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Sampling Soils for Fertilizer and Lime Recommendations

Michigan State University

Cooperative Extension Service

Farm Science Series

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SAMPLING SOILS FOR FERTILIZER AND LIME RECOMMENDATIONS

A good representative soil sample is the basis for a good soil test. The major objective of soil testing is to have a basis for intelligently using fertilizer and lime.

Soil testing is widely used for diagnosing problems, sometimes called "trouble shooting," because nutrient deficiencies and toxicities may result in growth characteristics and visual symptoms similar to those caused by insects, diseases, air pollutants, or certain herbicides.

Soil testing is an important diagnostic tool for evaluating nutrient imbalances and more recently for measuring trends in nutrient levels and to identify locations where nutrient losses (pollution) may occur.

When to Test

For general rotation crops, test soils at least once every 3 years. There is a distinct advantage in testing the last sod year of the rotation because lime, if needed, can be applied before breaking the sod. This not only makes for easier spreading and less soil compaction but provides ample time for the lime to become effective before acid-sensitive legumes are again seeded.

Where large amounts of fertilizer are used, test on an annual basis; for example, for truck cropping, home gardens and crop production in greenhouses.

Sampling the entire farm at one time is a good practice—this forces you to do some advance planning. Sampling the entire farm becomes a major time factor, especially on larger farms. This can best be done in the off-season. Knowing the soil test results and the recommended fertilizer materials required for all fields on the entire farm will enable you to more efficiently purchase and utilize both fertilizer and lime, particularly when the fertilizer contains micronutrients.

By John C. Shickluna (deceased) and Lynne S. Robertson (retired), formerly of the Crop and Soils Sciences Dept., MSU. Contact: Darryl D. Warncke.

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Uniform Sampling Areas

Before sampling a field, size it up for differences in soil characteristics. Consider its productivity, topography, texture, drainage, color of topsoil, and past management. If these features are uniform throughout the field, each composite sample of the topsoil can represent up to 10 or possibly 15 acres. Since most areas in Michigan are not composed of uniform soil, samples representing 20 or more acres are not likely to be representative of any soil in the field.

The County Soil Survey Report is an excellent source of information for determining the kinds of soils in each field on your farm, and should be used for determining soil boundaries for sampling purposes. Available soil survey information may be obtained from the Crop and Soil Sciences Department, Michigan State University and from the Soil Conservation Service.

For homeowners, areas near the house are likely to be different than those a few feet away. Carefully evaluate your lot in regard to where subsoil has been exposed in the process of grading around the building.



Use your County Soil Survey Report for determining the kinds of soils in each field of your farm.

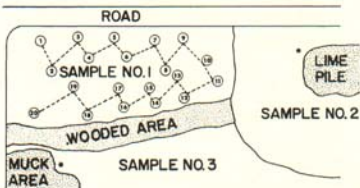
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If there is variation, whether it be around the home or in the field, take a composite sample from each predetermined area. A composite sample made up of samplings from two distinctly different areas is not representative of either area.

Taking the Sample

Soil samples may be taken at any time during the year where temperatures (lack of frost) and moisture conditions permit. With appropriate equipment, it is possible to sample the soil even when it is frozen. The same standards should be observed when sampling frozen soil. A given

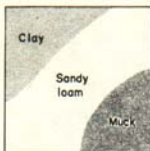
COURSE TO FOLLOW



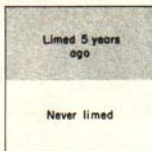
*Omit or take separate samples

In a non-uniform field, as shown above, a minimum of 3 samples are required to adequately represent the area. Sample numbers 1, 2 and 3 represent 3 different soil management groups. This condition is common in glaciated areas such as Michigan.

Each composite sample is made up of 20 borings taken as in sample No. 1.



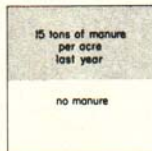
① 3 Composite samples



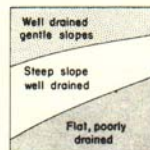
② 2 Composite samples



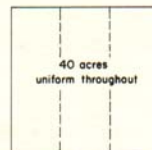
③ 2 Composite samples



④ 2 Composite samples



⑤ 3 Composite samples



⑥ 3 Composite samples

SOIL SAMPLING EQUIPMENT



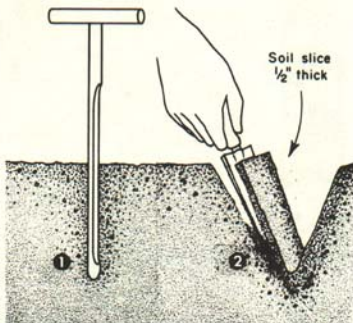
- ◀ Plastic Pail: 10- to 12-quart size. (Do not use metal pail if sample is to be tested for micronutrients.)
- ◀ Any one of the following: square pointed shovel or spade; soil auger; or soil sampling probe.
- ◀ Containers for samples—sample boxes or special paper bags. All equipment and containers should be absolutely clean.

A partial list of manufacturers of soil-sampling tubes*:

American Instrument Co., Silver Spring, Md.
 Arthur H. Thomas Co., Philadelphia, Pa.
 Central Scientific Co., Chicago, Ill.
 Elano Corp., 2455 Dayton-Xenia Road, Xenia, Ohio
 Kerkes Machine and Model Co., (Conner's Screws), 699 Lansing St., Charlotte, Michigan
 LeMotte Chemical Products Co., Towson, Baltimore 4, Md.
 Oliver Corp., 400 W. Madison, Chicago, Ill.
 Olson Mgt. Service, 904 W. Stephenson St., Freeport, Ill.
 Oakfield Apparatus Co., Box 65, Oakfield, Wisconsin.

