J. Aqua., **15** (2007): 45-53

CARP FRY REARING IN SMALL AND BACKYARD PONDS OF RURAL ORISSA: AN AVENUE FOR ECONOMIC UPLIFTMENT FOR RURAL WOMEN

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Demonstration of fry rearing was carried out in small homestead ponds of Khurda and Puri districts of Orissa, India in 12 ponds covering a total area of 0.5 ha involving 80 women during 2004 and in 24 ponds of 0.825 ha involving 116 women during the year 2005. With maximum survival level of 56%, the average survival level recorded during the year 2004 was 32.1%. Similarly, the average survival levels recorded in 2005 was as much as 26.7%. The growth of fry recorded on 20th day of rearing, in general, was within the ranges of 16 mm to 45 mm for both the years. Besides meeting own requirement of quality fish seed, some of the farmers could realize impressive net income levels of Rs 8100-9200 through sale of fry from the ponds of only 200 m^2 within a period of one month of seed rearing activity. Some of the farmers could also raise two crops within a season, demonstrating feasibility of multiple cropping.

INTRODUCTION

The Eastern Indian States including Orissa has been traditionally involved in fish culture in their small backyard ponds. In spite of the long history of fish culture, the State has been lagging behind in scientific fish culture. The smaller unit area of the pond resources, use of water for domestic chores, non-availability of adequate quantity of quality seed and above all lack of involvement have been responsible for such situation.

Compared to the marine fisheries, the involvement of women in freshwater aquaculture sector is significantly low. Some attempts have been made to involve the rural women in fish culture and most of such attempts have led to positive output (Jena *et al.*, 1998a). The present programme involved demonstrations of fry rearing in small and backyard kitchen ponds in Puri, Khurda districts of Orissa through a developmental project funded by Department of Biotechnology, New Delhi involving rural women, especially those are of socially and economically backward.

MATERIALS AND METHOD

The study was carried out for a period of two years, during 2004 and 2005 in Balipatna and Nimapara blocks of Khurda and Puri districts of Orissa, respectively.

During that 1st year 15 ponds covering a total area of 0.56 ha were covered involving 80 women. The activity was further extended to 24 ponds covering 0.72 ha water area involving 116 women. Survey of the villages and organizing meetings with the villagers were the initial approaches for selection of ponds and further the beneficiaries. The women selected for the programme were trained in different aspects of fish culture. Further, the prospects and possible constraints those may encounter during the period of culture operations were conveyed to the beneficiaries. All the relevant packages of practices with regards to carp seed rearing such as clearance of aquatic vegetation, eradication of predatory and weed fishes by application of bleaching powder; pond fertilization with both organic manures and inorganic fertilizers, stocking of carp seed and post-stocking pond management including supplementary feeding (Jena and Das, 2006) were demonstrated to the beneficiaries by involving themselves. Learning by doing was the approach for the extension of the technology.

As most of the ponds adopted under the programme were infested with submerged and floating weeds, the beneficiaries were instructed to remove them manually. The ponds were applied with bleaching powder (30% chlorine) @ 350 kg/ha-m of water for eradication of unwanted predatory and weed fishes ten days before stocking. Mixture of groundnut oil cake, cowdung and single super phosphate @ 350 kg, 100 kg and 25 kg/ha was applied as basal fertilization after though mixing. As most of these village ponds were highly productive, good natural plankton developed within three days of fertilizer application. The aquatic insects from the pond were removed through repeated netting by fry net, as application of soap oil emulsion was denied by the beneficiaries due to the use of pond water for domestic purpose.

The three Indian major carps, *viz.*, catla, (*Catla catla*), rohu (*Labeo rohita*) and mrigal (*Cirrhinus mrigala*) were the species cultured in the selected ponds. While monoculture of these species was carried out in most of the ponds during first year, the practice in second year was mostly polyculture of the three species due to difficulty in disposal of seed of single species. The ponds were stocked with carp spawn of three days old, procured from the hatcheries of CIFA and State Fisheries Department, Kausalyaganga. The participants were trained at their farm site itself on different aspects like seed requirement depending on the size of the pond, packing of seed with the oxygen and method of transfer, acclimatization of seed before release to the pond etc.

