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"Development on the margin"

Impact of Climatic Conditions on Rice Yield under Water-saving Irrigation in the Sahel

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Abstract

Interest in water-saving irrigation techniques in Senegal is rising from the aim to increase the domestic rice production and thus becoming self-sufficient via rice-rice double-cropping and expansion of the rice growing area and also from high irrigation costs due to increasing fuel and electricity prices.

Since climatic conditions in the Sahel are highly variable in the course of the year, we investigated water input, yield and water productivity of five selected genotypes under flooded and water-saving conditions in eleven bi-monthly staggered sowing dates, year-around. Experiments were conducted between November 2008 and October 2010 in Ndiaye, located in the Senegal River delta, with typical Sahelian climatic conditions and thus three distinct seasons: a hot-dry-season from March to July, a short wet-season from August to October and a cold-dry-season from November to February.

Yield reductions under water-saving irrigation were larger for most of the varieties after sowing in the cold-season, while sowing in the hot-dry-season and wet-season led to minor yield penalties compared to the continuously flooded treatment. Water productivity was increased in the water-saving treatment compared to flooded conditions after sowing in the hot-dry-season, whereas sowing in the cold-season lead to comparable water productivity in the water-saving as well as in the flooded treatment.

Since yield losses under water-saving conditions varied widely between the different seasons, we concluded that climatic conditions are a major determinant for performance of rice grown under water-saving conditions. Whereas extremely high vapour pressure deficits and thus an increased evaporative demand are leading rapidly to soil water deficits in the hot-dry-season, low minimum temperatures that are not buffered by a floodwater layer are resulting in decelerated development in the cold-season. The impact of weather parameters and microclimate on crop performance under water-saving irrigation will be presented and genotype-specific responses discussed.

Keywords: GxE interactions, lowland rice, Sahel, water-saving irrigation

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