

# Taking Soil Test Samples

*W.O. Thom, G.J. Schwab, L.W. Murdock, and F.J. Sikora*

The most important part of making fertilizer recommendations is collecting a good, representative soil sample. Soil test results and fertilizer recommendations are based solely on the few ounces of soil submitted to the laboratory for analysis. These few ounces can represent several million pounds of soil in the field. If this sample does not reflect actual soil conditions, the results can be misleading and lead to costly over- or under-fertilization. It is necessary to make sure that the soil sample sent to the laboratory accurately represents the area sampled.

## Sample Timing

Soil samples can be collected through much of the year, although fall (September to December) or spring (February to April) are the best times. Fall sampling will often result in a faster return of results and recommendations. Fall sampling will also allow the grower time to have the fertilizer applied well before planting the next crop. However, fall sampling results in lower pH and soil test K levels when conditions are dry. In either case, a field should always be sampled the same time of the year in order to make historical comparisons.

Most fields should be sampled every three to four years. High-value crops, such as tobacco, commercial horticultural crops, alfalfa, red clover, and corn silage, should be sampled annually so that plant nutrient levels can be monitored more closely. Application of manure can change soil test phosphorus, potassium, and zinc levels dramatically, so sampling manured fields each year is also recommended.

## Tools You Need

A soil probe, auger, garden trowel, or a spade and knife are all the tools you need to take the individual cores that will make up the “field” sample (Figure 1). You will also need a clean, dry, plastic bucket to collect and mix the sample cores. Be sure not to use galvanized or rubber buckets because they will contaminate the sample with zinc. Soil sample boxes or bags and information forms for submitting samples are available at all county Extension offices.

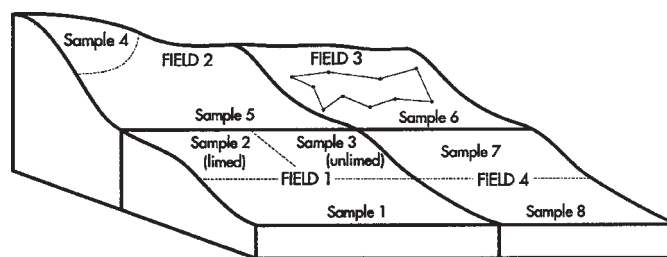
## Collecting Field Crop Samples

An individual sample should represent no more than 20 acres except when soils, past management, and cropping history are quite uniform. The most representative sample can be obtained from a large field by sampling smaller areas on the basis of soil type, cropping history, erosion, or past man-

agement practices (Figure 2). For example, a portion of a field may have a history of manure application or tobacco production while the other part does not. Phosphorus and potassium levels will likely be higher in these areas, causing the rest of the field to be under-fertilized if the field is sampled as one



**Figure 1.** A soil probe, auger, or spade and knife should be used in sampling soils. The spade sample must be trimmed as shown.



**Figure 2.** This shows how four fields might require the analysis of one to three composite samples for determining fertility needs. Each composite must contain 10 or more cores, as shown for Sample 6 in Field 3.

unit. It is much better to collect separate samples from these areas because their nutrient requirements are likely quite different from the rest of the field.

If a few years of yield maps are available, these can help identify areas of the field that should be sampled separately.

Soil sampling can also be used to “troubleshoot” areas of the field that are visually different or are consistently low yielding when compared to the rest of the field. Take a sample both from the poor growing area and adjacent areas of good growth. Keep good records indicating where each sample was taken.

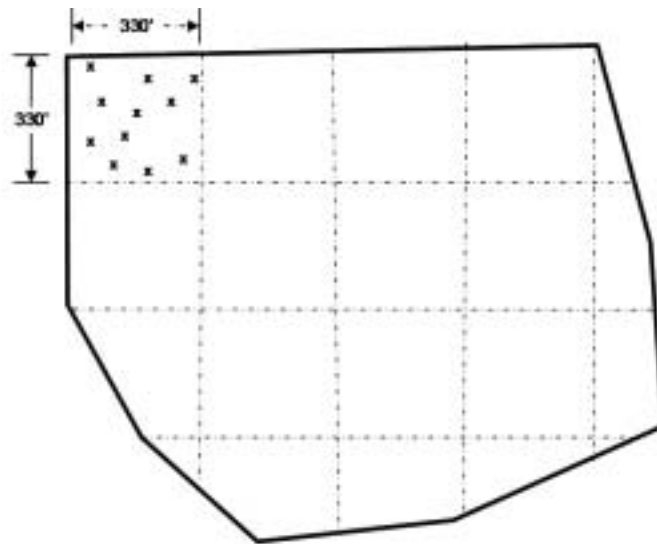
**Collect at least 10 soil cores for small areas and up to 30 cores for larger fields.** Take the soil cores randomly throughout the sampling area and place them in the bucket. **Do not sample:**

- back furrows or dead furrows,
- old fencerows,
- areas used for manure or hay storage and livestock feeding, and
- areas where lime has been piled in the past.

