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Coping with Water Scarcity: Alternate Wetting and Drying as Mitigation Strategy for Water-Shortages in a Rice Irrigation System in the Philippines.

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Abstract

Irrigated rice consumes a large share of increasingly scarce freshwater resources and several alternative irrigation techniques have been developed with the intention to save water and maintain high yields. One of these techniques, Alternate Wetting and Drying (AWD), is increasingly applied in farmers' fields in the Philippines, where irrigation water is usually applied when the water level drops below a threshold of 15 cm below the soil surface.

WEAP ("Water-Evaluation-and-Planning"), a decision supporting tool for the management of irrigation water, has been applied in order to evaluate potential water savings of irrigated rice under AWD in the Philippines. The tool was validated for a clay and a sandy soil on the experimental station of the International Rice Research Institute (IRRI) and thereafter, applied for the Angat-Maasim-River-Irrigation-System (AMRIS), an important rice-growing area. Source of the irrigation water used in AMRIS is a reservoir, which also supplies Metropolitan Manila with 97 % of its freshwater demand. In case of water shortages, Manila's demands are prioritised and rice production is threatened.

For the IRRI experimental station, irrigation water input under conventional and AWD irrigation was simulated for 10 years using WEAP and compared to experimental data. Introduction of AWD on clay soils saved 20 % (±9) in the dry season and 11 % (±16) in the wet season, whereas on sandy soils, it saved 8 % (±3) in the dry season and 29 % (±10) in the wet season.

The potential impacts of simplified IPCC climate change scenarios and an increasing freshwater demand of Manila on the water balance of AMRIS were simulated and evaluated. The combination of both scenarios had a significant effect on the water level of the reservoir, with a 10 % (± 4) larger depletion of the storage volume during the year. Moreover, inflow and precipitation were not sufficient to replenish the initial storage volume. Streamflow in the canals was reduced and could not meet the demand at the tail-end diversions. Implementation of AWD in AMRIS decreased the total water demand by 22 %.

Depending on the extent of the water shortage, different temporal and spatial AWD implementation approaches are proposed.

Keywords: Modelling, *Oryza sativa*, water-saving irrigation, WEAP

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