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FURROW DIKING AND SUBSOILING OF SOYBEANS
IN NORTHEAST TEXAS

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SUMMARY

Tillage treatments included flat planted versus bedded; subsoiled versus not subsoiled and furrow diked versus not diked. Treatments were studied at two locations in 1986 and 1987. The objective was to determine whether tillage treatments could result in more efficient utilization of moisture and increase soybean yields. Maturity Group IV soybeans were planted on April 16 and 17 at Pattonville and Hooks, Tx., respectively. Soybeans were harvested in late August or early September, in time to double crop with wheat. Tillage test results in 1986 indicated a 12 bu/ac yield increase at Hooks in the bedded, subsoiled, and diked 'Crawford' soybeans. Tillage treatments did not affect yield at Pattonville. Yield increases were not obtained for either furrow diking or subsoiling treatments in 1987.

INTRODUCTION

Soybean (Glycine Max (L.) Merr) yields in Northeast Texas are often very low because of moisture and heat stress during the pod filling period. Results from studies on sorghum (Sorghum bicolor L.) and cotton (Gossypium brisutum) indicate furrow diking significantly increased yields on the Rolling Plains and West Texas. Environmental conditions in East Texas usually result in ample rainfall in May and June, however dry conditions often occur in July and August. Group IV soybeans can be planted in mid-April and harvested in August in this region. Our objective in this study was to utilize tillage practices such as furrow diking and subsoiling to improve moisture utilization and increase grain yields of early planted Group IV soybeans.

PROCEDURE

This study was conducted over 2 years in Northeast Texas at Pattonville on a Houston blackland clay, and at Hooks on a river bottom Severn very fine sandy loam soil. In 1986, tillage treatments included bedded versus flat planted, diked (diked alternate furrows) versus not diked, and subsoiled versus not subsoiled. There were 4

TABLE 1. METHODS, RATES, AND DATES AT TWO LOCATIONS OVER TWO YEARS

	1986		1987	
	PATTONVILLE	HOOKS	PATTONVILLE	HOOKS
SOIL TYPE	HOUSTON BLACKLAND	SEVERN VFSL	HOUSTON BLACKLAND	SEVERN VFSL
FERTILIZATION	100 LBS/A P ₂ O ₅ 100 LBS/A K ₂ O	100 LBS/A P ₂ O ₅ 100 LBS/A K ₂ O	60 LBS/A P ₂ O ₅ 60 LBS/A K ₂ O	60 LBS/A P ₂ O ₅ 60 LBS/A K ₂ O
ROW SPACING	32 INCHES	32 INCHES	34 INCHES	36 INCHES
PLANTING DATE	APRIL 16	APRIL 17	APRIL 17	APRIL 15
HERBICIDE	PREEMERGENCE SEPTOR 2/3 PT/A PREEMERGENCE DUAL 1 1/2 PT/A POSTEMERGENCE NONE	SEPTOR 2/3 PT/A DUAL 1 1/2 PT/A NONE	SEPTOR 2/3 PT/A DUAL 1 1/2 PT/A POAST 1 1/2 PT/A	SEPTOR 2/3 PT/A DUAL 1 1/2 PT/A NONE
VARIETIES	CRAWFORD JMS 4982	CRAWFORD JMS 4982	CRAWFORD SPARKS	CRAWFORD SPARKS
DATE OF DIKING	MAY 30	MAY 29	JUNE 9	JUNE 3
PLOT SIZE	4 ROWS 25 FT LONG HARVESTED 2 ROWS 14 1/2 FT LONG	4 ROWS 25 FT LONG HARVESTED 2 ROWS 14 1/2 FT LONG	4 ROWS 22 FT LONG HARVESTED 2 ROWS 14 1/2 FT LONG	4 ROWS 22 FT LONG HARVESTED 2 ROWS 14 1/2 FT LONG
HARVEST DATE	AUGUST 25	SEPTEMBER 18	AUGUST 13 SPARKS SEPTEMBER 3 CRAWFORD	AUGUST 21 SPARKS SEPTEMBER 2 CRAWFORD

replications and experiments were arranged and analyzed as a split-split plot design. In 1987, tillage treatments at Pattonville were subsoiled versus not subsoiled, diked (each furrow) versus not diked and Crawford versus JMS 4982 with 4 replications. At Hooks tillage treatments were diked versus not diked and Crawford versus JMS 4982 with 8 replications. Specific treatments and details are presented in Table 1.

In addition, in 1987 two full season soybean varieties (Centennial and Bragg) were planted on May 11 at both locations. Tillage treatments were the same as the early April planted experiments. Furrow diking was conducted June 30 and July 1 at Pattonville and Hooks, respectively. Harvest dates at Hooks were October 30 and December 2, respectively for Centennial and Bragg soybeans. Harvest dates at Pattonville were November 6 and December 9, respectively for Centennial and Bragg soybeans.

RESULTS

Good soybean stands were obtained in experiments both years. Weed control was good to adequate although Morningglory (Convolvulus Arvensis L.) and Cocklebur (Xanthium Pensylvanicum Wallr.) were a problem at Hooks in 1986. Moisture stress was high at both locations during some periods, particularly in July and August of each year. Planting on beds increased yields in two of four experiments in 1986 (Table 2). In 1987, all plots were planted on beds.

TABLE 2. EFFECT OF BEDDING VERSUS FLAT PLANTING ON YIELD AVERAGED OVER ALL OTHER TREATMENTS FOR TWO VARIETIES AT TWO LOCATIONS IN 1986

	<u>Hooks</u>		<u>Pattonville</u>	
	<u>Crawford</u>	<u>JMS 4982</u>	<u>Crawford</u>	<u>JMS 4982</u>
	-----bu/ac-----			
Bedded	31.8a*	30.2a	17.7a	22.3a
Flat Bedded	32.5a	24.0b	16.2b	21.9a

*Means within a variety followed by the same letter are not significantly different at the 0.05 level as judged by the F-test.

