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Strengthening the livelihoods of rural women through polyculture of carps in seasonal ponds

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ABSTRACT

The investigation was carried out with an objective to disseminate the technology of carp polyculture among rural women in Boudh District of Odisha to strengthen their livelihood. Polyculture of carps was demonstrated in four seasonal ponds covering 9.5 ha of water spread area through participatory approach. Mixed fingerlings of *Labeo rohita, Catla catla, Cirrhinus mrigala, Cyprinus carpio* and *Ctenopharyngodon idella* were stocked @ 6500 fingerlings ha^{-1} and cultured for six months. The mean fish yield of the adopted ponds was 795.79 kg ha^{-1} in 6 months against the pre-adoption production level of 378.95 kg ha^{-1}. Involvement of rural women in polyculture of carps proved to be economically beneficial and it is hoped that this would go a long way in strengthening their livelihood.

Keywords: Livelihood, Polyculture of carps, Rural women, Seasonal ponds

Introduction

Involvement of rural women in aquaculture production activities including composite carp culture, seed rearing and integrated fish farming has been advocated for their socio-economic upliftment (Bhanot *et al.,* 1999) and generation of self employment (Sharma *et al.,* 1988, Thakur *et al.,* 1988). However, lack of focus coupled with cultural and social impediments limit the participation of women in training and empowerment. Women are involved in subsistence aquaculture in India, taking care of fish after stocking (Nandeesha, 2007). Appropriate extension programme for capacity building, motivation and adoption of scientific technology would help rural women in taking up aquaculture in a sustainable way. Carp culture in seasonal tanks was demonstrated by many workers (David and Rao, 1976; Mohanty and Pattnaik, 1984; Piska, 2000; Jena *et al.,* 2005). Short duration carp culture in community owned seasonal ponds can be taken up by women particularly of SC/ST category. The reports on the involvement of rural women belonging to SC/ST category in polyculture of carps in large seasonal ponds are scanty. Women can easily manage small backyard ponds (0.01 – 0.1 ha) for raising fish seed within a short period (Goswami and Ojha, 1997; Radheyshyam, 2002). Besides, they can undertake common carp breeding including collection of brood fish, brooder maintenance and egg hatching for production of fish seed and also in nursery rearing (Radhyeshyam *et al.,* 1999). Keeping this in view, the present study was undertaken to evaluate the incremental increase in carp polyculture production in large seasonal ponds through training-cum-demonstration involving rural women in Boudh District of Odisha.

Materials and methods

Study area

Boudh, an erstwhile sub-division of Boudh-Kondhamal, lies in the central part of Odisha. It is endowed with 2225 ha of aquatic resources (0.65% of total geographic area), however, only 49% of this resources is suitable for pisciculture (NIC, 2011). Private owned tanks constitute only 13% and Gram Panchayat tanks constitute 70.26% of the total aquaculture resources in the district. Both seasonal and perennial ponds are available. However, most of the ponds are seasonal in nature and hold water for 6-7 months. Ponds are having high percentage of rocks and gravels in the bottom. Total freshwater fish production during 2006-'07 was 3133.65 t which falls short of the total requirement of this district. Fishes are being imported from various adjacent districts.

Survey, selection of pond and beneficiaries

Base line reconnaissance survey was conducted to take stock of the existing carp culture scenario in the study area. Participatory Rural Appraisal (PRA) tools were employed to identify and prioritise the field problems. About 114 beneficiaries belonging to nine women self help groups (SHG) from Kantamal Block of Boudh District were selected

on the basis of poorest of poor having access to community ponds. A total of 9.5 ha water bodies spread over four ponds designated as p^1, Khaliabundh pond (1ha); p^2, Bramhani pond (1 ha); p^3, Nayamunda pond (3.5 ha) and p^4, Phatamunda pond (4 ha) were adopted for demonstration. During the survey, detailed information pertaining to the status of aquaculture, package of practices followed by the farmers and average production level of last three years in pre-adoption phase was collected from the beneficiaries of the adopted ponds.

Technology dissemination process

Hands on training was provided in different aspects of freshwater aquaculture *viz.,* pond preparation, liming, stocking, manure application, feeding, health care and harvesting. The principle of 'learning by doing' was employed to reinforce the new skills of carp polyculture. Training was imparted to a small group of 25 persons both on-farm and at the institute (Central Institute of Freshwater Aquaculture, Bhubaneswar) level. Critical inputs like fish seed, lime, feed and fertilizers were provided to the groups in order to encourage them to adopt scientific practices. Efforts were initiated to foster linkage with the bankers for extending institutional credit to women selfhelp groups and also with market for sale of the produce.

