



AGRICULTURAL ENGINEERING NEWS LETTER

AGRICULTURAL EXTENSION DIVISION
UNIVERSITY OF MINNESOTA

UNIVERSITY FARM, ST. PAUL, MAY 15, 1933—No. 14

SHEET EROSION AND THE LOSS OF SOIL FERTILITY

H. B. ROE

A SERIOUS PROBLEM

Soil washing is a problem which no Minnesota farmer who cultivates sloping land should ignore. Altho it is a natural occurrence that can never be entirely stopped, the idea still held by many people, that, on account of its natural character, nothing can be done successfully to control it, is a mistake.

Causes of soil washing. Soil washing results from the direct action of rain beating upon the bare surface of the soil and the rapid movement of the water down the slope. It is stimulated by alternate freezing and thawing in the spring of the year when the top soil is saturated, has little coherence, and contains fewer roots tending to check washing. It is emphasized in the finer and more uniform soils and on steep slopes. The eroding power of water increases many times faster than does its velocity of flow. If the velocity is doubled the eroding power may be increased in some cases as much as sixty-four times.

Sheet washing the most serious. Altho gullying, by its visible effects, more easily attracts attention it is less generally prevalent and does far less extensive damage than sheet washing, commonly called sheet erosion. Some sheet erosion occurs on all sloping land and wherever the top soil has been disturbed by cultivation or is not protected by some type of relatively permanent vegetative cover. As its name indicates, it is the removal of a thin sheet of top soil by water from rainfall moving over the surface as a continuous blanket with a velocity sufficient to carry soil particles with it. This action is so slow that it is often unsuspected until steadily decreasing yields warn the farmer that his richest soil is disappearing; but to the experienced eye, spots of gravel and yellow clay and stunted and sparse vegetation on the knolls always indicate its presence. Many farmers who recognize it consider soil erosion an unavoidable result of cultivation not seriously affecting fertility. Studies by both Federal and State agencies, however, show that most of the loss of fertility commonly attributed to continuous cropping is caused, instead by the many times more rapid action of sheet erosion which removes not only the fertile elements but the soil itself.

SAVING THE TOP SOIL, VITAL

The washing away of the receptive top soil greatly aggravates the damage to

farms because this destroys nature's storehouse for reserve moisture that the surface soil would normally absorb in a short time and pass on more slowly to the less receptive subsoil. Three-fourths of the available plant food and nearly all the humus is in the upper foot of soil which will absorb about twice as much water as will the subsoil and do it more quickly. Most of the rainfall would be absorbed by the surface soil if it could be held there for a time but frequently the water runs off before it has had time to be absorbed. It is, therefore, important to preserve the surface soil. Plant food removed from the soil in crops can be restored in fertilizers, but soil, washed from the fields is lost for good.

Erosion is stimulated by anything that tends to decrease a pervious condition of the soil, by denuding steep slopes of their vegetative cover, shallow inadequate tillage, impoverishment of the organic content of the soil by scanty use of barnyard and green manures, tillage and planting up and down the slope instead of across it, overpasturage of hilly or rolling land and growing cultivated crops on slopes too steep for profitable tillage. In southeastern Minnesota, many slopes with a fall of ten or fifteen feet to the hundred are now being farmed in row crops. Other steeper slopes are in hay or small grain. Little is being done to check erosion. In some cases the entire surface of the field has been washed off to the depth plowed. Eventually many fields in this region must be abandoned unless erosion is promptly checked.

EVENTUAL OUTCOME OF UNCONTROLLED EROSION

The depth of soil thus removed from many Minnesota fields does not exceed one-eighth inch annually, but, on some others in seasons of unusual rainfall, the rate of removal is much greater. The removal of one-eighth inch of soil in any one year may seem negligible; but one-eighth inch removed per year throughout the active life of the average farmer amounts to all or nearly all of the virgin top soil.

METHODS OF RESTORATION AND CONTROL

In deep residual or wind deposited soils productive capacity may be largely restored, even on badly eroded areas,

merely by the addition of commercial fertilizers, but such restoration will do nothing to conserve moisture and the additional yearly expense is quite as great as the first cost of constructing terraces which will prevent further serious loss of both soil and fertility, as well as of moisture. The yearly maintenance cost of terraces will be but a small percentage of their original cost. In the near future one "News Letter" will be devoted to terracing. Meanwhile, the following discussion of some of the simpler methods of erosion control, within the field of ordinary good farming practice, may be of interest.

Erosion can be greatly checked by increasing the absorptive capacity of the soil. This may be accomplished by deep tillage, tile drainage, and increasing the humus content through abundant use of barnyard manure and frequent green manure crops. Other field practices that help are contour plowing, planting and cultivation; avoiding of overpasturage; and maintaining forest and other cover crop growth on steep slopes. A good stand of alfalfa is one of the best means of controlling erosion.

Sod strips in natural water courses. In the bottom of natural depressions where water flows during rainy periods, a strip of firm sod one or two rods wide the whole length of the slope will prevent washing. It is easier to lift the plow or other implement while crossing this sod strip than it is to make frequent turns at the edge of a gully which is likely to occur in such a location if no preventive measure is taken. Such use of sod strips is increasing in the cornbelt with good results. However, these sod strips tend, in time, to build up until they cause the water to flow on either side instead of over them. When this occurs the old sod should be plowed out and a new strip seeded in.

Steep slopes should not be cultivated. In general, in Minnesota, slopes with a fall of over ten or twelve feet in one hundred should never be plowed. If, however, a shortage of plow land makes it imperative that a part of the steep slopes be planted to cultivated crops, strip farming should be employed—that is, comparatively narrow strips of cover crops should be alternated with similar strips of cultivated crops, the strips running along the contour.