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Soil Fertility and Conservation

A MINNESOTA PROGRAM

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Agricultural Extension Service
U. S. DEPARTMENT OF AGRICULTURE



KEEPING A FARM permanently productive calls for a program of balanced soil conservation. In recent years the term "soil conservation" has been widely used in connection with the physical control of soil erosion caused by wind and water. Much emphasis has been placed on this phase of soil conservation through the encouragement of contouring, strip cropping, and terracing. Valuable as these practices are, they do not correct the basic causes which make soil erosive. An adequate concept of soil conservation must include the conservation of plant food nutrients, for without these productivity cannot be maintained. Only by wise land use and intelligent management of the soil can fertility be safeguarded and unnecessary wastage from erosion be avoided. Such a system is the six-point Minnesota Soil Fertility and Conservation Program presented here. The importance of each of the six points will vary with the locality, the condition of the soil, or the kind of farming. Properly applied, all of the six principles add up to a program which will keep the soils of Minnesota permanently productive.

I. Drainage Land Clearing Cultivation

THERE ARE still many thousands of acres of underdrained land in Minnesota which could be made much more productive with adequate drainage systems.

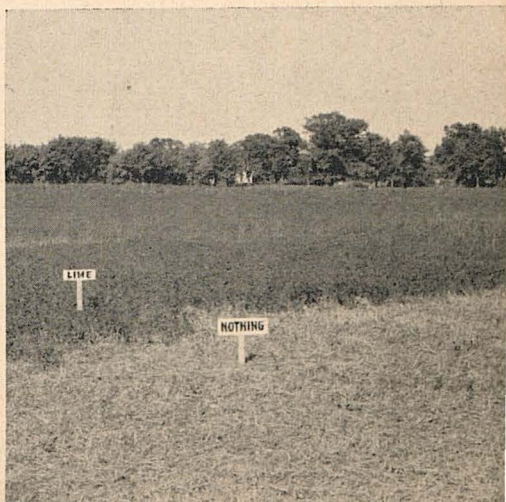
This was demonstrated during the recent wet years when a large amount of land produced no crop or a greatly reduced one. Too much water near the surface excludes air and thus restricts the feeding area of plant roots which will not develop without air. With good drainage, plant roots grow down as much as five feet, while poor drainage may limit root growth to a foot or less. Well-drained soils also warm up earlier in the spring and are less subject to frost heaving which can hurt new legume seedings or fall-seeded grain.

Like drainage, proper cultivation encourages soil granulation and aeration. Cultivation mixes crop residues and manure with the soil, thus maintaining the organic matter. It also conserves moisture by helping soil to soak up rain instead of letting it run off.

Land clearing in Minnesota presents several problems. Modern methods of clearing reduce cost and make large-scale clearing possible. On the other hand, the condition of the soil should be carefully considered to determine its suitability for farm crops before clearing is undertaken.

LIMING is the foundation of soil conservation in areas where soil is acid. Since not all Minnesota soils are acid, tests should be made before liming to determine actual need. The main areas of lime-deficient soils include the well-drained uplands of the southeastern part of the state and the sandy soils of the upper Mississippi Valley and north central and northeastern Minnesota. In these areas, liming is essential to success with alfalfa and sweet clover, but less so for the common clovers. Because it makes possible a legume in the rotation, liming indirectly helps other crops.

