

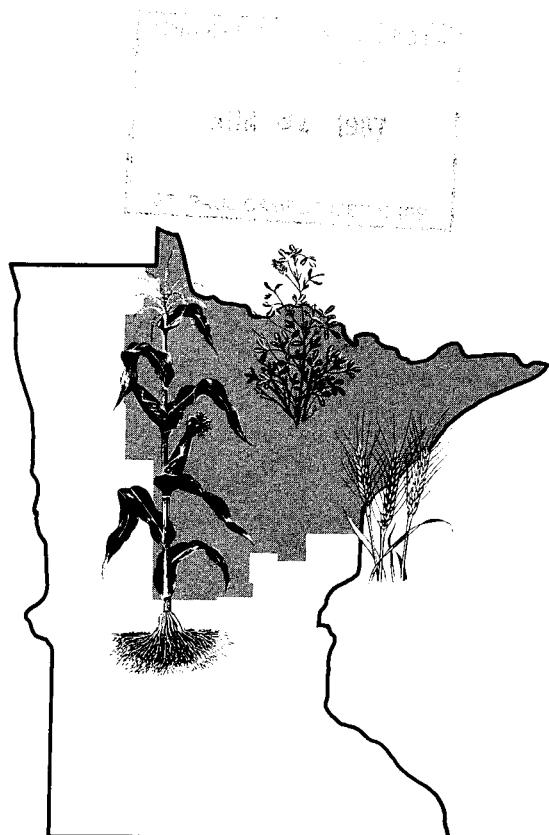
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MANAGEMENT OF CROPS AND SOILS  
IN NORTH CENTRAL  
AND NORTHEASTERN MINNESOTA  
CORRESPONDENCE COURSE

# Unit 1—Soils and Soil Testing

## Purposes

- Recognize the general soil categories and conditions on your farm and how these soils can be managed most effectively.
- Understand the importance of soil testing.
- Understand the importance of using the right fertilizer to improve crop production.



## GENERAL SOIL CATEGORIES FARMED IN NORTH CENTRAL AND NORTHEASTERN MINNESOTA

Soils are divided into four basic categories depending on their texture and organic matter content. These four groups are coarse, medium, fine, and organic soils.

Although farmers usually know the general texture (fineness or coarseness) of their soil, often they do not know many of the nutrient and physical properties associated with individual soil categories. A brief description of each follows.

**Coarse Textured Soils.** Sands, loamy sands, and sandy loams are examples of coarse textured soils. In north central and northeastern Minnesota, these soils are generally low in organic matter, high in phosphorus, low in potassium, and often low in both sulfur and boron, especially when alfalfa or corn is grown. Some magnesium deficiencies also have been observed, usually when the soil has not been limed with dolomitic limestone. These soils are acid and are generally droughty (dry). Unless irrigated, these dry soils often limit yields. These soils are often referred to as light or droughty soils. (See glossary for descriptions of soil terms.)

**Medium Textured Soils.** Examples are loams and silt loams. These soils are generally low to medium in organic matter, medium to high in phosphorus, and medium to low in potassium. They are acidic in nature. Often these soils are thought to be droughty, but University research has shown otherwise. For example, when these soils are properly limed and fertilized, yields of alfalfa have increased from two to six tons per acre.

**Fine Textured Soils.** These soils are the heavy clay types, such as clay loams and silty clays. They generally have a medium organic matter level and have medium soil test levels for both phosphate and potash. Although these soils are acidic at the surface, they often are underlain by a limy subsoil. If this is the case, moderate amounts of lime may be sufficient for establishing alfalfa.

**Organic Soils.** These peat soils are high in organic matter and are low in both phosphorus and potassium. Copper deficiencies have also been noted with small grains. These soils are slightly acid in nature and must be drained to be productive. Alfalfa production is not recommended on these peat soils. The very acid peats are not being farmed currently.

## SOIL TESTING AS A FERTILIZER MANAGEMENT TOOL

Soil tests represent a chemical means of determining the amounts of plant nutrients or food available in a soil and what nutrients need to be added for best crop growth. Even though a great deal may be known about the original (native) fertility of the soils in Minnesota, management practices such as amounts of manure applied, amounts of commercial fertilizers applied, and crop rotations used vary greatly from farm to farm. These practices change soil fertility levels. So soil tests reflect not only native fertility, but also past management practices of the farmer. It is, therefore, important that farmers test their soils properly to

determine the correct amounts and kinds of fertilizer and lime needed for realizing maximum economic yields.

