Monoculture of Silver Barb (*Puntius gonionotus* Bleeker) in Rice Floodwaters in Bangladesh

MOSTAFA ALAM, A.K. YOUSUF HAROON and G.C. HALDAR

Introduction

Bangladesh has more than 2.8 million ha of seasonal floodplains, where water remains for four to six months. These are traditionally used for farming rice during the wet season (Karim 1978). However, their carrying capacity is not utilized to the fullest extent. There exists tremendous scope for increasing fish and shrimp production by integrating aquaculture with rice farming during June-November. The abundant natural food, both planktonic and benthic in these ricefields, would allow rearing of microphagous and herbivorous fish for four to five months. There has been insufficient research on rice-fish culture in Bangladesh, but interdisciplinary research has started recently at the Fisheries Research Institute, the Farming System Research and Development Project of the Bangladesh Agricultural University, the Rice Farming Systems Division of the Bangladesh Rice Research Institute, and at other universities and by NGOs.

Integrated rice-fish farming research was conducted with various fish species [major carps (*Catla catla, Labeo rohita, Cirrhinus mrigala*), stinging catfish (*Heteropneustes fossilis*), tilapia (*Oreochromis* spp.) and giant freshwater prawn (*Macrobrachium rosenbergii*)] and at various stocking densities from July 1987 to June 1991, at the Riverine Station of the Fisheries Research Institute, Chandpur (Haroon et al. 1989, 1993, 1994; Haroon and Alam 1992). Further trials with silver barb (*Puntius gonionotus*) were promising and the results are summarized here.

On-station and On-farm Trials

P. gonionotus was stocked in three plots on-station (130, 150 and 180 m²) and one on-farm trial plot (4,200 m²) about one month after rice transplanting. The on-farm plot area included three fish refuge ponds (210, 345 and 416 m²) with transplanted Aman paddy (*Oryza sativa*, kharif season and locally improved variety) at a stocking density of 7,000/ha after one month of rice transplanting. The average individual weight at stocking was 9.75 g on-station and 15.35 g on-farm. Neither supplementary feed nor extra fertilizers were used during the culture period, except those used for conventional rice farming: in kg/ha - urea, 200; TSP, 130; cow manure, 250. The water level was maintained at around 0.5 m in the on-station ricefields and 1.5 m in the adjacent refuge canal (about 10% of the ricefield area). For the on-farm site, the water depth was 0.8-1.0 m. Rain was the only water source for the on-farm site and the main source for on-station, but water from a nearby pond was often used for irrigation on-station.

At the on-station site, fish were harvested by complete draining after 100 days (23 July - 31 October 1990). The average weight of harvested fish was 51.0 g (range 49.3 to 53.1 g). Survival was 97% and the gross yields from the small experimental plots ranged between 384.5 and 434.7 kg/ha: 5.0 kg from 130 m²; 6.4 kg from 157 m²; and 7.8 kg from 180 m². The plots had already been planted with transplanted Aman rice from late May to early June.

At the on-farm site, rice was harvested in late December. The fish gradually entered the three refuge ponds with the decline in water level. Fish were then harvested by repeated netting on 2 January 1991 after a total of 160 days since stocking. The average weight of harvested fish was 108.4 g, survival was 54.5% and the gross yield was 416 kg/ha.

Discussion

Despite the 60 days of culture period and the larger fingerlings stocked on-farm, the on-farm and on-station yields were almost similar. No firm conclusions can be drawn from such unreplicated comparisons, but there is an indication that, with better management (as practised on-station), on-farm yields could be increased. The net income from the fish produced in the on-farm trial was around US$342/ha in addition to that already obtained from rice. At these on-station and on-farm rice-fish sites, yields of transplanted Aman rice ranged between 1.20 and 2.67 t/ha. It seems that rice yields are similar or a little increased, but not reduced, by farming fish in the rice floodwaters. Without feeds or extra fertilizers (other than those used for conventional rice farming) about 400 kg/ha of fish can be produced from the same land and water resources. The costs of building dikes around the ricefield could be reduced by installing nylon net enclosures (Miah et al. 1994).

Microphagous and herbivorous fishes [*P. gonionotus*, common carp (*Cyprinus carpio*) and grass carp (*Ctenopharyngodon idella*)] should be the right choices for integration with rice in Bangladesh. The rice used should be the locally improved varieties, having moderate height, yield and resistance to insect pests. This sort of integration could become one of the best and most rational means of using limited agricultural land and water resources, and could generate employment opportunities, increase farmers' incomes and alleviate malnutrition by providing a regular source of animal protein.

References

Haroon, A.K.Y., M. Alam and M.A. Mazid. 1989. An experimental study on integrated paddy-cum-fish/shrimp farming practice in Bangladesh. I. Effect of stocking densities on growth and yield. Bangladesh J. Fish. 12:101-108.

Haroon, A.K.Y. and M. Alam. 1992. Integrated paddy-cum-fish/shrimp farming. Final report. Fisheries Research Institute, Riverine Station, Chandpur, Bangladesh. 41 p.

Haroon, A.K.Y., M. Alam and M.A. Mazid. 1993. Experimental study on paddy-cum-fish/shrimp farming in Bangladesh. II. Effect of fertilizers on growth and yield. Bangladesh J. Zool. 21:51-58.

Haroon, A.K.Y., M. Alam and M.A. Mazid. 1994. Experimental study of paddy-cum-fish/prawn farming in Bangladesh. III. Effect of supplemental field on giant freshwater prawn and trials with silver barb and tilapia. Bangladesh J. Zool. 22(1):89-95.

Karim, M. 1978. Status and potential of Bangladesh fisheries. Ministry of Fisheries and Livestock, Dhaka, Bangladesh. 125 p.

Miah, M.N.I., M.H. Ali and N.U. Ahmed. 1994. Mono- and polyculture of silver barb (*Puntius gonionotus*) in deepwater rice systems in Bangladesh. Naga, ICLARM Q. 17(3):26-27.

M. ALAM, A.K. YOUSUF HAROON and G.C. HALDAR are from the Fisheries Research Institute, Riverine Station, Chandpur 3602, Bangladesh.