EVALUATING PRODUCTION, FINANCIAL AND MARKETING PROBLEMS IN INLAND FISHING: DISCLOSING BARRIERS TO SUSTAINABILITY

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Abstract

Millions of people worldwide, especially in poorer nations, rely heavily on inland fisheries for their food, lives, and money. They do, however, have a number of difficulties that jeopardize their viability. This research looks at the marketing, financial, and production issues that Kerala, India's inland fisherman deal with. According to the report, Kerala's inland fisherman deal with a number of production issues, such as outdated gear, contaminated water, overfishing, erratic weather patterns, and inadequate training. In addition, they deal with financial issues including high equipment expenses, high operating costs, poor investment returns, a lack of insurance, and a heavy debt load. Low pricing, limited market accessibility, expensive transportation, rivalry, a shortage of storage facilities, and market volatility are some of the issues facing marketing. The study comes to the conclusion that these issues represent serious obstacles to Kerala's inland fisheries being sustainable. In order to solve these issues, it suggests a variety of measures, such as giving fishermen financial support, expanding market accessibility, and encouraging sustainable fishing methods.

Keywords:- Inland Fishing, Production Problems, Financial Problems, Marketing Problems, Sustainable Fishing.

The fisheries industry is universally acclaimed for its critical contribution to coastal societies, with production of fish persistently increasing despite issues such as climate change. China is the world's largest fish producer, followed by India, where Kerala is also a significant producer. In Kerala, 2.78 per cent of the state's labour force is engaged in the fishing industry and serves as an important contributor to food security and livelihoods (Pradeep Kumar et al., 2022).

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India's inland fisheries depend on reservoirs, rivers, lakes, canals, and ponds, which are primarily managed by small-scale fishers. Yet the industry is increasingly threatened by climate change, land use change, industrialization, and pollution (Kaur & Tewari, 2023a). While inland capture fisheries only provide 6.46 per cent of fish output, they are an important source of animal protein as well as rural employment. India is the second largest producer of aquaculture in the world, with total fish production of 16.24 MMT in 2021–22 (Department of Fisheries, 2023). Inland fisheries also hold vast potential to enhance rural livelihoods. In Kerala, the industry can take advantage of enormous inland water resources such as 44 rivers and thousands of hectares of tanks, ponds, and brackish water zones for aquaculture (Joseph, 2022a).

This research is directed at the production, financial, and marketing problems of Kerala's inland fishermen, including the use of outmoded equipment, water pollution, overfishing, excessive operational costs, low revenues, debt burden, poor market access, and price fluctuations.

Review of Literature

Inland waters or freshwater, lakes, rivers, reservoirs, and canals, account for only 0.01 per cent of the planet's water but are vital for aquaculture and fisheries (FAO, 2016). Freshwater fisheries are especially important in developing countries, generating 80 per cent of global inland capture production and being a low-cost income-generating activity for rural communities (FAO, 2003; Stokes et al., 2020). The industry is, however, often overlooked and poorly structured. Inland fish farming is influenced by various factors, including water quality, seed selection, stocking practices, and institutional ownership (Abood & Mohamed, 2020). Rising environmental threats, pollution, habitat loss, alien invasions, and climate change, are, nonetheless, undermining the sustainability and productivity of inland fisheries (Bricknell, 2021; Indrani & Kanagaraj, 2019). Inland ecosystems are also disturbed by infrastructure projects, such as dams, and increase the cost of production. Recent studies highlight the way inland fisheries act as a shock absorber during economic and environmental crisis like the COVID-19 pandemic and offer employment and nutrition when other sectors collapse (Freed et al., 2020; Lynch et al., 2020). Inland fisheries, yet, remain excluded by virtue of their restricted market integration, lack of data, and lack of legal acknowledgement (Bricknell, 2021).Socioeconomic research, for example, Alam & Yousuf (2024) and Joseph (2022b), suggests that problems persist: decreasing catches, poor education and infrastructure access, poor fishing gear, and low social mobility. Market, trade policy, and geopolitical variations also have an impact on the economic well-being of fisherfolk (Singh et al., 2024).Though institutions, the environment, and economics are globally accepted, there remain gaps in understanding their synergistic effects on trends in catches and the living of fishers. These gaps need to be addressed to inform the building of sustainable and inclusive policy for inland fisheries development.

