

## CORN AND SOYBEAN RESPONSE TO ROTATION AND TILLAGE

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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 2001. The environmental growing conditions were very favorable for corn and less than optimum for soybean which experienced a three week dry period from mid July through early August. Corn yield ranged from 98 to 119 bu/ac. Corn following soybean in a rotation had no effect on yield and there was no rotation by tillage interaction for yield. Fall paratill-bed, disk + paratill-bed and disk + bed, averaged over rotation system, had higher yield than no-till. The fall disk + paratill-bed and fall disk + bed had similar yield to the fall paratill-bed, and both had higher yield than no-till and ridge till. The corn-soybean rotation provided greater late season broadleaf weed control (morningglory) than continuous corn. The fall paratill-bed, fall disk + bed and fall disk + paratill bed also provided greater late season broadleaf weed control than no-till. The soybean data indicated a rotation by tillage interaction for yield. In the rotation, ridge till had lower yield than no-till, fall paratill-bed, fall disk + fall paratill-bed, and a fall disk + bed. In continuous soybean, no-till and ridge-till had similar and lower yield than fall paratill-bed, fall disk + bed, and a fall disk + paratill-bed. The fall paratill-bed and no-till were the only treatments which showed a yield response to the rotation.

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**MATERIALS AND METHODS:** A field study that was initiated in the fall of 1999 to evaluate corn and soybean response to a corn-soybean rotation with selected tillage systems was continued in 2001. The study was conducted as a split plot with rotation as main plot and tillage as subplots with 4 replications. Plot size was 8 rows x 55 ft. No P and K fertilizer was applied in the fall of 2000, since soil test results indicated high P and K levels. Nitrogen fertilizer solution (32% UAN) at 160 lb N/A was applied as a sidedress application to all corn plots on 5/07/01.

All tillage treatments except ridge till were applied 11/03/00 (Table 1). The ridge till treatment was applied to the corn and soybean during the growing season. All treatments were planted 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 4/11/01. Gramoxone + Atrazine + surfactant 0.47 + 2 lb ai + 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. Accent (nicosulfuron) + crop oil at 0.5 oz ai/ac + 2 pt/ac was applied post-directed to all corn plots for broadleaf signalgrass control on 5/23/01. The corn ridge till treatment received a ridge till cultivation on 5/23/01. Evik (ametryn) + surfactant at 1.8 lb ai/ac + 1 pt/ac was applied to all corn plots with a hooded shield sprayer on 5/26/01. Corn height was 12 to 24 inches tall at the time of application.

All soybean plots received a burndown application of Glyphos (glyphosate) at 1.2 lb ai/ac on 4/19/01. Deltapine DP5915RR soybean were planted no-till in 30 inch rows on all treatments 5/01/01. Gramoxone + surfactant at 0.5 lb ai/ac + 0.5 pt/ac was applied after planting soybeans on 5/01/01. Roundup Ultra (glyphosate) at 1.0 lb ai/ac was applied to all soybean plots on 5/17/01 and repeated 6/12/01 and 6/26/01. The soybean ridge tillage treatment received a ridge till cultivation 7/12/01. 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 9/11/01. The center 2 rows in each soybean plot was harvested for grain yield 10/25/01. All grain samples were weighed, and seed moisture and test weight was determined with Dickey John® GAC II grain analyzer. Corn and soybean grain yields were adjusted to 15 and 13% seed moisture, respectively. All data was subjected to statistical analysis and means were separated using Fisher Protected LSD at the 5% probability level.

