

International Journal of Agriculture Extension and Social Development

Volume 9; SP-Issue 5; May 2026; Page No. 88-92

Received: 02-02-2026
Accepted: 09-03-2026

Indexed Journal
Peer Reviewed Journal

Socio-economic profile and constraint analysis of fish farmers in Manipur during COVID-19: Evidence from Valley districts

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DOI: <https://doi.org/10.33545/26180723.2026.v9.i5Sb.3610>

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Abstract

The fisheries sector plays a vital role in ensuring food, nutritional, and livelihood security, particularly in developing regions such as Manipur; however, the COVID-19 pandemic caused severe disruptions to aquaculture systems through supply chain breakdowns, labour shortages, and market constraints. This study examines the socio-economic characteristics and constraints faced by fish farmers in the valley districts of Manipur during the pandemic period using primary data collected from 96 respondents through a structured interview schedule. Descriptive statistics and the Garrett ranking technique were employed for analysis. The socio-economic profile revealed that the majority of respondents belonged to the middle-age group (55.21%) and were predominantly male (86.46%), with moderate educational attainment as 27.08% had secondary education and 26.04% higher secondary education, while 17.71% were illiterate; notably, 67.71% had no formal training exposure. Farm size distribution indicated the dominance of small (33.33%) and medium (31.25%) farmers, with an average pond size of 1.96 ha, reflecting the prevalence of smallholder aquaculture systems, while 61.46% depended on middlemen for marketing and 79.17% practiced occupational diversification. The Garrett ranking analysis identified high cost of feed and inputs (score 82) as the most severe constraint, followed by non-availability of fish seed (70) and disruption in feed supply (63), along with market-related issues such as closure of fish markets (58) and transportation problems (54). The study concludes that smallholder fish farmers are highly vulnerable to external shocks and emphasizes the need for strengthening input supply systems, improving market access, and enhancing institutional support for resilience building.

Keywords: Fisheries, aquaculture, socio-economic characteristics, Garrett ranking, constraints analysis, COVID-19 impact

1. Introduction

Fisheries and aquaculture have emerged as one of the fastest-growing food production sectors globally, playing a critical role in ensuring food security, nutrition, and livelihood support. Fish is recognized as a rich source of high-quality protein, essential fatty acids, and micronutrients, contributing nearly 17 per cent of the global intake of animal protein (FAO, 2022) ^[2]. The sector supports the livelihoods of approximately 600 million people worldwide, many of whom belong to economically vulnerable communities (FAO, 2020) ^[1]. In developing countries, fisheries serve as a key driver of rural employment, income generation, and poverty alleviation. In India, the fisheries sector has experienced substantial growth in recent decades and has become an integral component of the agricultural economy. The country ranks among the top fish-producing nations, with aquaculture contributing a major share to total production (GoI, 2020). The sector provides direct and indirect employment to millions of people and plays a vital role in enhancing nutritional security. However, Indian fisheries are largely

characterized by small and marginal producers who operate under resource constraints and are highly susceptible to external shocks (Das *et al.*, 2022) ^[5].

Manipur, a landlocked state in the northeastern region of India, exhibits a strong cultural and economic dependence on fish. Fish constitutes an essential part of the local diet, with per capita consumption exceeding the national average (Government of Manipur, 2021) ^[4]. The valley districts, particularly Bishnupur and Imphal West, contribute significantly to the state's fish production due to favourable Agro-climatic conditions and availability of water resources. Aquaculture in these regions is predominantly practiced by small and medium farmers, making it a critical livelihood activity for rural households.

Despite its importance, the fisheries sector in Manipur faces several structural challenges, including inadequate access to quality inputs such as fish seed and feed, poor infrastructure, dependence on middlemen for marketing, and limited institutional support (Singh *et al.*, 2019) ^[11]. These constraints have historically limited the productivity and profitability of fish farming. The situation was further

exacerbated by the outbreak of the COVID-19 pandemic, which disrupted economic activities across the globe.

