PROFIT—Productive Rotations On Farms In Texas
ANNUAL REPORT

Enhancing Producer Profitability in Southern High Plains Cropping Systems through Sorghum Education, Demonstrations, and Applied Research
(Regional Project)

1. **Limited Irrigation Sorghum/Cotton Rotation *vs.* Continuous Cotton**
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SECTION 1

Project Description, Expected Results, Benefit to Producers, Project Accomplishments, Most Important Outcome, Producer Adaptation and Constraints

This long-term sorghum-cotton rotation was conducted near Plainview, TX, among sixteen 12-row strips to model sorghum-cotton rotation and document cotton yield response to sorghum rotation vs. continuous cotton yields. Expected results include information about cotton yield benefits following sorghum. Cotton yields among cropping history treatments show no significant response in 2001 to rotation to sorghum. The pivot-irrigated sorghum and cotton received approximately 0.65" moisture applied with LEPA once a week beginning in early June (total irrigation ~7.20"; rainfall during the cropping season was ~3.5"). Sorghum yield averaging 3377 lbs./A were in line with what could be expected from limited irrigation and the minimal amount of rainfall available to the crop.

Constraints to producer adaptation are the common unwillingness to break away from continuous cotton in spite of potential yield benefits to cotton. Furthermore, growers often prefer to keep a pivot in one crop. Though simplifying operations, growers then have difficulty making substantial improvements in cropping profitability because limited available water is spread too thin. Distributing water at different times by using two crops under the same pivot insulates the producer against thin water availability if only ½ of the acreage is being watered as water application is stretched over a longer period of time with crops like early planted sorghum and conventional cotton, which have differences in the timing of peak water demand.

Project Report

Kind of Project—Regional

Project Objectives—

A) Continue long-term sorghum-cotton rotation at Halfway, TX, under limited irrigation to evaluate cotton yield response following sorghum vs. continuous cotton.

B) Collaborate with on-farm demonstration of early planted sorghum and conventional cotton to model spreading water use during the cropping season to increase total water available to reduced acreages of each crop.

Methodology

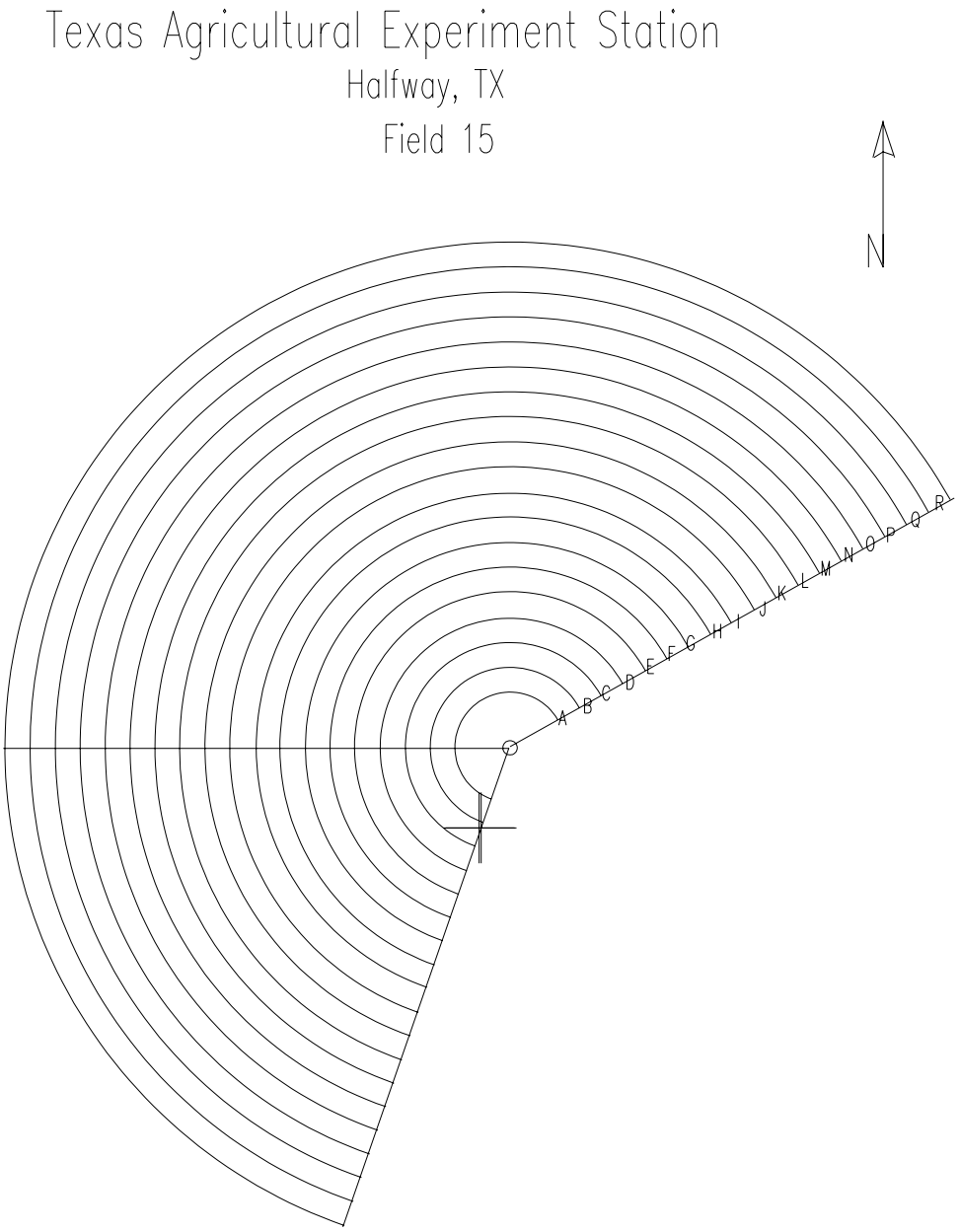
Sorghum and cotton was rotated according to plan (see table below) among 16 12-row wide 'arcs' after the 2000 cropping season. Sorghum yield goal was 4500 lbs./A. Cotton (Roundup Ready Paymaster 2282RR) was planted May 18, and grain sorghum (medium maturity Golden Acres 3838) was planted May 23 at 4.5 lbs./A. The field was fertilized according to soil test and yield goal: 100 lbs. P_2O_5/A, and 70 lbs. N/A. Yields were measured by strip for sorghum and rotational vs. continuous cotton. In addition, hand samples of cotton were picked for 4 rows X 6'1/2" in three areas of the field (west, north, and east), 3 plots at each location to verify machine harvest. The pivot at Halfway was used for scheduled irrigation in conjunction with Jim Bordosvsky's irrigation at different low water levels. The pivot-irrigated sorghum and cotton received approximately 0.65" moisture applied with LEPA once a week beginning in early June (total irrigation ~7.20"; rainfall during the cropping season was ~3.5").

