**An economic analysis of production and marketing of fish in Raipur district of Chhattisgarh, India**

**Abstract**

The study aims to examine the economics of fish production and marketing of fishin Raipur district of Chhattisgarh. Primary data was collected from 45 individual fishfarmers and 5 fish farmers’ cooperative societies in Raipur district. The findings reveal a trend in the area under fisheries, with a growth rate of 3.26% at the state level and 3.45% in Raipur, though the latter is statistically non-significant. In contrast, fish production has shown significant growth, with a 9.93% increase at the state level and 13.65% in Raipur. Productivity improvements are also evident, with a 3.58% rise in Chhattisgarh and 9.19% in Raipur district. The data shows that the majority of the farmers (74%) practice mixed farming, integrating fish farming with traditional agriculture. This practice serves as a risk management strategy, as it provides additional income in case of agricultural failure. The research highlights that the largest proportion of farmers are in the age group of30-50 years, representing 32% of the sample, while younger and older farmers account for 25% and 15%, respectively. The economic analysis of fish farming in the district reveals adverse range of net returns across different farm sizes. Small-scale farmers (less than 1 hectare) generally reported lower productivity and net returns compared to large-scale farmers (more than 2 hectares). The net returns of small-scale farmers ranged from Rs. 142,601 to Rs. 250,000 per hectare whereas large-scale farmers experienced returns between Rs. 500,000 and Rs. 832,790, per hectare emonstrating the higher profitability potential of larger-scale operations.

There were there marketing channel prevailing in the Study area viz: channel I (producer - consumer), channel II (producer - retailer - consumer) and channel III (producer – wholesaler – retailer - consumer), Most of the fishes were sold to channel I by fish farmer cooperative society and in case of individual fish farmer, channel III was popular.

KEY WORDS: production and marketing of fish , Raipur district , fish farmers, agriculture

1. **Introduction**

Fisheries sector in India play significant role in Indian economy. It provides livelihood to millions of fisher folk. The Blue Revolution in India demonstrated the importance of Fisheries and Aquaculture to improve the quality of life and economic well- being of people in rural areas and to create more livelihood opportunities (Rahaman et al., 2013; Ponnusamy et al., 2012).

India is the third largest fish producing country in the world accounting for 8% of global production and the 4th largest exporter of fish and fisheries products taking Brand India from Local To Global (Sahu et al., 2023). In terms of employment, the sector supports the livelihood of over 28 Million people in India especially the marginalized and vulnerable communities. India recorded highest export of 1.36 MMT worth $ 7.76 Billon in FY 2021-22 (Agricultural Outlook, 2023). The Indian economy is highly reliant on the fishing industry (Sharma & Singh, 2018). It increases national income, exports, food and nutritional security, and employment creation. The fisheries sector offers a livelihood for more than 2.8 crore primary level fishers and fish farmers, as well as many more people farther down the fishing value chain. The fish production has increased from 5.66 MMT in 2000-01 to 8.67 MMT in 2011- 12 and further to 16.25 MMT in 2021-22 (Handbook on Fisheries Statistics, 2023).

Chhattisgarh is playing an important role by generating self-employment through fisheries in rural areas. Fisheries business has generated an employment potential for about 2.20 Lakhs persons, most of them belong to weaker section of the society. States fisheries are mostly culture based in which Major carp fish group play a leading role (Kumari et al., 2017). Availability of 91,928 ponds covering 1.094 lakhs hectare water area is the main asset on which culture fisheries rest. So far 92% of the area has been covered. Fish production has recorded an average growth of 315 % during 2007-08 to year 2019-20 plan (Deng, 2020). Average Productivity in rural tanks is 3682 Kg/ha/year and 233 Kg./ha./year in irrigation tank .Fish production and productivity is gradually increased due to actions like, Use of balanced nutritious floating feed, fertilizers and high density of seed stocking (based on modern scientific technology) in ponds and tank. Stocking of large size fingerlings (75 mm and above) in selected reservoirs and ponds. Skill training imparted to the fishermen member engaged in reservoirs and ponds for fisheries development. At present 2.20 lakhs fish farmer in the state are engaged in fisheries activities providing 318 lakhs man days of employment round the year according to (Directorate of Fisheries, Government of Chhattisgarh 2023-24) For millions of people, fishing and aquaculture remain significant sources of food, nutrition, money, and a way of living. During 2019–20, the Fisheries sector generated export revenue of Rs. 46,662.85 crores. About 280 lakh people receive livelihood support from the sector at the primary level, and about twice as many do so further down the value chain.