The COVID-19 pandemic, declared in early 2020, led to widespread lockdowns and restrictions on movement, severely affecting agricultural and allied sectors. In fisheries, the pandemic disrupted the entire value chain, from input supply and production to transportation and marketing (FAO, 2020) ^[1]. Fish farmers faced multiple challenges, including non-availability of inputs, labour shortages, transportation bottlenecks, and closure of markets, resulting in reduced income and increased vulnerability (Sankar *et al.*, 2022) ^[13]. Similar observations were reported by Kumaran *et al.* (2021) ^[12], who highlighted that aquaculture systems experienced significant production and marketing constraints during the pandemic period.

The impact of COVID-19 was particularly severe on smallholder fish farmers, who constitute the majority of producers in regions like Manipur. These farmers typically operate with limited financial resources and have low risk-bearing capacity, making them highly vulnerable to disruptions. Dependence on intermediaries further reduces their bargaining power and income stability. Moreover, limited access to institutional credit and extension services constrains their ability to adopt adaptive strategies and recover from shocks (Chandrashekar *et al.*, 2020) ^[9].

Understanding the socio-economic characteristics of fish farmers is essential for assessing their resilience and vulnerability in the face of crises. Variables such as age, education, family size, farm size, occupation, and income influence farmers' decision-making, resource utilization, and adaptive capacity. In addition, identifying and prioritizing the constraints faced by fish farmers provides critical insights for policymakers and stakeholders to design effective interventions.

In this context, the present study aims to analyze the socio-economic characteristics of fish farmers in the valley districts of Manipur and to identify the major constraints faced by them during the COVID-19 pandemic using the Garrett ranking technique. The study seeks to provide empirical evidence on the challenges faced by fish farmers and to suggest policy measures for enhancing the resilience and sustainability of the fisheries sector.

2. Review of Literature

Fisheries and aquaculture play a crucial role in food security, nutrition, and livelihood generation, particularly in developing countries (FAO, 2022) ^[2]. In India, the sector has grown rapidly, contributing to employment and income, but is largely dominated by small and marginal farmers who are vulnerable to external shocks (Government of India, 2020; Das *et al.*, 2022) ^[3,5].

Previous studies indicate that fish farmers are generally middle-aged, moderately educated, and engaged in small-scale aquaculture. Thangjam and Jha (2019) ^[6] and Salam *et al.* (2020) ^[7] reported that farmers often depend on diversified livelihoods, while education influences the adoption of improved practices (Bharati *et al.*, 2017) ^[8]. Small farm size further limits access to inputs, credit, and markets, increasing vulnerability (Chandrashekar *et al.*, 2020) ^[9].

Marketing systems are largely dominated by intermediaries, reducing farmers' profit margins and bargaining power

(Pandey *et al.*, 2014; Singh *et al.*, 2019) ^[10,11]. The COVID-19 pandemic intensified these challenges by disrupting supply chains, restricting movement, and causing market closures, which led to input shortages and income losses (FAO, 2020; Kumaran *et al.*, 2021) ^[1,12].

Constraint analysis studies have identified high input costs, lack of quality seed, and weak institutional support as major issues in aquaculture (Das *et al.*, 2022) ^[5]. However, limited research exists on the combined analysis of socio-economic characteristics and constraints during COVID-19 in Manipur. Therefore, the present study addresses this gap using the Garrett ranking technique.

3. Methodology

3.1 Study Area

The study was conducted in the valley districts of Manipur, namely Bishnupur and Imphal West, which are the prominent fish-producing regions of the state. These districts were purposively selected due to their significant contribution to aquaculture production, availability of water resources, and concentration of fish farmers. The region is characterized by favourable Agro-climatic conditions for fish farming and a high dependence on fisheries as a livelihood activity.

3.2 Sampling Design and Sample Size

A multi-stage sampling technique was employed for the selection of respondents. In the first stage, two districts (Bishnupur and Imphal West) were selected purposively. In the second stage, villages with a high concentration of fish farmers were identified. In the final stage, 96 fish farmers were selected using simple random sampling to ensure unbiased representation.

