



Comparative Economics of Fish Farmers to Production and Marketing of Exotic and Local Breeds of Fish in Kabirdham District of Chhattisgarh

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ABSTRACT

Study has examined that comparative economics of fish farmers to production and marketing of exotic and local breeds of fish in Kabirdham districts of Chhattisgarh. The study revealed that the compound growth rate of area, production and productivity of fish showed the positive and significant growth rate in both Chhattisgarh state and Kabirdham districts except area under fish in district Kabirdham. The fish productivity of exotic breeds of samples fish farmer is 31.25 qt per ha, quintal respectively. However, the fish productivity of local breeds of samples fish farmer, is 17.20 qt per ha, respectively. The per hectare cost of exotic breeds of samples fish farmer, is ₹ 58624.33 per ha, per ha respectively. However, the per hectare cost of local breeds of fish of samples fish farmer, is ₹ 41398.25 per ha, respectively. The net return of exotic breeds of samples fish farmers, is ₹ 247495.99 per ha respectively. However, the net return of local breeds of samples fish farmers is ₹ 90807.55 per ha respectively. The cost benefit ratio of exotic breeds of samples fish farmer is 5.27:1 respectively. However, in case cost benefit ratio of local breeds of samples fish farmer is 3.09:1. The five marketing channel have been adopted in the study area, the most of fish farmers have sold the fish in channel fifth and sold quantity of fish, by fish farmers is 3497.50 qt. and 50.713 percent in the channel fifth. The net received price and incurred marketing cost of samples fish farmers are ₹ 8538.8 and ₹ 000 per qt, ₹ 6023.04 and ₹ 272.77 per qt, ₹ 7238.45 and ₹ 1138.00 per qt, ₹ 6731.86 and ₹ 3187.30 per qt and ₹ 5452.00 and ₹ 2201.5 per qt in the channel first, second, third, fourth and fifth respectively. The marketing efficiency and producer share in consumer rupees of samples fish farmer are 100.00% and 100%, 17.62% and 80.10%, 4.89% and 86.87%, 0.78% and 68.77% and 0.85% and 59.18% in the channel first, second, third, fourth and fifth respectively. It has observed that the channel first has most efficient for all fish producers of fish farmer and fish cooperative societies. The major socio economics constraints found that, restriction on medicine, feed and manure, lease processed poaching of fish and consumption and fish disposal etc. in the fish production, which in a weak position the fish production of both groups of fish producers. Fish producers are faced various constraints i.e. water stress, lack of the improved production technology unavailability of market and poor marketing facilities & poor credit & fiancé availability, poor storage facility and social and villager class conflict.

Key words: Local and exotic breeds of fish, Marketing cost, Marketing efficiency, Producer share in consumer rupee, Fish farmer, Fish cooperative societies, Fish self -help groups

Fish has historically played an important role in food security in many countries and contributes to do so in globally, providing 15-20 percent of animal protein intake.

Fish farming has been practicing in different parts of the world like Europe. Fish is one of the most important items of food in all over the world, due to steady growth of Indian

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population and increased problem of malnutrition. Considerable attentions to be given to enrich the biological value of the fish product in state of Tamil Nadu (Formerly Madras) and subsequently such as Bengal, Punjab, Uttar Pradesh, Baroda, Mysore and Hyderabad. Fisheries sector occupies an important place in socioeconomic development of state. Gross fish productions of Chhattisgarh state have three lacks fourteen thousand one hundred sixty-four tonne and area is one fifty-seven thousand nine hundred sixty-three hectare and the fish productivity is 1.988 tonne per hectare (Anonymous 2014-15). However, gross fish productions of India have Eighty-six lacks sixty-six thousand four hundred fifty tonnes and mean national pond production of India is 2900 kilogram per hectare or 2.9 metric tonnes per hectare (FAO report 2012-13 and 2014-15). China has first rank in fish production country in the world. However, India stands at the second place. In addition, major fish producing states i.e. West Bengal, Andhra Pradesh and Gujarat contribute 46. 2 percent production of total production of fishes in India. Catla (*Catla catla*), Rohu lebeo (*Labeo rohita*) and Mrigal (*Cirrhinus mrigla*) have the major groups of fishes, which contribute ninety percent of total fish production in India. Besides there are some exotic crops i.e. silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idetes*) and common carp (*Cyprinus carpio*) endemic carps they also contribute towards enhancement of fish production up to same standard in India.

The fish production across the country has played an important role and 4.47 percent share in the total GDP of agriculture and allied sector. Catla (*Catla catla*), Rohu lebeo (*Labeo rohita*) and Mrigal carp (*Cirrhinus mrigla*) are three major Indian carps and contribute over 90% of the total Indian aquaculture production. Jain and Pathak (2006) found that the average net income per fish farm estimated at ₹ 33244 per hectare indicate that fisheries could be a profitable enterprise for large number of rural people in Chhattisgarh (Goswami et al. 2010). The benefit cost ratio of 1: 0.70 could further improved upon through credit and support subsidy particularly, for creation of ponds and tank structure in the state of Chhattisgarh. The constraints identified in the include non-availability of improved fish shed, lack of capital and market infrastructure, lack of technical knowledge, theft and fear of enemies, water pollution and attack of fish parasites and disease. Research work has been conducted during the year 2013-18 to analyze the comparative economics of fish farmers to production and marketing of exotic and local breeds of fish in Kabirdham district of Chhattisgarh.

