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Awareness and Extent of Adoption of Sustainable practices in Fisheries by Fishermen

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ABSTRACT

Sustainable fishing practices are essential for preserving aquatic ecosystems and ensuring long-term fishery viability. This study assesses the awareness and adoption of sustainable practices among fishermen in Telangana, India. A stratified sampling method was employed across six districts, surveying 240 fishermen. Findings indicate that while awareness of sustainable practices is moderate, adoption levels remain relatively low due to factors such as limited extension services, economic pressures, and educational constraints. Key determinants of awareness and adoption include fishing experience, extension contact, and market orientation. The study underscores the need for enhanced extension services and policy interventions to promote sustainability in fisheries.

Keywords: *Sustainable fisheries, Inland fisheries, Awareness, Adoption, Fishermen, Telangana*

INTRODUCTION

Sustainable fishing practices are critical in maintaining the health of aquatic ecosystems, ensuring fish stocks remain viable, and supporting the livelihoods of communities dependent on fisheries. Fisheries in India, including those in the state of Telangana, face significant challenges due to overfishing, habitat degradation, and the lack of awareness and adoption of scientifically based, sustainable management practices. In Telangana, the fisheries sector plays a vital role in the socio-economic development of the rural population, with thousands of fishermen dependent on this industry. However, the extent to which sustainable practices are adopted among the fishermen in Telangana remains unclear. The adoption of sustainable fisheries practices is influenced by several factors, including knowledge, awareness, economic pressures, and the availability of extension services [4,5].

The awareness and extent of adoption of sustainable practices in the fisheries sector in Telangana, as studied in this research, is of paramount importance. The study assesses the level of awareness and adoption of sustainable fishing practices by fishermen in Telangana, aiming to highlight key challenges and opportunities for improving sustainability. The methodology employed involved a stratified sampling technique across six districts, with a sample of 240 fishermen representing various regions with differing fisheries and aquaculture activities. The study explores the correlation between fishermen's awareness of scientific practices in fisheries and the extent of their adoption of these practices, identifying key barriers and facilitators of sustainable practices.

Sustainable practices in fisheries, as outlined by the Food and Agriculture Organization [10], include practices like observing closed seasons, regulating fishing capacities, enforcing minimum catch sizes, and promoting the conservation of aquatic habitats. However, despite global recognition of these practices, adoption rates among fishermen, especially in regions like Telangana, are often low due to factors such as limited education, lack of extension services, and economic motivations that prioritize short-term gain over long-term sustainability [14]. This study aims to investigate how these factors impact the awareness and adoption of sustainable practices and to propose recommendations for policy and extension services to increase the adoption of such practices in Telangana's fisheries.

LITERATURE REVIEW

Research on sustainable fisheries management has highlighted the importance of awareness campaigns and the role of education in fostering the adoption of sustainable practices among fishermen. A study by [13] found that fishermen with higher levels of education and access to extension services were more likely to adopt sustainable practices, as they had a better understanding of the long-term benefits of such practices for both the environment and their livelihoods. Conversely, fishermen with limited education and fewer opportunities for training often prioritize immediate economic returns over sustainability.

Similarly, [5] emphasized that while awareness of sustainable practices is a crucial first step, it does not always translate into adoption.

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Their study in Nepal suggested that economic incentives, community involvement, and the availability of financial support for adopting sustainable practices significantly enhanced the rate of adoption among fishermen. This finding supports the notion that adoption is not solely a function of awareness but also socio-economic and institutional factors.

In the context of India, [24] explored the adoption of sustainable fisheries practices in various states, including Telangana. Their findings indicated that while awareness of sustainable practices was generally high, the adoption rates were low, particularly for practices requiring significant financial investment or changes in traditional fishing methods. The study concluded that a more integrated approach, combining education, policy support, and financial incentives, was needed to enhance the adoption of sustainable practices.

