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Constraints Perceived by Rainbow Trout (*Oncorhynchus mykiss*) Fish Farmers in Adoption of Fish Farming Practices in Jammu and Kashmir

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ABSTRACT

The study was conducted in the Srinagar district of Jammu and Kashmir (UT) to assess the constraints faced by rainbow trout fish farmers in the adoption of improved fish farming practices. The data were collected from randomly selected 53 fish farmers with the help of pre-tested interview schedule. The collected data were classified, tabulated and statistically analyzed. The findings revealed that majority of the fish farmers were under the middle age group (47.17%), educated up to a higher secondary level (41.51%), male (83.02%), married (83.02%), fish farming experience as medium (49.06%) and under high income group (60.38%) Further, results revealed that constraints like lack of quality fish seed availability was (technological constraints) perceived by 81.13 per cent fish farmers, poor transport facility was (infrastructural constraints) perceived by 77.36 per cent fish farmers and *high price of trout seed and feed* was (economic constraints) perceived by 92.45 per cent fish farmers which were indicating the major barriers in adoption of improved fish farming practices by the farmers in study area.

Keywords: Rainbow trout, socio-economic characteristics, constraints, fish farmers.

INTRODUCTION

The fisheries sector has an enormous potential to provide nutritional security as well as employment opportunities to millions of people. In this sector, about 28 million people are engaged directly or indirectly. India is the third largest fish-producing country in the world and accounts for 8.92% of the global production and second largest aquaculture nation in the world followed by China. The total fish production during 2022-23 was 17.54 MMT (million metric tonnes) with a contribution of 13.11 MMT from inland sector and 4.43 MMT from marine sector (Anonymous, 2023). Fish production in J&K union territory reached 28 thousand Mt in 2023–24. With the increase in the number of trout hatcheries 51 and 1368 trout units, the trout production biomass total of 2380 Mt in 2023–24. Rainbow trout holds significant value for anglers; the valley of Kashmir is renowned as Angler's Paradise due to its abundance of clear, cold-water turbulent streams, powerful springs, and high-altitude lakes (DoF, J&K).

The Kashmir region contributes significantly to trout production. The Kashmir province is composed of 486 km of rivers, 447 km of streams, and 157 square km of lakes (Sodhi *et al,* 2013). Trout is a cold-water fish that prefers clear, torrential streams and transparent, high-altitude lakes. These streams have a high oxygen level, little vegetation, and trout survive in water between 0°c and 20°c, with an ideal range of 5°c to 15°c. Furthermore, there is a sizable population of insects in these water bodies that serve as food for trout. Brown trout (*Salmo truttafario*) and rainbow trout (*Oncorhynchus mykiss*) are both popular in J&K (Singh *et al,* 2017). The first trout farm was established at Harwan, which is a suburb area of district Srinagar, in 1901 and Achhabal, rural area of district Anantnag in 1908 (Sehgal, 2012).

The demand for trout seed is expected to increase, but till now there has been a huge gap between production and demand due to a lot of hindrances. It was essential to find out the main causes that were responsible for its less adoption by the farmers whereby suitable measures may be suggested to the fish farmers to minimizing the constraints and ultimately increased the fish production in UT of Jammu and Kashmir. Therefore, the present investigation was carried out to assess constraints perceived by rainbow trout (*Oncorhynchus mykiss*) fish farmers in adoption of improved fish farming practices.

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Table 1: Socio-economic characteristics of fish farmers. (*n=53)

Sr. No.	Characteristic	Category	Frequency	Percentage
1	Age (Yr)	Young (18 to 35)	17	32.08
		Middle (36 to 50)	25	47.17
		Old (above 50)	11	20.75
2	Education	Illiterate	3	5.66
		Primary	7	13.21
		Secondary	12	22.64
		Higher secondary	22	41.51
		Graduate	6	11.32
		Post-graduate	3	5.66
3	Gender	Male	44	83.02
		Female	9	16.98
4	Marital Status	Unmarried	9	16.98
		Married	44	83.02
5	Family size	Small (up to 4 member)	21	39.62
		Medium (5 to7 member)	25	47.17
		Large (more than 7 member)	7	13.21
6	Land holdings	Marginal (less than 1 ha)	47	88.68
		Small (1-2 ha)	6	11.32
		Big (more than 2 ha)	0	0.00
7	Land ownership	Personal	3	5.66
		Lease	12	22.64
		Family	38	71.70
8	Type of house possession	Earthen	1	1.89
		Semi cemented	7	13.21
		Cemented	45	84.90
9	Livestock owned	Cow	28	52.83
		Sheep/Goat	12	22.64
		None	13	24.53
10	Fish farming experience	Low (< 5 years)	19	35.85
		Medium (5-10 years	26	49.06
		High (>10 years)	8	15.09
11	Annual income	Low (< 4 lakh)	3	5.66
		Medium (4-5 lakh)	18	33.96
		High (> 5 lakh)	32	60.38