## Grid Soil Sampling

With new advances in agriculture and the availability of global positioning satellites, it is now possible to divide a field into smaller units or grid cells that can be sampled individually. Soil test results from each grid can be used to prepare nutrient availability maps of fields. Variable-rate fertilizer and lime applications are then based on these maps. Grid soil sampling and prescription fertilizer maps may result in more accurate recommendations and may lead to greater efficiency in fertilizer use.

Currently the industry standard grid size is 2.5 acres, but Kentucky research shows that variability within areas as small as one acre can be as great as the variability within the entire field. Because soil variability is so high, it is important to treat each grid cell as a field. At least 10 random samples should be collected across the entire grid cell, rather than a few cores from the center of the grid (Figure 3). Grid sampling can be a good way to identify old field boundaries or parts of fields that have had different management in the past if they are unknown to the current producer. This intensive sampling is costly, and limited Kentucky research has not shown a predictable economic benefit when it is compared to the current recommended method of sampling according to soil type, past history, or past management zones.



**Figure 3. A field can be divided into 2.5-acre grid cells, as shown in the diagram above. Each cell should be treated as an individual field, and approximately 10 random cores should be taken from each cell.**

## Sampling after Banded Fertilizer Applications

Care must be taken when sampling no-till fields that have had fertilizer applied in bands rather than broadcast. Phosphorus, potassium, and zinc are immobile in the soil and remain in the concentrated band for several years after application. If these bands are completely avoided during sampling, soil test results will be lower than “actual,” leading to over-fertilization. If bands are included too often, soil test results will be higher than “actual,” causing an underestimation of fertilizer needs for the crop.

When the location of the bands is known, it is best to sample in the band one time for every 20 cores taken. If the location of the band is unknown, it is best to take pairs of random samples. The first core is completely random, and the second core is taken one-half the band spacing distance in a direction perpendicular to the band direction. For example, if banded fertilizer was applied on 30-inch spacing, the first core would be randomly selected, and the second sample would be taken 15 inches away (perpendicular to the direction of the band). This process would be repeated at least 10 times in a small field and up to 30 times in a larger field. The more cores that are collected, the more closely the sample will represent “actual” field conditions.

## Collecting Lawn or Garden Samples

Sample gardens, lawns, and landscaped areas separately. Collect cores randomly from each area. The area to sample for trees includes the soil below the width of the tree. For shrubs, flower beds, and gardens, sample just the soil where the plants are growing. You should sample problem areas and areas with shrubs, trees, or flower beds separately from other turf or lawn areas. **Do not sample:**

- compost areas,
- under the drip-line of trees, and
- close to driveways or streets.

## Sample Depth

One commonly overlooked component of soil sampling is the depth of soil to be tested. Most plant nutrients accumulate at the soil surface. This nutrient stratification is a result of past broadcast fertilizer applications and decomposition of plant residue on the soil surface. Because there is a higher concentration of nutrients on the soil surface, soil test values usually go down as the sample depth is increased. To obtain accurate and consistent (between different years) results, samples must be taken to the following depths for these areas:

**Tilled Areas**—Take soil cores to the depth of the tillage operation (usually 6 to 8 inches).

**Non- or Reduced-Tilled Areas**—Take soil cores to a depth of 3 to 4 inches for pastures, no-till planting (where fertilizer or lime remains on the soil surface), and minimum-till planting (where fertilizer is incorporated only in the surface 1 to 2 inches).