Statement of the Problem

Even with Kerala's abundance of inland waters, its inland fisheries industry is underdeveloped and only accounts for 20 per cent of the state's overall fish production. Inland fishermen have a number of challenges that hinder sustainability, including outdated equipment, contaminated water, seasonality, and inadequate training. They are additionally burdened by economic issues including high costs, low income, and limited credit availability. Low pricing, limited market access, and inadequate storage are examples of marketing issues that reduce profitability. Although there is a lack of comprehensive study, these issues vary by geography and fishing community. The main production, financial, and marketing challenges facing Kerala's inland fisherman will be evaluated in this study, along with the barriers to the sustainable growth of the industry.

Scope of the Study

This research deals with the identification and analysis of the production, financial, and marketing issues encountered by inland fishermen in Kerala. It assesses how these problems differ across regions, fishing operations, experience, and education levels. The research covers only 150 inland fishermen from various regions of Kerala and aims to give insights for sustainable development and policy intervention in the inland fishery industry.

Significance of the Study

The fisheries industry is a backbone of Kerala's economy, employing more than 10 lakh people, 2.4 lakh of them in inland fisheries, and providing food security and nutrition. India accounts for 7.58 per cent of the world's fish production, with fishing contributing to 1.24 per cent of GVA. During 2019–20, marine exports were 12.9 lakh metric tons valued at [1] 46,662 crores. While inland fisheries account for 74 per cent of India's entire fish production, Kerala's inland industry is underdeveloped and accounts for only 20 per cent of fish production in the state. With marine resources close to the ceiling, mobilizing the potential of the inland sector is critical. It is therefore crucial to study the production, financial, and marketing problems confronting Kerala's inland fishers to promote sustainable growth.

Objectives

- To analyze the production related problems faced by inland fishermen.
- To analyze the finance related problems faced by inland fishermen.
- To analyze the marketing related problems faced by inland fishermen.

Hypotheses

H1a: There is no significant region-wise difference in the production problems faced by inland fishermen in Kerala.

H1b: There is no association between the experience level of inland fishermen and the nature of production problems they encounter.

H1c: The method of fishing used by inland fishermen does not influence the nature of production problems they face.

H2a: There is no significant region-wise difference in the financial problems faced by inland fishermen in Kerala.

H2b: There is no association between the experience level of inland fishermen and the in the financial problems faced.

H2c: The method of fishing used by inland fishermen does not influence the nature of financial problems they face.

H3a: There is no significant region-wise difference in the marketing problems faced by inland fishermen in Kerala.

H3b: There is no association between the experience level of inland fishermen and the nature of marketing problems they encounter.

H3c: There is no relationship between the educational level of inland fishermen and the extent of marketing problems they encounter.

Methodology

The total population of the study consist of all the inland fishermen in Kerala. For the conduct of the study data were collected from 150 samples through random sampling technique to identify the various problems of the inland fisherman. Structured interview schedule was prepared and data were collected. The collected data were analysed using statistical tools like percentage method and ranking method and the hypotheses formulated were tested using Z test for two population proportion, ANOVA, Chi-square Test, Regression and Correlation.

Analysis and Interpretation

1. Demographic Profile

The majority of the fishermen are male, accounting for nearly two-thirds of the respondents, while a little over one-third are female. Most of the fishermen fall within the age range of 41-60 years (44.7 per cent), followed by the 21-40 age group (34.7 per cent). Very few respondents are either below 20 or above 60 years old. Over half of the respondents have 10-15 years of fishing experience (54.0 per cent), indicating a significant level of experience among the fishermen. The second largest group has 5-10 years of experience (20.7 per cent).

A majority of the respondents have completed matriculation (60.7 per cent), while nearly a quarter have attained higher secondary education (24.7 per cent). A smaller percentage of fishermen are illiterate (14.7 per cent) (Table 1). The highest proportion of respondents are from the South region (50.7 per cent), followed by the North (34.0 per cent) and Central (15.3 per cent) regions. Traditional fishing methods are used by the largest group of respondents (44.7 per cent), followed closely by those who use both traditional and modern methods (41.3 per cent). A smaller group uses only modern methods (14.0 per cent).

2. Hypotheses Testing

H1a: There is no significant region-wise difference in the production problems faced by inland fishermen in Kerala (Table 2).

