Table 2. Abscisic acid concentrations of leaf discs floated on solutions of polyethylene glycol 6000 to produce osmotic stress of -20 bars.

Temperature	Abscisic Acid Concentration (μg/g)	
	Low N	High N
15°C	4.8	5.1
20	17.8	12.0
25	16.2	7.3
30	7.4	5.1
35	1.9	3.9

Table 3. Effect of darkness before and during incubation on abscisic acid concentrations of leaf discs osmotically stressed to -20 bars.

	Abscisic Acid Concentration (μg/g)	
Preincubation Conditions	Incubated in Light	Incubated in Darkness
Light	13.9	7.4
Darkness	7.8	1.5

Evaluating Irrigation Practices on Cotton with Less than Optimum Available Water

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Shortages of irrigation water have occurred in the Western United States and are expected to become more severe as competition with domestic and industrial users increases. In addition to water shortages, costs of water are increasing, due to increasing power costs. This study was initiated to investigate the options available to cotton growers having water shortages.

Methods

The test was conducted on field B-3 of the University of Arizona, Marana Experimental Farm. Two techniques for reducing water use were utilized. One method was to cut back on early and/or late irrigations. July irrigations followed normal farm practice as data have indicated these irrigations are the most important for lint production. The other technique was to utilize skip row planting, 2X2 or 2X1, with irrigation only in the center furrow. This was shown to conserve water in California.

There were seven irrigation treatments in this test. The time and amount of irrigation, and monthly rainfall are given in Table 1. Treatments 6 and 7 were the skip row plantings, with treatment 6 being 2X1 and treatment 7 2X2. The test was preplant irrigated. Deltapine 55 cotton was planted on 27 April, 1981. The design was a randomized block with seven treatments and three replications. Plots were 6 40-inch rows wide and about 600 feet long, except treatment 6, which was 4 rows wide. The center two rows of each plot were spindle harvested into bags on 28 October, 1981. A second pick was made on 19 November, 1981.

Flower counts were made on 12 meters (40 feet) of one row for each plot twice weekly until 4 September, 1981. Seed cotton was hand picked from the same area each week as it matured until machine harvested.

Yield

Treatment lint yields for both picks are given in Table 2. The five solid planted irrigation treatments did not differ significantly in yield. Skip row treatments yielded significantly less than the solid plants (total acreage basis). Lint produced per inch of water applied (water use efficiency) was greater for low water use than for high water use.

A plot of yields of solid plant treatments against water usage revealed approximately a straight line relationship. This suggests that Treatment 1, which received the most irrigation water, could have benefitted from additional irrigation. However, irrigation water and rainfall for Treatment 1 should have been [illegible]quate in a normal cooler season. The record high temperatures in June and August, and above norma[illegible]eratures in July, plus a warm open fall probably accounted for greater water requirements in [illegible].

Gin turnout for the first harvest averaged 36.89%, the percent lint averaged 39.08%, seed 57.52%, and trash 5.59%. No significant differences were found among treatments in any category. Second harvest gin turnout was 34.76%, seed 53.14%, and trash 12.11%.

Income, Expenses and Net Return

Treatment 1 had the highest gross income and treatment 7 (2X2 skip row) produced the lowest. The difference was $245.28 (Table 3). Production costs, using Hathorn and Armstrong data, varied from $554.89 for Treatment 1 to $466.22 for Treatment 7. Costs were considered uniform for all treatments, except for pumping and ginning costs. The net return varied from $118.68 for Treatment 1 to a loss of $37.93 for Treatment 7, the 2X2 skip row. Thus, solid plantings gave a small, but positive, net return, while skip row plantings gave a loss. Further, the greatest net return was from the highest irrigation level used (Treatment 1).

From these results we conclude that a grower of upland cotton having a restricted water supply should reduce his acreage to permit a normal irrigation regime. Net income would be reduced if the available water was applied on a greater cotton acreage at a lower application rate.

Sequential Flower Counts and Harvests

Flower counts on a twice weekly basis, and boll counts and lint yield on a weekly basis are presented in Table 4. These data have not been thoroughly evaluated at this time.

Two preliminary observations on these data are of interest. Treatments receiving the earliest postplant irrigation on 3 June (Treatments 1 and 2) developed about the same number of flowers in the early season as the early stress treatments receiving the first postplant irrigation on 1 July. However, the 1 July first irrigation treatments had fewer mature bolls and less lint in the early picks than the 3 June first irrigation treatments. These differences were not statistically significant. The results suggest poor early boll retention where water stress existed.

Treatment pairs 1-2 and 4-5 received the same irrigations, respectively, until 26 August. At that time, Treatments 1 and 4 were irrigated, while Treatments 2 and 5 were not. The following week, 2 September, mature bolls and lint were significantly lower for Treatments 1 and 4 than Treatments 2 and 5, which did not receive that last irrigation. Treatments 1 and 4 had slightly more mature bolls and more lint than Treatments 2 and 5 during most succeeding weeks. At the end of the season, the treatments receiving the last irrigation on 26 August (final irrigation) had more cumulative lint yield than the drier treatments. These results demonstrate the delay of boll opening accompanied with irrigation. In some cases, late irrigation or late season rains can reduce lint yield due to this phenomenon.

Table 1. Irrigation water added and summer precipitation in irrigation test on DPL 55 cotton in field B-3 of the Marana Experimental Farm, Marana, Arizona in 1981.

