AGVISE LABORATORIES

Timely information for agriculture

Spring 2018

SOUTHERN TRENDS

RICHARD JENNY
AGRONOMIST/CCA

The fall soil sampling season is extremely busy for you and our laboratories. Each year, we gear up to test hundreds of thousands of soil samples during the peak of the season in October and November. Last fall at our Benson, MN laboratory, weather delayed soybean harvest and compressed our normal 7-8 week rush period into a 3-4 week time frame. This caused our service to be slower than usual for 2-3 weeks. For this coming fall, we are making some changes to help us offer faster service during the fall crunch time. We are planning to increase daily peak lab capacity by 15-20% and still provide excellent quality data to our customers. We have identified some bottlenecks in the laboratory and will be adding equipment, more personnel, and running longer hours during the peak period. These changes will put us in a good position for the coming fall season to provide our normal fast turnaround even during the peak fall season.

One way you can avoid the fall rush season is to perform more of your soil sampling in early summer (June). If you normally sample only the topsoil depth for a corn-soybean rotation, you can sample unfertilized soybean fields in May or June and collect consistent, high-quality soil samples. Sampling in June also gets soil test data in your hands sooner; once the soybeans are harvested, you can spread P & K right after harvest without any delay.

INSIDE

Long-term no-till and low pH in seed zone

JOHN BREKER
SOIL SCIENTIST

Soils across the northern Great Plains and Canadian Prairies generally have high soil pH (greater than 7.3); however, soil samples with moderately to strongly acidic pH (5.0-6.0) are becoming more common, particularly from long-term no-till fields in north-central Montana and southwest North Dakota. Soils with low pH can reduce the availability of certain nutrients, such as phosphorus. When soil pH is below 5.0, aluminum toxicity becomes a serious concern; aluminum is toxic to plants and reduces root growth, nutrient uptake, and yield.

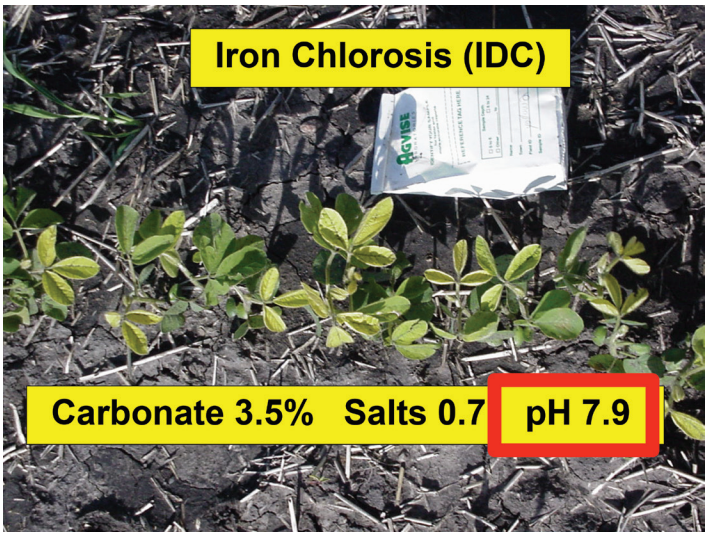
We know that these soils have become more acidic over the past few decades; continuous application of nitrogen fertilizers is well documented to lower soil pH. In long-term no-till fields, this effect is more pronounced because surface fertilizer application and accumulation of organic matter concentrates acidity at the soil surface (0-2 inch depth). These no-till fields may have surface soil pH in the 4.0-5.0 range, which can cause aluminum toxicity for young seedlings.