Research Objectives

This study focuses on the following objectives:

1. To assess the awareness levels of fishermen regarding sustainable practices in fisheries.
2. To evaluate the extent of adoption of these practices among fishermen in Telangana.
3. Relationship between profile characteristics of fishermen with awareness and adoption of sustainable practices in fisheries

METHODOLOGY

The Telangana state was chosen as the locale of the study. The existing 31 districts of the state are divided into three nearly homogeneous strata (each stratum with a given number of districts10-11-10) based on climate, rainfall, soil quality, resource spread, intensity and diversity of fisheries and aquaculture activities. For sampling, two districts from each stratum were selected in consultation with the Department of Fisheries. Thus six districts were selected for study. Karimnagar, Nizambad, Medak, Wanaparthy, Mahabubabad and Yadadri Bhuvanagiri districts were selected. Forty fishermen were selected from each of the selected districts purposively based on availability of aquatic resources.Thus, constituting a total of Two hundred and forty fishermen. Fishermen was operationalised as 'a registered member of fishermen cooperative society and are eligible for capturing fish in river, lake, tank, reserviour etc'. Ex-post facto research design was adopted in this study. The data was collected with the help of pretested interview schedule. The statistical methods and tests such as frequency, percentage, correlation and regression technique were used for the analysis of data.

In the present study adoption refers to the extent to which a practice on sustainable management in fisheries was in use by the respondents at the time of investigation. Awareness was operationalized as the degree to which the respondents had information related to scientific practices in fisheries.

Based on the review of literature and discussions with experts, major practices were documented. The selected major practices would reflect different aspects of adoption by the respondents. The Performa containing practices of adoption was given to 30 judges personally and 50 judges utilizing google forms for their judgment. The evaluation was obtained from experienced and senior behavioural scientists in the field of Social Science, Extension Education and professionals from the Department of Fisheries. Experts were asked to assess the relevancy of practices and sub practices. The degree of relevancy of each practice and sub practice was measured on a three-point continuum.

The comparative scores of 3, 2 and 1 were assigned for the “most relevant" (MR), “relevant" (R) and "not relevant" (NR) responses, respectively. Out of 50 judges (google forms), 21 judges had returned the Performa after duly recording their judgments in a stipulated span of one month. A total of fifty one responses were found to be appropriate for the item analysis.

Practices were subjected to an expert panel of judges to indicate their relevancy on the three-point continuum (*'Most Relevant'*, *'Relevant'* and *'Not Relevant'* and scored as 3, 2 and 1 respectively). Appropriateness of each practice and sub practice was defined with relevancy weightage (RW), relevancy per cent (RP) and mean relevancy score (MRS), using the following formulae given by Chaudhari *et al.,* (2007).

$$\text{Relevancy Weightage of } i^{th} \text{ indicator } (RW_i) = \frac{(MRX3)+(RX2)+(NRX1)}{\text{maximumpossiblescore}}$$

$$\text{Relevancy per cent of } i^{th} \text{ indicator } (RP_i) = \frac{(MRX3)+(RX2)+(NRX1)}{\text{maximumpossiblescore}} \text{ X } 100$$

$$\text{Mean Relevancy Score of } i^{th} \text{indicator } (MRS_i) = \frac{(MRX3)+(RX2)+(NRX1)}{\text{numberofjudgesresponded}}$$

Considering the calculated values, the practices were screened for their relevancy, having RW of more than 0.75, RP of more than 75.00 per cent and MRS of more than 2.25 were considered. Through the process, final practices were selected and modified as per the opinion of judges. For the adoption of sustainable practices in fisheries by fishermen, thirteen practices were finally selected.The practices finalized for adoption were used for awareness also.

Fishermen's responses were recorded on a three-point continuum viz., full adoption (3), partial adoption (2), and non-adoption (1). The summated scores were used to categorize respondents into high, medium, and low adoption levels based on quartile deviation.

