

**A 28-YEAR STUDY OF COTTON RESPONSE  
TO IRRIGATION IN NORTHWEST LOUISIANA**  
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**Abstract**

Although Louisiana is usually thought of as a state that receives above normal rainfall, certain parts of the state can be very dry during the agriculturally critical summer months. This is especially true of the northwest part of Louisiana where 20% of the cotton is grown. One major limitation to cotton productivity in this area is water. Forty-four-year average rainfall (1956-1999) for the critical months of June, July and August recorded at the Red River Research Station in Bossier City, Louisiana was 4.5, 3.7, and 2.8 inches, respectively. In 1956, a long-term irrigation study was initiated at the station to determine whether or not yield improvements in cotton with irrigation would be consistent enough to justify the expense of establishing an irrigation system. This study was conducted from 1956 until 1983. During the 28 years of this study, irrigation response ranged from an increase of 2087 pounds of seedcotton in 1956 to a loss of 295 pounds of seedcotton in 1983. However, the average significant increase of 347 pounds of seedcotton per acre over the 28-year period of this study and the fact that irrigation increased yields 18 of the 28 years indicates that, more often than not, irrigation would be beneficial in Northwest Louisiana.

**Introduction**

Louisiana is usually thought of as a state that receives above normal rainfall with little or no need for irrigation of agricultural crops. However, certain parts of the state can be very dry during the critical summer months. This is especially true of the northwest part of Louisiana where 20% of the cotton in the state is grown. One major limitation to cotton productivity in this area is water. Forty-four-year average rainfall (1956-1999) for the critical months of June, July and August recorded at the Red River Research Station was 4.5, 3.7, and 2.8 inches, respectively. It has been estimated, however, that 18, 28, and 39 inches of water are required to produce 1, 1.52 and 3.04 bales of cotton per acre, respectively (Waddle, 1984). From this data, it would appear that water availability is a major limiting factor to cotton production in Northwest Louisiana.

In 1956, the late David Melville initiated a long-term irrigation study at the station to determine whether or not yield improvements in cotton with irrigation would be

consistent enough to justify the expense of establishing an irrigation system. This study was conducted from 1956 until David's death in 1983.

**Materials and Methods**

This study was conducted at the Louisiana Agricultural Experiment Station's Red River Research Station in Bossier City, Louisiana, for 28 years. The soil type was a Norwood (Caplis) very fine sandy loam. Irrigation was scheduled when soil moisture approached 50% of field capacity as determined using gypsum blocks and oven-dried soil samples. Each time this occurred, approximately two inches of water was supplied using furrow irrigation.

Plots for this study consisted of eight 40'-rows 100 feet long. Cotton was usually planted the last week in April. The cotton variety planted varied from year to year, but was always a variety recommended for Louisiana. The four varieties most often used included Stardel, DPL-45, DPL-16, DPL-61, and DPL-55. Plots were harvested with a spindle picker. In some years a second harvest was conducted.

**Results and Discussion**

The average rainfall at the Red River Research Station for the months of June, July, and August during the 28 years of this study was 4.0, 3.7, and 2.6 inches, respectively, totaling 10.3 inches (Table 1) Under these conditions, non-irrigated cotton produced an average of 2,279 pounds of seedcotton per acre (Table 2). Using 50% field capacity as the criteria for furrow irrigating with 2 inches of water required an average of 2 irrigations each year during the 28-year period (Table 1). Supplementing the average 10.3 inches of June, July, and August rainfall with an average of 4 inches of irrigation increased seedcotton yield significantly by 347 pounds (Table 2).

During the 28 years of this study, irrigation response ranged from an increase of 2087 pounds of seedcotton in 1956 to a loss of 295 pounds of seedcotton in 1983. However, the average significant increase of 347 pounds of seedcotton per acre over the 28-year period of this study and the fact that irrigation increased yields 18 of the 28 years indicates that, more often than not, irrigation is beneficial in northwest Louisiana.

**References**

Waddle, B. A. 1984. Crop Growing Practices. In R. J. Kohel and C. F. Lewis (eds.) Cotton. American Society of Agronomy, Inc., Crop Science Society of America, Inc. and Soil Science Society of America, Inc. Madison, WI.

Table 1. The number of 2-inch irrigation events and total rainfall in June, July, and August during each year of the 28-year irrigation study

Year	Number of Irrigations	Rainfall (Inches)			Total
		June	July	August	
1956	4	2.80	0.94	0.84	4.58
1957	3	7.01	2.68	0.37	10.06
1958	2	11.22	2.39	3.70	17.31
1959	1	6.23	1.92	2.37	10.52
1960	2	6.47	1.20	1.87	9.54
1961	0	9.98	5.13	2.76	17.87
1962	3	3.67	0.76	3.26	7.69
1963	3	1.19	4.81	1.28	7.28
1964	3	2.25	1.44	6.92	10.61
1965	2	3.91	0.44	1.06	5.41
1966	1	1.08	2.52	5.61	9.21
1967	1	1.64	7.52	2.08	11.24
1968	0	2.69	5.31	4.16	12.16
1969	4	0.79	0.53	0.98	2.30
1970	1	3.06	2.33	4.11	9.50
1971	1	0.42	5.30	4.78	10.50
1972	0	1.20	10.18	3.35	14.73
1973	0	5.73	7.91	1.69	15.33
1974	2	5.07	4.66	3.55	13.28
1975	1	5.00	3.81	0.88	9.69
1976	2	5.91	5.77	1.90	13.58
1977	3	3.00	2.74	4.18	9.92
1978	1	1.41	3.87	3.34	8.62
1979	2	2.81	9.77	0.96	13.54
1980	3	4.02	1.43	0.56	6.01
1981	2	5.82	2.63	2.87	11.32
1982	3	2.60	2.96	1.96	7.52
1983	2	4.91	1.26	1.66	7.83
28-Yr Avg	2	4.00	3.65	2.61	10.26

Table 2. Irrigated and non-irrigated cotton yield and the difference between the two for each year of the 28-year study.

Year	Seed cotton yield (lbs/A)		
	Irrigated	Non-Irrigated	Difference
1956	3116	1029	2087
1957	2205	1689	516
1958	3137	2922	215
1959	4043	3434	609
1960	3920	3401	519
1961	2238	2238	0
1962	2134	1623	511
1963	3430	2627	803
1964	1984	1716	268
1965	2457	2102	355
1966	2188	2261	-73
1967	2665	2481	184
1968	2386	2386	0
1969	2481	1901	580
1970	1766	1582	184
1971	1721	1741	-20
1972	2979	2979	0
1973	1758	1758	0
1974	1461	1582	-121
1975	2011	1846	165
1976	2647	1912	735
1977	2860	2908	-48
1978	2925	3056	-131
1979	3447	3268	179
1980	2998	1824	1174
1981	2362	1637	725
1982	3609	3018	591
1983	2596	2891	-295
28-Yr Avg	2626	2279	347

\*Significant difference ( $\alpha=0.05$ ), by paired T-test.