MATERIALS AND METHEDS

Multistage stratified random sampling procedure has been adopting in this study. There were two strata divide to all random selected respondent. The participants have selected randomly from each stratum until the decided sample size i.e. one hundred fifty respondents have selected in the entire blocks of Kabirdham district by random sample method. However, randomly select the several special sample i.e. twelve fish producers, twelve fish producer

trader, twelve village trader, eight retailers, four wholesalers in the marketing analysis. However, randomly select the several special sample i.e. four fish co-operative societies include some consumers in constraint analysis of the study area.

The primary data have been collected through the personal interview from select sample fish farmers. However, secondary data have been collected through personal contact from journal, internet, and information of fish to directorate of fishery, Chhattisgarh, and deputy directorate of fishery, Kabirdham district. In addition, primary data has concerned about marketing and constraints i.e. local fish producer trader, village trader, wholesalers, retailers, and others market functionaries for analysis of fish marketing. Put the question to ask the sample fish producers from structure questionnaire & schedule at time of interview for gathered to primary information. The filled questionnaire and schedule are check and scrutinized immediately after the interview and the collect information. The collect information is edit and delete for the purpose to fulfill the research objectives. The statistical tools have been used in analysis of collected data. Primary data have entry in the EXCEL spreadsheet and cleaned for irregularities, the cleaned data has been summarizing in to descriptive format in term of frequencies, percentage and averages. Secondary data are entry in the EXCEL spreadsheet. Then data are recomputed to price reflect per quintal. The data relating to each management and marketing regime have assembled and reduced to comparable form by using the different statistical tools. Then information has processed and tabulated for use the research analysis.

Marketing channels

The different marketing channels have involved in fish marketing and which has fish passed through different route from producer to consumer in the study area. No sufficient fish markets have available due to low level of fish production, thus most of tinny fish producer have sale the own product direct to consumer, but some medium and large fish producer have adopted the following indirect fish marketing channel in the study area.

Producer- Consumer

Producer- Producer trader- Consumer

Producer- Village trader / Village retailer- Consumer

Producer- Fish co-operative societies or Fish self-help groups

Producer- Wholesaler- Retailer Consumer Compound growth rate or Exponential rate

$$Y = A \cdot B^t$$

$$\log y = \log A + t \log B$$

Compound Growth rate in percent = $(\text{Anti log of } B - 1) \times 100$

Where, Y= Area / Production / Productivity compound growth rate, A= Constant, B= Regression coefficient, t= time in year

Coefficient of variance = $(\text{Standard deviation}) / \text{Mean} \times 100$

Absolute change = Value of current year – Value of base year

Relative change = (Value of current year – Value of base year) / (Value of base year) × 100

Variable cost = Labour wise cost (Pond preparation + Feed application+ Initial liming and fertilizer application + Seed or fingerling application + Treatment + Netting + Storage cost + Water refilling + Repairing of bunds and embankment + Fish rearing) + Input wise cost (Seed or fingerling + Feed + Lime and fertilizer + Medicine and chemical) + Interest of working capital + Miscellaneous material

Fixed cost = (Rent amount + Rental value of pond + Depreciation+ Interest of fixed capital)

Total Cost = Variable Cost + Fixed Cost

Gross Return = Total fish production × Sale price of fish

Net Return = Gross return – Gross Expenses or total fish farming cost

Benefit Cost Ratio = B / C

Breakeven levels of fish produce analysis:

i. Price per quintal of fish = {Total cost (Fixed cost + Variable cost)} / (Total production)

ii. Production of fish = (Total cost (Fixed cost + Variable cost) / (Price per unit)

Marketing information:

Marketing cost

$MC = C_f + C_{m1} + C_{m2} + \dots + C_{mn}$

Where, MC = Total marketing cost of fish marketing. C_f = Cost paid by fishermen, $C_{m i^{th}}$ = Cost incurred by i^{th} middlemen

Gross margin

$M = S_{i^{th}} + P_{i^{th}}$

Where, M = Gross margin, $S_{i^{th}}$ = Sale value of produce for i^{th} middlemen, $P_{i^{th}}$ = Purchase value for i^{th} middlemen.

Net, margin

$Nm_{i^{th}} = Pr_{i^{th}} - (Pp_{i^{th}} + C_{m i^{th}})$

Where, $Nm_{i^{th}}$ = Net margin of i^{th} type of market middlemen, $Pr_{i^{th}}$ = total value of received per unit (sale price), $Pp_{i^{th}}$ = per unit purchase price of produce by the i^{th} middlemen, $C_{m i^{th}}$ = cost incurred by the i^{th} middlemen

Farmer price

$P_f = PA - Q$

Where, P_f = Net price received by the farmer, PA= Whole sale price, Q= Marketing cost incurred by the fishermen

Estimation of fish farmer's share or producer share in consumer rupees

$Ps = P_f / Pr \times 100$

Where, Fishermen or producer share in consumer rupee, P_f = Net price received by the farmer, Pr = Price paid by the consumer.

Estimation of the marketing pattern

$C = C_f + C_{m1} + C_{m2} + \dots + C_{mn}$

Where, C= Total marketing cost of producer, C_f = Cost paid by the farmers, $C_{m i^{th}}$ = Cost incurred by i^{th} of intermediary.

Estimation of marketing efficiency

$E = O / I \times 100$

Where, 'E' =index of marketing efficiency, 'O' = Output (added value / market margin), 'I' = Input (marketing cost)

Constraints analysis

Garrett's ranking technique

Percentage position = $(100 (R_{ij} - 0.05)) / (N_j)$

Where, R_{ij} = Rank give for the i^{th} item by j^{th} individual, N_j = Number of item rank by the j^{th} individual.

