6-1978

Cotton Irrigation

University of Tennessee Agricultural Experiment Station

W. L. Parks

Joseph R. Overton

Charles R. Graves

Bulletin 581
June 1978

Cotton Irrigation

W. L. Parks • Joseph R. Overton • Charles R. Graves

The University of Tennessee
Agricultural Experiment Station
D. M. Gossett, Dean
Knoxville

CONTENTS

Cotton Irrigation

W. L. Parks, Joseph R. Overton, and Charles R. Graves*

The cotton plant differs from many of the plants that farmers generally produce. As a seedling, it experiences difficulty in emerging if planted too deep or if the soil crusts. It needs enough water at this stage to permit easy emergence but cannot tolerate excess moisture that reduces oxygen supply to the young seedling and increases the incidence of seedling diseases.

As the young plants begin growing and developing, moisture use is not great. Evapotranspiration at this stage ranges between 0.15 and 0.18 of an inch per day with a major portion of the water loss being evaporation from the soil due to the larger portion of the soil surface being exposed to direct sunlight.

When the plants reach the flowering and fruiting stage, their moisture requirements become more critical and the average daily moisture use reaches a maximum which may range from 0.20 to 0.35 inches per day. If cotton plants experience moisture stress during this stage of growth, many of the flowers will shed and not set bolls. Generally 45 to 55% of the blooms result in bolls set. However, if extreme cycles in the soil moisture conditions occur during this stage of growth, the percentage of blooms setting bolls may be much lower. It is extremely important that the moisture conditions in cotton be favorable during the first 2 weeks of blooming because over 75% of the blossoms formed during this period may set bolls that will eventually be harvested. If most of the blossoms formed during this period are shed and do not set bolls, the energy of plants goes to vegetative growth and results in a taller, more bulky plant than normal. Setting the early fruit is essential to maintaining the normal stature of the plants. Less than 40% of the bolls formed during the 3rd, 4th, or 5th week of flowering set bolls that are eventually harvested.

Moisture use by cotton remains at a fairly high level for about 6-8 weeks after the initial blooms appear. This is the stage of highest energy production by the plants and most of this energy normally goes to boll growth and development. The moisture use rate declines during the next 3- to 4-week period and may reach levels as low as

*Professor and Associate Professors, respectively, Department of Plant and Soil Science.

0.10 of an inch per day. It is desirable that moisture stress occur during the latter part of this period, as this is when the bolls start opening and also when leaf fall begins. If excessive moisture exists during this period, leaf fall is delayed and the conditions within the plant canopy remain moist leading to boll rot and other forms of boll damage. Low rainfall and high temperature conditions in late September and early October generally favor cotton boll maturity, opening, and harvesting.

The results included herein are from irrigation experiments conducted at the West Tennessee Experiment Station from 1955 through 1967 and represent results where soil moisture conditions were maintained at or above prescribed levels during a period of time from shortly before initial blooming until boll maturity. Split plot experimental designs were used with moisture level being the main plots and nitrogen fertilization or variety being the split plot. No irrigations were applied after most of the bolls that would normally develop reached full size, in order to permit maturation and boll opening during normal moisture conditions.

RESULTS

The moisture release curve of the surface foot of a Memphis soil is shown in Figure 1. This was the soil used in these experiments and represents the more productive upland soils in the West Tennessee area. The soils of this area of the State are high in silt and fine sand which have a capacity to hold large amounts of water available to plants at low tension levels.

The gravitational water is that in the larger pore space and it is present only after heavy rainfall or large applications of irrigation water. It usually drains into the ground water or is drawn into drier soil areas by capillarity in 1 to 3 days after rainfall or irrigation. In this soil it represented 1.26 inches of water per foot of soil.

The readily available water is that water held between field capacity (1/3 bar) and 5 bars tension (1 bar $\cong$ 15 pounds per square inch equivalent negative pressure). It is readily available to plants and constitutes the main water source for crop plants in these soils. In this soil, the readily available water represented 2.73 inches per foot of soil.

The next small segment of water held between 5 bars tension and 15 bars tension (wilting point) is available to plants but with difficulty. Plants may survive dry periods using this water but will make little or no growth. The amount of this difficulty available water is low in the silty soils, but is considerably higher in the finer textured soils of the State. In the Memphis soil, it represented only 0.20 inch of water per foot of soil.

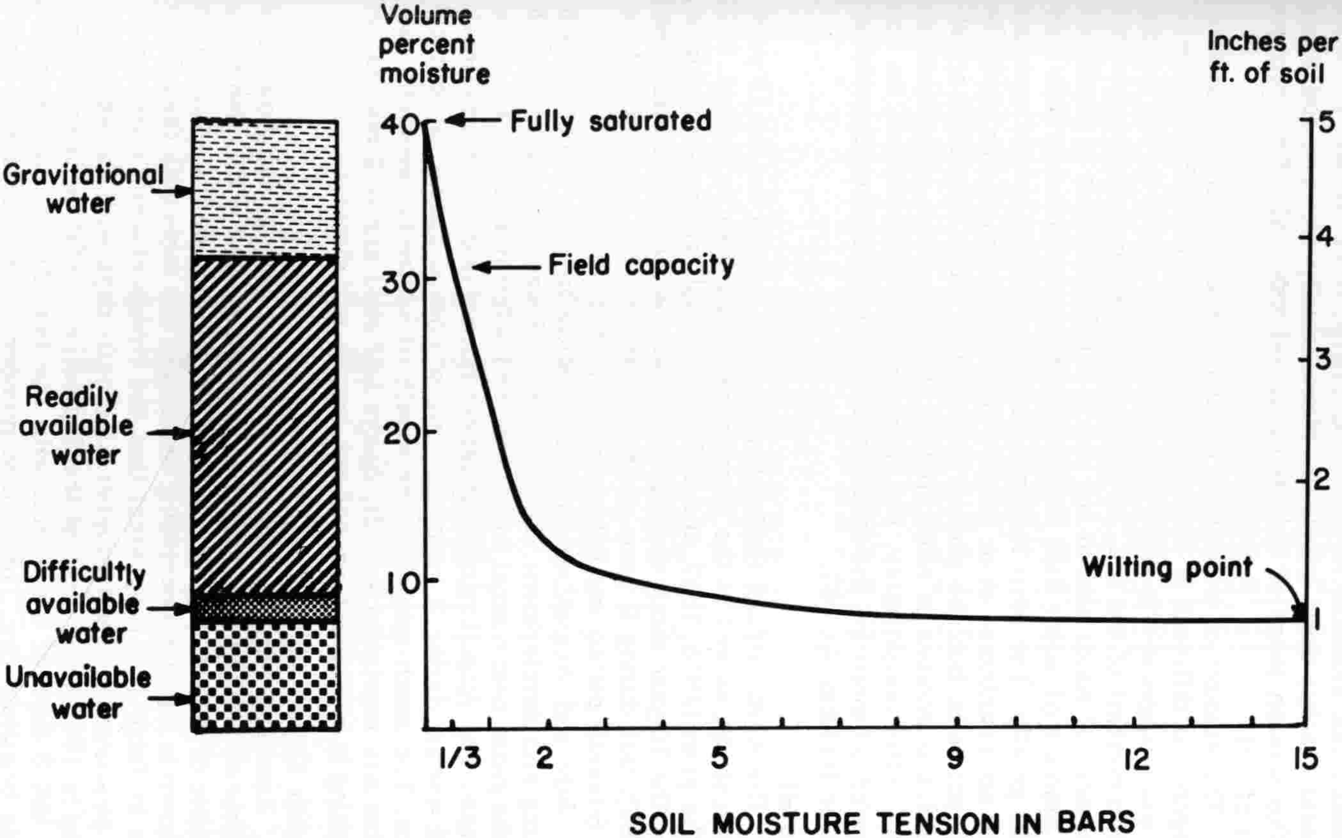

Figure 1. Moisture release curve of a Memphis soil.

The water held in all soils at a tension of 15 bars or greater is generally not available to most crop plants. When the soil moisture content reaches these levels, the plants usually die. The soil water in this tension range of the Memphis soil was 0.85 of an inch per foot of soil.

The amount of water held in each of these relative availability categories is different in different soils. It changes as the texture of the soil changes and in some instances it is influenced by the organic matter content of the soil. At a given soil moisture tension, the next increment of water held in any soil is equally available to plants but the amount of water held at a given tension by different soils may differ greatly. The crop response under conditions where moisture levels are maintained at or below a given tension should be similar in different soils, but the percent moisture at which irrigations are required, the amounts of water applied, and frequencies of applications could differ considerably. For more complete information on this phase of soil moisture, the reader is referred to Tennessee Experiment Station Bulletin No. 367.

Rainfall

The April through September monthly rainfall for the 13 years of the study, as well as the 70-year mean, is shown in Table 1. In 3 of the years (1955, 1957, and 1964) the rainfall was one-third higher than the 70-year mean and slightly above the mean in another year (1967); but during 9 years of the experiment, the total rainfall for the 6-month period was below the 70-year mean.

July and August are the more critical months in cotton boll setting and development. The July rainfall was above normal for 5 of the years, near normal for 3 years, and below normal for the other 5 years. The August rainfall was above normal in only 1 year (1964), near normal during 3 years, and below normal during the other 9 years. Too much rainfall in the month of September generally promotes late vegetative growth, delays leaf shed and boll maturation resulting in yield loss from boll rot, insects, and diseases.

