

THE 1999 COTTON RESEARCH VERIFICATION PROGRAM (CRVP): COMPARISON OF IRRIGATION SYSTEMS

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RESEARCH PROBLEM

The Cooperative Extension Service, University of Arkansas, has been demonstrating research-based recommendations through a whole-field Cotton Research Verification Program (CRVP) concept since 1980 (e.g., Plunkett *et al.*, 1999). The program entered its 20th anniversary year during 1999. Production recommendations are made from a multidisciplinary committee each year, then carried to and adapted for a specific field situation.

BACKGROUND INFORMATION

Yield variability is a yearly concern for Arkansas cotton growers. In 1999, yields were affected by a severe drought during the growing season (Oosterhuis, 1999). The drought was followed by a wet spring with moderate temperatures which allowed, for the most part, fast emergence, rapid growth, and heavy fruiting of all enrolled fields in the CRVP demonstrations (Plunkett *et al.*, 1999). During July of 1999, the weather changed to a hot, dry climate with low humidity and infrequent rainfall. The purpose of this paper is to evaluate the irrigation methods used in the CRVP fields versus the non-irrigated field situations.

RESEARCH DESCRIPTION

There were 10 fields enrolled in the 1999 CRVP, with eight having irrigation available and two being non-irrigated. Of the eight fields with irrigation, four were furrow-irrigated and four had center pivot irrigation. The center pivot fields were further broken into categories of center pivot-windshield wipe and center pivot-towable. Planting dates in the 1999 CRVP fields ranged from 3 May to 15 May. Only three fields were planted in the optimum planting date window from 1 May to 10 May due to rainfall occurrence the first week of May. Seven fields were planted from 11 May to 15 May.

The Irrigation Scheduling Program was used as a tool to aid in determining when irrigation was needed for each irrigated field. Rainfall amounts during a particular month do not adequately reflect the time rainfall occurred (Table 1) and the need for irrigation for a particular field; fields were irrigated near the deficit level indicated by the Irrigation Scheduling Program as much as possible. The towable center pivot systems proved

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somewhat inadequate in getting back to the CRVP field in a timely fashion, especially in the St. Francis County field.

Yields were significantly higher in the furrow-irrigated fields than the center pivot-irrigated fields (Table 2).

PRACTICAL APPLICATION

Data from the 1999 CRVP fields suggest that furrow-irrigated fields can produce higher yields than center pivot-windshield wipe and center pivot-towable systems during years with heavy fruiting in early season in which a hot, dry summer occurs. Research suggests that heavily fruited cotton plants in early season are susceptible to fruit shed during the bloom and boll development period when water becomes a limiting factor. Delays in providing irrigation or getting needed rainfall can cause fruit shed during the critical late squaring period, as well as the bloom and boll development period. More research is needed to determine how to best utilize center pivot-windshield wipe and center pivot-towable systems during years where droughts occur.

LITERATURE CITED

- Oosterhuis, D.M. 1999. Yield response to environmental extremes in cotton. *In:* D.M. Oosterhuis (ed.). Proc. 1999 Cotton Research Meeting and Summaries of Research in Progress. University of Arkansas Agricultural Experiment Station Special Report 193:30-38.
- Plunkett, D.E., W.C. Robertson, and K.J. Bryant. 1999. Annual Report, Cotton Research Verification Program. University of Arkansas Cooperative Extension Service, Little Rock, AR.

Table 1. Rainfall totals and irrigation frequencies prior to harvest.

	MAY	JUN	JUL	AUG	SEP	OCT
Crittenden						
Rainfall	1.1	2.1	3.0	0.5	3.0	6.2
Irrigation	0	0	3	3	0	0
Cross						
Rainfall	1.4	5.57	1.25	1.4	1.1	NA
Jefferson						
Rainfall	2.1	1.1	1.3	0.0	0.8	NA
Irrigation	0	1	2	2	0	0
Lincoln - ADC						
Rainfall	2.7	3.5	0.3	0.1	1.9	NA
Irrigation	0	0	3	2	NA	NA
Lincoln - Goodgame						
Rainfall	2.2	2.75	0	0.15	NA	NA
Irrigation	0	0	3	3	NA	NA
Mississippi						
Rainfall	0	5.35	1.25	1.0	NA	NA
Monroe						
Rainfall	1.08	3.63	1.28	1.0	0.4	0.5
Irrigation	2 ^z	1	3	4	NA	NA
Phillips						
Rainfall	1.3	3.95	2.5	0.4	3.2	NA
Irrigation	0	0	2	2	NA	NA
Poinsett						
Rainfall	4.8	4.2	0.2	0.75	0.5	NA
Irrigation	0	0	3	3	NA	NA
St. Francis						
Rainfall	1.6	3.0	0.35	1.55	2.0	NA
Irrigation	0	0	2	6 ^y	NA	NA

^z Irrigations at 0.5 inches each for chemical incorporation.

^y Two irrigations of three circles each at 0.7 inches per circle.

Table 2. Yields by irrigation method, 1999 CRVP fields.

Irrigation Method	County	Yield lb/acre
Furrow	Lincoln–ADC	1121
	Lincoln–Goodgame	1038
	Jefferson–Sites	1019
	Phillips–King	949
Center pivot – windshield wipe	Monroe	887
	Poinsett	724
Center pivot – towable	Crittenden	815
	St. Francis	681
None	Cross	525
	Mississippi	511