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FULL-LENGTH RESEARCH ARTICLE

Simulation of Grain Yield, Seasonal Evapotranspiration, Global Warming Potential and Yield Gap Analysis of Wheat Under Varied Water and Nitrogen Management Practices Using InfoCrop Model

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Abstract Simulation models can serve as useful tools in taking critical decisions with respect to optimization of input use in agriculture. A field experiment was conducted during 2009–2010 and 2010–2011 to study the effect of irrigation and N interaction on yield and input use efficiency in wheat (cv HD 2932) and to validate an indigenous generic simulation model "InfoCrop" to predict grain yield and actual evapotranspiration of wheat in a sandy loam soil (Typic Haplustept) of Indian Agricultural Research Institute, New Delhi. Wheat was grown with four levels of N, i.e., 0, 30, 60, 120 kg N/ha, and four irrigation levels, i.e., rainfed, and irrigation to meet 30, 60 and 100% soil moisture depletion from field capacity. It was observed that the model could account for 82% variation in the observed grain yield. The root mean square error between the observed and simulated grain yields of wheat was to the tune of 14.2% of the mean observed grain yield of wheat. The predictability of the model was better for irrigated treatments than for the rainfed treatment. There is a scope for improving the water balance module of the model to improve the predictability of actual evapotranspiration of wheat. It was also observed that the global warming potential during wheat growth increased with the increase in the water application. This clearly indicates a trade-off between the wheat production and global warming potential estimated by the model. Thus, global warming potential can be reduced through efficient use of water and nitrogen.

Keywords InfoCrop model · Simulation models · Wheat · Evapotranspiration · Global warming potential · Water balance