Based on the Z-tests for pairwise comparisons between regions, there are significant region-wise differences in some

Table 1

Demographic Variables

Characteristic	Value	Frequency	Percentage (%)
Gender	Male	97	64.7
	Female	53	35.3
Age	Below20	16	10.7
	21 -40	52	34.7
	41 – 60	67	44.7
	Above60	15	10.7
Experience	Less than 5 Years	16	10.7
	5-10 years	31	20.7
	10-15 years	81	54.0
	Above 15 years	22	14.7
Educational Background	Illiterate	22	14.7
	Matriculation	91	60.7
	Higher Secondary	37	24.7
Location	Central	23	15.3
	North	51	34.0
	South	76	50.7
Method of Fishing	Traditional	67	44.7
	Modern	21	14.0
	Both	62	41.3

Source: Primary data

Table 2

Region-wise Difference of Production Problem

Production Challenges	Region			C - N		C - S		N - S	
	Central	North	South	Z	P	Z	P	Z	P
Lack of modern equipment	69.6	86.3	72.4	-2.03	.041	0.32	.741	1.718	.085
Poor water quality	0	13.7	21.1	-2.63	.008	-3.42	.006	-1.06	.289
Overfishing	69.6	29.4	40.8	4.00	<.001	2.91	.003	-1.157	.246
Seasonal variations	65.2	72.5	78.9	-0.75	.453	-1.433	.149	-0.69	.49
Lack of training	34.8	29.4	61.8	.578	.561	-2.70	.006	-3.21	.0012

Source: Primary data

production problems faced by inland fishermen in Kerala. There are significant differences in "Lack of modern equipment" between Central and North regions. There are significant differences in "Poor water quality" between Central and both North and South regions. There are significant differences in "Overfishing"

between Central and both North and South regions. There are significant differences in "Lack of training" between Central and South, and between North and South regions. The p-value less than 0.05 show statistical significance. Since several production problems show significant differences across regions, we reject the null hypothesis H1a and conclude that there are significant region-wise differences in the production problems faced by inland fishermen in Kerala.

H1b: There is no association between the experience level of inland fishermen and the nature of production problems they encounter.

The Chi-square test findings demonstrate statistically significant connections between the expertise level of inland fishermen and their production challenges. The p-value is less than 0.05, and hence, an association is found between production problems like lack of modern equipment, poor water quality, seasonal variations, and lack of training and experience level of fishermen in Kerala. Current research indicates a correlation between the expertise of inland fishermen and the production challenges they face. The null hypothesis, which states that there is no association between the experience level of inland fishermen and the nature of the production difficulties they meet, has been rejected (Table 3).

H1c: The method of fishing used by inland fishermen does not influence the nature of production problems they face (Table 4).

According to the given data, the R-value is found to be 0.238, the R^2 value is 0.056, the Adjusted R^2 value is 0.050, and the Standard Error of the Estimate is computed as 1.17669. This suggests that the independent variable explains 5.6 per cent of the variability in the dependent factor. This leads to the validity of the regression fit, as evidenced by the ensuing ANOVA table (Table 5).

Based on the provided table, it is evident that the F value is 8.850 and the P value is 0.003, indicating statistical significance at a 5 per cent level of significance. This suggests that there is a significant correlation between the fishing method employed and the production-

Table 3

Production Related Challenges

Production related challenges	Chi-square Value	P value
Lack of Modern Equipment	20.905	.000
Poor Water Quality	24.208	.000
Overfishing	2.687	.442
Seasonal Variations	23.310	.000
Lack of Training	22.547	.000

Source: Primary data

Table 4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.238a	.056	.050	1.17669	.056	8.850	1	148	.003

Source: Primary data

related challenges encountered by fishermen. The impact of each individual is determined in the coefficient table provided (Table 6).

The p-value for the fishing approach is 0.003, which is below the significance level of 0.05. This suggests that the fishing technique used has a substantial impact on the types of challenges encountered by freshwater fishermen in their production activities. Given that the p-value for the fishing method is 0.003, which is below the significance level of 0.05, we can conclude that the null hypothesis should be rejected. The fishing technique employed by inland fishermen has a substantial impact on the specific production challenges they encounter.

H2a: There is no significant region-wise difference in the financial problems faced by inland fishermen in Kerala.

The table shows the descriptives of financial challenges in the central, northern, and southern regions (Table 7).