(Asking the question to sample fish producer and others respondents rank then ranked specific problems, which have faced by fish producer then according to their own perception in this method. The assigned rank is converting into percentage position, which has subsequently transferred into Garrett score using Garrett's table. For each constraint, scores of individual respondents are add together and then divided by total number of respondents. Thus, mean score for each constraint has ranked by arranging them in descending order).

RESULTS AND DISCUSSION

Change in area, production and productivity of fish

Base year, current year, absolute change and relative change of area, production and productivity of fishes in Kabirdham district and Chhattisgarh has analyzed and presented in (Table 1-2). It was observed that, base year (2011-12), current year (2015-16), absolute change and relative change of area in Kabirdham district have found to be 3959-hectare, 4737-hectare, 787 hectare and 19.01 percent respectively. In addition, base year (2011-12), current year (2015-16), absolute change and relative change of production in Kabirdham district have found to be 10774 quintal, 13257 quintal, 2483 quintal and 23.046 percent respectively. In addition, base year (2011-12), current year (2015-16), absolute change and relative change of productivity in Kabirdham district has found to be 2.72 quintal per hectare, 2.79 quintal per hectare, 0.07 quintal per hectare and 0.007 percent respectively. However, it has, observed that, base year (2004-05), current year (2014-15), absolute change and relative change of area in Chhattisgarh has found to be 137100-hectare, 157963-hectare, 20863 hectare and 15.61 percent respectively. In addition, base year (2004-05), current year (2014-15), absolute change and relative change of production in Chhattisgarh have found to be 96444 quintal, 314164 quintal, 217720 quintal and 225.75 percent respectively. In addition, base year (2004-05), current year (2014-15), absolute change and relative change of productivity in Chhattisgarh has found to be 0.703 quintal per hectare, 1.988 quintal per hectare, 1.285 quintal per hectare and 182.79 percent respectively. Therefore, it is concluded that extremely increase the production and productivity of Chhattisgarh than the Kabirdham district.

Variability in area, production and productivity of fish

Variability estimated by coefficient of variance for area, production and productivity of fish in Kabirdham district and Chhattisgarh has analyzed and presented in (Table 2). It has observed that, during the year 2010-11 to 2014-15 (period five years) variability estimated by coefficient of variance for area, production and productivity in Kabirdham district has found to be magnitude of 3.655, 6.912 and 8.061 percent respectively. However, during the year 2004-05 to 2014-15 (period ten years) variability estimated by coefficient of variance for area, production and productivity

in Chhattisgarh state has found to be magnitude of 4.319 percent, 34.170 percent and 0.426 percent respectively. Therefore, it has concluded that the productivity has more variable than the area and production in Kabirdham district. The fish production has more unpredictable than area and productivity of fish in Chhattisgarh state.

Table 1 Change in area, production and productivity of fish

Particulars	District Kabirdham	Chhattisgarh state
I. Area (Hectare)		
a. Base year	3959	137100
b. Current yea	4737	157963
c. Absolute change	778	20863
d. Relative change in percent	19.01	15.61
II. Production (Quintal)		
a. Base year	10774	96444
b. Current yea	13257	314164
c. Absolute change	2483	217720
d. Relative change in percent	23.046	225.75
III. Productivity (Quintal per hectare)		
a. Base year	2.72	0.703
b. Current yea	2.79	1.988
c. Absolute change	0.07	1.285
d. Relative change in percent	0.007	182.79

Table 2 Variability in area, production and productivity of fish

Particulars	District Kabirdham (C.V.)*	Chhattisgarh state (C.V.)*
Area	3.655	4.319
Production	6.912	34.170
Productivity	8.061	0.426

*C.V= Coefficient of co-variance

Compound growth rate of area, production and productivity of fish

The growth rate of fish production and productivity of Chhattisgarh state has showed positive and significant and growth rate of fish area of Chhattisgarh state has showed positive and non-significant. The growth rate of fish production and productivity of Kabirdham district has showed positive and significant and growth rate of fish area of Kabirdham district has showed negative and significant (Table 3).

Table 3 Compound growth rate of area, production and productivity of fish farmers

Particulars	Chhattisgarh	Kabirdham
Area	0.009%	-1.3%*
Production	13.00%*	4.4%*
Productivity	12.4%*	5.8%*

*Significant (at the 5% significant level)

General characteristics of sample fish producers in study area

The collect data from sample fish producers have analyzed and presented in the (Table 4), with their characteristics. The sample fish producers have selected to

local breed and exotic breed fish production separately (Chouhan and Sharma 1995). The local breed of fish farmers has belonged to the middle age groups i.e. 30-45 years.

Table 4 General characteristics of sample fish producers

Particulars	Fish Farmers	
	Local	Exotic
Total water spread area (ha)	115.39	164.72
Total production (Qt)	1985.40	5148.00
Productivity (Qt/ha)	17.20	31.25
Total no sample fish producer	96	54
Water area per fish producers (ha)	1.20	3.05
Total no of selected pond	107	75
Family composition per house hold of fish producers	4.23	10.56
Age group of pre house hold of fish producers		
Below -30 Years	22	8
30-45 Years	43	19
above 45 Years	31	27
Literacy of household/respondent		
Illiterate	22	11
Primary	31	6
Middle	12	4
Higher secondary	19	18
Professional or higher education	12	15
Literacy (percent)	77.08	79.62
Nature of ponds		
Seasonal	82	47
Multipurpose	7	5
Seasonal perennial	-	-
Seasonal multipurpose	7	2
Lease procedure		
Leased in (By F.F.D.A)	81	37
Leased out (self-controlled)	15	17
Adopted status		
Block	4	4
Districts	1	1
State	1	1
Disposal status		
Personal consumption (Qt)	145	141
Total sale quantity (Qt)	1840.40	5007.00
Lease rent/year in (₹)	2500	2500

