SOIL SAMPLING

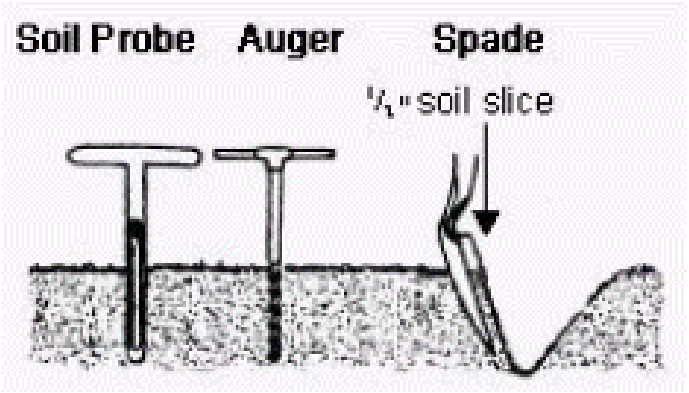
Beneficial results of a soil test depend on a good sample. The sample should represent the area it is taken from. A soil sample must be taken at the right time and in the right way. The tools used, area sampled, depth and uniformity of the sample, information provided, and packaging all influence the quality of the sample.

Correct Sampling Time

- Take a soil sample a few months before initiating any new landscaping—whether it be laying sod, starting a vegetable garden, putting in a flower bed, or planting perennials. This way, if the soil test report recommends lime, you will have enough time to apply it and have it adjust the soil pH before you plant.
- Sample established areas—lawns, trees, shrubbery, and other perennials—once every three or four years. You can sample at any time of year; however, mid-August through mid-September is an ideal time to take samples for cool-season grasses, such as fescue, bluegrass, and ryegrass. By sampling at this time, you can be ready to apply lime in the fall.
- If an established area exhibits abnormal growth or plant discoloration, take a soil sample right away. You may want to submit matching plant tissue samples or separate soil samples for nematode assay. For areas recently limed or fertilized, delay sampling at least six to eight weeks.

Use Clean Sampling Equipment

- Use a soil-sampling probe, an auger, a spade or shovel.
- Tools should be either stainless steel or chrome-plated. Do not use brass, bronze, or galvanized tools because they will contaminate samples with copper and/or zinc.
- If a shovel or a spade is used, dig a V-shaped hole to sample depth (4-6’’), then cut a thin slice as shown on the right.
- Mix soil cores for each sample in a clean, plastic bucket. If the bucket has been used to hold fertilizer or other chemicals, wash it thoroughly before using it for soil samples.

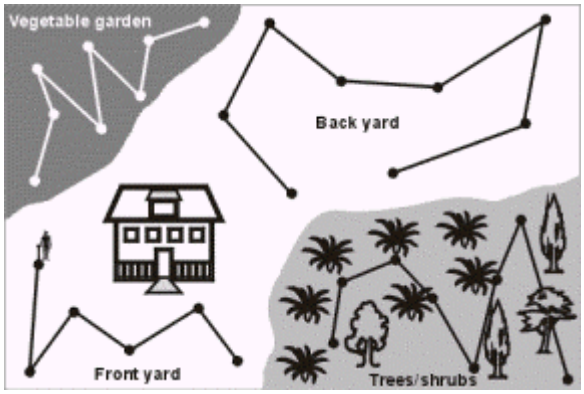


Sampling Area

- Each sample should represent only one soil type or area—for example, a lawn, vegetable garden or perennially landscaped area. For each unique area, take at least six to eight samples. Place all the samples for one unique area in a plastic bucket and mix

thoroughly. Use the mixture in the bucket to fill a soil sample bag about two-thirds full. Look for the fill line on the bag.

- If one area of your yard seems healthy and another has bare or yellow areas, sample healthy and unhealthy areas separately even if both are lawn grasses or flower gardens, etc.



Sampling Depth

- For lawns, sample to a depth of four inches, excluding any turf thatch.
- For vegetable and flower gardens, sample to the depth that you plan to incorporate lime or fertilizer, usually four to six inches.
- For shrubbery, remove any mulch or surface debris, then sample to a depth of four to six inches around the base of plants. Avoid zones where lime or fertilizer has been recently applied.

Submitting Samples

- Put samples in A&L sample bags or medium zip-lock bags.
- Use a ballpoint pen or water proved marker to label each sample bag and complete the soil submittal form. Do not use felt tip pens since most of them do not contain waterproof ink. Bags labelled with a pencil can be very difficult to read if they become dirty.
- List the crop code shown on the back of the information sheet in the appropriate column.
- *Do not* put information sheets inside sample bags. Attach information sheets to the outside of the shipping bag or put them inside the shipping box next to or on top of the samples.
- *Do not* use sample bags as mailing containers.

