

**Trickle and Level Basin Irrigation for 1985 Cotton  
at the Maricopa Agricultural Center**

O. F. French, Agricultural Research Technician, USDA-ARS; D. A. Bucks, Agricultural Engineer, USDA-ARS, U. S. Water Conservation Laboratory; R. L. Roth, Agricultural Engineer; B. R. Gardner, Research Chemist; E. A. Lakatos, W. A. Alexander, and D. E. Powers, Research Technicians, University of Arizona

Summary

Both trickle and level-basin irrigation methods, when properly managed and operated, achieved high cotton yields and water use efficiencies on a low water holding capacity soil in 1985. A maximum lint yield of 1906 kg/ha (3.8 bales/ac) was achieved for the DPL-90 variety with a single trickle irrigation line per every two rows irrigated daily on the narrow row spacing; however, the new DPL-775 was best overall.

The single trickle line per every two rows irrigated daily averaged 15% more lint cotton than the level-basin, every furrow irrigated weekly for both row spacings. The narrow-row spacing (30 inch between rows) outyielded the conventional spacing (40 inch between rows) by 15%, partly because of a higher plant populations.

Daily trickle irrigations averaged about 10% more yield than the twice weekly trickle irrigations, and the weekly level-basin irrigations averaged over 20% increase in yield over the biweekly (every two weeks) level-basin irrigations. Light-frequent irrigations can be advantageous for nonhomogenous soils in the semiarid Southwestern United States.

\*\*\*\*\*

This was a repeat of the 1984 study carried out in the same field with few minor adjustments (French et al. 1985). The objective of the 1985 study was to determine the effect of irrigation water placement and frequency on cotton production for the trickle and level-basin irrigation methods under optimum moisture conditions for conventional and narrow-row plantings using the newer short staple varieties.

Methods

Cotton varieties DPL-775, DPL-90, DPL-41, and Stoneville 825 were planted using the conventional-row (40 inch) spacing on April 5, 1985, at the Maricopa Agricultural Center on a sandy loam soil.

At the same time, DPL-775, DPL-90, DPL-30 and DPL-70 were planted on the narrow-row (30 inch) spacing. A Stanhay precision planter was used with the same planting rate on both row spacings. The plant densities were 33,000 and 44,000 plants/ac on the conventional and narrow-row plantings, respectively.

To give each row spacing treatment an equal opportunity for germination, the two row spacings were irrigated up after planting and excellent stands were obtained in both cases.

The irrigation treatments were as follows: (1) a single trickle line per two cotton rows irrigated daily; (2) a single trickle line per two cotton rows irrigated twice weekly; (3) a single trickle line per three cotton rows irrigated daily; (4) level basin, every furrow irrigated weekly; and (5) level-basin, every furrow irrigated biweekly (every two weeks). Irrigation treatments commenced on May 29 and continued through September 23 on both conventional and narrow-row plantings, and all treatments were replicated 6 times.

Irrigation quantities were based on the mean consumptive use curve developed by Erie et al. (1982) and adjusted to the actual weather conditions. The fertilizer applications were made through the irrigation systems as UN32. A total of 265 lbs/ac of nitrogen was applied over a nine-week period beginning the week of June 3 on all treatments.

The trickle line used was the Irridelco system with in-line, 0.5 gal/hr GPH emitters placed 40 inches apart along the lateral line. Irrigation water applied was measured through propeller-type water meters for both the trickle and level-basin irrigation plots. The amounts of water applied including establishment and effective rainfall, are given in Table 1.

**Table 1. Water Applied as Irrigation Water Plus Rainfall With Trickle and Level Basin Irrigation Systems**

Irrigation* Treatment	No. of Irrigations	Total Water**	Total Water**
		Applied (inches) 40-inch rows	Applied (inches) 30-inch rows
1	102	34.5	34.7
2	34	34.3	34.1
3	102	32.9	34.2
4	18	39.1	43.3
5	11	38.5	41.1

\* Irrigation treatments are described in methods.

\*\* Includes irrigation water applied for germination and during growing season plus rainfall of 1.2 inches.

### Results

Consumptive use was monitored using neutron moisture meters on treatments 1, 4, and 5. Treatment 1 was used to demonstrate the uniformity of soil water contents within the crop root zone under trickle irrigation over the growing season. Seasonal consumptive use or estimated evapotranspiration averaged approximately 35 inches on the level-basin irrigation treatments 4 and 5 for 1985.

The cotton was machine-picked on November 4, 1985, from two 30-foot long rows each, for all varieties and irrigation treatments. Lint yields and averages are presented in Table 2.

A maximum lint yield of 1906 lbs/ac (3.8 bales/ac) was achieved by the DPL-90 variety with the single trickle irrigation line per every two rows irrigated daily (treatment 1) on the narrow-row spacing. Lint yields from the single trickle line per two cotton rows (treatment 1) irrigated daily produced 20% and 10% more lint than the level-basin irrigation method (treatment 4) irrigated weekly for the conventional and narrow-row spacings, respectively.

Cotton lint yields were reduced by 13% and 24% on the single trickle line per three cotton rows (treatment 3) as compared with a single trickle line per two cotton rows (treatment 1) irrigated daily on the conventional and narrow-row spacings, respectively. The daily versus twice weekly trickle irrigations (treatments 1 and 2) indicated a 6% and 13% increase for the conventional and

narrow-row plantings, respectively, in favor of the more frequent trickle irrigation for the conditions of this experiment.

**Table 2. Average Lint Yields for Cotton With Trickle and Level Basin Irrigation Methods**

Row Spacing	Cotton Variety	Irrigation Treatments*					Average
		1	2	3	4	5	
(lbs/ac)							
Conventional 40 inch	DPL-775	1598	1497	1514	1197	1178	1397 <sup>a**</sup>
	DPL-90	1489	1542	1237	1248	1094	1322 <sup>ab</sup>
	DPL-41	1546	1404	1293	1380	973	1319 <sup>ab</sup>
	St.825	1351	1177	1266	1129	1255	1236 <sup>b</sup>
	Average	1496 <sup>a</sup>	1405 <sup>ab</sup>	1328 <sup>bc</sup>	1239 <sup>cd</sup>	1125 <sup>d**</sup>	1319
Narrow Row 30 inch	DPL-775	1637	1561	1484	1876	1223	1556 <sup>a**</sup>
	DPL-90	1906	1521	1376	1374	1284	1492 <sup>a</sup>
	DPL-30	1700	1633	1393	1613	1131	1494 <sup>a</sup>
	DPL-70	1810	1540	1415	1594	1214	1515 <sup>a</sup>
	Average	1763 <sup>a</sup>	1564 <sup>b</sup>	1417 <sup>c</sup>	1614 <sup>b</sup>	1213 <sup>d**</sup>	1514

\* Irrigation treatments are described in Methods; each number represents a mean of 6 replications.

\*\* Means within column and rows with the same letter are not significantly different at the .05 level; lint percentage averaged 37.7%.

The weekly level-basin irrigations (treatment 4) outyielded the biweekly schedule (treatment 5) by 10% on the conventional spacing and by 33% on the narrow-row spacing. This difference may have resulted because more irrigation water applied to the weekly treatment early in the growing season in order to get adequate coverage over the plots. Also, temperatures were unseasonably hot in late June and early July, which may have had a beneficial effect on the weekly treatments and the narrow-row spacing.

Varietal response indicated that the new DPL-775 variety was best for both row spacings for this particular year on all irrigation treatments. Overall, the narrow-row spacing outyielded the conventional row spacing by 15%, which could be attributed in part to the 33% higher plant population on the narrow-row compared with conventional plantings.