Important water quality parameters were monitored before stocking of fry at 10th day and 20th day of culture by following standard methods (APHA, 1998). Powdered mixture of groundnut oil cake and rice bran at 1:1 ratio was applied as supplementary feed daily @ 600 g/lakh of spawn per day in two split doses after sunrise and before sunset for initial five days after stocking and 1200 g subsequently. No intermediate fertilization were required to be given during the culture period as against the

recommended practice due to the presence of rich plankton population through out in most of the ponds. Harvesting of the stock though was initiated by 20th day, in most of the cases it was continued up to one month depending on the sell of fry.

RESULT AND DISCUSSION

The water quality parameters recorded in all the adopted ponds during 2004 and 2005 (Tables 1 and 2), in general, were within the optimum ranges (Jena *et al.*, 1998b, c; Biswas *et al.*, 2006). Except those in ponds P-8 in 2004 and P-15 in 2005, the transparency values registered in all the ponds were within the productive range, which may be corroborated to presence of good natural plankton productivity. The water pH of the ponds, in general, was alkaline in nature. The total alkalinity values of the ponds adopted in 2004 in the ranges of 61-152 mg $CaCO_3$/l showed high productivity status of the ponds. However, several ponds adopted in 2005 registered low alkalinity values. Perusal of the Tables 3 and 4 showed nutrients level, in general, were high in the ponds adopted during the year 2004 over those of 2005, which too was reflected in terms of overall higher fry survival in the year 2004.

Table 1. Performance of nursery rearing of carp fry in different villages in 2004

Pond no	Name of the village	Pond area (m^2)	Species stocked	Spawn stocked (lakh)	Stocking density (lakh)	Total fry produced (nos)	Survival (%)	Expenditure (Rs)	* Income from fry sale (Rs)
P-1	Sathilo	200	Mrigal	0.50	25	28,000	56.0	486	3200
P-2	Sathilo	220	Catla	0.50	23	21,500	43.0	686	9500
		C+M	0.50	23	17,500	35.0	600		
P-3	Sathilo	150	Rohu	0.25	17	10,000	40.0	314	2200
P-4	Budhipara	600	R+M	2.00	33	1,12,000	56.0	1658	8200
P-5	Singrisasan	220	Catla	0.50	23	23,000	47.0	475	3500
P-6	Singrisasan	200	Mrigal	0.50	25	19,000	38.0	486	1300
P-7	Hansapara	1500	C+M	4.50	30	90,000	20.0	2528	2850
P-8	Hansapara	400	Mrigal	1.00	25	29,000	29.0	972	1900
P-9	Sathilo	200	Mrigal	0.50	25	16,700	33.3	486	8620
P-10	Sathilo	230	Rohu	0.75	33	22,500	30.0	622	1900
P-11	Singrisasan	560	Catla	1.00	18	50,000	50.0	1586	500
P-12	Singrisasan	200	Rohu	0.50	25	1,200	2.4	486	1200
P-13	Tiranapada	500	C+R+M	1.00	20	28,000	28.0	1315	3100
P-14	Sathilo	200	Mrigal	0.50	25	3,000	6.0	486	600
P-15	Sathilo	200	Rohu	0.50	25	10,000	20.0	486	0
	Total/ Avg	5593		15.0	24.7	481,400	32.1	13672	35870

The economic gain indicated in the table does not include own requirement of fry

Table 2. Performance of nursery rearing of carp fry in different villages in 2005