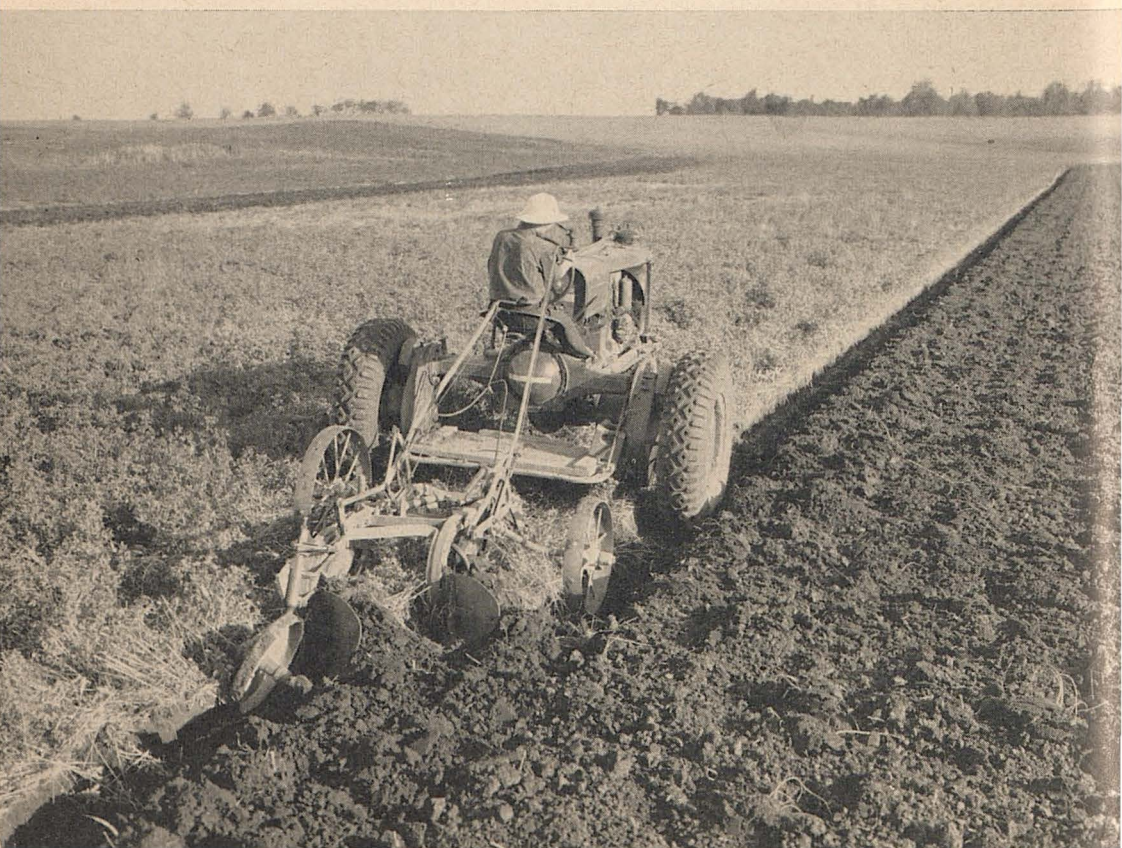
II. Liming Acid Soils



III. A Good Crop Rotation

A GOOD CROP ROTATION is the basis of any adequate soil fertility and conservation program. Its purpose is to maintain and improve the fertility of the soil and to control erosion and common weeds. Crop rotations should provide a balance between the soil-depleting crops, such as corn, potatoes, and grain, and soil-conserving crops, such as legume and grass mixtures, and should take into consideration type of soil, slope of land, and degree of erosion, as well as past management practices.

The balance between soil-depleting and soil-conserving crops will determine the fertility level of the soil and the extent to which erosion will be controlled. Conservation for use is growing the maximum amount of soil-depleting crops without reducing fertility or losing soil by erosion. To be most beneficial, soil-conserving crops must include inoculated legumes. Inoculation of the legume at time of seeding will help to improve stand, increase the fertility of the soil, and promote better growth and yield.





