ADOPTION OF SCIENTIFIC PRACTICES IN FISH FARMING IN TELANGANA STATE, INDIA

ABSTRACT

The study was undertaken in six districts of Telangana state *viz.* Karimnagar, Kamareddy, Medak, Wanaparthy, Mahabubabad and Yadadri Bhuvanagiri during 2019-2022 with an aim to study the extent of adoption of scientific fish farming practices. Ten fish farmers were selected from each of the selected districts using simple random sampling technique thus constituting 60 fish farmers. A structured questionnaire was used to collect responses about the adoption of scientific fish farming specifically based on preliminary survey as well as focus group discussions. The results depicted that nearly half (48.33%) had medium level of adoption followed by high (38.33%) and low (13.34%) level of adoption respectively. The variables such as fish farming experience, annual income, Pond size, Economic motivation and innovativeness reflected the strong association and effect on the extent of adoption.

Key words: Adoption, fish farmer, fish pond, Inland fisheries, scientific practices

INTRODUCTION

Fisheries and aquaculture is one of the fastest-growing industries in the World (Tacon, 2020) and has been playing an important role in the economic development front on account of its contribution to food and nutritional security, national income, employment opportunities as well as generating livelihood options (Kumar and Shivani, 2014). It is the primary source of animal protein for billions of people Worldwide, where capture fishery and aquaculture serves the livelihoods of more than 10% of the global population (Anonymous, 2020b). Fisheries and aquaculture supplies not only dietary essentials for human consumption, but also provides excellent opportunities for employment and income generation, especially in the more economically backward rural areas (Jayasankar, 2018).

India currently ranks 3rd in fisheries and 2nd in aquaculture production in the world, contributing 6.3% to the total global fish production (Anonymous, 2020a). Telangana, the youngest State in the Union of India, needs all round development and socially inclusive growth. Fisheries is one of the most important traditional occupation and is providing livelihoods to around 5 lakh families in the State apart from being an important source of food nutrient. Fisheries is one of the fast growing sectors generating income and employment in the state of Telangana. The sector is contributing 0.6 percent to the GSDP and plays an important role in the overall socio-economic development of fisher families in Telangana by providing nutrition & food security.

Inland fisheries in Telangana have been mostly confined to capture fisheries in reservoirs and tanks under lease/license system. With focus on enhancing irrigation and drinking water facilities in the form of irrigation projects in Krishna and Godavari river systems and Mission Kakatiya, a renewed focus is laid on improving the water storage capacity of water bodies thus increasing the water spread area (7.76 lakh ha). The fish production has increased from an estimated 1.93 lakh tonnes in 2016-17 to 2.94 lakh tonnes in 2018-19, catapulting the State to secure a spot among top five inland fish producing States in the country.

Although increase in water spread area, Productivity of fish will be improved only if fishermen / fish farmers are aware of scientific practices and adopting those practices. In this aspect the present article was focused on adoption of scientific fish farming practices.

MATERIALS AND METHODS

The Telangana state was chosen as the locale of the study. The existing 31 districts of the state were divided into three nearly homogeneous strata (each stratum with a given a number of districts 10-10-11) based on climate, rainfall, soil quality, resource spread, intensity and diversity of fisheries and aquaculture activities.

For sampling, two districts from each strata were selected in consultation with the Department of Fisheries. Thus six districts were selected for study. Karimnagar, Kamareddy, Medak, Wanaparthy, Mahabubabad and Yadadri Bhuvanagiri districts were selected. Ten fish farmers were selected from each of the selected districts using simple random sampling technique thus constituting 60 fish farmers. 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, regression were used for the analysis of data.

In the present study adoption refers to the extent to which a practice on scientific management in fish farming was in use by the respondent at the time of interview. Schedule was developed to measure the extent of adoption of scientific practices in fish farming.