RESULTS AND DISCUSSION

Based on the results presented in Table 1, the findings indicate that among the surveyed fishermen, approximately 46.67 percent had a medium level of awareness regarding scientific practices in fisheries, while 32.08 percent had a low level and 21.25 percent had a high level of awareness. In terms of adoption of scientific practices, 40.00 percent of the fishermen exhibited a medium level of adoption, followed by 35.83 percent with a low level and 23.75 percent with a high level of adoption. These findings align with [16], who also found that a significant portion of fishermen in rural regions exhibit moderate awareness regarding sustainable aquaculture practices due to limited access to information.

The lower to medium level of awareness was attributed to two main factors. Firstly, there appears to be a lack of sufficient extension staff and limited contact with extension services. This hinders the dissemination of information and knowledge about scientific fishing practices to the fishermen. [25] emphasize that extension services play a critical role in transferring knowledge to local communities, particularly in rural areas where access to information is limited. In line with this, [23] found that inadequate extension services significantly impact the awareness of fishermen regarding sustainable fishing practices. Secondly, the fishermen's education level seems to play a role, as those with lower education levels have limited exposure to information regarding the importance of sustainable fishing practices. This finding is consistent with [23] study, which indicates that fishermen with higher education levels are more likely to adopt sustainable practices.

Similarly, the lower to medium level of adoption of scientific fishing practices was attributed to several reasons. One key factor was the lack of awareness among the fishermen regarding the significance of scientific practices in fisheries. This lack of awareness stems from the same issues mentioned earlier, such as limited extension services and educational limitations. [20] highlighted that without proper awareness, even when sustainable practices are available, fishermen may not be inclined to adopt them. Another factor influencing adoption might be the economic motivation of the fishermen. The higher the economic motivation, the greater the focus on maximizing fish catch, which results in unsustainable fishing practices. [11] also discuss how economic pressures often overshadow long-term sustainability goals, as fishermen prioritize immediate economic returns over environmentally friendly practices.

Table 1. Categorization of fishermen based on their awareness and the extent of adoption of scientific practices in fisheries

S.No.	Category	Fishermen (n=240)			
		Awareness		Adoption	
		F	%	F	%
1.	Low	77	32.08	86	35.83
2.	Medium	112	46.67	97	40.42
3.	High	51	21.25	57	23.75
	Total	240	100	240	100
Awareness : Q1 (25th percentile) = 18 , Q3(75th percentile) = 23 Adoption : Q1 (25th percentile) = 19, Q3 (75th percentile)= 30					

Additional information provided in Table 2 reveals the distribution of fishermen's awareness and adoption of specific scientific practices in fisheries. All surveyed fishermen were found to be aware of practices such as "observing closed season" and closed areas, as well as "minimum catch size for inland fishes." Additionally, 87.92 percent of the fishermen were aware of "fishing capacity regulation/license for craft and gear." However, the awareness levels were relatively low for practices such as "license for all aquaculture units to control the introduction of exotic predatory fish" (9.58%) and "restoring connection between isolated ponds and open water bodies for facilitating breeding migration" (12.92%). [3] found that awareness of sustainable practices can vary significantly across different types of fishing practices, with more prominent regulations receiving more attention.

Regarding the adoption of scientific fishing practices, all fishermen had fully adopted the practice of "observing closed season and closed areas." A considerable number of fishermen (63.75%) also adopted the practice of "stocking & ranching," followed by 49.58% who adopted the practice of "minimum catch size for inland fishes." However, none of the surveyed fishermen had fully adopted the practices of "community pond/cages for fattening live juveniles of fishes landed in fishing gear" and "restoring connection between isolated ponds and open water bodies for facilitating breeding migration." [18] reported similar findings where practices that involved more immediate and direct benefits, such as "closed season," were adopted more frequently, whereas practices requiring higher investments or more complex techniques faced greater barriers to full adoption.