1. **MATERIALS AND METHODS**

Raipur district was selected purposively for the present study. In accordance with the annual report of the Directorate of Fisheries, Raipur rank 6thin fish and fish seed production followed by Jannjgir, Mahasamund, Rajnandgaon, Raigarh, Baloda Bazar districts. Raipur has 4 blocks i.e., Tilda, Dharsiwa, Arang and Abhanpur out of these four blocks two block Dharsiwa and Abhanpur block were selected purposively for the present study. There are many fish farmers who have individual tanks and pond in Raipur district. Fifty fish farmers in Dharsiwa and Abhanpur block of Raipur district was selected for the present study, five fish farmer cooperativesociety and forty five individual fish farmer was selected for the study.

### 2.1 Analytical tools

### 2.1.1 Production and benefit cost ratio

The data collected from the fish farmers and fish traders were used for estimating cost and returns structure by using fixed and variable cost. The formula used to find cost; return and annual compound growth rate are as follows:

1. Totalcost =Totalfixed cost +Total variablecost
2. Grossincome(Rs) =TotalYield (kg)\* MarketPriceof thefish (Rs/kg)
3. Netincome(Rs) =Grossincome –Total cost
4. Benefit-CostRatio =Netreturn/Total Cost
5. Input-OutputRatio=Gross Income/TotalCost

### 3. RESULTS

### 3.1 Cost and returns of selected fish farmer’s cooperative society in the study area

**Table 1: Cost of production**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Particulars** | **Cost (Rs./ha.)** |
| **A** | **VariableCost** |  |
| 1 | Biological weed removal of pond | 875(1.50) |
| 2 | Repairing of pond | 3158(5.70) |
| 3 | Guarding | 8232(14.86) |
| 4 | Treatment of pond water and fish | 6212(11.22) |
| 5 | Netting of fish | 12167(21.97) |
| 6 | Water Refilling | 601(1.09) |
| 7 | Fingerling | 11061(19.97) |
| 8 | Transportation of fingerling and marketable fish | 4527(8.17) |
| 9 | Labour | 7145(12.90) |
| **B** | **FixedCost** |  |
| 1 | LeaseRent | 1402(2.53) |
| **C** | **Total Cost (A+B)** | **55380****(100.00)** |
| **D** | **Production Quintal/ha.** | **20.5** |
| **E** | **Gross returns** | **231415** |
| **F** | **Netreturns** | **176035** |
| **G** | **Cost benefit ratio** | **1:3.18** |

