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Conservation Tillage Study

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Abstract
The project goal was to compare yields of three different tillage systems on a sloping, moderately well-drained soil (Nira), and on a nearly level, poorly-drained soil (Kalona) in a continuous corn and a corn-soybean system. These plots were started in 1990 and have continued to the present.

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Introduction

The project goal was to compare yields of three different tillage systems on a sloping, moderately well-drained soil (Nira), and on a nearly level, poorly-drained soil (Kalona) in a continuous corn and a corn-soybean system. These plots were started in 1990 and have continued to the present.

Materials and Methods

In the chisel-disk system, the plots previously in corn are chiseled in the fall. Both corn and soybean plots in this system are spring disked and field cultivated.

In the "alternative" tillage system, the continuous corn ground is fall chiseled and then planted in the spring without further tillage. In the corn-soybean rotation, the soybeans are no-till planted in narrow rows and the corn is planted following one spring pass with a field cultivator over the soybean stubble.

No fall or spring tillage was done in the no-till system. For planting in the no-till system, the planter is equipped with a knife and coulter for the fertilizer opener and a fluted coulter and finger row-cleaning wheels for residue clearing.

Nitrogen was spring applied and an N-P-K dry fertilizer was applied with the planter. Soil tests were high to very high so a rate of P and K below crop removal was applied.

Results and Discussion

Table 1 contains the past five-year yields for each tillage system and crop sequence on both the Nira and Kalona soils. Yields prior to 2010 were summarized in previous annual reports.

During the past five years in the continuous corn, the chisel-disk system has out-yielded the no-till system by about 10 bushels/acre on the Kalona soil but only by 2.4 bushels/acre on the Nira soil. On the rotated corn, five-year yield averages have varied by only 2 bushels/acre across tillage systems on the Kalona soil and by 8.6 bushels/acre on the Nira soil.

The largest yield differences between the no-till and chisel-disk systems usually occurred in years with wet springs and perhaps less-than-ideal conditions at planting. These conditions can increase problems with sidewall or planter furrow compaction, causing yield reductions in the no-till planted corn.

Soybean yields between tillage systems were very similar. Five-year averages showed less than a 1 bushel/acre difference across tillage systems on both the Kalona soil and Nira soil. This fits with other observations that soybeans usually do not suffer the sidewall compaction problems of corn and yields are similar between tillage systems. In the past five years, the 10-in. row no-till soybeans have not shown any yield difference from the 30-in. row soybeans.

Table 1. Yield results for Kalona and Nira Soils.

	Kalona soil			Nira soil		
	Corn on corn yield - bu/acre			Corn on corn yield - bu/acre		
	No-till	Alternative	Chisel-disk	No-till	Alternative	Chisel-disk
2010	178	138	199	114	104	85
2011	140	171	144	151	162	160
2012	78	87	104	100	92	109
2013	102	110	104	106	125	115
2014	232	229	233	199	211	213
Average	**146.1**	**146.9**	**156.8**	**134.1**	**139.0**	**136.5**
	Corn on soybeans yield - bu/acre			Corn on soybeans yield - bu/acre		
	No-till	Alternative	Chisel-disk	No-till	Alternative	Chisel-disk
2010	170	170	165	130	128	121
2011	159	150	147	149	156	168
2012	121	142	151	99	93	108
2013	140	134	146	132	123	139
2014	227	226	204	191	186	196
Average	**163.5**	**164.6**	**162.7**	**140.1**	**137.5**	**146.1**
	Soybeans yield - bu/acre			Soybeans yield - bu/acre		
	No-till	Alternative	Chisel-disk	No-till	Alternative	Chisel-disk
2010	53.1	48.3	48.4	60.8	55.1	62.7
2011	47.1	41.9	44.2	56.4	57.3	52.6
2012	58.7	62.9	61.4	51.5	50.5	53.1
2013	40.8	46.9	44.0	35.4	35.8	35.6
2014	68.8	68.3	69.5	67.5	73.3	72.4
Average	**53.7**	**53.7**	**53.5**	**54.3**	**54.4**	**55.3**