2004 Corn and Grain Sorghum Research Summary

Project Title: Improving Corn Irrigation Practices and Recommendations in Arkansas (Year 1)

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Crop: Corn

Objectives:
1. Develop a new crop coefficient curve for irrigation scheduling of corn and determine whether the curve needs to be adjusted for maturity of the particular hybrid grown.
2. Field test the resulting Irrigation Scheduler program for corn.
3. Conduct on-farm tests and demonstrations of irrigation-related production practices.

2004 Results: Field studies under this project were conducted at NEREC, Keiser, and on-farm at corn verification fields and with other interested growers. Three Pioneer hybrids of different relative maturities (P33J57 – 113 day, P32P76 – 116 day, P31B13 – 119 day) were planted on April 2, on 38-inch rows at NEREC. The irrigation system was operated daily in the absence of rain from May 28 through July 18 at rates of 100% and 60% of the estimated evapotranspiration (ET), along with a nonirrigated check. Yield differences were not significant among the three treatments (Table 1).

Table 1. Results from 2004 drip irrigated corn at NEREC. No significant hybrid effects or interactions were observed.

	Irrigation Treatment*		
	Hi	Lo	NI
	(100% ET)	(60% ET)	
Irrigation Period (IP)	5/28-7/18	5/28-7/18	5/28**
ET during IP (in)	13.5	13.5	13.5
Rain during IP (in)	9.5	9.5	9.5
Rain during IP (% of ET)	70	70	70
Irrigation (in)	7.8	5.5	0.07
Irrigation (% of ET)	58***	41	1
Avg. SWD during IP (in)	0.7	1.4	4.0
Yield (bu/acre@15%)	194 a	193 a	184 a

* Irrigation treatments: Hi = 100% of daily ET replaced each day; Lo = 60% of daily ET replaced each day; NI = nonirrigated
** water applied flushing irrigation system
*** effective rainfall reason value < 100

Although the yield for the nonirrigated treatment was numerically lower than the others, the difference was not significant. Even though the estimated soil water deficits were fairly high for the nonirrigated plots (average of 4 inches during the irrigation period), the frequent rains and the relatively cool temperatures (average of 88 during the irrigation period) combined to keep moisture stresses from seriously impacting yield. Drainage improvements made to the field appeared to alleviate the problems observed in the 2003 study, and the drip irrigation system worked well at allowing the application of precise amounts of water.

The Irrigation Scheduling Program was used on seven irrigated Research Verification fields – 2 grain sorghum and 5 corn. The average yield for the grain sorghum fields was 114 bu/ac with only 2 furrow irrigations. The average yield for the corn was 160 bu/ac with an average of 3 furrow irrigations and the 2 non-irrigated corn fields averaged 153 bu/ac. Irrigation, weather and crop development data from the Research Verification fields will be studied over the winter to determine the effectiveness and accuracy of the Irrigation Scheduling Program. The first impression is that the computerized projections fit the crop well in 2004 even though there was only a 7 bu/ac average increase due to irrigation. The relatively wet year resulted in rainfalls occurring soon after most of the irrigations and in some cases areas of the fields were negatively impacted by poor drainage.

An on-farm demonstration of a Phaucet Computer program to design furrow irrigation of twin-row grain sorghum on a bed was conducted with a Lincoln county producer. The producer indicated the program design resulted in the field irrigating more uniformly and quicker than in previous years. A Prairie county producer was assisted on the use of a Surge Valve for furrow irrigation of a corn field. The producer indicated the Surge Valve reduced his irrigation labor and made it easier to water the field uniformly and quicker than in past years. On-farm fertigation demonstrations (injection of fertilizer through center pivot sprinkler) were set up for two corn fields. Complications due to weather, backflow protection requirements and securing fertilizer nurse tanks resulted in the producers having to back out of the demonstration. On-farm assistance was provided to a Craighead county producer who was trying to determine how to make a pre-tassel fertilizer application through fertigation. The producer was very satisfied with the results. The installation requirements and accuracy of the non-invasive flow meter was field tested and determined to be satisfactory for making the precise flow measurements needed for conducting fertigation tests under a center pivot.

Impact: With the relatively cool temperatures and frequent rainfall, significant yield differences were not observed in the 2004 NEREC study. However, the drip irrigation system was successfully used to precisely apply water to the plots. Research results along with observations and irrigation data from the Verification fields and on-farm demonstrations will aid Arkansas corn and grain sorghum producers. Irrigation is an essential component of the corn production system in Arkansas and as more data are collected, the findings from this project will tailor irrigation recommendations to Arkansas conditions, rather than trying to adapt them from very different climates.