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The use of rice and fish polyculture in rice fields to improve rice yields hence food security in Bunyala - Kenya

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Background

Rice is an important food crop in Kenya's drive to attain food security. However, its productivity remains low against an overall increase in national demand due to overdependence on rice monoculture leading to decline in soil fertility resulting from continuous cultivation, nutrient extraction through crop harvest and inadequate nutrient replacement. This can be mitigated by modern technologies that increase soil fertility such as integrated rice-fish (RFC) farming. Despite the potential of RFC, no attempts have been made yet in Bunyala irrigation scheme. In the scheme, paddy fields remain flooded for 3-4 months of a growing season during which, growth of fish is possible. RFC can give a net profit-cost ratio 4% higher than rice monoculture due to increased rice yields, saving on labour and material inputs and the net profits from fish production (Osiyo, 2010).

Aim

To assess the effect of fish polyculture on growth and yield of rice and determine which of the two fish species, would perform best in the rice-fish culture.

Methodology

A field experiment was carried out in Bunyala Irrigation Scheme. The experiment was laid out in a complete randomised design with rice monoculture as the controls. The Nile Tilapia (Oreochromis niloticus) and Catfish (Clarias gariepinus) was separately integrated with a locally grown rice variety (Basmati) to determine which one of them is better for rice-fish culture. Monosex tilapia and catfish of approximately 20g were stocked at 4 fingerlings per m2. Data on water quality parameters such as Dissolved Oxygen, pH, temperature, alkalinity, orthophosphate and nitrates-N, plant height, tillers and panicles/stool, harvest index, 1000-seed weight and seed yield/m2, incidence of stem-borers, weed abundance and dry matter and per cent survival and total wet weight of fish were recorded.

Results

Mean values of the water quality parameters were measured in the plots during the experimental period. They were within the recommended acceptable range for growth of Clarias spp. (Viveen et al.,1985) as well as that of Oreochromis spp.

Both morning and values were fairly constant. However there was remarkable fluctuation in the afternoon pH values in all the treatments. Dissolved oyxygen showed a similar pattern. The morning values were slightly low but remarkably uniform in all the rice-fish plots. The values were however higher in the rice monoculture plots and ranged from 4.5 - 8.5 mg l-1. Plant height was used to evaluate the effects of treatment on plant growth. In the beginning the rice-fish plots' height had significantly shorter plants probably since fish had not grown fully as to warrant their significant effect. The height of the plants was also affected by the heigh water level since the rice require some alternate periods of almost dry padies for maximum growth. The stem borers seem to have had less impact on the crop in the integrated plots compared to the monoculture plots. Rice-fish polyculture gave significantly ($P< 0.05$) higher yield than rice monoculture. The rice yields were best in the plots with catfish. Although there were no significant differences in the initial weights of the fish stocked, the fish yields differed significantly ($P< 0.05$) in terms of weight gain.

Mean net fish production was highest for the catfish. Though recovery was low like that of tilapi,the catfish had gained more weight thatn the tilapia. Tilapia are slow in feeding which led to their low weight. Fish survival in all treatments (percent recovery) was quite low due to many predators such as the mangoose, eagle and seals among others and night thieves.

Research application

This research findings are expected to be used to advise farmers on the practicability of integrated rice fish farming and the benefits they stand to gain when they adopt it as compared to rice-monoculture system. This study would also provide a future reference for other researchers and provide a base for future research work since not everything was exhausted by it.

Conclusion

Integrated rice-fish polyculture is an innovative alternative of enhancing agricultural production by reducing labour costs and agrochemicals and increasing yield per unit production area. Ialternativef adopted, integrated rice-fish farming will definately improve food security in Bunyala. This is because it will significantly increase rice yields and produce fish on the same resource base of land, water and labour.

Challenges

It was not possible to control water level due to different planting times and different cultivars' cultivated by the different farmers hence varying water levels required for best performance.

The fish were predated on by so many predators such as moles, mangoose, birds and human thieves.

Limitations

Farmers are scaptical about adopting the system since they think that the pond area is going to reduce their cultivatable paddy. They therefore need to be convinced that the small cultivable paddy area used for fish refugia does not result in net loss, but a net gain in both rice and fish production which is going to diversify their food as well sources of income.

Acknowledgement

Lots of appreciation goes to the farmers in Bunyala (Mr. Peter and Christopher Alando for providing us with their farm where we prepared our experimental plots.I would also like to thank the National Irrigation Board for their technical and advisory surport.My aapreciations also go to Kenyatta university teaching ataff, management and laboratory technicians for providing me with ample place to do my laboratory analysis.My utmost thanks go to RUFORUM for their financial support,exporture and correspondences which enlighted me.

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