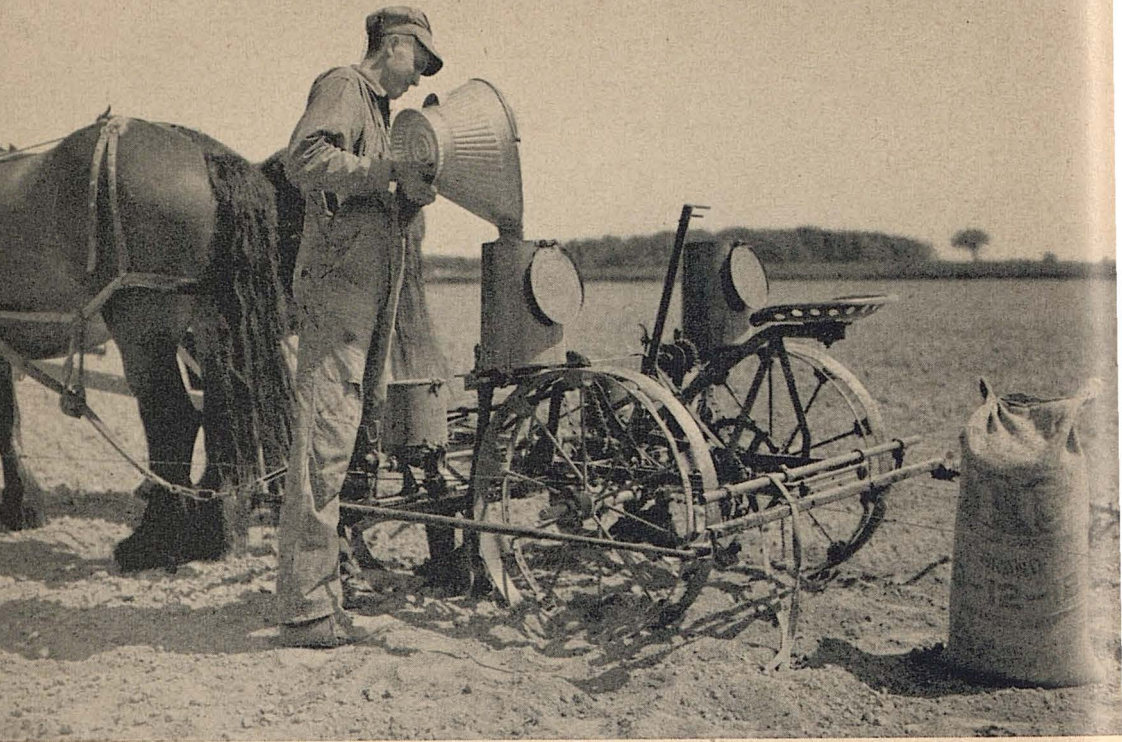
IV. Maintaining Organic Matter

ORGANIC MATTER is the life of the soil and the storehouse of fertility.

High crop yields have always been associated with soils high in organic matter. The quality as well as the quantity of organic matter is important. Crop residues and manure derived from legumes decompose more rapidly than straw or cornstalks and furnish relatively larger amounts of nutrients to the soil.

The effects of organic matter in the soil are: (1) it contains reserve supplies of plant food nutrients; (2) it feeds the vast population of microorganisms in the soil; (3) it maintains the physical condition of the soil; (4) it increases the intake and movement of water in the soil; and (5) it prevents erosion.

Organic matter may be maintained and increased by adding barnyard manure, growing and turning under green manure, and returning crop residues. All of these practices are important, and each should be used when it best fits into the rotation system.



V. Adding Commercial Fertilizers

ALTHOUGH MINNESOTA soils are naturally fertile, they are losing fertility more rapidly than we realize. Many of our soils are producing lower yields than they once did.