Table 1. Limited irrigation, TAES-Halfway. Crop sequence planted in 12-row strips in circular rows under an 8-span center pivot.

Code for sorg hum an d cotton strips

	C	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Year	*T1*	T2	T3	T4	T3	T2	*T1*	T4
2000	*Cot*	Cot	Cot	Sorg	Cot	Cot	*Cot*	Sorg
2001	***Cot***	**Cot**	**Sorg**	**Cot**	**Sorg**	**Cot**	***Cot***	**Cot**
2002	*Cot*	Sorg	Cot	Cot	Cot	Sorg	*Cot*	Cot
2003	*Cot*	Cot	Cot	Sorg	Cot	Cot	*Cot*	Sorg
2004	*Cot*	Cot	Sorg	Cot	Sorg	Cot	*Cot*	Cot
2005	*Cot*	Sorg	Cot	Cot	Cot	Sorg	*Cot*	Cot

Year	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**
	T2	T3	*T1*	T4	T3	T4	*T1*	T2
2000	Cot	Cot	*Cot*	Sorg	Cot	Sorg	*Cot*	Cot
2001	**Cot**	**Sorg**	***Cot***	**Cot**	**Sorg**	**Cot**	***Cot***	**Cot**
2002	Sorg	Cot	*Cot*	Cot	Cot	Cot	*Cot*	Sorg
2003	Cot	Cot	*Cot*	Sorg	Cot	Sorg	*Cot*	Cot
2004	Cot	Sorg	*Cot*	Cot	Sorg	Cot	*Cot*	Cot
2005	Sorg	Cot	*Cot*	Cot	Cot	Cot	*Cot*	Sorg



‘A’ to ‘R’ (see attached table) runs from inside to outside.

Results and Discussion

Average sorghum yield among the four strips was 3377 lbs./A, or about 1100 lbs./A less than the yield goal. We attribute this to receiving only about half the rainfall typically expected during the course of the growing season. Sorghum typically yields about 350-425 lbs./A per effective

inch of stored soil moisture, rainfall, or irrigation, with about 6" of moisture needed to get the plant to the point of seed production. In this regard the approximately 14" of water available to the sorghum crop would be expected to produce a crop of about 2800-3200 lbs./A.

Cotton yields using the stripper were not significantly different, averaging 436 lbs./A lint for cotton after cotton and 410 lbs./A after sorghum (P = 0.640). Hand picked samples yielded considerably more, and we believe this was due to the effort to pick uniform areas. Crop growth throughout the same strip was often variable, particularly over the east half of he field (poorer). Handpicked lint samples yielded 767 lbs./A for continuous cotton and 759 lbs./A (P = 0.922) for cotton after sorghum. Lack of measured yield response could have been due to some tie-up of N by sorghum residues, which was observed in Kevin Bronson's PROFIT work in the sorghum-cotton test at the Lubbock Center.

Is project meeting stated objectives? Partially. Objective A is being met with the on-station project at Halfway. No significant yield responses in cotton following sorghum were observed this year. For objective B we have still not been able to find a satisfactory cooperator to conduct the demonstration.

Technology Transfer and Education Activity

Technology developed and available to producers: Information regarding rotational cotton response to grain sorghum vs. continuous cotton. Guidelines for stretching limited water resources for dividing center pivots into cotton and early planted sorghum so as to increase water available to cotton later in the season.

Publications: None.

Presentations: Field site was focal point of crop tour during Halfway Experiment Station field day, Sept. 11. Sorghum/cotton crop rotation and management of limited water in a system like at Halfway was the focal point of more than 12 extension talks given by Dana Porter and Calvin Trostle in 2001.

Student Education: One South Plains college student and one Plainview High School student received training in grain sorghum production due to his help in planting and irrigating the study.