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Aditya Kumar Malla
Ph.D. Research Scholar, Department of Extension Education, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

Dr. SP Sangramsingh
Assistant Professor, Department of Extension Education, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

Dr. BP Mohapatra
Professor and Head, Department of Extension Education, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

Nagma Halima Saik
Ph.D. Research Scholar, Department of Extension Education, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

Jeebanjyoti Behera
Ph.D. Research Scholar, Department of Extension Education, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

Corresponding Author:
Aditya Kumar Malla
Ph.D. Research Scholar, Department of Extension Education, College of Agriculture, OUAT, Bhubaneswar, Odisha, India

A study on the extent of adoption of aquaculture technology as a means of rural youth livelihood in coastal Odisha

Aditya Kumar Malla, Dr. SP Sangramsingh, Dr. BP Mohapatra, Nagma Halima Saik and Jeebanjyoti Behera

Abstract
The present study will be of great use to extension workers, planners, administrators and research workers, as it would throw some light on rural youth entrepreneurship qualities of pisciculture farmers. The objective of the study was to assess the extent of adoption of pisciculture technology as a means of rural youth livelihood in coastal Odisha. Both purposive and multistage random sampling methods were adopted for the selection of the district, grampanchayat, village and respondents. A total of 180 numbers of respondents were selected for the purpose of the investigation. Based on the descriptive statistics, most of the respondents had medium extent of adoption on pond requirement in pisciculture. The youth entrepreneurs in pisciculture had high extent of adoption on pre-stocking management, pond management and harvesting and post-harvesting management of the pisciculture. On the other hand, the study also revealed that education level, annual income, house type, pond size, extension contact, information source use, risk orientation, scientific orientation and innovation proneness were significantly and positively correlated with the adoption of various pisciculture technologies. It is therefore concluded that these aspects may be taken care of by the policy makers, scientist, extension agencies working in the area, so that the youth entrepreneurs in pisciculture will adopt recommended practices and harvest desirable quantity of fish not only to increase their standard of living but also make the area as well as the state self-sufficient in fish production, to fulfil at least internal requirements.

Keywords: youth entrepreneurs, cultivable fish species, pre-stocking management and harvesting and post-harvesting management

1. Introduction
India offers a huge potential for pisciculture development. The country has a coastline of 7,517 km and an extensive river and canal system of about 195.210 km, consisting of 14 major rivers, 44 medium rivers and numerous small rivers and streams. Fishing in India is a major industry in its coastal states, employing over 14 million people. Pisciculture contributes around 1% to India's gross domestic product and over 5% to the agricultural GDP. Different species of Indian carps (C*atla catla*), roho (*Labeo rohita*) and mrigal (*Cirrhinus cirrhosus*) contribute between 70% and 75% of the total freshwater fish production, while silver carp, grass carp, common carp and catfish make up 25% to 30% of the production. Odisha's 480 km long coastline with 24,000 sq. km area within the continental shelf has ample potential for marine fisheries development. The sector plays as elemental role in uplifting economically the poor fisherman community in terms of income and employment generation. The State ranks 10th in terms of the production of fish and produced 4.50 percent of the total fish production in the country during 2014-15. During 2016 -17, Odisha produced 608.10 TMT of fish of which 455.00 TMT came from inland sources and 153.11 TMT from marine sources. During 2018-19, Jagatsinghpur produced 14361 MT of fish that came from 3456 ha of fresh water and 2119.33 MT of prawn and 8159.21 MT of shrimp, 260.06 MT of crab and 1457.02 MT of fish came from 1652.39 ha of brackish water.
Youth being enthusiastic, vibrant, innovative and dynamic in nature is the most important section of the population. As per India's Census 2011, Youth (15-24 years) in India constitutes one-fifth (19.1%) of India's total population. Entrepreneurship in pisciculture has been connected with a progressive modernization of farming activity and is connected with multifunctional rural development. Small enterprises in rural areas play a major role in the rural economy as they ensure higher economic prosperity to rural people than that of large

companies dominating the economy with little or no ownership of local people. The present study will be of great use to extension workers, planners, administrators and research workers, as it would throw some light on youth entrepreneurship qualities of pisciculture farmers. The findings of the study will be certainly helpful to the administrators and field workers, while developing and implementing the new programmes for the benefit and modernization of fish farming to the expectations.