The ANOVA test results suggest that the mean financial problems faced by inland fishermen in the Central, North, and South regions of Kerala are not significantly different (Table 8). Despite

Table 5

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.254	1	12.254	8.850	.003
	Residual	204.919	148	1.385		
	Total	217.173	149			

Source: Primary data

Table 6

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Constant	1.940	.225		8.608	.000
	Method of Fishing	.308	.104	.238	2.975	.003

Source: Primary data

Table 7

Descriptives

Financial Challenges								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Central	23	3.39	1.270	.265	2.84	3.94	2	5
North	51	2.75	1.197	.168	2.41	3.08	1	5
South	76	2.75	1.584	.182	2.39	3.11	1	5
Total	150	2.85	1.427	.117	2.62	3.08	1	5

Source: Primary data

Table 8

ANOVA

Financial Challenges					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.059	2	4.029	2.005	.138
Within Groups	295.415	147	2.010		
Total	3.3.473	149			

Source: Primary data

some variation in the means (Central: 3.39, North: 2.75, South: 2.75), the differences are not statistically significant at the 0.05 level. Hence the researcher fails to reject the null hypothesis. Therefore, we conclude that the region does not significantly impact the financial challenges faced by inland fishermen in Kerala.

H2b: There is no association between the experience level of inland fishermen and the in the financial problems faced (Table 9).

The Chi-square test results indicate a significant association between the experience level of inland fishermen and the financial problems they face. This means that different experience levels are associated with different types of financial challenges. Fishermen with less than 5 years of experience are more likely to face high operational costs and debt burden (Table 10).

Fishermen with 5-10 years of experience face a balanced mix of financial challenges, including high cost of equipment, high operational costs, low returns on investment, and debt burden. Fishermen with more than 15 years of experience face high cost of equipment and high operational costs, but not low returns on investment or debt burden. The analysis concludes that there is a significant association between the experience level of inland fishermen and

Table 9

Cross Tabulation

			Financial Challenges				Total
			High cost of equipment	High operational cost	Low returns on investment	Debt Burden	
Experience	Less than 5 years	Count	0	8	0	8	16
		Expected Count	2.3	6.3	3.1	4.3	16.0
	5-10 years	Count	8	8	7	8	31
		Expected Count	4.5	12.2	6.0	8.3	31.0
	10-15 years	Count	7	28	22	24	81
		Expected Count	11.9	31.9	15.7	21.6	81.0
	Above 15 years	Count	7	15	0	0	22
		Expected Count	3.2	8.7	4.3	5.9	22.0
Total		Count	22	59	29	40	150
		Expected Count	22.0	59.0	29.0	40.0	150.0

Source: Primary data

Table 10

Chi - Square Tests

	Value	df	Asymptotic Significance (2 - sided)
Pearson Chi-Square	37.905a	9	.000
Likelihood Ratio	50.566	9	.000
Linear by Linear Association	8.696	1	.003
No. of Valid Cases	150		

Source: Primary data

the financial problems they face. Therefore, we reject the null hypothesis H2b, indicating that the financial challenges faced by fishermen vary significantly with their level of experience.

H2c: The method of fishing used by inland fishermen does not influence the nature of financial problems they face (Table 11).

Based on the provided information, the R-value is determined to be 0.107, the R^2 value is 0.012, the Adjusted R^2 value is 0.005, and the Standard Error of the Estimate is 1.424. This indicates that the independent variable accounts for only 1.2 per cent of the variability observed in the dependent factor. This confirms the regression fit, as demonstrated in the subsequent ANOVA table.

The p-value exceeds 0.05, suggesting that the model lacks statistical significance. Thus, the method of fishing does not significantly predict the financial problems faced by inland fishermen (Table 12).

Since the p-value for the method of fishing is 0.191, which is greater than 0.05, we fail to reject the null hypothesis. This means that the method of fishing used by inland fishermen does not significantly influence the nature of the financial problems they face.

H3a: There is no significant region-wise difference in the marketing problems faced by inland fishermen in Kerala (Table 14).

The analysis of marketing challenges faced by inland fishermen in Kerala reveals significant region-wise differences. Specifically, the Central region faces fewer problems related to low prices, market access, competition, and lack of storage compared to the North and South regions, but encounters more issues with market fluctuations. The North region experiences significant challenges with low prices, market access, competition, and market fluctuations, while the South region struggles with market access and storage issues, albeit with fewer problems related to high transportation costs and market fluctuations compared to the North.

