

Economic analysis of inland fish production in Northern Dry Zone of Karnataka

ABSTRACT

Indian fisheries and aquaculture is an important sector of food production, providing nutritional security to the food basket, contributing to the agricultural exports and engaging about 14 million people in different activities. The present study was carried out in two districts, viz. Vijayapur and Bagalkote of northern dry zone of Karnataka. Primary data required for the study was collected from 60 sample farmers, 30 from each district in the study area for the year 2018-19. Financial feasibility tools (Pay Back Period, Net Present Values, Internal Rate of Returns and Benefit-Cost Ratio) were used to fulfill the specific objective. The total capital investment in inland fish farming of per pond was Rs.73309. The total cost involved for fish production was highest in Vijayapur district Rs.46782.28/pond/year compared to Bagalkote district Rs.38794.6/pond/year. The inland fish farming was financially feasible in both the districts as evidenced by Pay Back Period which is less than two years, net present value Rs.264047.50 in Vijayapur and Rs.246991.9 in Bagalkote districts, B:C ratio (1.84) in Vijayapur district, (1.92) in Bagalkote district and internal rate of returns higher than the opportunity cost of capital with 43 per cent and 45 per cent in Vijayapur and Bagalkote districts respectively.

Keywords: Inland fish farming, cost and returns, financial feasibility, benefit-cost ratio.

1. INTRODUCTION

India is one of the largest fish producing countries in the world and shares 7.58% to the global production. Contributing 1.24% to India's Gross Value Added (GVA) and 7.28% (2018-19) to the agricultural GVA, fisheries and aquaculture continue to be an important source of food, nutrition, income and livelihood to millions of people. Fisheries sector in India has shown impressive growth with an average annual growth rate of 10.88% during the year from 2014-15 to 2018-19. The fish production in India has registered an

average annual growth of 7.53% from 2014-15 to 2018-19 and stood at an all-time high of 137.58 lakh metric tons during 2018-19. (NFDB, 2020) (7)

Karnataka is the 9th largest fish producing state in the country. It has 320km long coastline along with 27,000 sq.km continental shelf area, 5.65 lakh hectares of various inland water resources and has vast scope for fisheries development. The brackish water area of 8000 hectares also provides good scope for fish culture. There are about 9.61 lakh fishermen in the state of which 3.28Lakh fishermen in marine and 6.33Lakh fishermen are in Inland who are involved in various fisheries activities. During the year 2017-18, the total inland fish production of the state is 1.88Lakh tones.

The total inland fish production in Karnataka was 1,58,568 Mts. Shivamogga, Mandya and Bellary are top three fish producing districts about 17,443 Mts, 12,924 Mts and 10,388 Mts respectively. Karnataka contributes about (4.64 %) to total fish production in India. The Northern Dry Zone of Karnataka comprises of Koppal, Gadag, Dharwad, Belagavi, Vijayapur, Bagalkote, Bellary, Davangere and Raichur districts. Among these districts Vijayapur was the third highest (4,744 Mts) and Bagalkote was the third lowest (3,349 Mts) in fish production (1).

The objectives of the study were to estimate the cost structures and assess the financial feasibility of investment in the inland fisheries in Northern Dry Zone of Karnataka.

2. METHODOLOGY

This study was conducted in Northern Dry Zone of Karnataka. Northern Dry Zone consists of nine districts viz., Bellary, Raichur, Vijayapur, Davangere, Belagavi, Koppal, Bagalkote, Dharwad, and Gadag districts. Out of which Vijayapur and Bagalkote districts were selected purposively based on researcher convenience and by looking into third highest and third lowest fish production districts respectively for the period of 2018-19. The list of inland fish farmers was collected from Fisheries Research and Information Center, Bhutnal, Vijayapur and Fishery Department office in the respective districts. From selected districts, sixty fish growers 30 each were selected. Thus sample size consists of 60 respondents. The data were collected by survey method with the help of well-structured and pre tested schedule.