*This representative list of manufacturers and dealers of sampling tubes, known to the author, implies no recommendation or endorsement by Michigan State University of these companies' products.

HOW TO USE SAMPLING TOOLS



1. Sampling probe provides uniform sampling cores—easy to use—saves time—best tool for sampling farm soils.
2. Use a narrow ($1\frac{1}{2}$ inch) garden dibble to take a slice of soil $\frac{1}{2}$ inch thick.

area should be sampled about the same time each year due to the variation in nutrient availability that may arise with time of sampling.

From each predetermined area, regardless of size or use, prepare a composite sample by taking not less than 20 samplings consisting of vertical columns or cores of soil approximately $\frac{1}{8}$ square inch in cross section and to plow depth. That is, each sampling should be a vertical column of soil $\frac{1}{8}$ inch by 1 inch by 8 inches deep, or a cylindrical column of soil $\frac{1}{8}$ of an inch in diameter to plow depth.

It has been found that 20 well-taken samplings or soil cores per composite sample from a given area regardless of size will result in laboratory tests which can be duplicated much more frequently than where only 5 or 10 samplings comprise the composite sample. Furthermore, 20 samples per area appear to give as good results as 40 or even 100 samplings.

Avoid sampling unusual areas unless such locations are sampled and packaged separately—those close to gravel roads, dead furrows, previous locations of brush, lime or manure piles, fence rows, potholes, fertilizer bands, or burned muck areas.

Subsoil samples taken at a depth of 18 to 24 inches, especially with organic soil, will often aid in making lime recommendations. Subsoil samples need not be a composite.

Soil Sampling for No-Till, Conservation Tillage and Till Planting on Ridges

Refer to Soil Sampling for No-Till and Conservation Tillage Crops, E-1616 and Till Planting on Ridges, E-1683.



Place 20 individual samplings from the area involved in a clean plastic pail.



Mix the soil thoroughly—revolve the pail to ensure that a good mix is obtained.



Place a pint of the soil in a clean container for transferring to the soil testing laboratory.

Break Clods—Mix Thoroughly

As the individual samplings are taken, place them in a plastic pail until 20 or more are collected from the area involved. Then mix the soil in the pail thoroughly with the hands and by revolving the pail while held at an angle of 45 degrees. Do not use metal pails if the sample is to be tested for micronutrients.

If the soil is very wet at sampling time it may be necessary to partially air dry the sample in order to obtain an adequately mixed sample. The drying *should not* be done with artificial heat. Avoid drying soil samples in areas containing gases such as ammonia.

If the soil is very dry it may be necessary to crush the cores before a good mix can be obtained. A clean wooden surface and a rolling pin work well.

Preparing and Packaging the Sample

After the sample is thoroughly mixed, place a pint of the soil in the container for transferring to the testing laboratory. You can get special containers provided by the Crop and Soil Sciences Department of Michigan State University at your County Extension Office; from fertilizer dealers or salesmen, from lime vendors; or directly from the MSU Crop and Soil Sciences Department. The purchase of the soil container pays for the cost of the soil test.

If these are unavailable, any clean container of one-pint capacity that can be tightly closed should prove satisfactory. But do not use rusty or otherwise contaminated containers, such as metal cans—any foreign material may affect the soil test.

Changes in nutrient availability in the soil samples, particularly phosphorus, have resulted from drying the soil samples prior to the analysis. *Do not force-dry* the samples by placing them on radiators or inside ovens before submitting them to the laboratory.

Provide Complete Information

The more complete the information provided, the better will be the fertilizer recommendation.

Fill in the information requested on the special soil container, or if an ordinary container is used, label the package with the owner's name and address and the field number. Use a waxed pencil or pen.

The following information should accompany the sample:

1. Previous crop grown
2. Crop or crops to be grown
3. Whether the field will be manured for the crop being grown (kind and rate of application)
4. Depth of plowing
5. Soil type, series or soil management group name
6. Yield goal
7. Whether irrigation is to be used
8. Special problems or conditions

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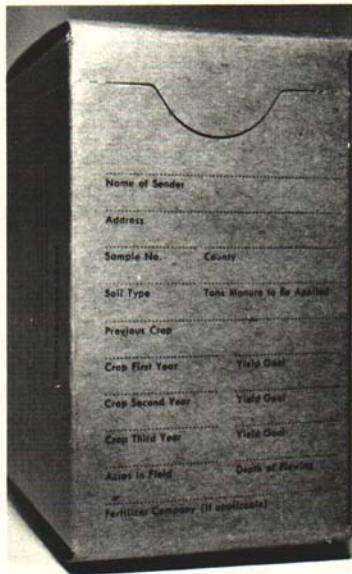
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This type of container is available at County Extension offices, the MSU Crop and Soil Sciences Department at East Lansing and from fertilizer and lime dealers.

Information concerning the various soil tests available from the Michigan State University Soil Testing Laboratory may be obtained from your County Extension Office.

The interpretation of the soil test results and the fertilizer recommendations will accompany your soil test report. Various University publications, such as Extension Bulletin E-550 entitled, "Fertilizer Recommendations for Michigan Vegetable and Field Crops," may help you understand the fertility conditions of your soil and what you can do about them. Contact your County Extension Office for pertinent and timely publications.

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