

This study is significant because it offers insightful information about the financial situation of traditional gill net fishermen in Kashmir's Tulmulla stream. It illustrates the economic feasibility of artisanal fishing and the difficulties brought on by overfishing, pollution, and illicit activities by examining expenses, revenue, and profitability. In addition to improving the livelihoods of nearby fishing communities and aiding in the conservation of the region's aquatic resources, the findings can assist policymakers in creating stronger support systems and encouraging sustainable fishing methods.

**Materials and method**

The present study was conducted in Ganderbal district of Jammu and Kashmir and from the Ganderbal district, 5 villages were selected namely Watalbag Lar, Tulmulla, Rakh Rabitar, Korag Darakpora and Rabitar Dab. From the selected villages 10 licenced fishers were selected randomly from each village. Thus, the study was confined to 50 fishers from 5 villages. The data was collected by direct interview method from sample fishers by using pre-tested survey schedule designed for that purpose.

Fixed cost includes the depreciation on capital cost and interest on capital cost. The depreciation was calculated by straight line method (purchased value – present value) / Life expectancy. Interest was calculated by simple interest formula and percentage of interest at which loan was taken. The variable cost (VC) encompasses expenses like maintenance of vessel, maintenance of gear, licence fee, and family labour.

The total cost was calculated by adding the fixed cost and variable cost. Total revenue was calculated by selling price of fishes per kilogram and multiplying it with the quantity of catch. Net operating income, net income and B:C ratio were calculated by the following formula.

**Result and Discussion**

In the Tulmulla stream, all the interviewed fishers were males and actively engaged in fishing with licence. The cost and profit margin are determined by the dynamics of local supply, demand, and season. Fish are usually sold at local markets or to local contractors at set prices during periods of plentiful availability.

The fixed capital cost of a gill net was ₹ 50,673.32. Particulars included to calculate the fixed capital include cost of vessels, net, rope and floats. Vessels accounted for the largest share at ₹ 49,333.33 (97.36%), followed by the net at ₹ 1,006.66 (1.98%), ropes at ₹ 223.33 (0.44%), and floats at ₹ 110.00 (0.22%).

The cost structure of traditional fisheries in the region was categorised into two main groups: variable costs and fixed costs. The cost and return analysis was calculated as per annum per fisher which included Total catch (kg), Average selling rate (Rs/kg), Total revenue, Net operating income and net income. The variable cost included maintenance of vessel, maintenance of gear, licence fee and family labour while as fixed cost included depreciation and interest on capital cost calculated per annum.

The sub total of variable cost (A) was ₹ 10453.34 (58.26 %). Among the variable costs, family labour constituted the highest cost component, accounting for ₹ 8080.00 (45.03 %), followed by maintenance of vessel ₹ 1316.68 (7.34 %), licence fee at ₹ 800 (4.46%) and maintenance of gear ₹ 256.66 (1.43%). The sub total of fixed costs (B) calculated was ₹ 7488.79 (41.74%). Fixed costs were primarily attributed to the depreciation on capital costs at ₹ 2928.20 (16.32%) and the interest on capital cost @ 9% at ₹ 4560 (25.42 %). The total cost (A + B) was calculated at ₹ 17,942.13. In analysis of return, the total catch was 449.00 kg, average selling rate ₹ 208.30 per kg. Total revenue calculated was ₹ 93,526.70. The net operating income calculated at ₹ 83,073.36 and net income were ₹75,584.57 respectively. B: C ratio was calculated at 5.21 (Table 1).

Bhat *et al*. (2025) reported gill net to be a profitable fishing gear in Dal Lake. *Dar et al*., 2015 estimated economic performance of three different gillnet fishing units operating along Mumbai Coast for Non-motorised at ₹ 45965, for OBM at ₹ 65,012, and ₹ 13,0577 for IBM. Luther *et al*. (1997) reported the capital investment of gillnetters in Chennai from ₹ 3,01,000 to ₹ 4,00,000. Capital investment ranged from ₹ 1, 00,000 to ₹ 1, 10,000 for two gillnetters operated along the Cochin coast during years 1981 and 1982 (Silas *et al*., 1984). Annamalai and Kandoran, 1990 reported the capital investment of ₹ 49,973 to ₹ 82,117 for mechanised gillnetters operated along Kerala coast. Sathiadhas and Benjamin, (1990) reported ₹85,000 to ₹1,00,000 operated along Tamil Nadu coast during year 1985-86.