Over the years, many field experiments with different fertilizers and different crops have been conducted by University scientists. Even though experiments may not have been conducted on your farm, they have been run on soils that are the same or at least similar to yours. Lime and fertilizer recommendations you receive for your farm are based on research conducted on similar soils. You can expect a higher yield if you follow these recommendations.

Knowing what not to apply is just as important as knowing what to apply. You can make such determinations only through a good soil testing program.

## SOIL SAMPLING IS IMPORTANT

The results of any soil test can only be as good as the soil sample submitted for analysis. The soil sample must be representative of the field being tested. Instructions for collecting soil for testing are given on the Soil Sample Information Sheet. Information on how to take a good soil sample is also available from your county agent's office, your local ASCS office, or your local fertilizer dealer. In many cases, your local fertilizer dealer has the equipment and information necessary for collecting soil samples. The most important thing to remember is that only a good representative soil sample can indicate what your lime and fertilizer needs are. Be sure you sample your fields properly.

A recent soil test of one of your fields would be helpful as you participate in this course. You can order materials for sending in your soil tests by checking the bottom of the attached return form.

## Glossary Of Soil Terms

**Boron:** An essential element needed only in small quantities (a micronutrient) for normal plant growth. The fertilizer forms generally used are Borax and Sol-U-Bor.

**Copper:** An essential element needed only in small quantities (a micronutrient) for normal plant growth. Fertilizer forms generally used are copper sulfate and organic chelates.

**Droughty soils:** Soils that are dry or have a poor ability to retain adequate moisture. Droughty soils are generally coarse, sandy soils.

**Essential elements:** Nutrients (plant food) required for a plant to complete its life cycle.

**Limestone:** A soil amendment used to reduce soil acidity. It is most often used when alfalfa is grown in the crop rotation.

**Dolomitic limestone:** A liming material that contains both calcium and magnesium carbonates. It is the most common form of limestone mined and used in Minnesota.

**Calcitic limestone:** A liming material that contains only calcium carbonates. This limestone is generally not recommended in north central and northeastern Minnesota because magnesium deficiencies may occur. Most calcitic limestone used in northern Minnesota comes from Michigan.

**Magnesium:** An essential element most often needed on acid soils. Deficiencies generally are corrected by using dolomitic limestone or magnesium-containing fertilizers such as Sul-Po-Mag or K-Mag.

**Nitrogen:** An essential element needed for all crops except legumes such as alfalfa or clover, which get their nitrogen from the atmosphere.

**Organic matter:** That portion of the soil derived from plant and animal residues that has not yet broken down into inorganic compounds. In general, coarse textured soils have low organic matter contents.

**Phosphate:** Common term used for the phosphorus in a fertilizer.

**Phosphorus:** An essential element for plant growth. Coarse textured soils in Minnesota generally are medium to high in native phosphorus.

**Potash:** A common term used for the potassium in a fertilizer.

**Potassium:** An essential element that is generally low in coarse, sandy textured soils in Minnesota.

**Soil pH:** A term used to describe soil acidity numerically. Soil pH 5.5 is acid; soil pH 6.5 to 7.0 is neutral. A neutral soil pH is necessary for growing alfalfa.

**Sulfur:** An essential element that is generally low in coarse, sandy textured soils in Minnesota. Fertilizer forms of this element used most often are elemental sulfur, gypsum, and sulfate-containing fertilizers like Sul-Po-Mag and K-Mag.

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# Soils and Soil Testing

*Please fill out and return*

Name \_\_\_\_\_

Address \_\_\_\_\_ County \_\_\_\_\_

1. What type of farm do you operate (dairy, beef cattle, cash crop, etc.)?
2. What category or categories of soils predominate on your farm?
3. What are your major crops and your crop rotation?
4. Do you use soil testing as a management tool? If you do, how often do you test in your crop rotation?
5. Have you applied lime or fertilizers on your farm (including manure)? If you have, what, how often, and how much?

6. How many years have you been farming?
  
7. Do you farm on a full- or part-time basis? (In other words, is farming your only occupation?)
  
8. Do you have any questions relating to your soils or to soil testing?

The following materials are available on request. Please check those you would like to receive.

- Sampling Soil for Fertilizer and Lime Recommendations*, Soils Fact Sheet 4.
- Soil sample boxes and information sheets