

If you have questions about or do not agree with the proposed water allocated to your farm or with your water duty acres, you should contact the DWR immediately. It will be easier to make changes to the proposed values rather than to wait for them to become final and then have to resort to formal hearings and legal measures.

The law requires that water pumped in 1984 be measured and the volume used reported by March 31, 1985. If irrigation water has been pumped after midnight, December 31, 1983, it should have been measured.

Many approved water measuring devices are available and being used. The most commonly used devices, according to farmer response to the DWR, are recording meters. They are the easiest to use since they can be read directly in acre-feet. They also are more expensive, require maintenance, and are usually permanently installed at one location. The second most used facilities are the services of consultants who, for a fee, will make the measurements using their own equipment. The third most frequently used type of device is one of several available rate-of-flow devices. These measure the rate of flow rather than volume of flow as required by the DWR and are used in conjunction with an electric or gas meter which serves as a totalizer. These devices can be portable and usually require less maintenance than the recording meters.

The law requires a minimum of two water measurements per year to relate water flow to electric or gas consumption. It is recommended that more than two measurements per year be taken to insure accuracy and to help manage the irrigation water.

Remember, there is a one-time only tax credit for the purchase and installation of the water measuring device. This applies only to the Arizona State tax and allows the costs to be spread over three years.

#### **DEFICIT IRRIGATION WITH A DRIP SYSTEM**

**D. A. Pennington, B. B. Taylor, S. W. Stedman,  
J. E. Malcuit and T. S. Hitz**

**Former Extension Specialist and Current Assistant Farm Manager,  
Extension Agronomists and Research Assistants**

The total number of acres on a farm that can be planted to cotton at one time is limited by the amount of water available during the peak water use period of July and August. The available water is a sum of the water that can be delivered to

the field and the usable water stored in the soil. A planned use or depletion of stored soil water during peak water use periods, along with efficient drip irrigation systems will allow the maximum number of acres to be planted with a limited water supply.

To use stored soil water, irrigation applications must be less than the evapotranspiration (ET) needs of the crop. The resulting deficit irrigation with gradually increasing soil water tensions may place unwanted stress on a flowering cotton plant. This is especially critical since peak water use by the plant and peak flowering fall at the same general time. To test the effects of deficit irrigation on cotton during peak flowering, field plots were established on the farm of Dennis Nowlin.

The plots were located about 12 miles west of Casa Grande, near Stanfield, on a clay loam soil with a total water holding capacity of 3.5 to 4 acre inches of water per foot of soil. A plot capacity drip irrigation system was made available to the University of Arizona by Bill Young of Horizon Irrigation and by Dennis Nowlin. Delta Pine 41 was planted dry on 40 inch rows in a 4 x 1 skip row pattern and watered up with a drip system on April 13, 1983. The drip lines were laid on the soil surface 80 inches apart (every other row) with 40 inches between emitters in a line. Nitrogen was applied as UN32 solutions with irrigation water through mid-August. The nitrogen rate was about one pound of nitrogen for each 0.1 acre inch of water. Each plot was four rows wide by 810 feet long (0.25 acre).

Four water treatments were replicated three times. Treatments were 1) estimated ET, water applied twice daily, 2) 85% of treatment #1, water applied twice daily, 3) 70% of Treatment #1, water applied twice daily and 4) 100% of Treatment #1, water applied every other day. All treatments received estimated ET through June 16. Application frequencies and amounts were irregular due to the small amount of water required by the crop up to mid-June. From June 16 to July 22, Treatments 1, 2, and 3 received equal water at rates estimated to match ET. At peak flowering time, July 22, variable water rates were applied to Treatments 1, 2, and 3 for a 35 day period, ending August 25. From August 26 to the end of the season all three received the same amount of water. The change in watering frequency for Treatment 4 began on June 16 and continued throughout the rest of the season. Semi-weekly water applications along with consumptive use as reported by Erie and Bucks in consumptive use of water by crops in Arizona are given in Table 1.

Soil moisture depletion was monitored using a neutron probe calibrated to this soil. Seven access tubes were placed in each treatment of replication one. The average total water in the top three feet of soil for Treatments 1, 2, and 3 are given in Figure 1.

**Table 1. Semi-monthly Acre Inches of Applied Water.**

1983 Nowlin				
Date	Wet	Medium	Dry	Consumptive Use by Erie*
April 1-15	---	---	---	0.15
16-30	6.44	6.44	6.44	0.33
May 1-15	0	0	0	0.68
16-31	3.18	3.18	3.18	1.28
June 1-15	1.84	1.84	1.84	1.95
16-30	2.93	2.93	2.93	3.30
July 1-15	3.48	3.48	3.48	4.65
16-31	5.63	5.09	4.55	5.84
August 1-15	5.07	4.29	3.51	5.70
16-31	4.55	4.05	3.55	5.60
September 1-15	3.35	3.35	3.35	4.35
16-30	---	---	---	3.30
October 1-15	---	---	---	2.25
16-31	---	---	---	1.25
November 1-15	---	---	---	0.57
<b>TOTAL</b>	<b>36.47</b>	<b>34.65</b>	<b>32.83</b>	<b>41.2</b>

Although the field had minor flood damage in early October, the cotton was harvested on November 7 and seed cotton weights are given in Table 2.

