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Sustainable Aquaculture for a Secure Future

Title: Manipulation of species combination for enhancing fish production in polyculture systems involving major carps and small indigenous fish species

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Abstract: A sustainable semi-intensive pond aquaculture technology including major carp species as 'cash-crop' and small indigenous fish species (SIS) as food for the farmers' families is being optimized in Bangladesh. This is done through manipulations of the fish species combinations stocked, considering the ecological effects produced by bottom feeders on the pond bottom and filter feeders in the water column. The present paper presents results of experiments performed simultaneously in 64 farmers' fish ponds, located in 4 distant agro-ecological regions of Bangladesh. In each region each experiment involved 4 treatments, 4 replicates per treatment. The control polyculture was the traditional stocking of 33 rohu (*Labeo rohita*), 33 catla (*Catla catla*), and 34 common carp (*Cyprinus carpio*) per 100 m², with the addition of 250 SIS and 3 silver carp (*Hypophthalmichthys molitrix*) per 100 m². In previous experiments this silver carp addition was found to have no effects on the other fish and on the environment, compared to the traditional stocking without silver carp. Interferences on the water column (Water treatment) were achieved changing the density of the herbivorous fish (reducing catla density to 24/100 m² and increasing silver carp to 12/100 m²), and on the bottom (Bottom treatment) doing so on the benthophagous fish (replacing 10/100 m² common carp by mrigal). Both interferences were simultaneously carried out in the Water and Bottom treatment. Harvesting weight and biomass, growth rate,

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survival and yield of each species and total yield, food conversion ratio and income obtained in the different treatments and regions are presented and their interactions through the food web are discussed. Performing the same experiment in four distant regions of the country allowed observing if the effects of the Water column and/or Bottom interventions differ among regions, and accelerating the dissemination of the “cash-SIS” technology throughout the country. The manipulations performed did not affect the small fish mola, which reproduced and yielded equally well in all the polycultures. This allowed a continuous mola supply for consumption by the farmers' families throughout the culture season, and opened the option to consume or sell the larger amounts of mola gathered at final harvest. Manipulation of species composition proved to be a useful tool to affect the pond ecosystem towards improving fish yield and corresponding income. Just by substituting almost a third of the catla by silver carp increased total yield by 16%. When also almost a third of the common carp was substituted by mrigal, total yield increased a further 3%. In both cases selling the whole production increased income by 27%, which gives the farmer the option to keep part of the fish for family consumption.

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