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Keys To

Soil Sampling Success

for Hertford County Producers

Soil Sampling Basics

Properly collecting soil samples is the most important step in any nutrient/soil amendment management program. Proper soil sampling should reflect tillage, past fertilizer/soil amendment placement, cropping patterns, soil type, and perhaps old field boundaries. Nearly all North Carolina soils are naturally acidic and need lime, about once every 3 years.

Timing

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. Since soil test values have the tendency to vary between seasons, it is important that soil samples are taken during periods when the variations have hit average values. These periods are generally in the early fall (September-November) and again in the late March-April time frames.

Sampling Methods

There are numerous methods of soil sampling available today due to advances in precision agriculture. A critical step in obtaining accurate soil tests is collecting representative samples in the field. Typically, uniform fields should be sampled in a simple random pattern across the field collecting at least 15-20 equal size soil cores. Avoid, or sample separately, areas like abandoned farmsteads and feedlots, manure piles, fences, roads, eroded knolls, low areas, and salty or wet spots. Fields with significant landscape or other differences should be divided into separate sample areas. Differences may include soil types, slope, degree of erosion, drainage, crop and/or manure history, or other factors that may influence soil nutrient levels. More intensive sampling should be used where detailed information about field nutrient variability is needed (i.e. precision application techniques and zone development). It is recommended that fields are divided into small areas that represent 5 to 10 acres each for soil testing purposes. Sampling may be made with a stainless steel or chrome-plated soil tube, soil auger, or spade. Do not use brass, bronze, or galvanized tools because they will contaminate samples with copper and/or zinc. The desired depth for cropland is plow depth (6 to 8 inches or more), and 2 to 4 inches for pasture land, or no-till crop fields.

Interpreting Fall Soil Reports

Soil test reports can provide a great deal of information as to the current situation of a field. Listed below are some of the key points to consider when results are interpreted.

Liming: Aluminum toxicity is the main culprit affecting whether a field needs to be limed. Most soil pH levels fall between 4.0 and 7.0. Soil pH affects the rooting environment and the ability of a crop to take up essential nutrients. Lime can be applied anytime to a field, but fall applications provide the best results. In no-till fields, a low pH is difficult to correct and tillage of a field may be necessary. Any field to be converted to no-till should have an adequate pH level before planting.

Phosphorous (P): Phosphorous plays a key role in the normal growth and maturity of a crop. Its primary function is capturing and converting the sun's energy into useful plant compounds. Crops in fields with adequate phosphorous levels are more uniform and typically mature earlier. The ideal range for the P index would be 60-70. For P indices of over 100, no fertilization is recommended, due to very high levels of phosphorous. For example, if a soil report has a P index of 100, this is equal to 490 pounds of P_2O_5 in a field.

Potash (K): Postassium is essential in the uptake of N and P. Potassium also helps wheat to withstand the winter kill. In order to determine the total number of pounds of K_2O per acre, multiply the K index times 3.484 times 1.2. The K recommendation for a field will likely need to be reevaluated for a field if samples are taken in the fall. Index values of 50 or less may respond to P or K additions, while values greater than 50 are unlikely to respond to additional P or K.

Sulfur (S): The soil test for sulfur is now reported on all samples, since the results are easily obtained when other analysis are performed. However, the presence of sulfur in a soil sampled in the fall may not indicate the status of soil the following spring or summer. If the sulfur index is greater than 25 and the sample is very recent, then little response is expected to S additions.

Manganese (Mn): Manganese is the micro-nutrient that is most affected by soil pH. On a soil sample report, "Mn-I" is a measure of manganese in the soil at the current pH level. Over-limed fields can cause pH levels to reach 7.0 and manganese to become deficient. Since manganese is key to enhancing photosynthetic efficiency and dry matter production, it is important that any deficiencies be corrected. Most Mn deficiencies can be corrected with the application of a foliar fertilizer product.

Zinc (Zn): Growers who apply animal waste should be cautious when applying manure. Multiple applications of manure can create a zinc index of 250 ppm or greater which will render a field unusable for peanut production.

Copper (Cu): Copper levels are most influenced by the organic matter in a soil. If small grains become deficient in copper, growers should apply 2.5 lbs./acre of copper sulfate in mid-February.

In terms of deficiencies, the earlier that the correction is made, the lower the risk of a reduction in yield.