3.3 Data Collection

Primary data were collected through personal interviews using a pre-tested structured interview schedule. The data collection was carried out during the post-COVID period, focusing on the impact of the pandemic on fish farming activities. Secondary data were obtained from government reports, research articles, and publications of the Food and Agriculture Organization (FAO, 2020; FAO, 2022) ^[1,2].

3.4 Variables Considered

(i) Socio-personal Variables

- Age
- Gender
- Education
- Social group
- Religion
- Training exposure
- Family size

(ii) Socio-economic Variables

- Farm size
- Occupation
- Marketing type
- Annual income

(iii) Constraints

Constraints faced by fish farmers during COVID-19 were

identified and ranked using the Garrett ranking technique.

3.5 Analytical Tools and Techniques

3.5.1 Descriptive Statistics

Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to analyze the socio-economic characteristics of the respondents.

3.5.3 Garrett Ranking Technique

The Garrett ranking technique was used to prioritize the constraints faced by fish farmers. This method converts ranks assigned by respondents into numerical scores, allowing comparison across factors (Garrett and Woodworth, 1969) ^[14].

The per cent position of each rank was calculated using the formula:

$$\text{Percent Position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

Where:

- R_{ij} = Rank given for the i^{th} factor by the j^{th} respondent
- N_j = Total number of factors ranked by the j^{th} respondent

The percent positions were then converted into Garrett scores using the Garrett conversion table. The scores of each constraint were summed across all respondents and divided by the number of respondents to obtain the mean score:

$$\frac{\sum S_{ij}}{N}$$

$$\text{Mean Score} = \frac{\sum S_{ij}}{N}$$

Where:

- S_{ij} = Garrett score for the i^{th} constraint by the j^{th} respondent
- N = Total number of respondents

The constraints were then ranked based on the mean scores, with higher scores indicating more severe constraints.

3.5.4 Percentage Analysis

The percentage of respondents under each category was calculated using:

$$\text{Percentage} = \frac{\text{Number of respondents in the category}}{\text{Total number of respondents}} \times 100$$

3.6 Data Processing and Validation

The collected data were coded, tabulated, and analyzed using appropriate statistical tools. Data cleaning was performed to remove inconsistencies and ensure accuracy. The results were presented in tabular form for better interpretation.

4. Results and Discussion

4.1 Socio-personal Characteristics of Fish Farmers

Table 4.1: Socio-personal Profile of Respondents (n = 96)

Variable	Category	Frequency	Percentage (%)
Age (years)	Young (<35)	13	13.54
	Middle (35–50)	53	55.21
	Old (>50)	30	31.25
Sex	Male	83	86.46
	Female	13	13.54
Education	Illiterate	17	17.71
	Primary	14	14.58
	Secondary	26	27.08
	Higher Secondary	25	26.04
	Graduate	11	11.46
	Above Graduate	3	3.13
Training Exposure	None	65	67.71
	Once	17	17.71
	Twice	3	3.13
	Thrice	1	1.04
	>3 times	10	10.42
Family Size	Small (<5)	37	38.54
	Medium (5–10)	55	57.29
	Large (>10)	4	4.17

The socio-personal profile indicates that the majority of fish farmers (55.21%) belong to the middle-age group, reflecting an economically active workforce. Male dominance (86.46%) suggests limited participation of women in fisheries decision-making. Educational distribution shows moderate literacy, with 53.12% having secondary and higher secondary education combined, which may support technology adoption, although the presence of 17.71% illiterates indicates gaps.

A critical observation is that 67.71% of farmers had no training exposure, highlighting weak extension outreach.

Family size distribution shows that 57.29% belong to medium-sized households, indicating moderate dependency pressure.

