TILLAGE STUDIES IN FARGO-RYAN SILTY CLAY LOAM SOILS IN THE 2009-2010 CROP YEAR

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Introduction

Strip-till on heavy clay soils can be challenging, especially when corn is raised before the sugarbeet year in 22-inch rows. Previous years of work in no-till, strip-till and conventional till treatments in this study have demonstrated that strip-till can be successfully accomplished in normal to drier years, but being able to fall strip-till consistently is probably not possible when the fall season is wet. In 2009-2010, the fall was sufficiently wet to exclude a fall strip-till treatment; however, a spring strip-till treatment was possible. The objective of this trial was to compare no-till, conventional till and spring strip-till treatments for yield and quality in sugarbeet and yield in corn and soybean.

Methods

For the areas devoted to corn and sugarbeets in 2009-2010, the treatments have been imposed since 2005, so this was the 6th consecutive year of tillage studies. For the area in soybean 2009-2010, this was the 3rd consecutive year.

Soybean

Each plot was 11 feet wide (6, 22-inch rows) by 25 feet long. The experimental design was a randomized complete block with 3 treatments (conventional, no-till and strip-till) and 6 replications. The conventional till plots, which were in sugarbeets in 2009, were chisel plowed 8 inches deep on 11/19/2009. In the spring, the plots were field cultivated 3 inches deep on 5/20, the day before seeding. Roundup Max® at 22 oz/acre with 17 lb ammonium sulfate/100 gallons mix was applied 4/23 as a burndown. The previous year, 2009, the spring strip till using a shank in the spring produced a shallow (2-inch) valley in which the 2009 crop was planted. On either side of the valley was a small berm (about 2 inches high). The spring 2010 strip-till treatment used the residue cleaners only remove the residue and about ½ inch soil from one of the berms on 5/20, and the seed was planted the following day, 5/21 about 1 ½ inch deep. Peterson Farm Seed variety 1008 RR was seeded at a rate of 100,000 seeds/acre in 22 inch rows. Roundup Max at 22 oz/acre with ammonium sulfate was applied for post-emergence weed control on 6/2 and 6/18. The middle two rows of soybeans were harvested 9/22 using a Hege plot combine. Stand counts were made after harvest. Grain was dried in a forced air oven and then measured for yield, grain moisture and test weight.

Corn

Each plot was 11 feet wide (6, 22-inch rows) by 25 feet long. The experimental design was a randomized complete block with 3 treatments (conventional, no-till and strip-till) with 12 replications. The conventional till plots, which were in soybean in 2009, were chisel plowed 8 inches deep on 11/19/2009. A spring soil test to 2 feet showed residual nitrate of 58 lb/acre. Soil P was 23 ppm, K was 430 ppm and Zn was 1 ppm. Therefore, only N was applied to corn. The conventional till plots received 140 lb N as ammonium nitrate, the no-till and strip-till plots received 80 lb N/acre on 5/19. The conventional plots were field cultivated 3 inches deep on 5/20, the day before seeding. A strip-till tool was set to aggressively remove about ½ inch of the berm on one side of the 2009 seeding valley the day before seeding (5/20). Pioneer 39D85 was seeded 5/21 at a seeding rate of 40,000 seeds/acre. The no-till and strip-till plots received another 60 lb N/acre as 28-0-0 UAN dribbled between the rows on 7/15. Corn was harvested by hand (row 3) on 10/6. Ears were dried, then shelled for weight, moisture and test weight.

Sugarbeet

Each plot was 11 feet wide (6, 22-inch rows) by 25 feet long. The experimental design was a randomized complete block with 3 treatments (conventional, no-till and strip-till) with 12 replications. The conventional till plots, which were in corn in 2009 were mowed and chisel plowed 8 inches deep on 11/19/2009. The conventional plots were field cultivated 5/20 to a 3 inch depth after fertilizer N application. Residual soil nitrate in the spring was 30 lb N to 2 feet. Ammonium nitrate (34-0-0) at a rate of 100 lb N/acre was applied 5/19 to the conventional plots, and 40 lb N/acre were applied to the no-till and strip-till plots the same day. The strip-tiller was aggressively used on 5/20 to remove the residue and about ½ inch of berm from the 2009 spring stip-till pass. Sugarbeets were seeded at 65,000 seeds/acre on 5/21 using Hilleshog 4094 RR with Tachegaren and Poncho. An additional 60 lb N/acre was applied to no-till and strip-till plots on 7/15 using 28-0-0 UAN dribbled between the rows.

Sugarbeets were harvested 10/11 using a 2-row harvester. Beets were weighed and final stand counts were conducted. Tare bags were sent to the East Grand Forks Quality Laboratory for quality measurements.

Results

Soybean

There were no differences in final stand or yield with tillage treatment. Due to a high water table and subsequent high salinity in the western-most plots, some plots were not used in the analysis.

Table I. Soybean yield and final stand with tillage treatment, 2010.

Treatment	Final Stand (pl/25'row)	Yield, bu/acre
Conventional	252	42.4
Strip-till	241	49.8
No-till	236	47.8
LSD 5%	NS	NS

Corn

There were no difference in final stand, yield or test weight with tillage treatment. Corn yields were the best achieved on this plot from the onset of the study.

Table 2. Corn final stand, test weight and yield due to tillage treatment, 2010.

Treatment	Final Stand, plants/acre	Test Weight, lb/bu	Yield, bu/acre
Conventional	39,800	56.4	200
Strip-till	39,200	56.8	196
No-till	39,200	57.0	190
LSD 5%	NS	NS	NS

Sugarbeet

There were no differences in final stand, tonnage beet yield or recoverable sugar per acre. There was a small decrease in percent recoverable sugar and recoverable sugar per ton with no-till compared to the conventional till and strip-till treatments. The per cent loss to molasses was smaller with conventional tillage than the other two treatments.

Table 3. Sugarbeet yield final stand and quality due to tillage treatment, 2010.

Treatment	Final Stand Plants/ 100 ft row	Tons/acre	Per cent Recoverable sugar	Per cent Loss to molasses	RST Lb/t	RSA Lb/a
Conventional	87	27.4	16.7	1.18	334	9200
Strip-till	95	28.5	16.5	1.26	330	9400
No-till	89	29.8	16.3	1.27	325	9600
LSD 5%	NS	NS	0.3	0.05	4.9	NS

Summary-

In the 6th year of this long-term tillage experiment, there were no differences in yield of corn or soybean with no-till or strip-till treatments compared to the conventional treatment. Recoverable sugar per acre was no different with conventional till in sugarbeet compared with strip-till and no-till, although loss to molasses was higher for the conservation tillage treatments, and percent recoverable sugar was lower with no-till than the other two treatments. The major drawback of the strip-till system appears to be the inability of an operator to use a fall strip-till in some years with wet falls. In the 6 years of this study, fall strip-till was not possible in two of those years. Spring strip tended to be successful when a shank was not used, as in 2010, compared to 2009 when it was used, but formed a valley that was prone to temporary flooding periodically.