However, the exotic breeds of fish farmers have belonged to the age groups 45- above years. However, literacy of all sampled fish farmers has most of primary level education, but exotic breeds of fish producers have higher secondary and higher educated. However, average water area for local breeds of sample fish farmers have 1.20 hectare. However, average water area for exotic breeds of sample fish farmers, have 3.05 hectare. Selected number of ponds for local breeds of sample fish farmers are 107. However, selected number of ponds for exotic breeds of sampled fish farmers 75. Fish production for local breeds of sample fish farmer have 1985.40 quintal. However, fish production for exotic breeds of sample fish farmer have 5148.00 quintal. Productivity for local breeds of sample fish farmers have 17.20 quintal per hectare. However, productivity for exotic breeds of sample fish farmers have

31.25 quintal per hectare. Most of fish farmers' ponds have seasonal in nature for local and exotics both type of fish producers. However, most of fish producers' pond has seasonal in nature, which hampers management of pond for various, fish production activities under water stress conditions. The most of pond have leased in and selected beneficiaries leased amount have fixed by F.F.D.A (Fish Farmer Development Agency). Selected number of fish producer of local breeds among sample fish farmer have 96 respectively. However, selected numbers of fish producer of exotic breeds among sample fish farmer have 54 respectively. Family compositions per household of fish farmer for local and exotic breeds have 4.23 and 10.56 quintals respectively. The under privileged fish farmers have produce the fish and gain the income from sold the fish. Lease rent of both local and exotic breeds among sample fish farmer have ₹ 2500 and ₹ 2500 per year per ha respectively (Table 5). Bulk of fishpond have managing and control by community village pond (CVPs) in the study area. However, few ponds are controlled and managed by private village pond (PVPs). CVPs are allotting the pond in lease to entitled person by the village panchayat in consultation with F.F.D.A. Allotment of fishpond has prefer to village based cooperative society, small fish farmer groups and individually which have belong to scheduled caste or scheduled tribes or fishermen's categories and belonging person in below poverty line as per the norms fixed by village panchayat and rural development department, government of Chhattisgarh.

Fish production cost measure for sample fish producer in study area

The fish production cost have compute toward fish producer work out independently for sample fish farmer in (Table 5). Fish production cost of exotic breeds have ₹ 59541.53 per hectare. However, fish production cost of local breeds have ₹ 41696.29 per hectare. Under variable cost for labour wise involved costs in pond preparation of exotic breeds have ₹ 2031.32 per hectare with 3.40 percent. However, feeding expenses of exotic breeds have ₹ 1138.90 per hectare with 1.90 percent. However, netting expenses of exotic breeds have ₹ 1537.15 per hectare with 2.57 percent. However, seed application expenses of exotic breeds have ₹ 492.04 per hectare with 0.83 percent. Labour wise costs in pond preparation of local breeds have ₹ 1457.92 per hectare with 3.47 percent. However, feeding cost of local breeds has ₹ 1119.68 per hectare with 2.66 percent. However, netting cost of local breeds has ₹ 1567.72 per hectare with 3.75 percent. However, seed or fingerling application costs of local breeds have ₹ 512.17 per hectare with 1.21 percent. Under the variable cost for material wise seeds or fingerling cost of exotic breeds have ₹ 39123.96 per hectare with 65.73 percent. However, feeds cost of exotic breeds have ₹ 2128.46 per hectare with 3.57 percent. However, interests of working capital of exotic breeds have ₹ 4995.45 per hectare with 8.38 percent. Material wise costs for seedling or fingerling of local breeds have ₹ 25426.81 per hectare with 60.77 percent. However, Feed costs of local breed have ₹ 2327.75 per hectare with 5.55 percent.

Table 5 Fish production cost measure of sample fish producer

Particulars	Fish Farmers	
	Local (₹/ha)	Exotic (₹/ha)
I. Variable/Working Cost		
A. Labour wise cost		
Pond preparation	1457.92 (3.47)	2031.32 (3.40)
Feed application	1119.68 (2.66)	1138.9 (1.90)
Initial liming and application fertilization	163.79 (0.39)	412.82 (0.68)
Seed / Fingerling application	512.17 (1.21)	492.04 (0.83)
Treatment Expenses	168.12 (0.40)	237.37 (0.40)
Watching Expenses	0	940.38 (1.58)
Netting	1567.72 (3.75)	1537.15 (2.57)
Storage Expenses	145.59 (0.35)	98.95 (0.17)
Water Refilling	0	329.04 (0.54)
Repairing of bond and embankment	0	0
Fish Rearing	233.12 (0.55)	152.07 (0.25)
Sub total	5368.11	7370.04
B. Input / Material wise cost		
Feeds	2327.75 (5.55)	2128.46 (3.57)
Lime and manure/ fertilizers	402.54 (0.95)	475.80 (0.79)
Treatment / Medicine	645.85 (1.53)	819.87 (1.38)
Seed / Fingerling	25426.81 (60.77)	39123.96 (65.73)
Miscellaneous	58.06 (0.14)	36.42 (0.06)
Sub total	28861.01	42584.51
C. Interest of working capitals	3422.91 (8.18)	4995.45 (8.38)
D. Total working/ variable cost	37652.03 (86.59)	54950.00 (92.32)
II. Fixed / Overhead cost		
A. Rent of ponds	2574.74 (6.14)	2621.41 (4.40)
B. Depreciation	257.47 (0.61)	262.14 (0.44)
C. Rental value of pond	1000.00 (2.39)	1500.00 (2.52)
D. Interest of fixed capital	212.05 (0.51)	207.98 (0.35)
E. Total fixed cost	4044.26 (9.66)	4591.53 (7.70)
III. Total cost	41696.29 (100.00)	59541.53 (100.00)

