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Fish farming to enhance their socio-economic condition and farmers' perceptions towards developmental needs in Odisha of India

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Abstract

Modern inland fish farming is a highly profitable venture for Indian farmers, as the demand for fish is rising daily due to its easy availability in rivers, ponds, and reservoirs. Additionally, fish is a rich source of nutrients, including calcium, magnesium, and omega-3 fatty acids. Due to this, the fish farmers of Odisha are more interested in cultivating inland fish. The study was conducted in four districts of Odisha to understand the perception of fish farmers regarding their socio-economic development after adopting fish farming practices. Both purposive and random sampling methods were used for the selection of respondents. The findings showed that fish farming had a good impact on the socio-cultural development of the farmers. The fish farmers demonstrated a moderate level of development in terms of infrastructure, stakeholder relationships, and access to finance and credit.

Keywords: Fish farming, developmental needs, and perception of farmers

1. Introduction

Fish farming is beneficial for the economic development of farmers in India. In Many states of India, fish farming is done as the country has a rich source of water bodies and also a very long coastal belt. Mruthyunjaya (2004) [8] reported that the fishery business is a profitable enterprise providing family employment and income throughout the year. The study also reported that fishermen with higher incomes have a greater economic incentive to earn more. Kawarazuka & Bene (2011) [6] found that fish have high nutritional value (particularly small fish) in terms of micronutrients (bioavailable calcium, vitamin A, iron, and zinc), and the potentially effective contribution that fish can offer in principle to address multiple micronutrient deficiencies in developing countries. The farmers are not only cultivating fish but also exporting them to various countries, including Australia and Japan. Odisha is one of the largest producers and consumers of fish, encompassing both marine and freshwater fisheries. An attempt was made to ascertain the extent of respondents' perception about the different aspects of fish cultivation that need to be improved or developed, essentially for their socio-economic development.

Materials and Methods

The highest inland fish-producing districts were selected from four agroclimatic zones of Odisha, which were Khorda, Denkanal, Sambalpur, and Bhadrak. From these four districts, two blocks were selected purposively based on the production of fresh fish farming. Then, four panchayats were purposively selected as the study area, from which a total of 240 fish farmers were randomly selected to determine their development status after adopting fish farming. For that purpose, some major domains of socio-economic development have been considered. These are the needs for skill competency in technology use, the need for economic development through fish farming, the need for infrastructure development, the need for social development, the need for development of credit and financial conditions, and the need for development of linkages with stakeholders, among others. Under each major domain, a number of statements were considered, against which respondents were asked to indicate their responses on a three-point scale with corresponding scores of 2, 1, and 0, respectively. Finally, the perception index for each major domain of development has been calculated and placed in the tables below separately for each domain.

Results and Discussion

The development index can be found in many ways. Not only socio-economic development, but also the development of fish farmers in terms of skill competency in handling technology, infrastructural development, and the timely availability of credit, was studied to understand the overall development of fish farmers.

Perception about the need for skill competency in technology use

The technology development helped the fish farmers decrease the cost of farming and management, as well as increase production and income. The extension officer who disseminates the technology might have arranged various extension approaches to develop the technological knowledge and skills of the fish farmers.

Table 1: Perception about need for skill competency in technology use (n=240)

Sl. No.	Parameters	Index Value				
		Khordha (n=60)	Dhenkanal (n=60)	Bhadrak (n=60)	Sambalpur (n=60)	Index (n=240)
1	Skill competency on nursery management	82.50 (H)	76.67 (H)	76.67 (H)	71.67 (M)	76.87 (H)
2	Competency in selecting quality fingerlings	84.17 (H)	81.67 (H)	75.00 (M)	80.00 (H)	80.21 (H)
3	Adoption of recommended practice	70.83 (M)	60.00 (M)	63.33 (M)	60.83 (M)	63.75 (M)
4	Exposure to various sources of information	64.17 (M)	62.50 (M)	51.67 (M)	58.33 (M)	59.17 (M)
5	Easy availability of technological information	40.83 (SM)	29.17 (SM)	21.67 (L)	25.83 (SM)	29.37 (SM)
6	Exposure to latest technological developments	49.17 (SM)	32.50 (SM)	31.67 (SM)	19.17 (L)	33.12 (SM)
7	Permanency in flow of technological information	10.00 (L)	16.67 (L)	17.50 (L)	13.33 (L)	18.54 (L)
	Overall Index	57.38 (M)	51.31 (M)	48.21 (SM)	47.02 (SM)	51.57 (M)

