CORN TILLAGE

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Soil tillage is a subject that has been researched extensively, discussed frequently but is still not well understood. Each tillage operation should be evaluated on the basis of its contribution to one or more of the following:

1. Good seed to soil contact.
2. Weed and vegetation control, including the management of crop residues.
3. Incorporation of lime, fertilizer and manure.
4. The release of nutrients from organic matter through improved aeration.
5. Improving soil tilth.
6. Increasing soil water retention through greater infiltration and storage.
7. Temperature control for seed germination.

There is not good agreement among researchers with respect to choice of tillage systems. Crop response to tillage will vary greatly with differences in climate, soil type and previous crop history. Areas as close as Ontario, New York and Ohio have produced different results from similar tillage experiments. However some general conclusions can be discussed from these efforts.

The effects of tillage tend to be short lived, lasting for one season, or for only a few weeks after planting. Tillage will not compensate for other neglected management practices. Only rarely can tillage solve longer-term structural problems caused by cropping practices, or inherent soil physical limitations. Tillage can create differences in the density, roughness, or aggregate fineness of surface soil; but these changes will disappear relatively quickly with rainfall or other weather patterns. However, the short-term changes created by tillage can have a notable effect on crop yield.

Research in Ontario (Canada) shows the benefit from tillage is confined (with rare exceptions) to the surface layer of soil. In experimental results from Woodslee and Guelph (Ontario) with corn,yields have not been improved with primary tillage deeper than 4 inches. Although soil at greater depths can become very 'hard' (as measured by plow draft, etc.) when not tilled regularly, this hardness may have limited effect on crop growth. If subsoil is not disturbed roots are capable of penetrating the many pores and cracks created by frost, wetting-and-drying cycles, earthworms, and the roots of the previous crop. These cracks and pores can be easily sealed by implement travel or operation on wet ground. Damage created in the autumn may be partially or completely obliterated by winter frost action. However soil has almost no opportunity to recover rapidly from damage caused by implement travel on wet soil in spring.

Soils need to be worked only enough to ensure optimum crop production and weed control. The fineness of the immediate soil zone in contact with the seed has been closely correlated to corn yields. Tillage treatments in Ontario which have produced the finest seedbed have generally given the highest yield. On land which has been most recently in sod, soil already exists in a fine granular structure which tillage cannot improve. Tillage is often of value in killing the sod, accelerating soil drying in spring, incorporating manure, herbicides or fertilizer, and compacting soil to prevent excessive desiccation after planting; but these benefits are at the expense of an increased rate of organic matter and soil structural deterioration with tillage operations.

Tillage of coarse sands, and gravelly loams, will rarely improve soil structure. Provided weeds and pests are controlled and fertility is maintained yields may be higher with no pre-plant tillage because of the moisture conservation provided by a surface mulch of crop residue. Conventional tillage using the moldboard plow and disk harrow gives good consistent results in most of the soil conditions found in Massachusetts. However, there is a tendency often to over-work soils with repeated secondary tillage. An alternative to conventional tillage on sandy loams and silt loams might be a single heavy disking before planting, or the use of the chisel plow with the disk. On clay soils primary tillage is best done in autumn so winter frost action can reduce large clods created during plowing.

Reduced tillage can provide savings in terms of energy and time, both important inputs in producing a corn crop. The energy used in tillage represents less than 25% of the total energy inputs, but systems of reduced tillage for fuel conservation may be very important when fuel is in short supply. Growing a zero-tillage corn crop may only involve 60% of the time required for the conventional tillage system, but the savings in time and energy need to be balanced with the extra management skills needed.

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