Demonstration of carp polyculture

Taking into consideration the inherent water quality and soil conditions, schedules were prepared for each pond and management was done accordingly. Fingerlings (8-10 cm) of *Labeo rohita, Catla catla, Cirrhinus mrigala, Cyprinus carpio* and *Ctenopharyngodon idella* were stocked. The average stocking density was 6500 fingerlings ha^{-1}. As post-stocking care of fishes, the beneficiaries were taught about the procedure of using organic manure like cattle dung, poultry litter and farm yard manure in the pond. Besides organic manure, inorganic fertilizer *viz.,* urea and DAP (di ammonium phosphate) were used for augmenting phytoplankton production. A mixture of mustard oil cake and rice bran at a ratio of 1:1 by weight was given as supplementary feed @ 2-3% of the estimated biomass. Dispensing of feed in the form of dough, preferably in feed trays or gunny bag hung at uniform distance inside the ponds was demonstrated. Depending on the water quality, lime was applied as per requirement. Periodic sampling was done to monitor fish health status. Fish production level was recorded after harvesting the fishes from the pond.

Results and discussion

The average productivity of the adopted ponds before adoption was found to be 378.95 kg ha^{-1} (Table 1). Prior to adoption, the beneficiaries used to stock mixed seeds of Indian major carps (*L. rohita*, *C. catla*, *C. mrigala*,). Fish seed of 2-2.5 cm size were stocked at an average density of 12,000 ha^{-1}. Fig. 1 represents the average share of various inputs in variable cost of the adopted ponds. Share of various inputs in variable cost in decreasing order were

Table 1. Production and average yield in pre-adoption and post-adoption phase

Pond name	Pre-adoption details					Post- adoption details				
	Species stocked	Stocking density	Stocking size (cm)	Total production (kg)	Average yield (kg ha^{-1} in 6 months)	Species stocked	Stocking density	Stocking size (cm)	Total production (kg)	Average yield (kg ha^{-1} in 6 months)
p^1	*L. rohita*, *C. catla*, *C. mrigala*,	12000	2-2.5	700		*L. rohita*, *C. catla*, *C. mrigala*, *C. carpio* and *C. idella*	6500	8-10	1100	
p^2	*L. rohita*, *C. catla*, *C. mrigala*,	12000	2-2.5	1100	378.95	*L. rohita*, *C. catla*, *C. mrigala*, *C. carpio* and *C. idella*	6500	8-10	2300	795.79
p^3	*L. rohita*, *C. catla*, *C. mrigala*,	9000	2-2.5	300		*L. rohita*, *C. catla*, *C. mrigala*, *C. carpio* and *C. idella*	20000	8-10	1500	
p^4	*L. rohita*, *C. catla*, *C. mrigala*,	10000	2-2.5	1500		*L. rohita*, *C. catla*, *C. mrigala*, *C. carpio* and *C. idella*	25000	8-10	2660	

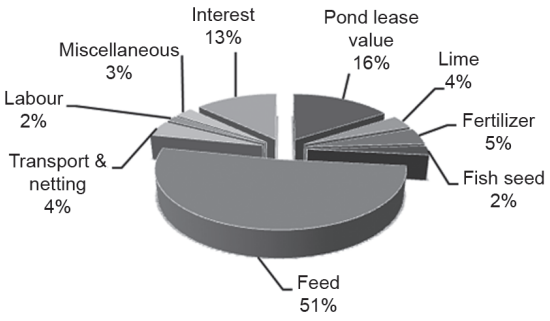

Fig. 1. Average share of various inputs in variable cost

feed (51%), lease value (16%), interest (13%), fertilizer (5%), netting & transport (4%) and lime (4%). Labour and seed constituted only 2% each in variable cost.

As evident from Table 1, the mean production from the adopted ponds was 795.79 kg ha^{-1} in 6 months culture period as against the pre-adoption production level of 378.95 kg ha^{-1} during the same culture period. Overall productivity level has gone up by 110% as compared to pre-adoption level. The average production cost was worked out to be Rs.29,107.58 ha^{-1} (Table 2). The

Table 2. Economics of grow-out carp culture in Boudh for 6 months of culture period (2010-'11)

Item	Rate (Rs.)	p^1		p^2		p^3		p^4	
		Quantity	Cost (Rs.)	Quantity	Cost (Rs.)	Quantity	Cost (Rs.)	Quantity	Cost (Rs.)
I. Expenditure									
Pond lease value (actual)		-	5000.00	-	5000.00	-	15500.00	-	20880.00
Lime	10 per kg	110 kg	1100.00	150 kg	1500.00	385 kg	3850.00	450 kg	4500.00
Urea	7 per kg	100 kg	700.00	150 kg	1050.00	300 kg	2100.00	400 kg	2800.00
DAP	14 per kg	50 kg	700.00	90 kg	1260.00	150 kg	2100.00	200 kg	2800.00
Fish seed	Rs.125 per 1000 seed	6500 no.	812.50	7000 no.	875.00	22750 no.	2843.75	23500 no.	2937.50
Mustard oil cake	16 per kg	1200 kg	19200.00	2000 kg	32000.00	2000 kg	32000.00	2500 kg	40000.00
Rice bran	2.5 per kg	1000 kg	2500.00	2000 kg	5000.00	3750 kg	9375.00	4500 kg	11250.00
Transport charge	-	-	1000.00	-	1000.00	-	1500.00	-	1500.00
Netting charge	500 per net	4 times	2000.00	4 times	2000.00	4 times	2000.00	4 times	2000.00
Labour charge	150 per man-day	5men	750.00	6 men	900.00	16 men	2400.00	16 men	2400.00
Miscellaneous expenditure		-	1375.25	-	1425.50	-	2600.00	-	2745.25
Sub total expenditure			35137.75		52010.50		76268.75		93812.75
Interest on sub total expenditure (15% for 6 months)			2635.33		3900.79		5720.16		7035.96
Total expenditure			37773.08		55911.29		81988.91		100848.71

