

Soil Sampling – The Key to Effective Nutrient Management Planning

Why Soil Sample?

Agriculture is subject to high input costs along with increasing demands to protect the environment. As a result, farmers are utilizing nutrient management plans (NMPs) to better manage their inputs at rates that can sustain crop production and protect the environment. NMPs require current representative soil test results. Table 1 summarizes the purpose, methods, and results of soil sample testing.

Table 1. Soil Sampling Routines

Purpose of Sample	What to Test	Depth	Time of Year	Notes
Basic Fertility – acidity and nutrients	pH, P, K, Ca, Mg & micronutrients	15 cm (6 in) 5 cm (2 in) if no-till or pasture > 3 yrs	Spring or Fall	Fall preferred to get timely results
Nitrogen	nitrate & ammonia N	30 cm (12 in)	Spring or Summer	Summer before side dressing, store at 4°C.

Sampling of soil can occur any time of the year as long as results are obtained in time to develop fertilizer and manure application recommendations. The preferred time to sample is fall. Early fall will allow for fall liming if required, but late fall after harvest will allow time to test samples and provide results to plan for the next growing season. Post harvest samples also take into account crop removal of nutrients as well as fertilizer effects on soil acidity. Chose a sampling time, then keep it consistent from year to year and preferably within the crop rotation. For example, sample before the most profitable crop. Soil sample recommendations for lime are based on a 15 cm (6 inch) soil depth. If you till deeper than 15 cm, you may need to adjust lime rates up from the recommendation. Conversely in a non-till or permanent sod situation, lime rates can be reduced.



Photo by Eastern Canada
Soil & Water Conservation Centre

What You Need To Do

A producer first needs to develop a sample plan by identifying fields into areas that samples are to be taken from. This can be done with the help of aerial photography that can usually be obtained from Service New Brunswick (SNB) or from some offices of the Department of Natural Resources. Various software programs are also available to producers to make their own maps using GPS coordinates they have taken along field boundaries. The New Brunswick Department of Agriculture and Aquaculture (NBDAA) developed a GIS-based "[Agricultural Resource Management System](http://www2.gnb.ca/content/gnb/en/departments/10/agriculture/content/arms.html)" (ARMS) to delineate agricultural land and assign a unique number to each field. This tool may be useful to identify sample areas and is located on the department's website at <http://www2.gnb.ca/content/gnb/en/departments/10/agriculture/content/arms.html> .

Even with the use of aerial photos, GPS or GIS systems, producers may sub-divide fields into additional sample areas based on:

- a) soil variability within a field, due to soil type and/or differences in fertility;
- b) areas of different production potential (low versus high yielding fields);
- c) field size - areas should not exceed 10 ha (25 ac) in size, for samples to be representative;
- d) variations in topography;
- e) differences in crop type or variety;
- f) methods of previous fertilizer, manure, or lime applications and degree of tillage mixing.

Each sample area should be assigned a permanent number for future reference and comparison of results through time. Sample areas should be sampled once every three years; even more frequently on sandier soils or with crops that are heavy feeders such as silage corn and alfalfa.

It is recommended that a complete set of soil tests be taken every two or three years and that at least three of these sets be kept on hand for comparisons to be properly made.

Tools You Need

To take representative samples you can use a soil auger or probe. Some farmers make a hole in a flat plastic container and use a cordless drill to sample through the hole. Sample buckets should be stainless steel or plastic. Sample bags should be contaminant free and samples must be kept cool and dry.



