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Determinants to Behavioural Intention of Fish Farmers to Adopt Carp Polyculture

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HIGHLIGHTS

- Theory of planned behaviour (TPB) was applied to understand people's intention to adopt composite carp culture and its determinants.
- Majority of the farmers were found in medium level of behavioural intention and the farmers' intentions were significantly shaped by perceived usefulness, ease of implementation, economic benefits, social influence, access to technical knowledge, and institutional support.

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ABSTRACT

The study was carried out in Ganjam district of Odisha to measure the behavioural intention of the fish farmers to adopt composite carp culture with the objective of assessing the determinants to behavioural intention of fish farmers to adopt carp culture. Both purposive and random sampling procedures were followed in selecting 120 respondents. Data were collected through pre-tested structured interview schedule during 2023-24. Majority of the farmers were found in medium level of behavioural intention followed by high- and low-level behavioural intention. Seven variables such as area under fish farming, information source utilization, participation in extension activities, innovativeness, risk preference and economic motivation showed a highly significant and positive relationship with the behavioural intention of fish farmers. Strengthening extension facilities to ensure effective monitoring and follow up farmers, conducting training programmes focused on scientific and technical knowledge related to carp culture, improving the execution of existing fishery development schemes, developing a comprehensive disease management plan and encouraging more number of fish farmer producer organisations were the suggestions in order to improve the overall productivity and sustainability of composite carp culture, ultimately benefiting farmers and enhancing their livelihoods.

INTRODUCTION

The fisheries sector, contributing about 6.72 per cent to the agricultural GVA with a compound annual growth rate of 8.9 per cent between 2014-15 and 2022-23 is crucial to the Indian economy. The sector provides livelihood to about 30 million fishers and fish farmers at the primary level and twice the number along the value chain (MoFAHD, 2026). Indian fisheries in context of inland fisheries have witnessed a paradigm shift through emerging as a major contributor of fish production from 36% in the mid-1980 to 70% in the recent past (Shasani et al., 2020). Diverse geographically in many aspects, Odisha have 7.04 lakh Ha of freshwater resources, 4.18 lakh ha of brackish water resources and 480 Kms. of coastline. Odisha is one of the major fish producing states and ranks 4th in total fish production in India after Andhra Pradesh, West Bengal and Karnataka (MoFAHD, 2023-24). There is a four-fold increase in total fish production in the state over the last 21 years. Among the 33 districts of Odisha state, Ganjam district contributes 5525

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MT of fish from 1929.24 ha of water area in terms of pond and tanks and is considered to be one of the potential aquaculture resources districts of the state. Being a resource rich district, it provides an excellent employment opportunity to rural poor and to meet the growing demand for fish. Despite several efforts, the adoption rate is beyond governmental expectations. Adoption of scientific fish farming practices by the farmers is of paramount importance for bridging this gap (Varshney et al., 2020). The recent measures therefore have targeted intensive aquaculture in ponds and tanks through integrated fish farming, carp polyculture and running water fish culture (DADF, 2019). Composite carp culture is defined as the culture in which more than one type of compatible fishes is cultured simultaneous and it enables to get maximum fish production from a pond through utilization of available fish food organisms in all the natural niches. Depending on the compatibility and type of feeding habits of the fishes, it involves stocking of Indian major carps (IMCs) such as catla (*Catla catla*), rohu (*Labeo rohita*), and mrigal (*Cirrhinus mrigala*) as well as three other exotic carps *viz*, silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*) and common carp (*Cyprinus carpio*). These three IMCs contribute the major chunk of the freshwater aquaculture production followed by the exotic carps forming the second important group (Rutayisire et al., 2017). It is crucial to gain a deeper understanding of how to motivate farmers to adopt fish production. Identifying the socio-psychological factors and beliefs that influence farmers' intentions to engage in fish farming can offer valuable insights. These insights can guide the development and refinement of existing policies to better support adoption efforts. With this objective, the study has been undertaken.

METHODOLOGY

The study was carried out in Ganjam district of Odisha. Ganjam district was selected purposively for being one of the top potential fishery districts of the state contributing 8-9% of fish production of the state (MoFAHD, 2023-24). Ganjam district comprises of twenty-two community development blocks out of which three blocks namely Chhatarpur block, Bhanjanagar block and Purushottam block were selected on random sampling basis and five villages from each block were selected randomly; thus, a total of 15 villages were covered. From each village (15 villages), 8 farmers were chosen as respondents following random sampling technique making total 120 respondents for the present study. Primary data were collected through a pre-tested structured interview schedule. This study uses the theory of planned behavior (TPB) to understand farmers' motivation to adopt fish production. TPB offers an empirically supported framework where intention is the main predictor of behavior (Ajzen, 2012 & Hagger et al., 2018). Intention is influenced by three factors: attitude (positive or negative evaluation of the behavior), subjective norms (perceived social support), and perceived behavioral control (belief in one's ability to perform the behavior). This helps explain what drives farmers to engage in fish production. The TPB postulates that to change behaviour, beliefs underlying that behaviour need to be changed (Ajzen & Schmidt, 2020). Specifically, those beliefs that are most salient for people are the best candidates to address in an intervention targeted to change behaviour, because salient beliefs are the considerations that lead people to engage or not engage in a particular behaviour (Yzer & Gilasevitch, 2019). Hence, identifying the salient behavioural beliefs, normative beliefs and control beliefs that represent factors that would facilitate farmers to adopt fish production is of vital importance. Seventeen statements were taken under the five components of intention, attitude, subjective norm, perceived behavioural control and self-identity following the scale developed by Silva et al. (2020). The farmers were asked to respond to each statement in a 5-point continuum, the frequency was recorded. The mean score was then worked out and presented in Table 1. The range of behavioural intention score was from 17 (Minimum score) to 85 (Maximum score). For each respondent, the total score was calculated and it was divided into three categories using arbitrary method. The categories are i.e. low (d"67 score), medium (67-75 score) and high (e"75 score). The respondents were categorized accordingly.

