

No-till seen as great soil builder

NEWARK, Del. — No-tillage has received top billing for some time as an energy-saving way to grow field crops. It's also time-saving, and has the potential to increase yields.

Now a researcher at the University of Delaware's Agricultural Experiment

Station reports another important benefit from no-till: soil improvement.

Results of field experiments at the Delaware research station show that no-till increases organic matter in the soil, conserves moisture, and raises the nutrient-holding capacity of

soils. University agronomist William Mitchell has studied fourteen pairs of farms (tillage vs. no-tillage) in continuous corn production from one to eight years, with a broad range of soil types. His tests confirm that no-till is a valuable soil builder.

A buildup of organic matter or humus under no-tillage was clearly evident in test fields, reports Mitchell. It was most apparent in soil depths up to three inches. But in some cases, it reached depths of nine inches. Increases in humus ranged from zero for some reduced tillage (chisel plowed) fields to almost 50 percent for fields which had been in no-tillage for seven to eight years.

"This buildup in organic matter explains the higher

yield potential of no-tillage fields," he says.

Mitchell's studies show that nutrient exchange capacity is higher with no-tillage, and leaching of nutrients is reduced.

The added nutrient-holding capacity (or cation exchange capacity) of soils in no-till fields comes from the accumulation of organic matter in them, explains the agronomist. This increased nutrient-holding capacity minimizes the leaching of such nutrients as calcium, magnesium and potassium.

Soil in the average no-tillage field in the Delaware study had 21 percent more exchange capacity than soil in tilled fields, he reports. Some long-range no-tillage fields had 55 percent more exchange capacity.

"This highly desirable change in soil activity generally extended to a depth of six inches, in contrast to organic matter accumulation which was concentrated in the top three inches of soil," he says.

There was evidence that accumulated organic matter under no-till effectively reduced potassium leaching. Soil samples from no-tillage fields contained 30 percent more potassium than those from plowed fields. In one case, where 200 pounds of potash had been broadcast annually since 1972, there was 60 percent more potassium in the three-inch soil depth under no-till than in soil samples from plowed land.

Samples taken from a loamy sand soil routinely cultivated showed a dramatic rate of potassium leaching in a single season under irrigation and heavy rainfall. Under the same conditions without tillage, there was no evidence of leaching.

A comparison of soil samples from conventionally tilled fields with those from no-till fields under rye, vetch and corn residue covers showed organic matter levels ranging from 1.47 percent

(conventional tillage), to 1.93 (rye cover), 2.13 (vetch cover) and 1.83 (corn residue cover) after seven years.

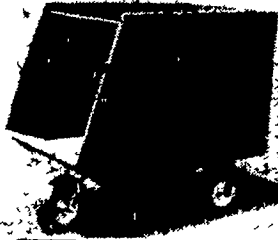
Assuming a five percent nitrogen level, this organic matter contained about 735 pounds of nitrogen per acre for conventional tillage, 965 pounds for no-till with rye cover, 1,065 pounds for no-till with vetch, and 915 pounds for no-till with corn residue as a cover.

Mitchell also found that no-till cover crops acted like pumps, bringing phosphorus, potassium, boron, manganese, and zinc from deep in the soil and concentrating them in the topsoil layer where they were readily available to corn plants.

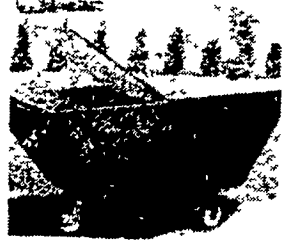
For example, potassium in the top nine inches of soil under full tillage tested at 189 pounds per acre. No-tillage without a cover crop raised the K level to 231 pounds, thanks to accumulated organic matter and reduced leaching. When rye and vetch covers were added, K accumulated to a high of 292 pounds.

The scientist found similar nutrient accumulations in the topsoil with other elements, especially in the case of boron, a highly leachable nutrient.

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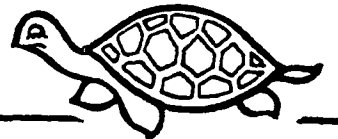
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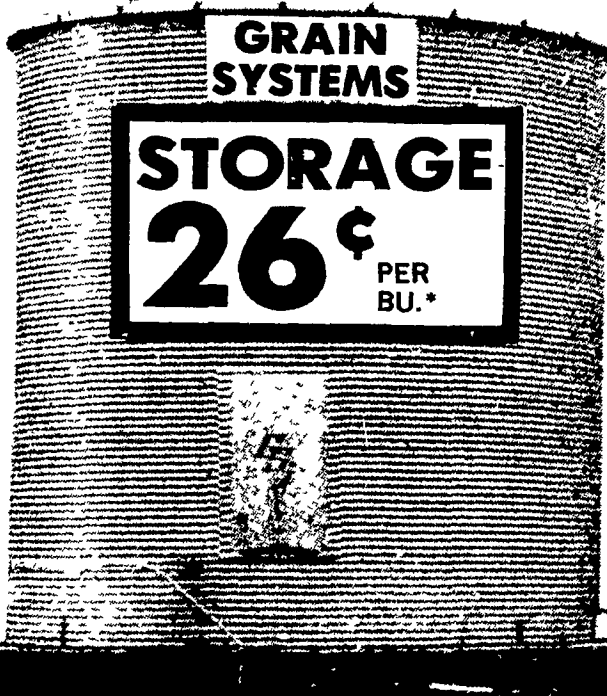
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