Drouth Days

Assuming that the soil on which the cotton was grown was capable of holding 3.00 inches of available water for the plants, the number of drouth days experienced by the crop during each month is shown in Table 2. Comparing the data in this table with the rainfall data in Table 1, it is apparent that the 3 years of above normal rainfall produced the least number of drouth days with the exception being in 1955 when most of the September rainfall occurred during the last 3 days of the month with the first 27 days of the month being relatively dry. The highest number of drouth days occurred during the 3 years when the total rainfall during the 6-month period

Table 1. Monthly rainfall during cotton growing season at the West Tennessee Experiment Station (1955-1967)

	Year													
Month	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	70 yr. mean
	Inches													
April	6.88	6.52	6.12	4.97	2.68	2.81	4.76	3.22	3.89	9.47	5.74	5.50	3.60	4.66
May	5.05	2.40	5.29	2.66	2.75	2.62	4.67	2.33	4.75	3.14	3.03	5.80	9.14	3.97
June	2.33	5.09	6.85	3.33	4.16	3.68	4.75	2.49	2.23	5.31	2.61	0.88	2.90	4.08
July	12.97	0.88	6.76	3.37	4.71	5.35	3.80	2.16	3.56	5.43	4.41	4.19	5.27	4.46
August	3.01	1.48	2.30	1.03	2.55	2.13	3.66	1.19	1.17	6.40	1.63	3.79	2.67	3.28
Sept.	3.93	0.02	4.21	4.98	1.73	1.47	0.64	5.41	0.99	4.85	4.24	0.77	2.33	3.39
Total	34.17	16.39	31.53	20.34	18.58	18.06	22.28	16.80	16.59	34.60	21.66	20.93	25.91	23.84

Table 2. **Drouth days at a 3-inch moisture base for unirrigated and irrigated cotton on a Memphis soil at the West Tennessee Experiment Station (1955-1967)**

UNIRRIGATED

	Year												
Month	**1955**	**1956**	**1957**	**1958**	**1959**	**1960**	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**
April	0	0	0	0	0	0	0	0	0	0	0	0	0
May	0	0	0	0	7	0	0	11	2	0	2	0	0
June	3	16	0	14	9	22	0	16	5	4	13	17	12
July	3	14	2	13	6	2	11	22	16	0	12	8	0
August	2	24	8	27	21	14	12	27	28	5	18	9	13
September	24	30	9	11	12	21	26	0	21	12	7	26	18
Total	32	84	19	65	55	59	49	76	72	21	52	60	43

IRRIGATED AT 2 BARS TENSION

	Year												
Month	**1955**	**1956**	**1957**	**1958**	**1959**	**1960**	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**
April	0	0	0	0	0	0	0	0	0	0	0	0	0
May	0	0	0	0	7	0	0	11	2	0	0	0	0
June	3	16	0	14	9	22	0	16	5	4	13	17	12
July	3	2	0	11	2	0	11	4	13	0	7	3	0
August	0	2	0	0	4	0	1	0	0	0	0	1	13
September	0	26	0	0	4	0	10	0	4	12	0	26	18
Total	6	46	0	25	26	22	22	31	24	16	22	47	43

was near 16 inches (1956, 1962, and 1963). Even though the rainfall during the period was only slightly below normal in 1958, 1961, 1965, and 1966, many drouth days resulted because of the rainfall distribution.

Irrigation Application

Soil moisture was monitored by gravimetric moisture determinations on frequently collected soil samples. The cotton was grown on beds and small dams at the ends of plots held water on the desired treatments. Furrow irrigations were applied when the soil moisture level reached 2, 5, or 9 bars tension. In this soil, the 2-bar treatment meant applying 2 inches of water when about two-thirds of the available water had been used. The 5-bar treatment involved less frequent applications of 2.5 inches of water when the soil was drier than at the 2-bar treatment. The 9-bar treatment involved applying 2.8 inches of water at times when the soil was drier than the 5-bar treatment. In all three irrigation treatments, the amount of water applied was sufficient to bring the surface foot of the soil to field capacity. The 2-bar treatment was used in all experiments while the 5- and 9-bar treatments were used in different experiments.

The dates of irrigation and amounts of water applied at each irrigation as well as the total amounts of water received by each irrigation treatment are shown in Table 3.

The most irrigations (6) were required in 1962 at 2 bars tension when the April-September rainfall was only 16.8 inches. However, almost a third of this rainfall came in September which was too late for cotton. This was also the year that had the greatest number of drouth days during the July-August period when cotton is usually setting and developing bolls.

Four irrigations were required at 2 bars tension in 1958, 1960, and 1963. Two of these years also had a high number of drouth days in the July-August period. In 1960, two of the irrigations were in late August and early September.

Cotton Yields

The average seed cotton yield produced by each moisture treatment is shown in Table 4. Lint cotton yields for the different treatments are given in Tables 8 through 18 for most of these experiments. These data represent 19 experiments over a 13-year period (1955-1967). In 7 of these experiments, the 2-bar irrigation treatment resulted in a significant yield increase. In two cases (1964 and 1966) the yields were decreased significantly. In 1 year (1967) no irrigation was required. In 9 of the experiments, no significant effects from irrigation were obtained.

The greatest irrigation responses were obtained in 1956, 1958, 1962, and 1963. The average yield increase from irrigation over these

Table 3. Amounts of water applied and dates of irrigation on a Memphis soil at the West Tennessee Experiment Station (1955 – 1967)

	Irrigated at 2 bars tension			Irrigated at 9 bars tension			Total water + rainfall + irrigation April – September		
								Irrigated at	
Year	Dates of application	Inches each irrigation	Total inches	Dates of application	Inches each irrigation	Total inches	No irrig.	9 bars	2 bars
1955	Aug. 15, 31, & Sept. 10	2.0	6.0	August 22	2.8	2.8	34.2	37.0	40.2
1956	July 16, 31; August 15	2.0	6.0	August 10	2.8	2.8	16.4	19.2	22.4
1957	July 15; August 23	2.0	4.0	September 5	2.8	2.8	31.5	34.3	35.5
1958	July 30; Aug. 11, 28; Sept. 9	2.0	8.0	Aug. 12; Sept. 12	2.8	5.6	20.3	25.9	28.3
1959	July 17; Aug. 17	2.0	4.0	August 18	2.8	2.8	18.6	21.4	22.6
1957	August 9, 26	2.0	4.0	September 7	2.8	2.8	31.5	34.3	35.5
1958	July 30; Aug. 11, 28; Sept. 8	2.0	8.0	Aug. 12; Sept. 12	2.8	5 6	20.3	25.9	28.3
1959	July 17; Aug. 17	2.0	4.0	August 18	2.8	2.8	18.6	21.4	22.6
								Irrigated at	
	Irrigated at 2 bars tension			Irrigated at 5 bars tension			No irrig.	5 bars	2 bars
1960	July 19; Aug. 5, 17; Sept. 2	2.0	8.0	August 18	2.5	2.5	18.1	20.6	26.1
1961	August 7, 18	2.0	4.0	None	–	–	22.3	22.3	26.3
1962	July 5, 16, 30; Aug. 8, 17, 23	2.0	12.0	July 14; Aug. 21	2.5	7.5	16.8	24.3	28.8
1963	July 25; Aug. 8, 14, 24	2.0	8.0	Aug. 5, 22	2.5	5.0	16.6	21.6	24.6
1964	August 4	2.0	2.0	None	–	–	34.6	34.6	36.6
1965	July 21; Aug. 4, 20	2.0	6.0	August 18	2.5	2.5	21.7	24.2	27.7
1966	July 25	2.0	2.0	July 29	2.5	2.5	20.9	23.4	22.9
1967	No irrigations applied.						25.9		

Table 4. Seed cotton yields in irrigation experiments at the West Tennessee Experiment Station (1955-1967)

Moisture treatment	Year																		
	1955	**1956**	**1957**	**1957**	**1958**	**1958**	**1959**	**1959**	**1960**	**1961**	**1962**	**1963**	**1964**	**1964**	**1965**	**1965**	**1966**	**1966**	**1967**
	Pounds per acre																		
No irrigation	2102	1066	2203	2362	2093	2468	2710	2674	2710	3025	1960	2323	2759	1882	3721	3227	3001	3703	1037
Irrigated at 9 bars tension	2550	1661	2301	2428	2723	2823	2952												
Irrigated at 5 bars tension									3049	2904	3202	3436		1990		3899	2686		
Irrigated at 2 bars tension	2501	2137	2373	2761	3170	3452	2968	3073	3243	2686	3761	3582	2160	1452	4338	3980	2783	3557	1037
L.S.D. (5%)	N.S.	427	N.S.	N.S.	520	629	N.S.	N.S.	266	N.S.	238	557	N.S.	242	N.S.	323	218	N.S.	N.S.

4 years was 1,302 pounds of seed cotton per acre and ranged from 1,071 pounds per acre in 1956 to 1,801 pounds per acre in 1962. These were years of low August rainfall and generally years of below-average July rainfall. The greatest number of drouth days (84, 65, 76, and 72, respectively) also occurred during these 4 years and the amounts of water applied in the 2-bar irrigation treatment ranged from 6 inches in 1956 to 12 inches in 1962.

An average seed cotton yield increase of 748 pounds per acre was obtained in the 13 year-site locations that produced a yield increase from irrigation. This group of experiments required an average of slightly over three irrigations per year applying an average of 6.5 inches of water each year. Thus, during these experiments an average seed cotton yield increase from irrigation of 116 pounds per acre per inch of water applied was obtained.

During 5 year-site locations, irrigation at 2 bars tension resulted in a yield decrease, with yields averaging 346 pounds of seed cotton per acre less than the unirrigated treatment. During these years, water applications averaged slightly over 2 inches per year in one irrigation.

In the 18 year-site experiments that involved irrigation (no water was applied in 1967), an average yield increase of 444 pounds of seed cotton per acre was obtained from an average application of 5.3 inches of water or 84 pounds of seed cotton per acre-inch of water applied.

Response to the 5-bar irrigation treatment averaged 434 pounds seed cotton per acre in seven experiments from 1960 to 1966. This treatment required 2.5 inches per application and averaged 2.86 inches per year with no irrigations in 1961 and 1964. These years were very diverse with decreased yields resulting in 1961 and 1966. Large increases of 1,243 and 1,113 pounds of seed cotton per acre were obtained in 1962 and 1963 which required 7.5 and 5.0 inches of water, respectively. There was an average increase of 188 pounds of seed cotton per acre-inch of water.

Response to the 9-bar treatment averaged 348 pounds seed cotton per acre in seven experiments from 1955 to 1959. This increase was to an average of 3.6 inches of water with only 1 year (1958) requiring more than one irrigation. This was a return of 97 pounds seed cotton per acre-inch of water.

The 5-bar and 9-bar treatments involved larger, less frequent irrigations and a smaller total amount of water. Although the cotton response per inch of water applied was higher than on the 2-bar treatment, total yields were less. This indicates the cotton plant was more responsive to moderate, more frequent applications of water, totaling more water, but providing a continuous situation favoring normal development and avoiding dry conditions followed by a saturated soil condition.

Irrigation-nitrogen Experiments

The results from 9 years of irrigation-nitrogen experiments are shown in Table 5. During 5 of these years, a significant yield increase from irrigation was obtained. No significant yield increase from nitrogen application above 50 pounds per acre was obtained in any of the experiments. However, during the first 5 years of the experiments (1957-1959), there was an indication that with irrigation, a nitrogen fertilization rate higher than 50 pounds per acre might be desirable.

