PREPLANT AND POST PLANT TILLAGE FOR FULL SEASON SOYBEANS ON CLAYEY AND SILT LOAM SOILS

T.C. Keisling[1], C.R. Dillon[2], L.R. Oliver[3], F.L. Baldwin[4], L.O. Ashlock[4]. and E.E. Evans[1]

INTRODUCTION

Many experiments have been performed where no-till production systems are contrasted to tilled production systems. These production systems are compared in-total to decide which are the most conducive to profitable production systems.

On soils that have poor internal drainage or impermeable layers close to the surface (less than 22 inches), preplant tillage that produces a surface mulch may conserve soil moisture by preventing evaporation in the spring prior to planting. This would be especially true in regions of ample late winter and early spring rainfall. Soils such as those described above will have a profile that is full of water. It is conceivable that a surface mulch of dead plant debris could have the same moisture conserving effect. A similar moisture conservation scenario could also be operational after planting.

The infiltration rate of swelling clay or crusting silt loam soils may be increased and changed dramatically by physical plowing or cultivation. This could also be a contributing factor for surface mulches of plant debris that would trap and hold water in the field longer for increased infiltration.

Aeration may also be a factor that limits plant root growth and moisture uptake. Poor root growth could also be the result of soil density or compaction that can be ameliorated by tillage operations.

The basic question of the value of preplant and post-plant tillage has not been addressed in Arkansas. The objective of studies reported herein was to assess the effect of convention flat seed bed preparation and post-plant tillage on soybean production on a Sharkey and Loring soil.

[1] Dept. of Agron. located at NEREC, Keiser. AR.
[2] Dept. Agric. Ecvn. & Rural Soc.. located at Fayetteville, AR.
[3] Dapt. of Agron., located at Fayetteville. AR.
[4] Coop. Ext. Ser., located at Little Rock, AR.

MATERIALS AND METHODS

Experiments were continued in 1993 at the Northeast Research and Extension Center (NEREC) at Keiser, AR and at the Cotton Branch Experiment Station (CBES) at Marianna, AR. The experimental design was a stripped split plot. The main plots were preplant tillage with the subplots being post-plant cultivation. The treatment design was a 2 x 2 factorial of preplant (yes or no) and post-plant (yes or no) tillage. Selected cultural practices and site characteristics are described in Table 1. Grain yields were adjusted to 13% moisture. Estimated costs and profits were made utilizing the Mississippi State University budget generator (Spurlock, 1992) and a soybean price of $6.02 per bu.

RESULTS AND DISCUSSION

The yield results obtained for 1993 are presented in Table 2. It should be noted that 1993 was an extremely dry growing season. The yield differences though small at NEREC were statistically significant for preplant tillage but not for post-plant tillage. Those obtained for both pre and post-plant tillage were statistically significant at CBES.

The economic returns for each treatment combination is presented in Table 3. Production costs generally increase as tillage inputs increase. However, profits are decreasing with the increasing tillage at NEREC. A component analysis is presented in Table 4. It is quite informative to note the loss in profit associated with pre and post-plant tillage at NEREC. At a time when profits and losses are critical, this data strongly suggests that tillage is just an added expense on clay soils.
On the silt loam soil, preplant tillage was the most profitable practice. One trip with a disk and do-all increased profits 1400%. This shows the importance of preplant tillage on these soils during dry growing seasons. During a wet season (1992), tillage made no difference and was reported at the conservation tillage conference last year.

REFERENCES

Spurlock, R. 1992. Mississippi State University budget generator. Miss. St. Univ. Agric. Exp. Stn. Tech. Bull. No. 52.

ACKNOWLEDGEMENTS

Mr. Glenn Flynn, Res. Spec., Dept of Agric. Econ. & Rural Soc. Fayetteville, AR, for budget preparation.

Table 1. Selected site characteristics, cultural practices, and temporal log for tillage experiments at NEREC and CBES.

	Location	
	NEREC	CBES
Soil Type	Sharkey silty clay	Loring si.l
Planting Date	5-26-93	5-27-93
Seed Bed Prep.		
Disking	5-26-93	5-27-93
Chem.Burn Down'	5-26-93	5-27-93
Soybean Variety	Pioneer 9592	N.K. 59-60
Seeds/Row-ft	3-5	3-5
Row Spacing	19 inches	19 inches
Harvest Date	10-27-93	10-26-93
No. Reps		
Preplant Tillage	6	9
Post-plant Tillage	8	4

[1] Burn down was with Roundup® at 1.5 pints/acre of 4.7 lb ai/gal formulation.

Table 2. Pre and post plant tillage effects on soybean grain yield.

Location	Tillage					
	Preplant			Post-plant		
	Yes	No	Diff.	Yes	No	Diff.
	Bu/Acre					
NEREC	53.3b*	51.5a	1.8	52.4a	52.5a	-0.1
CBES	26.9a	15.9b	11.0	22.7a	20.0b	2.7

* Numbers at same location and compared for either preplant or post-plant tillage followed by the same letter are not different at the 10% level according to Fisher's F test.

Table 3. Economic returns estimated for various tillage regimes for $6.02 soybeans.

Tillage				
Preplant	Yes		No	
Post-plant	Yes	No	Yes	No
	NEREC			
Operating cost	$ 72.42	$ 70.55	$ 62.35	$ 60.47
Total Cost	$ 99.24	$ 95.90	$ 85.76	$ 82.42
Profit	$220.42	$226.17	$224.87	$227.61
	CBES			
Operating cost	$ 47.73	$ 45.84	$ 50.73	$ 54.39
Total Cost	$ 72.68	$ 69.32	$ 74.15	$ 76.34
Profit	$ 91.06	$ 89.60	$ 4.11	$ 6.14

Table 4. Component analysis for pre and post plant tillage operations.

	NEREC			
	Yield (bu)	Operating Cost	Total Cost	Profit
		$/acre		
Base (No-Till)	51.5	$60.47	$82.42	$227.61
Adding Pre Plant Tillage	1.8	$10.08	$13.48	- $1.44
Adding Post-Plant Tillage	- 0.1	$ 1.88	$ 3.34	- $2.74
Total	53.2	$72.43	$99.24	$223.43
	CBES			
Base (No-Till)	13.7	$54.39	$76.34	$ 6.14
Adding Pre Plant Tillage	11.0	- $8.55	- $7.02	$ 83.46
Adding Post-Plant Tillage	2.7	- $3.66	- $2.19	- $ 2.03
Total	27.4	$42.18	$67.13	$ 87.57