6-1985

After 15 Years of No-Tillage Corn

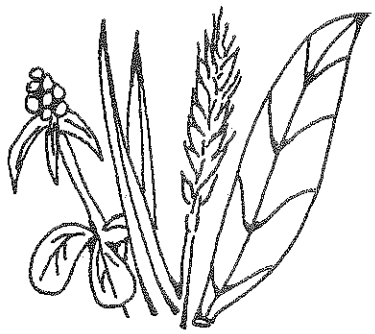
Robert L. Blevins
University of Kentucky

COOPERATIVE EXTENSION SERVICE

University of Kentucky, College of Agriculture
Lexington, Kentucky 40546

Department of Agronomy

Soil Science News & Views



Vol. 6, No. 6 June 1985

AFTER 15 YEARS OF NO-TILLAGE CORN

R.L. Blevins

Farmers shifting from a system of agricultural production that includes intensive tillage operations to a reduced or no-tillage system are often concerned about how this change may affect soil properties and productivity. No-tillage leaves the residues and fertilizers on the soil surface with no mechanical incorporation and may result in soil properties greatly different from plowed soils.

In the spring of 1970, a field experiment was initiated at Lexington on a Maury silt loam soil to compare no-tillage and conventional tillage (moldboard plowing and discing) for continuous production of corn with different N rates. Nitrogen treatments of 0, 75, 150 and 300 lb/acre N as ammonium nitrate were surface broadcast each year at corn planting time.

Soil Properties

Changes in soil properties which have taken place during the 15 years of the study include an increase in organic matter and soil organic nitrogen under no-tillage. After 10 years, the surface 0 to 2 inches of soil contained twice as much organic matter and organic N as conventionally tilled treatments. Soil pH for unlimed plots decreased at a faster rate with no-tillage than with conventional tillage especially at high N fertilizer rates. However, this acid producing effect was found to easily be corrected by timely applications of lime. Where lime was applied according to soil test recommendations the pH of the surface soil was slightly higher under no-tillage than conventional tillage. Bulk density did not change suggesting that soil compaction was not a problem with either tillage system. Although quantitative measurements have not been made, visual observations indicate the higher levels of organic matter at the soil surface under no-tillage has improved soil aggregation and stability.

Corn Yields

Corn grain yields for the long-term study are shown in Table 1. There was little response to N beyound the 150 lb/acre rate for no-tillage and not much yield increase beyond the 75 lb/acre N rate under conventional tillage. The lower yield for no-tillage

beyond the 75 lb/acre N rate under conventional tillage. The lower yield for no-tillage at the lower N rates is commonly observed on well-drained soils such as the Maury. During the past few years, this yield response seems to be changing some. In 1984, all no-tillage treatments outyielded the conventional tillage treatments (Table 1). The build-up of organic matter that has occurred at the soil surface under no-tillage over 15 years appears to be contributing more to the supply of available N for the corn crop than in earlier years of the study. Although not clearly so, Table 1 suggests that a reduction in yield has occurred over time for both no-tillage and conventional tillage systems. However, making a valid comparison of yields over time is complicated by seasonal climatic variations. The low yields for 1982-through 1984 were related to moisture conditions that ranged from disastrous in 1983 to less than favorable rainfall distribution in 1982 and 1984.

Summary

The data from this study shows that, under similar soil and climatic conditions, corn can be grown continuously using no-tillage management without harming the physical or chemical quality of the soil. Where soil acidity was controlled by liming, control of weeds was not a problem during the 15 years, nor were insects or diseases a problem. However, it is not suggested that continuous no-tillage corn production for long periods is an ideal management practice for Kentucky. The use of other crops in a rotation system is usually helpful in controlling possibly troublesome weed, insect and disease populations, and may produce higher yields than monoculture systems of the crops.

Table 1. Summary of corn yields under no-tillage and conventional tillage management with four rates of N fertilizer. Lexington(1970-84).

	Fertilizer Applied lb/acre							
Year	0		75		150		300	
	NT	CT	NT	CT	NT	CT	NT	CT
	Grain yields, bu/acre							
1970	90	91	99	90	99	90	105	90
1971	99	151	166	180	170	159	173	162
1972	118	130	153	161	149	159	155	165
1973	66	66	119	123	126	129	121	135
1974	89	129	154	162	165	163	167	162
1975	60	78	97	80	100	82	106	96
1976	69	85	144	129	156	141	170	141
1977	58	88	106	123	109	127	115	132
1978	33	67	78	100	85	97	99	100
1979	73	68	118	130	123	124	121	123
1980	58	95	113	126	136	129	125	141
1981	79	79	117	111	144	124	150	143
1982	50	53	66	88	95	97	92	100
1984	60	55	92	74	110	86	94	80
Avg.1970-84	72	88	116	120	126	122	128	126

*No grain yield was obtained in 1983 due to severe drought.