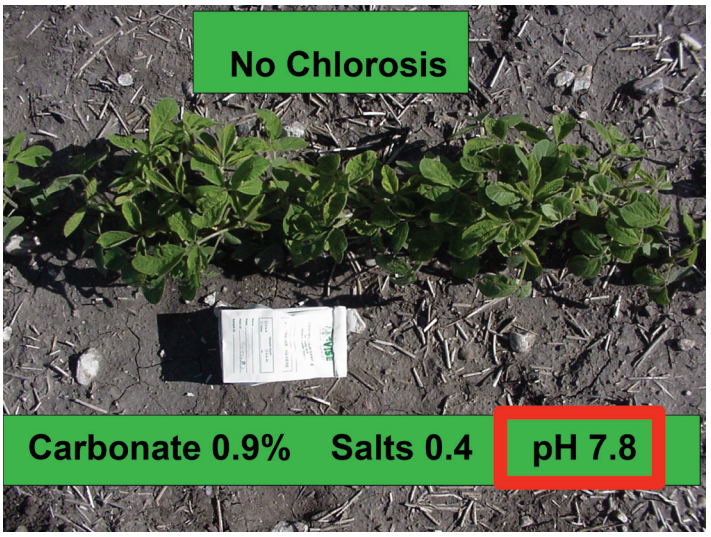
In areas with limited access to lime, farmers may apply high rates of seed-placed phosphorus (about 40 lb/acre P_2O_5) to tie-up the soluble aluminum, improving wheat seedling establishment; this is a strategy used on acidic soils in western Kansas and Oklahoma. In the Southern Plains, most wheat varieties are rated for aluminum tolerance; however, we currently lack aluminum-tolerance ratings in northern wheat varieties because this problem is relatively new to our region.

There is interest in liming these no-till fields to correct aluminum toxicity. A buffer pH test, which can be requested, is used to determine the required lime rate. Surface application of lime without incorporation can effectively raise pH in no-till fields because the acidity is concentrated at the soil surface. This year AGVISE will be starting a long-term project to evaluate surface applied lime in no-till fields. We will keep you updated as we learn more about managing acidic soils in the Northern Plains.

Managing Soybean IDC with Soil Testing

Soybeans suffering from iron deficiency chlorosis (IDC) were widespread last year across a large region. Because of this, we are getting questions on how to reduce IDC for the coming year. IDC symptoms often appear as soybean enters the first to third-trifoliate leaf stage. Soybean IDC is characterized by distinct interveinal chlorosis (yellow leaf with green leaf veins) on the newest leaves.

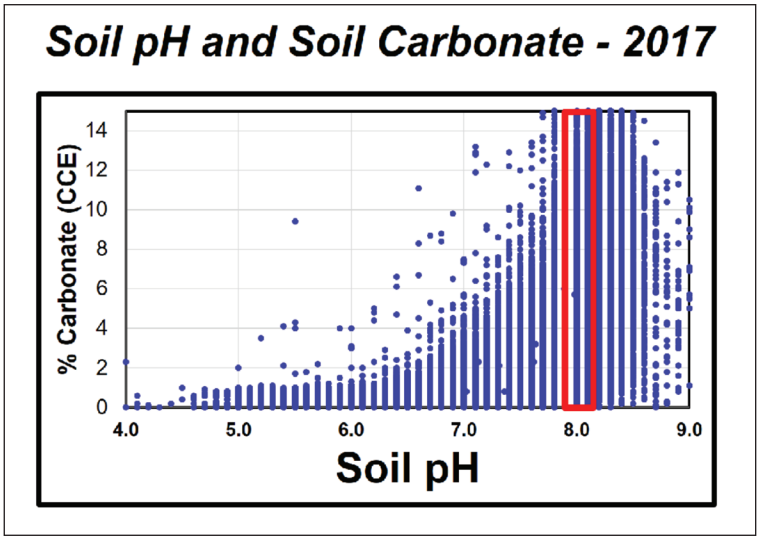




Soybean IDC is not caused by low soil iron but instead caused by soil conditions that decrease iron uptake by soybean roots. University research has shown that soybean IDC risk and severity are primarily related to soil carbonate content. Carbonate is reported as CCE (calcium carbonate equivalent) on your soil report. Soybean IDC risk is made worse by high soluble salts (electrical conductivity, EC).

In 2001, AGVISE collected soil samples from 102 soybean fields with IDC. We tested soil properties to see what was different between the IDC area and an adjacent area with healthy, green soybeans. The soil properties most different were the carbonates and salinity. These observations reinforced what had been observed by university researchers in the region. The soil test data and observations from these 102 fields was used to developed a risk index based on carbonates and salinity to help growers determine IDC risk (see table).