Table 11

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.107a	.012	.005	1.424	.012	1.727	1	148	.191

Source: Primary data

Table 12

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.500	1	3.500	1.727	.191
	Residual	299.974	148	2.027		
	Total	303.473	149			

Source: Primary data

Table 13

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	Constant	2.523	.273		9.250	.000
	Method of Fishing	.165	.125	.107	1.314	.191

Source: Primary data

H3b: There is no association between the experience level of inland fishermen and the nature of marketing problems they encounter (Table 15).

The Chi-square test results indicate that there are significant associations between the experience level of inland fishermen and several marketing problems they encounter. There are statistically significant associations between experience level and the challenges of low prices ($p = 0.000$), lack of market access ($p = 0.000$), competition ($p = 0.006$), and market fluctuations ($p = 0.003$). This indicates that the experience level of fishermen significantly influences how they encounter these specific marketing problems. Conversely, no significant associations were found for high transportation costs ($p = 0.085$) and lack of storage ($p = 0.112$), suggesting that these issues are not significantly affected by the experience level of the fishermen. Therefore, we reject the null hypothesis that there is no association between the experience level of inland fishermen and

Table 14

Region-wise Difference in Marketing Challenges

Marketing Challenges	Region			C - N		C – S		N - S	
	Central	North	South	Z	P	Z	P	Z	P
Low Prices	69.6	86.3	72.4	-2.014	.044	-0308	.756	1.7169	.085
Lack of Market Access	34.8	70.6	69.7	-3.585	.003	-3.493	.000	0.098	.920
High Transportation Cost	65.2	56.9	39.5	0.851	.395	2.572	.016	1.74	.081
Competition	0	15.7	9.2	-2.91	.003	-9.229	.001	-7.65	.001
Lack of Storage	0	15.7	31.6	-2.91	.003	-4.33	.001	-1.87	.061
Market Fluctuations	69.6	31.4	10.5	3.82	.000	6.030	.001	2.567	.010

Source: Primary data

Table 15

Marketing Challenges

Marketing Challenges	Chi-square Value	P value
Low Prices	39.787	.000
Lack of Market Access	50.729	.000
High Transportation Cost	6.626	.085
Competition	12.496	.006
Lack of Storage	5.992	.112
Market Fluctuations	19.373	.003

Source: Primary data

the nature of marketing problems they encounter.

H3c: There is no relationship between the educational level of inland fishermen and the extent of marketing problems they encounter.

The correlation analysis indicates no significant relationship exists between the educational level of inland fishermen and the extent of marketing problems they encounter (Table 16). The Pearson correlation coefficient is very close to zero, and the p-value is insignificant, leading to the conclusion that educational background does not play a significant role in influencing marketing problems. This finding implies that interventions to address marketing problems may need to consider factors other than educational level.

Findings and Suggestions

The research revealed that the majority of the inland fishermen in Kerala were males in the 41–60 years age group with 10–15 years of experience and matriculation-level education. Traditional fishing practices were predominantly adopted. Production problems—like poor water quality, inadequate equipment, overfishing, and the lack of proper training—were region-specific, particularly in the South and Central regions. Less experienced fishermen experienced production difficulties, as affected by the fishing practice. Financial difficulties were associated with experience but were invariant by region. Marketing problems, such as low prices and poor access, were higher in the North and South, with the degree of experience influencing severity, but not education.

To surmount these challenges, the research recommends intervention measures. Subsidy for modern technology and experience-level training can solve production problems. Low-interest loans, insurance, and more robust cooperatives are advisable for financial support. Enhanced cold storage, transportation, and local markets can eliminate market barriers, while mobile-based price platforms and value-added processing units can increase incomes. Regular regional surveys and policy planning involving inland fishermen are critical to

Table 16

Correlations

		Educational Background	Marketing Problems
Educational Background	Pearson Correlation	1	-.011
	Sig. (2 tailed)		.892
	N	150	150
Total MP	Pearson Correlation	-.011	1
	Sig. (2 tailed)	.892	
	N	150	150

Source: Primary data

sustainable development and better livelihood.

Conclusion

This study thoroughly examined the demographic attributes and difficulties encountered by inland fishermen in Kerala. The findings highlight significant region-wise differences in production problems, with issues such as lack of modern equipment, poor water quality, overfishing, and lack of training varying across regions. These findings suggest targeted interventions, experience-based training programs, enhanced market access and infrastructure, and tailored financial support programs to address the specific needs and challenges of inland fishermen, thereby improving their productivity and livelihoods.

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