Indian Journal of Hill Farming 26(2):32-34 Available online at www.kiran.nic.in

Comparative Study of Composite Fish Culture (CFC) and Local Practices of Fish Culture in East Siang District, Arunachal Pradesh

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Received 24.9.2013, Revised 29.10.13, Accepted 4.11.13

ABSTRACT

A multilocational trial on composite fish culture (CFC) was carried out to evaluate growth, yield and economic analysis of fish culture during three successive years 2010–2012 in East Siang District of Arunachal Pradesh, India. The study revealed that growth of silver carp and catla is better than that of other fish species in CFC. Fish yield was more in CFC than the traditional fish farming system in all locations under study with the highest harvest of 20.6 q ha^{-1}. An increment of fish harvest up to 114 % was recorded by adopting CFC. Gross profit to the tune of Rs. 2, 62,233 and Rs. 1, 25,500 per hectare were recorded from CFC and local practice with a net profit of Rs. 1, 44,067 and Rs. 61,700 per hectare and benefit-cost ratio of 2.21 and 1.96 respectively.

Key words: Composite fish culture, local practice, yield, benefit- cost ratio

INTRODUCTION

Fishery in Arunachal Pradesh is mostly based on capture from natural resources. There is a large cultivable fresh water area in Arunachal Pradesh in the form of ponds, tanks and beels etc., of which only small part is utilized for fish culture. According to the census 2007-08, the fishery production in East Siang District covers an area of 233 ha. There is a tremendous gap between the demand (180 tons per annum and supply (16 tons per annum of fish in the district (Haloi 2009). Though fishery is an important sector of livelihood for the local community, but still the technology of aquaculture has not been well established among them. The fish growers of the state traditionally growing different varieties of fishes in polyculture method were species ratio and water quality management is not been practiced. Fishes are feed with locally available feed materials like banana leaf, banana pseudostem, rice bran, cow dung etc. In their practice, proper stocking density and selection of compatible species is also not maintained. There are many fish culture technologies available and among them, the Composite Fish Culture (CFC) system is the most sustainable for this region. In this system, distinctive compatible species of Indian and Exotic carps of different feeding habits are stocked and cultured in the same pond so that all its ecological niches are utilized by the fishes. Present investigation is an attempt to quantify the yield advantages of CFC over the local traditional fish culture system. Effort has also been made to find out economic sustainability of CFC in the study area for logical analysis and adoption by the fish growing community of the district.

MATERIAL AND METHODS

The study was carried out during the years 2010-2012. The experiment was carried out in Mangnang, Sille, Nari, Mirem, Ledum and Tabi villages of East Siang District, Arunachal Pradesh geographically

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located between 27.300° to 29.420° North latitude and 94.420° to 95.350° East longitude with an altitude of 133m in to 300 m. Fingerlings of Rohu (*Labeo rohita*), Catla (*Catla catla*), Mrigala (*Cirrhinus mrigala*), Grass Carp (*Ctenopharyngodon idella*), Common carp (*Cyprinus carpio*) and Silver carp (*Hypophthalmichthys molitrix*) were stocked in a ratio 2 Catla: 2 Rohu: 1.5 Mrigal: 2 Silver carp: 1 Grass carp: 1.5 Common carp (Mahapatra et al. 2006) @ 7000 fingerlings per ha.

The management practices in composite fish farming can be categorized as Pre-stocking, stocking and post-stocking management. The major steps followed in pre-stocking management were aquatic weed clearance by manual effort, eradication of predatory and weed fish by repeated netting, manuring by using cow dung 1000 kg/ha/ month and liming with quick lime @ 2000 kg/ha/ yr for regulating pH of pond water. One third quantity of total amount of lime was applied as initial dose and rest was applied in seven split doses after checking pH of the pond water. In stocking management, transportation of fingerling is one of the most important steps. In the present investigation, transportation of fingerlings was done in the early morning hours with oxygen packing from Mini Carp Hatchery located at Dhemaji District, Assam. Acclimatization of the fingerlings was also done by putting the Oxyzen packed polythene bags in pond water for 30 minutes followed by addition of excess water in the same bag and releasing the fishes slowly in the pond for reducing the stress related to temperature fluctuation. Supplementary feeding of oil cake and rice bran with a mixing ratio of 1:1 was done @ 2-3% of body weight of fishes. Manuring was also done once in a month to maintain water quality of the ponds. Sampling for checking the health and growth were also done once in two months.