Soybean IDC is common in the Upper Midwest, Northern Plains, and Canadian Prairies, where soils can have high carbonates and/or soluble salts. Within a field, chlorosis symptoms are usually confined to soybean IDC hotspots with high carbonates and soluble salts. Soybean IDC severity is made worse by cool, wet soils and soils with high residual nitrate. Soil pH is not a good indicator of soybean IDC risk because many high pH soils do not have high carbonates or soluble salts, which are the two principal factors causing IDC. The figure shows the carbonate level vs. the soil pH on 70,000 soil samples from this region. In the red-highlighted area, all samples have a high pH of 8.0, but the carbonate in these soils ranges from less than 1% to over 10%. Just because a field has a high pH, it does not necessarily have a high carbonate level. A soil test must be done to determine carbonate level. To reduce your chance of IDC in your soybean fields this year, here are some things you can do:



Managing IDC with soil testing can be done by following these steps:

1. Test each field or management zone for carbonate and salinity. Determine the IDC risk (see IDC risk table).

2. Plant soybeans in fields with lowest carbonate and salinity (low IDC risk).
3. On fields with moderate to high IDC risk, choose an IDC tolerant variety. This is your best option to mitigate IDC risk.
4. Plant soybeans in wider rows. Soybean IDC tends to be less severe in wide-row spacings (plants are closer together) than narrow-row spacings or solid-seeded spacings.
5. Apply chelated iron fertilizer (e.g., high quality FeEDDHA) in-furrow at planting on moderate to high risk IDC fields.
6. Avoid planting soybeans on soils with very high IDC risk.

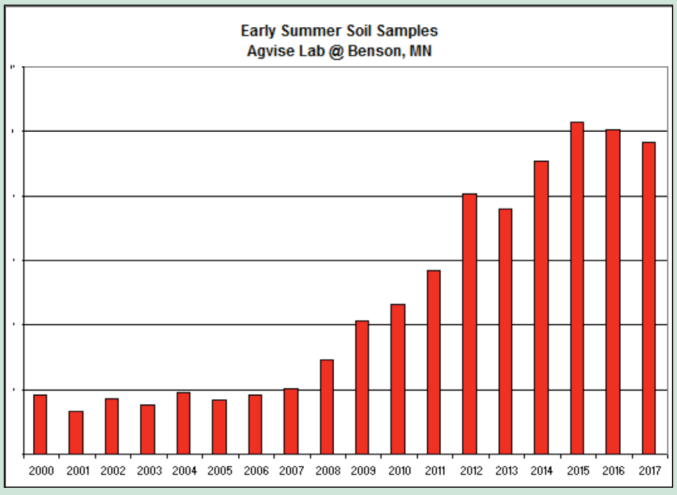
Risk of Soybean IDC – AGVISE Laboratories

CCE Soil Level (Carbonate)	Salt level (routine 1:1 test)	IDC Severity Risk
%	Mmhos/cm	Relative Risk
0-2.5%	<0.5	Low
0-2.5%	0.5 – 1.0	Moderate
0-2.5%	>1.0	Very High
2.6-5.0%	0-0.25	Low
2.6-5.0%	0.26-0.50	Moderate
2.6-5.0%	.51-1.0	High
2.6-5.0%	>1.0	Very High
>5.0%	0-0.25	Moderate
>5.0%	.26-0.50	High
>5.0%	0.51-1.0	Very High
>5.0%	>1.0	Extreme

Early Summer Grid Sampling

Topsoil grid sampling (2.5 acres/grid) in early summer continues to increase, especially in the corn-soybean growing regions we serve. Early summer sampling (late May through June) sampling has been an excellent time period to collect soil samples, instead of waiting until the soybean post-harvest fall sampling season (October). The chart shows this trend over the past number of years at our Benson, MN laboratory.

Early sampling fits well for topsoil only sampling situations (e.g., corn-soybean rotation) when testing mainly for P, K, pH, OM, Zn, salts, carbonates, Ca, Mg, Na (CEC and base saturation). Micronutrients, such as B, Fe, Mn and Cu, can also be tested in early summer. There are several advantages of grid sampling in early summer. You get excellent soil core quality, consistent sampling depth, firm soil conditions, and you avoid the post-harvest rush in the fall. Grid sampling in early summer is best done on non-fertilized soybean fields. Fields that were fertilized or manured in the spring should be sampled in the fall.



Magic Products

It is again that time of year when growers are bombarded with "new" fertilizer products. While products do have to be labeled for their nutrient content (%), there is little else required, like proven efficacy.