Irrigation-variety Experiments

The cotton yields from the irrigation-variety experiments are shown in Tables 6 and 7. These experiments were conducted over an 11-year period and during 5 of these years (1958, 1960, 1962, 1963, and 1965), a significant yield increase from irrigation was obtained. The unirrigated and irrigated yields of each variety are shown in Table 6. This shows the extent that the yields of specific varieties may be increased with favorable moisture management.

In 1962 and 1963, rainfall was well below normal (16.8 and 16.6 inches, respectively) for the crop season; drouth days were high (76 and 72, respectively), and cotton response was highly significant to irrigation. A check of the irrigated and unirrigated yields during these 2 years shows the extent of the yield potential of cotton varieties tested during this period. Auburn 56 and Dixie King were the two highest yielding varieties during these 2 years with Auburn 56 averaging 116 pounds per acre more. DPL—Fox 4 was the next highest yielding variety, averaging only 90 pounds per acre below Dixie King.

It must be remembered however, the high yields obtained during these 2 years with irrigation cannot be attributed entirely to the additional moisture contributed through irrigation. During the years of low rainfall, the incoming radiant energy from the sun is higher and the thermal currents thus produced also renewed CO_2 supplies near the leaves. This increased radiation and air movement preventing CO_2 from reaching limiting levels produces a higher yield of cotton than when equivalent amounts of water are received from rainfall. Periods of cloudy weather retard plant growth and development through decreased radiant energy and lower temperatures even though the cloudy weather may produce rainfall, which supplies water for plant growth. This is one reason why years of above-average rainfall like 1955, 1957, and 1964 do not produce extremely high cotton yields. It is also one of the reasons why cotton yields in regions of irrigated agriculture are often higher than yields obtained in the humid region.

The average yields of the varieties under all irrigated and unirri-

Table 5. Nitrogen effects on cotton yields in irrigation experiments on a Memphis soil (1955-1963)

Pounds N/A	Year 1955	1956	1957	1958	1959	5-yr. mean	Year 1960	1961	1962	1963	4-yr. mean	Overall mean
	Pounds seed cotton per acre											
	NO IRRIGATION						NO IRRIGATION					
50	2276	1056	2209	2118	2674	2067						2067
100	2033	1113	2064	2202	2844	2051	2840	3047	1971	2436	2574	2283
150	1997	1027	2335	1936	2517	1962						1962
200							2586	2998	1949	2216	2437	2437
	IRRIGATED AT 9 BARS TENSION						IRRIGATED AT 5 BARS TENSION					
50	2490	1763	2428	2372	2868	2384						2384
100	2555	1619	2332	2880	2904	2458	3014	2850	3237	3367	3117	2751
150	2607	1602	2144	2916	2977	2449						2449
200							3065	2950	3170	3489	3169	3169
	IRRIGATED AT 2 BARS TENSION						IRRIGATED AT 2 BARS TENSION					
50	2410	2040	2280	2880	2916	2505						2505
100	2574	2291	2458	3146	3086	2711	3195	2786	3716	3579	3319	2981
150	2520	2081	2380	3497	3219	2739						2739
200							3305	2571	3807	3598	3320	3320
	NITROGEN TREATMENT											
50	2392	1620	2306	2457	2819	2319						2319
100	2387	1674	2285	2743	2945	2407	3025	2904	2974	3122	3006	2673
150	2375	1570	2286	2783	2904	2384						2384
200							2977	2831	2977	3098	2971	2971
L.S.D. (5%)	N.S.	N.S.	N.S.	N.S.	N.S.	–	N.S.	N.S.	N.S.	N.S.	–	–

Table 6. Yields of cotton varieties under irrigated and unirrigated conditions on a Memphis soil (1957-1967)

Variety	Irrig. tmt.*	Year 1957	1958	1959	3-yr mean	Year 1960	1961	1962	1963	4-yr mean	Year 1964	1965	1966	1967	4-yr. mean	Overall mean
		Pounds seed cotton per acre														
Coker 100W	0	2806	2516	2920	2747											2747
	+	2990	3436	3210	3212											3212
Fox	0	2349	2484	2678	2504											2504
	+	2777	3710	3387	3291											3291
Stoneville 7	0	2099	2581	2597	2426											2426
	+	2614	3629	2968	3070											3070
DPL 15	0	2084	2420	2710	2405	2517	2941	1719	2009	2297						2343
	+	2588	3387	2984	2986	3279	2614	3582	3086	3140						3074
Empire	0	2468	2387	2500	2452	2638	3170	2045	2384	2559						2513
	+	2719	3210	2516	2815	3134	2856	3727	3679	3349						3120
Pope	0	2364	2452	2823	2546	2783	3062	1912	2457	2554						2550
	+	2879	3339	2726	2981	3049	2602	3315	3534	3125						3063
Cobal	0					2432	2916	1960	2287	2399						2399
	+					2783	2457	3643	3812	3174						3174
Coker 100A	0					2529	2928	1924	2190	2393						2393
	+					3388	2517	3666	3485	3264						3264
DPL–Fox 4	0					2856	2699	1984	2432	2493						2493
	+					3316	2674	4042	3606	3410						3410
Auburn 56	0					3025	3388	2190	2529	2783	1613	3442	3170	971	2299	2541
	+					3533	3025	3993	4066	3654	1264	3684	2372	971	2073	2864
Dixie King	0					2916	3074	2045	2287	2581	1560	3334	2831	1080	2201	2391
	+					3219	2602	3969	3860	3413	1425	4141	2856	1080	2376	2894
DPL–SL	0					2723	3022	1864	2360	2492	1398	2823	2735	655	1903	2198
	+					3546	2759	3921	3170	3349	1156	3496	2251	655	1890	2619
Auburn M	0										2743	3576	3485	1198	2751	2751
	+										1936	4276	3364	1198	2694	2694
Rex Smoothleaf	0										2205	3119	2928	1287	2385	2385
	+										1398	4114	2977	1287	2444	2444
Stardel	0										1963	3119	3001	1064	2287	2287
	+										1855	4060	3122	1064	2525	2525
Stoneville 213	0										1667	3334	3025	1029	2264	2264
	+										1237	4141	2493	1029	2225	2225
Carolina Queen	0										1318	3065	2323		2235[2]	2235
	+										968	3657	2202		2276[2]	2276
Coker 201	0													893	893[3]	893
	+													893	893[3]	893

*0 indicates no irrigation and + indicates irrigation at 2 bars tension

[2] 3-year average.

[3] 1-year's data.

Table 7. Average cotton variety yields in irrigation experiments on a Memphis soil (1957-1967)

Variety	Year			3-yr. mean	Year				4-yr. mean	Year				4-yr. mean	Overall mean
	1957	1958	1959		1960	1961	1962	1963		1964	1965	1966	1967		
	Pounds seed cotton per acre														
Coker 100W	2741	2984	3049	2925											2925
Fox	2570	3081	3113	2921											2921
Stoneville 7	2323	3016	2823	2721											2720
DPL 15	2354	2807	2855	2672	2928	2759	2735	2710	2783						2735
Empire	2518	2774	2549	2614	2928	2977	2977	3098	2995						2832
Pope	2595	2823	2887	2768	2904	2880	2686	3122	2898						2842
Cobal					2686	2783	2880	3291	2910						2910
Coker 100A					3001	2807	2904	3049	2940						2940
DPL–Fox 4					3073	2638	3170	3219	3025						3025
Auburn 56					3315	3194	3267	3436	3303	1640	3711	2807	971	2282	2792
Dixie King					3025	2856	3146	3219	3062	1667	3845	2710	1080	2326	2694
DPL–SL					3170	2928	2977	2904	2995	1371	3334	2444	655	1951	2473
Auburn M										2420	3953	3340	1198	2728	2728
Rex Smoothleaf										1882	3765	2904	1287	2460	2460
Stardel										1963	3576	2977	1064	2395	2395
Stoneville 213										1560	3818	2735	1029	2286	2286
Tenn. 56-210										2259	3845	3340	1158	2651	2651
Carolina Queen										1237	3523	2130		2297[1]	2297
Coker 201													893	893[2]	893
L.S.D. (5%)	273	N.S.	226	–	242	128	165	169	–	242	296	290	236	–	–

[1] 3-year mean. [2] 1-year's data.

gated conditions are shown in Table 7. A significant difference among the varieties occurred in every year of the experiments except 1958. It is interesting to note that the average variety yields were greater on the years of a significant response to irrigation. This indicates the total microclimate effect on the growth of the cotton plant, higher light intensities, higher temperatures, more CO_2 diffusion, and movement and adequate water from irrigation all contributed to the higher yields.

In the first 11 irrigation experiments conducted over a 9-year period from 1955 through 1963, the cotton variety Empire was utilized with the same rate of fertilization (100 pounds of nitrogen per acre and enough phosphate and potash to maintain a high soil test level). The percent lint of each treatment was determined each year and the cotton yield values expressed in pounds of lint per acre for these experiments are reported in Table 8.

Irrigation at 2 bars tension increased lint cotton yields in nine of the experiments and the yield increase was significant in three experiments. Irrigation at this level lowered lint yields in 1959 and 1961. An average of the first 7 years of the experiments showed that irrigating at 9 bars tension resulted in a 100-pound per acre lint yield increase and almost a 200-pound per acre lint yield increase was obtained for irrigating at 2 bars tension. Similar results were obtained during the last 4 years (1960-63) of the experiments except that the average increase for the 5-bar irrigation treatment was over 100 pounds of lint per acre. This would be expected, as the 5-bar treatment maintains a slightly higher level of soil moisture than the 9-bar irrigation treatment.

In the 2-bar irrigation treatment, an average of 6.5 inches of water was applied each year resulting in an average yield increase of 196 pounds of lint per acre for the 11 experiments or about 30 pounds of lint per acre-inch of water. The 9-bar irrigation treatment averaged 3.6 inches of water per year for a yield increase of 100 pounds of lint per acre for seven experiments or about 28 pounds of lint per acre-inch of water. The 5-bar irrigation treatment averaged 3.8 inches of water each year for a 116-pound lint yield increase or about 31 pounds of lint per acre-inch of water.

The greatest yield increase of 506 pounds of lint per acre occurred in 1962 when six irrigations totaling 12 inches of water were applied. This resulted in about 42 pounds of lint per acre-inch of water applied. Overall, the lint yield increase per inch of water was quite similar. In the extremely dry year (1962), the additional response per inch of water applied was probably due to increased radiation (less cloudy weather), better CO_2 renewal through thermal currents, and indicates the plant responded to a more favorable environment.