Based on the review of literature and discussions with experts, various parameters with respect to fish farming were identified. The selected parameters and statements would reflect different aspects of adoption by respondents. The Performa containing parameters and respective statements of adoption was given to 30 judges personally 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 parameters and statements. The degree of relevancy of each parameter and statement had to be given 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. Appropriateness of each parameter and statement was defined with relevancy weightage (RW), relevancy per cent (RP) and mean relevancy score (MRS), using the following formulae used by Chaudhari *et al.,* (2007).

$$\text{Relevancy Weightage of } i^{th} \text{ indicator } (RW_i) = \frac{(MR \times 3)+(R \times 2)+(NR \times 1)}{\text{maximum possible score}}$$

$$\text{Relevancy per cent of } i^{th} \text{ indicator } (RP_i) = \frac{(MR \times 3)+(R \times 2)+(NR \times 1)}{\text{maximum possible score}} \times 100$$

$$\text{Mean Relevancy Score of } i^{th} \text{ indicator } (MRS_i) = \frac{(MR \times 3)+(R \times 2)+(NR \times 1)}{\text{number of judges responded}}$$

Considering the calculated values, the parameters 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 was considered. Through the process, final indicators and respective statements were selected and modified as per the opinion of judges. For adoption of scientific practices in fish farming a total of thirty statements concerning different practices/principles of fish farming under six parameters were finally selected.

The responses were elicited on three point continuum viz., full adoption, partial adoption and non-adoption with assigned score of three, two and one respectively. The summated score was worked out by totaling the scores on each of the statements, as adoption score of an individual. Based on the total scores of respondents they were further categorized into high adoption, medium adoption and low adoption categories taking into consideration the quartile deviation.

Table 1. List of Adoption and their criteria

S.No.	Category	Criteria
1.	Low adoption	Below lower quartile (Q_1) (25^{th} percentile)
2.	Medium adoption	Between Q_1 and Q_3(25_{th}&75_{th} percentile)
3.	High adoption	Above upper quartile (Q_3) (75_{th}percentile)

Adoption gap was computed as the difference between maximum obtainable score and obtained score of a practice and it was expressed in percentage. (Yadav, 2012).

RESULTS AND DISCUSSIONS

Adoption of the technology by the fish farmers depends greatly on the feasibility, sustainability, stability, compatibility, divisibility, simplicity, visibility and profitability parameters of the recommended technology. In order to assess the extent of adoption, various recommended practices under pond requirement, cultivable fish species, pre-stocking management, pond management, disease management, harvesting and post-harvesting management were taken into consideration and the responses about their adoption were recorded in a 3 point continuum and analysed. The results and discussion under different sub-heads were presented below.

Table.2 Distribution of fish farmers based on their extent of adoption of scientific practices in fish farming

S.No	Statements	Adoption			Mean	Rank	Gap %
		FA	PA	NA			
i. Pond requirement							
(i)	Having pond size of 0.2 to2 ha	49 (81.67)	11 (18.33)	0 (0.00)	2.7	IV	10.00
(ii)	Maintaining depth of water not more than 5ft	51 (85.00)	9 (15.00)	0 (0.00)	2.8	II	6.67
(iii)	Making bottom of pond sloppy for better drainage	60 (100.00)	0 (0.00)	0 (0.00)	3.0	I	0.00
(iv)	Restricting inflow of water from outside	48 (80.00)	12 (20.00)	0 (0.00)	2.8	II	6.67

