COTTON CROP COEFFICIENTS (K_c) FOR NORTHEAST LOUISIANA USING WEIGHING LYSIMETERS

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Abstract

Cotton (Gossypium hirsutum L.) is an important commercially grown crop in the northeast part of Louisiana. Research-based information is available on some aspects of irrigation but there is a lack of information on cotton water use in this region. Our objectives were to develop locally-based crop coefficients (K_c) to estimate cotton water use. Crop coefficients (K_c) are ratios of crop evapotranspiration (ET_c) at a given stage of growth to reference evapotranspiration (ET_o) calculated from weather measurements made over a reference grass surface. An experiment was conducted at the Northeast Research Station, Saint Joseph, LA in 2009. Cotton (Stoneville ST 5458 B2RF) was planted in peat pots on April 27-29, which were transplanted onto paired weighing lysimeters and their immediate surroundings on May 8. The field surrounding the lysimeters was planted on April 25-27. Changes in mass (kg) on a daily basis for both lysimeters were recorded using a Campbell Scientific CR3000 data logger from August 5 onward. These changes in mass were converted to equivalent water depths (mm) and represent ET_c. For measurement of ET_{0} , a reference weather station was completed. Bermuda grass (*Cynodon dactylon* L.) was planted on April 17 as a reference surface. An area of 102 m by 102 m was demarcated and divided into 3 bays each of 34 m width to allow intermittent shallow flood irrigation. A tower of 10 m height was instrumented to allow an array of measurements including wind speed, solar radiation, air temperature, and relative humidity as required to calculate ET_o from the American Society of Civil Engineers (ASCE) Standardized Reference Evapotranspiration Equation. These weather parameters were recorded using a CR3000 data logger. Adequate lysimeter soil water was maintained during the data collection period. Apparent residual nitrogen caused relatively vigorous plant growth on the lysimeters, which was countered by a plant growth regulator application on August 14 and by crossing stems of lysimeter plants on August 22. Values of ET_c and ET_o were within ranges of 4.31 mm to 7.06 mm and 3.57 mm to 5.01 mm, respectively, during the period from August 7 to September 9. Single daily measurements of K_c ranged from 1.20 to 1.50 during this period with the exception of two outliers. Crop coefficients did not decline toward the end of this period possibly due to delayed canopy senescence caused by residual nitrogen in the lysimeters. In summary, the majority of work on the facilities for this project was finished and preliminary late season crop coefficients were determined.