The fish catch from Tulmulla stream was found to decline compared to earlier reports of local fishermen. Numerous human activities, such as the ongoing rise in water pollution, overfishing, anthropogenic activities, and the use of prohibited nets, are to blame for the decline in fish catch and the alterations in fish composition in the stream. (Hussain and Rashid, 2021; Khanday *et al*., 2021; Bhat *et al*., 2022; Dar *et al*., 2023). Both illegal and licensed fishermen consistently violate regulations like mesh size and overfishing (Khan and Ali, 2013; Sultan and Kant, 2016). According to the Fisheries Act, 2018, fish less than 5 inches in length should be able to escape from nets using a suitable mesh size of one and a half inches (1½ʺ) for fishing. However, fishermen on the River Jhelum have also been seen to employ a half-inch (½ʺ) mesh size (Gul *et al*., 2024). Additionally, these fishermen use prohibited gill nets at night when field labor is scarce, recovering them early in the morning to evade fisheries regulatory staff. Consequently, the stream's fish population has drastically decreased as a result of this prolonged non-compliance. This may cause permanent changes in the water chemistry and may harm its ecosystem. These effects extend beyond aquatic life, as it is not only the fish that are impacted (Ahmed *et al*., 2017) thus; the fishers become the victims of these anthropogenic activities.

Significant research has been conducted on the economics of both small and large-scale fisheries (Narayanakumar *et al*., 2009: Narayanakumar, 2009a, 2012b; Belton and Thilsted, 2014; Aswathy *et al*., 2015; Jamnia, *et al*. 2015; Pio *et al*. 2016; Radhakrishnan *et al*. 2018; Viswambharan *et al*., 2018; Rodrigues *et al*., 2019; Carvalho *et al*., 2020; Johnson *et al*., 2022; Raju *et al*., 2022; Gul *et al*., 2024, Bhat *et al*., 2025). These studies consistently indicate that the transition from traditional to modern fishing methods enhance the economic and financial viability of fisheries.

**Conclusion**

The economic analysis of gill net fishing in the Tulmulla stream reveals that it is a financially viable for the livelihood of the local fishers in the area, with reasonably good benefit-cost ratio and income. However, challenges like declining fish stocks, pollution, and non-compliance with fishing regulations threaten the fish sustainability. The study emphasizes the need for improved management, awareness, and policy support to ensure both economic stability for fishers and conservation of the aquatic ecosystem.

**Statements and Declarations:**

**Conflict of interest:**

Authors explicitly declare that they have no conflict of interest.

**Ethical Approval**

Author(s) would like to confirm that the manuscript does not involve any ethical concerns. It does not include research on human or animal subjects and is based solely on publicly available geospatial and ecological datasets. Therefore, ethical approval is not required for this study.

**Disclaimer**

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 the writing or editing of this manuscript.

**Funding:** Not applicable

**References**

Ahmed, I., Ahmad, Z., & Ahmad, I. (2017). Current status of fish fauna of river Jhelum and Dal lake of Kashmir valley. *Bull. Pure Appl. Sci. Zool*, 36(2): 85-89

Allam, B. W., Khalil, H. S., Mansour, A. T., Srour, T. M., Omar, E. A., & Nour, A. A. M., (2020). Impact of substitution of fish meal by high protein distillers dried grains on growth performance, plasma protein and economic benefit of striped catfish (*Pangasianodon hypophthalmus*). *Aquaculture*, 517, 734792.

Aswathy, N., Narayanakumar, R., Philipose, K. K. and Imelda, J., (2015). Costbenefit analysis and input requirements for mariculture of finfishes in India, pp. 301-304.

Belton, B., & Thilsted, S. H., (2014). Fisheries in transition: Food and nutrition security implications for the global South. *Global Food Sec*. 3(1): 59-66.

Bhat, F. A., Maqbool, M., Hussain, T., Parry, U. R., & Dar, S., (2025). Catch Per Unit Effort, Catch Composition and Economic Analysis of Fishing Gears Operating in Dal Lake: A Baseline Study for Fisheries Management. *Asian Journal of Advanced Research and Reports*, 19(5), 128-143.

Bhat, F. A., Yousuf, A. R. and Balkhi, M. H. 2020. Diversity of fishes in Jammu and Kashmir state. *Biodiversity of the Himalaya:* Jammu and Kashmir State **18**: 859-887.