RESULTS

Behavioural intention of fish farmers

Behavioural intention of fish farmers reflects the extent to which individuals were motivated to perform a given behaviour and was conceptualized as the most proximal antecedent of behaviour. It is believed that behavioural intention is one of the important factors to accelerate the farmers to adopt new technology. It was observed from Table 1 that attitude plays a vital role in shaping the behavioural intention of the farmers with highest average mean score 4.31 while majority of respondent have agreed with the statement that "adopting carp polyculture is more advantageous than monoculture" (mean score 4.54) and ranked I from the statements of attitude category which is important to motivate the farmers to adopt composite carp culture. Intention serves as the immediate precursor to the actual behaviour of farmers with average mean score 4.29 where majority of the fish farmers have agreed with the statement that they intend to adopt fish production in the next years. As per the respondent farmers, self-identity also plays a vital role, which refers to how individuals perceive themselves in relation to a specific behaviour, it encompasses the personal beliefs and self-conceptions that influence their intentions to engage in that behaviour, with average mean score of 4.12. The other factors influencing the behavioural intention were Subjective Norm and Perceived Behavioural Control with average mean score of 3.90 and 3.85 respectively.

Level of behavioural intention of the respondents

The range of behavioural intention score was from 17 to 85. For each respondent, the total score was calculated and it was divided into three categories using arbitrary method. The categories are i.e. low (≤67 score), medium (67-75 score) and high (≥75 score). The respondents were categorized accordingly and is presented in the table below. It is depicted that, 46.66% of the respondents had medium level of behavioural intention followed by 41.67% respondent farmers having high level and 11.67% having low level behavioural intention respectively.

Table 1. Behavioural Intention of fish farmers

Item	Statement	Mean Score	Rank
INT1	Do you plan to start producing fish in the upcoming years?	4.38	I
INT2	How much sure is your intention for carp polyculture in the next years?	4.23	III
INT3	How likely is it that you will adopt carp polyculture in the next years?	4.28	II
	Average mean score	4.29	
ATT1	Adopting carp culture is more advantageous than monoculture.	4.54	I
ATT2	Carp polyculture is a viable business with tangible results.	4.52	IV
ATT3	In carp polyculture the resources are used efficiently.	4.09	III
ATT4	Carp polyculture addresses food insecurity.	4.11	II
	Average mean score	4.31	
SN1	The majority of your important people believe that you should start carp polyculture in the coming years.	4.14	I
SN2	The majority of people whose opinions you respect would be in favor of you adopting carp polyculture in the upcoming years.	4.08	II
SN3	In the coming years, the majority of farmers like you will switch to carp polyculture.	3.39	IV
SN4	The adoption of fish production in the upcoming years would be approved by those involved in the fish supply chain.	4.00	III
	Average mean score	3.90	
PBC1	Adopting carp polyculture in the next years is completely up to you.	3.93	III
PBC2	You have the ability to adopt carp polyculture in the coming years.	4.15	II
PBC3	You possess adequate resources (financial and knowledge) to support fish production during this period.	4.23	I
PBC4	It is very easy to adopt fish production in the next years.	3.09	IV
	Average mean score	3.85	
SI1	You picture yourself as a fish farmer in the future.	4.00	II
SI2	Becoming a fish farmer is a key part of your goals and dreams for what lies ahead.	4.25	I
	Average mean score	4.12	

N: B- *INT- Intention, *ATT- Attitude, *SN- Subjective Norm, *PBC- Perceived Behavioural Control, *SI- Self Identity

(Max-5, Min-1)

Relationship of behavioural intention with the selected independent variables

The relationship between selected socio-economic characteristics of fish farmers and their behavioural intention was worked out by correlation coefficient and the computed 'r' values are presented in Table 2. The table indicates that six variables such as area under fish farming (X_6), information source utilization (X_8), participation in extension activities (X_{10}), innovativeness (X_{11}), risk preference (X_{12}) and economic motivation (X_{14}) showed a highly significant and positive relationship at 5% level whereas, scientific orientation (X_{13}) and knowledge level (X_{15}) showed significant and positive relationship at 1% level. Information sources utilization of the fish farmers had a positive and significant correlation with the behavioural intention. Six variables such as education (X_2), family type (X_3), family size (X_4), experience in fish farming (X_5), Annual income (X_7) and social participation (X_9) were found to have non-significant relationship. Age (X_1) was found to have a negative as well as significant relation-ship with the behavioural intention of fish farmers.

