

1976 Annual Report Project 01563

Tillage-Planting Systems for Crop Production

1976 provided the second year of data from this project on Chalmers silty clay loam at the Agronomy Farm. Plow, chisel, ridge and no-till tillage systems were compared for continuous corn, corn after soybeans, soybeans after corn and continuous soybeans.

Plowing, chiseling and ridging were done in the fall. Ridges were re-shaped with a Lilliston rolling cultivator in the spring. Seedbed preparation on plowed and chiseled plots included discing once and field cultivating once. Anhydrous ammonia was applied preplant at 180 lbs/Ac actual N and 100 lbs/Ac of 18-46-0 starter was used for corn. No fertilizer was applied for the 1976 soybeans.

Corn plots were planted on April 29 and 30, and soybeans were planted May 10 and 11. Seeding rates calculated from weight of seed used were as follows:

	<u>Corn, seeds/Ac</u>	<u>Soybeans, lbs/Ac</u>
Plow	24,172	44.5
Chisel	23,235	43.8
Ridge	24,612	46.3
No-till	23,586	47.5

Preemergence herbicides used were Atrazine (2 lb.) - Lasso (2½ qt.) - Paraquat (1 pt.) for corn after corn; Bladex (2 lbs.) - Lasso (2½ qt.) - Paraquat (1 pt.) for corn after soybeans; and Lorox (2 lb.) - Lasso (2½ qt.) - Paraquat (1 pt.) for all soybeans. Herbicides were used in 40 g/Ac of water for all pre-emergence treatments. In addition, Basagran was used post-emergence on all soybeans for better nutsedge and smartweed control. All soybeans were also cultivated, but corn was left uncultivated. Milkweeds were controlled by hand in all plots.

Four rows from the center of each 12-row soybean plot were combine harvested on Oct. 5. Three rows from the center of each 12-row corn plot were combine harvested on Nov. 4.

RESULTS AND DISCUSSION

Stand, plant height, and harvest data for both corn and soybeans are summarized in Table 1. Significant F values for these factors are indicated in Table 2.

Table 1. Corn and soybean response to tillage, Chalmers si. c. 1., 1976

Prev. Crop	Tillage	CORN				SOYBEANS		
		Stand 4 wks.	Ht. 4 wks.	Ht. 8 wks.	% Moist.	Bu/Ac	Ht. 8 wks.	Bu/Ac
Corn	Plow	22,782	13.8"	70.3"	23.0	140.4	18.4"	54.4
	Chisel	23,315	13.7	66.6	23.4	147.4	17.4	50.7
	Ridge	22,907	12.1	68.0	23.4	154.7	18.9	50.9
	No-till	20,660	12.3	57.9	24.3	153.7	16.1	48.3
Beans	Plow	22,750	15.5	70.4	22.9	145.1	17.6	48.0
	Chisel	22,472	15.2	72.4	23.1	140.8	17.2	45.5
	Ridge	22,032	13.2	69.9	23.1	154.7	18.5	46.0
	No-till	19,722	12.7	66.3	23.1	143.4	17.3	41.4

Table 2. Factors having sig. dif. F. values at .05, Chalmers si. c. 1., 1976

	CORN				SOYBEANS		
	Stand 4 wks.	Ht. 4 wks.	Ht. 8 wks.	% Moist.	Bu/ Ac	Ht. 8 wks.	Bu/ Ac
Reps							
Prev. crop		✓	✓				✓
Tillage	✓	✓	✓	✓	✓	✓	✓
Prev. crop X tillage			✓				✓

Table 3. Corn and soybean yields, Chalmers si. c. 1. 1975-76

Prev. crop	Tillage	Corn, Bu/Ac			Soybeans Bu/Ac		
		1975	1976	Avg.	1975	1976	Avg.
Corn	Plow	176.1	140.4	158.2	56.4	54.4	55.4
	Chisel	165.0	147.4	156.2	57.6	50.7	54.1
	Ridge	141.4 ^{a/}	154.7	148.0	49.9	50.9	50.4
	No-till	165.4	153.7	159.5	56.0	48.3	52.1
Soybeans	Plow	167.4	145.1	156.2	52.7	48.0	50.3
	Chisel	177.1	140.8	158.9	52.2	45.5	48.8
	Ridge	149.5 ^{a/}	154.7	152.1	49.1	46.0	47.5
	No-till	175.2	143.4	159.3	47.8	41.4	44.6

^{a/}Poor stand & plow growth due to shallow planting and a dry spring.