		Irrigation Treatment						
Date	Hours of Irrigation	1	2	3	4	5	6	7
4/13	24 hours	12"	12"	12"	12"	12"	12"	12"
6/3	3 hours	3.1	3.1					
6/17	5 hours	2.3	2.3	2.3			1.5	1.1
7/1	3 hours				1.1	1.1		
7/17	12 hours	6.0	6.0	6.0	6.0	6.0	2.0	1.5
8/6	12 hours	5.0	5.0	5.0	5.0	5.0		
8/26	10 hours	4.5			4.5			
TOTAL		32.90	28.40	25.30	28.60	24.10	15.50	14.60
July rain		4.49						
August rain		3.08						
September rain		.30						
Total Rain		7.87	7.87	7.87	7.87	7.87	7.87	7.87
Total Moisture		40.77	36.27	33.17	36.47	31.97	23.37	22.47

Table 2. First harvest, second harvest, total lint yield, and lint/inch of irrigation water for DPL 55 cotton receiving seven different irrigation treatments at Marana, Arizona in 1981.

Treatment	1st Harvest 10/28 Lint	2nd Harvest 11/19 Lint	Total Lint	Lint/Inch of Irrigation Water Applied
1	1091 a*	57 ab	1148 a	34.9
2	1034 a	46 abc	1080 a	38.0
3	970 a	48 abc	1017 a	40.2
4	1012 a	65 a	1076 a	37.6
5	963 a	54 abc	1017 a	42.2
6	717 b	34 c	752 b	48.5
7	688 b	42 bc	730 b	50.0

*Means within a column do not significantly differ at the 95% confidence level if followed by the same letter according to the Student-Newman-Keuls test.

Table 3. Income, expenses, and net return for seven irrigation treatments on DPL 55 cotton at Marana, Arizona in 1981.

Treatment	Income: Lint @* $0.5425/lb.	Income: Seed @* $0.0284/lb.	Income: Total Income
1	$ 622.79	$ 50.78	$ 673.57
2	585.90	47.77	633.67
3	551.72	45.01	596.73
4	583.73	47.60	631.33
5	551.72	44.99	596.71
6	407.96	33.26	441.22
7	396.03	32.26	428.29

Treatment	Expenses: Pumping,** energy + repairs	Expenses: Ginning*** @ $0.0284/lb.	Expenses: Other** Costs	Expenses: Total Costs	Net Return
1	$ 101.39	$ 88.64	$ 364.86	$ 554.89	$118.68
2	87.52	83.35	364.86	535.73	97.94
3	77.97	78.53	364.86	521.36	75.37
4	88.14	83.18	364.86	536.18	95.15
5	74.27	78.55	364.86	517.68	79.03
6	47.77	58.05	364.86	470.68	-29.46
7	44.99	56.37	364.86	466.22	-37.93

*Lint and seed value at Marana on 1 December, 1981.

**Variable costs for pumping with electric motor and fixed costs for producing upland cotton less costs of rood. From Hathorn, S., Jr. and J.F. Armstrong. 1981 Arizona field crops budgets, Pima County. University of Arizona, Extension Service.

***Ginning costs at Marana on 1 December, 1981.

Table 4. One day flower counts (X1000), mean of two counts, weekly mature boll mumbers (X1000), and weekly lint production of DPL 55 cotton for 7 irrigation treatments at Marana, Arizona in 1981.

Treatment	Mean number (X1000) of flowers/acre produced daily									
	6/29 & 7/2	7/7 & 10	7/13 & 17	7/20 & 24	7/27	8/3 & 6	8/10 & 13	8/17 & 20	8/24 & 28	8/31 & 9/3
1 3 June 1st	5	18	22	26	27	11	3	3	0.5	0.2
2 3 June 1st	6	15	23	29	27	12	3	2	0.8	0.2
3 17 June 1st	6	16	21	27	22	9	2	2	0.5	0.1
4 1 July 1st	7	15	20	24	19	11	4	3	1.0	1.0
5 1 July 1st	5	15	20	23	21	9	4	4	1.5	0.6
6 2X1	3	12	16	17	15	8	2	1	0.1	0
7 2X2	3	9	10	13	12	8	3	2	1.1	0.1

	Mean number (X1000) of mature bolls/acre/week											
	8/10	8/17	8/24	9/2	9/8	9/15	9/21	9/28	10/5	10/12	10/19	10/26
1 3 June 1st	0.7	4	30	54	59	54	29	11	9	10	3	2
2 3 June 1st	0.7	5	34	109	56	44	9	8	6	5	1	2
3 17 June 1st	0.3	6	48	94	58	32	6	5	3	4	1	1
4 1 July 1st	0	1	39	58	48	48	27	19	11	13	3	4
5 1 July 1st	0	1	30	81	45	39	39	11	10	10	2	2
6 2X1	0.3	7	53	74	27	18	3	2	3	1	1	1
7 2X2	0.8	5	36	51	26	32	10	9	3	4	1	1

	Lbs. lint/acre/week											
	8/10	8/17	8/24	9/2	9/8	9/15	9/21	9/28	10/5	10/12	10/19	10/26
1 3 June 1st	2	19	116	219	212	188	103	33	29	27	10	7
2 3 June 1st	2	21	138	420	187	131	23	17	20	12	2	6
3 17 June 1st	1	22	179	363	182	95	15	13	9	6	1	1
4 1 July 1st	0	4	171	221	161	195	94	54	38	39	7	11
5 1 July 1st	0	3	119	313	156	108	53	27	28	26	4	5
6 2X1	1	29	182	230	71	37	5	4	7	2	2	1
7 2X2	3	19	131	197	104	93	31	24	10	12	4	3