However, Interest of working capital of local breeds has ₹ 3422.91 per hectare with 8.18 percent. Under the fixed cost for pond rent of exotic breeds have ₹ 2621.41 per hectare with 4.40 percent. However, rental value of pond cost in exotic breeds have ₹ 1500 per hectare with 2.52 percent. However, depreciation of pond in exotic breeds has ₹ 262.14 per hectare with 0.44 percent. However, interests of fixed capital pond in exotic breeds have ₹ 207.98 per hectare with 0.35 percent. However, pond rent costs of local breed have ₹ 2574.74 per hectare with 6.14 percent. However, rental value of pond for local breed have ₹ 1000 per hectare with 2.39 percent. However, depreciation of pond for local breed have ₹ 257.47 per hectare 0.61 percent. However, Interest of fixed capital in pond of local breed has ₹ 212.05 per hectare with 0.51 percent. Involved minor fish production cost are water refilling, watchman, and treatment in both type of exotic and local breeds of fish farmers.

Table 6 Profitability measure in fish production of sample fish producer

Particulars	Fish Farmers	
	Local	Exotic
Production in qt per ha	17.75	30.60
Price in ₹ per qt.	6943.50	10000.00
Fish production cost in ₹ per ha	41696.29	59541.53
Gross return in ₹ per ha	123247.12	306000.00
Net return in ₹ per ha	81550.83	246548.47
Cost benefit ratio in percent	1.95 : 1	4.14 : 1
Break-even level of output of fish		
i. Price	2349.08	1945.80
ii. Production	6.00	5.95

Cost distribution in fish production of sample fish producer in study area

The cost distribution of production by local and exotic breeds of fish produce have obtained more than ninety percent expense in working cost out of total cost however more than seventy-five percent expense in material wise cost out of total working cost respectively presented in (Table 6). Labour wise costs of exotic breeds of sample fish farmer have ₹ 7370.04 per hectare with 13.41 percent. However, labour wise costs of local breeds of sample fish farmer have ₹ 5368.11 per hectare with 14.22 percent. Input or material wise costs of exotic breeds of sample fish farmer have ₹ 42584.51 per hectare with 77.50 percent. However, input or material wise costs of local breeds of sample fish farmer have ₹ 28861.01 per hectare with 76.47 percent. Working cost of exotic breeds of sample fish farmer has ₹ 54950.00 per hectare with 92.30 percent. However, working cost of local breeds among sample fish farmer have ₹ 37652.03 per hectare with 89.60 percent. Fixed cost of exotic breeds among sample fish farmer have ₹ 4591.53 per hectare with 7.70 percent. However, fixed cost of local breeds among sample fish farmer have ₹ 4044.26 per hectare with 9.62 percent. Fish production cost of exotic breeds of sample fish farmer have ₹ 59541.53 / ha. However, fish production cost of local breeds of sample fish farmer have ₹ 41696.29 / ha.

Profitability measure in fish production of sample fish producers in study

Gross return, net return, cost benefit ratio, fish production, selling price, total cost, cost of production, and Break-even point in fish production of sample fish producers for local and exotic breeds have calculated independently and presented in (Table 7). Fish producers have common trend that used more recourses and rise more production of exotic breeds in the study area. Fish production of exotic breeds of fish farmer, have 30.60 quintal per hectare. However, fish production of local breeds of sample fish farmers have 17.75 quintal per hectare. Price of exotic breeds of fish farmer has ₹ 10000.00 per quintal. However, price of local breeds of fish farmers have ₹ 6943.50 per quintal. Fish production cost of exotic breeds of fish farmers have ₹ 59541.53 per hectare. However, fish production cost of local breeds of fish farmers have ₹ 41696.29 per hectare. Gross returns of exotic breeds of fish farmers have ₹ 306000.00 per hectare. However, gross return of local breeds' fish farmers have ₹ 123247.12 per hectare. Net returns of exotic breeds of fish farmers have ₹ 246548.47 per hectare. However, net returns of local breeds of fish farmers have ₹ 81550.83 per hectare. Net return for local breeds have low than exotic breeds due to price of exotics breeds is high and its productivity is also high. Cost benefit ratio of exotic breeds of sample fish farmers have 4.14:1. However, cost benefit ratios for local breeds of sample fish farmers have 1.95:1. Costs of fish production of exotics breeds of fish farmer have ₹ 1945.80 per hectare. However, costs of fish production of local breeds of sample fish farmers have ₹ 2349.08 per hectare. Break-even points of exotic breeds of fish farmer have 5.95. However, break-even points of local breeds of sample fish farmers have 6.00: (Table 6). Fish production of local breeds has low then the exotic breeds due to low productivity in nature, using the improper practices of fish production apply natural feeding practices, improper and un-recommended dose in local breed fish production by fish producer in the study area.

