Irrigation Management Alternatives that Mantain High Productivity While Using Less Water in Uruguayan Rice

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Abstract

Improvement of water use efficiency in rice crop systems has gained importance over the last decades as it is a limiting factor for the expansion of rice crop in Uruguay. The current scenario has encouraged the adoption of efficient water use technologies to enhance water productivity and contribute to the rational use of this resource. The objective of this study was to evaluate the effect of different water managements during the vegetative stage of the crop on yield (kg ha^{-1}), total water use (m^3 ha^{-1}), irrigation water use (m^3 ha^{-1}), and water productivity (kg m^{-3}). The experiments were conducted during three consecutive seasons from 2010/2011 through 2012/2013 at Paso de la Laguna Experimental Station (INIA Treinta y Tres, Uruguay). A complete randomized block design with 5 irrigation treatments and four replications was used. An overall three year analysis was done using a linear mixed model. Treatments consisted of a set of three conventional water managements and a set of two controlled deficit irrigations (CDI). Conventional treatments consisted of three different flooding moments: 15, 30 and 45 days after emergence (CF15, CF30 and CF45); and the CDI treatments were intermittent irrigation (II) and alternate wetting and drying (AWD). Results showed that CF15, CF30 and II treatments reached higher yields (10592, 10454 and 10189 kg ha^{-1}, respectively) followed by CF45 and AWD (9653 and 9287 kg ha^{-1}, respectively). Mean total water use reached 11508 m^3 ha^{-1}, while mean irrigation water use was 8044 m^3 ha^{-1}. AWD significantly reduces mean total water use and mean irrigation water use. Mean total water productivity was 0.89 kg m^{-3} while mean irrigation water productivity was 1.31 kg m^{-3}. The study demonstrated that controlled deficit irrigation alternatives were effective to maintain high values of water productivity. However, AWD treatment can compromise yield; therefore the overall tradeoffs between crop productivity and water use should be thoroughly assessed before stimulating farmers the adoption of these technologies.

Keywords: water productivity, water use, controlled deficit Irrigation