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Rice-fish farming model in water logged condition in eastern Terai region of Nepal

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Abstract
Rice-fish farming as a cost effective integrated practices for marginal and poor farmers. It is one of the effective farming methods for increasing productivity of rice by recycling the energy and matter of a given ecosystem in sustainable manner. An experiment was carried out at Regional Agricultural Research Station (RARS), Tarahara, Nepal for 90 days during March to June 2015 to evaluate performance of Common carp and tilapia in rice plot. The rice field was occupied 10 % refuge area in one side of rice plot as holding place for fish emergencies. The height of dike was maintained 0.5 m, top width was 0.4 m and base width was 0.5 m. The water level maintained during the research period was up to 25 cm and fish production could reached 450-500 kg/ha without providing any supplementary feed to the fish stocked in their rice field. The fish harvested weight from common carp and tilapia polyculture 32.15 g was higher than monoculture of common carp was 20.10 g and monoculture of tilapia was 18.54 g. This study showed that production of rice do not decrease with use of refuge in ricefield. The rice production with fish was 4.5 mt/ha and without fish rice production was 3 mt/ha. The rice production increased by 10-12%.

Keywords: rice-fish, cost effective, integrated, common carp, tilapia and polyculture

1. Introduction

Rice-Fish culture produces more income than rice monoculture (Ali and Mateo 2007) [1]. The profitability of rice-fish culture has been reported higher than rice monoculture (Ahmed, *et al*., 1992) [2]. Integration of fish with rice farming improves diversification, intensification productivity, profitability, and sustainability (Ahmed *et al*. 2007) [3]. Integrated rice-fish farming system, fish improve soil fertility by increasing the availability of nitrogen and phosphorus (Dugan *et al*. 2006) [4]. The feeding behaviour of fish in rice plot control aquatic weed germination and reduces pest (Halwart and Gupta, 2004) [5]. Moreover, fish eat flies, snails and insects, and can help to control malaria mosquitoes and water-borne diseases (Matteson, 2000) [6]. This technology, adequate supply of carbohydrate and also the supply of animal protein. Fish, particularly small fish, are rich in micronutrients and vitamins, and thus human nutrition can be greatly improved through fish consumption (Larsen *et al*. 2000) [7].

Nepal has tremendous flow of water where 6000 rivers and 398000 ha irrigated rice field. The government statistics shows that rice-fish farming covers approximately 160 ha in Nepal (Pradhan *et al*. 2002) [8]. In Nepal, rice fish farming started from 1964, can introduced Nile tilapia and common carp in rice field (Gurung *et.al.* 2002) [9]. The low adoption of rice-fish farming, attributed to inadequate knowledge of rice-fish farming technology, increased use of insecticide in rice field, and few social problems (Wagle 2000, Gurung 2001) [10, 11].

Besides, the use of hybrid rice, biotechnology, insecticides, fertilizers, irrigation, and crop intensification for rice production, one of the alternatives could be rice-fish farming system for increasing rice field productivity (FAO, 2004) [12].

Rice-fish farming is one of the low cost simple technologies, which should be adopted easily among the farmers. Integration of fish with rice farming provides economic and environmental benefits to the farmers and also helps in providing balance diet to the people through regular supply of fish. Thus, wider adoption of rice-fish farming may contribute to increased food security in rural areas in. This paper also attempts to explore the possible reasons for slow adoption of this technology by the farmers in eastern terai region of Nepal and to suggest the potential ways to improve the adoption and dissemination of the technology.

2. Material and methods

The experiment was conducted at RARS, Tarahara of eastern terai region of Nepal. In this experiment Chaite-2 rice cultivars was tested in combination of fish. There were 12 rice plot was selected, each plot size was 100 m2. The size of refuge was 10 % occupied in rice plot. The height of dike was maintained 0.5 m, top width was 0.4 m and base width was 0.5 m. In dry season April to July, 2015 chaite-2 rice variety was used in this experiment. Seedlings bed prepared and grown 50 kg/katha were transplanted when 25 to 30 days old. The standard method of planting was line to line distance 25 cm and row to row 20 cm distance. The application of chemical fertilizer N:P:K at the rate of 100:30:30 kg/ha involved basal application and two top dressing at the time of tillering and penicle initiation.