H = High, M = Medium, SM = Semi-medium, L = Low

The above table revealed that respondents had a high level of need perception for Skill competency in nursery management and Competency in selecting quality fingerlings. Respondents were found to have a medium level of need perception regarding the Adoption of recommended practices and Exposure to various sources of information.

Respondents were found to have a semi-medium level of need perception in case of Easy availability of technological information and Exposure to the latest technological developments. They were found to have a low level of need perception regarding aspects such as permanency in the flow of technological information. While examining the overall perception index, it was found that the respondents had a medium to semi-medium level of need perception regarding various aspects of technology use competency. The results are quite in line with the respondents' knowledge and adoption level. The extension advisory system should take this into account to formulate its technology dissemination and training approach. Carballo *et.al.* (2008) [3] had also found similar results.

Perception of need for economic development through fish farming

Fish farmers earn a profit from fish farming, which ultimately helps them improve their economic condition and social status. Economic development also helped farmers increase their standard of living.

Table 2: Perception of need for economic development through fish farming (n=240)

Sl. No.	Parameters	Index Value				
		Khordha (n=60)	Dhenkanal (n=60)	Bhadrak (n=60)	Sambalpur (n=60)	Index (n=240)
1	Increase in production and productivity	91.67 (H)	86.67 (H)	85.00 (H)	82.50 (H)	86.45 (H)
2	Good rapport with trades and business men	73.33 (M)	69.17 (M)	69.17 (M)	62.50 (M)	68.54 (M)
3	Competency in collecting market information	54.17 (M)	53.33 (M)	40.00 (SM)	35.83 (SM)	45.83 (SM)
4	Disposal of the produce with remunerative price	32.50 (SM)	30.83 (SM)	23.33 (L)	28.33 (SM)	28.75 (SM)
5	Substantial increase in income	70.83 (M)	70.00 (M)	56.67 (M)	54.17 (M)	62.92 (M)
6	Competency in post-harvesting management	31.67 (SM)	28.33 (SM)	31.67 (SM)	27.50 (SM)	29.79 (SM)
7	Substantial increase in employment generation	79.17 (H)	78.33 (H)	73.33 (M)	69.17 (M)	75.00 (M)
8	Avenues for self-employment	91.67 (H)	90.00 (H)	87.50 (H)	85.00 (H)	88.54 (H)
	Overall Index	65.62 (M)	63.33 (M)	58.33 (M)	55.62 (M)	60.72 (M)

H = High, M = Medium, SM = Semi-medium, L = Low

From the table, it can be observed that respondents had a high perception of the need for an Increase in production and productivity, as well as avenues for self-employment, for their economic development. In the case of aspects such as good rapport with tradesmen and businessmen, a Substantial increase in income, and a Substantial increase in employment generation, they had a medium level of perceived need for economic development, with little district difference.

In aspects such as competency in collecting market information, Disposal of produce at a remunerative price, and Competency in post-harvesting management, respondents had a medium level of need perception for their economic development.

While considering the overall need perception index, it was found that respondents had a medium level of need perception of different aspects towards their economic development.

Perception of need for infrastructure development

Infrastructure in fish farming included facilities, accessories, equipment, and other resources required for development. The primary data collected from the fish farmers through personal interviews, analyzed and presented in the table below.