Bhat, S. U., Nisa, A. U., Sabha, I. and Mondal, N. C., (2022). Spring water quality assessment of Anantnag district of Kashmir Himalaya: Towards understanding the looming threats to spring ecosystem services. *Appl. Water Sci*., 12(8): 180

Carvalho, N., Anrooy, R., Vassdal, T., & Dagtekin, M., (2020). Technoeconomic performance review of selected fishing fleets in Europe. Food and Agriculture Organisation of the United Nations, Rome, Italy. https:// [www.fao.org/documents/card/fr/c/ca9188en/](http://www.fao.org/documents/card/fr/c/ca9188en/).

Dar, S. A., Ganie, D. H., Teeli, J. I. & Bhat, S. U., (2023). A policy approach for sustainable governance of sand mining activities in NW Kashmir Himalayas. *The Extractive Industries and Society*, 13: 101204

Dar, S. A., Thomas, S. N., & Husain, N. (2015). Economic Performance of Three Different Gillnet Fishing Units Operating along Mumbai Coast. *Economic Affairs*, 60(3), 451-456.

DoF GoI 2020. Handbook on fisheries statistics 2020. Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying Government of India, New Delhi, India. https://dof.gov.in/sites/default/ files/2021-02/Final Book.pdf.

DoF GoI, (2022). Inland fisheries. Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India. https://dof. gov.in/inland-fisheries (Accessed 28 December 2022)

FAO, (2023). International Year of Artisanal Fisheries and Aquaculture (IYAFA) 2022, Final Report. Food and Agriculture Organisation of the United Nations, Rome, Italy. 84 p. https://www.fao.org/artisanal-fisheriesaquaculture-2022/home/en/.

Gul, S., Prakash, S., Qureshi, N. W., Yadav, V. K., Sharma, A., & Mir, S. A.. (2024). Economic assessment and sustainable management of artisanal fisheries: Insights from River Jhelum, Kashmir, India. *Indian Journal of Fisheries*, 71(3).

Gul, S., Prakash, S., Qureshi, N. W., Yadav, V. K., Sharma, A., & Mir, S. A., (2024). Economic assessment and sustainable management of artisanal fisheries: Insights from River Jhelum, Kashmir, India. *Indian Journal of Fisheries*, *71*(3).

Hussain, J. & Rashid, G., (2021). Diversity and distribution pattern of fish fauna of River Jhelum, Kashmir Himalayas*. Int. J. Aquat. Sci*, 12(2): 5553-5561.

Jamnia, A. R., Mazloumzadeh, S. M. & Keikha, A. A., (2015). Estimate the technical efficiency of fishing vessels operating in Chabahar region. *Southern Iran. J. Saudi Soc. Agric. Sci*, 14(1): 26-32.

Sathiadhas, R., & Benjamin, R. E. (1990). Economics of Mechanised Fishing Units along Tamilnadu coast. *Seafood Export Journal*, *22*(11), 15-30.

Johnson, B., Narayanakumar, R. & Swathilekshmi, P. S., (2022). Economic performance of marine fishing methods in Ramanathapuram District of Tamil Nadu. Indian J. Ext. Educ., 58(1): 54-58.

Khan, I. & Ali, M., (2013). Current status of the fish fauna of River Jhelum, Kashmir, J&K. Open access scientific report, 2(3): 1-3.

Panigrahy, S., Singh, T. S., Patel, J. G., Romshoo, S. A., Qadri, T., Rashid, I., & Muslim, M. (2010). National Wetland Atlas: Jammu and Kashmir. *Ministry of Environment and Forests Government of India*.

Wilen, J., 1979. Fishermen Behaviour and the Design of Efficient Fisheries Regulation Programmes. Journal of Fisheries Research Board of Canada, 36:855-858

Khanday, S. A., Bhat, S. U., Islam, S. T. & Sabha, I., (2021). Identifying lithogenic and anthropogenic factors responsible for spatio-seasonal patterns and quality evaluation of snow melt waters of the River Jhelum Basin in Kashmir Himalaya. Catena, 196: 104853

Annamalai, V. and Kandoran, M.K. 1993. Economic and behavioral trends in low energy fishing in the South coast of India. In: V.C. George, V. Vijayan, M.D. Varghese, K. Radhalakshmi, S.N. Thomas and J. Joseph (Eds.), Proc. of the Nat. Workshop on Low Energy Fish. Society of Fisheries Technologists (India), 239-242.

Luther, G., Pilai, Jayaprakash, P.P. Gopakumar, G., Satianandan, T. V., Molly, V., Sathia, R. & Sivakami, S., (1997). Gillnet Fisheries of India, Mar. Fish Infor. Serv., T & E Ser., 150: 1-23.