Table 8. Effects of irrigation on lint yield of Empire cotton at the West Tennessee Experiment Station, Jackson, Tennessee, 1955-1963

Year							Avg. 7 expt.	Year				Avg. 4 expt.	Avg. 11 expt.
1955	1956	1957	1957	1958	1958	1959	1955-1959	1960	1961	1962	1963	1960-1963	1955-1963
Pounds of lint cotton per acre													
NO IRRIGATION													
704	443	692	866	821	859	918	757	999	1153	786	977	979	838
IRRIGATED AT 9 BARS TENSION													
856	656	802	831	1022	896	937	857						
IRRIGATED AT 5 BARS TENSION													
								982	920	1171	1305	1095	
IRRIGATED AT 2 BARS TENSION													
873	852	841	1063	1062	1111	835	948	1013	1048	1292	1386	1185	1034
L.S.D. (5%)													
N.S.	170	N.S.	184	N.S.	N.S.	40	72	N.S.	N.S.	94	N.S.	140	–

Cotton Fiber Characterization

In one of the nitrogen experiments, one variety experiment, and the nitrogen-variety experiment, extensive fiber data were obtained on randomly selected boll samples collected before harvest and these data are presented in this section. Many of the terms used in the tables may be defined as follows:

Bolls per pound represent the number of bolls of cotton required to give 1 pound of seed cotton when a representative boll sample was hand picked.

Fineness of fibers was measured on the Aerolometer and "A" is the surface area per unit volume of fibers (below 400—coarse, 400-500—average, above 500—fine to very fine). "D" is a measure of maturity (below 20 mature to very mature, 20-35 average, 36-60 immature, over 60 is very immature).

The percent lint is the percent of the seed cotton that is lint. Two measurements are given in lint length. The upper half mean (UHM) is the average length of half of the fibers by weight that contain the longest fibers and the mean fiber length is the average length of all fibers longer than 1/4 inch.

The micronaire equivalent is expressed in micronaire units as calculated from fineness measurements determined on the Aerolometer. The micronaire is the fineness of the fiber taken from the ginned lint as measured by the micronaire instrument and expressed in micronaire units (micrograms per inch of fiber).

In expressing fiber strength, "T_1" is the strength of a bundle of fibers measured on the Stelometer with the two jaws holding the fiber bundle separated by 1/8 inch space and expressed in centinewtons per tex. "E_1" is the percentage elongation at break of the center 1/8 inch of the fiber bundle when measuring T_1 strength on the Stelometer.

Boll Size, Percent Lint, Fiber Qualities, and Lint Yield

Boll size, percent lint, fiber qualities, seed cotton, and lint yields from the 4-year (1955-1958) nitrogen irrigation experiment are shown in Tables 9, 10, 11, and 12. In these experiments, a significant response to irrigation of slightly over 1,070 pounds seed cotton per acre was obtained in 1956 and 1958. In each of these years, boll size was increased, percent lint was decreased, lint length was increased, fiber fineness increased in 1958, fiber strength increased only in 1956, and elasticity increased both years. Nitrogen rates had no great effect on the boll or fiber properties.

Boll size, percent lint, fiber qualities, and yields from the variety-irrigation experiments in 1957, 1958, and 1959 are shown in Tables 13, 14, and 15. In these experiments, a significant response to irrigation occurred only in 1958. This is evident in the bolls per pound and the percent lint values, as irrigation usually produced larger bolls

Table 9. Boll size, percent lint, fiber* characteristics, and yield summary of Empire cotton produced under various irrigation and nitrogen treatments on a Memphis soil in 1955

Irrigation	Nitrogen pounds per/A	Bolls per lb.	Per-cent lint	Length UHM	Fineness A	Strength T_1	Yield per acre (lb.) Seed cotton	Lint
No irrigation	50	56.3	33.6	1.15	557	1.89	2276	764
	100	60.1	34.6	1.14	553	1.93	2033	703
	150	60.1	34.7	1.16	537	1.98	1997	693
Average		58.8	34.3	1.15	549	1.93	2102	721
Irrigated at 9 bars tension (1 irrig.)	50	58.7	35.2	1.12	552	1.83	2490	876
	100	57.7	33.5	1.19	556	1.96	2555	856
	150	56.9	34.5	1.18	537	2.02	2607	899
Average		57.8	34.4	1.16	548	1.94	2550	877
Irrigated at 2 bars tension (3 irrig.)	50	61.0	34.8	1.14	547	1.91	2410	839
	100	57.7	33.9	1.16	529	1.99	2574	873
	150	57.7	35.0	1.15	539	1.99	2520	882
Average		58.8	34.6	1.15	538	1.96	2501	865

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 10. Boll size, percent lint, fiber* characteristics, and yield summary of Empire cotton produced under various irrigation and nitrogen treatments on a Memphis soil in 1956

Irrigation	Nitrogen pounds per/A	Bolls per lb.	Per-cent lint	Lint length		Fineness		Strength		Yield per acre (lb.)	
				UHM	Mean	A	D	T_1	E_1	Seed cotton	Lint
No irrigation	50	61.3	39.7	1.03	.84	424	29	1.58	6.0	1056	419
	100	63.0	39.8	1.00	.79	435	32	1.59	5.7	1113	443
	150	65.3	40.1	.98	.76	447	34	1.56	5.8	1027	412
Average		63.2	39.9	1.00	.79	435	32	1.58	5.8	1066	425
Irrigated at	50	63.0	40.1	1.04	.84	429	33	1.71	6.1	1763	707
9 bars tension	100	61.7	40.5	1.00	.80	424	31	1.68	6.2	1619	656
(1 irrig.)	150	60.7	40.6	1.02	.84	398	23	1.77	6.6	1602	650
Average		61.8	40.4	1.02	.83	417	29	1.72	6.3	1661	671
Irrigated at	50	55.6	37.8	1.10	.86	458	41	1.72	6.4	2040	771
2 bars tension	100	56.7	37.2	1.12	.91	429	33	1.72	6.4	2291	852
(3 irrig.)	150	55.7	38.2	1.08	.85	435	33	1.76	6.2	2081	795
Average		56.0	37.7	1.10	.87	441	36	1.73	6.3	2137	806

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 11. Boll size, percent lint, fiber* characteristics, and yield summary of Empire cotton produced under various irrigation and nitrogen treatments on a Memphis soil in 1957

Irrigation	N lb. per A.	Bolls per lb.	Per-cent lint	Lint length		Micron. Equiv.	Fineness		Strength		Yield in lb./A	
				UHM	Mean		A	D	T_1	E_1	Seed cotton	Lint
No irrigation	50	55.6	34.0	1.11	.88	3.7	500	39	1.62	6.5	2209	751
	100	58.0	33.5	1.09	.88	3.8	491	40	1.64	7.1	2064	691
	150	55.0	34.1	1.10	.88	3.9	488	37	1.61	6.9	2335	796
Average		56.2	33.9	1.10	.88	3.8	493	39	1.62	6.9	2203	746
Irrigated at 9 bars tension (1 irrig.)	50	56.7	33.9	1.13	.91	3.8	483	35	1.65	7.0	2428	823
	100	56.4	34.4	1.08	.87	3.9	490	36	1.67	7.0	2332	802
	150	54.8	34.5	1.11	.89	4.0	477	34	1.60	6.9	2144	740
Average		56.0	34.3	1.11	.89	3.9	483	35	1.64	7.0	2301	788
Irrigated at 2 bars tension (2 irrig.)	50	56.9	35.6	1.11	.89	4.1	475	34	1.66	7.1	2280	812
	100	52.7	34.2	1.14	.95	3.8	490	37	1.69	7.3	2458	841
	150	53.8	33.7	1.11	.94	3.8	484	37	1.69	7.1	2380	802
Average		54.5	34.5	1.12	.93	3.9	483	36	1.68	7.2	2373	818

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 12. Boll size, percent lint, fiber* characteristics, and yield summary of Empire cotton produced under various irrigation and nitrogen treatments on a Memphis soil in 1958

Irrigation	N lb. per A.	Bolls per lb.	Per-cent lint	Lint length		Micron. Equiv.	Fineness		Strength		Yield in lb./A	
				UHM	Mean		A	D	T_1	E_1	Seed cotton	Lint
No irrigation	50	59.2	36.3	1.08	.91	4.6	453	33	1.72	7.1	2118	769
	100	58.9	37.2	1.07	.91	4.6	451	29	1.79	6.5	2202	819
	150	59.3	37.4	1.06	.92	4.8	438	29	1.76	6.8	1936	724
Average		59.1	36.9	1.07	.91	4.7	447	30	1.76	6.8	2093	771
Irrigated at 9 bars tension (2 irrig.)	50	59.1	35.3	1.11	.94	4.4	474	36	1.70	7.3	2372	837
	100	57.5	35.5	1.10	.94	4.5	467	36	1.74	7.7	2880	1022
	150	58.5	34.5	1.10	.94	4.4	467	35	1.77	7.5	2916	1006
Average		58.3	35.1	1.10	.94	4.4	469	36	1.74	7.5	2723	955
Irrigated at 2 bars tension (4 irrig.)	50	56.1	33.8	1.15	.98	4.0	494	44	1.76	7.4	2880	973
	100	56.0	33.8	1.13	.94	4.0	495	43	1.76	7.3	3146	1063
	150	57.1	33.1	1.14	.97	4.1	499	44	1.74	7.5	3497	1158
Average		56.4	33.6	1.14	.96	4.0	496	44	1.75	7.4	3170	1065

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 13. Boll size, percent lint, fiber* characteristics, and yield summary of cotton varieties produced with irrigation treatments on a Memphis soil in 1957

