

## CORN AND SOYBEAN RESPONSE TO ROTATION AND TILLAGE ON A LEEPER SILTY CLAY LOAM SOIL

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**ABSTRACT:** A study, initiated in the fall of 1999 to evaluate corn and soybean response to a corn-soybean rotation and selected tillage systems, was continued in 2002. The environmental growing conditions were very favorable for corn and less than optimum for soybean which experienced a 3-week dry period from July 31 through August 24. Corn yield ranged from 142 to 167 bu/ac. There was a rotation by tillage interaction for yield. The fall disk + paratill-bed was the only treatment which showed a positive yield response to rotation while no-till showed a negative response to the rotation. With continuous corn, no-tillage, ridge-tillage, and fall disk + paratill-bed showed similar yield and were higher than the fall disk + bed. In the rotation, no-till had lower yield than all of the other treatments. All treatments provided greater than 84% late season broadleaf control. Rotation had no effect and there was no rotation by tillage interaction for late-season broadleaf weed control. No-tillage and ridge-tillage provided 87 to 88% control compared to fall paratill-bed, fall disk + paratill-bed, and fall disk + bed which provided  $\geq 97\%$  control. Soybean yields ranged from 26 to 35 bu/ac. The data indicated rotation had no effect on yield and there was no tillage by rotation interaction. Averaged over rotation, the fall disk + paratill-bed produced more yield than no-till, ridge-till, fall paratill-bed, and fall disk + bed. No-till, ridge-till, fall paratill-bed, and fall disk + bed showed no yield difference.

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**KEYWORDS:** Corn, soybean, rotation, tillage, clay soil

**MATERIALS AND METHODS:** A field study initiated in the fall of 1999 to evaluate corn and soybean response to a corn-soybean rotation with selected tillage systems was continued in 2002. The study was conducted as a split plot in a randomized complete block design with rotation as main plot factor and tillage as subplot factor with 4 replications. Plot size was 8 rows x 55 ft. Since soil test results indicated high P and K levels, no P and K fertilizer was applied in the fall of 2001. Nitrogen fertilizer solution (32% UAN) at 175 lb N/A was applied as a sidedress application (6 inches from the row and 2 inches deep) to all corn plots on 5/15/02.

All tillage treatments except ridge-till were applied 11/03/01 (Table 1). The ridge-till cultivation treatment was applied to the corn and soybean during the growing season. A burndown application of Glyphos (glyphosate) + Clarity (banvel) at 1.0 + 0.125 lb ai/ac was made to all plots on 3/07/02. All treatments were planted no-till with a no-till planter equipped with residue movers and colters. Pioneer 3223 corn hybrid was seeded at 28,000 seed/ac in 30-inch rows on 4/16/02. Gramoxone Max (paraquat) + dimethenamid-P and atrazine (Guardzman Max) +

surfactant at 0.75 + 0.63 + 1.24 lb ai/ac + 0.2 pt/ac was applied preemergence to all corn plots after planting. Lorsban (chlorpyrifos) at 1.3 lb ai/ac was applied in-furrow at planting. The corn ridge-till treatment received ridge-till cultivation on 5/23/02. Evik (ametryn) + surfactant at 1.8 lb ai/ac + 1 pt/ac was applied to all corn plots with a hooded shield sprayer on 6/05/01. Corn height was 16 to 30 inches tall at the time of application. Corn plots received Intrepid (methoxyfenozide) at 0.0625 lb ai/ac on 6/24/02 for southwestern corn borer (*Diatraea grandiosella*) control.

Deltapine DP5915RR soybean was planted no-till in 30 inch rows on all treatments 4/23/02. Roundup Ultra (glyphosate) + Classic (chlorimuron) at 1.0 lb ai/ac + 0.0625 oz ai/ac was applied to all soybean plots on 5/16/02. Roundup Ultra Max (glyphosate) at 0.75 lb ai and 0.625 lb ai/ac was applied to all soybean plots on 6/13/02 and 6/21/02, respectively. The soybean ridge-till treatment received a ridge-till cultivation 5/23/02 and 6/20/02. Corn plots were rated for broadleaf weed control at corn harvest.

The center 2 rows in each corn was harvested with a plot combine for grain yield 9/03/02. The center 2 rows in each soybean plot was harvested for grain yield 10/09/02. All grain samples were weighed, and seed moisture and test weight was determined with Dickey John® GAC 2000 grain analysis computer. Corn and soybean grain yields were adjusted to 15 and 13% seed moisture, respectively. All data was subjected to SAS Mixed procedure statistical analysis and means were separated using Fisher Protected LSD at the 5% significance level.