2.1 Analytical tools:

Financial feasibility analysis

To evaluate the financial feasibilities of investment in inland fisheries, the standard tests viz. undiscounted cash flow measure a) payback period and discounted cash flow measures a) Net present worth, b) Benefit – cost ratio and c) internal rate of return were employed. In the study cash flow for ten years were considered at the discount rate of 12 per cent.

a) Net Present Value (NPV)

The present value represents the discounted value of the net cash inflows to the project. In the present study, a discount rate of 12 per cent was used to discount the net cash inflows representing the opportunity cost of capital. It can be represented by

$$NPV = \sum_{t=1}^n Y_n (1+r)^{-n} - I$$

Where,

Y_n = the net cash inflows in the year n

r = discount rate

I = Initial investment

The decision rule associated with the Net Present Value is, the project will be accepted if its value is positive and reject if its value is negative (if the net present value is zero, it is a matter of indifference).

b) Benefit Cost Ratio (BCR)

The Benefit Cost Ratio (BCR) was worked out by using following formula

$$BCR = \frac{\sum \text{Discounted cash inflow}}{\sum \text{Discounted cash outflow}}$$

It measures the present value of returns per rupee of invested and it is a relative measure. The decision rule is that, accept the project, when BCR is greater than one, reject it when BCR is less than one and if BCR is zero, it is a matter of indifference.

c) Internal Rate of Return (IRR)

The rate at which the Net Present Value of the project is equal to zero is Internal Rate of Return (IRR) of the project. The net cash inflows were discounted to determine the present worth following the interpolation technique. The method of interpolation followed is as under:

$$\text{IRR} = \left(\text{Lower discount rate} \right) + \left(\text{Difference between two discount rates} \right) \times \left(\frac{\text{Present worth of net cash flow at lower discount rate}}{\text{Absolute difference between the present worths of net cash flows at the two discount rates}} \right)$$

Internal Rate of Return is a relative measure. To accept the project, the calculated IRR should be greater than the ongoing opportunity cost of capital.

d) Pay Back Period (PBP)

Payback period represents the length of time required for the stream of cash proceeds produced by the investment to be equal to the original cash outlay *i.e.* the time required for the project to pay for itself. In the present study, payback period was calculated dividing the initial investment by average net cash inflow.

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{Average annual net cash inflow}}$$

According to the payback criterion, the shorter the payback period, the more desirable is the project.

3. RESULTS AND DISCUSSION

3.1 Capital investment in the fish pond

The cost for establishment of fish pond, the expenditure required for tarpaulin, temporary farm building/ shed, electric motor/ pumpset, pipe line and different equipments purchased specially for fish production were considered as a capital investment. It is the one time fixed investment incurred in the inland fish farming and the maintenance of these was made for every three years. Thus after every three years, 10 per cent of the total investment is involved in the total cost assessment as the repairs and maintenance is involved

Table.1 shows the capital invested per fish pond (30×30 m) in the study area. In Vijayapur district, the values for the establishment of fish pond was Rs. 40000 (37.08 per cent), for tarpaulin Rs. 12000 (15.93 per cent), pipeline Rs. 4500 (5.97 per cent), nets Rs. 800 (1.06 per cent) and for farm building Rs. 7000 (9.29 per cent). The total investment costs Rs. 75336.