				Lint length			Fineness		Strength		Yield in lb./A	
Irrigation	Varieties	Bolls per lb.	Per-cent lint	UHM	Mean	Micron. Equiv.	A	D	T_1	E_1	Seed cotton	Lint
No irrigation	Empire	55.6	35.1	1.15	.93	3.5	510	42	1.63	7.1	2468	866
No irrigation	DPL 15	77.9	36.3	1.12	.93	3.7	504	41	1.86	8.6	2084	756
No irrigation	Coker 100W	66.3	33.8	1.13	.89	3.8	489	37	1.73	8.0	2806	948
No irrigation	Pope	72.2	37.8	1.05	.84	3.5	437	51	1.73	5.8	2364	894
No irrigation	Stoneville 7	73.4	36.9	1.07	.89	3.9	493	41	1.52	8.8	2099	775
No irrigation	Fox	70.6	34.1	1.13	.92	4.1	457	28	1.73	6.9	2349	801
Average		69.3	35.7	1.11	.90	3.8	482	40	1.70	7.5	2362	840
9 bars ten.	Empire	52.1	35.1	1.13	.95	3.6	525	38	1.54	6.7	2368	831
9 bars ten.	DPL 15	74.3	37.1	1.12	.92	3.9	487	36	1.74	8.6	2391	887
9 bars ten.	Coker 100W	63.2	35.7	1.13	.93	3.9	492	36	1.70	8.2	2426	866
9 bars ten.	Pope	65.4	38.3	1.09	.89	3.9	462	24	1.80	5.4	2541	973
9 bars ten.	Stoneville 7	65.7	36.2	1.10	.90	4.1	476	39	1.57	9.3	2254	816
9 bars ten.	Fox	70.1	34.7	1.17	.99	4.2	472	35	1.80	7.0	2585	897
Average		65.1	36.2	1.12	.93	3.9	486	35	1.69	7.5	2428	878
2 bars ten.	Empire	52.3	39.1	1.12	.85	3.9	489	36	1.67	7.0	2719	1063
2 bars ten.	DPL 15	69.0	37.6	1.12	.94	4.1	469	32	1.71	9.0	2588	973
2 bars ten.	Coker 100W	60.3	36.4	1.17	1.01	4.1	447	25	1.64	8.2	2990	1088
2 bars ten.	Pope	66.1	37.8	1.04	.80	3.8	490	39	1.76	6.3	2879	1088
2 bars ten.	Stoneville 7	69.5	36.4	1.11	.90	4.0	478	42	1.54	8.9	2614	951
2 bars ten.	Fox	65.9	35.5	1.16	1.00	4.4	429	28	1.88	7.3	2777	986
Average		63.9	37.1	1.12	.92	4.1	467	34	1.70	7.8	2761	1025

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 14. Boll size, percent lint, fiber* characteristics, and yield summary of cotton varieties produced with irrigation treatments on a Memphis soil in 1958

			Per-	Lint length			Fineness		Strength		Yield in lb./A	
Irrigation	Varieties	Bolls per lb.	cent lint	UHM	Mean	Micron. Equiv.	A	D	T_1	E_1	Seed cotton	Lint
No irrigation	Empire	56.2	35.9	1.12	.95	4.3	470	29	1.74	7.0	2387	857
No irrigation	DPL 15	81.5	38.7	1.07	.91	4.6	457	32	1.78	8.7	2420	937
No irrigation	Coker 100W	69.8	35.4	1.11	.96	5.0	432	28	1.79	8.2	2516	891
No irrigation	Pope	72.8	38.9	.99	.84	4.7	447	20	1.93	5.2	2452	954
No irrigation	Stoneville 7	74.3	37.7	1.07	.90	5.0	427	28	1.57	8.5	2581	973
No irrigation	Fox	75.0	35.5	1.08	.94	5.2	424	22	1.93	8.8	2484	882
Average		71.6	37.0	1.07	.92	4.8	443	27	1.79	7.7	2468	913
9 bars ten.	Empire	56.2	32.8	1.15	.95	4.0	500	39	1.85	7.8	2726	894
9 bars ten.	DPL 15	88.3	36.3	1.16	1.00	4.3	484	33	1.81	9.0	2629	954
9 bars ten.	Coker 100W	70.5	33.3	1.16	1.01	4.2	474	32	1.76	8.8	3016	1004
9 bars ten.	Pope	74.7	36.0	1.12	.96	4.1	485	31	1.81	7.2	2661	958
9 bars ten.	Stoneville 7	75.5	34.6	1.13	.94	4.3	488	37	1.68	7.9	2839	982
9 bars ten.	Fox	74.3	34.3	1.17	1.03	4.7	446	29	1.82	9.1	3032	1040
Average		73.3	34.6	1.15	.98	4.3	480	34	1.79	8.3	2823	977
2 bars ten.	Empire	56.6	34.6	1.10	.92	4.3	474	30	1.70	6.3	3210	1111
2 bars ten.	DPL 15	77.0	38.2	1.13	.98	4.0	503	33	1.87	8.9	3387	1294
2 bars ten.	Coker 100W	60.8	35.2	1.10	.93	4.8	443	24	1.75	9.1	3436	1209
2 bars ten.	Pope	69.3	38.1	1.05	.92	4.7	447	25	1.88	6.6	3339	1272
2 bars ten.	Stoneville 7	68.8	36.1	1.06	.92	4.7	450	28	1.57	9.4	3629	1310
2 bars ten.	Fox	70.5	35.2	1.07	.93	5.4	400	16	1.85	7.1	3710	1306
Average		67.2	36.2	1.09	.93	4.7	453	26	1.77	7.9	3452	1250

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 15. Boll size, percent lint, fiber* characteristics, and yield summary of cotton varieties produced with irrigation treatments on a Memphis soil in 1959

Irrigation	Varieties	Bolls per lb.	Per-cent lint	Lint length		Micron. Equiv.	Fineness	Strength		Yield in lb./A	
				UHM	Mean		A	T_1	E_1	Seed cotton	Lint
No irrigation	Empire	58.2	36.8	1.09	.85	4.12	479	1.68	7.2	2500	920
No irrigation	DPL 15	60.2	37.4	1.10	.87	4.45	449	1.65	8.0	2710	1014
No irrigation	Coker 100W	65.8	36.1	1.13	.92	4.10	482	1.68	7.6	2920	1054
No irrigation	Pope	66.8	37.6	1.03	.83	3.87	500	1.63	6.2	2823	1061
No irrigation	Stoneville 7	70.3	36.5	1.04	.83	4.22	469	1.56	8.2	2597	948
No irrigation	Fox	69.7	37.3	1.10	.94	4.70	429	1.82	7.5	2678	999
Average		65.2	37.0	1.08	.87	4.24	468	1.67	7.5	2710	999
9 bars ten.	Empire	52.2	35.8	1.10	.90	3.87	501	1.64	6.7	2613	935
9 bars ten.	DPL 15	75.7	38.6	1.12	.92	4.18	472	1.76	9.1	2855	1102
9 bars ten.	Coker 100W	63.3	34.3	1.12	.93	4.13	476	1.73	7.7	3000	1029
9 bars ten.	Pope	68.7	37.9	1.03	.84	4.12	479	1.73	6.1	3113	1180
9 bars ten.	Stoneville 7	68.6	35.0	1.07	.88	4.22	469	1.65	8.5	2871	1005
9 bars ten.	Fox	66.0	36.9	1.07	.90	4.96	411	1.78	7.7	3291	1214
Average		65.8	36.4	1.09	.90	4.25	468	1.72	7.6	2952	1078
2 bars ten.	Empire	53.2	33.1	1.15	.92	3.56	531	1.56	7.4	2516	833
2 bars ten.	DPL 15	76.2	35.8	1.15	.94	3.60	525	1.87	8.6	2984	1068
2 bars ten.	Coker 100W	67.7	34.4	1.16	.94	3.90	499	1.69	7.8	3210	1104
2 bars ten.	Pope	69.0	39.1	1.05	.81	3.65	522	1.80	6.7	2726	1066
2 bars ten.	Stoneville 7	67.4	32.4	1.10	.88	3.82	503	1.56	8.5	2968	962
2 bars ten.	Fox	68.9	34.3	1.13	.94	4.19	469	1.74	7.4	3387	1162
Average		67.1	34.9	1.12	.91	3.79	508	1.70	7.7	2968	1033

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

and the percent lint is usually lowered because larger seed were produced.

Lint length was increased by the 9-bar irrigation treatment in 1958 and by the 2-bar irrigation treatment in 1959. Irrigation reduced mivronaire in 1959, had no effect in 1958, and increased it in 1957. In 1958, the year of a significant yield increase from irrigation, no great variety average differences were found in micronaire, specific surface, or fiber strength that could be attributed to irrigation. However, for the variety DPL-15, increasing moisture decreased micronaire and increased specific surface and strength of the fiber.

Seed cotton and lint yields indicate the relative response to irrigation and the extent that individual varieties responded to irrigation. In 1958, the variety Fox was most responsive to irrigation and the variety Empire was least responsive.

The 4-year period 1960-63 represents an extensive study on boll and fiber characteristics from irrigation-nitrogen-variety experiments and these data are shown in Tables 16, 17, 18, and 19. In 1960, a small but significant response to irrigation was obtained. A small but nonsignificant yield reduction occurred in 1961. Large significant yield increases were obtained in 1962 and 1963 with the greatest increase occurring in 1962.

In 1962, irrigation increased boll size, lint length, micronaire equivalent, and fiber strength but decreased the percent lint. Similar relationships were found in the 1963 crop except for micronaire which decreased instead of increasing with irrigation. Generally, the boll size increase was about 15% and the decrease in percent lint was between 2 and 4%.

In 1960, when the response to irrigation was small, no great change in average boll size was evident. The drop in percent lint was about the same as in 1962. Micronaire and fiber strength showed a slight decrease from irrigation.

In 1961, when a small yield decrease from irrigation occurred, the number of bolls per pound, percent lint, lint length, micronaire, or fiber strength were not affected by the two August irrigations in the 2-bar irrigation treatment.

The nitrogen treatments had no significant effects on yields, boll, or fiber properties.

In 1962, irrigation caused the greatest change in boll size in Pope and DPL-SL but caused the least change in the large-boll varieties such as Dixie King, Empire, and Cobal. It reduced the percent lint in all varieties with the greatest reduction occurring in Empire and the least in Cobal. DPL-Fox 4 and Empire showed the greatest lint length increase from irrigation and DPL-15 showed the least. The micronaire equivalent was increased by irrigation the most in DPL-Fox 4, the least in DPL-15 and Auburn 56, and was decreased in Empire.

