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Integrated aquaculture with animal components and horticulture crops: Role of women in integrated aquaculture for household

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ABSTRACT

Integrated farming system is a valuable approach to addressing the problems of sustainable economic growth for farming communities. The integration of aquaculture with duck and poultry birds in pond site along with crop farming offers greater efficiency in resource utilization with production of addition food and income. The system involves recycling of waste or by products of one farming system as inputs for another compatible system and ensures efficient utilization of available farm space for maximising production. Women's role and participation has often been ignored partly due to socio-cultural taboo against them. The present paper therefore, highlights that fisherwomen play a critical role in sorting of fish fingerlings, feeding of animals reared in ponds and of vegetable and fruit trees. Active help from local governments and mass literacy campaigns are very much needed to upgrade the knowledge of fisherwomen and skill.

Keywords— *Aquaculture, Fisherwomen, Fingerling, Fertilizer, Animal husbandry*

1. INTRODUCTION

Integrated fish farming means a process of farming where fish in cultured along with other farm products and animal husbandry centred on the fish farm. In India, the integration of fish culture with livestock rearing and crop farming holds great promise and potential for augmenting the production of animal protein and betterments of livelihood of rural people (Pullin and Shehadah, 1980). These mutually reinforcing aquatic and terrestrial production system totally recycle the entire farm procedure and ensure efficient and optimum utilization of the animal and farm waste for increasing the production of fish protein, at a low input cost (Santhanam *et. al.* 2002). This culture practice provides livelihood to the family of fisherman and the contribution of women in to the livelihood of the household is significant. The women of India must grow and develop in this regard. Tyagi (2009) observed that in the families where the participation of women was higher, the families performed better livelihood achievements. In this integrated farming if the rearing of ducks and poultry birds is sited on the pond embankments, the fish utilize the spill over feed and also their excreta. The excreta of the animals' act as an efficient fertilizer in fish ponds. There are hardly any authentic statistics available on the number of women involved in fisheries related work. However, in capture fisheries role of women has been investigated by Mukherjee *et. al.* (2010). Therefore, it is urgently needed to examine the socio-economic status of the fisherwomen and if possible, suggest suitable strategies for sustainable inland fisheries development.

2. MATERIALS AND METHODS

The experiment was conducted in a 1.40 ha pond and 0.1 ha ponds in Krishnanagar, West Bengal. The average depths of the ponds were 1.0 to 1.5 m. In fish-cum-duck farming system the ducks moved in the pond during day time but during night they were housed in a floating duck house with shed made of bamboo mating over with supported wooden pillars. Initially the ponds were manured by cow dung collected from nearby areas. Lime was applied two times during the course of experiment @ 100kg/ha. each time. On decomposition the cow dung enriches the soil and water with nutrients and planktons. One pond (1.0 ha.) was initially stocked at the stocking density of 8,000 fingerlings/ha. in the species ration of Catla: Rohu: Mrigel i.e. 2.0:2.0:1.2 and Grass carp: Common carp i.e. 1.5:0.6 . Another pond (0.1 ha.) was initially stocked with fingerlings at a stocking density of 6,300 fingerlings/ha. in the species ratio of Catla: Rohu: Mrigel i.e. 1.0:1.5:2.5 and Grass carp: Common carp i.e. 1.5:1.8. As a part of experiment after nine months partial harvesting was done and a second stock of fish fingerlings of 1,000 having species ratio of Catla : Rohu : Mrigel i.e. 1.0:1.2:2.5 and Common carp 2.5 were stocked. Lime was applied twice during the course of experiment @ 200kg/ha. for release of nutrients from water body. One hundred fifty and one hundred ducklings (Khaki campbell) were reared in the first (1.0 ha.) and

second (0.1 ha.) ponds respectively. In the initial phase ducks were depended upon natural floating weeds present in the pond, but later on balanced poultry feed supplemented with crushed molluscs. All the works have been managed by the women.

In fish-poultry integration, the poultry birds were kept in confinement in cage with no access to outside. In one pond (1.0 ha.) three hundred birds were reared. The shed of the poultry was constructed over the dyke for facilitating manurial management. The birds were fed with starter feed. Droppings obtained from birds were sufficient to supply required nutrients for one-hectare water area. No additional fertilizers and supplementary feed were provided in the pond except that of liming at two intervals.

The embankment of fish ponds was planted with vegetables such as brinjal, tomato, spinach, lettuces and fruit trees like banana and papaya. The trees were supplied with pond mud as a fertilizer.