There was two fish species (common carp and tilapia) were stocked in rice plot. The stocking density of common carp and tilapia were 1 fish/m^2. The stocking size of both fish were 10-20 g. There was four treatments common carp and rice, tilapia and rice, common carp and tilapia and rice, and rice only (control) were replicate three times. During the experimental period water level maintained upto 25cm in rice plot. Without providing any supplementary feed to the fish stocked in their rice field during the experimental period.

Rice plot was prepared by ploughing and harrowing with the help of spade and racker respectively. The water quality parameters DO, pH and temperature monitoring fortnightly. For fish harvesting, completely drained rice field and fish were collected in the refuge. Fish harvesting was done 15 days before rice harvesting.

Fig 1: Rice Production

Fig 2: Monthly growth check of fish

3. Statistical Analysis

Data processing and illustrations were performed using Microsoft excel. Differences between treatments were analyzed with Genstat version 7.

4. Results and discussion

The growth of common carp and Tilapia polyculture was significantly higher (p<0.01) as compared to monoculture of common carp and tilapia in all monthly growth check This research showed that the final harvested weight from common carp and tilapia polyculture 32.15 was higher than monoculture of common carp was 20.10 and monoculture of tilapia was 18.54. Baba *et al.* (2013) [13] reported that Nile tilapia (*O. niloticus* L.) was successfully grown on a "No feed" regime, in a rainfed lowland rice farm and fish growth of 121 g/fish over 139 days (four and half months). Wagle (1998) [14] reported that *C. carpio* exhibited the higher growth rate (1.92 to 2.5 g.day^{-1}) at all stocking densities than did by *O. niloticus* (1.08 to 0.93 g.day^{-1}).

The research showed that stocking density of both fish were 1 f/m2 which exhibited improve growth and production of rice and fish. Similarly, Fagi *et al.* (1992) [15] reported the negative effect on rice yields with the high stocking density of fish in rice field.

The water level maintained during the research period was up to 25 cm and fish production could reached 450-500 kg/ha without providing any supplementary feed to the fish stocked in their rice field. Ali and Mateo (2007) [1] showed that the highest increase (34.61%) in net income was from 11-15 cm water depth with feeding supplementary feed.

The survibility of common carp and tilapia during the experimental period was 80% and 70% due to maintained water level in rice plots. Some mortality occurred during the experimental period due to predation by birds. Low water level, declining water pH and temperature at later stage of rice growing period did affect (P<0.05) the growth and survivability of fish in rice field (Wagle *et al.* 2004) [16].

The research also showed that the rice production with fish was 4.5 mt/ha and without fish rice production was 3 mt/ha. The rice production increased by 10-12%. Baba *et al.* (2013) [13] also reported that the average yields of rice with fish was as high as 4.6 t/ha.

Table 1: Different growth stage of different fish species

Growth Stage	Common+Tilapia	Common	Tilapia	Mean
Stocking (g)	12.97	12.43	11.93	12.45
Growth (g)	17.41	15.22	13.87	15.50
Harvesting (g)	32.15	20.10	18.54	23.60
Mean	20.84	15.92	14.78	
SED	1.290			
lsd	2.734			
CV%	9.2			
F-sig(P-Value)	<0.001			

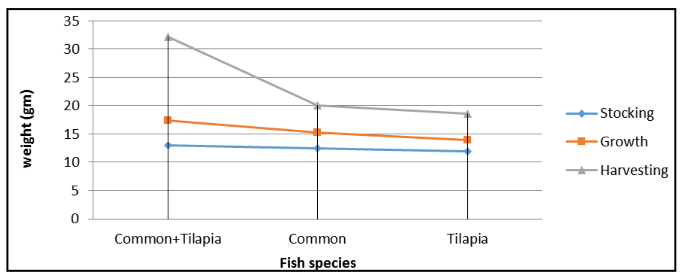

Fig 3: Stocking, growth and harvesting of different species of fish

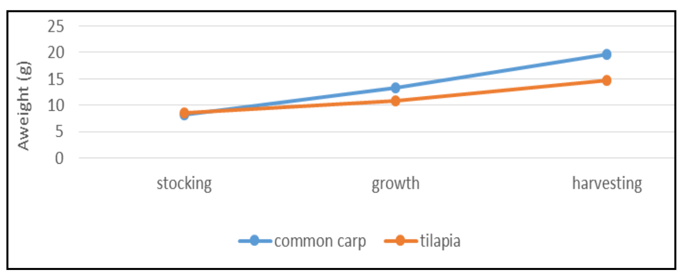

Fig 4: Growth trend of common carp and tilapia

5. Conclusion

Rice fish farming is a resource utilization, productivity and food supply. And also suggested that it is sustainable farming alternative to rice monoculture. The adaptation of rice fish farming, particularly lack of knowledge and risk association of flood and drought. The polyculture of common carp and tilapia fish play vital role to enhance productivity through natural resource mobilization of the rice field.