Table 3: Perception of need for infrastructure development: (n=240)

Sl. No.	Parameters	Index value				
		Khordha (n=60)	**Dhenkanal (n=60)**	**Bhadrak (n=60)**	**Sambalpur (n=60)**	**Index (n=240)**
1	Purchase of fishing accessories	54.17 (M)	40.00 (SM)	40.00 (SM)	35.83 (SM)	45.83 (SM)
2	Expansion of fishery activities	13.33 (L)	16.67 (L)	34.17 (SM)	21.67 (L)	21.45 (L)
3	Development of additional pond	38.33 (SM)	36.67 (SM)	30.00 (SM)	32.50 (SM)	34.37 (SM)
4	Establishing nursery pond	20.83 (L)	18.33 (L)	13.33 (L)	14.16 (L)	16.67 (L)
5	Productive time management	33.33 (SM)	32.50 (SM)	32.50 (SM)	41.67 (SM)	35.00 (SM)
6	Optimum utilization of resources	67.50 (M)	43.33 (SM)	50.83 (M)	40.00 (SM)	50.42 (M)
7	Renovation of dwellings	37.50 (SM)	28.33 (SM)	38.33 (SM)	27.50 (SM)	32.92 (SM)
8	Development of essential family assets	37.50 (SM)	20.83 (L)	18.33 (L)	20.00 (L)	24.17 (L)
9	Improvement in overall living condition	53.33 (M)	62.50 (M)	34.17 (SM)	37.50 (SM)	46.87 (SM)
10	Own irrigation system for fishing pond	58.33 (M)	48.33 (SM)	43.33 (SM)	49.17 (SM)	49.79 (SM)
	Overall Index	41.42 (SM)	34.58 (SM)	33.50 (SM)	32.00 (SM)	35.74 (SM)

H = High, M = Medium, SM = Semi-medium, L = Low

From the table, it can be observed that respondents had low to medium levels of perceived need for infrastructure development, which is necessary for their economic development. Regarding aspects such as the optimum utilization of resources, respondents had a medium level of perceived need. In aspects such as purchasing fishing accessories, developing additional ponds, Productive time management, renovating dwellings, improving overall living conditions, and owning an irrigation system for the fishing pond, respondents had a medium level of need perception. In the case of aspects such as the expansion of fishery activities, establishing nursery ponds, and the Development of essential family assets, respondents were found to have a low level of perceived need regarding their socio-economic development. The results aligned with those of Asche (2012)[2].

The overall index suggests that respondents had a moderate level of awareness regarding various aspects of infrastructure development that could improve their socio-economic condition.

Need perception for the development of socio-personal attributes

Improvement in social status brings social equity, justice, prestige, and a more positive perception towards the adoption of technologies. The social status of a person establishes their control over resources and increases their occupational competency and decision-making capacity.

Table 4: Need perception for development of socio-personal attributes (n=240)

Sl. No.	Parameters	Index value				
		Khordha (n=60)	Dhenkanal (n=60)	Bhadrak (n=60)	Sambalpur (n=60)	Index (n=240)
1	Good linkage with extension officials	90.83 (H)	75.00 (M)	71.67 (M)	71.67 (M)	77.29 (H)
2	Better coordination and team spirit	84.17 (H)	88.33 (H)	83.33 (H)	77.50 (H)	83.33 (H)
3	Improvement in decision making ability	91.67 (H)	88.33 (H)	87.50 (H)	90.83 (H)	89.58 (H)
4	More attention from the departments	70.00 (M)	67.50 (M)	70.00 (M)	65.83 (M)	68.33 (M)
5	Helping others in crisis	81.67 (H)	82.50 (H)	72.50 (M)	70.00 (M)	76.67 (H)
6	Developing resources on community basis	75.83 (H)	72.50 (M)	70.83 (M)	71.67 (M)	72.71 (M)
7	Good harmony among fishing community	95.00 (H)	85.83 (H)	91.67 (H)	86.67 (H)	89.79 (H)
	Overall Index	84.17 (H)	80.00 (H)	78.21 (H)	76.31 (H)	79.67 (H)

H = High, M = Medium, SM = Semi-medium, L = Low

From the above table, it can be gathered that respondents had a high level of need perception towards the socio-personal attributes, such as good linkage with extension officials, better coordination and team spirit, Improvement in decision-making ability, and maintaining good harmony among the fishing community with minimal district variations.