2. Material and Methods

The study was conducted in Balikuda, Biridi, Erasama, Jagatsinghpur, Kujanga, Naugaon, Raghunathpur and Tirtol blocks of Jagatsinghpur district. Both purposive and multistage random sampling methods were adopted for the selection of the district, gram panchayat, village and respondents. A list of youth entrepreneurs in pisciculture of these selected villages was obtained from the Assistant Fisheries Officers and the scientists of KVK, from this list structure random sampling method was followed to select respondents of the study. A total of 180 (hundred eighty) respondents were selected for the purpose of the investigation. Ex post facto research design was implemented in the study. The primary data were collected personally by interviewing the selected respondents with the help of structural and pre-tested interview schedule which was pretested with 10 per cent samples other than the respondents of the study. The secondary data were collected from various government departments, journals, publications and statistics departments. The data were analyzed through the computer using frequency, percentage, mean correlation and standard deviation.

3. Result and Discussion

3.1 Adoption of pond requirement

Pond is the first and foremost resource needed for practising pisciculture technology. Therefore an attempt was made to find out the adoption of various technologies regarding pond requirement and the findings were presented in table 1.

Table 1: Adoption of pond requirement (N=180)

SI. No.	Statements	Fully adopted		Partially adopted		Not-adopted	
		f	p	f	p	f	p
1	Having pond size of 0.2 to2 ha	127	70.56	16	8.88	37	20.56
2	Maintaining depth of water not more than 5ft	132	73.33	29	16.11	19	10.56
3	Making bottom of pond sloppy for better drainage	137	76.11	31	17.22	12	6.67
4	Restricting inflow of water from outside	133	73.89	31	17.22	16	8.89
5	Keeping pond in good hygienic condition	67	37.22	88	48.89	25	13.89

Sl. No.	Categories	f	p
1	Low	36	20
2	Medium	81	45
3	High	63	35

Data from table 1 revealed that the practice of making the bottom of the pond sloppy for better drainage was fully adopted by 76.11% of fish growers. Next to this, the practices such as maintaining the depth of water not more than 5 ft., restricting the inflow of water from outside and maintaining pond size of 0.2 to 2 ha were fully adopted by 73.89% of fish farmers.

This finding is in the line with the findings of Sen and Das (1986) [4], Solanki (1990) [5] and Nath (1993).

3.2 Adoption of cultivable fish species

The success of fish culture often depends upon the choice of fish species. Suitable species of fish must be adopted for getting better yield as well as profit. Therefore the adoption of different cultivable fish species by the fish growers was analysed and presented in table 2.

Table 2: Adoption of cultivable fish species (N=180)

SI. No.	Statements	Fully adopted		Partially adopted		Not-adopted	
		f	p	f	p	f	p
1	Using Catla-Rohu-Mrigal at 4:3:3 proportion	129	71.67	41	22.78	10	5.55
2	Cultivating Grass carp and Silver carp with Common carp	32	17.78	27	15	121	67.22
3	Cultivating prawn with fish	5	2.78	59	32.78	116	64.44
4	Pearl cultivation with fish	3	1.67	41	22.78	136	75.55
5	Keeping air breathing fish species with carps	3	1.67	38	21.11	139	77.22

Sl. No.	Categories	f	p
1	Low	94	52.22
2	Medium	67	37.22
3	High	19	10.56

Table 2 indicated that 71.67% of the fish growers had fully adopted a culture of catla-rohu-mrigal at 4:3:3 proportion. Next to this, 17.78% of fish farmers had fully adopted composite fish culture. The percentage of non-adopters in cultivating prawn with fish, pearl cultivation with fish and keeping air breathing fish species with carps were 64.44, 75.55 and 77.22 respectively. This was due to the complexity of the technology and lack of acquaintance with the technology.