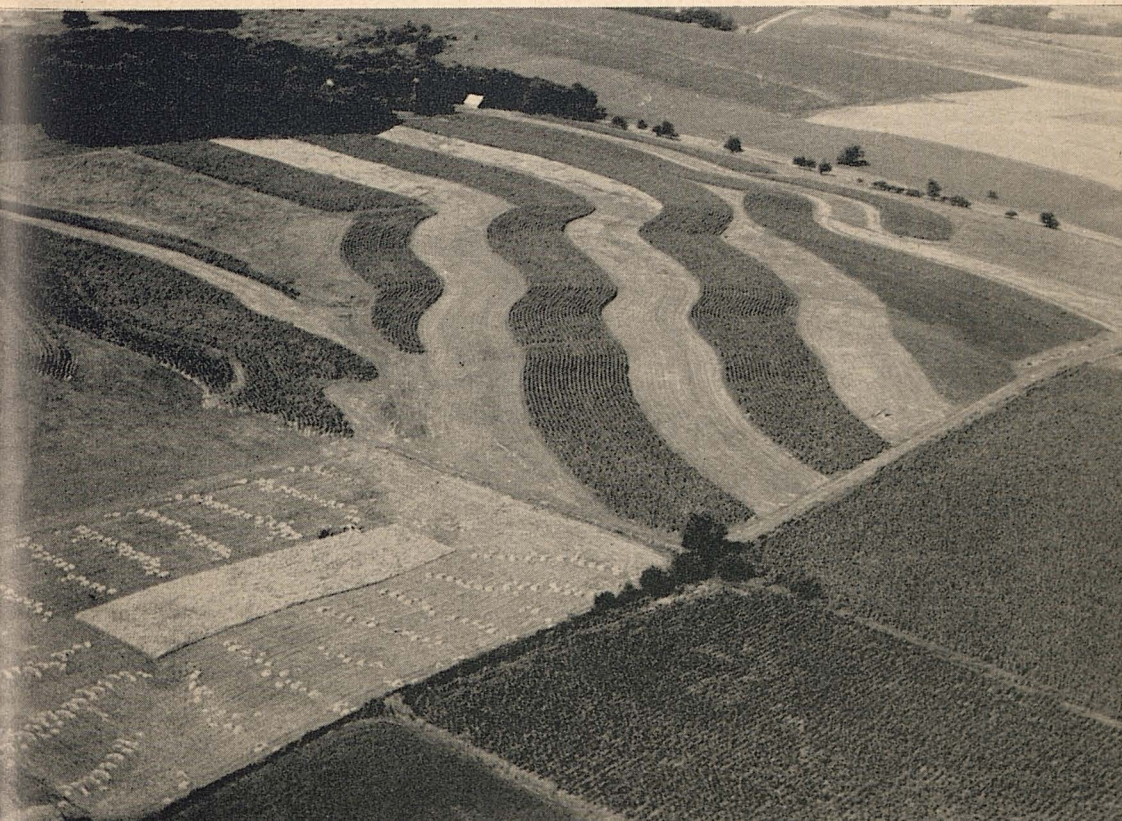
Increased response to commercial fertilizer is a sure sign plant nutrients are needed.

Nutrients are removed from the farm most rapidly by cash crops. All livestock and livestock products also remove plant food, but less rapidly because a part is returned in the manure. The removal of phosphorus and potash is the most serious, since they can be returned only in the form of commercial fertilizers. Most of the needed nitrogen can be grown on the farm by seeding an adequate acreage of legumes and by maintaining a high level of soil organic matter. The use of fertilizers will increase the yield of crops, improve their quality, and hasten maturity. A soil conservation program must include the use of fertilizers to replace the mineral nutrients sold from the farm.

VI. Practising Erosion Control

PROPER LAND USE and good soil management should be supplemented by simple erosion control practices to maintain yields and reduce wind and water erosion to a minimum. Among the more common water erosion control practices are grassed waterways, contour cultivation, and strip cropping. On certain slopes such practices as terracing may be employed, although their need may often be reduced by using longer crop rotations supplemented with the other erosion control practices, or by adjustments in land use, such as seeding to permanent hay or pasture. The protection of sloping land against water erosion is accomplished not only by contour cultivation, strip cropping, and similar practices, but also by maintaining the organic matter content and fertility so that the soil will hold water and support vigorous soil-binding crops.

The same basic principles apply to wind erosion control. Wind erosion control practices include field strip cropping, use of surface residues, maintenance of vegetative cover, and rough tillage.



Failure to Conserve Soil Invites Disaster in Years to Come

Water and wind erosion, such as shown on the right, sets in when fertility and organic matter are permitted to decline to the point where a vigorous crop can no longer be supported. The only prevention is to restore fertility, establish a good rotation which includes a legume, and give erodible soils the protection they must have to remain productive.



These potholes still occupy much good land in Minnesota. Proper drainage will restore such acres for productive use.

This animal is suffering from lack of phosphorus in his feed and forage. This element must be returned to the land in the form of commercial fertilizer.

UNIVERSITY FARM, ST. PAUL 1, MINNESOTA

Cooperative Extension Work in Agriculture and Home Economics, University of Minnesota, Agricultural Extension Division and United States Department of Agriculture Cooperating, Paul E. Miller, Director. Published in furtherance of Agricultural Extension Acts of May 8 and June 30, 1914.