

LANGNER, PHILIPPE and STEPHEN R. KAFFKA\*, Department of Agronomy and Range Science, Univ. of California, Davis CA 95616. Consumptive water use and yield of fall-planted sugarbeets in California's San Joaquin Valley.

A line-source irrigation trial was carried out during two years to quantify water use, biomass accumulation and sugar yields of an October-planted sugarbeet crop in the San Joaquin Valley of California, at a site with low winter rainfall. Irrigation water was applied at rates varying from approximately 85% to less than 10% of estimated crop ET. Measurements with a neutron access probe were used to schedule irrigations and estimate water recovery from the soil to a depth of 2.75 m. Harvests were made in May, June, and July each year. In the first year, winter rainfall was twice the long-term average, and sugarbeet root yields failed to respond to irrigation water gradients until the final harvest in July. In the second year, rainfall was below average and root yields responded to the irrigation gradient at all three harvests, with response increasing with successive harvests. Total biomass (DM) increased with increasing irrigation levels, but root and sucrose yields reached a maximum at irrigation levels between 50% to 60% of crop ET. Water use efficiency values ( $Q_w$ : 0.0036 Mg DM  $cm^{-1}$  and  $S_w$ : 0.0017 Mg sucrose  $cm^{-1}$ ) were approximately one-third higher than those reported for comparable studies for spring-planted beets in California. In deficit treatments, sugarbeets recovered water from depths greater than 2.75 m. Sucrose concentration was increased by deficit irrigation but decreased at the most severe deficit levels. A decrease in sugar concentration under extreme deficit was correlated with increased amino-N levels in those treatments.