Table 16. Boll size, percent lint and fiber* characteristics, and yield summary of cotton varieties produced with nitrogen and irrigation treatments on a Memphis soil in 1960

Irrig. Level	N Level	Variety	Bolls per lb.	Percent lint	Lint length		Micron. Equiv.	Strength		Yield in lb./acre	
					UHM	Mean		T_1	E_1	Seed Cotton	Lint
0	100	Cobal	57.5	35.2	1.12	.95	3.90	1.79	7.9	2517	886
0	100	DPL–Fox 4	70.1	35.5	1.11	.97	4.28	1.95	7.7	3001	1065
0	100	Empire	66.1	36.1	1.07	.88	4.05	1.83	7.8	2759	996
0	100	Pope	71.1	37.0	1.03	.85	3.80	1.80	6.2	2856	1057
0	100	DPL–SL	79.4	37.6	1.10	.93	4.08	1.82	9.3	2856	1074
0	100	Coker 100A	67.3	34.5	1.10	.92	3.90	1.77	8.0	2614	902
0	100	DPL–15	76.1	37.6	1.05	.86	3.70	1.77	9.1	2710	1019
0	100	Dixie King	57.9	36.3	1.04	.87	3.90	1.71	6.2	3025	1098
0	100	Auburn 56	67.9	33.9	1.07	.90	3.65	1.79	7.9	3219	1091
		Variety mean	68.2	36.0	1.08	.90	3.92	1.80	7.8	2840	1021
0	200	Cobal	63.0	35.3	1.11	.93	3.68	1.92	7.7	2347	828
0	200	DPL–Fox 4	72.5	36.2	1.05	.91	4.25	1.74	8.0	2710	981
0	200	Empire	66.1	35.7	1.06	.86	3.85	1.75	7.3	2517	899
0	200	Pope	71.8	37.8	1.01	.82	3.73	1.62	6.7	2710	1024
0	200	DPL–SL	80.6	37.6	1.10	.94	4.23	1.85	9.2	2589	973
0	200	Coker 100A	70.8	36.8	1.03	.87	3.93	1.63	8.0	2444	899
0	200	DPL–15	78.1	38.0	1.05	.89	3.88	1.90	8.5	2323	883
0	200	Dixie King	59.3	36.4	.99	.80	4.05	1.43	6.9	2807	1022
0	200	Auburn 56	64.7	34.5	1.05	.89	3.98	1.67	7.5	2831	977
		Variety mean	69.7	36.5	1.05	.88	3.95	1.72	7.8	2586	943
5 bars	100	Cobal	57.7	33.5	1.12	.93	3.58	1.69	8.5	2856	957
5 bars	100	DPL–Fox 4	70.1	34.1	1.07	.90	4.10	1.75	7.5	3049	1040
5 bars	100	Empire	63.8	34.0	1.16	1.00	3.73	1.71	7.6	2880	979
5 bars	100	Pope	66.7	36.0	1.04	.87	3.60	1.67	6.3	2977	1072
5 bars	100	DPL–SL	81.1	35.7	1.09	.92	3.65	1.74	9.5	3364	1201
5 bars	100	Coker 100A	63.8	36.2	1.11	.92	4.05	1.58	7.6	2928	1060
5 bars	100	DPL–15	77.7	36.8	1.11	.93	3.65	1.65	9.3	2880	1060
5 bars	100	Dixie King	55.1	34.9	1.10	.91	4.05	1.58	6.6	2977	1039
5 bars	100	Auburn 56	69.4	34.3	1.10	.93	3.78	1.59	8.1	3219	1104
		Variety mean	67.3	35.1	1.10	.92	3.80	1.66	7.9	3014	1057

Table 16. Continued–

Irrig. Level	N Level	Variety	Bolls per lb.	Percent lint	Lint length		Micron. Equiv.	Strength		Yield in lb./acre	
					UHM	Mean		T_1	E_1	Seed Cotton	Lint
5 bars	200	Cobal	54.9	33.7	1.16	.98	3.68	1.80	7.7	2807	946
5 bars	200	DPL–Fox 4	73.5	34.8	1.12	.95	4.08	1.72	8.3	3073	1069
5 bars	200	Empire	63.8	34.5	1.11	.94	3.68	1.59	7.0	3122	1077
5 bars	200	Pope	68.2	37.3	1.07	.90	3.75	1.71	6.7	2783	1038
5 bars	200	DPL–SL	81.5	36.4	1.06	.88	3.85	1.71	9.1	3098	1128
5 bars	200	Coker 100A	66.1	34.8	1.15	.95	3.90	1.65	8.3	3170	1103
5 bars	200	DPL–15	79.4	36.5	1.09	.90	3.65	1.87	9.1	3122	1140
5 bars	200	Dixie King	56.4	35.0	1.09	.91	3.75	1.68	6.5	2904	1016
5 bars	200	Auburn 56	67.0	33.5	1.08	.92	3.60	1.71	8.4	3509	1176
		Variety mean	67.9	35.2	1.10	.93	3.77	1.72	7.9	3065	1077
2 bars	100	Cobal	54.9	33.7	1.16	1.00	3.73	1.80	7.7	2735	922
2 bars	100	DPL–Fox 4	70.1	35.0	1.11	.97	4.08	1.88	7.8	3146	1101
2 bars	100	Empire	62.0	32.6	1.15	.96	3.65	1.68	7.8	3098	1010
2 bars	100	Pope	66.1	35.2	1.07	.89	3.53	1.84	6.4	3025	1065
2 bars	100	DPL–SL	79.4	35.4	1.12	.93	3.60	1.54	9.3	3461	1225
2 bars	100	Coker 100A	64.9	32.0	1.12	.91	3.95	1.67	7.8	3340	1069
2 bars	100	DPL–15	78.5	34.6	1.11	.93	3.28	1.63	9.2	3291	1139
2 bars	100	Dixie King	54.2	34.3	1.14	.96	3.78	1.64	7.2	3098	1063
2 bars	100	Auburn 56	65.8	32.9	1.08	.93	3.93	1.62	8.6	3557	1170
		Variety mean	66.2	34.0	1.12	.94	3.73	1.70	8.0	3195	1085
2 bars	200	Cobal	54.7	33.2	1.17	.98	3.75	1.82	8.1	2831	940
2 bars	200	DPL–Fox 4	72.1	33.7	1.14	.97	4.03	1.74	8.5	3485	1174
2 bars	200	Empire	63.0	32.8	1.14	.96	3.50	1.75	7.5	3170	1040
2 bars	200	Pope	69.8	35.3	1.05	.88	3.40	1.71	6.6	3073	1085
2 bars	200	DPL–SL	78.1	34.9	1.18	1.00	3.53	1.88	9.6	3630	1267
2 bars	200	Coker 100A	67.0	32.1	1.15	.95	3.63	1.57	8.6	3436	1103
2 bars	200	DPL–15	75.4	34.7	1.14	.96	3.60	1.77	9.1	3267	1134
2 bars	200	Dixie King	54.9	33.3	1.16	.97	3.80	1.46	7.5	3340	1112
2 bars	200	Auburn 56	66.4	32.3	1.10	.93	3.68	1.75	7.7	3509	1133
		Variety mean	66.8	33.6	1.14	.96	3.66	1.72	8.1	3305	1110

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 17. Boll size, percent lint and fiber* characteristics, and yield summary of cotton varieties produced with nitrogen and irrigation treatments on a Memphis soil in 1961

Irrig. Level	N Level	Variety	Bolls per lb.	Percent lint	Lint length		Micron. Equiv.	Strength		Yield in lb./acre	
					UHM	Mean		T_1	E_1	Seed Cotton	Lint
0	100	Cobal	62.0	36.4	1.17	1.00	3.83	1.93	8.0	2904	1057
0	100	DPL–Fox 4	68.2	35.9	1.16	.97	4.52	1.94	7.8	2662	956
0	100	Empire	52.6	36.1	1.13	.92	3.88	1.83	7.2	3194	1153
0	100	Pope	66.1	37.4	1.06	.91	4.33	1.93	6.8	3098	1159
0	100	DPL–SL	74.6	38.3	1.17	.99	4.35	1.95	9.4	3098	1187
0	100	Coker 100A	67.0	36.2	1.20	1.04	4.15	1.72	6.9	2952	1069
0	100	DPL–15	76.9	36.4	1.18	1.01	4.00	1.93	8.9	2904	1057
0	100	Dixie King	53.2	35.8	1.13	.92	4.10	1.93	6.8	3146	1126
0	100	Auburn 56	67.3	35.9	1.14	.96	4.20	1.83	7.4	3461	1242
		Variety mean	65.3	36.5	1.15	.97	4.15	1.89	7.7	3047	1112
0	200	Cobal	59.5	36.9	1.18	1.02	3.95	2.01	7.8	2928	1080
0	200	DPL–Fox 4	67.0	36.2	1.14	.98	4.80	1.93	7.5	2735	990
0	200	Empire	52.1	36.1	1.13	.91	4.00	1.83	7.1	3146	1136
0	200	Pope	69.1	39.2	1.04	.85	4.18	1.92	6.2	3025	1186
0	200	DPL–SL	73.9	38.4	1.17	.99	4.63	1.89	9.8	2952	1134
0	200	Coker 100A	64.9	38.5	1.16	.96	4.48	1.77	6.8	2904	1118
0	200	DPL–15	76.5	37.8	1.12	.94	4.30	1.92	7.9	2977	1125
0	200	Dixie King	52.6	36.5	1.12	.93	4.37	1.89	6.1	3001	1095
0	200	Auburn 56	65.5	35.8	1.11	.95	4.32	1.83	8.3	3315	1187
		Variety mean	64.6	37.3	1.13	.95	4.34	1.89	7.5	2998	1117
5 bars	100	Cobal	58.8	34.9	1.19	.98	3.93	1.93	6.8	2928	1022
5 bars	100	DPL–Fox 4	71.1	34.6	1.17	1.01	4.20	2.00	7.6	2420	837
5 bars	100	Empire	56.0	35.1	1.13	.90	3.68	1.84	6.2	2614	918
5 bars	100	Pope	68.8	37.2	1.08	.88	3.88	1.98	6.8	2928	1089
5 bars	100	DPL–SL	76.1	37.6	1.19	1.02	4.23	1.97	9.0	2880	1083
5 bars	100	Coker 100A	62.0	37.2	1.18	1.00	4.58	1.79	8.0	3122	1161
5 bars	100	DPL–15	75.4	37.7	1.14	.95	4.18	1.77	7.9	2783	1049
5 bars	100	Dixie King	53.0	35.7	1.15	.96	4.22	1.78	7.1	2807	1002
5 bars	100	Auburn 56	66.7	35.6	1.14	.97	4.08	1.80	7.5	3170	1129
		Variety mean	65.3	36.2	1.15	.96	4.11	1.87	7.4	2850	1032