Corn -- Stands for plow, chisel, and ridge systems were very similar, but no-till stands were 2,000-3,000 ppa lower than for other systems, following both corn and soybeans. In this dry year, the reduced no-till stand should have had little negative effect on yield.

Corn after corn plant growth was similar to that in past years, with no-till about 12 inches shorter than conventional corn at eight weeks. No-till corn growth was reduced about one-half this amount when corn followed soybeans. No-till corn was one percent wetter at harvest than corn in other systems following corn, but had about the same moisture following soybeans.

Ridge and no-till corn yields were highest, and plow yields lowest, with chisel intermediate, following corn. Following soybeans, ridge yield was again highest, with little difference among other systems. This yield pattern is essentially the opposite of our 1975 data, resulting in little difference among two-year average yields (Table 3). Particularly surprising were the no-till yields -- 10 bu/Ac better following corn than following soybeans. Apparently, climatic factors favored surface residue systems in 1976. Unusual success with no-till corn after corn was also reported by Dr. Barber at the Purdue Agronomy Farm and by Dr. VanDoren in Ohio for the 1976 season.

Soybeans -- While corn yields were essentially reversed from 1975, both plant growth and yield of soybeans in 1976 were very similar to 1975. Yield differences due to tillage were small, with plow highest, chisel and ridge intermediate, and no-till lowest. Again in 1976 all systems yielded less following soybeans than after corn, the average difference being about five bu/Ac. Giant foxtail offered more competition in no-till beans after beans than in no-till beans after corn, but cause of the reduced beans after beans yield for other systems was not apparent.

Soil temperatures -- Max.-min. thermometers were installed in one rep. of the cont. corn plots for each of the four tillage systems in 1976. Dial-type thermometers were inserted into corn after bean plots when max.-min. temperatures were read each day. These readings should be compared with those listed at "current" in cont. corn plots. Readings were taken near mid-day. All readings were taken at a 4-inch depth in the row.

Table 4. Soil temperatures, Chalmers si. c. l., 1976

Tillage	Corn after corn						After beans	
	5/5-6/7			6/8-7/8			current temp.	
	Max.	Min.	Current	Max.	Min.	Current	5/5-6/7	6/8-7/8
Plow	66	57	62	75	69	72	62	74
Chisel	66	56	60	75	68	72	62	73
Ridge	65	57	61	76	70	73	62	74
No-till	62	56	59	72	65 69	71	60	74

Soil temperature differences among systems for corn after corn were similar to past years, with no-till averaging 3-4° below other systems. However, maximum temperatures were 9-10° F lower than maximums recorded in 1975 in these same plots for the first six weeks after planting. While low spring soil temperatures are usually associated with wet soils, this was not the case in 1976. The season was unusually dry until late June.

Weed control -- The milkweed problem gets worse each year in non-plowed plots. Hand hoeing will again be necessary in 1977 in order to evaluate other aspects of tillage. Nutsedge was less competitive in 1976 due to the dry spring but was still a problem in lower areas of Rep. I. Giant foxtail was serious enough in no-till soybean plots to have had some effect on yield. It was worse in beans after beans than in beans after corn. Lasso rates will be increased in 1977 for better control. Smartweeds and morning glory increased slightly in no-plow soybeans and may be a significant problem in the future.

PREPARATION AND PLANS FOR 1977

Plowing, chiseling, and ridging were completed last fall. The straight chisel points used left considerably more surface residue cover than the twisted chisel points used in past years. Phosphorus and potassium (200#/Ac 0-46-0 + 300#/Ac 0-0-60) were broadcast with an easy-flo spreader before fall tillage. Soil tests indicate a need for lime, and it will be applied after harvest in 1977.

Sencor will replace Lorox in the preemergence weed control mixture for soybeans in 1977 to achieve broader-spectrum weed control. Also, Lasso will be increased to 3 qts./Ac for better foxtail control. Control of problem weeds remains the number-one threat to no-plow tillage in this experiment, just as it does in many Indiana farm fields.

Dr. Moldenhauer's J.D. max-emerg planter will be evaluated for ridge planting, if it arrives before the planting season. If it is more satisfactory than the A.C. planter we have been using, it will be used on all ridged plots.

A special effort will be made in 1977 to get data relating corn and soybean diseases and soybean nematodes to tillage system. If personnel are available, soil physical properties and soybean rooting patterns will also be studied in 1977.