

## Response of sunflower to strategies of irrigation

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When insufficient water is available to meet the potential evapotranspiration of a crop, the grower must take critically important decisions of when and how much to irrigate. Such decisions require a knowledge of the possible water demand of the crop and are conditional upon rainfall and an understanding of the response of the crop to water supply. Confident water budgeting requires experimental data on the response of the crop to water-supply.

### Methods

The progressive growth and water-use of 12 treatments of sunflower subjected to a range of irrigation sequences were measured throughout their growing season. The treatments included late-start and early-stop sequences, strategic irrigation and controls that were either irrigated weekly to maintain potential evapotranspiration or were reliant on rainfall.

### Results and Discussion

In the two years of experimentation, growing season rainfall and Class A pan evaporation were 121, 92 and 804, 798 mm respectively. The two control treatments set the boundaries to yield which ranged between 1.1 and 4.5 t/ha all at 48.3% oil content. The efficiency of water-use in the production of seed ( $EE_s$ ) ranged from 4.0 kg/ha/mm for the rainfed control to 8.0 kg/ha/mm which was achieved by a treatment in which a 2-weekly watering schedule was maintained from budding to maturity. Other strategically irrigated treatments also had water-use efficiencies in excess of that of the weekly irrigated control.

Analysis of the seasonal progression of water-use shows that the major contributor to higher water-use efficiency in the sub-optimally irrigated treatments was a reduction in soil evaporation in which the responsiveness of leaf area to water supply played an important role. The efficiency of use of transpired water in the production of biomass ( $ET_b$ ) was constant across all but one treatment in which weekly irrigation was commenced at budding. In this treatment there was a significant ( $P < 0.05$ ) increase in  $ET_b$  relative to the other crops (24.3 v. 20.8 kg/ha/mm). Early vegetative growth was readily manipulable by delayed irrigation which conserved water for the seed filling period and improved by an increase in harvest index.