**RESULTS AND DISCUSSION:** The environmental growing conditions were very favorable for corn and less than optimum for soybeans which experienced a three week dry period from mid July through early August. Corn yield data indicated no response to rotation and no rotation by tillage interaction (Table 1). Corn yield ranged from 98 to 119 bu/ac. The no-till yield of 101 bu/ac (averaged over rotation) was less than fall paratill-bed, fall disk + bed and disk + fall paratill-bed. Ridge till had similar yield to no-till, fall paratill-bed and fall disk + bed. Late season data indicated rotation and tillage had an effect on late season broadleaf (morningglory species) weed control. The rotation provided higher level of control than continuous corn (93% vs 84%). The fall disk + paratill-bed and disk + bed showed greater broadleaf weed control than ridge till and no-till. Soybean yield data indicated a rotation by tillage interaction (Table 2). No-till and fall paratill-bed were the only treatments which showed rotation increased yield. In continuous soybean, the fall paratill-bed, fall disk + fall paratill-bed and fall disk + bed had at least 10 bu/ac more yield than no-till and 6 bu/ac more than ridge till. Ridge till also produced about 4 bu/ac more than no-till. In the rotation, ridge till produced lower yield than all other treatments. No-till, fall paratill-bed, fall disk + paratill-bed, and disk + bed produced greater than 40 bu/ac and were higher than ridge till.

**Table 1.** Influence of tillage and crop rotation on corn yield and late season weed control in 2001, MAFES Northeast Branch Station, Verona, MS.

Tillage systems	-----Cropping sequence-----		
	Continuous Corn	Rotation (2 yr) Bn Fb corn	Mean
	-----Corn yield bu/ac-----		
1) No-till (NT)	97.9	104.6	101.2
2) Ridge-till (RT)	101.2	110.8	106.0
3) Fall paratill-bed (FPTB)	106.7	118.6	112.5
4) Fall disk + FPTB	117.1	118.4	117.8
5) Fall disk + bed	<u>106.7</u>	<u>119.0</u>	112.8
Mean	105.9	114.2	
Tillage (T) LSD (.05): 10.9 % CV: 10	Rotation (R) LSD (.05): NS	T x R LSD (.05): NS	
	-----% Broadleaf control 9/22/01-----		
1) NT	78	89	83
2) RT	76	94	85
3) FPTB	89	91	90
4) Fall disk + FPTB	90	91	93
5) Fall disk + bed	<u>86</u>	<u>96</u>	91
Mean	84	93	
Tillage (T) LSD (.05): 5 % CV: 6	Rotation (R) LSD (.05): 8	T x R LSD (.05): NS	

**Table 2.** Influence of tillage and crop rotation on soybean yield, population, and plant height at maturity in 2001, MAFES Northeast Branch Station, Verona, MS.

Tillage systems	LSD (.05) <sup>1</sup>	-----Cropping sequence-----		
		Continuous soybean	Rotation (2 yr) corn Fb Bn	Mean
-----Soybean yield bu/ac-----				
1) No-till (NT)	6.5	26.8	41.5	34.0
2) Ridge-till (RT)	NS	31.2	36.8	34.1
3) Fall paratill-bed (FPTB)	1.4	37.7	44.8	41.2
4) Fall disk + FPTB	NS	40.1	41.0	40.1
5) Fall disk + bed	NS	<u>38.9</u>	<u>42.9</u>	<u>40.9</u>
	Mean	34.9	41.4	37.8
	LSD (.05)	3.7	3.1	
-----Plants/ac x 1000-----				
1) NT		78.4	77.5	77.3
2) RT		80.8	73.8	77.3
3) FPTB		83.0	79.2	81.1
4) Fall disk + FPTB		87.1	85.9	86.5
5) Fall disk + bed		<u>83.0</u>	<u>87.6</u>	<u>85.3</u>
	Mean	82.5	80.8	81.6
Tillage (T) LSD (.05): 7.1				
Rotation (R) LSD (.05): NS				
T x R LSD (.05): NS				
% CV: 18.4				
-----Plant height (in) at Maturity-----				
1) NT		19.7	23.0	21.4
2) RT		21.5	22.8	22.1
3) FPTB		24.8	27.7	26.3
4) Fall disk + FPTB		25.9	27.1	26.5
5) Fall disk + bed		<u>26.5</u>	<u>26.6</u>	<u>26.5</u>
	Mean	23.6	25.5	24.6
Tillage (T) LSD (.05): 1.0				
Rotation (R) LSD (.05): 1.6				
T x R LSD (.05): NS				
% CV: 7.6				

<sup>1</sup> LSD (.05) comparison of continuous soybean and corn followed by soybean at each tillage treatment.