

Tillage systems - yield interactions with previous history

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When making comparisons between tillage systems there is little point in working on soils which have had a history that will bias the interpretation of the advantages of one treatment over another.

Van Doren and Triplett (1) examined the results of experiments where corn growth after emergence in tilled (ploughed plus secondary tillage) soil was compared with growth in non-tilled soil. The data used for their comparisons had equal plant populations and weed control. Their findings taken from research in Ohio and Virginia, are of particular interest. No-tillage planting of corn following a row crop in clay loam to clay soils produced lower yields than the fall-ploughed conventional tillage system. Corn yield from the two tillage systems were equal on the clay loam to clay soils following sod and on the silt loam soils following a row crop. No-tillage planting of corn following sod on silt loam soils produced substantially greater yields compared with the spring ploughed conventional tillage systems in both States. They concluded, "this apparent interaction between soil type and previous crop should be examined to establish major causes for variations in yield differences between tillage treatment".

Phillips et al. (2) reported that "except for a few unusual situations, soil water content is almost always higher under the no-tillage system than under conventional tillage. This is attributed to reduction of evaporation losses due to the mulch on the surface".

There is considerable evidence, however, that more continuous macropore systems are developed under no-till. Tillage which shears the soil at some depth below the surface seals off channels developed by plant roots, or shrinkage cracks which conduct water to lower levels for storage in, or drainage from the profile. From four years of observations, Ehlers and van de Ploeg (3) noted that at water potentials of -100mb or greater, hydraulic conductivity was higher in untilled than tilled soil. They concluded that larger pores are broken up in tilled soil but remain continuous in untilled soil.

Sites for the comparison of tillage treatments should be weed free, have similar plant population, should have no known physical barrier to growth and if possible no-till treatments should be imposed on soils with a well developed macroporous system.

1. Van Doren, D.M., Jr., and Triplett, G.B., Jr. 1969. Research circular 169, Ohio Agricultural Research and Development Center, Wooster, Ohio.

2. Phillips, R.E., Blevins, R.L., Thomas, G.W., Frye, W.W., and Phillips, S.H. 1980. Science 208: 1108-1113.

3. Ehlers, W., and van der Ploeg, R.R. 1976. Zeitschrift fur Pflanzenernahrung and Bodenkunde 3: 373-386.