A medium level of need perception was observed in the case of socio-personal attributes, such as receiving more attention from departments and developing resources on a community basis. While considering the overall index in this regard, it was found that respondents had a high level of need perception towards the development of different socio-personal attributes. Jega *et al.* (2018) [5] found, in their study, that diversifying the number of fish cultured through domestication, breeding, and the culture of wild species may significantly boost fish production and reduce imports. The incorporation of social, cultural, and economic development aspects of fishermen's needs must be adequately considered in future fisheries development plans.

Table 5: Perception of need for improvement of credit and finance facilities: (n=240)

Sl. No.	Parameters	Index value				
		Khordha (n=60)	Dhenkanal (n=60)	Bhadrak (n=60)	Sambalpur (n=60)	Index (n=240)
1	Building good rapport with credit institutions	39.17 (SM)	38.33 (SM)	25.83 (SM)	30.00 (SM)	33.33 (SM)
2	Availing credit as per the requirement	69.17 (M)	65.83 (M)	60.83 (M)	62.50 (M)	64.58 (M)
3	Paying instalment as per capability	65.83 (M)	65.83 (M)	75.83 (H)	73.33 (M)	70.21 (M)
4	Flexibility in repayment	30.83 (SM)	35.00 (SM)	34.17 (SM)	24.17 (L)	31.04 (SM)
5	Easy processing of documents	13.33 (L)	14.17 (L)	19.17 (L)	26.67 (SM)	18.33 (L)
6	Timely credit disbursement	66.67 (M)	58.33 (M)	50.83 (M)	54.17 (M)	57.50 (M)
7	Insurance coverage	84.17 (H)	78.33 (H)	75.83 (H)	80.00 (H)	79.58 (H)
	Overall Index	52.74 (M)	50.83 (M)	48.93 (SM)	50.12 (M)	50.65 (M)

H = High, M = Medium, SM = Semi-medium, L = Low

In case of aspects like availing credit as per the requirement, paying installment as per capability, and timely credit disbursement, respondents were found to have a medium level of need perception. While in the case of aspects like building good rapport with credit institutions, flexibility in repayment, respondents were found to have a semi-medium level of need perception, and in the case of easy processing of documents, respondents were found to have a low level of need perception. The overall index shows that respondents had a semi-medium to medium level of need perception. Patel *et al. (2019)* [10] *and et al. (2020)* found that fish farmers have gained an increased level of satisfaction through growth in fish culture production, accompanied by corresponding economic gains.

Further, attempts have been made to ascertain the need perception of respondents towards the development of linkages with stakeholders. The results are presented in the table below.

Table 6: Need perception towards development of linkage with stakeholders (n=240)

Sl. No.	Parameters (Linkages with)	Index value				
		Khordha (n=60)	Dhenkanal (n=60)	Bhadrak (n=60)	Khordha (n=60)	Index (n=240)
1	Fishery research institutes	95.00 (H)	74.17 (M)	71.67 (M)	59.17 (M)	75.00 (M)
2	Fishery Scientists	90.00 (H)	65.83 (M)	72.50 (M)	69.17 (M)	75.21 (H)
3	State fishery development	85.00 (H)	69.17 (M)	69.17 (M)	66.67 (M)	72.50 (M)
4	Marketing organizations	71.67 (M)	63.33 (M)	49.17 (SM)	52.50 (M)	59.17 (M)
5	Input dealers	61.67 (M)	60.83 (M)	56.67 (M)	55.83 (M)	58.75 (M)
6	Traders and businessmen	77.50 (H)	75.00 (M)	74.17 (M)	74.17 (M)	75.20 (H)
7	Meteorological officials	25.00 (L)	25.00 (L)	15.83 (L)	16.67 (L)	20.62 (L)
8	State disaster management agency	20.83 (L)	23.33 (L)	09.17 (L)	13.33 (L)	16.67 (L)

