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● Department of Agronomy

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DOES NO-TILL CHANGE SOIL MANAGEMENT PRACTICES?

R. L. Blevins

● Successful no-tilling requires a different approach to soil management practices. Since continuous no-tillage systems leave residues on the soil surface without mechanically mixing them into the plow layer and since lime and fertilizer are surface-applied, no-tilled soils have biological, chemical and physical properties contrasting with those of a plowed soil. For any crop production system to be widely accepted and used it must provide and maintain desirable physical properties of the soil, control erosion and replace nutrients removed by crops and other losses. This can be accomplished in a no-till system if proper management is used.

Surface Residues

The distinguishing characteristics of no-tillage crop production systems with respect to surface residues is the approach to managing crop residues. In no-tillage, emphasis is on keeping the residues on or near the soil surface to reduce soil and water losses and to improve weed control. Because of this, it is possible to increase the level of organic matter and organic nitrogen in the surface soil layers. Uniform distribution of residues on the soil surface is desirable and this may require chopping or shredding of previous crop residues. Although concern has been expressed about excessive accumulation of surface residues with no-till, they usually decompose rapidly enough under Kentucky's climate to prevent the problem. If the residues do become a problem, a once-over disking operation will usually alleviate it. Although it is not necessary to turn-plow the soil every 2 or 3 years, use of crop rotations is usually beneficial for insect, disease and weed control.

Managing Soil Fertility

Broadcast applications of nitrogen, phosphorus and potassium fertilizers have proven to be practical and effective in a no-tillage system, even without incorporation and mixing following fertilizer application as in conventional tillage.

● One big difference in no-tillage is more rapid acidification of the surface soil. In no-tillage cropping systems the zone of acidification occurs primarily in the upper

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4 inches of soil. A rapid decrease in surface pH is caused by surface applied N-fertilizer and surface concentration of decaying residues. However, on crops such as soybeans that receive little or no N-fertilizer, the acid producing effect is not a problem. This acidification of the soil surface can be easily corrected by surface-applying lime based on recommendations from a routine lime requirement soil test.

Because more rapid changes in soil fertility occur in the upper part of the soil, it is important that samples collected for soil test analysis be taken from the 0 to 4-inch layer rather than the plow-layer depth normally recommended for conventional tillage management systems. For no-tillage corn production where high N rates are used it is important to soil test more frequently, at least every two years.

If soils with slow internal drainage are used for no-tillage, certain management practices should be used which differ somewhat from the more conventional tillage methods. Since the presence of surface residues causes surface soils to remain wetter and cooler than a plowed soil, planting dates of corn will usually need to be delayed until seed-zone temperature warms enough for good germination. Also, special effort must be made to obtain the desired plant populations (through careful planting depth, proper seed coverage, and/or higher seeding rate).

Although careful management of nitrogen fertilizer is necessary on soils which drain slowly even when using conventional tillage, it is more critical under no-tillage due to the increased potential for nitrogen fertilizer losses from denitrification and leaching. The best practice to minimize excessive nitrate-nitrogen losses is split application of N-fertilizer or to wait 4-6 weeks after planting to apply all the nitrogen.

Yields

Even though different management practices are necessary for successful no-till crop production, yields are usually about the same as from conventionally tilled crops. During years with seasonal moisture stress, they may be considerably greater. Table 1 shows results from several studies comparing no-till and conventional corn production.

Soil Series	Number of years studied	Location	Corn Yield (bu/ac)	
			No-till	Conventional
Maury	13	Fayette Co.	127	125
Crider	6	Hardin & Jefferson Cos.	159	135
Tilsit	5	Caldwell Co.	111	113
Allegheny	3	Breathitt Co.	175	174