Narayanakumar, R. 2009a. Economic analysis of cage culture of sea bass. In: Course Manual, National Training on Cage Culture of Seabass. ICARCentral Marine Fisheries Research Institute, Kochi, India, pp. 120-122.

Narayanakumar, R., Sathiadhas, R. & Aswathy, N., (2009). Economic performance of marine fishing methods in India. Mar. Fish. Infor. Serv. T&E Ser., 200: 3-16.

Pio, V. M., González-Poblete, E., Pezzuto, P. R. & Wahrlich, R., (2016). A cost-benefit analysis of three gillnet fisheries in Santa Catarina, Brazil: Contributing to fisheries management decisions. *Lat. Am. J. Aquat. Res*., 44(5)

Radhakrishnan, K., Prakash, S., Narayanakumar, R., Krishnan, M., Madan, M. S. & Kumar, N. R., (2018). Economic analysis of marine fishing crafts in Thoothukudi Province, Tamil Nadu. *Indian J. Geo Mar. Sci*, 47(3): 653-659.

Raju, S. S., Narayanakumar, R., Shubhadeep, G., Phalguni, P. & Subal, K. R., (2022). “Economic performance of marine fishing operations in the state of Odisha, India. *Indian J. Fish*, 69(2): 111-118.

Rodrigues, A. R., Abdalla, P. R. & Gasalla, M. A., (2019). Cost structure and financial performance of marine commercial fisheries in the South Brazil Bight. *Fish. Res*, 210: 162-174

Schorr, D. K., (2005). Artisanal fishing: promoting poverty reduction and community development through new WTO rules on fisheries subsidiesAn issue and options paper. https://wedocs.unep.org/bitstream/handle/20.500.11822 /25946/AFSchoor.pdf?sequence=1&isAllowed=y

Silas, E.G., Pillai, P.P., Jayaprakash, A.A. & Pillai, M.A., (1984). Focus on small scale fisheries: Drift gillnet fishery off Cochin. 1981 and 1982. Mar. Fish. Infor. Serv., 55: 1-12.

Sultan, S. & Kant, R., (2016). Survey and study of fish fauna of River Jhelum, Kashmir (J&K). *Int. J. Multidiscip. Res. Dev*, 3(1): 278-280.

Viswambharan, D., Jasmine, S., Swathi Lekshmi, P. S. & Rohit, P., (2018). Economic analysis of hook and line fishery of Thiruvananthapuram coast, Kerala. J. Mar. Biol. Ass. India, 60(1): 86-90.

**Table 1. Fixed capital of Gill net in the study area**

|  |  |  |  |
| --- | --- | --- | --- |
| **S No.** | **Particulars** | **Fixed capital in Rs.** | **Percentage (%)** |
| **1.** | Vessel | 49333.33 | 97.36 |
| **2.** | Net | 1006.66 | 1.98 |
| **3.** | Rope | 223.33 | 0.44 |
| **4.** | Floats | 110.00 | 0.22 |
|  | **Total** | **50673.32** | **100** |

**Table 2: Cost and return analysis of Gill net (Rs. /fisher/annum)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S No.** | **Particulars** | **Cost in Rs.** | **Percentage (%)** |
| **A.** | **Variable costs** |  |  |
| **1.** | Maintenance of Vessel | 1316.68 | 7.34 |
| **2.** | Maintenance of Gear | 256.66 | 1.43 |
| **3.** | Licence fee | 800.00 | 4.46 |
| **4.** | Family labour | 8080.00 | 45.03 |
|  | **Sub Total** | **10453.34** | **58.26** |
| **B.** | **Fixed cost** |  |  |
| 1. | Depreciation on capital cost | 2928.20 | 16.32 |
| 2. | Interest on capital cost@ 9% | 4560.59 | 25.42 |
|  | **Sub Total** | **7488.79** | **41.74** |
| **C.** | **Total cost (A+B)** | **17942.13** | **100** |
|  | **Analysis of returns** |  |  |
| **D.** | **Total catch (kg)** | 449.00 |  |
| **E.** | **Average selling rate (Rs/Kg)** | 208.30 |  |
| **F.** | **Total revenue** | 93526.70 |  |
| **G.** | **Net operating income** | 83073.36 |  |
| **H.** | **Net income** | 75584.57 |  |
| **I.** | **B:C ratio** | 5.21 |  |

**Fig. 1** **Different cost components and returns (Rs/Fisher/Annum)**