Pond No	Name of the village	Area of pond (m^2)	Species	Spawn stocked (lakh)	Stocking density (lakh)	Fry produced (nos)	Survival (%)	Total expenditure (Rs)	*Income from fry sale (Rs)
P-1	Sathilo	200	C+R+M	0.75	37.5	22,500	30	686	2,600
P-2	Sathilo	220	C+R+M	1.0	45.5	42,000	42	887	7,800
			C+M	0.5	24	17,500	35	300	
P-3	Sathilo	150	C+R+M	0.75	50	7,500	10	686	200
P-4	Budhipara	600	C+R+M	2.0	33	30,000	15	2126	8,200
			C+R+M	2.0	33	78,000	39	1100	
P-5	Singrisasan	220	Catla	0.5	23	5,000	10	543	340
P-6	Singrisasan	200	Mrigal	0.5	25	17,500	35	343	2,000
P-7	Hansapara	1500	C+R+M	3.5	23	87,500	25	3745	3,200
P-8	Sathilo	200	C+R+M	0.75	37.5	30,000	40	686	2,600
P-9	Sathilo		C+R+M	0.75	37.5	18,800	25	732	1,700
P-10	Sathilo	230	C+R+M	0.75	32.5	12,000	16	686	1,700
P-11	Singrisasan	200	Rohu	0.75	37.5	8,600	12	343	340
P-12	Sathilo	200	C+R+M	0.75	37.5	39,800	53	686	8,800
P-13	Sathilo	200	C+R+M	0.75	37.5	30,000	40	710	6,240
P-14	Gandilo	300	C+R+M	0.75	25	35,300	47	875	7,800
P-15	Panchala	200	C+R+M	0.75	37.5	11,300	15	715	1,000
P-16	Panchala	200	C+R+M	0.75	37.5	20,300	27	715	3,200
P-17	Bagalpur	200	Catla	0.5	25	5,500	11	511	1,100
P-18		200	Catla	0.5	25	2,800	6	511	560
P-19		200	Rohu	0.5	25	7,000	14	311	1,400
P-20		200	Mrigal	0.5	25	3,000	6	311	600
P-21	Rheodopara	400	C+R+M	1.0	25	32,300	43	1086	5,300
P-22	Gandilo	450	C+R+M	1.25	27.5	30,000	24	744	2,840
P-23	Sasan	350	C+R+M	1.0	28.5	41,000	41	1300	2,200
P-24	Bhoisahi	200	C+R+M	0.75	37.5	12,800	17	686	1,350
	Total/Avg.	7,231		24.25	32.0	6,48,000	26.7	22,024	73,070

The stocking and harvesting particulars of the adopted ponds are presented in Tables 1 and 2, which showed all the ponds except that of one in Hansapara village are smaller in size ranging 0.015 to 0.06 ha. Analysis of production performance of carp fry irrespective of species showed except those of ponds P-12 and P-14 in village Singrisasan and Sathilo, the survival levels in all other ponds adopted in 2004 were quite remarkable. Further, with maximum survival level of 56% recorded in pond P-1 stocked with mrigal, the average survival level of 32.1% was even comparable with the results obtained under several experimental trials with Indian major carps (Jena *et al.*, 1996, 1998b, c) and also

Table 3. Water quality parameters of the adopted ponds of different villages in 2004

Pond No.	Transparency (cm)	Temperature (°C)	pH	DO (mg/l)	TA (mg $CaCO_3$/l)	CO_2 (mg/l)	TAN (mg/l)	NO_2-N (mg/l)	NO_3-N (mg/l)	PO_4-P (mg/l)
P-1	17±2	29.4±1.4	7.29±1.09	4.83±1.17	104±12	16.8±9.4	0.46±0.18	0.04±0.01	0.23±0.13	0.58±0.5
P-2	14±3	30.5±0.7	7.41±0.30	3.70±0.41	109±9	21.4±1.7	1.08±0.22	0.04±0.01	0.28±0.04	0.44±0.24
P-3	17±3	31.1±0.7	7.42±0.23	4.23±0.35	76±22	11.6±2.9	0.52±0.25	0.02±0.01	0.35±0.15	0.39±0.38
P-4	13±3	30.5±0.7	8.08±0.21	4.37±0.37	152±15	0	0.35±0.02	0.03±0.01	0.24±0.15	0.42±0.14
P-5	17±3	30.9±1.3	7.60±0.12	3.12±0.25	106±20	20.0±11.3	0.27±0.02	0.07±0.04	0.27±0.08	0.73±0.28
P-6	18±4	30.9±0.9	7.23±0.18	7.53±3.19	66±20	21.2±15.2	0.93±0.23	0.03±0.01	0.24±0.27	0.51±0.56
P-7	14±2	31.0±0.1	7.36±0.40	4.75±0.85	61±8	20.9±8.6	0.92±0.16	0.04±0.0	0.26±0.11	0.48±0.12
P-8	40±16	30.7±0.6	7.17±0.85	4.57±1.17	110±14	17.8±4.2	0.59±0.19	0.03±0.01	0.29±0.02	0.38±0.02
P-9	15±2	30.8±0.8	7.34±0.22	3.13±0.91	107±20	19.0±8.8	0.78±0.15	0.03±0.01	0.33±0.07	0.28±0.25
P-10	14±2	31.0±1.4	8.27±0.28	4.40±0.20	153±14	16.7±4.6	0.31±0.14	0.03±0.02	0.37±0.12	0.48±0.13
P-12	14±2	30.8±0.8	7.34±0.22	3.00±1.41	107±19	19.0±8.8	0.78±0.25	0.03±0.01	0.33±0.07	0.28±0.25
P-13	13±2	30.5±0.8	7.44±0.18	3.00±1.11	77±27	22.5±6.4	0.49±0.20	0.04±0.01	0.29±0.07	0.38±0.19