The variation in awareness levels among different scientific practices can be attributed to several factors. Practices that were more widely known and emphasized, such as "observing closed season" and "minimum catch size for inland fishes," were likely to have higher awareness levels due to their prominence in regulations and awareness campaigns. On the other hand, practices with lower awareness levels, such as "license for all aquaculture units to control the introduction of exotic predatory fish" and "restoring connection between isolated ponds and open water bodies for facilitating breeding migration," received less attention in terms of information dissemination and education initiatives. [2] also highlighted that awareness levels are often influenced by the intensity and frequency of campaigns and local regulations that focus on specific practices.

The level of adoption of different scientific practices was influenced by various factors. Practices that were relatively easier to implement or have immediate economic benefits, such as "observing closed season and closed areas," had higher adoption rates. Practices that require significant investment, changes in fishing techniques, or collaboration with other stakeholders face more challenges in terms of full adoption, as seen with "community pond/cages for fattening live juveniles of fishes landed in fishing gear" and "restoring connection between isolated ponds and open water bodies for facilitating breeding migration." [19] argue that the economic feasibility and perceived short-term benefits are critical factors that determine the rate of adoption of sustainable practices in fisheries.

Table 2.Distribution of fishermen based on their awareness and the extent of adoption of scientific practices in fisheries (n=240)

S.No	Statements	Aware		Adoption			Mean	Rank	Gap %
		Yes	No	FA	PA	NA			
(i)	Fishing capacity regulation/ license for craft and gear	211 (87.92)	29 (12.08)	91 (37.92)	130 (54.17)	19 (7.92)	2.33	IV	22.33
(ii)	Avoidance/Prevention of destructive fishing gears and practices	123 (51.25)	117 (48.75)	96 (40.00)	58 (24.17)	86 (35.83)	2.07	V	31.00
(iii)	Mesh size regulation	42 (17.50)	198 (82.50)	29 (12.08)	76 (31.67)	135 (56.25)	1.33	XI	55.67
(iv)	Minimum catch size for inland fishes	240 (100.00)	0 (0.00)	119 (49.58)	70 (29.17)	51 (21.25)	2.80	II	6.67
(v)	Observing closed season and closed areas	240 (100.00)	0 (0.00)	240 (100.00)	0 (0.00	0 (0.00)	3.00	I	0.00
(vi)	Discouraging use of mosquito nets/ destructive fishing gears	133 (55.42)	107 (44.58)	81 (33.75)	93 (38.75)	66 (27.50)	1.60	VIII	46.67
(vii)	Community pond/cages for fattening live juveniles of fishes landed in fishing gear	21 (8.75)	219 (91.25)	0 (0.00)	61 (25.42)	179 (74.58)	1.33	XI	55.67
(viii)	Species enhancement in selected water bodies	63 (26.25)	177 (73.75)	32 (13.33)	83 (34.58)	125 (52.08)	1.60	VIII	46.67
(ix)	Prevent habitat degradation process	143 (59.58)	97 (40.42)	73 (30.42)	96 (40.00)	71 (29.58)	1.93	VII	35.67
(x)	Banning of fish seed collection from natural waters	167 (69.58)	73 (30.4)2	99 (41.25)	63 (26.25)	78 (32.50)	2.07	V	31.00

(xi)	Stocking & ranching	189 (78.75)	51 (21.25)	153 (63.75)	49 (20.42)	38 (15.83)	2.40	III	20.00
(xii)	Restoring connection between isolated ponds and open water bodies for facilitating breeding migration	31 (12.92)	209 (87.08)	13 (5.42)	51 (21.25)	176 (73.33)	1.53	X	49.00
(xiii)	License for all aquaculture units to control the introduction of exotic predatory fish	23 (9.58)	217 (90.42)	0 (0.00)	0 (0.00)	240 (100.00)	1.00	XIII	66.67

Relationship between profile characteristics of fishermen with awareness on sustainable practices in fisheries

It could be observed from Table 3 that, out of 12 independent variables studied, 7 variables were positively and significantly correlated with awareness of sustainable practices in fisheries, while 5 variables were found to have a non-significant relationship.