DISCUSSION

From the behavioural intention of the farmers, it is observed that attitude of fish farmers plays a crucial role in their behavioural intention to adopt composite carp culture, with the ranking of attitudes as the most influential factor. As the strong positive attitude among fish farmers regarding the advantages of adopting composite carp culture emphasizes the critical role of perception in shaping behavioural intention of farmers. The next most influential factor was intention which is defined as a person's readiness or willingness to perform a specific behaviour. As comparatively less farmers were agreed with these factors which having several

Table 2. Correlation analysis of selected independent variables with the behavioural intention of fish farmers to adopt carp culture

Independent Variables	Correlation Coefficient (r)
Age (X_1)	-0.238*
Education (X_2)	0.081 ^{NS}
Family type (X_3)	-0.195^{NS}
Family size (X_4)	-0.147^{NS}
Experience in fish farming (X_5)	0.264 ^{NS}
Area under fish farming (X_6)	0.302**
Annual income (X_7)	0.174^{NS}
Information source utilization (X_8)	0.367**
Social participation (X_9)	0.142^{NS}
Participation in extension activities (X_{10})	0. 561**
Innovativeness (X_{11})	0.576**
Risk preference (X_{12})	0.265**
Scientific orientation (X_{13})	0.321*
Economic motivation (X_{14})	0.483**
Knowledge level (X_{15})	0.615*

** Significant at 5% level of significance; * Significant at 1% level of significance, NS-non-significant

implications for the adoption of scientific practices in aquaculture, they might lack the motivation that require substantial time, effort, and resources. Similar findings were reported by Lokman et al. (2024); Tunca et al. (2024); Argade et al. (2023); Brugere et al. (2021) and Borges et al. (2019). Inviting successful local fish farmers to share their experiences can help create role models and inspire others. Establishing or strengthening local fish farming associations that encourage networking, collaboration, and collective learning. This can help farmers develop a sense of belonging and commitment to the profession. Similar findings were reported by Rise et al. (2010). Regarding the results from the association between selected independent variables and behavioural intention, Information sources utilization of the fish farmers had a positive and significant correlation with the behavioural intention. Fish farmers gained valuable knowledge about fish culture practices from various sources, which also helped them understand the important roles of training, credit, and subsidies. The behavioural intentions of the respondents were significantly influenced by their participation in extension activities. Farmers who engaged with social systems beyond their immediate environment had better opportunities to interact, exchange ideas, and share experiences with others (Niangati et al., 2025). Policymakers should prioritize strengthening extension channels and providing adequate resources to improve communication among fish farmers, thereby boosting productivity and promoting sustainability in the fisheries sector (Mondal et al., 2024). Innovativeness is linked to a person's willingness to embrace changes that lead to adopting new ideas and methods in scientific fish culture. People with a strong inclination toward innovation usually have a higher risk tolerance. It can be concluded that those who are more risk-oriented tend to adopt new practices more readily. Interestingly, fish farmers adopted scientific fish culture despite the inherent risks involved in the enterprise. A strong and significant positive relationship was found between economic motivation and the behavioral intention of fish farmers, which also encouraged other motives, including psychological ones, to adopt more productive and profit-driven strategies. This practice supports the efficient use of all ecological zones within the pond, enhances the maximum standing crop, and empowers rural youth, ultimately improving food and nutritional security (Prakash et al., 2018). The size of the pond significantly influenced the behavioural intention of fish farmers, indicating that larger water bodies encourage the adoption of scientific fish farming practices. Age showed a significant negative relationship with behavioural intention, as younger farmers were more enthusiastic and eager to learn and apply scientific technologies. The findings were in accordance with the findings reported by Goswami et al. (2012).

CONCLUSION

The findings revealed that farmers' intentions are significantly shaped by factors such as perceived usefulness, ease of implementation, economic benefits, social influence, access to technical knowledge, and institutional support. Farmers who perceive carp polyculture as a profitable and sustainable aquaculture practice are more likely to develop a positive intention toward its adoption. The study further highlights the importance of extension services, training programmes, and access to reliable information in enhancing farmers' confidence and willingness to adopt improved fish farming practices. Social networks and the experiences of fellow farmers also play a crucial role in influencing adoption decisions. The adoption of appropriate management and adaptation strategies in composite carp culture not only enhances farmers' economic well-being but also contributes to food security, rural development, and the long-term resilience of aquaculture systems.

DECLARATIONS

Ethical approval and consent to participate: Informed consent was obtained from all respondents prior to data collection.

Consent for publication: All participants provided their consent for the publication of the data included in this study.

Competing interests: The authors declare that they have no competing interests.

Conflict of interest: The authors declare that there is no conflict of interest regarding the publication of this paper. All authors have critically reviewed, revised, and approved the manuscript and take full responsibility for its content.

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