Diking, by itself, did not increase soybean yields in any of 6 experiments over 2 years at either location. Mean yields over all varieties and experiments were 30.1 and 30.0 bu/ac, respectively for the diked and non-diked treatments.

Subsoiling increased soybean yields 6 bu/ac in one experiment out of five in 1986. Mean yields for subsoiled versus not subsoiled were 27.1 and 27.3 bu/ac, respectively.

In 1986, a 3-way interaction for bedding, diking, and subsoiling was detected at Hooks. The data indicate that the highest yield was produced from soybeans which had been diked, subsoiled, and bedded and the lowest yield was from the not diked, not subsoiled and not bedded treatment (Table 3).

TABLE 3. THREE WAY INTERACTIONS FOR CRAWFORD SOYBEAN YIELDS FOR THREE TILLAGE TREATMENTS AT HOOKS, TX., 1986

	<u>Bedded</u>	<u>Not Bedded</u>	
	-----bu/a-----		
Subsoiled	39.3*	32.5	Diked
Subsoiled	29.9	38.4	Not Diked
Not Subsoiled	27.4	31.8	Diked
Not Subsoiled	30.7	27.3	Not Diked

*Significant differences in yields at the 0.01 level of probability.

Yield differences were observed for different varieties in 1987 (Table 4) at Hooks, but not at Pattonville. At Hooks, Crawford produced 45 bu/ac compared to 32 bu/ac for Sparks. At Pattonville both varieties produced about 32 bu/ac. There was no significant advantage for furrow diking at either location (Table 4) in 1987. The mean yields for subsoiled versus not subsoiled averaged over varieties are presented in Table 5. No differences in yield were observed in 1987.

TABLE 4. EFFECT OF FURROW DIKING ON APRIL PLANTED SOYBEAN YIELDS AT TWO LOCATIONS IN 1987

	<u>Hooks</u>		<u>Pattonville</u>	
	<u>Crawford</u>	<u>Sparks</u>	<u>Crawford</u>	<u>Sparks</u>
	-----bu/ac-----			
Diked	44.3	30.9	32.9	33.9
Not Diked	46.0	33.6	31.0	31.6
Mean	45.2a*	32.2b	32.0b	32.7b

*Significant differences were observed at the 0.05 level for varieties at Hooks as judged by the F-test.

TABLE 5. EFFECT OF SUBSOILING ON APRIL PLANTED SOYBEAN YIELDS AT PATTONVILLE AVERAGED OVER DIKING TREATMENTS IN 1987

	<u>Variety</u>		<u>Mean</u>
	<u>Crawford</u>	<u>Sparks</u>	
	-----bu/a-----		
Subsoiled	30.6*	32.5	31.5
Not Subsoiled	33.4	32.9	33.1

*No significant differences in yield were measured.

Yield differences were observed for different varieties in 1987 at Hooks when the yield for Crawford and Sparks was 45.2 and 32.2 bu/ac, respectively (Table 6). No real differences were detected at Pattonville where both varieties yielded about 32/ac.

TABLE 6. YIELD FOR 2 SOYBEAN VARIETIES AVERAGED OVER OTHER TREATMENTS AT TWO LOCATIONS IN 1987

<u>Variety</u>	<u>Hooks</u>	<u>Pattonville</u>
	-----bu/ac-----	
Crawford	45.2a*	32.0a
Sparks	32.2b	32.7a

*Means within column followed by the same letter are not significantly different at the 0.05 level of probability as judged by the F-test.

In the late planted experiment with full season soybeans very low yields were obtained at Pattonville. Yields were not significantly different and ranged from 3 to 9 bu/ac due to August and September drought. At Hooks, significant differences were measured for yield for varieties where Centennial yielded 3 bu/ac more than Bragg (Table 7). No yield differences were found between furrow diking treatments.

TABLE 7. YIELD OF CENTENNIAL AND BRAGG SOYBEANS PLANTED MAY 11, 1987 at HOOKS, TEXAS

	<u>Diked</u>	<u>Not Diked</u>	<u>Mean</u>
	-----bu/ac-----		
Centennial	35.3	33.3	34.3 a**
Bragg	32.3	30.1	31.2 b
Mean	33.8 a	31.7 a*	

* Diking treatment mean yields were not significant.

**Variety mean yields were significantly different at the 0.07 level of probability according to the F-test.

DISCUSSION

Diking of cotton and sorghum land in the Rolling Plains has consistently increased yields. We have not been able to improve moisture utilization and increase soybean yields with furrow diking and/or subsoiling. Perhaps we have not had the types of rains which would have allowed dikes to reduce runoff during the past two growing seasons. Both field sites are quite level and although runoff does occur, it would be relatively slow. The Houston blackland soil cracks during moisture stress periods and this would effect runoff and may lessen the water holding ability of furrow dikes. The Severn soil at Hooks is quite sandy and water penetration would have been fairly rapid. Therefore, unless heavy rainfall occurred, moisture penetration into the non-diked plots may have been similar to the furrow diked plots. We will continue the experiment in 1988 and collect soil moisture data in addition to soybean yield data. With this additional information we hope to determine whether furrow dikes are hold water and reduce runoff, and thereby improving soil moisture levels.

CONCLUSIONS

1. In this study, the tillage practice of furrow diking did not increase soybean yields during the past two years.
2. Subsoiling of soybeans only increased soybean yields in one experiment out of five and may offer little yield advantage.
3. The combination of subsoiling and diking together may increase soybean yields in some years.
4. Group IV soybeans planted in mid-April have potential to produce soybean yields of 30 bu/a even with little rainfall in July or August.