TILLAGE STUDIES ON COTTON

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INTRODUCTION

Deep tillage with implements that have new designs continues to be of interest. This is especially true with the increasing weights of farm machinery and equipment that have sufficient weight to severely compact soil. Soil compaction can limit water infiltration, water storage and/or root penetration of the soil. Although many deep tillage experiments have been conducted in the past, they were conducted in late winter or early spring when soil was wet and gave no yield increases. Recent work suggested that with clays, fall tillage when the soil was dry would give yield responses to soybeans. Experiments were initiated to investigate the influence of the new equipment designs on deep fall tillage when the soil was dry.

The continued loss of soil organic matter also is contributing to compaction of soil. This compaction can be shallow and in the form of crusts that retard emergence and growth. An experiment was started in 1997 to assess the importance of these shallow crusts on end-of-the-season lint yield.

MATERIALS AND METHODS

Experiments were begun at the Northeast Research and Extension Center (NEREC), Keiser, Arkansas, on a Sharkey silty clay in 1993 and at Delta Branch, Clarkedale, Arkansas, on Dubbs-Dundee silt loam in 1996. Tillage experiments consisted of eight treatments arranged in a randomized complete block with eight replications at the two locations. The treatments were 1) check, 2) subsoil in fall with parabolic subsoiler in the seedling row, 3) subsoil in fall with parabolic subsoiler at a 45 degree angle to seedling row, 4) subsoil in spring with parabolic subsoiler in the seedling row, 5) subsoiling shallow in the fall with parabolic subsoiler in the seedling row, 6) para-till in fall with seedling row, 7) DMI winged tip straight shank run just beneath the plow pan in fall and 8) DMI winged tip straight shank run with tip 12 to 14 in. deep in fall.

Crusting experiments were begun in 1997 at Delta Branch on Dubbs-Dundee silt loam. The crusting duration was simulated by placing a 10-ft board over the seedling row at cracking and removing it at 2, 3, 5, 7 and 10 days later.

RESULTS AND DISCUSSION

Results from the deep tillage experiments are shown in Table 1. Note that at NEREC there is a year effect. The year effect was due primarily to treatments giving different yield responses from one year to the next. Other deep tillage treatments were somewhat intermediate between the check and the parabolic subsoiler in the fall. Of particular interest was the lack of response of the implements that did not disturb the soil surface significantly. Results from one year's data at Delta Branch indicate that different implements than those used at NEREC resulted in higher yields. This indicates that farmers may want to use different deep tillage implements on different soil types.

Shallow crusts that delayed plant emergence for more than two days reduced lint yields substantially (Fig. 1). Yield reductions of as much as 50% resulted from seedlings being trapped in a crust at the cracking stage for about four days. Seedings were observed to exhibit "big shank," broken hypocotyls and small cotylendary leaves.

Table 1. Lint yields at Northeast Research and Extension Center (NEREC), Keiser, Arkansas, and Delta Branch, Clarkedale, Arkansas.

Treatment	NEREC			Delta
Year	95	96	97	97
	----------lb lint /acre----------			
1. Conventional	681a	555a	915a	830ab
2. Parabolic in fall	709a	589a	747a	836ab
3. Parabolic in fall 45	---	---	---	827ab
4. Parabolic in spring	733a	605a	848a	830ab
5. Parabolic shallow in fall	---	---	---	788b
6. Para-till in fall	700a	604a	816a	874a
7. DMI winged tip 12 to 14"	709a	555a	749a	871a
8. DMI winged tip just beneath plow pan in fall	---	---	---	809b

Fig. 1. Effect of length of time crust is in place from beginning cracking.

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