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Irrigation and Fertilization Management of Avocados

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The avocado irrigation and fertilization project commenced in the spring of 1987 at two sites: Corona Foothill Properties near Corona (Riverside County) and Cashin Properties near Valley Center (San Diego County). Historically, water usage can be as much as 55% of production costs and may increase in the next decade.

This project which is located at two sites utilizes an integrated approach to determine the amount and cost of irrigation water applied in relation to fertility management, yield, and fruit quality. The water/fertility interrelationships to bloom, fruit set, and fruit quality of succeeding crops will be evaluated on the basis of yield, fruit size distribution and dollar return to the growers. The three irrigation treatments are 80%, 100%, and 120% of evapotranspiration (ET_c). ET_o (reference) will be based on measurements taken at UCR, Rancho California, and San Diego. The crop coefficients (K_c) in the formula $ET_c = ET_o \times K_c$ are determined at Corona Foothill on a weekly basis using CIMIS ET_o's and are correlated to tensiometer and neutron probe site readings. In 1988-1989 pressure bomb readings will also be taken. An initial determination of water costs (high, low, and median) were obtained from San Diego County Advisor Weisheit and will be updated annually.

At the Corona site, the interrelationship of the irrigation treatments to nitrogen and zinc nutrition will be monitored. At the Valley Center site three fertilizer trials have been initiated using a single irrigation treatment of 100% ET_c. The first trial will evaluate the interaction of nitrogen and phosphorus nutrition, the second trial will monitor the possible influence of potassium nutrition and the third will involve differential nitrogen rates. The results from the fertilizer treatments will be related to leaf analysis which will be collected on individual trees at both sites in the fall of each year. Selected trees in each irrigation treatment at the Corona location will be monitored annually for the relative amounts of bloom, fruit set. These data will be correlated to yield, leaf analysis the prior fall, and the relative amount of starch in the leaf.

Frost damage which occurred in late 1987 and early 1988 and Santa Ana weather conditions (August 1987) have been evaluated at both sites. The initial evaluation of leaf

analysis, tree conditioning, and frost damage (each test tree has been evaluated), indicate that no significant differences existed among trees prior to initiation of treatment.

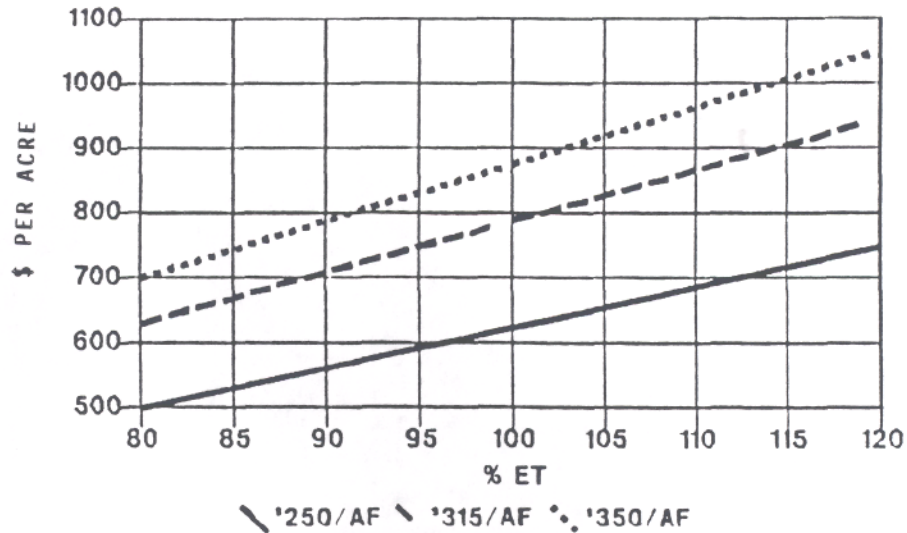
	Corona		Valley Center
1987	ETc irrigation, 80%, 100%, 120% ETo & Kc Leaf analysis Soil/water analysis Flower bloom Tree measurements	1987	Irrigation uniformity Leaf analysis
1988	Continue 1987 studies Leaf area index Bloom/yield Establish fertilizer treatments Begin nitrate movement studies	1988	100% ETc scheduling Establish N/P, N, K treatments Tree measurements
1989	Continue 1988 studies Begin storage tests Begin cost studies	1989	Continue 1988 studies Yield information
1990	Continue 1989 studies Begin economic studie	1990	Continue 1989 studies Fruit storage quality Economic studies
1991	Continue 1990 studies Projected completion	1991	Continue 1990 studies Projected completion

The projected time line for 1987-1991 is as follows:

Short Term Relevance

The irrigation crop coefficients for mature avocado trees have been determined for 1987 by actual water usage and projection. The crop coefficients are characterized by a peak of .55 for July and a low of .35 in December. Complete monthly Kc's are in our separate hand out, but it should be noted they are data for only one year. Actual and projected water usage for 1987 for the three irrigation treatments were 80% ETc, 24"/A; 100% ETc, 30"/A; and 120% ETc, 36"/A.

Figure 1. Relationship between water usage and cost per acre for mature avocados.



The relationship between the ET_c and water cost are given in figure 1. For example, if the trees were irrigated with \$250 AF water at 80% ET_c , then costs could range from \$500/A to \$700/A. If irrigated at 120% ET_c and water costs in San Diego are \$350 AF, the water production function could range from \$750/A to \$1050/A. In considering the economics of producing avocados in the San Diego and Riverside growing areas, a major input into total costs is price of the water. Further refinement of avocado crop coefficient and the yield vs. water use and cost will be reported in the 1989 annual report.

Long Term Relevance

The long term goal of this project is to integrate fertility, water use, and certain other management principles to yield, quality, and dollar return to growers.

Long term expectations:

- water management efficiency determinations (CU's)
- refine monthly crop coefficients (Kc's)
- refine fertility needs (as related to tissue analysis)
- relationship between productivity, cost input and dollar return
- relationship between fruit maturity, size, storage quality, and production practices