Table 17. Continued—

Irrig. Level	N Level	Variety	Bolls per lb.	Percent lint	Lint length UHM	Lint length Mean	Micron. Equiv.	Strength T_1	Strength E_1	Yield in lb./acre Seed Cotton	Yield in lb./acre Lint
5 bars	200	Cobal	57.7	35.4	1.19	.99	3.95	1.97	8.7	3049	1079
5 bars	200	DPL—Fox 4	70.1	35.0	1.16	1.00	4.35	1.87	7.1	2710	949
5 bars	200	Empire	54.3	35.9	1.10	.91	3.63	1.84	7.0	3194	1147
5 bars	200	Pope	69.4	38.0	1.05	.86	4.23	1.86	6.2	2977	1131
5 bars	200	DPL—SL	75.4	37.2	1.17	1.02	4.35	1.87	9.6	3049	1134
5 bars	200	Coker 100A	65.8	36.8	1.21	1.04	4.28	1.70	7.4	2807	1033
5 bars	200	DPL—15	76.5	37.2	1.13	.94	4.18	1.95	9.2	2759	1026
5 bars	200	Dixie King	54.3	36.2	1.13	.95	4.33	1.82	6.9	2880	1043
5 bars	200	Auburn 56	68.2	35.0	1.13	.94	4.05	1.89	8.4	3122	1093
		Variety mean	65.7	36.3	1.14	.96	4.15	1.86	7.8	2950	1071
2 bars	100	Cobal	57.9	35.5	1.20	.99	3.93	1.84	8.5	2614	928
2 bars	100	DPL—Fox 4	71.1	35.1	1.16	1.01	4.38	1.81	8.5	2783	977
2 bars	100	Empire	54.5	35.6	1.14	.98	3.83	1.76	6.4	2952	1051
2 bars	100	Pope	69.8	37.7	1.06	.85	4.20	1.95	7.1	2662	1004
2 bars	100	DPL—SL	72.5	36.7	1.18	1.01	4.35	1.80	8.7	2662	977
2 bars	100	Coker 100A	65.5	37.6	1.15	.95	4.30	1.78	8.1	2759	1037
2 bars	100	DPL—15	76.9	36.4	1.16	.99	3.98	1.79	8.6	2807	1022
2 bars	100	Dixie King	54.2	36.8	1.14	.97	4.08	1.72	7.5	2710	997
2 bars	100	Auburn 56	69.8	35.3	1.14	.97	4.03	1.69	7.6	3122	1102
		Variety mean	65.8	36.3	1.15	.97	4.12	1.79	7.9	2786	1011
2 bars	200	Cobal	59.1	35.0	1.25	1.05	3.85	1.82	8.5	2299	805
2 bars	200	DPL—Fox 4	69.8	34.4	1.14	.99	4.40	1.89	7.3	2565	882
2 bars	200	Empire	54.7	35.0	1.17	.98	3.60	1.86	7.3	2759	966
2 bars	200	Pope	70.1	37.4	1.04	.82	4.02	1.83	6.0	2541	950
2 bars	200	DPL—SL	77.3	36.6	1.16	1.01	4.15	1.92	9.5	2856	1045
2 bars	200	Coker 100A	65.8	36.4	1.20	1.03	4.15	1.66	7.3	2275	828
2 bars	200	DPL—15	79.4	36.0	1.15	.98	3.70	1.89	9.5	2420	871
2 bars	200	Dixie King	55.4	36.9	1.15	.98	4.15	1.82	6.9	2493	920
2 bars	200	Auburn 56	65.8	35.5	1.14	.97	4.28	1.84	8.8	2928	1039
		Variety mean	66.4	35.9	1.16	.98	4.03	1.84	7.9	2571	923

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 18. Boll size, percent lint and fiber* characteristics, and yield summary of cotton varieties produced with nitrogen and irrigation treatments on a Memphis soil in 1962

Irrig. Level	N Level	Variety	Bolls per lb.	Percent lint	Lint length UHM	Lint length Mean	Micron. Equiv.	Strength T_1	Strength E_1	Yield in lb./acre Seed Cotton	Yield in lb./acre Lint
0	100	Cobal	67.3	35.9	1.06	.82	3.83	1.83	6.0	2081	747
0	100	DPL–Fox 4	74.6	36.8	.99	.79	4.85	1.65	8.6	1984	730
0	100	Empire	61.2	38.8	.99	.77	4.30	1.68	5.2	2033	789
0	100	Pope	81.1	38.4	.96	.75	3.63	1.49	7.5	1912	734
0	100	DPL–SL	83.3	38.3	1.06	.89	4.22	1.92	8.5	1888	723
0	100	Coker 100A	75.8	37.4	1.09	.88	4.13	1.65	8.3	1984	742
0	100	DPL–15	86.2	39.1	1.01	.83	4.45	1.85	8.0	1670	653
0	100	Dixie King	60.5	37.9	1.02	.81	4.43	1.49	7.6	1984	752
0	100	Auburn 56	75.8	36.4	1.00	.82	4.33	1.71	7.2	2202	802
		Variety mean	74.0	37.7	1.02	.82	4.24	1.70	7.4	1971	741
0	200	Cobal	66.4	37.2	1.02	.79	4.10	1.70	7.7	1839	684
0	200	DPL–Fox 4	79.4	36.5	.99	.79	4.88	1.86	7.6	1984	724
0	200	Empire	60.0	38.8	.98	.76	4.17	1.67	7.6	2057	798
0	200	Pope	83.3	38.9	.90	.68	3.85	1.52	5.1	1912	744
0	200	DPL–SL	85.7	38.3	1.01	.79	4.43	1.81	8.7	1839	704
0	200	Coker 100A	75.8	37.4	1.00	.78	4.28	1.65	6.4	1863	697
0	200	DPL–15	85.2	38.6	1.01	.83	4.50	1.65	8.8	1767	682
0	200	Dixie King	57.5	37.9	1.03	.84	4.40	1.74	5.5	2105	798
0	200	Auburn 56	74.3	35.6	1.03	.82	4.23	1.69	8.7	2178	775
		Variety mean	74.2	37.7	1.00	.79	4.32	1.70	7.3	1949	734
5 bars	100	Cobal	59.3	36.8	1.12	.91	4.18	1.92	6.7	3001	1104
5 bars	100	DPL–Fox 4	67.9	35.3	1.12	.93	4.90	2.00	8.8	3630	1281
5 bars	100	Empire	53.8	37.6	1.08	.86	4.23	1.85	5.7	3122	1174
5 bars	100	Pope	68.5	38.4	1.05	.79	4.01	1.64	7.1	2831	1087
5 bars	100	DPL–SL	72.1	37.5	1.13	.91	4.78	1.89	8.1	3098	1162
5 bars	100	Coker 100A	68.2	37.7	1.12	.91	4.72	1.69	8.0	3049	1149
5 bars	100	DPL–15	72.8	38.3	1.07	.87	4.45	1.82	7.6	2904	1112
5 bars	100	Dixie King	52.4	36.7	1.11	.89	4.23	1.64	7.5	3775	1385
5 bars	100	Auburn 56	66.1	35.7	1.11	.90	4.32	1.82	7.1	3727	1331
		Variety mean	64.6	37.1	1.10	.89	4.42	1.81	7.4	3237	1198

Table 18. Continued–

Irrig. Level	N. Level	Variety	Bolls per lb.	Percent lint	Lint length		Micron. Equiv.	Strength		Yield in lb./acre	
					UHM	Mean		T_1	E_1	Seed Cotton	Lint
5 bars	200	Cobal	56.6	35.8	1.15	.92	4.35	1.88	8.2	3096	1109
5 bars	200	DPL–Fox 4	67.3	36.3	1.11	.93	4.83	1.97	7.0	3436	1247
5 bars	200	Empire	53.8	37.3	1.10	.84	4.13	1.83	7.6	3243	1210
5 bars	200	Pope	70.1	38.3	1.00	.76	4.15	1.70	5.4	2880	1103
5 bars	200	DPL–SL	72.1	38.0	1.12	.91	4.95	1.99	8.8	3219	1223
5 bars	200	Coker 100A	63.8	37.0	1.13	.90	4.75	1.88	7.1	3267	1209
5 bars	200	DPL–15	69.8	37.2	1.12	.96	4.38	1.96	8.9	2880	1071
5 bars	200	Dixie King	52.8	37.0	1.11	.91	4.48	1.80	5.9	3073	1137
5 bars	200	Auburn 56	68.2	35.0	1.11	.89	4.23	1.84	8.6	3436	1203
		Variety mean	63.8	36.9	1.11	.89	4.47	1.87	7.5	3170	1168
2 bars	100	Cobal	55.6	35.2	1.17	.93	4.13	1.80	6.8	3703	1303
2 bars	100	DPL–Fox 4	67.3	35.4	1.13	.96	5.08	1.94	8.7	3969	1405
2 bars	100	Empire	52.3	35.2	1.13	.90	3.85	1.68	6.6	3678	1295
2 bars	100	Pope	67.0	36.6	1.05	.83	3.95	1.78	7.3	3315	1213
2 bars	100	DPL–SL	69.1	35.9	1.16	.94	4.60	1.86	8.5	3872	1390
2 bars	100	Coker 100A	65.2	35.7	1.17	.96	4.42	1.78	8.6	3775	1348
2 bars	100	DPL–15	72.8	38.3	1.07	.89	4.45	1.88	7.3	3315	1270
2 bars	100	Dixie King	52.4	36.4	1.10	.90	4.55	1.67	7.6	3848	1401
2 bars	100	Auburn 56	55.1	34.3	1.09	.87	4.38	1.61	7.3	3969	1361
		Variety mean	61.9	35.9	1.12	.91	4.38	1.78	7.6	3716	1332
2 bars	200	Cobal	54.2	35.4	1.18	.97	4.43	1.80	8.5	3582	1268
2 bars	200	DPL–Fox 4	67.9	34.8	1.13	.94	5.05	1.91	6.9	4114	1432
2 bars	200	Empire	53.4	34.9	1.11	.89	3.88	1.69	7.2	3775	1317
2 bars	200	Pope	67.6	36.9	1.03	.85	4.33	1.77	6.0	3315	1223
2 bars	200	DPL–SL	73.2	36.6	1.14	.92	4.43	1.83	9.9	3969	1453
2 bars	200	Coker 100A	63.0	35.7	1.13	.89	4.50	1.62	7.8	3557	1270
2 bars	200	DPL–15	75.0	37.5	1.11	.91	4.28	1.77	9.4	3848	1443
2 bars	200	Dixie King	49.5	35.3	1.09	.84	4.45	1.49	6.6	4090	1444
2 bars	200	Auburn 56	65.2	34.3	1.13	.93	4.45	1.63	8.2	4017	1378
		Variety mean	63.2	35.7	1.12	.90	4.42	1.72	7.8	3807	1359

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

Table 19. Boll size, percent lint and fiber* characteristics, and yield summary of cotton varieties produced with nitrogen and irrigation treatments on a Memphis soil in 1963

