Soil testing Q & A

by Dr. Adrian Johnston*

Soil testing... if you feel as though you have heard enough about soil sampling, you are in for a big surprise. With the increased focus on nutrient management planning of intensive livestock areas, and farm planning programs to manage fertilizer nutrients, we are on the verge of major soil sampling promotional campaigns in most provinces. For the average grower, fertilizer cost is also becoming a major challenge in budgetting for crop inputs. Soil testing is an excellent way to minimize the 'guesswork' associated with seeding a crop for maximum economic yield. This fertilization article reviews some of the common questions posed each year from crop advisers who take and interpret soil samples.

Collecting a good custom soil sample – why is it still a challenge?

It has been said a thousand times, soil sampling practices are where the vast majority of errors occur. If you consider that the sample is subject to accepted North American handling protocols once it reaches the soil testing laboratory, any field sampling problem that affects the sample ahead of time will impact the results obtained and thus the recommendations made. For the sake of keeping a customer and getting them used to the best science-based soil fertility planning tool, be sure you are getting good samples.

Why is it important to consult with, or take along, the farmer when custom soil sampling?

The potential for sampling the 'wrong' location is very high in a field you have never been in before, trying to decide the best location to collect your soil cores. With the farmer riding along, or providing clear direction on paper ahead of time, the sample operator has clear guidance as to where not to sample in the field. This becomes critical, considering the time and effort required to collect soil samples and the need for composite samples to be representative of the dominant production area in the field. Once these preferred sampling areas have been identified, marking them with GPS allows for future reference when sampling again.

Why do we insist that for a composite sample the operator collect 15 to 20 sample cores?

When composite sampling, getting a representative sample is critical. While a composite sample will not provide any insight into the variability found in a particular field, picking the right spots to represent the average production areas is critical. In collecting the sample, imagine what happens to the average value when one bad core (saline for instance) ends up mixed in with the rest. The more samples collected, the more dilution will occur from this one bad core.

For example, there are saline areas in many fields in semi-arid regions. However, when you get a soil sample back saying the field is saline, not just the three acres at the base of the hill you have always known about, you know that it is a poor representative sample for the field. One bad core mixed in with eight to 10 others is a far bigger problem than one bad core mixed in with 15 to 20 cores. If the differing areas of the field are large, they should be separated into a sub-region and a sample collected from that particular region. This will aid in fertilizer application rate management. Sample number, or intensity in a field, should increase with the amount of rainfall received, or where irrigation is used.

Sampling around last year's fertilizer bands – how do you avoid high residual nutrients?

Selecting a sampling location to collect your soil cores also requires asking how fertilizer P and K were applied the year before. While most N and S sources are mobile in the soil and move away from the band location in soil water, P and K additions will remain very close to their original band location. If applied in the seedrow, or in a side-band, these are areas to avoid sampling. Sometimes growers will apply P and K in the mid-row band with their N and S, so these areas should also be avoided. A few simple questions can avoid excessively high soil nutrient levels which end up reducing confidence in the sample collected.

How does sampling to a uniform depth avoid disappointment?

Nutrient concentration in the soil can vary significantly with soil depth. Care must be taken when collecting a composite sample to ensure that the sampling depth is uniform, and if different from the option provided on the sample bags, this is noted. For example, if the laboratory suggests a sampling depth of zero to six inches and six to 24 inches, but you actually have samples that are zero to four inches and four to 16 inches, noting this on the sample bags will ensure that the

Figure 1.

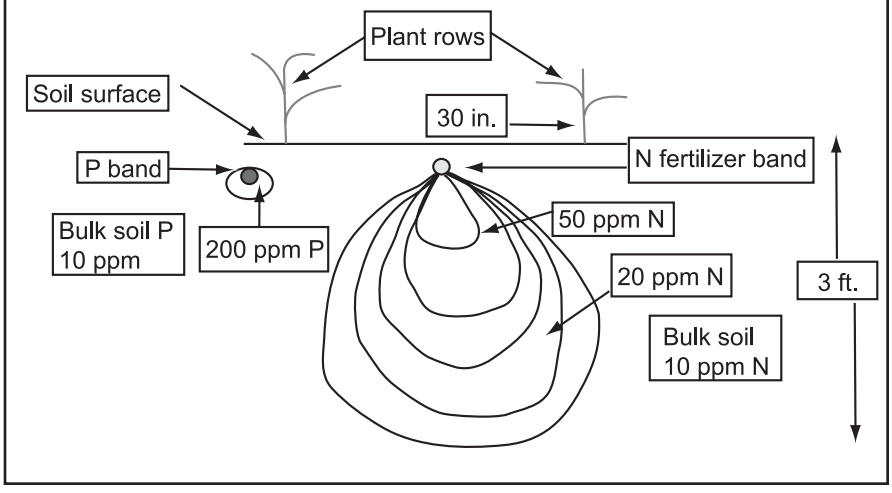


Figure 2. Conventional sampling.