Photo by New Brunswick Department of

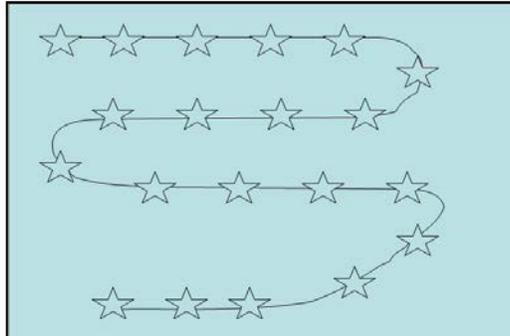


Photo by New Brunswick Soil and Crop Improvement Association

Methods of Sample Collection

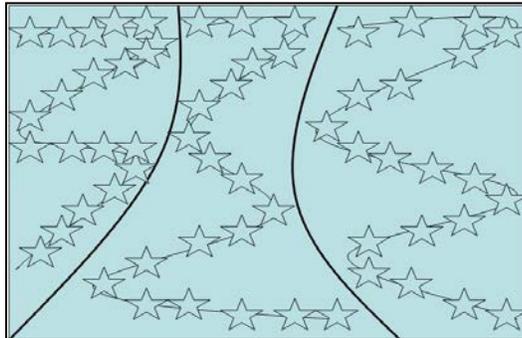
Three methods of soil sample collection commonly used within the Province are described below, depending on the degree of variability within a field.

- 1. Composite Sample:** The most common sample collection method is to take a random sample from the field, without any reference to topography or other field features. This method works well in fields that are uniform in soil type, production and management history.



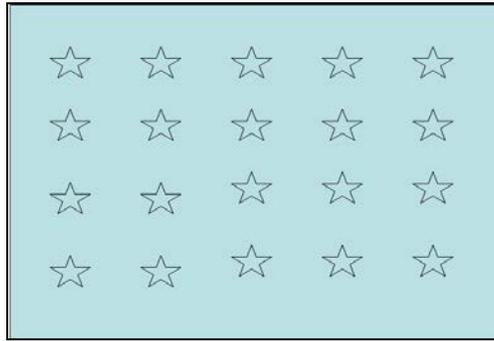
= one composite soil sample, made up of 20+ sub-samples

- 2. Stratified Composite Sample:** A field may be broken down into areas of similar topography, management history and/or crop performance. Each area is then sampled separately.



= three composite soil samples, each made up of 20+ sub-samples

- 3. Systematic or Grid Sampling:** Sampling points are pre-determined across a field at fixed intervals such as one per hectare. Then four to five sub-samples are taken near each point. Each point then has its own soil sample and result. With this information a fertility map may be created for the field showing areas of similar fertility. This may have benefit for high value crops or crops sensitive to certain nutrient levels and/or pH. If soils are high testing in nutrients, this method of sampling will likely have fewer benefits. This method is related to the use of GPS equipment.



**= 20 composite soil samples, each
made up of 4 or 5 sub-samples**

Points to Consider:

***Sample areas should not exceed 10 ha (25 ac),
assuming uniform field conditions.***

***Method 3 can produce a fertility map for variable
rate application of fertilizers.***

***Cost and effort will increase from method 1 through
method 3.***

How to Prepare a Composite Soil Sample

After you have collected 20-30 sub-samples from the field in a bucket, remove any crop debris or stones, crush clods and mix thoroughly. After mixing the sample, place 500 ml (2 cups) of soil in a soil sample bag marked with the field identification number, date collected and producer name.

Confirm with the chosen lab that soil sample analysis will be done using methods common to the region. For example, the NB Agricultural Laboratory used a Mehlich III extraction for nutrient analysis and provided general recommendations based on results from this analysis method.

Avoid Certain Field Conditions

Try to stay away from areas with potential sources of sample misrepresentation or sample them separately:

- a) eroded areas;
- b) poorly drained areas;
- c) areas with different cropping patterns;
- d) areas with different lime, manure or fertilizer treatments;
- e) headlands and line fences;
- f) recent fertilizer bands;
- g) dead furrows that expose subsoil;
- h) areas adjacent to roads, lime, manure or crop residue piles.

What Do I Do Now?

Keep good records and maintain a consistent sampling plan. The cost of analysis and sample collection is very low, on a per acre basis, when compared to other production costs. Therefore, to get the most out of your soil testing program, keeping records and being consistent is essential in order to realize the benefits of nutrient management planning.