3.3 Adoption of pre-stocking management:

The pond environment provides the optimum conditions for the growth of fish. Hence the pond should be free from predators, aquatic weeds and weed fish. The fingerlings are

only then safely released into the pond. An attempt was made to analyse the adoption of different practices of pre-stocking management. The findings were presented in table 3.

Table 3: Adoption of pre-stocking management (N=180)

SI. No.	Statements	Fully adopted		Partially adopted		Not-adopted	
		f	p	f	p	f	p
1	Using Mahua oil cake to kill unwanted species	61	33.89	101	56.11	18	10
2	Using lime @ 2.5 qt/ha per annum.	129	71.67	46	25.56	5	2.77
3	Using cow-dung as organic manure	144	80	32	17.78	4	2.22
4	Growing Dhanicha for manures	97	53.89	66	36.67	17	9.44
5	Eradicating predators and unwanted species	136	75.55	39	21.67	5	2.78
6	Releasing fingerlings at proper time	139	77.22	27	15	14	7.78

Sl. No.	Categories	f	p
1	Low	40	22.22
2	Medium	56	31.11
3	High	84	46.67

The data from table 3 revealed that the using of cow-dung as organic manure, the practice of releasing fingerlings at proper time and the practice of eradicating predators and unwanted fish species was fully adopted by 80%, 77.22% and 75.55% of fish growers respectively. This might be due to possession of sound knowledge about timing of release of fingerlings and their protection. The adoption of using mahua oil cake to kill unwanted species and growing dhanicha for manures was 33.89% and 53.89% respectively.

3.4 Adoption of pond management

Pond management includes pond amelioration, fertilizer application, mannuring, application of lime, checking fish movements etc. It is of due importance since it is the dwelling place for fishes and has direct impact on growth and yield offish. So, the adoption of some pond management practises were studied in table 4.

Table 4: Adoption of pond management (N=180)

SI. No.	Statements	Fully adopted		Partially adopted		Not-adopted	
		f	p	f	p	f	p
1	Maintaining stocking density of 2000 fingerlings/ac of pond.	82	45.56	91	50.55	7	3.89
2	Applying cow dung and fertilizers	141	78.34	35	19.44	4	2.22
3	Intermediary netting to clear water and regulate fish movement	121	67.22	43	23.89	16	8.89
4	Applying lime at proper time and dose	129	71.67	34	18.89	17	9.44
5	Giving supplementary feeds as recommended	114	63.33	57	31.67	9	5
6	Application of recommended fertilizers	121	67.22	55	30.56	4	2.22

Sl. No.	Categories	f	p
1	Low	43	23.89
2	Medium	49	27.22
3	High	88	48.89

It was observed from table 4 that most of the fish farmers were adopting all the pond management practices such as intermediary netting, lime application, supplementary feeding to fishes, application of recommended fertilizers and maintenance of stocking density of 2000/acre of pond. An adoption of respondents was observed in maintaining stocking density of 2000 fingerlings/ac of pond was 45.56%. This may be due to a lack of knowledge about the stocking of fingerlings and unavailability of suitable pond conditions.

The above result is in the line with the finding reported by Solanki (1990) [5].

3.5 Adoption of disease management

Prevention and management of fish diseases are one of the most important parts of pisciculture. Proper care of disease attack, control measures in disease attack, pond hygiene are the essential practices to consider. Hence, an attempt was made to discover the adoption of disease management practices which was analysed and presented in table 5.

