

Hourly Water Use and Irrigation Scheduling

Hourly Cotton Crop Water Use and its Importance for Irrigation Scheduling

When water allocations are limited probe users are taking readings at two day and sometimes daily intervals when scheduling irrigations. The objective being to irrigate the cotton crop on the day the field would begin to lose yield due to lack of soil moisture. Probe users taking readings at short intervals need to be aware of the importance of the relative time of the day any two consecutive readings are taken. This is especially important when calculating the daily water use and using this value for precisely predicting irrigation dates to maximize yield from limited water.

To illustrate the importance of time of day to calculation of daily water use neutron probe readings were taken every half hour during the day for a cotton crop on 16 February 1989 to determine the rate of cotton crop water use in mm/hour for different times of the day. This crop had ceased producing new leaves and was in the process of filling the remainder of its green bolls. Daily water use in the three day period immediately prior to 16 February was 8mm per day. Counts were taken over a 64 second interval not the usual 16 seconds and 3 tubes were averaged at the site. Readings were taken every half hour from 8.00am to 7.00pm and then again at 8.00am the following morning.

In Figure 1 soil water content is plotted against time for the 0-70cm layer of the soil profile and the line is a smooth curve drawn through the data. The rate of water use of the cotton crop in mm/hour for every half hourly probe reading is plotted in Figure 2.

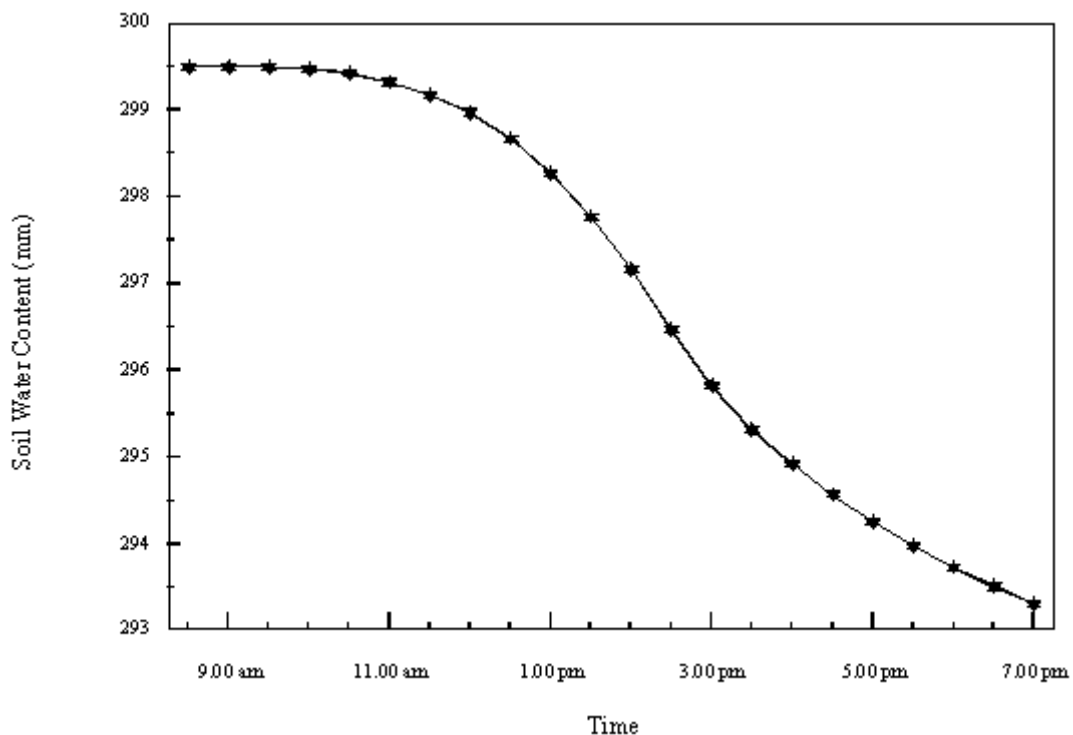


Figure 1. Hourly Changes in Soil Water Content for Cotton.

