1970

No-Tillage -- Suitability to Kentucky Soils

Robert L. Blevins
University of Kentucky

*CROPS *SOILS

UNIVERSITY of KENTUCKY • COLLEGE of AGRICULTURE

AGRONOMY NOTES

DEPARTMENT of AGRONOMY Lexington 40506

Vol. 3, No. 2

NO-TILLAGE — SUITABILITY TO KENTUCKY SOILS

by

R. L. Blevins

As more farmers adopt no-tillage methods of farming the question arises whether or not all soils are suited to this practice. To get an idea of how well suited the no-tillage method of corn production is to a wide variety of soils, we made a survey in five different physiographic regions of Kentucky in 1969.

The soils studied and corn yields obtained are listed in Table 1. This table also indicates some of the soil properties which suggest how intensively the soil can be used, and how well suited it is for corn production. Since this was a survey, we had no experimental control on factors such as corn variety, planting dates, fertility treatments, and climatic differences. These variables prevent us from making reliable comparisons among soil types or physiographic regions. These data are presented for the purpose of summarizing no-tillage corn yields from a large number of farms over a wide range of soil conditions. The average corn yield of the 40 sites reported in Table 1 was 125 bushels per acre.

We did have a few study sites where corn variety, fertilizer applied, and planting dates were the same for a given soil. The only difference was in the method of tillage employed at these sites. At these sites we compared no-tillage with conventional corn production in the same fields (Table 2). Four out of six soils studied produced higher yields under no-tillage management in 1969, while the other two showed no difference in yield between the two systems.

An example of the effect of this type of corn production on steep slopes was observed on a moderately steep (25%) Baxter cherty silt loam soil. We would normally recommend this particular soil with 25% slope to be kept in continuous cover since the erosion hazard would be severe under conventional tillage practices. On this particular field, corn was seeded into a heavy fescue sod which was then chemically killed. This provided an excellent mulch cover which controlled erosion even during periods of excessive runoff brought about by summer storms. These storms resulted in approximately three inches of rainfall on June 23rd and two inches more on June 29th. Under these conditions this field produced 134 bushels of corn per acre with no visable evidence of erosion during the growing season.

A high percentage of soils in Kentucky suitable for cropland are characterized by having silt loam surface layers. Comparisons of corn production by conventional cultivation versus no-tillage on soils with silt loam textures shows that no-tillage systems conserve more moisture and generally produce higher corn yields. This is

Agricultural and Home Economics Extension Service of the University of Kentucky, the United States Department of Agriculture, cooperating. Charles E. Barnhart, Director. Issued in furtherance of the Acts of May 8 and June 30, 1914.

supported by Van Doren (Crops and Soils Magazine, Dec. 1969), who reported that Ohio soils with high silt contents in the surface produced higher yields under no-tillage than under conventional methods. In our study (Table 1) yields of 160 and 141 bushels per acre of corn were produced on loam and fine sandy loam surface soils, respectively. In addition to moisture conservation, no-tillage planting seems particularly suitable for Kentucky because of the large acreage of sloping land with medium textured surfaces which present a high erosion hazard under conventional tillage.

As a result of the soil and water conservation benefits of the system, it seems that no-tillage generally is suitable over the range of soil and slope conditions in Kentucky normally adapted to intensive corn production. No-tillage also would seem suitable for use on an additional acreage of sloping land which we normally do not cultivate. The old adage "the better the soil, the better the crop," however, is still meaningful. There is still some question as to the suitability of no-tillage methods on wet, clayey soils in Kentucky. Additional studies are needed to evaluate the applicability of such management practices on these soils.

This new method of farming significantly increases the potential for row crop production in Kentucky without increasing the risk of erosion losses or soil deterioration. In addition to making it possible to crop more intensively, this new system of farming also results in increased yields on many of our soils.

Table 2. A comparison of corn yields on six different soils using no-tillage vs. conventional tillage methods during 1969.

Soil	Soil Texture	Soil Slope	Parent Material	Corn Yield bu./Ac. No-tillage	Corn Yield bu./Ac. Conventional
Crider	silt loam	3%	loess over limestone	143	128
Donerail*	silt loam	3%	phosphatic limestone	136	117
Faywood	silty clay loam	7%	limestone	132	133
Grenada	silt loam	2%	loess over acid sand-stone and shale	104	104
Loradale*	silt loam	6%	phosphatic limestone	130	110
Lowell	silt loam	8%	limestone	149	132
			Average ------------	132	121

*Data from S. H. Phillips experimental plots in Woodford and Fayette Counties.