	p^1	p^2	p^3	p^4
II. Sale proceeds Production (kg)	1100	2300	1500	2660
III. Income				
Gross income (fish sale) (Rs.90 kg^{-1})	99000.00	207000.00	135000.00	239400.00
Net income (16-14)	61226.92	151088.71	53011.09	138551.29
Net return on expenditure (%)	162.09	270.22	64.66	137.38
B:C ratio	1.62	2.70	0.64	1.37

Grand total of expenditure = Rs. 276521.99; Total area = 9.5 ha

Mean/average expenditure = Rs. 29107.58 ha^{-1}; Total gross income ($p^1+p^2+p^3+p^4$) = Rs. 680400

Total net income ($p^1+p^2+p^3+p^4$) = Rs. 403878.01; Average net income = Rs. 42513.47 ha^{-1}

production system practiced by the farmers enabled them to earn a net income of Rs. 42513.47 ha^{-1}. This resulted in a net return of 137.38% of the variable cost. The percentage increase in carp production of the adopted ponds is shown in Fig.2. The B: C ratios for four adopted ponds (p^1 p^2, p^3 and p^4) were worked out to be 1.62, 2.70, 0.64 and 1.37 respectively.

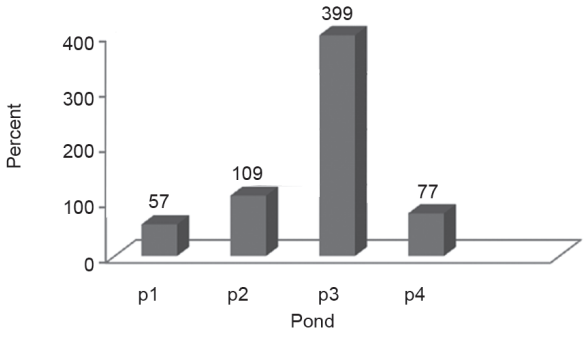

Fig. 2. Percentage increase in carp production (per ha)

Women beneficiaries were actively involved in all the steps in carp polyculture. It was also observed that increase in fish yield has resulted in increased household consumption of quality fish. Enhanced consumption of fish by the participating women has improved nutritional status of their families. Jena *et al.* (1998) reported that small seasonal backyard kitchen ponds (0.05-0.2 ha) used for carp seed raising by tribal women in Odisha could enhance the economic status of women, when managed properly. Goswami (2009) reported that rural women in coastal areas of South 24-Parganas perform many fishery activities including fish seed collection, net weaving, fish marketing and fish harvesting. They take part in decision making related to fishery activities which is fairly a good indicator of their status. Women in aquaculture have been found to significantly contribute to the income of their family (Roy, 2003). According to Ponnusamy and Gupta (2009), aquaculture in combination with other farm enterprises in the coastal regions of the country significantly contributes to the livelihood security of farm families in a system's perspective.

During the course of the present study, several constraints were encountered. Non-availability of desired quality and quantity of fish seed was a major constraint in fish culture operation in Boudh. Poor water retention capacity (6-7 months) of the pond causes water scarcity. High rate of evaporation and seepage loss were added to the problems. High lease value which was in the range of Rs. 15000-35000 ha^{-1} for 3 years and poor technical knowledge of the women also acted as deterrent to fish farming. Mohanty and Jena (1996) reported that a social dogma persisted among women as they thought fish seed production is highly complex and a fear of psychosis disabled them to participate in fish culture. Saha and De (2001) reported that high cost of feed, non-availability of quality seed, absence of organised marketing, poor technical skill of farmers, paucity of credit and social problems hinder aquaculture development.

The package of practices demonstrated during the study, laid emphasis on low–cost interventions with minimum external inputs. Moreover, linkages were established with seed and other inputs. Stocking of bigger size fingerlings / yearlings (size ranges from 8-15 cm) was recommended as it grows very fast within 6 -7 months period. Use of farm made feeds, feeding methods and feeding strategies need to be promoted for enhancing production. Vimala *et al.* (2004) suggested that in order to harness the potential of farm women in increasing aquaculture production, their access to technology, credit, inputs and marketing have to be ensured. The beneficiaries expressed that the institutional interventions of CIFA enhanced their level of confidence. It has also developed favourable attitude towards scientific fish farming practices. This was evident from the fact that the SHGs continue to practice scientific fish farming even after withdrawal of project support. It is suggested that more and more tribal women are given access to community ponds, technology and training so as to enable them derive socio-economic benefits from carp polyculture.

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