*n=number of respondents

MATERIALS AND METHODS

The UT of Jammu and Kashmir consists of 20 districts. Out of which, the Srinagar district was selected purposively for the present investigation due to the district having a good opportunities in terms of fish production and consumption. From the list of total 71 trout fish farmers of Srinagar district, out of which only 53 (75%) respondents were selected through random sampling technique for the study purpose. The secondary data about fish farming activities of the district were collected from the department of fisheries, Srinagar. The primary data were collected from the selected fish farmers by personal interview with the help of pre-tested structured interview schedule during the year 2023. The collected data were classified, tabulated and analyzed by using the appropriate statistical tools like frequency, percentage, mean and standard deviation *etc.*

RESULTS AND DISCUSSION

Socio-economic characteristics of fish farmers

The data (Table 1) indicated that the majority of respondents (47.17%) belonged to the middle age group followed by 32.08 per cent in the young age group and 20.75 per cent in the old age group. Regarding education levels, 41.51 per cent fish farmers

had completed higher secondary education, followed by secondary (22.64%), primary (13.21%), graduate (11.32%), and post-graduate (5.66%) qualifications. Only 5.66 per cent respondents were in illiterate category. The gender ratio showed a significant disparity; with 83.02 per cent of respondents being male and 16.98 per cent female were involved in fish farming activities. In terms of marital status, data revealed that 83.02 per cent of fish farmers were married, while 16.98 per cent were unmarried. Family size distribution indicated that 47.17 per cent of respondents belonged to medium-sized families, followed by small (39.62%) and large (13.21%) families. Landholding patterns highlighted that 88.68 per cent fish farmers were having marginal land holdings, 11.32 per cent were having small land holdings, whereas, none of the fish farmers were having big land holdings. In terms of land ownership, 71.70 per cent practiced fish farming on family-owned land, 22.64 per cent on leased land, and 5.66 per cent on personal land. Housing types showed that 84.90 per cent of respondents lived in cemented houses, 13.21 per cent in semi-cemented houses, and 1.89 per cent in earthen houses. Livestock ownership data revealed that 52.83 per cent of fish farmers owned cows, 22.64 per cent owned sheep or goats, and 24.53 per cent had no livestock owner. Fish farming experience varied, with 49.06 per cent were having medium experience followed by 35.85 per cent low experience and 15.09 per cent were having high experience, respectively. Annual income distribution indicated that 60.38 per cent respondents fell into the high-income category, followed by medium (33.96%) income, and only 5.66 per cent respondents were fell into low income group. These economic disparities highlight the importance of equitable income distribution for fostering social cohesion and harmony within the community.

The data indicated that near about fifty per cent of respondents belonged to the 36–50 age groups. It means middle age group fish farmers were actively engaged in fish farming activities due to their personal experience and having good earning from the fish farming. The findings of Kumar *et al* (2015), Salam *et al* (2020), and Surendran and Alex (2023) highlighted that middle-aged individuals were actively engaged in aquaculture and agricultural activities due to their experience, economic responsibilities, and willingness to adopt the improved fish farming practices. Education plays a vital role in encouraging farmers to adopt the fish farming. The majority of fish farmers had attained education up to the higher secondary level, indicating that good access to school education and higher studies. This finding aligns with the studies of Kumar *et al* (2015), Salam *et al* (2020), and Surendran and Alex (2023) who reported that educated farmers were more likely to adopt improved agricultural methods. Majority of fish farmers were married and also, they have medium family size which facilitated the operation of fish farming through the collective efforts of their family members. The results were in line with the findings of Kumar *et al* (2015), Salam *et al* (2020) and Wake (2021). Maximum number of fish farmers were having marginal land holdings *i.e.* less than one hectare due to the division of land among family members from generation to generation. The findings supported with the findings of Kumar *et al* (2015), Salam *et al* (2020), and Wake (2021). Further the majority of respondents had owned livestock, with cattle and goats being the most common. These research findings were aligned with Wake (2021) who reported that livestock and aquaculture function as integrated farming systems within rural economic activities. A significant portion of fish farmers earning more than ₹5 lakh annually which indicating as fish farming is economically profitable. The findings were supported with the findings of Kumar *et al* (2015), Salam *et al* (2020) and Surendran and Alex (2023).