(v)	Maintaining pond in good hygienic condition	39 (65.00)	21 (35.00)	0 (0.00)	2.4	V	20.00
ii. Cultivable fish species							
(i)	Using Catla-Rohu-Mrigal at 4:3:3 proportion	43 (71.67)	17 (28.33)	0 (0.00)	2.7	I	10.00
(ii)	Cultivating Grass carp and Silver carp with Common carp	35 (58.33)	19 (31.67)	6 (10.00)	2.5	II	16.67
(iii)	Cultivating prawns with fish	0 (0.00)	6 (10.00)	54 (90.00)	1.1	IV	63.33
(iv)	Pearl cultivation with fish	0 (0.00)	0 (0.00)	60 (100.00	1.0	V	66.67
(v)	Keeping air breathing fish species with carps	16 (26.67)	9 (15.00)	35 (58.33)	1.7	III	43.33
iii. Pre-stocking management							
(i)	Using mahua oil cake to kill unwanted species	0 (0.00)	0 (0.00)	60 (100.00)	1.0	VI	66.67
(ii)	Using lime @ 2.5 qt/ha per annum	23 (38.33)	37 (61.67)	0 (0.00)	2.4	III	20.00
(iii)	Using cow-dung as organic manure	44 (73.33)	16 (26.67)	0 (0.00)	2.7	I	10.00
(iv)	Growing dhaincha for manures	0 (0.00)	33 (55.00)	27 (45.00)	1.8	V	40.00
(v)	Eradicating predators and unwanted species	11 (18.33)	31 (51.67)	18 (30.00)	1.9	IV	36.67
(vi)	Releasing fingerlings at proper time	51 (85.00)	9 (15.00)	0 (0.00)	2.7	I	10.00
iv. Pond management							
(i)	Maintaining stocking density of 2000 fingerlings/ac of pond.	41 (68.33)	11 (18.33)	8 (13.33)	2.6	III	13.33
(ii)	Applying recommended dose of fertilizers	22 (36.67)	31 (51.67)	7 (11.67)	2.2	IV	26.67
(iii)	Intermediary netting to clear water and regulate fish movement	45 (75.00)	15 (25.00)	0 (0.00)	2.2	IV	26.67
(iv)	Applying lime at proper time and dose	50 (83.33)	10 (16.67	0 (0.00	2.7	II	10.00
(v)	Giving supplementary feeds as recommended	54 (90.00)	6 (10.00)	0 (0.00	2.9	I	3.33
(vi)	Removal of aquatic weeds (manually/mechanically)	0 (0.00)	49 (81.67)	11 (18.33)	1.9	VI	36.67
v. Disease management							
(i)	Applying proper control measures in disease attack	60 (100.00)	0 (0.00)	0 (0.00)	3.0	I	0.00
(ii)	Preventing cattle and human bathing	32 (53.33)	28 (46.67)	0 (0.00)	2.6	III	13.33
(iii)	Keeping pond always clean and in hygienic condition	60 (100.00)	0 (0.00)	0 (0.00)	3.0	I	0.00
vi. Harvesting and Post-harvesting management							

(i)	Harvesting of fish by netting only	43 (71.67)	17 (28.33)	0 (0.00)	2.2	III	26.67
(ii)	Harvesting at proper stage	50 (83.33)	10 (16.67)	0 (0.00	2.7	II	10.00
(iii)	Freezing the fish after harvest if required	0 (0.00)	19 (31.67)	41 (68.33	1.3	V	56.67
(iv)	Not harvest the fish by completely draining the water	43 (71.67)	17 (28.33)	0 (0.00)	2.1	IV	30.00
(v)	Disposing fish immediately after harvest	60 (100.00)	0 (0.00)	0 (0.00)	3.0	I	0.00

i. Adoption of pond requirement

Data from the table.2 revealed that, the practice of “making bottom of pond sloppy for better drainage” was fully adopted by cent per cent of fish farmers followed by “maintaining depth of water not more than 5feet” (85.00%), “having pond size of 0.2 to2 ha” (81.67%), “restricting inflow of water from outside” (80.00%) and “maintaining pond in good hygienic condition” (65.00%).