H = High, M = Medium, SM = Semi-medium, L = Low

From the table, it can be observed that respondents had a high need perception for linkages with Fishery Scientists and with Traders and businessmen. While they were found to have a medium level of need perception towards linkages with Fishery research institutes, State fishery development, and marketing organizations. The findings have similarities with Allison and Ellis (2001) [1], Wandji *et al.* (2012) [11], and Haobijam and Ghosh (2018) [4].

Respondents were found to have a low level of need perception for Meteorological officials and the State disaster management agency. The overall index indicates that respondents had a medium level of perceived need in this regard, with minimal district differences. The consolidated results of the respondents' need perception are presented in Table 7.

Table 7: Consolidated results of need perception of respondents towards development:

Index	Skill competency	Economic development	Infrastructure development	Socio-personal attributes	Credit and finance	Linkage with stakeholders
Low (0-25)						
Semi-medium (26-50)			35.74			
Medium (51-75)	51.57	60.72			50.65	56.64
High (76-100)				79.67		

From the table, it can be observed that respondents had a high need perception for the development of their socio-personal attributes, as well as a medium level need perception for skill competency, economic development, credit and finance facilities, and linkages with stakeholders. In case of need for infrastructure development, they had a semi-medium level of need perception. The results are quite in line with their socio-economic orientation, knowledge, and adoption level. education, income from fishery, extension contact, and sources of information used appeared as important variables for every count. In all those areas, respondents were inclined towards belonging to the semi-medium to medium level, and this cumulative reflection was evident in their perception of the need for different aspects of development. Respondents' overall perception was limited to their education, knowledge, sources of information used, and extension contact. Moreover, lower economic conditions left little scope for the respondents to have a clear idea of the need for development.

A further attempt was made to ascertain the association between respondents' need perception and selected socio-economic attributes.

Table 8: Correlation between selected socio-economic attributes with need perception

Attributes	Need perception
Age (X1)	0.132*
Education (X2)	0.707**
Land Holding (X3)	0.410**
Farming Experience (X4)	0.461**
Family Size (X5)	0.195**
Extension Contact (X6)	0.581**
Source of Information used(X7)	0.650**
Cosmo politeness (X8)	0.539**
Membership status (X9)	0.229**
Income from fishery (X10)	0.643**

* Significant at 0.05 level, ** Significant at 0.01 level

From the above table, it can be observed that all the selected socio-economic attributes of the respondents were positively and significantly related to their perception of different aspects of development, mostly at a 1% level of significance, except for age. The findings therefore suggest that officials and extension personnel should consider these attributes of the respondents when planning educational activities, as well as implementing training and demonstrations, to achieve the desired results. Khadka and Tiwari (2020) [7] found that improved aquaculture promotes the formation of farmers' groups, builds relations with the government, adopts a different strategy of fish farming, and

seeks experts' assistance to develop aquaculture as a sustainable livelihood.

Conclusion

The fish farmers of Odisha, after adopting modern and new technological practices, have improved their standard of living. The farmers have faced numerous problems during the adoption of new farming practices, but with the help of extension workers and by availing themselves of various government policies, they can easily overcome these constraints, which ultimately indicates the socio-economic development of the farmers. The farmers also exhibit the highest socio-personal development, followed by skill competency, economic development, easy access to credit and finance, and good coordination with stakeholders. Inland fish farming not only improves the standard of living of the fish farmers but also improves the state's production and productivity by providing a sustainable development for them.

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