The study reveals that the majority of fish farmers are middle-aged and male-dominated, indicating an economically active but gender-skewed workforce. Similar trends have been reported by Thangjam and Jha (2019) ^[6] and Salam *et al.* (2020) ^[7]. Moderate levels of education among respondents suggest potential for technology adoption; however, the presence of illiteracy may limit access to information and institutional services, as noted by

Bharati *et al.* (2017) ^[8]. The low level of training exposure is a critical limitation, reducing farmers' adaptive capacity during crises (Chandrashekar *et al.*, 2020) ^[9].

4.2 Socio-economic Characteristics

Table 4.2: Socio-economic Profile of Fish Farmers (n = 96)

Variable	Category	Frequency	Percentage (%)
Farm Size	Marginal (<1 ha)	27	28.12
	Small (1–2 ha)	32	33.33
	Medium (2–4 ha)	30	31.25
	Large (>4 ha)	7	7.29
Marketing Type	With middlemen	59	61.46
	Without middlemen	14	14.58
	Mixed	23	23.96
Occupation	Fisheries only	20	20.83
	Fisheries + Animal Husbandry	39	40.63
	Fisheries + Agriculture	24	25.00
Annual Income	Others	13	13.54
	Low	4	4.17
	Medium	15	15.63
	High	77	80.21

The farm size distribution confirms the dominance of small (33.33%) and medium farmers (31.25%), together accounting for 64.58% of the sample, indicating a smallholder-based aquaculture system. The low proportion of large farmers (7.29%) suggests limited capital-intensive operations.

Marketing analysis reveals that 61.46% of farmers depend on middlemen, indicating weak direct market access and reduced bargaining power. Occupational diversification is significant, with 79.17% engaged in multiple income sources, primarily fisheries combined with animal husbandry (40.63%) and agriculture (25%). This reflects risk mitigation strategies.

A large proportion (80.21%) falls under the high-income category; however, this may reflect aggregated household income rather than fisheries income alone.

The dominance of small and medium farmers confirms the

smallholder nature of aquaculture in the study area, making farmers more vulnerable to external shocks (Das *et al.*, 2022) ^[5]. Heavy reliance on middlemen for marketing reduces price realization and bargaining power, consistent with findings of Pandey *et al.* (2014) ^[10] and Singh *et al.* (2019) ^[11]. Occupational diversification observed among farmers reflects a risk mitigation strategy, although it may not fully offset shocks such as the COVID-19 pandemic.

4.3 Garrett Ranking of Constraints

Table 4.3: Ranking of Constraints Faced by Fish Farmers

Rank	Constraint	Garrett Score
1	High cost of feed and inputs	82
2	Non-availability of fish seed	70
3	Disruption in feed supply	63
4	Closure of fish markets	58
5	Transportation problems	54
6	Low fish price	50
7	Labour shortage	47
8	Movement restrictions	44
9	Lack of institutional credit	41
10	Reduced income	38
11	Lack of extension services	35
12	Fear of COVID-19	32

The Garrett ranking analysis reveals that input-related constraints were the most severe during the COVID-19 period. High cost of feed and inputs ranked first, followed by non-availability of fish seed and disruption in feed supply, indicating major supply chain disruptions.

Market-related constraints such as closure of fish markets (Rank 4) and transportation problems (Rank 5) highlight the impact of lockdown restrictions on distribution systems. Dependence on middlemen further intensified these challenges, reducing farmers' income realization.

Institutional constraints, including lack of credit and extension services, ranked lower but remain important structural issues. Interestingly, fear of COVID-19 was ranked lowest, suggesting that economic challenges outweighed health concerns among fish farmers.