An adoption gap of 20.00% was found in keeping pond in “good hygienic condition”. This might be due to non-availability of sufficient pond and lack of technical know-how about pond hygiene. Sufficient training should be provided regarding pond hygiene to decrease the adoption gap.

ii. Adoption of cultivable fish species

Table.2 indicated that, 71.67 per cent of the fish farmers had fully adopted “culture of catla-rohu-mrigal at 4:3:3 proportion”. Next to this, 58.33 per cent of fish farmers had fully adopted composite fish culture of “cultivating grass carp and silver carp with common carp”. The percentage of non-adopters in “cultivating prawn with fish”, “pearl cultivation with fish” and “keeping air breathing fish species with carps” were 90.00, 100.00 and 58.33 per cent respectively.

The adoption gap of “pearl cultivation with fish, “cultivating prawn with fish” and “air breathing fish species with carps” were 66.67, 63.33 and 43.33 per cent respectively. The possible reason might be due to complexity of the technology and lack of acquaintance of the technology.

iii. Adoption of pre-stocking management

The data from the table.2, revealed that, the practice of "releasing fingerlings at proper time" and the practice of "using cow dung as organic manure" was fully adopted by 85.00 and 73.33 per cent of fish farmers respectively. This might be due to possession of sound knowledge about timing of release of fingerlings and their protection. The adoption gap of "using mahua oil cake to kill unwanted species" and "growing dhaincha for manures" were 66.67 and 40.00 per cent respectively. Knowledge and skill development about use of these locally available materials can decrease the adoption gap.

iv. Adoption of pond management

It was observed from the table.2. that, majority of the fish farmers (90.00%) had fully adopted the practice of "giving supplementary feeds as recommended" followed by "applying lime at proper time and dose" (83.33%), "intermediary netting to clear water and regulate fish movement" (75.00%), "maintaining stocking density of 2000 fingerlings per acre of pond" (68.33%) and "applying recommended dose of fertilizers" (36.67%). An adoption gap of 36.67 per cent was observed in "removal of aquatic weeds". This might be due to lack of awareness and knowledge about the damage caused by aquatic weeds and unavailability of suitable pond conditions.

v. Adoption of disease management

A look in to the table.2 indicated that, cent percent of fish farmers had fully adopted the practices like "applying proper control measures in disease attack" and "keeping pond always clean and in hygienic condition". While 53.33 per cent had fully adopted the practice of "preventing cattle and human bathing". The adoption gap of practice "preventing cattle and human bathing" was found to be 13.33 per cent. This happened solely due to social problems.

vi. Adoption of harvesting and Post-harvesting management

Data from the table.2 disclosed that, cent per cent of fish farmers had fully adopted the practice of "disposing fish immediately after harvest" followed by "harvesting at proper stage" (83.33%) while equal per cent of 71.67 had fully adopted the practices "harvesting of fish by netting only" and "not harvesting the fish by completely draining the water". The two practices had high adoption rate because of sound knowledge about the technology.

About 56.67 per cent gap in adoption of “freezing the fish” was seen. This was due to easy disposal of harvested fish, lack of proper freezing equipment and high cost of the technology.

Further, the respondents were categorized basing on their awareness and adoption behavior relating to all the above mentioned recommended practices which was presented in table 3.

Table.3 Categorisation of fish farmers based on the extent of adoption of overall scientific practices in fish farming

S.No.	**Category**	**Adoption**	
		F	**%**
1.	Low adoption (<64)	8	13.34
2.	Medium adoption (64-69)	29	48.33
3.	High adoption (>69)	23	38.33
	Total	60	100

From the data presented in Table.3, it was apparent that, nearly half (48.33%) had medium level of adoption followed by high (38.33%) and low (13.34%) level respectively.

It is clear from results that, majority of fish farmers had high to medium level of adoption behaviour of scientific practices. The possible reason might be that fish farmers were profit oriented who adopt scientific practices for good yield and profits. The fish farmers had medium to high level of economic orientation and innovativeness which might have lead to the above results.