3. OBSERVATION

In the present study the women of age group 35 to 45 years are involved in whole integrated farming processes including supply of feed to the animals and taking care of the vegetables (Fig.1). The fishermen are involved in raring and care of fish on regular basis. The fishing community lives in small house adjacent to pond site and literacy rates are comparatively low. However, the fisherwomen sending their children to the school and they are also paying attention for education of their girl child.

In the first experimental pond (1.0 ha.) the fishes are harvested after twelve months rearing. The production of that recorded to 850 kg of fish which corresponds to a production rate of 8,500 kg/ha./year. The duck laid 3,500 eggs and a total of 3,700 kg of duck flesh has been produced in one year. The total fish yield in the second experimental pond has been recorded to 6,525 kg of fish/ha./year without any supplementary feed and fertilizer. The ducks in the second pond laid 1575 eggs and a total of 2500 kg of duck flesh has been produced in one year (Figs. 2,3).

In fish-cum-poultry bird farming 300 numbers of birds are reared. The poultry birds laid 4000 eggs and a total of 3,000 kg of bird's flesh has been produced (Figs. 2,4).

The vegetables and fruit trees grown on the pond embankments provides extra income to the family of farmers (Figs. 7,8).
The fisherwomen are also actively involved in the rearing and maintenance of pond as well as rearing of ducks and poultry birds (Figs. 5,6).

4. DISCUSSION

Fish culture in combination with livestock and vegetables is a unique and lucrative venture and provides a higher income and makes available a cheap source of protein and other nutrients for the rural population under one interlinked system. In this practice, excreta of ducks and poultry birds either recycled for use by fish or serve as direct food for fish. Hence, the expenditure towards fertilizers and supplementary feeds for fish culture is not only curtailed to the minimum but also there is economy of space. In addition, the droppings of duck and poultry binds contain organic and inorganic substances with a number of elements for production of fish food organisms of carps (Santhanam *et. al.* 2002). Majumdar *et. al.* (2018) emphasised that fish farming with poultry birds, the excreta provides of nutrient base for zooplankton and phytoplankton development. Besiders manuring, ducks eradicate the unwanted water insects and their larvae which may be the vectors of fish pathogenic organisms. Ducks aso help in aerating the pond water and raking the pond bottom during dabbing for food collection (ICAR, 2009). Luomba (2013) emphasised that within the Lake Victoria region women are involved in aquaculture-related activities. They are known to play a critical part; from pre-harvest and harvest to post-harvest processing women are accustomed to several daily routines such as cooking, child rearing, farming and household gardening work whish have enabled them to accommodate fish farming (Burton *et. al.*, 1999). Women involvement in fisheries subsector particularly inland fisheries and fish culture including making fishing nets, repair and maintenance the gear, sorting of fingerlings have been increasing in south west coastal areas of Bangladesh (Morula and Naher, 2014).

In the present study, the role of fisherwomen in the production of fish, livestock and vegetables have paramount importance for the nutrition of their family. Based on ICAR norms. more than two-thirds of population in rural households in India are undernourished (Chand and Jumrani, 2013). It has been revealed that protein and iron intake by the fisherwomen is considerably lower than the recommended dose of ICMR. Majority of the Indian rural women face nutritional deprivation since their childhood. Proverty is not only major cause of malnutrition and under-nourishment. Socio-cultural values are also biased against women (Anonymous, 1997). Most of the fisherwomen reported that they seldom met Fishery Extension Officers, Village Panchayet personnel and the policies do not focus on fisherwomen as the target group.

The present practices have been devoid of systematic and scientific approaches. While integration of duck and poultry with fish have been proved to be economically viable, several other components like cattle rearing and horticultural crops can also be effectively integrated depending on the regional demand. From the cattle rearing in addition to milk, installation of biogas plants may also source of income and the slurry from the plants may be applied into fish ponds as fertilizer.

5. ACKNOWLEDGEMENT

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APPENDIX

Legends of the figures

Fig 1: Picture showing the experimental pond.
Fig 2: Showing the shed of ducks on the embankments of the pond.
Fig 3: Ducks floating freely within the pond.
Fig 4: Showing poultry shed and poultry birds within it.
Fig 5: Fisherwomen at the site of experimental pond doing maintenance of pond.
Fig 6: Fisherwoman at the pond site busy in rearing and manuring the pond with proper efficacy.