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7. References

1. Ali MH, Mateo LG. Economics of Rice-Fish culture in wetland Rice Ecosysytems. SAARC Jn. of Agriculture. 2007; 5(2).
2. Ahmed M, Bimbao MAP, Sevilleja RC. The economics of rice-fish in Asia mixed system. A case study of the Philippines, p 207-216. In: C.R. dela Cruz, C. Lightfoot, B. A. costa-Pierce, V. R. Carangal and Bimbao (eds.). 1992. Rice-fish research and development in Asia. International Center for Living Aqualic Resources Management (ICLARM). Makati, Manila, Philippines. ICLARM Conf. Proce. 1992; 24:457.
3. Ahmed N, Wahab MA, Thilsted SH. Integrated aquaculture-agriculture systems in Bangladesh: potential for sustainable livelihoods and nutritional security of the rural poor. Aquaculture Asia. 2007; 12(1):14-22.
4. Dugan P, Dey MM, Sugunan VV. Fisheries and water productivity in tropical river basins: enhancing food security and livelihoods by managing water for fish. Agricultural Water Management. 2006; 80:262-275.
5. Halwart M, Gupta MV. Culture of fish in rice fields. Food and Agriculture Organization of the United Nations and the WorldFish Center. 2004; pp. 83.
6. Matteson PC. Insect-pest management in tropical Asian irrigated rice fields. Annual Review Entomology. 2000; 5:549-574.
7. Larsen T, Thilsted SH, Kongsbak K, Hansen M. Whole small fish as a rich calcium source. British Journal of Nutrition. 2000; 83:191-196.
8. Pradhan GB, Dahal SP, Singh DM. Status and potentiality of rice-fish farming and implication approach of developed technology. A paper presented in the workshop on "Workshop on rice-fish farming for productivity enhancement: A scientific basis for wider adoption" held in Kathmandu on 19th July 2002, 2002.
9. Gurung TB, Bista JD, Dhakal HP. Ecological principle of rice-fish farming and research experiences: An implication for wider adoption. A paper presented in the workshop on "Workshop on rice-fish farming for productivity enhancement: A scientific basis for wider adoption" held in Kathmandu on 19th July 2002, 2002.
10. Wagle SK. Refuse system, fish species and density, rice cultivar, fertilization and feeding regime in rice-fish farming. Review report, Agriculture Research Centre (Fisheries), Pokhara, 2000.
11. Gurung TB. Study on the performance of rice-fish farming under the integrated rice fish culture in the hills. Project Completion Report (PP 71/99) submitted to HARP, Kathmandu, Nepal, 2001.
12. FAO. Rice is life: Increased, sustainable rice production key to global food security, 2004. http://www.fao.org/newsroom/en/focus/2004/36887/index.html
13. Baba IIY, Abudulai M, Dogbe W, Hoskaya A. Integrated rice-fish farming as a business: The case of Golinga irrigation scheme small farmers. Journal of Agricultureal Extension and Rural Development. 2013; 8(8):154-163.
14. Wagle SK. Rice-fish farming: trench design, stocking density, water management and the productivity, In B. R. Pradhan, S. K. Wagle, O. Yamada and M. Takano (eds.) Proceedings of Present Status of Fisheries Research, Development and Education in Nepal, JICA/NARC. 1998; pp. 24-28.
15. Fagi AM, Suriapermana S, Syamsiah I. Rice-fish farming research in low land areas: the west Java case, In C. R. Dela Cruz, C. Lightfoot, B. A. Costa-Pierce, V. R. Carangal and M. P. Bimbao (eds.) Rice-Fish Research and Development in Asia, ICLARM Conf. Proc. 1992; 24:273-286.
16. Wagle SK, Gurung TB, Bista JD. Effect of fish stocking size, Density and Ferilizer on water quality in Rice fields for productivity Enhancement in Integrated Rice-Fish farming in Hills of Nepal. Fisheries Research Centre, p.o. Box 274, Pokhara, Kaski, Nepal. Paper prepared for presentation in 7th Asian Fisheries Forum to be held on 30th Nov. to 4th Dec., 2004 at Hotel Equatorial, Penang, Malaysia, 2004.