The variables occupation (X3), economic motivation (X7), and market orientation (X9) had a significant relationship at the 5 percent level of significance, while the variables fishing experience (X4), extension contact (X6), group cohesiveness (X11), and group leadership (X12) showed a highly significant relationship at the 1 percent level of significance with awareness of sustainable practices in fisheries. These findings are consistent with previous studies, which have highlighted the role of professional engagement and socio-economic factors in influencing sustainable practice awareness [15,21].

Conversely, variables such as age (X1), education (X2), annual income (X5), risk orientation (X8), and innovativeness (X10) had no significant relationship with awareness of sustainable practices in fisheries. This suggests that awareness is influenced more by occupational and social interaction factors rather than demographic attributes [22].

Factors Influencing Awareness of Sustainable Practices in Fisheries

Occupation (X3), Economic Motivation (X7), and Market Orientation (X9): The significant relationship at the 5 percent level suggests that individuals engaged in specific occupations, those with higher economic motivation, and those who are market-oriented are more likely to be aware of scientific practices in fisheries. Market-driven individuals are likely exposed to technological advancements and sustainable practice awareness through competitive industry trends and regulatory requirements [1].

Fishing Experience (X4), Extension Contact (X6), Group Cohesiveness (X11), and Group Leadership (X12): The highly significant relationships at the 1 percent level indicate that individuals with more fishing experience, greater extension contact, stronger group cohesiveness, and effective group leadership are more aware of sustainable practices. Studies have shown that experienced fishermen are more likely to adopt sustainable practices due to their direct interactions with resource availability changes over time [9]. Furthermore, extension services play a crucial role in information dissemination and capacity-building among fishing communities [8].

Age (X1), Education (X2), Annual Income (X5), Risk Orientation (X8), and Innovativeness (X10): The lack of significant relationships between these variables and awareness of scientific practices in fisheries suggests that demographic factors alone do not determine sustainable practice awareness. This supports findings from previous research that highlights the complexity of adoption behaviours in fisheries [6].

Extent of Contribution of Profile Characteristics to Awareness of Sustainable Practices in Fisheries

A close examination of Table 3 reveals that four variables, namely extension contact, economic motivation, and group cohesiveness, were significant in multiple regression analysis.

Further, it may be observed from Table 3 that 54.9 percent of the variation in awareness of sustainable practices in fisheries could be explained by all the 12 variables included in the study. The R-squared value of 0.549, with a significant 'F' value (16.56*), confirms the significance of regression at the 5 percent level. This aligns with previous studies demonstrating that socio-economic factors and external advisory services significantly influence sustainable practice adoption [12].

Relationship between Profile Characteristics of Fishermen and Adoption of Sustainable Practices in Fisheries

From Table 3, it can be observed that 8 out of 12 independent variables were positively and significantly correlated with the adoption of sustainable practices in fisheries, while 4 variables had a non-significant relationship.

The variable extension contact (X6) had a significant relationship at the 5 percent level of significance, while the variables occupation (X3), fishing experience (X4), annual income (X5), economic motivation (X7), market orientation (X9), group cohesiveness (X11), and group leadership (X12) showed highly significant relationships at the 1 percent level with the adoption of sustainable practices in fisheries. Previous research has highlighted similar trends, suggesting that economic incentives, market exposure, and strong group dynamics contribute to the uptake of sustainable fisheries management practices [7].