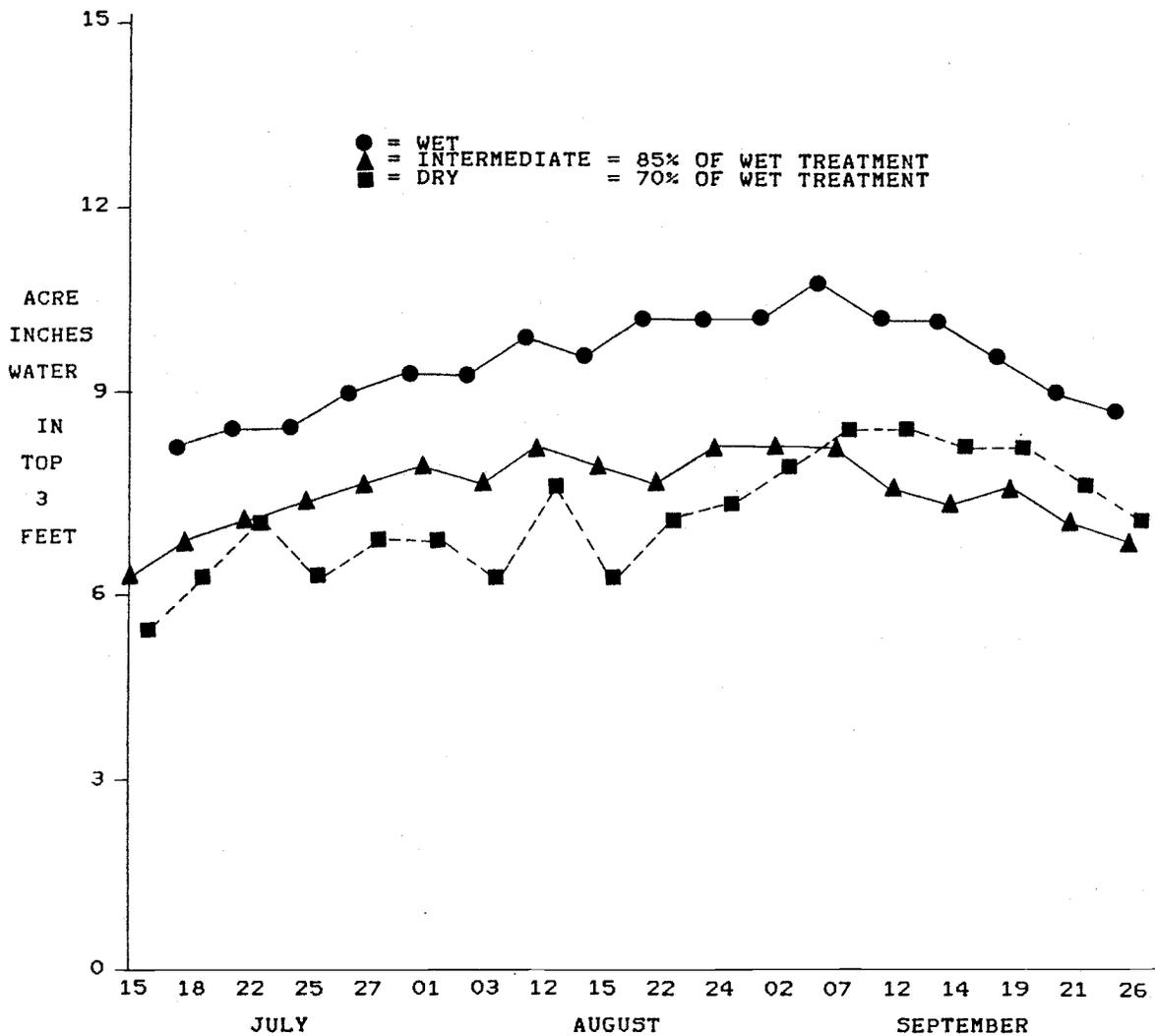
Results suggest:

- 1) Deficit irrigation is not effective when using frequent irrigation intervals. Although differences were not significant, the yield of Treatment 3 was 7% less than Treatment 2 with only 5.5% less water.
- 2) A two day irrigation interval in this soil type (clay loam) is as effective as twice daily frequency.

**Table 2. 1983 Seed Cotton Yields from One Fourth Acre Drip.**

Irrigated Plots at Dennis Nowlin's Farm

Treatment	Wet Twice A Day	Intermediate Twice A Day	Dry Twice A Day	Wet Every Other Day
REP				
1	1040	1020	1005	1035
2	970	975	895	1030
3	945	990	890	985
AVERAGE	985	995	930	1017
LB. SEED COTTON/ACRE	3940	3980	3720	4068



**Figure 1. Total water in top three feet of soil profile.**