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## 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

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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.

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Fertilizer Applied lb/acre				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	150		300		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	CT	<u>NT</u>	CT		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	acre		- <b></b> -		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	90	105	90		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	159	173	162		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	159	155	165		
1975 60 78 97 80 100   1976 69 85 144 129 156   1977 58 88 106 123 109   1978 33 67 78 100 85   1979 73 68 118 130 123   1980 58 95 113 126 136   1981 79 79 117 111 144   1982 50 53 66 88 95	129	121	135		
197560789780100197669851441291561977588810612310919783367781008519797368118130123198058951131261361981797911711114419825053668895	163	167	162		
1977588810612310919783367781008519797368118130123198058951131261361981797911711114419825053668895	82	106	96		
1977588810612310919783367781008519797368118130123198058951131261361981797911711114419825053668895	141	170	141		
1979 73 68 118 130 123   1980 58 95 113 126 136   1981 79 79 117 111 144   1982 50 53 66 88 95	127	115	132		
1980 58 95 113 126 136 1981 79 79 117 111 144 1982 50 53 66 88 95	97	99	100		
1981 79 79 117 111 144 1982 50 53 66 88 95	124	121	123		
1981 79 79 117 111 144 1982 50 53 66 88 95	129	125	141		
· · · · · · · · · · · · · · · · · · ·	124	150	143		
	97	92	100		
	86	94	80		
lvg.1970-84 72 88 116 120 126	122	128	126		

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

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