Some promotions sound pretty attractive. Many of these companies tell growers they can use less of their "new" fertilizer product and get the same yields as applying higher rates of conventional fertilizer products. In the short term, this may be true, especially if the grower's soil test levels are high right now. But in the long term, nutrients removed by crops must be replaced for the soil to stay productive.

Some companies will tell growers to apply a normal rate of their conventional fertilizer products and also apply some of their new magic fertilizer material. These companies will have growers split fields and apply their new product to one half of the field. Then when they find one field where the new product yielded better, they claim it was due to their product (it may have taken 20 split-field comparisons to find one field where their magic product appeared to make a difference). Since there are no replicated strips, there is no way to know if the response was real or if it was just a random event. These companies do not care since they just need one split-field example to market their magic product for several years or until a new magic product is formulated that is even better!

Most growers are pretty savvy when it comes to new magic fertilizer products. If a grower wants to evaluate a new product, they will put some replicated strips in one field and evaluate yield data before they apply it to the whole farm. With variable-rate equipment and yield monitors being more common, replicated fertilizer treatments to evaluate new products are much easier than before. In the end, the marketplace will decide which new fertilizer products will survive and which ones will not. The internet also allows growers to trade notes with other farmers evaluating the same products in replicated trials on their farms. The more information that can be gained from new products, the sooner everyone will know if they are better than the products we are using now.

Smells Like Money to Me!

With lower commodity prices and tighter margins, many growers are taking another look at the "original" fertilizer. Manure is no longer considered a waste. The value of manure nutrients in real dollars can be large, even if it is a smelly solution!

Accurate information is the most important part of calculating the value of manure and proper application rates. Have your manure and soil tested! Using the "book" values for manure nutrients when budgets are tight is not a good management plan. Variability in manure sources is tremendous, and manure testing allows you optimize manure application.

The manure samples we test at AGVISE Laboratories have a wide range of nutrient amounts. Management practices, feed rations, storage, time of year, and many other factors influence the amount of nutrients in the manure at hauling. In liquid swine manure, the highest phosphate-phosphorus content was 120 lbs/1000 gallons, the lowest value was less than 1 lb/1000 gallons. The average swine manure phosphate-phosphorus content was around 18 lbs/1000 gallons. For poultry manure, the total nitrogen ranged from 26 lbs/ton to 143 lbs/ton with an average total nitrogen around 58 lbs/ton. With so much variability, how could anyone not afford to have manure tested? Here are some points to consider when making manure applications:

Determine the nutrient value of the manure. Have the manure tested and then calculate the nutrients that will be available to crops depending on the application method and timing of incorporation. Remember to consider the cost of the micronutrients, such as zinc only, in the manure if needed for the crop. If you are applying 200 lbs/acre of potassium and the field only needs 50 lbs/acre, calculate the value based on 50 lbs/acre. Deduct application costs associated with

handling and hauling manure that are above the costs of applying commercial fertilizer.

Determine the needs of the field. After having soil tests done, determine which fields would benefit most from manure application. Typically, very low testing fields benefit the most from manure applications. Manure is not like commercial fertilizer where you can order a custom blend. In many cases, several nutrients in the manure will be in excess of the crop need. Nutrients like phosphorus and potassium can be built up for future crops, but caution needs to be taken so these levels do not become excessively high. Applying manure before corn in a corn-soybean rotation takes advantage of extra phosphorus and potassium. Matching the field to the manure supply will also give the most economical use of the nutrients.

Regulations have mandated testing manure in some areas, but the current price situation for fertilizers and commodities make manure a good choice when it is available. Many growers are putting this valuable nutrient resource to good use!

President's Column Cont...

There is a logical explanation for this relationship between salinity and nitrate. Fields with very low salinity normally have well-drained soils. During the growing season, normal rainfall may leach both salts and nitrate below the 24" soil depth.

Soils with high salts (greater than 3.0 mmhos/cm) usually have poor drainage and poor crop growth. Nitrate-nitrogen will build up in salty areas because poor crop growth does not use all the nitrogen fertilizer applied. In fields with saline areas, the areas with high salinity and poor crop growth can have soil nitrate over 500 lbs/acre. For this reason, we always tell agronomists to stay away from saline areas when soil sampling (or collect a separate sample). If one or two probes from a saline area are included in a composite field sample, the soil test nitrate could be greatly inflated and would not reflect the nitrate across the majority of the field. The field will be under-fertilized, and yield will be reduced for most parts of the field.

