WATER USE REQUIREMENTS OF NORMAL AND HIGH DENSITY WALNUTS

D. A. Goldhamer, T. M. DeJong, D. Ramos, R. Beede, S. Sibbett

Recent research indicates that increasing the number of trees per acre results in greater yields during the early years of an orchard, but it also presumably increases the water requirements and shortens the time needed to reach the maximum evapotranspiration (ET) rate of a mature orchard. Moreover, in spite of the importance of walnuts in California, little information exists on its basic water needs, which are required for sound irrigation management. Therefore, a 2.5 acre experimental orchard was established this year at the Kearney Horticultural Field Station to evaluate the water requirements of walnuts under both high and conventional density plantings. The plot design consists of two blocks each 1.25 acres, one with 11 x 22' spaced Chico trees and the other under normal density (22 x 22'). A low volume sprinkler system was installed on both plots with automatic and water metering devices to measure the volume of applied water. A soil water balance approach requiring knowledge of applied water and changes in soil water status in the profile will be used to determine ET.

Besides establishing the orchard, the initial objectives included measuring water use of first year trees, which involved small lysimeters due to the difficulty in monitoring relatively low ET with a soil-based approach. Results indicated that actual tree water use (transpiration) was quite low and never exceeded 0.5 gallons/tree/day. However, soil evaporation, which depends, in part, on the size of the wetted surface area, irrigation frequency, and the degree of canopy shading, was by far the larger component of ET, even with a localized irrigation system. Thus, the method of irrigation and on-farm water management largely determine gross irrigation requirements of a first year orchard.

We hope to continue this research over the next five years in order to develop the relationship between crop water use and canopy development as well as to establish the degree of canopy cover that corresponds to orchard maturity with respect to water requirements. Additionally, studies addressing the effects of water stress on the carbon budget and orchard productivity will be conducted on isolated trees. Data will also be collected on tree growth and nut yield to allow economic analysis of high density walnuts in the San Joaquin Valley.