Table.1 Capital Investment in Fish Pond (30×30 m)

(Rs./pond)

SN	Particulars	Vijayapur	Bagalkote	Overall
1	Establishment of fish pond	40000 (37.08)	37300 (40.29)	38650 (52.92)
2	Tarpaulin	12000 (15.93)	12000 (16.96)	12000 (16.43)
3	Pipe line	4500 (5.97)	4500 (6.36)	4500 (6.16)
4	Motor/ Pumpset	11036 (14.65)	9174 (12.97)	10105 (13.84)
5	Nets	800 (1.06)	768 (1.09)	784 (1.07)
6	Farm building	7000 (9.29)	7000 (9.90)	7000 (9.29)
	Total	75336 (100)	70742 (100)	73039 (100)

Note: Figures in parentheses indicate percentage to the total

In Bagalkote district, the values for various costs incurred in investment in fish pond were as follows, for establishment of fish pond was Rs. 37300 (40.29 per cent), tarpaulin Rs. 12000 (16.96 per cent), pipeline Rs. 4500 (6.36 per cent), nets Rs. 768 (1.09 per cent) and for farm building Rs. 7000 (9.90 per cent). The total investment costs Rs. 70742.

Overall of both Vijayapur and Bagalkote districts, capital investment in fish pond was Rs. 73039. Among all the items, the share of total expenditure on establishment of fish pond was Rs. 38650 (52.92 per cent). The other important items of costs were tarpaulin Rs. 12000 (16.43 per cent), pipeline Rs. 4500 (6.16 per cent), electric motor (or) pumpset Rs. 10105 (13.84 per cent), nets Rs. 784 (1.07 per cent) and for farm building Rs. 7000 (9.29 per cent).

3.2 Cost of production of inland fish in the study area.

The overall, per pond total cost of production was Rs. 42788.44. The items included under variable costs accounted (37.83 per cent) of the total cost of production.

The results of cost incurred for inland fish production in Vijayapur and Bagalkote district are presented in Table.2. The total cost involved for fish production in Vijayapur district was Rs.46,782.28/pond/year, of which total variable costs was Rs.18,873.36/pond/year (40.15 % of the total cost) and the total fixed cost was Rs.27,998.92/pond/year (59.85 % of the total cost). While in Bagalkote district, total cost involved for fish production was Rs.38,794.60/pond/year, for which total variable costs was Rs.13,588.56/pond/year (35.03 % of total cost) and total fixed cost was Rs.25,206.04/pond/year (64.97 % of total cost).

Overall, in both districts the average total cost of fish production was Rs. 42,788.44/ pond/year, for which total variable cost contributes Rs.16,185.96/pond/year (37.83 % of the total cost) and total fixed cost contributes Rs.26,602.48/pond/year (62.17 % of the total cost). Among the variable cost items, the major share Rs.4137.50 (9.67 % of total cost) accounts for cost of fish feed followed by Rs. 3250.00 (7.60 % of total cost) accounts for cost on fingerlings, followed by labour 7.34 per cent of total cost. Among the fixed cost the major share was on rental value of land which accounts cost of 37.51 per cent of total cost followed by interest on fixed cost 17 per cent of the total cost.

The results revealed that, total cost involved in inland fish production in Vijayapur was more as compared to Bagalkote district; this is mainly because of quality of inputs and source of availability of inputs to the farmer was superior to the Bagalkote district farmers. Hence, the price of inputs was more in Vijayapur district. The results obtained as of total cost were in conformity with the results reported Brijesh *et al.* (2013).

Table.2 Cost of production of inland fish in the study area (pond/year)

SI. No	Particulars	(Rs. /Pond/year)					
		Vijayapur (n=30)	%	Bagalkote (n=30)	%	Overall (N=60)	%
I	Variable Cost						
1	Fingerlings	3500.00	7.48	3000.00	7.73	3250.00	7.60
2	Fish feed	4550.00	9.73	3725.00	9.60	4137.50	9.67
3	Fertilizer	930.00	1.99	700.00	1.80	815.00	1.90
4	Lime	528.00	1.13	800.00	2.06	664.00	1.55
5	Hired labour	4198.00	8.97	2083.00	5.37	3140.50	7.34
6	Imputed value of family labour	1886.00	4.03	1074.00	2.77	1480.00	3.46
7	Miscellaneous*	1800.00	3.85	1200.00	3.09	1500.00	3.51
8	Interest on working capital @ 8%	1391.36	2.97	1006.56	2.59	1198.96	2.80
	Sub total	18783.36	40.15	13588.56	35.03	16185.96	37.83
II	Fixed Cost						
1	Rental value of land	17000.00	36.34	15100.00	38.92	16050.00	37.51
2	Land revenue	75.00	0.16	75.00	0.19	75.00	0.18
3	Depreciation	1883.60	4.03	1542.00	3.97	1712.80	4.00
4	Interest on fixed capital @ 12%	9040.32	19.32	8489.04	21.88	8764.68	20.48
	Sub total	27998.92	59.85	25206.04	64.97	26602.48	62.17
	Total cost of production (I+II)	46782.28	100.00	38794.60	100.00	42788.44	100.00

