

REDUCED TILLAGE SYSTEMS FOR SUGARBEET ROTATIONS

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INTRODUCTION

Although many sugarbeet growers leave some residue on the soil following tillage operations in rotation, almost none of these tillage systems leave as much residue on the surface as no-till or one-pass seeding systems such as those practiced commonly west of the Red River Valley. One reason for the reluctance to move to more no-till systems is the need for row cultivation for weed control. With the promised coming of Roundup-Ready sugarbeets by the 2008 growing season, the need for cultivation and lower residue soil will be reduced.

Other barriers preventing movement to more residue cover are wetter and cooler soils. Strip-till has been shown by studies farther east to increase the rate of soil warming and drying similar to conventional till systems. It is the objective of this continuing study to examine no-till and strip till rotation systems with conventional till to determine the yield consequences of moving to these systems.

METHODS

A study was initiated during the spring of 2004 to examine tillage systems in sugarbeet production on the NDSU campus, in a Fargo silty clay loam soil. In 2004, corn was grown and harvested in 22-inch rows. The tillage treatments were then imposed that fall in two cropping blocks. Within each block, plots that were 11-feet wide by 30-feet long, were treated with either tillage using a chisel plow set at 8-inches deep in the fall, a spring strip-till pass, or left alone and seeded no-till in the spring. The treatments were organized using a randomized complete block design, with three tillage treatments and twelve replications. In 2005, sugarbeets followed corn in one block, and soybean followed corn in the other. Following harvest, a chisel plow was again used to till the conventional till plots, and the Yetter strip-till unit was used to prepare the field for spring seeding. The no-till plots remained untouched.

In the spring of 2006, soil samples taken to 2-feet in depth showed that P and K levels were adequate for both sugarbeet and soybean production. The sugarbeet area was supplemented with 25 lb N/acre as ammonium nitrate. Conventional-till plots were tilled using a tandem disc set at 3-inches prior to seeding on 5/22. Sugarbeets were seeded on soybean ground on 5/22. Soybeans were seeded on sugarbeet ground the same day. The sugarbeet variety Seedex Alpine was seeded in 22-inch rows with 5-inch in-row spacing. Counter 15 was applied in a surface band behind the sugarbeet press wheels, with drag-chain incorporation.

The soybean variety Traill RR was seeded in 22 inch rows at a seeding rate of 150,000 seeds/acre. Seeding of both sugarbeet and soybean was conducted using a John-Deere MaxEmerge 2 planter. Roundup was used to control weeds in the soybean block, while micro-rates and no cultivation was used to control weeds in the sugarbeet block. Hand-weeding in the sugarbeet plots was minimal, and was not influenced by tillage system.

Statistical analysis was conducted in SAS, using the PROC MIXED procedure, with spatial repeated methods to take out the spatial effects within the plot area.

RESULTS and DISCUSSION

No results associated with sugarbeet stand, production or quality, were influenced by treatment (Table 1). These data suggest that no-till and strip-till systems performed similarly. There were no harvest problems due to residue, nor were any seeding problems associated with residue apparent in the spring.

Table 1. Effect of tillage on sugarbeet stand, production and quality, Fargo, 2006.

Treatment	Yield	Stand	Sugar	SLM	RST	RSA	Amino-N
	tons/a	plants/100 ft	%	%			ppm
Conventional	24.0	196	17.8	1.22	332	9255	374
Strip-till	23.9	193	18.0	1.19	337	9076	384
No-till	23.4	228	18.0	1.17	336	8943	364
Significance	NS	NS	NS	NS	NS	NS	NS

SLM is sugar-loss to molasses, RST is recoverable sugar per ton, RSA is recoverable sugar per acre.

NS is no significance at the 5% probability level.

Soybean yield was not affected by tillage treatment (Table 2). This is consistent with other yield observations of soybean within North Dakota and in states farther east.

Table 2. Soybean yield as affected by tillage treatment, Fargo, 2006.

Treatment	Yield, bu/a
Conventional	25.0
Strip-till	23.9
No-till	20.9
Significance	NS

The campus tillage study will continue in 2007, with the blocks being seeded to soybeans following sugarbeets and corn following soybeans.

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