**Fig 1 :** Pie chart present theCost of production



**Table 2. Economic of fish production find individual fish farmer (Rs/ha.)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.No** | **Particular** | **Smallfish farmer(less than 1 ha)** | **Medium fishfarmer (1 to 2 ha)** | **Large fish farmer(more than 2 ha)** | **Remark** |
| **A** | **Variablecost** |  |  |  |  |
|  | a. Labour cost | 26000(8.14) | 45000(11.48) | 120000(22.66) | 350-400Rs per head for daily wages,8000Rs+foodperheadforpermanentlabour |
|  | Total | 26000(8.14) | 45000(11.48) | 120000(22.66) |  |
|  | b. Material cost |  |  |  |  |
|  | Lime | 2500(0.78) | 2800(0.71) | 3500(0.66) | Lime is used for maintain pH @10Rs/Kg\*250kg/ha |
|  | Fish fingerlings & Transportation | 25000(7.83) | 23000(5.87) | 20000(3.78) | 4000 (IMC) fingerling or yearling/acre,2-3Rs per piece, IMC(Indian Major Carp) Rohu, Catla and Mrigal |
| a | Commercial fish feed | 165000(43.85) | 208000(53.06) | 255000(48.16) | Commercial feed is balance diet for fish ,mainly farmer used 26-32% protein feed resulting average 1.4 FCR(feed conversion ratio)price@38-42RsKG |
|  | Natural feed | 14500(9.24) | 15000(3.83) | 9500(1.79) | Production of phytoplankton&zooplankton by fermentation of MOC,DORB,molassesandyeast |
|  | Fertilizer/vitamin&mineralmixture | 4500(4.54) | 5000(1.28) | 4000(0.76) | NPK@Rs30-45/Kg,vit@Rs600Kg, Minmix@Rs200-300/Kg |
|  | Medicine/probiotics | 6200(1.94) | 7400(1.89) | 8500(1.61) | Medicine is used for bacterial, fungalandvirusespronedisease,Probiotics is mainly millions of beneficial bacteria for decompose ofFish excreta and organic load |
|  | Security (camera) | 0 | 0 | 3600(0.68) | onetimeinvestment,@Rs300Monthly data/wifi charge. |
|  | Catching/Harvesting | 7500(2.35) | 10800(2.76) | 14400(2.72) | Catching is for sampling fish health and size,@ 4 labour X 100Rs= 400 Rs in every month, Harvesting is catching marketable size fish 750gm-1500gm, need minimum10skilledlabor@350 Rs/head=3500 |
|  | Aeration | 0 | 0 | 10000(1.89) | Aeration is important for maintaining oxygen level,4 wheel peddle aerator @28000/piece |
|  | Electricity | 3600(1.13) | 6000(1.53) | 9000(1.70) | Electricity for pump or bore well is mainly free from commercial rate and government provide free or subsidized electricity connection for agricultural allied sector |
|  | c.Miscellaneous expenses | 4500(1.41) | 7000(1.79) | 12000(2.27) | Wiring, pipe work, camera, tools plastic containers, nets, weighingmachine, pump etc |
|  | Total | 259300 | 330000 | 469500 |  |
| (81.21) | (84.18) | (88.67) |
| **B** | **Fixedcost** |  |  |  |  |
|  | a. Lease rent of pond | 60000(18.79) | 62000(15.82) | 60000(11.33) | Lease/Rentfor1ha@62500Rs (Average) |
|  | Total | 65000 | 65000 | 65000 |  |
| (18.79) | (15.82) | (11.33) |
| **C** | **Total Cost(A+B)** | **319300** | **392000** | **529500** |  |
| **(100.00)** | **(100.00)** | **(100.00)** |

Note- the lease rent covers the combined costs of pond construction, equipment and shelters.

Table -2 is a detailed breakdown of annual costs for small (<1 ha), medium (1– 2 ha), and large (>2 ha) fish farmers, divided into variable and fixed expenses. Variable costs dominate, accounting for 81.21% (Rs 2,59,300) for small farms, 84.18% (Rs 3,30,000) for medium farms, and 88.67% (Rs 4,69,500) for large farms. Labour costs increase significantly with farm size, from Rs.26,000(8.14% of total costs) for small farms to Rs 1,20,000 (22.66%) for large farms, reflecting the higher workforce needs of larger operations. Material costs, including lime, fish fingerlings, commercial fish feed, and medicines, form the largest share. Commercial fish feed is the most significant expense, comprising 43.85% (Rs 1,65,000), 53.06% (Rs 2,08,000), and 48.16% (Rs 2,55,000) of total costs for small, medium, and large farms, respectively. Additional material costs include fish fingerlings (Rs 25,000 for small farms, decreasing to Rs 20,000 for large farms), natural feed, and fertilizers. Larger farms incur unique costs for aeration (Rs 10,000) and security cameras (Rs 3,600). Fixed costs, primarily pond lease rent, remain consistent at Rs 60,000–62,000 across all farm sizes accounting for 18.79% of total costs for small farms, 15.82% for medium farms, and 11.33% for large farms. Total annual costs are Rs 3,19,300 for small farms, Rs 3,92,000 for medium farms, and Rs 5,29,500 for large farms, highlighting increased investments and economies of scale as farm size grows.