Constraints faced by the trout fish farmers in adoption of fish farming practices

Technological constraints

The data (Table 2) revealed that lack of quality fish seed availability was most perceived under technological constraints by 81.13 per cent trout fish farmers and occupied ranked as first. Whereas, difficulty to identify the quality fish seed was second most important technological constraints, which were perceived by 67.92 per cent fish farmers. Likewise, unavailability of skilled labour (26.42%) was perceived next important technological constraints. Further, the data revealed that lack of knowledge about scientific fish farming were perceived by 18.87 per cent fish farmers and occupied ranked as fourth among the technological constraints.

Infrastructural constraints

Poor transport facility was the most perceived under infrastructural constraints by 77.36 per cent of trout fish farmers and occupied ranked as first and *timely unavailability of quality seed and other inputs* was second important infrastructural constraints perceived by 39.62 per cent fish farmers. Further the data reported that *lack of access to water quality* (30.19%) was next important constraints and occupied ranked as third. Similarly, the inadequate *supply of medicines* were reported by 24.53 per cent fish farmers

Table 2: Constraints faced by the trout fish farmers in adoption of fish farming practices.
(n= 53 Multiple response)

Sr. No.	Constraint	Frequency	Percentage	Rank
A	**Technological constraints**			
1	Lack of quality seed availability	43	81.13	I
2	Difficulty to identify the quality fish seed	36	67.92	II
3	Unavailability of skilled labour	14	26.42	III
4	Lack of knowledge about scientific fish farming	10	18.87	IV
B	**Infrastructural constraints**			
1	Poor transport facility	41	77.36	I
2	Timely unavailability of quality seed and other inputs	21	39.62	II
3	Lack of access to water quality	16	30.19	III
4	Inadequate supply of medicines	13	24.53	IV
C	**Economic constraints**			
1	High price of trout seed and feed	49	92.45	I
2	Inaccessibility of marketing facility	32	60.38	II
3	Losses due to disease outbreaks	17	32.08	III
4	Low demand in local market	15	28.30	IV
5	Unawareness about government schemes	4	7.55	V
D	**Culture constraints**			
1	Water pollution	51	96.23	I
2	Less availability of fish feed in local market	44	83.02	II
3	Slow growth rate of fish	14	26.42	III
4	Insufficient availability of modern farm implements	8	15.09	IV
E	**Social constraints**			
1	Lack of financial support	22	41.51	I
2	Inadequate family encouragement	8	15.09	II
3	Illiteracy	3	5.66	III
F	**Extension constraints**			
1	Lack of farm publication	39	73.58	I
2	Lack of mass media exposure	28	52.83	II
3	Insufficient farm sites visit by the extension personnel's	19	35.85	III
4	Lack of need-based training program	13	24.53	IV

and occupied ranked as fourth under the infrastructural constraints.

Economic constraints

It was found that the *high price of trout seed and feed* was most perceived economic constraints by 92.45 per cent trout fish farmers and occupied ranked as first. Similarly, *inaccessibility of marketing facility* (60.38%) was perceived next important economic constraints and occupied ranked as second. Further the data revealed that *losses due to disease outbreaks* was perceived by 32.08 per cent fish farmers and ranked as third, while low *demand in local market* (28.30%) and unawareness about government schemes (7.55%) were perceived ranked as fourth and fifth respectively, by the fish farmers among the infrastructural constraints.