**Lawns and Turfgrasses**—Collect soil cores to a depth of 3 to 4 inches.

## Sample Preparation

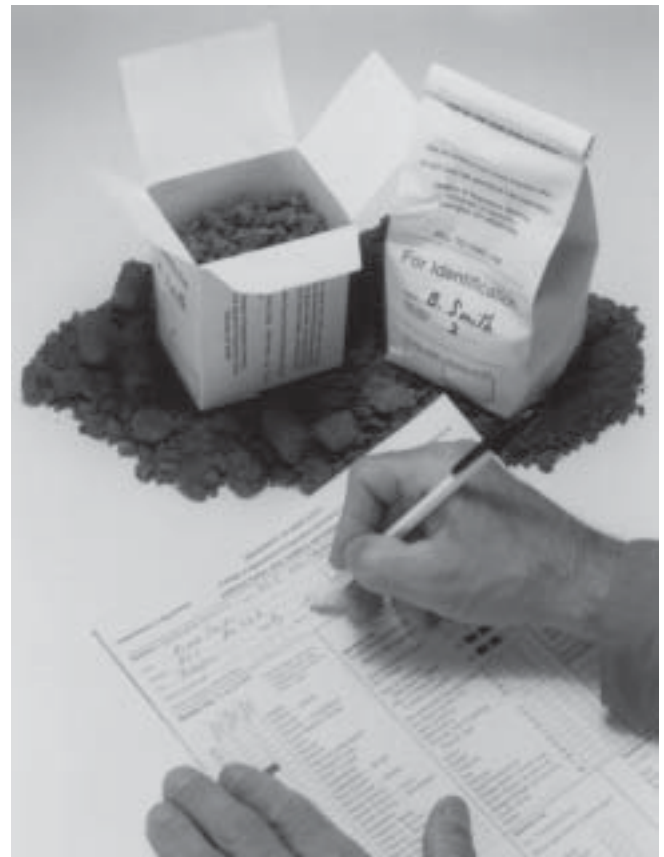
After all cores for an individual sample are collected and placed in the bucket, crush the soil material and mix the sample thoroughly (Figure 4). Allow the sample to air dry in an open space free from contamination. **Do not dry the sample in an oven or at an abnormally high temperature.** When dry, fill the sample container with the soil (Figure 5).



**Figure 4.** Break up clods while a sample is moist, and spread out to air dry in a clean area.

Sampling and preparing the soil for submission is only half of the process. The other equally important part is filling out a sample information sheet so that the desired crop, tillage, and other information can be considered when making the fertilizer recommendation (Figure 5). The sample information sheet contains all the important information required to provide accurate lime and fertilizer recommendations. Sample information sheets for the University of Kentucky Soil Testing Laboratory can be found on the Web at <<http://soils.rs.uky.edu/sample1.htm>>. The types of forms available are the:

- agricultural form,
- home lawn and garden form, and
- commercial horticulture form.



**Figure 5.** Thoroughly mix the air-dried sample, fill the sample bag or box, mark with your sample designation, fill out the information sheet, and take the sample to your county Extension office.

Each form asks for primary and alternative crops, as well as other background information. The amount of background information needed depends on the crop to be grown. Table 1 is provided as a guide to the background information needed for major agricultural crops (a) and home lawn and garden plants (b). Help on filling out the forms can be provided by your county Extension office.

It is very important to complete the pertinent sections of the sample information form. This will assure that you receive the most accurate fertilizer recommendations possible. Soil samples should be taken to your county Extension office; from there they will be sent to the UK Soil Testing Laboratory. Results and recommendations will be e-mailed to the county office usually within one to two weeks of submission.

**Table 1. List of required crop information for accurate lime and fertilizer recommendations.**

<b>A. Agricultural Soil Sample Form</b>				
<b>Primary Crop</b>				
<b>Required Information</b>	<b>Corn</b>	<b>Soybeans</b>	<b>Tobacco</b>	<b>Forages</b>
Previous crop	yes <sup>1</sup>	no <sup>2</sup>	yes	no
Primary management	yes	no	no	yes
Previous management	yes	no	no	no
Primary use	yes	no	no	yes
Previous use	no	no	no	no
What was there 2 years ago?	no	no	yes	no
Soil drainage	yes	no	yes	no

<b>B. Home Lawn and Garden Soil Sample Form</b>			
<b>Primary Crop</b>			
<b>Required Information</b>	<b>Vegetables &amp; Fruits</b>	<b>Turfgrass</b>	<b>Landscape Plants</b>
Turfgrass location	no <sup>2</sup>	yes <sup>1</sup>	no
General information	no	yes	no

<sup>1</sup> Yes = Information is needed for accurate recommendations.  
<sup>2</sup> No = Information is not needed for accurate recommendations.