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Response of Transpiration of Lowland Rice Varieties to Water-saving Irrigation

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Abstract

A growing world population decreases water availability for agriculture while the demand for rice, the major staple crop for a large part of the world's population, increases at the same time. Growing rice with less water while maintaining its high yields is one of the major objectives in rice research to date.

Through adapting the system of irrigation, unproductive water losses such as evaporation, percolation and seepage can be reduced and the level of productive water use then depends mainly on transpiration. Little is known on how such water saving techniques affect transpiration of rice as it is more difficult to observe in the field and it is influenced by varietal characteristics as well. A field experiment was conducted at the Sahel station of AfricaRice in the northern part of Senegal with the aim to assess the transpirational responses of two contrasting lowland rice genotypes to irrigation management. The irrigation treatments were (1) flooded – a constant ponded water layer of about 10 cm throughout the season and (2) Saturated Soil Conditions – frequent irrigation to saturate the top soil without stagnant water to reduce unproductive water losses. Leaf gas exchange was measured (1) twice a week at noon on all active leaves of the main culm and (2) weekly diurnals each with three replications. Changes in transpiration were observed for leaf development and age as well as for diurnal kinetics. These measurements will be used to calculate transpiration over the cropping period in order to estimate water losses through transpiration on field level. Differences between treatments and varieties will be determined and compared with lysimeter results for evapotranspiration and evaporation obtained from the same plots. The results will be discussed in view of the effects of water-saving irrigation on transpiration of the two varieties as dependent on leaf senescence levels and diurnal microclimatic effects.

Keywords: Field water balance, genotypic variation, irrigated rice, unproductive water losses