There are many relationships that exist between nutrients and soil properties. Some of these relationships can help you explain to farmers why it is critical to collect soil samples in the correct way and explain what can happen if you do not! We will be discussing other soil relationships in future newsletters.

Can I Count On That High Soil Nitrate Test?

This past summer, drought affected large areas of ND, SD, MT, and SK and reduced yields greatly. When you have a drought that greatly reduces early season growth and yield, there is usually high nitrate remaining in the soil, like we saw in drought-affected areas this fall (see map on high nitrate areas).

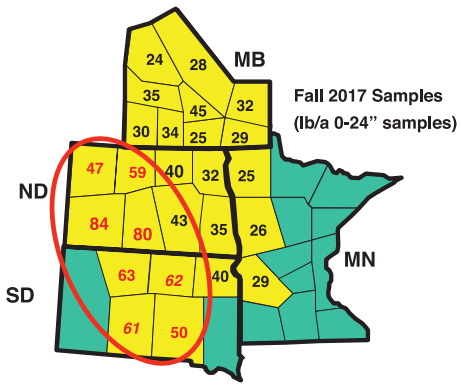
After a drought, we often get the question, "Can I count on the nitrate in my soil test for the 2018 crop?" The simple answer is yes; you can count on the nitrate in the soil test, but there are other factors you need to consider. Even in a drought, areas of each field produce higher yield due to factors like higher clay content and better moisture holding capacity. In those areas with better yield, there will be less nitrate left in the soil profile.

Let's imagine you have a field severely affected by drought and areas of the field still had about 50% of normal yield (maybe lower landscape position or better water holding capacity). The composite soil test for this field tested 140 lb/acre nitrate-N after harvest, but the better producing areas only tested 80 lb/acre. Based on the composite soil test of 140 lb/acre, you would only need to apply a little starter N for most crops. If you applied only a starter N amount, the parts of the field that produced a moderate crop and only tested 80 lb/acre will be under-fertilized and cost you yield this year.

If you only have a composite soil sample from the whole field, you need to consider variability in soil nitrate across the field caused by the drought. You will want to apply a base fertilizer N rate to cover the parts of the field that have lower nitrate than the field average. The N rate you apply to cover up that variability may range from 30-60 lb/acre and every situation is different.

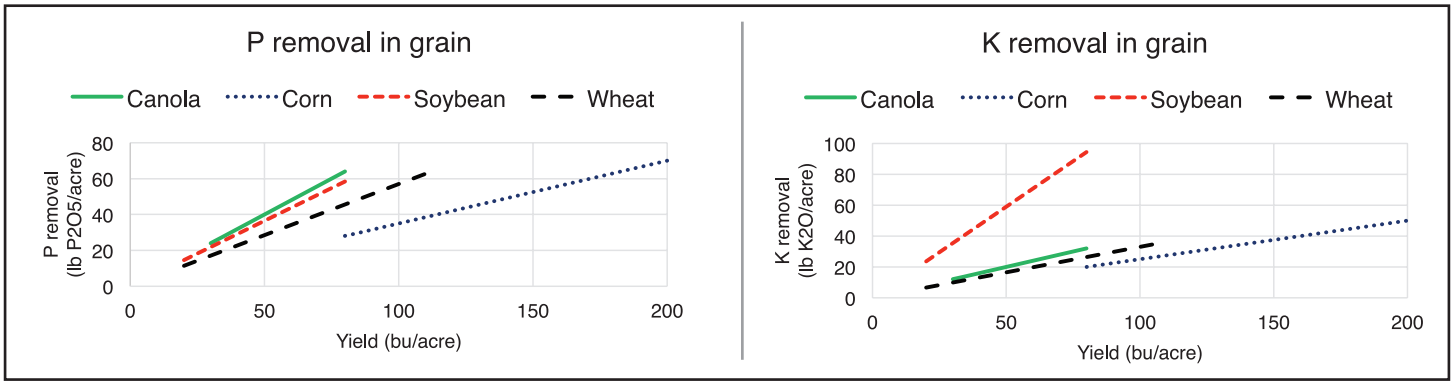
If you have been doing zone soil testing, you will have a much better idea of the N fertilizer needs in all parts of your fields. With zone soil testing based on productivity, you will have the soil nitrate test level in each zone to use to make your N fertilizer decisions this spring. If you have only been doing 0-6" or topsoil testing, you do not have enough information on the nitrate in the soil profile to make an educated decision on the N fertilizer your fields will need. You will need to do some soil testing to 24" this spring to get the information you need to make a good decision on your N fertilizer rate. There is no way to model how much nitrate is left in the soil profile after a drought. Soil testing to 24" is the best way to determine the amount of nitrate in the soil profile.