Table 4. Water quality parameters of the adopted ponds of different villages in 2005

Pond no.	Transparency (cm)	Temperature (°C)	pH	TA (mg $CaCO_3$/l)	CO_2 (mg/l)	TAN (mg/l)	NO_2-N (mg/l)	NO_3-N (mg/l)	PO_4-P (mg/l)
P-1	8±2	29.1±1.0	7.18±0.08	129±25	18.3±8.8	0.22± 0.23	0.05±0.03	0.45± 0.31	0.72±0.34
P-2	15±3	28.9±0.4	7.77±0.45	77±36	14.6±14.0	0.25±0.37	0.03±0.02	0.35± 0.31	0.29±0.38
	16±2	30.1±1.3	7.74±0.31	69±18	10.6±10.0	0.10±0.07	0.04± 0.02	0.22± 0.02	0.39±0.22
P-3	20±4	29.4±0.4	7.23±0.44	44±28	15.3±10.0	0.44±0.61	0.01±0.01	0.11±0.09	0.19±0.26
P-4	20±4	29.5±0.2	7.35±0.27	68±24	17.3± 14.4	0.38±0.54	0.06±0.02	0.17± 0.09	0.09±0.01
	21±4	29.4±0.6	6.73±0.31	28±10	19.3±4.1	0.13±0.18	0.13±0.02	0.08±0.01	0.38±0.54
P-5	11±5	29.5±0.7	6.83±0.30	26±11	18.0± 5.8	0.20±0.24	0.06±0.02	0.39±0.08	0.11±0.13
P-6	21±3	29.4±0.7	7.68±0.27	70±27	9.7±10.0	0.04±0.02	0.05±0.04	0.20±0.14	0.25±0.09
P-7	14±1	29.0±0.7	7.90±0.17	41±6	7.3± 5.7	0.01±0.00	0.14±0.02	0.23±0.17	0.12±0.13
P-8	28±12	28.9±0.6	7.42±0.30	55±26	26.0± 6.0	0.24±0.25	0.08± 0.01	0.41± 0.19	0.12±0.19
P-9	27±10	28.7±0.9	7.47±0.35	41±26	24.0±4.0	0.08± 0.01	0.01±0.0	0.15±0.08	0.16±0.21
P-10	18±4	29.5±0.7	8.26±0.26	42±26	2.0±3.4	0.03±0.03	0.02± 0.01	0.18±0.22	0.06±0.01
P-11	19±5	28.9±1.2	7.93±0.62	36±17	4.6±5.0	0.07±0.02	0.05±0.03	0.15±0.10	0.19±0.23
P-12	28±3	28.7±0.9	8.05±0.92	40±18	18.6±9.2	0.08±0.02	0.01±0.0	0.04 ± 0.02	0.10±0.11
P-13	19±3	28.6±0.8	7.58±0.08	104±28	20.0±17.4	0.36±0.30	0.05± 0.02	0.12±0.14	0.15±0.17
P-14	25 ±5	28.8±0.4	7.27±0.08	70±53	25.7±12.6	0.37±0.51	0.08± 0.02	0.43±0.40	0.08±0.02
P-15	41±19	28.4±0.6	7.50±0.32	66±35	24.9± 9.4	0.29±0.28	0.02± 0.02	0.17±0.12	0.23±0.18
P-16	28±2	28.7±1.0	7.38±0.16	46±32	13.3±12.2	0.15±0.20	0.03±0.03	0.22±0.01	0.09±0.08