RESULTS AND DISCUSSION

Present study revealed that Composite Fish Culture has many advantages over local practice of fish culture. Talukdar and Sontaki (2005) described various advantages of CFC. Different fish species *viz.* Silver carp, Catla, Mrigala, Grass Carp, Common carp and Rohu harvested from Mangnang, Mirem, Nari, Sille, Ledum and Tabi villages of East Siang District showed that growth of silver carp and catla was better than other fish species in CFC. Silver carp and catla was recorded to grow faster with an average size of 771.6 g and 791.4 g respectively in eight months of culture period. This might be attributed to balance feeding to the fishes as well as manuring of pond in CFC and consequently optimum production of phytoplankton and zooplankton which were basic food for silver carp and catla respectively (Wohlfarth and Schroeder 1979). In all the locations under study congenial water temperature for fish growth was observed from April to October. Pre-monsoon rainfall in the month of April, May followed by monsoon rainfall during June to September favoured fish culture in the district.

It was noted that, the fish yield was more in CFC than traditional fish farming system in all locations under study. Average fish yield recorded in CFC was 18.9 q ha^{-1}, 19.3 q ha^{-1} and 20.6 q ha^{-1} during 2010, 2011 and 2012 respectively as compared to 10.0 q ha^{-1}, 9.0 q ha^{-1} and 9.3 q ha^{-1} during the aforesaid period (Table 1). This might be attributed to pre-stocking, stocking and post-stocking management practices. Gradual increase in fish productivity in CFC over local practice might be due to the residual effect of incorporation of inputs viz. lime, manure and feeding materials in the same pond over the years. Similar observations were also made by Murty et al. 1978 and Yadava et al. 1992. An increment of fish harvest to the tune of 89% , 113 % and 114 % was recorded by adopting composite fish farming in the year 2010, 2011 and 2012 respectively (Table 1).

Economic analysis of fish farming in CFC and local practice was made to evaluate the sustainability of CFC. Average total cost of production over the period of 2010-2012 was Rs. 1, 18,167and Rs. 63,800 in CFC and local practice respectively (Table 2). Variation in the cost of production in different years was due to variation in cost of inputs. More cost of production in CFC as compared to the local practice is due to feeding, manuring, liming and using chemicals in the former system. Mean yield of fishes obtained from these two systems were 19.6 q ha^{-1} and 9.43 q ha^{-1}. Gross profit to the tune of Rs. 2, 62,233 and Rs. 1, 25,500 per hectare were recorded from CFC and local practice with a net profit of Rs. 1, 44,067 and Rs. 61,700 per hectare respectively. This gave an average benefit-cost ratio of 2.21 in CFC and 1.96

Table 1 : Year wise average yield (q ha^{-1}) of fishes in CFC and local practice of fish farming during the study period

Year	Mangnang	Mirem	Nari	Sille	Ledum	Tabi	Avg. yield
			Average yield (q ha^{-1}) of fishes in CFC				
2010	22.0	17.3	18.5	17.8	17.2	20.8	18.9 (89%*)
2011	20.1	19.6	22.0	18.2	17.0	18.9	19.3 (114%*)
2012	21.7	22.0	20.8	17.4	17.6	23.9	20.6 (113%*)
			Average yield (q ha^{-1}) of fishes in local practice				
2010	10.8	9.5	10.3	9.7	10.2	9.3	10.0
2011	8.5	9.6	7.4	10.2	7.9	10.1	9.0
2012	9.6	9.8	8.5	9.5	8.2	10.2	9.3

Note: *Fish yield Increase in CFC over local practice (%)

Table 2: Economics of fish farming in CFC and local practice during the study period

Parameter (Average of different location)	CFC				Local practice			
	2010	2011	2012	Avg.	2010	2011	2012	Avg.
Total Cost of production (Rs. ha^{-1})	106500	117000	131000	118167	58000	64500	68900	63800
Mean Yield of fishes (q ha^{-1})	18.9	19.3	20.6	19.60	10.0	9.0	9.3	9.43
Gross profit (Rs.ha^{-1})	226800	250900	309000	262233	120000	117000	139500	125500
Net returns(Rs. ha^{-1})	120300	133900	178000	144067	62000	52500	70600	61700
Benefit Cost ratio	2.13	2.14	2.36	2.21	2.07	1.81	2.02	1.96

· Sale price of fish per kg was Rs.120, Rs. 130 and Rs. 150 in the year 2010, 2011 and 2012 respectively.
Total cost of production includes cost of labour for pond preparation and management, fertilization application, liming, netting etc. and material cost like fish fingerlings, feed, fertilizer, lime etc.

in the local practice. The result reflects that production of fishes and profitability is more than double in CFC over the local practice which is because of adoption of good management practices. Biswas et al. 1991 reported that those farmers, who have a tendency to maximize their earnings, have higher adoption of Composite Fish Farming System. Our results showed that CFC could be a beneficial venture for optimum utilization of land and water resources of East Siang District of Arunachal Pradesh. Adoption of this technique will open avenues for self-employment, supplement the income of the farmers and enhance fish production.

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