Table 7 Cost distribution in fish production of sample fish Producer

Particulars	Fish Farmers	
	Local	Exotic
Labour wise cost in ₹ per ha	5368.11	7370.04
	(14.22)	(13.41)
Material wise cost in ₹ per ha	28861.01	42584.51
	(76.47)	(77.50)
Interest of working capitals	3422.91	4995.45
	(9.07)	(9.08)
Sub - total	37652.03	54950.00
	(100.00)	(100.00)
Fixed cost in ₹ per ha	4044.26	4591.53
	(9.62)	(7.70)
Working cost in ₹ per ha	37652.03	54950.00
	(89.60)	(92.30)
Total cost in ₹ per ha	41696.29	59541.53
	(100.00)	(100.00)

Marketing pattern of local and exotic breeds of fish in study area

Local and exotic breeds of fish producer have adopted different marketing pattern and presented in (Table 8). Fish production of exotic breeds of sample fish farmers, have 5148.00 quintal. However, fish productions of local breeds of sample fish farmers have 1985.40 quintal. Fish consumption of exotic breeds of fish farmer have 141.00 quintal. However, fish consumption of local breeds of sample fish farmer have 145.00 quintal. Sold quantity of exotic breeds of sample fish farmers have 5007.00 quintal. However, sold quantity of local breeds of sample fish farmers have 1840.40 quintal. Marketed surplus of exotic breeds of sample fish farmers have 5007.00 quintal. However, marketed surplus of local breeds of sample fish farmer have 1840.40 quintal.

Table 8 Fish disposal pattern and received price through different marketing channel of farmers

Channels	Total sold quantity (qt.)	Percentage	Price received (₹ per qt.)
I	583.60	8.462	8538.80
II	930.50	13.492	6023.04
III	389.10	5.641	7238.50
IV	1451.20	21.042	6731.86
V	3497.50	50.713	5452.00
Total	6851.90	100.00	Average 6796.83

The marketing channels and disposal pattern of fish in study area

The samples of fish producer are disposing the fish in different marketing channels of study area. Fish passed from consumer to producer through three to five marketing channels in study area and presented in (Table 9). Most of fish farmer have adopted five marketing channels in disposal of produced fishes. Sell quantity of the sample fish farmers have 583.60 quintal, 930.50 quintal, 389.10 quintal, 1451.20 quintal and 3497.5 quintal in the channel first, second, third, fourth and fifth respectively. However, received price by different channels have ₹ 8538.80 per quintal, ₹ 6023.04 per quintal, ₹ 7238.50 per quintal, ₹ 5452.00 per quintal in the

channel first, second, third, fourth and fifth respectively. The average received prices by the sample fish farmers have ₹ 6796.83 per quintal.

Market analysis for different marketing channel

The market analysis among different adopted marketing channel of sample fish producers have present in the (Table 10). The marketing analysis have examined and analyzed the adopted marketing channel of fish farmers i.e. first, second, third, fourth and fifth. However, include contents have producer or farmer price, marketing cost, market margin, difference of farmers and consumer prices, retailer sale price, marketing efficiency and producer share in consumer rupee of fish farmer. Producer or farmer price of fish farmer has ₹ 8538.80 per quintal, ₹ 6023.04 per quintal, ₹ 7238.45 per quintal, ₹ 6731.86 per quintal and ₹ 5452.00 per quintal in channel first, second, third, fourth and fifth respectively. Marketing cost of fish farmer has ₹ 000 per quintal, ₹ 272.77 per quintal, ₹ 1138.80 per quintal, ₹ 3187.30 per quintal and 2201.50 per quintal in channel first, second, third, fourth and fifth respectively. However, market margin of fish farmer has ₹ 000 per quintal, ₹ 1171.16 per quintal, ₹ 525.01 per quintal, ₹ 1034.79 per quintal and ₹ 1798.50 per quintal in channel first, second, third, fourth and fifth respectively. However, difference of farmers price and consumer price of fish farmers have ₹ 000 per quintal, ₹ 1444.43 per quintal, ₹ 1663.81 per quintal, ₹ 3978.14 per quintal and ₹ 4001.00 per quintal in channel first, second, third, fourth and fifth respectively. However, retailer price of fish farmers has ₹ 8538.80 per quintal, ₹ 7467.47 per quintal, ₹ 8902.26 per quintal, ₹ 10710.00 per quintal and ₹ 9453.00 per quintal in channel first, second, third, fourth and fifth respectively. However, marketing efficiency of fish farmer has 429.72 percent, 46.10 percent, 32.46 percent and 81.68 percent in channel second, third, fourth and fifth respectively. However, producer share in consumer rupee of fish farmer has 100.00 percent, 80.65 percent, 81.31 percent, 62.85 percent and, 57.67 percent in channel first, second, third, fourth and fifth respectively (Das *et al.* 2013). The channel first has not any marketing cost and market margin due to absent of the intermediaries. Therefore, channel first has most efficient channel.

Table 9 Market analysis for sample fish farmer

Particulars	Channel-I	Channel-II	Channel-III	Channel-IV	Channel-V
Retailer sale price (₹/q)	8538.80	7467.47	8902.26	10710.00	9453.00
Marketing cost (₹/q)	000	272.77	1138.80	3187.30	2201.50
Market margin (₹/q)	000	1172.16	525.01	1034.79	1798.50
Fish farmer price (₹/q)	8538.80	6023.04	7238.45	6731.86	5452.00
Differences of farmer price and consumer price (₹/q)	000	1444.43	1663.81	3978.14	4001.00
Marketing efficiency (%)	-	429.72	46.10	32.46	81.68
Producer share in consumer rupees (%)	100.00	80.65	81.31	62.85	57.67

Constraints of fish production and marketing

The sampled fish producer have faced the many problems in fish production and marketing in the study area however, analyzed by garrets score ranking technique faced constraints are.