Hertford County Nutrient Indexes 2015

Crop	Corn	Cotton	Peanuts	Soybeans	Tobacco
Ave. pH	6.0	6.0	6.0	6.0	6.1
Ave. P-Index	123	90	99	128	113
Ave. K-Index	63	57	56	63	40
pH Range	4.7 - 7.2	4.5 - 7.3	5.0 - 6.7	5.0 - 6.8	5.6 - 6.6
P-Index Range	15 - 599	10 - 833	16 - 336	10 - 833	17 - 368
K-Index Range	14 - 281	10 - 205	13 - 124	20 - 180	16 - 82
# of Samples	1089	3766	371	320	102

The above table represents the average values for Hertford County following the 2015 growing season. Following the conclusion of harvest in 2016, similar conclusions will be made for use prior to the 2017 growing season. There are a lot of takeaways to be mentioned based on this table. The average P-index indicates that most of our soils in Hertford County contain very high levels of phosphorous, which means no additional is needed. The average K-index shows that our soils contain adequate levels of potassium and a response to additional K fertilization is not likely. Although, the results on tobacco show that the K-index was lower, and a response may occur to additional K fertilization.

Understanding how the P- and K-index work is key to the successful application of necessary nutrients through fertilization. Being able to interpret whether or not a specific field requires P & K inputs will contribute to a great deal of savings with regards to fertility inputs for the crop year.

Have you ever taken a Nematode Assay?

A nematode assay is a microscopic examination of soil and roots that identifies species, estimates population size and assesses the potential danger of any plant-parasitic species present. Because nematodes are so small, a test is necessary to confirm their presence. Plant-parasitic nematodes are characterized by having a needle-like structure in the mouth called a stylet that, depending on the nematode species, is used to feed on plant parts that may include roots, stems, leaves and seeds. Nematodes interfere with nutrient uptake and can make plants more susceptible to disease-causing bacteria, fungi and viruses. Infected plants are often stunted or discolored, and yield can be drastically reduced. Nematodes cause millions of dollars in crop losses each year. In many cases, the damage is blamed on some other problem, such as nutrient deficiency, drought or disease.

Why are they important?

Having a current nematode assay report can help you plan ahead and select strategies that are best suited to your particular situation. Take steps to manage nematodes before planting. If you have results from a nematode assay, you will know whether you should choose an alternate crop, look for a resistant variety, plan to rotate crops and fields and/or apply a nematicide. After a crop is in the field, management options are limited. Effective approaches often include a combination of biological, cultural, chemical and mechanical control measures.

How do you take the sample?

Proper sampling involves the collection of composite samples, each of which is made up of 20 1-inch-diameter soil cores. The cores should be collected in a systematic, zig-zag pattern. Take one sample per 5 acres. For larger fields with a similar soil type and cropping history throughout, collect samples from two to five randomly selected 4- to 5-acre sections that are representative of the field.

When collecting soil cores, insert a sampling tube at a slight angle under the plant. Insert the tube deep enough (8 to 10 inches) that it cuts through the root zone, thus ensuring that soil and roots are included in the core. After all cores have been taken, thoroughly mix the soil before removing enough to fill the shipping box. To be properly identified, nematodes must arrive at the nematode laboratory alive. Thus, nematode samples must be protected from temperature extremes and should not be stored for longer than two days. Keep the samples in a cool storage room or in a refrigerator until they are ready for shipment. Nematode assay sample kits are available at the Hertford County Extension Center.

When should the samples be taken?

The timing of collecting nematode samples is important because nematode populations fluctuate throughout the year. Nematodes may be undetectable during the winter and early spring but increase to very high levels before harvest; following harvest, population levels may decline precipitously. Sampling when population densities are high decreases the risk of failing to detect a damaging species. It is recommended that nematode assays are done prior to harvest, when nematode populations are at their peak and the crop is still in the field.

Nematode populations overwinter primarily as eggs. "Winter" can loosely be defined as November through March when most North Carolina soils are too cold to support active root growth of warm-season crops. Unfortunately, typical laboratory assays do not detect nematode eggs, so samples collected in the winter frequently fail to detect

nematodes when there are actually many nematode eggs present. Samples collected during the winter are of little value for comparison to threshold levels. The only value that such samples can have is to identify certain species as being present in the field. It must be noted that failure to detect a species does not necessarily mean that it is not present; the species may be present at low levels that the random sample missed or it may be present only as eggs, which the assay cannot detect. Samples taken during the fall are preferred over taking them during the winter.

Assay Results

Over the past 3 years, a total of 28 nematode assays were conducted for Hertford County growers. Assays were primarily conducted in fields where cotton, peanuts, wheat, and cucumbers were to be grown. The assay results list the numbers of nematodes recovered from soil (nematodes/500cc soil) and roots (nematodes/gram root), if roots were included. Problem nematodes are indicated with asterisks on the assay report. One asterisk (*) indicates low hazard. Nematodes are stressing the plants, but other factors (such as disease or moisture stress) are probably also present. Two asterisks (**) indicate high hazard. Nematodes are likely to be damaging plants severely even in the absence of other stress factors.

Nematode assays are a vital tool available to growers in Hertford County. They allow us to make sound decisions related to the management strategies we implement each year