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Paddy cum Fish Culture: Beneficial technology in Low land Areas of Rice.

KEYWORDS: Paddy cum fish culture, Fingerlings, B C Ratio, Yield, Net Return

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ABSTRACT *Rice-fish culture experiments were conducted by Krishi Vigyan Kendra, Pratapgarh to compare and evaluate the feeding, growth, survival and yields of fish culture in 2014 and 2015 respectively and to compare paddy and fish yield between rice-fish and rice-alone situations. Survival, growth rate and yields were better with the rice – fish field than the rice-alone situations field.*

The results of paddy-cum-fish culture experiments at farmer's field with Kaveri variety of paddy the fish yield was 12.8-16.8 Q/ha crop with paddy fish culture in 125 days culture. Paddy yields were 59.4-65.4 Q/ha crop in rice-fish field and 57.2-59.2 Q/ha crop in rice-alone culture with insignificant differences between the years. Water quality parameters were, in general, within the acceptable range for fish culture.

Introduction

Production of fish in rice fields is almost as old as the practice of rice or paddy culture itself (combined culture of rice and fish is also known as Paddy-cum-fish culture. (Jhingran, 1975; Kutty, 1976). Whenever water is stagnated within bunds as for rice culture, fish which naturally occur in the irrigation water and nearby tanks and pools enter the paddy-fields and grow there until harvest, along with the paddy. Thus fish production in rice fields dates from very early days, even though it was based on capture rather than culture.

It is suggested that fish culture in rice fields was introduced into South-East Asia from India about 1500 years ago, where presently it is the best developed (Tamura, 1961; Coche, 1967; Vincke, 1979). In the vast areas where rice grew with rain or irrigated water, wild fish also grow. Therefore the recorded production of fish from rice fields (until recent introduction of high yielding technology for rice production bringing in the "green revolution") must be much lower than the actual production realized. Thus in India where fish culture in rice fields is expected to have originated, the production figures shown are not impressive (Hora & Pillay, 1962; Coche 1967).

The greatest difficulty in rice-cum-fish culture is one that the improved modern technologies of agriculture in vogue in cultivating rice - large amounts of chemical fertilizers, herbicides and pesticides are used in growing rice - most of these are harmful to fish.

Rearing of fish along with paddy is an old practice in India (Alikunhi 1955). The practice of culturing fish in rice fields is a long tradition in many parts of Asia. It has largely been practiced in a traditional way in the Indian coastal states of Kerala and West Bengal. However, it has not been popular, although considerable potential exists, in West Bengal, Assam, Bihar, Orissa and Andhra Pradesh (Ghosh et al. 1985).

Materials and Methods

The study was conducted in low land area of Pratapgarh districts. Fifteen farmer's field was selected at Babaganj and Rampur Sangramgarh block of the district. The experimental fields were prepared by ploughing, cultivator passing, and pudding and finally leveled. A rescue pit was provided in each of these plots for safe refuge of fish during dewatering of the plots for agronomical practices. The bunds were raised to 20 to 25 cm height with single passage for inlet and outlet of water, which was protected with 3 to 4 mm mesh frame of 25 sq cm. Fertilizers were applied at the rate of 120: 60: 0 kg N: P: K per hectare. Kaveri variety of paddy seedlings was transplanted from seed bed by giving 25x15 cm spacing. After 15 days of transplantation fingerlings varying from 28 to 80 mm in length and 0.95 to 1.30 gm in weight were stocked at the rate of 7,000 - 8,000 per hectare in treatments II, III respectively and the I was kept as control. Second dose of fertilizer was given after 30 days at the rate of 80 kg N per hectare. After stocking, the bunds were regularly checked and leakages due to damage by crabs were rectified. During the period of observation the water level was maintained from 8 to 10 cm. A trench of 50-60 cm deep and 50-60 cm wide is made at the lower side of each paddy field. The length of the trench would be as per the length of the field.

In this paper, economic analysis is made only on simultaneous system in which fish and rice are cultured in the same field, with rice as the main crop. Preparation of the paddy fields starts in May-June and cropping of locally available variety of rice is completed within June-July. As the water level increases with the onset of monsoon, the farmers release fingerlings at a paddy field up to July and start migrating to the actual fish pond as the water level goes down in the paddy field. Paddy is harvested during November-December followed by harvest of fish.

Based on data collected, costs and returns and maximum profitability of the farming system were worked out. The production of a fish crop between the rice crops gives the farmer an off-season occupation (Hora and Pillay, 1962).

Results and Discussion

A wide variety of fish species have been cultured including common carp (Cyprinus carpio), Indian Major Carp- rohu (Labeo rohita), mrigal (Cirrhinus mrigala) and catla (Catla catla), Chinese carp -silver carp (Hypophthalmichthys molitrix) and occasionally grass carp (Ctenopharyngodon idel-

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la), tilapia (Oreochromis niloticus) and silver barb (Puntius javanicus) (Gupta et al. 1998). Fingerlings of Labeo rohita, Catla catla, Cirrhinus mrigala, Hypophthalamichthys molitrix, Cyprinus carpio and Ctenopharyngodon idella were mainly stocked by the farmers in the paddy field. During the period of observation the water temperature varied from 15°C to 45°C with the pH values varied from 6.5 to 8.5.