Faced constraints about village pond utilization

The fish farmer opinion about the problem of village pond utilization have find with the direct interview. Garrett's score has greater than twenty-four listed in descending order by faced problem of sample fish farmers

and presented in (Table 11). It has inferred that, constraints faced by fish farmer have i.e. Satisfaction level of selection criteria for beneficiaries, finishing lease duration or period, conflict between villagers and fish producers, conflict between community and fish produce and satisfaction level for process of lease rate determination with obtained Garrett's score have i.e. 50, 60, 24, 39, and 75 respectively. However, satisfaction level of lease rate determination has major problems than followed the constraints finishing lease duration or period and satisfaction level of selection criteria for beneficiaries of fish farmers. The selection criterion of fishpond has not fair due to bias allotment of pond by village panchayat. Delay transfer of leasing right and violation of norms found as common in fish farmer.

Table 10 Faced constraints about village ponds utilization

Particulars	No. of fish farmers	
	Garrett's score	Garrett's rank
Satisfaction level of selection criteria for beneficiaries	50	iii
Finishing lease duration or period	60	ii
Conflict between villagers and fish producers	24	v
Conflict between community and fish produce	39	iv
Satisfaction level for process of lease rate determination	75	v

Table 11 Faced constraint about pond preparation

Particulars	No. of fish farmers	
	Garrett's score	Garrett's rank
Application level of soil testing	24	v
Labour availability	75	i
Application of silt and predators removing	50	iii
Pond utilization	40	vi
Pond repairs	60	ii

Table 12 Faced constraints about seed, feed and manures and other fertilizers

Particulars	No. of fish farmers	
	Garrett's score	Garrett's rank
Seed availability	69	ii
Feed availability	53	iv
Transportation availability	59	iii
Utilization knowledge of feeds and manures	32	vii
Utilization knowledge of fertilization and manures	47	v
Application of manure and fertilization	9	viii
Application of feeds	41	Vi
Seed price	79	i

Faced constraints about pond preparation

The farmer opinion about the problem of pond preparation have find with direct interview. Garrett's score has greater than twenty-four listed in descending order by faced problem of sample fish farmers and presented in (Table 12). It has inferred that constraints faced by fish farmer have i.e. application level of soils testing, labour availability, application of silt and predators removing, pond utilization and pond repairs with obtained Garrett's score have i.e. 24, 75, 50, 40 and 60 respectively. However, labour availability has major problems than followed the constraints pond repairs and application of silt & predators removing of fish self-help groups. Labour availability has common constraint faced by all groups of fish producers.

Table 13 Faced constraints about disease, predators and weed problems

Particulars	No. of fish farmers	
	Garrett's score	Garrett's rank
Disease	43	iii
Predatory	73	i
Weeds	57	ii
Skin problem	27	iv

Faced constraints about seed, feed, manures and fertilizers

The fish farmer opinion about the problem of seed, feed, manures and fertilizers have find with direct interview. Garrett's score has greater than nine listed in descending order by faced problem of sample fish farmers and presented in (Table 13). It has inferred that constraints faced by fish farmer have i.e. seed availability, feed availability, transportation, utilization knowledge of feeds and manures, utilization knowledge of fertilizer application and manures, application of manure and fertilizer application, application of feeds, seed price with obtained Garrett's score have i.e. 69, 53, 59, 32, 47, 9, 41 and 79 respectively. However, Seed price has major problems than followed the constraints seed availability and utilization knowledge of feeds and manures of fish farmer.

Table 14 Farmer perceptions about Extension services rendered by FFDA

Particulars	No. of fish farmers	
	Garrett's score	Garrett's rank
Adopting level of advising by FFDA (technical information)	50	ii
Satisfaction level of training programme	70	i
Panchayat and FFDA officer setting to conflict	31	iii

Faced constraints about disease, predators and weed

The farmer opinion about disease, predators and weed have find with the direct interview. Garrett's score has greater than twenty-seven listed in descending order by faced problem of sample fish farmers and presented in (Table 14). It has inferred that constraints faced by fish farmer have i.e. disease, predatory, weed, and skin problem with obtained Garrett's score have i.e. 43, 73, 57 and 27

respectively. Most of fish producer have faced the aquatic weed problem and predator fish in the pond. The predators' fish has eaten the domesticated fish in the pond so create the heavy losses in the fish yield. Aquatic weed, disease and predator have major problems of fish producers, while weed infestation and predator problem have common in each type fish producer in the study area.

Table 15 Faced constraint about natural calamities and human creative problems

Particulars	No. of fish farmers	
	Garrett's score	Garrett's rank
Natural calamities (Drought and floods)	70	i
Human creative (Thrift and quarrels)	50	ii
Water stressing	31	iii

Farmer perceptions about extension rendered services by FFDA

The farmer opinion about perceptions about Extension rendered services by FFDA has found with the direct interview. Garrett's score has greater than thirty listed in descending order by faced problem of sample fish farmers and presented in (Table 15). It has inferred that constraints faced by fish farmer have i.e. FFDA advising (technical information), satisfaction level of training programme and Panchayat and FFDA officer setting to conflict with obtained Garrett's score have i.e. 50, 70 and 31 respectively. However, satisfaction level of training programme has major problems then followed problems the adopting level of advising by FFDA (technical information), Panchayat, and FFDA officer setting to conflict of fish farmers. However, FFDA advising (technical information) has major problems then followed problems the satisfaction level of training programme of fish self-help groups. These results are in accordance to Nesar (2009). Most barriers found in fish production have lack of awareness, low attendance of training programme and improper technical advice provided by FFDA in study area.