Relationship of profile characteristics of fishermen with awareness and adoption of sustainable practices in fisheries

S. No.	Profile characteristics	'r' value	'r' value
		Awareness	Adoption
X_1	Age	0.118	0.113
X_2	Education	0.095	0.182
X_3	Occupation	0.519*	0.821**
X_4	Fishing experience	0.862**	0.881**
X_5	Annual income	0.351	0.765**
X_6	Extension contact	0.795**	0.552*
X_7	Economic motivation	0.558*	0.661**
X_8	Risk orientation	0.511	0.441
X_9	Market orientation	0.621*	0.765**
X_{10}	Innovativeness	0.457	0.309
X_{11}	Group cohesiveness	0.866**	0.844**
X_{12}	Group Leadership	0.741**	0.811**

***Significant at 0.01 level *Significant at 0.05 level NS- Non-significant*

It could be observed from Table 3 that, out of 12 independent variables studied, 7 variables were positively and significantly correlated with awareness of sustainable practices in fisheries, while 5 variables were found to have a non-significant relationship.

The variables occupation (X3), economic motivation (X7), and market orientation (X9) had a significant relationship at the 5 percent level of significance, while the variables fishing experience (X4), extension contact (X6), group cohesiveness (X11), and group leadership (X12) showed a highly significant relationship at the 1 percent level of significance with awareness of sustainable practices in fisheries. These findings are consistent with previous studies, which have highlighted the role of professional engagement and socio-economic factors in influencing sustainable practice awareness [15,21].

Conversely, variables such as age (X1), education (X2), annual income (X5), risk orientation (X8), and innovativeness (X10) had no significant relationship with awareness of sustainable practices in fisheries. This suggests that awareness is influenced more by occupational and social interaction factors rather than demographic attributes [22].

Factors Influencing Awareness and Adoption of Sustainable Practices in Fisheries

Occupation (X3), Fishing Experience (X4), Annual Income (X5), Economic Motivation (X7), Market Orientation (X9), Group Cohesiveness (X11), and Group Leadership (X12): The highly significant relationships at the 1 percent level indicate that individuals with specific occupations, more fishing experience, higher annual income, stronger economic motivation, market-oriented attitudes, and better group cohesiveness and leadership are more likely to adopt sustainable practices in fisheries. These factors may contribute to increased awareness, resources, incentives, and social support for sustainable practices [1].

Extension Contact (X6): The significant relationship at a 5 percent significance level suggests that individuals with greater extension contact are more likely to adopt sustainable practices in fisheries. This implies that access to extension services, which provide information, guidance, and support, can play a role in promoting the adoption of sustainable practices [9].

Age (X1), Education (X2), Risk Orientation (X8), and Innovativeness (X10): The lack of significant relationships between these variables and the adoption of sustainable practices in fisheries suggests that factors such as age, education, risk orientation, and innovativeness might not have a direct impact on adoption. This supports findings from previous research highlighting the complexity of adoption behaviours in fisheries [6].

Extent of Contribution of Profile Characteristics to Awareness and Adoption of Sustainable Practices in Fisheries

A close examination of Table 3 reveals that seven variables, namely education, fishing experience, economic motivation, market orientation, innovativeness, group cohesiveness, and group leadership, were significant in multiple regression analysis.

Further, it may be observed from Table 3 that 72.6 percent of the variation in the adoption of sustainable practices in fisheries could be explained by all the 12 variables included in the study. The R-squared value of 0.726, with a significant 'F' value (24.31**), confirms the significance of regression at the 1 percent level. This aligns with previous studies demonstrating that socio-economic factors and external advisory services significantly influence sustainable practice adoption [12].

CONCLUSION

The study revealed that the majority of fishermen in Telangana exhibit a medium level of awareness and adoption of scientific fishing practices, with key factors influencing these outcomes being limited extension services, lower education levels, and economic motivations. Awareness and adoption were positively influenced by factors such as fishing experience, extension contact, economic motivation, and group cohesiveness. While all fishermen were aware of practices like observing closed seasons and minimum catch size regulations, adoption varied widely depending on the ease of implementation and economic benefits. The findings highlight the importance of strengthening extension services and enhancing education to promote greater adoption of sustainable practices, which would contribute to the long-term sustainability of the fisheries sector in Telangana.

CONLICTS OF INTEREST: All authors declare that they have no conlicts of interest.

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