*includes water cost, transportation charges etc

3.3 Cost and returns of the inland fish farming.

Cost and returns obtained from the inland fish farming in Vijayapur and Bagalkote districts are shown in Table 3. The total cost of production of inland fish per (30×30 m) pond in Vijayapur and Bagalkote districts were Rs. 46782.28 and Rs. 38794.60 respectively. The total cost of production on an average accounts of Rs. 42788.44. The yield of inland fish in Vijayapur and Bagalkote districts were 1575 kgs and 1400 kgs respectively. The overall yield is 1487.50 kgs. The analysis of total returns from fish production indicates that the total returns obtained per pond (30x30m) per year in Vijayapur district was Rs.1,02,375 while it was Rs.91,000 per pond (30x30m) per year in Bagalkote district. On an average Rs. 96687.50 per pond per year was obtained from fish production. Fish production in the study area was found to be profitable as indicated by per pond net returns. Net returns in Vijayapur district was Rs. 55592.72/pond/year and in Bagalkote district was Rs. 52205.4/pond/year. The average net returns were Rs. 53899.06/pond/year.

Table.3 Cost and Returns realized in inland fish farming

Sl. No.	Particulars	Vijayapur (n=30)	Bagalkote (n=30)	Overall (N=60)
1	Total cost (Rs./Pond)	46782.28	38794.60	42788.44
2	Yield (kg/Pond)	1575	1400	1487.50
3	Price per Kg (Rs.)	65	65	65
4	Total returns (Rs./Pond)	102375.00	91000.00	96687.50
5	Net returns (Rs./Pond)	55592.72	52205.40	53899.06
6	Cost of production (per kg)	29.70	27.71	28.76

The total cost involved for production for 1 kg of fish in Vijayapur district was Rs. 29.70 and in Bagalkote district was Rs.27.71. On an average total cost involved for production of one kg of fish was Rs.28.76.

The total yield obtained was highest in Vijayapur district (1575 kg/pond/year) compared to Bagalkote district (1400kg/pond/year). Thus, it clearly indicates that net returns and yield obtained in Vijayapur was more compared to Bagalkote district. This could be due to usage of good quality fingerlings, level of input application, management and care by the farmers towards fish production in Vijayapur district.

3.4 Financial feasibility of investment in inland fish farming

To evaluate the financial feasibility of investment in inland fish farming, the most appropriate tools (or) techniques for project evaluation employed were Pay Back Period (PBP), Net Present Values (NPV), Benefit-Cost Ratio (BCR) and Internal Rate of Returns (IRR) and the results were presented in table.4

Table.4 Financial feasibility of investment in Inland Fish Farming

SN	Particulars	Vijayapur	Bagalkote
I	Undiscounted measure		
1	Pay Back Period (years)	1.91	1.82
II	Discounted measure		
1	NPV (₹/pond)	264047.5	246991.9
2	B:C Ratio	1.84	1.92
3	IRR (%)	43	45

Note: Discount rate @ 12% for the period of 10 years.

The Pay Back Period for the establishment and maintaining of inland fish pond was lower in Bagalkote district (1.82 years) as compared to Vijayapur district (1.91 years) and this was due to higher net returns because of proper care and management followed at the fingerling stages of rearing. The recovery period of investment was less than 2 years rewarding the producer to earn sufficient income and the following years generates additional revenue.

