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Adaptive On-farm Evaluation of Resource Conserving Rice Cultivation Practices in the Middle Senegal River Valley

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Abstract

Sahelian rice production is often critiqued as sub-optimally yielding, highly input intensive, and resource and cost inefficient. Now practiced in six Sahelian countries, the System of Rice Intensification (SRI) has been proposed as a potentially viable alternative to conventional rice cultivation. Principles include the use of single, young transplants at wide spacing, compost, mechanical + manual weed control, and intermittent irrigation. We report on three seasons of on-farm experiments in three locations in the Senegal River Valley. During the 2008 Dry Season, farmers' (FP) and recommended management practices (RMP) were compared with a locally adapted version of SRI (ASRI), which employed all principles, but substituted compost with mineral fertilizer. Across sites, we found significant yield increases for RMP (+20%) and ASRI (+31%) relative to FP. But while farmers appreciated the yield and water saving benefits of ASRI, they also found it labor demanding, especially for weeding activities that coincided with horticultural crop labor requirements. Farmers subsequently designed and implemented a fourth system that hybridized RMP and ASRI (hereafter “Hybrid”), by maintaining intermittent irrigation, increasing crop density and following a single round of mechanical weeding with localized herbicide applications. RMP, ASRI and Hybrid yields were 25%, 25% and 19% greater than FP in the 2008 Wet Season. The Hybrid system was generally successful in reducing weed biomass; it also reduced labor and input requirements, and gave the highest net profits in 2 of 3 sites. In the 2009 Dry Season, the Senegalese State halted subsidies for herbicides. RMP, ASRI and Hybrid yields were 36%, 37% and 34% greater than FP. The Hybrid approach reduced herbicide use by 38% and 57% compared to FP and RMP, and was most profitable at all sites. Modeling the economic impact of water savings reinforces these results, although analysis of data on farmers' perceptions of the systems highlighted key constraints associated with scaling-up to the whole-irrigation system level. We underscore that rather than rigidly comparing pre-defined cropping systems, far greater research emphasis should be placed on experimentally integrating farmers' ideas and efforts to learn from and modify farming practices to local socioeconomic and agronomic circumstances.

Keywords: Adaptive management, bioeconomic analysis, rice, Sahel, SRI, System of Rice Intensification, water savings, weed management