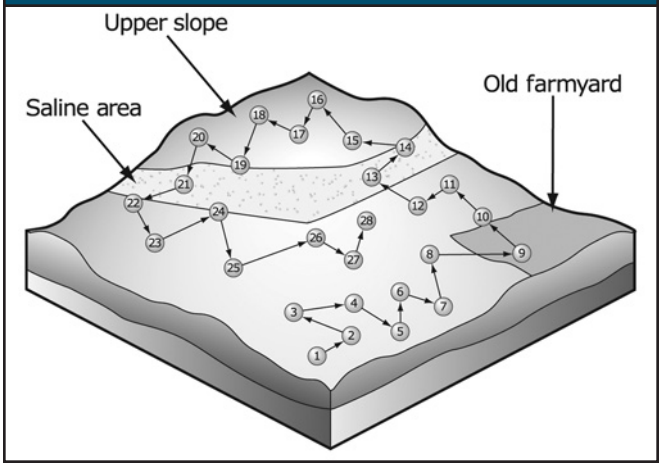
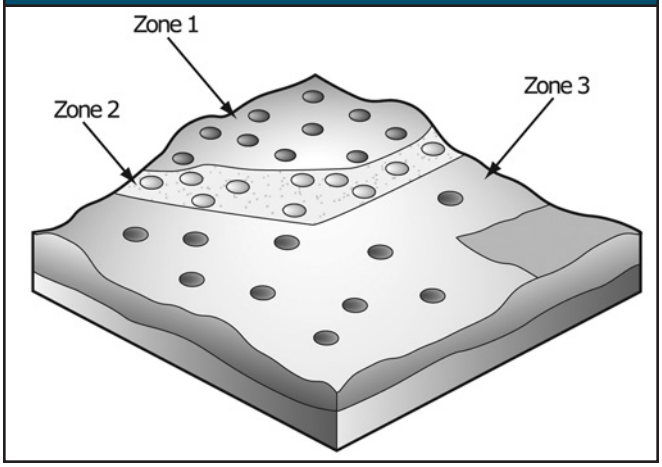


Figure 3. Sampling by management zone.



laboratory uses the appropriate conversion factors when estimating the supply of available nutrients. A change in the depth you submit to the laboratory is not a problem, it is just ensuring that you note on the sample bag what depth the sample was collected.

Sample timing – Why is it important to sample at the same time each year?
One of the advantages that soil sampling provides is the opportunity to monitor soil nutrient changes and trends over time. However, to make a good comparison it requires sampling from the same areas from year to year, and sampling at the same time of year. Taking samples for spring seeded crops after fall harvest is ideal. Sampling in the fall prior to any tillage helps to minimize field variability and ensures uniform sample core collection. Canola and pulse fields should be sampled later in the fall once soil temperatures drop below 50 degrees F (10 degrees C), while all cereal stubbles can be sampled after crop harvest. Where possible, avoid sampling frozen soils. Spring is also a good time to sample, with the laboratories offering rapid turn-around in sample handling.

Composite versus site-specific sampling, what are the advantages?
One of the ways in which some farmers have changed their soil sampling practices to minimize variability from year to year is to move to site-specific sampling. Using GPS, they establish a series of four or five co-ordinates in their fields which they believe best represent the field average. These are then provided to the sample operator, who drives to these locations using a truck-mounted GPS receiver. Once in these locations, the operator drives in a tight circle and collects four to five samples for the composite of 15 to 20 total cores from the field. This avoids sampling areas where problems are known to exist, such as salinity, old yard sites and areas where manure was previously applied. With this site-specific information, the farmer can then make his own changes to application rates based on his past knowledge of crop response in specific areas of the field.

Grid sampling – is it for your farm?
Grid sampling has been proposed as a means of obtaining the most accurate picture of soil nutrient variability within fields. This variability can then be managed with nutrient additions to increase field uniformity and uniformity in crop response. Grid sample cells vary in size, ranging from a low of one acre to a high of five acres. In many cases, grid sample results are used to manage less mobile nutrients like P and K. Areas low in P and K can receive more fertilizer, while those areas high in P and K will receive little or no fertilizer addition.

From a cost of sampling perspective, grid sampling can be very expensive. While it is not conducted on an annual basis, a five acre acre grid on a 160 acre field would require 32 separate analyses... cost prohibitive for many semi-arid cropping regions. While grid sampling has been shown to be profitable in areas where building soil P and K play a major role in increasing yield level and uniformity, it is not likely to be popular with growers in areas where P and K are applied annually at rates similar to crop removal. ■

Fertilization management should be based on a sound soil test strategy.

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