Faced constraints about natural calamities and human creative problems

The farmer opinion about natural calamities and human creative problems has found with the direct interview. Garrett's score has greater than thirty-one listed in descending order by faced problem of sample fish farmers and presented in (Table 16). It has inferred that constraints faced by fish farmer have i.e. natural calamities (Drought and floods), human creative (Thrift and quarrels) and water stressing with Garrett's score 70, 50 and 31 respectively. However, natural calamities (Drought and floods) has major problems then followed problems the human creative (Thrift and quarrels) and water stressing of fish farmers. However, natural calamities (Drought and floods) has major problems then followed problems the human creative (Thrift and quarrels) and water stressing of fish self-help groups. Natural calamities and human creative problems have most barriers in the fish farming. Natural calamities include that

flood, drought and some infected, viral diseases and human creative problems includes that thrift of fishes, water refilling stress and village and community conflict. Water stressing is most common problems of fish production in off-season of rain by fish producers in the study area.

Table 16 Faced constraints about the finance and insurance

Particulars	No. of fish farmers	
	Garrett's score	Garrett's rank
loan or fund availability	73	i
High interest/utilization	27	iv
Insurance conflict	57	ii
Subsidy	43	iii

Table 17 Faced constraints about the marketing and disposal

Particulars	No. of fish farmers	
	Garrett's score	Garrett's rank
Transportation	66	ii
Price	50	iv
Payment	35	vi
Delay payment	22	vii
Selling	43	v
Satisfaction level to market information	78	i
Storage	58	iii

Faced constraints about the finance and insurance services

The farmer opinion about finance and insurance services i.e. loan or fund availability, high Interest or utilization, Insurance conflict and subsidy has found with the direct interview. Garrett's score has greater than twenty-seven listed in descending order by faced problem of sample fish farmers and presented in (Table 17). It has inferred that constraints faced by fish farmer have i.e. loan or fund availability, high Interest or utilization, Insurance conflict and subsidy with Garrett's score 73, 27, 57 and 43 respectively. However, loan or fund availability has major problems then followed problems the Insurance conflict and subsidy of fish farmer. but few fish producer have barrowed the fund in outside of the nearest funding institution i.e. Commercial bank, cooperative bank and other non-institutional funding agency as relative or fish producer trader and others (Gauraha *et al.* 2007). The most of fish producer have face to non-insurance conflict case due to lacks of aware of the insurance benefits. Most of fish producer has faced the loan availability and insurance conflict. Government subsidy scheme and other facility have operated unfair and biased so loan supply has affected in the study are.

Faced constraints about the marketing and disposal

The farmer opinion about marketing and disposal i.e. transportation, price, payment, delay payment, selling, satisfaction level to market information and storage has found with the direct interview. Garrett's score has greater than twenty-two listed in descending order by faced problem of sample fish farmers and presented in table 18. It has

inferred that constraints faced by fish farmer have i.e. transportation, received price, payment, delay payment; selling, satisfaction level to market information and storage with Garrett's score have i.e. 66, 50, 35, 22, 43, 78 and 58 respectively. The facing problems by fish producer have transportation, large number of intermediaries, high rate of market fee, storage fee, late information market price and other information, bias transfer of payment and delay payment not gating the appropriate price of fish in the study area (Salam et al. 2019).

Investigation it could be concluded that, family size of exotic breeds of fish farmer has large than the local breeds of fish farmer. However, most of the exotic breeds of fish produce are higher educated than local breeds fish producer. However, the local breeds of fish farmer have low aged than the exotic breeds fish farmers. Growth rate among area, production and productivity have concluded that, production and productivity growth rate have high than the area. Most of local and exotic breeds of fish producer have expenses in Fish production expenses among local and exotic breeds of fish producer have more material wise cost than the labour wise cost. All type of local and exotic breeds of fish producers have more than ninety percent expenses in working cost and seventy-five percent expenses in material wise costs. Fish production of the fish farmer of exotic breeds has high than then local breeds of fish. Sale price of the fish farmer for exotic breeds have high than local breeds of fish. Gross returns of fish farmers of exotic breeds have

high than local breeds of fish. Net return of fish farmers of exotic breeds have high than local breeds of fish. Cost benefit ratios of the fish farmers of exotic breeds have high than local breeds of fish. Five marketing channels have adopted in fish marketing in study area where fish disposed between producer to consumer. Disposal of fish among fish farmer were preferred marketing channel fourth and fifth. Channel first have highest producer price, Channel four have highest marketing cost, Channel fifth have highest marketing margin, Channel first have highest producer share in consumer rupee and marketing efficiency. So, channels first have more efficient and profitable than other adopted marketing channels but fish farmer has preferred the channel four due to more economic in marketing view. The major socio-economic constraints of the fish farmer have discovered the fish production of local and exotic breeds in the study area. Obtain constraints i.e. unavailability good quality of seed and fingerling, lease problems, social conflict, weed infestation and disease, water stress, natural and human create problems and Improper provide the extension training and services by F.F.D.A. (Fish farmer development authority) and poor & irregular financing services. In addition, restriction of use of medicine, feed, manure and fertilizers, leasing process and poaching by society and community. The marketing constraints of fish for local and exotic breeds of fish i.e. transportation, selling, market information, price, storage, fish rearing, retail and wholesale market both poor marketing system.

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