A catchment-scale irrigation systems model for sugarcane Part 2: Model application

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Abstract

In the face of growing uncertainty regarding water availability to irrigated agriculture in South Africa, a computer simulation model, *ACRUCane*, has been developed to provide management information to irrigators of sugarcane and catchment water managers. *ACRUCane* can be used to simulate catchment hydrology, sugarcane yield, irrigation water requirement and water supply. The development and verification of the model is described in a companion paper. In order to illustrate the application of the model, it was configured to represent a catchment in northern KwaZulu-Natal (Pongola) with runoff feeding into a dam which supplied water for a dragline irrigation system. Various 'what if' scenarios representing potential changes to the irrigation system or management practice were assessed. Analysis of the simulated scenarios showed the interdependencies between irrigation application uniformity and irrigation scheduling. Improved application uniformities needed to be combined with improved scheduling to obtain maximum benefit, estimated to be approximately R3 000/ha. Improved scheduling resulted in fewer seasons with water shortages and crop yield reductions. Replacing the dragline system with subsurface drip (SSD) resulted in gains in the proportion of applied water used beneficially and a small increase in crop yields. However, the amount of water applied using both types of irrigation system and the impacts on the dam storage levels were very similar. The increased capital cost of the SSD system relative to the dragline system resulted in marginally lower profits.

Keywords: *ACRUCane,* irrigation systems, water management, modelling, hydrology, water resources, sugarcane, irrigation economics