Median 0-24" Soil Nitrate following Wheat in 2017



High yields – Plan to keep up on P and K

Improved crop varieties have been delivering higher and higher yields, even some surprisingly impressive yields in recent dry years. Along with higher yields comes higher crop removal of phosphorus and potassium. These graphs demonstrate how high-yielding crops can remove more P and K than typical yields from 20 or 30 years ago. If your fertilization strategy has not changed (e.g., only starter P for wheat), you may be removing more P than you are adding. To keep soil fertility levels from dropping, be sure that you are adjusting P and K rates to account for higher crop removal. Soybean is an exceptionally large K exporter, over twice as much as a good wheat yield. If you grow soybean, watch soil test K over time; you may be removing K faster than you think!



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PRESIDENT'S CORNER

BOB DEUTSCH
PRESIDENT
SOIL SCIENTIST/CCA

Have you ever called a soil scientist at AGVISE to discuss why a field is high in nitrogen? If you have, the first question we usually ask is, "What is the salt level (electrical conductivity, EC) in the field?" The reason for this question is there is a strong relationship between high nitrate-nitrogen carryover and high salts.

The line graph below illustrates the relationship between the average salinity and the average nitrate (0-24 inch depth) for soil samples tested in 2017. The data illustrates how the nitrate increases sharply on samples with salinity greater than 3.0 mmhos/cm (1:1 routine method). The lowest nitrogen values are found on samples with salts below 0.1 mmhos/cm.

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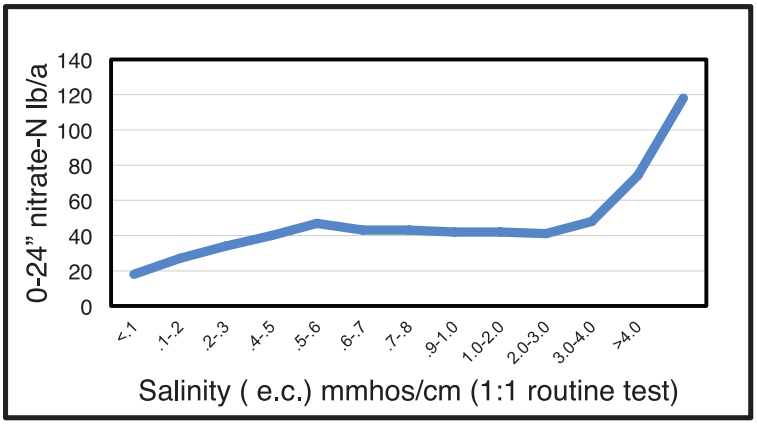
0-24" Nitrate-N vs. Salt (E.C.) 2017



NORTHERN NOTES

JOHN LEE
SOIL SCIENTIST/CCA

With low commodity prices and questionable soil moisture this spring, it would be easy to have low expectations, but that is not the feeling I am getting from farmers. When warm temperatures and spring showers start greening things up, it just brings a smile to everyone involved in agriculture! Stop and smell the tulips!

With more soybean acres expected again this year, I am hoping that all fields destined for soybeans have been tested for carbonates and salinity. If you know the carbonate (CCE) and salinity levels of a soil, you will know the iron deficiency chlorosis (IDC) risk if you plant soybeans. Last year was an exceptionally bad IDC year across the whole region, and we do not want to repeat that (see article on IDC)!

Spring soil testing has already started in many areas and we are doing our best to provide great service as usual! If you need any soil sampling supplies or sampling equipment, we can get it to you ASAP!

We hope you have a great spring season!

Giant Pumpkin Growers

Start your seeds!