Irrig. Level	N. Level	Variety	Bolls per lb.	Percent lint	Lint length		Micron. Equiv.	Strength		Yield in lb./acre	
					UHM	Mean		T_1	E_1	Seed Cotton	Lint
0	100	Cobal	71.1	39.8	1.06	.87	4.28	1.78	7.5	2347	934
0	100	DPL–Fox 4	73.9	39.9	1.05	.92	5.25	1.95	7.0	2589	1033
0	100	Empire	63.3	40.9	1.00	.83	4.43	1.71	6.4	2396	980
0	100	Pope	75.0	41.5	.95	.79	4.15	1.81	6.0	2517	1045
0	100	DPL–SL	80.6	41.4	.99	.83	5.13	1.79	9.0	2662	1102
0	100	Coker 100A	76.9	40.5	1.04	.87	4.73	1.72	7.0	2275	921
0	100	DPL–15	82.4	41.8	.98	.84	4.75	1.85	8.2	2033	850
0	100	Dixie King	62.8	39.7	1.00	.84	4.48	1.70	6.3	2372	942
0	100	Auburn 56	72.1	38.9	1.05	.90	4.38	1.72	7.8	2735	1064
		Variety mean	73.1	40.5	1.01	.85	4.62	1.78	7.2	2436	986
0	200	Cobal	72.1	39.4	1.02	.81	4.25	1.81	7.1	2226	877
0	200	DPL–Fox 4	78.5	39.3	.98	.83	5.20	1.85	7.3	2275	894
0	200	Empire	62.8	40.6	1.02	.83	4.15	1.69	6.4	2372	963
0	200	Pope	78.1	40.1	.88	.68	4.33	1.56	6.0	2396	961
0	200	DPL–SL	79.4	40.7	1.02	.88	4.95	1.85	8.5	2057	837
0	200	Coker 100A	75.8	39.4	.97	.80	4.95	1.73	7.2	2105	829
0	200	DPL–15	80.2	43.9	.98	.82	5.03	1.76	8.5	1984	871
0	200	Dixie King	64.7	39.2	.95	.78	4.63	1.60	6.0	2202	863
0	200	Auburn 56	78.1	39.1	.96	.80	4.43	1.70	7.5	2323	908
		Variety mean	74.4	40.2	.98	.80	4.66	1.73	7.2	2216	889
5 bars	100	Cobal	60.7	37.2	1.14	.92	4.08	1.91	7.7	3703	1378
5 bars	100	DPL–Fox 4	66.1	36.6	1.13	.96	4.97	1.81	7.7	3436	1258
5 bars	100	Empire	54.2	38.6	1.11	.93	4.03	1.85	6.8	3388	1308
5 bars	100	Pope	67.0	38.8	1.04	.85	4.40	1.84	6.1	3291	1277
5 bars	100	DPL–SL	72.8	38.8	1.14	.95	4.60	1.94	8.9	3122	1211
5 bars	100	Coker 100A	68.5	38.8	1.15	.96	4.63	1.75	7.1	3412	1324
5 bars	100	DPL–15	73.9	40.4	1.12	.96	4.35	1.90	9.3	3001	1212
5 bars	100	Dixie King	56.0	36.9	1.10	.92	4.58	1.76	6.6	3340	1232
5 bars	100	Auburn 56	68.8	35.8	1.10	.91	4.50	1.85	7.5	3606	1291
		Variety mean	65.3	38.0	1.11	.93	4.46	1.85	7.5	3367	1277

Table 19. Continued–

Irrig. Level	N. Level	Variety	Bolls per lb.	Percent lint	Lint length		Micron. Equiv.	Strength		Yield in lb./acre	
					UHM	Mean		T_1	E_1	Seed Cotton	Lint
5 bars	200	Cobal	58.8	37.6	1.17	.99	4.20	1.79	7.9	3824	1438
5 bars	200	DPL–Fox 4	67.9	37.6	1.12	.96	4.78	1.94	7.8	3727	1401
5 bars	200	Empire	56.4	38.3	1.11	.92	4.03	1.73	7.1	3122	1196
5 bars	200	Pope	68.2	39.1	1.00	.81	4.40	1.81	6.2	3509	1372
5 bars	200	DPL–SL	72.1	38.9	1.10	.91	4.53	1.91	9.6	3243	1262
5 bars	200	Coker 100A	66.7	38.7	1.14	.83	4.63	1.87	8.0	3509	1358
5 bars	200	DPL–15	78.5	39.8	1.13	.93	4.30	1.82	9.3	3073	1223
5 bars	200	Dixie King	57.9	37.5	1.10	.92	4.65	1.79	7.0	3606	1352
5 bars	200	Auburn 56	64.4	36.1	1.11	.96	4.43	1.78	7.9	3775	1363
		Variety mean	65.7	38.2	1.11	.91	4.44	1.83	7.9	3489	1329
2 bars	100	Cobal	58.6	35.2	1.18	.98	3.95	1.79	8.5	3630	1278
2 bars	100	DPL–Fox 4	71.8	35.9	1.16	1.02	4.58	1.76	8.0	3557	1277
2 bars	100	Empire	53.6	36.1	1.12	.96	4.15	1.69	7.6	3848	1389
2 bars	100	Pope	67.9	37.6	1.10	.92	4.23	1.85	6.4	3461	1301
2 bars	100	DPL–SL	72.8	36.9	1.16	.96	4.38	1.96	10.0	3315	1223
2 bars	100	Coker 100A	67.3	38.1	1.20	1.02	4.38	1.79	7.3	3436	1309
2 bars	100	DPL–15	72.5	38.2	1.14	.91	4.00	1.82	8.9	3098	1183
2 bars	100	Dixie King	54.0	37.8	1.16	1.00	4.28	1.73	6.8	3896	1473
2 bars	100	Auburn 56	62.0	35.5	1.16	.96	4.08	1.66	8.4	3969	1409
		Variety mean	64.5	36.8	1.15	.97	4.23	1.78	8.0	3579	1316
2 bars	200	Cobal	56.6	34.7	1.16	.97	4.08	1.88	8.2	3993	1386
2 bars	200	DPL–Fox 4	68.2	35.0	1.13	.99	4.45	2.00	7.5	3654	1279
2 bars	200	Empire	54.0	34.5	1.15	.96	3.95	1.73	7.3	3509	1211
2 bars	200	Pope	64.9	36.4	1.10	.94	3.98	1.90	6.8	3606	1313
2 bars	200	DPL–SL	75.0	36.5	1.15	.97	4.10	1.85	11.0	3025	1104
2 bars	200	Coker 100A	69.1	36.9	1.19	1.03	4.25	1.81	8.0	3533	1304
2 bars	200	DPL–15	73.2	36.6	1.16	1.03	4.03	1.86	10.0	3073	1125
2 bars	200	Dixie King	53.4	35.2	1.14	.94	4.25	1.82	7.2	3824	1346
2 bars	200	Auburn 56	64.7	36.2	1.13	.94	4.43	1.73	8.7	4162	1507
		Variety mean	64.3	35.8	1.15	.97	4.17	1.84	8.3	3598	1286

*Fiber data by USDA Regional Cotton Research Laboratory, Knoxville.

The strength (T_1) was increased in DPL-Fox 4 and Pope but not changed greatly in the other varieties by irrigation.

SUMMARY AND CONCLUSIONS

Nineteen experiments were conducted over a 13-year period on a Memphis soil at the West Tennessee Experiment Station evaluating the effects of irrigation levels, nitrogen rates on yield, and fiber properties of many cotton varieties. One year did not require irrigation; seven experiments produced a significant response to irrigation. In five experiments, irrigation decreased yields and in 2 of the years, the yield reduction was significant. In nine experiments, irrigation had no significant effects upon yields even though nine of the experiments occurred during years of below-average rainfall. Cotton was more responsive to the more moderate but consistent moisture regime of the 2-bar irrigation treatment than to the 4- and 9-bar treatment.

Irrigation generally increased boll size, decreased the percent lint, and its influence on the fiber characteristics varied with different varieties and years.

Nitrogen levels had no great effect on cotton yields or fiber characteristics even though in some years of high irrigation, response indicated that nitrogen levels above 50 pounds of nitrogen per acre might be desirable.

Cotton varieties differed in their yield response to irrigation as well as to the effect of irrigation on boll size, percent lint, and lint characteristics.

Irrigation generally delayed maturity and picking time, increased insect control problems, and in some cases contributed to lodging. Cotton production with irrigation required a higher level of overall management than unirrigated cotton.

THE UNIVERSITY OF TENNESSEE
AGRICULTURAL EXPERIMENT STATION
KNOXVILLE, TENNESSEE 37901

STATION OFFICERS

Administration

Edward J. Boling, President
Webster Pendergrass, Vice President for Agriculture
B. H. Pentecost, Assistant Vice President
D. M. Gossett, Dean
T. J. Whatley, Associate Dean
J. I. Sewell, Assistant Dean
O. Clinton Shelby, Director of Business Affairs
G. W. F. Cavender, Director, Office of Communications

Department Heads

C. J. Southards, Agricultural Biology
J. A. Martin, Agricultural Economics and Rural Sociology
D. H. Luttrell, Agricultural Engineering
R. R. Johnson, Animal Science
Judith L. Kuipers, Child and Family Studies
Roy E. Beauchene, Food Science, Nutrition, and Food Systems Administration
J. T. Miles, Food Technology and Science
Gerhardt Schneider, Forestry
D. B. Williams, Ornamental Horticulture and Landscape Design
L. F. Seatz, Plant and Soil Science
Anna J. Treece, Textiles and Clothing

Agricultural Research Units

Main Station, Knoxville, John Hodges III, Superintendent of Farms
University of Tennessee Comparative Animal Research Laboratory, Oak Ridge, H. E. Walburg, Laboratory Director
The University of Tennessee at Martin, Martin, Harold J. Smith, Dean, School of Agriculture.

Branch Stations

Dairy Experiment Station, Lewisburg, J. R. Owen, Superintendent
Highland Rim Experiment Station, Springfield, L. M. Safley, Superintendent
Middle Tennessee Experiment Station, Spring Hill, J. W. High, Jr., Superintendent
Plateau Experiment Station, Crossville, R. D. Freeland, Superintendent
Tobacco Experiment Station, Greeneville, Donald D. Howard, Superintendent
West Tennessee Experiment Station, Jackson, James F. Brown, Superintendent

Field Stations

Ames Plantation, Grand Junction, James M. Bryan, Superintendent
Forestry Field Stations at Tullahoma, Wartburg, and Oak Ridge, Richard M. Evans, Superintendent
Milan Field Station, Milan, T. C. McCutchen, Superintendent

(1.8M/10-78)