Table 1. A summary of data collected on no-tillage corn plots (1969) including yield, type of sod, kind of soil and pertinent soil properties.[1/]

Soil	Surface Texture	Slope	Depth[2/]	Soil Drainage	Soil pH 0-7"	Planting Date	Type of Sod	Corn Yield bu./Ac.
Eastern Pennyroyal								
Cumberland	Silt loam	3%	Deep	Well-drained	6.3	May 3	Rye	120
Cumberland	Silty clay loam	14%	Deep	Well-drained	6.4	May 3	Rye	100
Huntington	Silt loam	1%	Deep	Well-drained	6.4	May 3	Rye	129
Fredonia	Rocky silt loam	3%	25-40"	Well-drained	6.2	May 15	Fescue	108
Pembroke	Silt loam	4%	Deep	Well-drained	5.6	——	Fescue	133
Mountview	Silt loam	2%	Deep	Well-drained	6.8	May 1	Fescue	145
Mountview	Silt loam	4%	Deep	Well-drained	——		Fescue	137
Mountview	Silt loam	3%	Deep	Well-drained	——		Rye	132
Baxter	Silt loam	25%	Deep	Well-drained	6.4	May 1	Fescue	134
Baxter	Cherty silt loam	18%	Deep	Well-drained	——		Rye	133
Elk	Silt loam	1%	Deep	Well-drained	6.1	May 15	Fescue	144
Dickson	Loam	3%	26"*	Moderate	6.6	May 15	Fescue	160
Hartsell	Fine sandy loam	6%	30"	Well-drained	6.6	May 15	Fescue	141
Taft	Silt loam	2%	20"*	Somewhat poorly	——		Fescue	151
Dunning	Silty clay loam	1%	Deep	Poorly-drained	5.7	May 7	Fescue	97
Dabney	Silt loam	9%	Deep	Well-drained	6.3	April 4	Fescue & Clover	105
Outer Bluegrass & Knobs								
Bedford	Silt loam	10%	21"*	Moderate	6.6	May 5	Orchard Grass	129
Brashear	Silt loam	4%	Deep	Well-drained	5.5	May 5	Bluegrass	110
Faywood	Silty clay loam	7%	30"	Well-drained	5.5	May 3	Wheat	132
Hagerstown	Silt loam	4%	Deep	Well-drained	5.6	May 3	Wheat	122
Johnsburg	Silt loam	1%	22"*	Somewhat poorly	6.2	May 3	Orchard Grass & Fescue	110
Lowell	Silt loam	8%	Deep	Well-drained				
Inner Bluegrass								
Donerail	Silt loam	3%	Deep	Moderate	5.0	April 26	Bluegrass	136
Donerail	Silt loam	1%	Deep	Moderate	——	April 26	Bluegrass	152
Loradale	Silt loam	6%	Deep	Well-drained	6.8	May 22	Bluegrass	130

(Table continued on following page)

Table 1. (Cont.)

Soil	Surface Texture	Slope	Depth[2/]	Soil Drainage	Soil pH 0-7"	Planting Date	Type of Sod	Corn Yield bu./Ac
Western Coalfields								
Falaya	Silt loam	1%	Deep	Somewhat poorly	5.2	May 13	Continuous Corn	150
Grenada	" "	6%	22"*	Moderate	5.7	May 24	Fescue	100
Grenada	" "	2%	26"*	Moderate	5.8	April 25	Rye	104
Loring	" "	9%	28"*	Moderate to well	5.8	April 25	3rd yr. No-til	162
Loring	" "	10%	30"*	" " "	6.1	April 25	2nd yr. No-til	154
Loring	" "	3%	30"*	" " "	6.4	April 27	3rd yr. No-til	160
Western Pennyroyal								
Bedford	Silt loam	1%	18"*	Moderate	7.0	April 26	Fescue	88
Crider	" "	10%	Deep	Well-drained	6.0	April 22	Fescue	76
Crider	" "	4%	Deep	Well-drained		April 27	Fescue	143
Crider	" "	3%	Deep	Well-drained	6.3	April 15	Fescue	75
Dickson	" "	4%	25"*	Moderate	6.8	May 30	Red Clover	89
Huntington	" "	2%	Deep	Well-drained	6.5	May 30	Alfalfa	192
Pembroke	" "	2%	Deep	Well-drained	5.8	April 24	Wheat	108
Pembroke	" "	3%	Deep	Well-drained	6.9	April 22	Fescue	80
Pembroke	" "	8%	Deep	Well-drained	7.1	April 9	Rye	91

1/ The author is indebted to Extension Specialists Hugh Hurst, Cliff Taylor, J. T. Williams, and John Wills, who assisted in collecting this data.

2/ In this column, "Deep" means that there is no layer restricting root penetration to a depth of 42 inches.

* Fragipan horizon that may restrict root penetration.