

## PRIMARY TILLAGE EFFECTS ON SOIL SUSCEPTIBILITY TO EROSION AFTER SUGARBEET HARVEST

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### ABSTRACT

Erosion damages hundreds of thousands of acres of arable land producing low residue crops in Minnesota and North Dakota each year, according to Soil Conservation Service data. An annual sugarbeet grower survey showed the most common tillage tools used after the 1991 sugarbeet harvest were chisel plows, disks, field cultivators, and deep tillage tools; 48, 24, 14, and 7 percent respectively. Field experiments were conducted from 1989 to 1994, to determine the effect of tillage after sugarbeet harvest on subsequent crop yields, percent ground cover, surface roughness, and soil aggregate size.

Use of a field cultivator after beet harvest increased residue cover by 72 percent versus untilled checks. Residue cover was increased by 22 percent with a disk and 10 percent with a chisel plow, but reduced 85 percent with a moldboard plow.

Field surface random roughness was greatly increased by moldboard plowing and significantly increased by the chisel plow and disk operations.

Soil aggregate geometric mean diameter in the fall was greatly increased by moldboard plowing and small increases occurred after fall tillage with a disk and chisel plow. Tillage with a field cultivator after beet harvest had almost no effect on soil aggregate geometric mean diameter. Overwinter weathering processes reduced geometric mean diameter of soil aggregates by about 20-50 percent for the no-till, chisel, disk, and field cultivator treatments, depending on soil type. Aggregate geometric mean diameter decreased about 80 percent over winter on all soils following fall moldboard plowing. Geometric mean diameter aggregate size remained above the 0.84 mm minimum particle size erosion threshold for all soil types and tillage operations in all years.

Small grain yields the year following fall tillage were not affected by tillage treatment at any location.