**RESULTS AND DISCUSSION:** The environmental growing conditions were very favorable for corn and less than optimum for soybeans which experienced a 3-week dry period for the month of August. Corn yield data indicated no rotation by tillage interaction and yields ranged from 142 to 167 bu/ac (Table 1). The fall disk + paratill-bed was the only treatment which showed a positive yield response to rotation while the no-till showed a negative response to the rotation. All other treatments indicated rotation had no effect on yield. With continuous corn, no-tillage, ridge-tillage, and fall disk + paratill-bed had similar yield and were higher than the fall disk + bed treatment. In the rotation, no-till had lower yield than all other treatments, except fall disk + paratill-bed. Rotation had an effect on late season broadleaf weed (morningglory species) control but there was no tillage by rotation interaction. Averaged over rotation, all treatments gave > 86% broadleaf control. The fall disk + paratill-bed and disk + bed; however, showed 5 to 10% higher broadleaf weed control than ridge-tillage and no-tillage.

Soybean yield data indicated yields ranged from 26 to 35 bu/ac (Table 2). Rotation had no effect on yield and there was no rotation by tillage interaction. The fall paratill-bed, averaged over rotation, had the highest yield of 33.5 bu/ac and was greater than all other treatments. The mean plant population at harvest was 123,900 plants/ac with no difference due to tillage or rotation, and there was no tillage by rotation interaction. Plant height at maturity indicated no rotation by tillage interaction. However, soybeans following corn in a rotation were slightly taller. The fall paratill-bed, fall disk + paratill-bed, and fall disk + bed were 2.5 to 4.9 inches taller than no-tillage and ridge-tillage.

**COOPERATORS:** None

**PUBLICATIONS:** None

**Table 1.** Influence of tillage and crop rotation on corn yield and late season weed control in 2002, MAFES Northeast Branch Station, Verona, MS.

Tillage systems	-----Cropping sequence-----		
	Continuous corn	Rotation (2 yr) soybean Fb <sup>1</sup> corn	Mean
	-----Corn yield bu/ac-----		
1) No-tillage	161.1	141.7	151.4
2) Ridge-tillage	163.7	158.0	160.9
3) Fall paratill-bed	149.7	160.2	155.0
4) Fall disk + fall paratill-bed	166.5	151.8	159.2
5) Fall disk + bed	<u>143.3</u>	<u>161.6</u>	<u>152.3</u>
Mean	156.9	154.7	155.8
WIR LSD(.05): 12.4 <sup>2</sup>	WIT LSD (.05): 14.9 <sup>3</sup>		
	-----% Broadleaf control 8/26/02-----		
1) No-tillage	85	89	87
2) Ridge-tillage	86	90	88
3) Fall paratill-bed	90	97	94
4) Fall disk + fall paratill-bed	95	98	97
5) Fall disk + bed	<u>93</u>	<u>93</u>	<u>93</u>
Mean	90	93	92
Tillage (T) LSD (.05): 4	Rotation (R) LSD (.05): NS		T x R LSD (.05): NS

<sup>1</sup> Fb means followed by.

<sup>2</sup> LSD comparison within rotation system.

<sup>3</sup> LSD comparison within tillage system.

**Table 2.** Influence of tillage and crop rotation on soybean yield, population, and plant height at maturity in 2002, MAFES Northeast Branch Station, Verona, MS.

Tillage systems	-----Cropping sequence-----		
	Continuous soybean	Rotation (2 yr) corn Fb <sup>1</sup> soybean	Mean
	-----Soybean yield bu/ac-----		
1) No-tillage	26.0	32.1	29.1
2) Ridge-tillage	26.6	31.0	28.8
3) Fall paratill-bed	29.2	33.4	31.3
4) Fall disk + fall paratill-bed	31.9	35.0	33.5
5) Fall disk + bed	<u>27.8</u>	<u>31.3</u>	<u>29.6</u>
Mean	28.3	32.6	30.5
Tillage (T) LSD (.05):	3.0		
Rotation (R) LSD (.05):	NS		
T x R LSD (.05):	NS		
	-----Plants/ac x 1000-----		
1) No-tillage	127.8	125.8	126.8
2) Ridge-tillage	122.5	127.0	124.8
3) Fall paratill-bed	116.9	126.3	121.6
4) Fall disk + fall paratill-bed	120.0	120.8	120.4
5) Fall disk + bed	<u>126.1</u>	<u>125.8</u>	<u>126.0</u>
Mean	122.7	125.1	123.9
Tillage (T) LSD (.05):	NS		
Rotation (R) LSD (.05):	NS		
T x R LSD (.05):	NS		
	-----Plant height (in) at Maturity-----		
1) No-tillage	25.8	29.8	27.5
2) Ridge-tillage	25.0	28.1	26.6
3) Fall paratill-bed	29.7	30.5	30.1
4) Fall disk + fall paratill-bed	30.9	32.0	31.5
5) Fall disk + bed	<u>29.6</u>	<u>32.5</u>	31.1
Mean	28.2	30.6	
Tillage (T) LSD (.05):	1.7		
Rotation (R) LSD (.05):	1.0		
T x R LSD (.05):	NS		

<sup>1</sup> Fb means followed by.