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Effect of Planting Dates of No-Till and Conventional Corn on Soils with Restricted Drainage

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EFFECT OF PLANTING DATES OF NO-TILL AND CONVENTIONAL CORN ON SOILS WITH RESTRICTED DRAINAGE

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No-till corn is best adapted to well drained soils. It is on these soils that no-till has been most successful and the practice most widely accepted. On soils that are moderately well to somewhat poorly drained, no-till corn can also be successful but more management is required. Three areas which require more attention are weed control, nitrogen management and planting. It has long been recognized that no-tilling results in cooler soil temperatures which can delay and reduce seed germination and seedling emergence. Additional research also indicates that diseases which attack the corn seedling in the emergence stage are more prevalent in no-till stands. These diseases are most active when the soil is both wet and cold, thus causing an already slowly growing seedling greater potential stress. It is presently recommended that no-till corn producers delay the start of planting four to five days on well drained soils to allow these cooler soils to warm sufficiently.

After field observations of problems in early planted no-till corn on soils with restricted drainage, it was thought that planting delays greater than four to five days might improve no-till stands and yields. The main concern with greater planting delays, however, was whether or not delayed planting would decrease yields as is the case with corn under conventional tillage.

To help answer questions about these problems, we conducted an experiment at Princeton from 1979 through 1982 on a moderately well to somewhat poorly drained soil.

HOW IT WAS DONE

The study site was on a transitional soils area composed of Zanesville, Tilsit, and Johnsburg soils. A fragipan ranges from 18" to 28" below the surface. Pioneer 3369A corn was planted by conventional and no-till methods in early May, mid-May, and early June (Table 1) at approximately 22,000 seeds per acre with a no-till planter at a depth of about 1 to 1½ inches. The mulch on the no-till plots was a mixture of corn residue and a killed wheat cover crop. A soil insecticide was applied in the row and the weed control program consisted of appropriate contact and preemergence herbicides. N was applied at the rate of 150 lb./ac about 5 weeks after planting and P and K were added according to soil test recommendations. The design was a randomized complete block with 4 replications.

TABLE 1. PLANTING DATES

Planting Date	1979	1980	1981	1982
1(early)	**	April 25	May 2	April 28
2(mid)	May 17	May 12	May 28	May 12
3(late)	June 19	June 6	June 13	June 9

** Not planted due to excessive wetness.

EFFECT ON YIELD

Corn yields are shown in Table 2. Over the 4 years, no-till yields were higher than conventional yields for the second and third planting dates and were equal to them on the first planting date. Overall, no-till corn yields were higher than conventionally tilled corn. Weather data for two week periods following planting are shown in Table 3. This is a rough measure of the soil moisture conditions during this time. It doesn't take into account evaporative conditions and moisture content prior to planting. During the years that were wetter immediately after planting (1979 and 1981), conventionally tilled corn yields were comparable to or higher than those grown no-till. However, no-till yields were considerably better during the drier years (1980 and 1982). Conventionally tilled corn yields decreased consistently and dramatically with each additional delay in planting date. It is thought that yields of the conventionally tilled corn decreased with time due to increased moisture stress with later planting. May 1 is usually about as early as conventionally tilled corn can be planted on these soils due to wetness.

The no-till corn yields decreased only at the last planting date, and the mid-May planting was slightly better than the early May planting. Mid-May appeared to be the optimum planting date for no-till corn on these soils. This is about 2 weeks later than the optimum for conventionally tilled corn. Evidently, the soil temperature had warmed sufficiently to produce a vigorous growing seedling and the chances of encountering excessively wet conditions were reduced by that date. The second planting date was the best for 2 of the 3 years when all planting dates were compared in the no-till corn. The weather data suggests that the optimum planting conditions for the second planting date may have been more due to temperature than soil wetness, although both would have been involved.

It is quite interesting to note that yields of no-till corn held up with the later planting dates much better than did conventionally tilled corn. This was probably due to the greater soil moisture available in the no-till plantings. The no-till yields from the early June plantings were as good as the conventionally tilled yields from mid-May plantings, and the mid-May no-till plantings yielded better than the early May conventionally tilled plantings. This indicates that the planting dates are not nearly as critical for no-till as for conventional till on these soils and that no-till would be the preferred planting method during years that delayed planting is unavoidable due to weather conditions. Even early June no-till planting gives very adequate corn yield performance on these soils.

EFFECT ON STAND

Final plant populations (Table 2) were generally lower for no-till than conventional till, but the differences were not great. Stands were always greater for conventional till at the last planting date. During the wetter years, (1979 and 1981), the conventional till stands were better than no-till stands at the two earlier planting dates. However, the no-till stands were better during the drier years (1980 and 1982). Final plant stands were not closely related to grain yields.

SUMMARY AND CONCLUSIONS

Although there was year to year variation, no-till planted corn on moderately well to somewhat poorly drained soils yielded as well or better than conventionally planted corn. Generally no-till corn yields were greater than conventional till yields during drier years.

Early planting was not as critical for no-till as for conventional till. Yields from conventional till decreased rapidly with each planting date after early May. Yields with no-till planting increased from early May to mid-May and decreased less sharply than conventional till after that time.

It appeared that the optimum planting date on these soils was early May for conventional tillage and mid-May for no-till.

No-till planting was clearly superior to conventional till at the later planting dates. The no-till corn yields for the early June planting were as great as the mid-May conventional till plantings and the mid-May no-till plantings were greater than the early May conventional till plantings.

It appeared that the planting date for no-till corn on these soils should be postponed until mid-May to improve the chances of good stands and increased yields.

TABLE 2. EFFECT OF TILLAGE AND PLANTING DATE ON CORN YIELDS AND STAND COUNTS

Planting date	Corn yield (bu/acre) CT*	NT*	Plants/acre (x1000) CT*	NT*
		1979		
1	-	-	-	-
2	134	104	18.4	16.0
3	133	127	21.8	20.1
		1980		
1	87	91	19.9	20.0
2	57	104	20.1	22.0
3	44	63	21.3	19.9
		1981		
1	150	134	17.4	16.0
2	100	112	13.9	13.8
3	112	128	19.5	17.6
		1982		
1	127	143	19.8	19.2
2	123	175	18.3	19.4
3	42	90	18.9	16.1
		Average (1980-82)		
1	121	121	19.0	18.3
2	91	130	17.4	18.4
3	68	94	20.0	17.9

* CT - Conventional Tillage ** NT - No-tillage

TABLE 3. RAINFALL AND AIR TEMPERATURES FOR TWO WEEKS FOLLOWING EACH PLANTING DATE.

Planting date	Rainfall (inches) Total	Rainfall (inches) Departure*	Temperature Average	Temperature Departure*
		1979		
1	3.3	+0.9	66	+1.5
2	3.8	+1.4	66	-2.5
3	0.7	-1.1	75	0.0
	7.8	+1.2		
		1980		
1	1.1	-1.3	56	-7.0
2	3.9	+1.5	67	0.0
3	0.0	-1.8	71	-2.0
	5.0	-1.6		
		1981		
1	1.0	-1.4	61	-3.5
2	6.1	+4.2	76	+4.5
3	2.3	+0.5	77	+2.5
	9.4	+3.3		
		1982		
1	0.4	-2.0	64	+0.5
2	3.7	+1.3	71	+4.0
3	1.2	-0.6	72	-2.0
	5.3	-1.3		

*Departure from the normal for that period.

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