Simulating Cotton Growth and Development under Different Irrigation Scheduling Regimes

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1. INTRODUCTION

- Biophysical models integrated with Decision Support Systems can be helpful tools for irrigation scheduling.
- The objectives of this study were (a) to evaluate the capability of the Cropping System Model (CSM)-CROPGRO-Cotton for simulating cotton growth and development under different irrigation scheduling regimes, and (b) to evaluate the potential of the CSM-CROPGRO-Cotton model as a tool for irrigation scheduling.

2. MATERIALS AND METHODS

- Two experiments were conducted during the 2004 and 2005 growing seasons at the rainout shelters of the Griffin Campus of the University of Georgia.
- The CSM-CROPGRO-Cotton model (Jones, et al., 2003; Hoogenboom et al., 2004) was used to define the irrigation threshold (IT) treatments by estimating the timing of irrigation and the amount of water to apply.
- Each rainout shelter corresponded to one IT, which included 40%, 60%, and 90%.
- The irrigation event was triggered when the soil water content in the irrigation management depth dropped below the specified IT, e.g., for 40% IT irrigation was applied when water content in the soil dropped until 40% of the total soil water available.
- The model requires daily weather data, thus actual weather were used until the current date and the daily weather data of past 10 years were used to project the weather until the end of the growing season.

3. RESULTS

- The CSM-CROPGRO-Cotton model simulated cotton phenology and yield fairly accurately for all irrigation treatments (Fig. 1 and 2).
- The highest cumulative irrigation and evapotranspiration (ETc) corresponded with the 90% IT followed by the 60% IT (Fig. 3 and 4).
- The highest lint yield was obtained with the 60% and 90% IT (Table 1).
- The 60% will conserve water compared to the 90% IT.
- Increasing irrigation depths for the first 60 days have to be used by the model to improve irrigation scheduling (Fig. 5).

4. CONCLUSIONS

- The CSM-CROPGRO-Cotton model can be a promising tool for irrigation scheduling. However a variable irrigation management depth should be used and a correct characterization of the soil properties is needed.
- Further research includes the evaluation of the model for irrigation scheduling in farmers’ fields.

5. REFERENCES