Table.4 Correlation and multiple regression of profile characteristics of fish farmers with adoption of scientific practices in fish farming

S. No.	**Profile characteristics**	**Adoption of scientific practices**			
		Correlation coeff.	**Reg Coeff.**	**SE of Reg Coeff.**	**‘t’ value**
X_1	Age	0.199	-0.009	0.338	0.027 NS

X_2	Education	0.710*	1.166	0.325	4.978**
X_3	Occupation	0.707*	0.056	0.304	0.184 NS
X_4	Fish farming experience	0.770**	0.918	0.348	2.640**
X_5	Annual income	0.770**	0.890	0.417	2.131*
X_6	Pond size	0.797**	-2.302	0.759	3.034**
X_7	Type of pond	0.406	-0.063	0.119	0.532NS
X_8	Pond ownership	0.745*	0.489	0.256	1.909*
X_9	Extension contact	0.668*	0.085	0.133	0.643 NS
X_{10}	Economic motivation	0.797**	2.0311	0.2183	9.65**
X_{11}	Risk orientation	0.532	-0.0592	0.1295	0.39NS
X_{12}	Market orientation	0.668*	1.1132	0.5092	2.13*
X_{13}	Innovativeness	0.816**	0.4299	0.1963	2.26**
	R^2		0.841		
	F		21.56**		

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

Relation between profile characteristics of fish farmers Vs adoption of scientific practices in fish farming

It could be observed from the table.4 that, the variables such as age (X_1), Type of pond (X_7) and Risk orientation (X_{11}) had no significant relationship with the adoption of scientific practices in fish farming.

The variables education (X_2), occupation (X_3), pond ownership (X_8), extension contact (X_9) and market orientation (X_{12}) had significant relationship at 5 per cent level of significance. While the variables Fish farming experience (X_4), annual income (X_5), Pond size (X_6), Economic motivation (X_{10}) and Innovativeness (X_{13}) shown highly significant relationship at 1 per cent level of significance with the adoption of scientific practices in fish farming.

Extent of contribution of profile characteristics of fish farmers on the adoption of scientific practices in fish farming

A close observation of the table.4 revealed that eight variables viz., education, fish farming experience, annual income, pond size, pond ownership, economic motivation, market orientation and innovativeness were significant in multiple regression analysis.

Further, it may be observed from the table.4 that, 84.1 per cent of the variation in the adoption of scientific practices in fish farming could be explained by all the 13 variables included in the Study. R^2 value of 0.841 with significant 'F' value (21.56**) revealed the significance of regression at 1 per cent level.

CONCLUSION

Based on the findings presented, the overall conclusions regarding the adoption of scientific practices in fish farming are as follows:

The majority of fish farmers demonstrated a medium to high level of adoption behavior towards scientific practices. This suggests that the fish farmers are profit-oriented and motivated by the potential for good yields and profits. Their medium to high economic orientation and innovativeness likely contribute to their adoption behaviour. Several variables were found to have a significant relationship with the adoption of scientific practices in fish farming. These include education, occupation, pond ownership, extension contact, and market orientation. Fish farming experience, annual income, pond size, economic motivation, and innovativeness showed a highly significant relationship. These variables play a crucial role in influencing the adoption of scientific practices. The multiple regression analysis revealed that approximately 84.1% of the variation in the adoption of scientific practices in fish farming can be explained by the 13 variables included in the study. This suggests that a wide range of factors, including education, experience, income, motivation, and innovativeness, collectively contribute to the adoption of scientific practices. Adoption gaps were observed in certain practices such as pond hygiene, pearl cultivation with fish, cultivating prawn with fish, and freezing fish. These gaps may be attributed to factors such as limited availability of resources, lack of technical knowledge, complexity of the technology, and social barriers. In summary, while the majority of fish farmers demonstrated a positive attitude towards adopting scientific practices, there are still areas where improvements can be made. Targeted interventions, such as providing training on pond hygiene and promoting awareness about innovative practices, could help bridge the adoption gaps and further enhance the overall adoption of scientific practices in fish farming.

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