Changes in soil water content are relatively small until 11.00am. After this depletion of the profile goes on steadily throughout the day. Water use peaks between 2.00pm and 3.00pm which corresponds with the hottest time of the day. At the end of the day soil water content was still declining and between 7.00pm and 8.00am the next day 1.5mm was lost from the profile. From

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8.00am on 16 February to 8.00am on 17 February water use was 7.7mm which agrees with the figure of 8mm per day obtained by the agronomist on the farm over the previous 3 days.

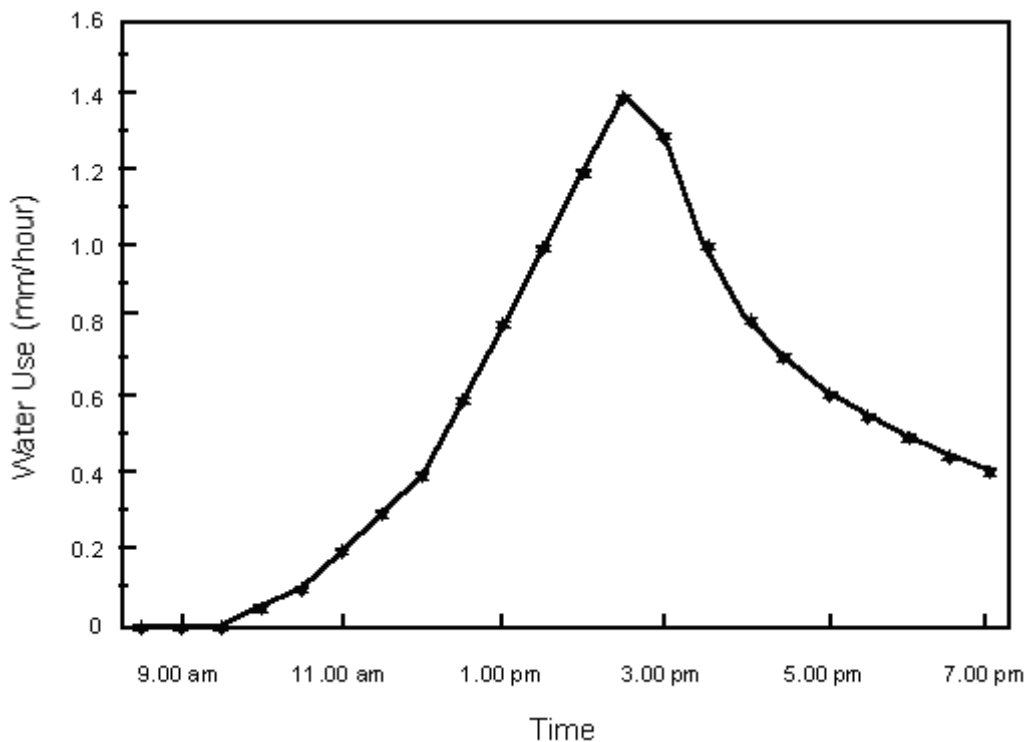


Figure 2. Hourly Water Use for Cotton.

This data indicates the importance of taking readings at the same time each day to ensure that daily water use figures are as accurate as possible. If readings are taken early in the morning then the effects are not as great and timing less important. For readings later in the day the timing will have a greater effect and becomes more important. In calculating daily water use for example 2.00pm yesterday and 3.00pm today would give a daily water use of 9.3mm, but if yesterdays reading was at 3.00pm and todays reading was at 2.00pm daily water use would be 6.7mm. If the field had 30mm of water left in the profile then the days to irrigation are 3.2 days versus 4.5, a difference of 1.3 days. This difference is crucial when trying to precisely time irrigations, especially on compacted fields where irrigating one day late can mean a large reduction in yield.

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