P-17	7±2	29.2±0.2	7.44±0.32	51±36	20.0±11.4	0.29±0.22	0.05± 0.02	0.49±0.31	0.40±0.06
P-18	13±10	29.2±0.2	7.58±0.28	54±29	19.3±15.8	0.24±0.36	0.06±0.01	0.34±0.03	0.22±0.05
P-19	11±3	28.9±0.7	7.41±0.12	383±32	15.3±11.7	0.49±0.47	0.07± 0.05	0.29±0.02	0.12±0.17
P-20	15±2	28.6±1.4	7.46±0.06	45±8	19.3±8.9	0.10±0.07	0.07±0.03	0.32±0.03	0.09±0.07
P-21	13±2	29.4±2.4	7.20±0.24	32±14	15.4±4.3	0.08±0.04	0.04± 0.02	0.44±0.23	0.63±0.46
P-22	7±2	30.0±2.4	7.26±0.13	35±7	15.0±2.7	0.06±0.03	0.06± 0.03	0.75±0.01	0.40±0.14
P-23	18±6	29.8±3.1	8.68±0.26	35±17	6.1±5.4	0.07±0.00	0.05±0.04	0.11±0.16	0.08±0.01
P-24	23±1	29.9±1.2	7.56±0.10	61±16	11.0±3.1	0.06±0	0.05±0.02	0.21±0.08	0.07±0.01

demonstration programmes undertaken village ponds (Selvaraj and Kanaujia, 1979 and Patnaik *et al.*, 1989). Similarly, the average survival level of 26.7% in 24 adopted ponds in 2005 was also quite impressive. However, some of the ponds *viz.*, P-3 in Sathilo, P-11 and P-15 in Singrisasan and four ponds (P-17 to P-20) in Bagalpur village registered significantly low survival of fry, which was due to the submergence of pond dykes during heavy rain. The growth of fry recorded on 20th day of rearing period for both the years, in general, was within the ranges of 16 mm to 45 mm, which is comparable to the results obtained in different trials as mentioned above. Jena *et al.* (1998a) though reported very high survival levels of ranging 29.4-55.0% in rural ponds of Keonjhar district of Orissa, such result was confined only to a few ponds. Considering large-scale adoption of the nursery raising programme during the present study in as many as 15 ponds in 2004 and 24 ponds in 2005, the output in terms of growth and survival was quite impressive, which also indicated adoption of appropriate packages of practices by the farmers. Tables 1 and 2 also showed the expenditure incurred by the farmers towards the cost of different inputs for pond preparation, seed and supplementary feed, and also gross income realized from the sale of fry. However, savings in term of left-over seeds, for meeting their own requirement has not been included in the analysis. The potentiality of such small homestead pond could be demonstrated by some of the enthusiastic farmers through realization of impressive net income level of Rs 8100-9200 from ponds of only 200 m^2 within a period of one month of seed rearing activity. Further, some of the farmers could also raise two crops within a season, demonstrating feasibility of multiple cropping through systematic planning. Through the experience of such demonstration programme for community mobilization towards seed rearing was quite encouraging, difficulty in disposal of fry in several cases was a major hurdle. Sustainability of large-scale adoption of such seed rearing activity requires systematic planning for disposal of their produce, which may be possible through mobilization of such small-scale farmers to form SSGs.

ACKNOWLEDGEMENTS

We are grateful to the Director, National Research Centre for Women in Agriculture for the encouragements. Financial support received from the Department of Biotechnology, New Delhi is gratefully acknowledged. We are thankful to all the women farmers from the adopted villages and their family members for their wholehearted co-operation during the study period.

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