Table – 1 Particular of paddy plants of the experimental fields

Treatments	Av. Ht. of plants in cm.	No. of tiller per hills	No. of effective tiller per hills	Av. length of panicle in cm	Av. No. of grains per panicle
T1	62	12	10	22.2	176
T2	62.5	13	11	22.8	175
T3	63	14	12	23.3	175.5

The result indicates that the average Ht. of plants 13-14 cm., No. of tiller per hills 13-14, No. of effective tiller per hills 11-12, Av. length of panicle in cm 22.8-23.3 and Av. No. of grains per panicle 175-175.5 respectively.

Table – 2 Particular of Number, size range and weight of fish and fish yield

Plot no.	No. of fish stocked	Size range in mm	Av. wt of each fish in gram	No. of fish recovered	Size range in mm	Av. wt of each fish in gram
T1	-	-	-	-	-	-
T2	2000	45-60	1.20	1203	118-171	302.06
T3	2000	40-55	1.30	1174	120-170	304.12

The result indicates that the No. of fish stocked 2000, Size range in 40-60 mm, Av. weight of each fish 1.20-1.30 gram, No. of fish recovered 1,174-1,203, Size range in 118-171 mm and Av. weight of each fish in 302.06-304.12 gram.

Table 3 Particular of Effect of Paddy (Paddy cum Fish Culture)

Year -2014					Year -2015			
Plot no.	Yield (qt./ha)	Increase in yield (%)	Net return (Rs./ha)	B:C Ratio	Yield (qt./ha)	Increase in yield (%)	Net return (Rs./ha)	B:C Ratio
T1	59.2	-	54,160	3.3	57.2	-	51,452	3.1
T2	64.3	3.37	59,790	3.5	59.4	3.84	58,159	3.4
T3	65.4	5.14	61,220	3.6	60.3	5.41	61,067	3.6

In year 2014 the result indicates that the paddy cultivation gave 3.37 & 5.14 per cent increase in paddy yield over farmer's practice. Farmer achieved Rs. 59,790 and 61,220 from the Paddy crop in same area. In year 2015 the result indicates that the paddy cultivation gave 3.84 & 5.41 per cent increase in paddy yield over farmer's practice. Farmer achieved Rs. 58,159 and 61,067 from the Paddy crop in same area.

Table 4 Particular of Effect of Fish (Paddy cum Fish Culture)

Year -2014					Year -2015			
Plot no.	Yield (qt./ha)	Increase in yield (%)	Net return (Rs./ha)	B:C Ratio	Yield (qt./ha)	Increase in yield (%)	Net return (Rs./ha)	B:C Ratio
T1	0	0	0	0	0	0	0	0
T2	12.8	12.8	5,440	1.9	13.8	3.93	7,600	2.3
T3	16.8	16.8	8,000	2.4	14.6	5.79	7,980	2.4

In year 2014 the result indicates that the paddy cum fish culture under fish gave 12.8 & 16.8 per cent increase in fish yield over farmer's practice. Farmer achieved Rs. 5,440 and 8,000 additional incomes from the fish culture in same area. In year 2015 the result indicates that the fish cultivation gave 3.93 & 5.79 per cent increase in fish yield over farmer's practice. Farmer achieved Rs. 7,600 and 7,980 additional incomes from the fish culture in same area. There should be a 10 days gap in between transplanting of paddy and stocking of fish seed in the rice field. Experiments conducted on rice-fish farming at the farmer's field of Pratapgarh district revealed that paddy cultivation gave a net profit of Rs 6, 000 to Rs 8, 000 ha only, whereas, under rice-fish farming a net profit of about Rs 18, 000 to Rs.23, 000 per ha per yr was obtained (Raju and Reddy 1998) similarly. On an average 66.67 per cent of total respondents adopted rice-fish culture. The average weight of fish in gram (gm) at harvest for a period of 120-150 days was as follows:

Conclusion and Recommendations

The present study has clearly indicated that rice-fish culture is a viable, environment friendly, low-cost, low-risk additional economic activity with multiple benefits including increased incomes and greater availability of fish to rural farming community. Further work is needed in other regions of the country with different agro ecological conditions. Extension and development agencies should pay due attention to bring the benefits of the technology to marginal farmers. It is also necessary for the researchers as well as the fisheries and agriculture extension workers to work closely with farmers for technology transfer.

The farmers in the study areas have interest in expanding fish culture along with rice cultivation. A location specific program in this aspect will be more appropriate to motivate them to take up rice-fish culture in a scientific way.

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