Soil Sampling Methods

Properly collecting soil samples is the most important step in any nutrient/soil amendment management program. Soil sampling should reflect tillage, past fertilizer/soil amendment placement, cropping patterns (and corresponding irrigation requirements), soil type (including drainage and slope characteristics) and perhaps old field boundaries (such as old feedlots, indrows, altered stream beds, etc.). Trends toward reduced and/or zero tillage and technology for variable rate fertilization (VRF) have especially demanded that soil samples be taken more

comprehensively and intensively for more accurate fertilizer and soil amendment application. This brochure will discuss the many methods used for taking an accurate soil sample using various methods and under several different types of tillage situations. The most commonly used method for soil sampling would be based on soil types. Fields are split into sampling areas that contain similar soils. Hillsides are kept separate from bottoms since the soil types will vary. Soil survey maps, if applicable, can help organize the soil types throughout the sampling area. Samples will not necessarily need to be collected for every soil type; however, similar soils should be kept together. Sampling maps can be kept to note the locations of the cores for subsequent sampling. The sampling area will be dependent on the soils and topography. Generally, an area of forty acres is considered the maximum size. Smaller sampling areas may be needed if the soils are quite variable or a production problem is apparent. Once the sampling area is determined, a sufficient number of cores should be taken to acquire a representative sample. This is generally 10 to 20 cores. The depth of sample for surface soils would be 0 to 6 inches or as deep as the primary tillage. Deeper samples to 24 or 36 inches can be taken for residual nitrate-nitrogen. These deep samples would be kept separate from the surface samples and noted accordingly on the bag and submittal form.

Seasonal Effects on Soil

Test Values There can be considerable seasonal influence on soil test values and every effort to maintain consistency within season when taking soil tests should be made. The two analytes most affected by seasonal influences are potassium and pH. in soils having medium to high clay contents, potassium soil test values have a tendency to be higher during the winter months. Soil pH values can also vary appreciably over the year depending on nitrogen and sulfur inputs, amounts of rainfall or irrigation and soil buffering capacity (amount and types of clay and free carbonates).

Given that soil test values will vary between seasons, one approach as to when soil samples should be taken is during those periods when the variations hit average values. These periods are generally in the early fall (September-November) and again in the late March-April time frames. In attempts to ideally correlate soil test values to yield, tests should be taken to coincide with a given crop's critical nutrient demand period, usually when nutrient uptake is at its fastest rate. Most generally, however, the ideal time frame for taking soil samples should be based on ease of field access, so that differences in soil type, slope, drainage and cropping pattern can be most easily accounted for.

Year to year variation of soil test values can be appreciable as well, depending on the amount and timing of rainfall, and the duration of freezing and thawing over the winter months. Considerable interpretive value can be obtained from soil tests taken consecutively over 5-7 years to establish the extent of yearly variability in attempts to better manage fertilizer and soil amendment inputs for build-up, draw-down or maintenance purposes.

Crop Effects on Soil

Test Values Soil sampling events should be consistent as much as possible as significant differences in total nutrient uptake between crops or crop specific nutrient inputs exist that can impact on soil test values. For instance, in the fall, exchangeable potassium will test lower following corn than following soybeans, due to larger seasonal potassium uptake by corn during the growing season. Soil pH may be lower in the early fall following corn vs. following soybeans, due to nitrogen and/or sulfur inputs on the corn. Irrigation requirements

vary between crops, leading to possible soil test variations following the irrigation season in the areas of nitrate-nitrogen, sulfate-sulfur, boron, soil pH, sodium, carbonates, and electrical conductivity as a function of soluble salts. Effect of a given crop on seasonal nutrient uptake and crop specific nutrient/irrigation requirements can help explain a great deal of year to year soil test variation.

Grid Soil Sampling

Development of site-specific nutrient management via global positioning systems (GPS) and variable rate fertilization (VRF) demands that soil sampling be intensively organized into a systematic grid pattern. Grid soil samples should be taken at a specific point, either within the grid cell or at intersection points between grid cells, consisting of 8-10 cores per sample taken within a 10-foot radius.To more correctly represent soil test variability within a field (especially for implementation of soil test mapping), the grid sample points should be organized into a systematic grid-diamond pattern or a systematic unaligned grid pattern as shown in figures 2 and 3. The grid-diamond pattern is accomplished by shifting the sample points to the left or right of the grid cell center in alternating rows perpendicular to the measurement pattern (established by counting rows, using distance measuring devices, or GPS). The systematic unaligned sampling pattern is best utilized via GPS, following this procedure:

- Divide the field into cells by means of a coarse grid. Square cells are the norm but not mandatory.
- Superimpose a finer grid (reference grid) in each coarse cell. For example, if there are 5 rows and 5 columns in the coarse grid, you might choose to divide each coarse cell into 25 smaller cells.
- Choose a corner of the coarse grid, say top left, and randomly select a reference cell—in this sample, one of the 25 reference cells.
- Move horizontally to the next coarse cell in the top row and keep the X coordinate the same but randomly select a new Y coordinate.
- Repeat the process for all the coarse cells in the top row.
- Return to the upper left corner and repeat the process down the first column of cells, this time keeping the Y coordinate the same, but changing the X coordinate in each successively lower coarse cell.
- The remaining positions are determined by the X coordinate of the point in the left-hand square of its row and the Y coordinate of the point in the uppermost square of its column.

Non-Grid Soil Sampling

While this method is less systematic and precise than grid sampling, reliable results can be obtained if sample points and/or walk patterns are consistent between sampling events (utilizing row counts, distance measuring devices, or GPS). The area represented by each sample should be no more than 20 acres depending on soil type, slope, drainage, old field boundaries and variation in cropping pattern. 15-25 cores per sample are recommended. A variation on the grid-point sampling technique can be useful in developing more consistent, non-grid sample results. Specific points within the field are chosen based off of soil type and yield data (if available), and 10-15 cores are taken within a 20-foot radius around each point. Using GPS would enhance relocating sample points to insure consistency for this sampling method.