 **Table 3.Productions cost and return of fish production of individual fish farmers**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S.No** | **particulars** | **Small farmer** | **Medium farmer** | **Large farmer** |  **Remark** |
| **A** | **Total Cost(A+B)** | **319300****(100.00)** | **392000****(100.00)** | **529500****(100.00)** |  |
| **B** | **Productivity(quintal)/hactare** | **36.5** | **42.2** | **56.0** | average 40 to 50 quintalt/hectare production is found in good cultural practices in fish farming by the expert |
| **C** | **Averageselli.ng price(Rs/Kg)** | **130** | **140** | **145** | Price for per Kg fish depends on fish body weight and their verity |
| **D** | **Gross Return(Rs/ha)** | **474500** | **590800** | **812000** |  |
| **E** | **Net return(Rs/ha)** | **155200** | **198800** | **282500** |  |
| **F** | **cost of production(Rs****/Qt)** | **8747** | **9289** | **9544** |  |
| **G** | **B:Cratio** | **1:0.48** | **1:0.5** | **1:0.53** |  |
| **H** | **Input-Output ratio** | **1:1.48** | **1:1.5** | **1:1.53** |  |

In the table no.3 shows the data compares the performance of small, medium, and large fish farmers in terms of production, cost, and profitability. The total production per hectare increases with farm size, ranging from 36.50 quintals for small farmers to 56.00 quintals for large farmers. Expert studies suggest that a good cultural practice in fish farming typically yields 40 to 50 quintals per hectare (Source: http://www.nabard.org/) . The average selling price per kilogram also rises with farm size, the fish species examined are Indian major carps (IMCs)—notably Catla, Rohu, and Mrigal. The analysis reveals that larger farms achieve a higher average selling price per kilogram (₹145) compared to smaller farms (₹130). This price difference is attributed to the larger size of the fish: as IMCs grow their bone and spine structures—especially the Y‑shaped muscle bones and dorsal-fin spines—become well-developed, which simplifies cleaning and filleting. In larger fish, these thickened spines are easier to remove or manage during processing, enhancing consumer convenience and acceptability, thereby supporting the premium price per kilogram.

Gross returns increase from Rs 474,500 for small farmers to Rs 812,000 for large farmers, while net returns follow the same pattern, rising from Rs 155,200 to Rs 282,500. The cost of production per quintal is slightly higher for larger farms, ranging from Rs 8,747 for small farmers to Rs 9,544 for large farmers. Larger aquaculture farms incur higher production costs per quintal due to several factors. Feed inefficiencies increase as stocking densities rise, leading to higher feed conversion ratios and elevated feed costs, which constitute over 50% of total expenses. Additionally, larger operations require more extensive infrastructure and labor, further escalating costs. The Benefit-Cost (B:C) ratio improves with farm size, from 0.46 for small farms to 0.52 for large farms, indicating better return sown investment for larger operations. Similarly, the input-output ratio increases from 1.46 for small farmers to 1.52 for large farmers, suggesting greater efficiency and profitability with larger farm sizes. Overall, larger fish farming operations tend to yield higher returns and exhibit better cost efficiency compared to smaller ones.

1. **Conclusion**

Fish farming in India has emerged as a profitable and scalable agricultural enterprise, with profitability increasing alongside farm size. Small-scale farms (<1 ha) exhibit a cost-benefit ratio of 0.46, while large-scale farms (>2 ha) achieve a higher ratio of 0.52, indicating greater efficiency and returns on investment. This trend is attributed to economies of scale, where larger operations can better absorb fixed costs, negotiate lower input prices, and achieve higher productivity per hectare surpassing those of smaller farms. Additionally, the Pradhan Mantri Matsya Sampada Yojana (PMMSY) has further incentivized fish farming by providing subsidies for pond construction, thereby reducing initial capital requirements and promoting growth in the sector. However, challenges such as high feed costs, limited access to quality seeds, and inadequate marketing infrastructure persist, particularly for small-scale farmers. Addressing these issues through improved access to quality inputs, training, and market linkages is essential to enhance the profitability and sustainability of fish farming across all scales. Overall, with appropriate support and management, fish farming can significantly contribute to rural livelihoods and food security in India.

**Consent**

**As per international standards or university standards, respondents’ written consent has been collected and preserved by the author(s).**

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