Table 5: Adoption of disease management (N=180)

SI. No.	Statements	Fully adopted		Partially adopted		Not-adopted	
		f	p	f	p	f	p
1	Application of recommended dose of lime	81	45	67	37.22	32	17.78
2	Potassium per-management treatment as prophylactic measure against disease	123	68.33	46	25.56	11	6.11
3	Preventing cattle and human bathing	14	7.78	127	70.56	39	21.66
4	Keeping pond always clean and in hygienic condition	112	62.22	37	20.56	31	17.22
5	Applying proper control measures in disease attack	124	68.89	31	17.22	25	13.89

Sl. No.	Categories	f	p
1	Low	72	40
2	Medium	63	35
3	High	45	25

A look in to table 5 indicated that 68.33% of fish growers were fully adopting the practice of potassium per-management treatment as a prophylactic measure against disease. The practice of proper control for disease attack and keeping pond always clean and in hygienic condition was fully adopted by 68.89% and 62.22% respectively.
However, only 7.78% of fish growers were successful in fully preventing cattle and human from bathing in their ponds. This happened solely due to social problems. The analysis suggests that the fish growers need comprehensive training on the application of lime and care of disease attack.

3.6 Adoption of harvesting and post-harvesting management

Harvesting is equally important with post-harvesting practices. Harvesting of fishes at the proper stage using suitable methods and disposal of fishes are some of the critical factors which are discussed below in table 6.

Table 6: Adoption of harvesting and post-harvesting management (N=180)

SI. No.	Statements	Fully adopted		Partially adopted		Not-adopted	
		f	p	f	p	f	p
1	Harvesting of fish by netting only	89	49.44	83	46.11	8	4.44
2	Harvesting at proper stage	132	73.33	48	26.67	0	0
3	Freezing the fish after harvest if required	24	13.33	104	57.78	52	28.89
4	Disposing fish immediately after harvest	156	86.67	24	13.33	0	0
5	Complete harvesting at 10-12 months duration	134	74.45	42	23.33	4	2.22

Sl. No.	Categories	f	p
1	Low	33	18.33
2	Medium	51	28.33
3	High	96	53.34

Data from table 6 disclosed that 86.67% of fish growers were disosing fish immediately after harvest. 74.45% of fish growers were complete harvesting at 10-12 months duration. The two practices had a high adoption rate because of sound knowledge about the technology. 73.33% and 49.44% of fish growers had fully adopted the practice of harvesting at the proper stage and harvesting of fish by netting only respectively.
About 13.33% in the adoption of freezing the fish was seen. This was due to the easy disposal of harvested fish, proper freezing equipment and a high cost of the technology.
The above finding is opposite to the finding reported by Patel and Sangle (1993) [3].

Table 7: Correlation of independent variables with adoption level of respondents

Sl. No.	Variables	r- value	Remarks
1	Age	-.056	NS
2	Education level	.184	*
3	Family size	.055	NS
4	Annual Income	.219	*
5	Experience in pisciculture	-.154	NS
6	House type	.386	**
7	Pond type	-.026	NS
8	Ownership of Ponds	.144	NS
9	Ponds size	.389	**
10	Extension contact	.362	**
11	Information source use	.246	**
12	Economic motivation	-.188	*
13	Risk orientation	.346	**
14	Scientific orientation	.213	*
15	Innovation proneness	.534	**

** . Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)
NS. Correlation is not significant

The data reported in table 7 revealed that education level, annual income, house type, pond size, extension contact, information source use, risk orientation, scientific orientation and innovation proneness were significantly and positively correlated with the adoption of various pisciculture technologies. The economic motivation was significantly and negatively correlated with adoption whereas age, family size, experience in pisciculture, pond type and ownership of ponds were not correlated.

4. Conclusion

The study as a whole indicated that pisciculture is perceived as one of profitable and feasible enterprises in the coastal Odisha. The youth entrepreneurs had also need regular visits of the technical personnel, exposure for developing confidence, training and demonstrations for skill competency, literatures for reference and other advisory services particularly for predatory and weed fish eradication, stocking, supplementary feeding and pond environment monitoring and health management.
It is therefore concluded that these aspects may be taken care of by the policy makers, scientist, extension agencies working in the area, so that the youth entrepreneurs in pisciculture will adopt recommended practices and harvest a desirable quantity of fish not only to increase their standard of living but also make the area as well as the state self-sufficient in fish production, to fulfill at least internal requirements.

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