The per pond Net Present Values at 12 per cent discount rate for 10 years period in the inland fish farming is worked out to be Rs. 264047.5 and Rs 246991.9 in Vijayapur and

Bagalkote respectively. The higher net present value in Vijayapur may be due to the continuous high net returns obtained during the economic life.

The IRR worked out for Bagalkote was higher (45 %) compared to Vijayapur (43 %). The IRR values of both the districts realized to be higher than the opportunity cost of capital *i.e.*, the lending interest rate (12 %) of banks for the long-term loans, indicates the higher average earning power of amount invested in inland fish farming.

The benefit-cost ratio at 12 per cent discount rate was worked out to be 1.84 and 1.92 in Vijayapur and Bagalkote districts, respectively. As the BCR values were more than unity, the investment made in both the districts in inland fish farming should be considered as profitable enterprise. Moreover, among both the districts, the BCR of Bagalkote was slightly higher than the Vijayapur which revealed that investment made in the inland fish farming in Bagalkote was relatively more attractive than Vijayapur.

The foregoing results showed that BC Ratio was greater than unity, net present value was positive and IRR was higher than the existing interest rate of banks *i.e.*, 12 per cent. The investment in inland fish farming would be recovered in less than 2 years in both the districts. Thus, the results of this study justified the farmers' investment in inland fish farming. All these measures were clearly disclosed that the investment in inland fish farming is a profitable and feasible enterprise.

4. CONCLUSION

The results from the study reveals that the total capital investment in inland fish farming of per pond was Rs.73309. The total cost involved for fish production was highest in Vijayapur district Rs.46782.28/pond/year compared to Bagalkote district Rs.38794.6/pond/year. The inland fish farming was financially feasible in both the districts as evidenced by Pay Back Period which is less than two years, net present value Rs.264047.50 in Vijayapur and Rs.246991.9 in Bagalkote districts, B:C ratio (1.84) in Vijayapur district, (1.92) in Bagalkote district and internal rate of returns higher than the opportunity cost of capital with 43 per cent and 45 per cent in Vijayapur and Bagalkote districts respectively.

It is concluded that inland fish farming could be taken as subsidiary occupation by farmers that create additional revenue and increase their annual income. To increase the production, need based training have to provide to the inland fish farm farmers to develop skills in fish production. Extension agencies should approach inland fish farmers and inform them about subsidies, schemes and regarding training facilities. Incentives in terms of good

quality fingerlings, provision of fishnets and other equipment at subsidized rate would encourages the rural youth to take up inland fisheries.

REFERENCES

1. Anonymous, 2017, Inland fish production, Government of Karnataka, 2017-18: pp. 1-2
2. Brijesh, K., Biradar, R. S., Biswajit, D. and Sharma, R. Economics of fish production in Bharatpur district, Rajasthan, India. *Fishery technology*. 2013; 50 (2):180-184.
3. Devi, S. Z., Singh, N. R., Anandkumar, N. and Laxmi, T. H. Fish production in Manipur- An economic analysis. *Journal of Crop and Weed*. 2014; 10 (2): 19-23.
4. Kumar, R., Umesh, K. B. and Rajeesh, E. Economics of inland fish production in Karnataka. *Journal of Rural Development*. 2007; 26: 121-136.
5. Harish, K. H. R., 2019, An economic analysis of production, consumption and marketing of fish in North Karnataka. *M.Sc. (Agri.) Thesis*, University of Agricultural Sciences, Dharwad, Karnataka, India.
6. Tara, S., Shivachandra, D., Rishiram, K., Kamala, G. and Jeevan, L. Economics of fish production at Chitwan District of Nepal. *Journal of Agriculture and Natural Resources*. 2018; 1(1): 21-31.
7. www.nfdb.gov.in/about-indian-fisheries.