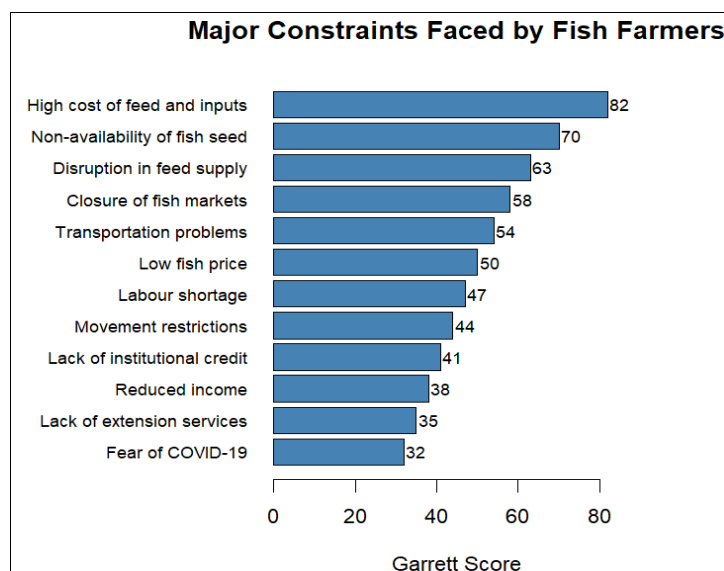


Fig 1: Representation of Major Constraints Faced by Fish Farmers During COVID-19

The Garrett ranking analysis shows that input-related constraints, particularly high feed cost and non-availability of fish seed, were the most severe, indicating disruptions in supply chains. This aligns with reports by the Food and Agriculture Organization (2020). Market-related issues, including closure of fish markets and transportation problems, further affected income, as also observed by Kumaran *et al.* (2021) ^[12] and Sankar *et al.* (2022) ^[13]. Institutional constraints such as lack of credit and extension services limited farmers' coping ability, while psychological factors were relatively less significant.

Overall Implications

The findings indicate that the vulnerability of fish farmers during COVID-19 was largely shaped by their socio-economic conditions, particularly small farm size, dependence on intermediaries, and limited institutional support. Strengthening input supply systems, improving direct market access, and enhancing training and extension services are essential for building resilience in the fisheries sector.

Summary

The study analyzed the socio-economic characteristics and constraints faced by fish farmers in the valley districts of Manipur during the COVID-19 pandemic based on data collected from 96 respondents. The results showed that the majority of farmers belonged to the middle-age group (55.21%) and were predominantly male (86.46%). Educational levels were moderate, with 53.12% having secondary and higher secondary education, while 17.71% were illiterate. A significant proportion (67.71%) had no training exposure. The farm structure was dominated by small (33.33%) and medium (31.25%) farmers, indicating the prevalence of smallholder aquaculture. Marketing practices revealed that 61.46% of farmers depended on middlemen, and 79.17% practiced occupational diversification.

The Garrett ranking analysis identified high cost of feed and inputs (score 82) as the most severe constraint, followed by non-availability of fish seed (70) and disruption in feed supply (63). Market-related issues such as closure of fish markets (58) and transportation problems (54) further affected production and income. Institutional constraints, including lack of credit and extension services, also contributed to reduced coping capacity.

Conclusion

The study concludes that the vulnerability of fish farmers during COVID-19 was primarily driven by their socio-economic conditions, particularly the dominance of smallholder systems and dependence on intermediaries. Input supply disruptions and market constraints significantly affected farmers' production and income, with the highest severity observed in rising feed costs and limited availability of fish seed. The high dependence on middlemen (61.46%) further reduced price realization, while low training exposure (67.71%) limited adaptive capacity.

To enhance resilience, there is a need to strengthen local input supply systems, ensure timely availability of quality seed and feed, and promote direct marketing channels to reduce dependence on intermediaries. Improving access to

institutional credit and expanding extension services will be critical for building farmers' capacity to respond to future shocks. Policy interventions focused on small and medium farmers can significantly improve the sustainability and stability of the fisheries sector in Manipur.

Limitations of the Study

The study is based on data collected from selected districts and may not fully represent the entire state. The findings are also limited to the post-COVID period and depend on respondent's recall and perception.

Acknowledgements

Author would like to thank his advisory committee for their enormous support and encouragement throughout his research work. He would also like to extend his gratitude to the CoA, CAU, Imphal for providing the opportunity to carry out the research work as a part of Masters' Degree programme.

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