COMPARISON OF THE FAO-56 WATER BALANCE MODEL AND THE DSSAT CROPPING SYSTEM MODEL FOR COTTON IRRIGATION SCHEDULING IN ARIZONA

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Abstract

Irrigated agriculture remains a primary user of fresh water both nationally and globally. Concerns about water scarcity, arising due to aridity, drought, desertification, and water shortage, have driven efforts to improve approaches for managing agricultural irrigation water. The objective of this study was to compare two approaches for scheduling irrigation to cotton in Maricopa, Arizona: one based on the FAO-56 water balance method and another based on the DSSAT Cropping System Model. The former used a trapezoidal crop coefficient curve as defined in the FAO-56 guidelines for computing crop water requirements. The latter calculated a dynamic crop coefficient curve based on simulated cotton development and growth. Both models were used to schedule irrigation for cotton under a linear move irrigation system in 2014 and 2015. In the 2014 season, the total irrigation amount calculated by the two models was similar; however, the DSSAT model called for less irrigation in the early season and more in the late season. Cotton yield from plots managed by DSSAT was 25% higher than that managed by FAO-56, but sprinkler calibration may also be a factor. Further modifications to the DSSAT model in the 2015 season led to more similar irrigation schedules among the two models. Yield results for the 2015 season are forthcoming. The study has led to the improvement of a dynamic crop growth and water balance model, which has been proven for use as a real-time irrigation scheduling tool for cotton in Arizona.