Cultural constraints

Water pollution was most perceived by 96.23 per cent fish farmers under the cultural constraints and occupied ranked as first, whereas the less availability of fish feed in local market was perceived by 83.02 per

Table 3: Category-wise overall position of constraints as perceived by the trout fish farmers. (n= 53)

Sr. No.	Category	Number of Statements	MPS	Rank
1	Cultural constraints	4	55.19	I
2	Technological constraints	4	48.58	II
3	Extension constraints	4	46.70	III
4	Economic constraints	5	44.15	IV
5	Infrastructural constraints	4	42.92	V
6	Social constraints	3	20.75	VI

MPS=Mean Per cent Score

cent fish farmers and occupied ranked as second among the culture constraints. Further the data revealed that slow growth rate of fish and insufficient availability of modern farm implements were perceived by 26.42 and 15.09 per cent fish farmers and occupied ranked as third and fourth respectively, under the culture constraints.

Social constraints

The (Table 2) revealed that lack of financial support was most perceived by the 41.51 per cent fish farmers among the social constraints and occupied ranked as first, whereas the inadequate family encouragement (15.09%) were perceived next important social constraints by the fish farmers and occupied ranked as second. Further the data revealed that illiteracy were perceived only by 5.66 per cent fish farmers and occupied ranked as last under the social constraints.

Extension constraints

The data presented in Table 2 showed that lack of farm publication was most perceived by 73.58 per cent fish farmers and occupied ranked as first under the extension constraints. Whereas, the lack of mass media exposure was second most important extension constraints which were reported by 52.83 per cent fish farmers. Likewise, the insufficient farm sites visits by the extension personnels' and lack of need-based training program were the next important extension constrains perceived by 35.85 per cent and 24.53 per cent fish farmers and occupied the ranked as third and fourth, respectively.

Categories-wise overall ranking of constraints

The overall ranking of constraints as perceived by the trout fish farmers in adoption of fish farming practices as presented in Table 3.

The data depicted in Table 3 revealed that cultural constraints (55.19 MPS) ranked first in adoption of fish farming practices. Technological constraints (48.58 MPS), extension constraints (46.70 MPS) and economic constraints (44.15 MPS) were ranked second, third and fourth, respectively. Furthermore, the constraints like infrastructural constraints (42.92 MPS) was recorded ranked as fifth, while social constraints (20.75 MPS) was recorded as last position (20.75 MPS) among the category of overall ranking of constraints as perceived by the trout fish farmer in the study area.

The findings indicated that culture constraints was one of the important constraints among all these constraints, under this head major issues as reported by fish farmers were water contamination due to the pesticides and fertilizers residues from the agriculture fields specially from orchards, sewage flow and anthropogenic garbage. Similarly, the lack of quality seed availability was reported as a technological constraint due to the limited availability of trout hatcheries and inadequate transport facilities for fish and fisheries products. Further the extension constraints highlights outreach and communication barriers, including the limited availability of farm publications, insufficient need-based training and awareness programs conducted for the fish farmers.

Economical constraints and infrastructural constraints which were indicating that financial barriers and deficiencies in physical infrastructure pose moderate but significant challenges to implementation of sustainable fish farming practices. These findings align with findings of Salam *et al* (2020), Chettri (2021) and Surendran and Alex (2023).

CONCLUSION

From the above findings, it can be concluded that majority of the trout fish farmers were under middle age group, educated up to a higher secondary level, possess medium family size, marginal land holding, good numbers of house possessions, medium fish farming experience, and having high annual income. The various constraints like lack of quality seed availability, poor transport facility, high price of

trout seed and feed, water pollution, lack of financial support and lack of farm publications were the important constraints in adoption of improved fish farming practices. From the overall raking of constraints, cultural constraints was observed as the most important constraint whereas, social constraints were found as least important constraint in the adoption of trout fish farming practices by the fish farmers. It is suggested that government agencies should be provide affordable transportation facility for the fish farmers, concerned agencies and subject experts should be given more focus on reducing the seed and feed cost by using available low-cost ingredients. Furthermore, marketing infrastructure should be strengthened to ensure better market access as well as extension agencies should be given more emphasis to create mass awareness among fish farming community to maintaining pollutant-free of water resources.

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