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Potentials and Risks of Alternate Wetting and Drying in Rice Production of the Dry Savannah Zone of West Africa

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Abstract

Irrigated rice farming plays a vital role in global food security but also requires more water than any other staple crop. Meeting the high demand for rice to feed the growing population under increasing water scarcity is one of the major challenges of the twenty-first century. Alternate wetting and drying (AWD) is one of the most widely advocated water-saving irrigation technologies. The technology was introduced only recently in the dry Savannah zone of West Africa, where it is still largely unknown by farmers. We assessed the effect of AWD on grain yield and irrigation water productivity against the backdrop of possible N losses. Participatory on-farm trials compared AWD to farmers' irrigation practice in four irrigation schemes of Burkina Faso during both the dry and the wet seasons of 2018 and 2019. AWD was compared to farmer' irrigation practice (FP) in 156 pairwise comparisons of AWD and FP plots. In addition, soil nitrate-N dynamics in relation to soil water content was assessed in dry season 2019. Compared to farmers' practice (FP), irrigation water input with AWD technology was reduced by 32 % in the dry and by 25 % in the wet season. With no significant effects on grain yields (mean of 4.9 Mg ha^{-1}) AWD increased the irrigation water productivity by 64 %. However, each AWD cycle resulted in soil N mineralisation of about 3 kg N ha^{-1} and the loss of this nitrate-N upon rewetting. Total N losses increased with soil drying intensity and the number of AWD cycles and reached up to 30 kg ha^{-1}. While AWD appears to be an effective strategy to save irrigation water with no rice yield penalty, the observed nitrate losses point towards possible negative longer-term impacts on soil fertility and productivity in rice irrigation schemes of the dry Savannah zone.

Keywords: AWD, Burkina Faso, *Oryza sativa*, water productivity, water-saving technology

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