Row Crop Performance with Tillage Systems and Placement of Fertilizer

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Field trials were conducted at the NDSU Carrington Research Extension Center to examine row crop response to tillage systems (direct seeded = no-till), with emphasis on strip till. Crop and test years included: soybean, 2005-06, 2009; sunflower, 2006-09; corn, 2007-09; and pinto bean, 2007 and 2009. The dryland trials were established on a Heimdal-Emrick loam soil with spring wheat as the previous crop. Conventional-till treatments were tilled at a 2- to 4-inch depth in the fall and spring before planting, and also between plant rows during the growing season. Strip-till treatments were established in the fall (October or November) and in the spring (April, 2006-07) using a Yetter strip-till unit set at a depth of 3 to 7 inches that produced 8- to 12-inch wide tilled strips. Soybean was planted in 21-inch rows in 2005, and all crops were planted in 30-inch rows during 2006-09. In 2008-09, corn and sunflower treatments included 4- to 6-gal/A of 10-34-0 liquid fertilizer applied deep-band (5-7 inches) in the previous fall, and in-furrow and 2- by 2-inch band during planting. In 2009, fertilizer placement treatments were added to dry bean and soybean trials, which included 6 gal/A of 10-34-0 liquid fertilizer band applied as in-furrow, 2- by 2-inch, and mid-row during planting.

Table 1 summarizes seed yield of the four crops. Corn, soybean, and sunflower seed yield were similar among tillage systems. However, strip- and no-till soybean, and strip-till sunflower average yield tended to be higher than yield with conventional till. The three-year average corn yield tended to be highest with conventional till and lowest with no-till. Fall strip-tilled pinto bean had a greater seed yield compared to other tillage treatments in 2007. In 2009, conventional-till pinto bean yield was greater than yield with no-till. Across years, conventional- and strip-till yields tended to be greater than yield with no-till.

Table 1. Crop yield with tillage systems, Carrington, 2005-09.

	Soybean				Sunflower					Corn				Dry Bean		
	2005	2006	2009	ave	2006	2007	2008	2009	ave	2007	2008	2009	ave	2007	2009	ave
Tillage system	bu/A				lb/A					bu/A				lb/A		
Conventional	21.7	16.2	35.7	24.5	1160	1040	1173	733	1027	155.8	109.5	94.7	120.0	1820	2533	2176
No-till	22.6	18.1	38.5	26.4	1338	956	1253	730	1069	140.1	104.0	93.4	112.5	1886	2074	1980
Strip till (fall)	23.4	18.4	37.7	26.5	1134	1086	1501	870	1148	160.8	96.2	90.8	115.9	2129	2286	2208
Strip till (spring)	x	18.4	x	x	1379	942	x	x	x	166.9	x	x	x	1745	x	x
LSD (0.05)	NS			x	NS				x	NS			x	209	306	x

Discussion on crop response to fertilizer placement will be focused on corn. Table 2 indicates 2008-09 corn performance with tillage systems and placement of fertilizer. Due to a high level of soil phosphorus (20 ppm) in 2008, crop response with fertilizer placement did not occur except with days to silk. Silk date was delayed one to two days without banded fertilizer. In 2009, soil phosphorus was at a medium level (9 ppm). Plant emergence slightly varied among treatments. In-furrow fertilizer resulted in taller plants early in the season (data not shown) and earlier silk date compared to other strip-till fertilizer treatments. Corn seed yield and quality were similar among treatments. This likely was due to less than optimum level of soil nitrogen available during the growing season. However, yield tended to be highest with strip till with fall deep-banded fertilizer. Also, test weight tended to be highest and seed moisture lowest with in-furrow placed fertilizer in strip till.

Table 2. Corn response to tillage systems and placement of fertilizer, Carrington, 2008-09.

	2008						2009					
Tillage system/ fertilizer placement[1]	Plant Emerge	Silk Date	Stand	Seed Yield	TW	Seed Moisture	Plant Emerge	Silk Date	Stand	Seed Yield	TW	Seed Moisture
	Jday		plt/A	bu/A	lb/bu	%	Jday		plt/A	bu/A	lb/bu	%
Convent-ional/ 2x2 inch band	149	217	29,880	109.5	55.5	22.7	152	222	31210	94.7	51.4	22.0
No-till/ 2x2 inch band	150	218	27,890	104.0	54.6	22.5	153	223	30545	93.4	50.2	22.1
Strip till/ 2x2 inch band	150	218	31,875	96.2	54.9	23.6	152	222	31210	90.8	51.3	21.5
Strip till/ in-furrow	151	217	24,570	100.5	55.1	21.9	152	219	29215	88.0	52.9	19.6
Strip till/ fall band	150	218	26,560	95.6	54.0	24.2	151	222	33535	102.2	51.9	20.8
Strip till/ none	150	219	26,560	92.8	54.5	24.4	152	222	29550	94.0	51.3	20.4
LSD (0.05)	NS	1	NS				1	1	NS			1.3

[1]Strip till = fall (October 23, 2007; October 31, 2008); 10-34-0 applied at 5 gal/A in 2008 and 6 gal/A in 2009.

Tillage and fertilizer placement trials have been initiated during the fall of 2009 to continue testing of corn, dry bean, soybean and sunflower performance in 2010.