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Diversifying rice production systems by integrating with fish for food, nutrition and economic security in Ghana

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Abstract

Optimisation of Inland Valley (IV) land use through sustainable intensification and diversification of resource-poor smallholders' income sources is required for achieving the Sustainable Development Goals of food and nutrition security, and sustainable economic growth in the global south. This pilot study on integrating rice and fish farming systems aimed to test the feasibility of the integrated system in IV bottom areas for improving food and nutritional security and increasing farmers' income. On-farm demonstration experiments were conducted in October 2019–May 2020 and July 2020–February 2021 in an almost chemical-free environment at two sites: Adugyama, where rice-catfish integrated farming was compared with the sole rice cropping; and Biemso, where rice-tilapia integrated farming was compared with the sole rice cropping. Data were collected on rice grain yield, weight of 1000 grains, total aboveground biomass, fish yield and the profitability of the systems. The results showed that although the average rice grain yield from sole rice fields ($4.8\text{--}6.2\text{ t ha}^{-1}$) was higher (i.e., by 15%; 0.7 t ha^{-1}) than the yield from rice+fish fields ($3.7\text{--}5.9\text{ t ha}^{-1}$), the fish yield in the range of $2.4\text{--}5.5\text{ t ha}^{-1}$ compensated for the reduction in grain yield. The economic analysis showed that integrated rice-fish system with a benefit-cost (B:C) ratio of 2.2 was more profitable than the sole rice system with a B:C ratio of 1.6. This pilot study has clearly indicated that integrated rice and fish farming system improves IV bottom catena profitability and optimises IV land use for ensuring food and nutrition security and increasing smallholder farmers' income in Ghana and potentially in similar agro-ecologies of West Africa.

Keywords: Agro-pisciculture, inland valleys, Integrated rice-fish, nutrition security, optimising land use