

NORTHERN NOTES

For those who have experienced a severe drought, it is not something you want to experience again. When you see crops wither and die and farmers suffering with little or no crop, it is hard to watch. Unfortunately, this was one of those years in the western areas of North and South Dakota. Hopefully, fall rains will recharge the soil profile and help with a better start next year.

In the eastern areas, while it was drier than normal, crop yields are expected to be about average. The result of these dry conditions and lower than expected yields will likely be higher than normal soil nitrate levels following harvest (see article on drought effects on soil N). Getting a 0-24" soil nitrate test on all fields this fall is critical. This information will enable growers to know how much extra nitrate is left in the soil profile and may allow them to apply lower rates of N fertilizer for next year's crop.

With the dry conditions this summer, we expect a busy fall soil testing season. Having the best sampling equipment is key to running an efficient operation. We have a good inventory of probe tubes and tips for all soil conditions. If you need to replace your sampling system or add another one, now is the right time (see article on fall special on sampling systems).

We hope you have a great harvest season! Take care and stay safe!



JOHN LEE
SOIL SCIENTIST/CCA

Fall Special on 24" Hydraulic Sampling System

AGVISE is offering special pricing on the first 25 soil sampling systems sold after August 1 this fall. This special price applies to our 24" electric/hydraulic soil sampling system. AGVISE will credit \$200 of free laboratory analysis to your account with the purchase of one \$2,900 sampling system. This offer is only good for the first 25 sampling units sold this fall. Our sampling system includes two stainless steel probe bodies with tips and our heavy duty (HD) probe with HD tip. The HD probe is best for wet and frozen soils. You can view all components of this sampling system on our website (www.agvise.com). Click on Products and Equipment, then Hydraulic Sampling Equipment.

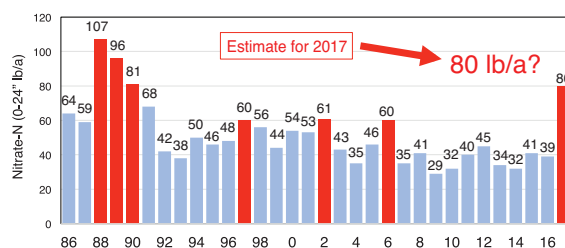
For customers who need to sample deeper for deep-rooted crops (e.g., sugarbeet), we also offer a telescoping, 42" hydraulic cylinder system. This system is powered by either an 8 HP Honda hydraulic pump or an electric/hydraulic pump. Call for details on these systems.

Effect of Drought on Soil N Levels

Western parts of North and South Dakota suffered through an exceptionally dry spring and growing season this year. With low yields in many areas, we expect the average soil N following short season crops like spring wheat to be higher than normal. Lower crop nitrogen uptake and no N losses to leaching or denitrification usually result in more nitrate left in the soil profile than normal.

In the figure below, you can see that major drought years, such as 1988, resulted in high nitrate levels after wheat in many fields (107 lb N/acre average). Years with moderate drought, such as 2002 and 2006 in spring wheat growing areas, resulted in higher nitrate carryover as well. We will not know what the actual soil nitrate levels are until late fall when soil testing is wrapped up.

**Average Soil Nitrate Following "Wheat"
1986 – 2017 (0-24" lb/a)**



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Feed Nitrate Testing in a Drought Year

Drought is an unwelcome but well-known phenomenon on the Northern Plains and Canadian Prairies. In 2017, rainfall had been sparse and scattered across the region, and high temperatures exceeding 90 to 100° F (32 to 38° C) during the growing season pushed some crops beyond their breaking point. Drought and heat stress has caused numerous fields to dry up, often resulting in abortion of grain kernels and seed pods. More frequently than desired, farmers and ranchers have been salvaging their remaining crop by cutting and baling fields as livestock feed.

When drought-stressed annual crops (e.g., wheat, barley, oat, corn) are cut for hay, producers must exercise caution about livestock nitrate poisoning when feeding these forages. Drought-stressed crops often accumulate nitrate because plant uptake of nitrate exceeds plant growth and nitrogen utilization. Nitrate is usually concentrated in lower plant parts (lower stem or stalk). When livestock, particularly sheep and cattle, ingest forages with a high nitrate content, nitrate poisoning can occur if large amounts of nitrate convert to nitrite in their digestive system.

This summer AGVISE has received a high number of forage samples for nitrate analysis. The earlier feed samples submitted to AGVISE have mostly tested in the safe to slight nitrate toxicity risk range (<1100 ppm NO₃-N); however, some forage samples have tested in the high and severe nitrate toxicity risk ranges. The relatively low number of samples with a high nitrate content this year is likely caused by low plant uptake of soil nitrate in dry soils, particularly near the soil surface, and high nitrogen losses from surface-applied urea lacking sufficient spring rainfall. As we receive more forage samples for nitrate analysis, the number of samples with a high nitrate content will likely increase. A feed nitrate analysis is the best method to assess the risk of nitrate poisoning of livestock.

When collecting plant material for nitrate analysis, collect the plant parts that will be eaten by livestock. If plant material will be grazed, recall that lower plant parts contain higher nitrate concentrations; monitor grazing height closely.

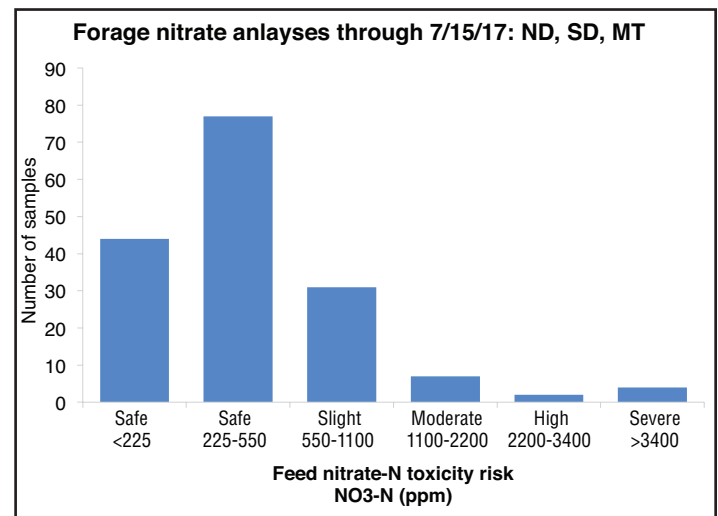
If plant material will be cut and baled, you should collect plant material above the cutter bar height. Alternatively, plant material can be sampled with a hay probe after being baled.

AGVISE Laboratories offers nitrate and complete feed/hay analysis of livestock feed. Feed nitrate analysis has next-day turnaround like regular plant tissue samples. Rapid turnaround on nitrate analysis is important for producers debating to cut and bale small grains or corn as livestock feed. Complete feed/hay analysis (dry matter, crude protein, acid detergent fiber, neutral detergent fiber, relative feed value, fat, ash, etc.) using NIR requires 2-3 days and using wet chemistry requires 3-4 days for results. We also offer water analysis, including total dissolved solids, nitrate, and sulfate, to assess livestock drinking water quality.

Please call AGVISE staff in Northwood, ND (701-587-6010) or Benson, MN (320-843-4109) with questions about nitrate, feed/hay, or water analysis. We can send you sampling supplies if needed.



JOHN BREKER
SOIL SCIENTIST



Soybean IDC – Better Strategies for 2018

Soybean iron deficiency chlorosis (IDC) was bad in many areas this year. With soybean acres continuing to increase, we need to develop a better plan for 2018. Factors that caused severe IDC this year are related to soil properties and management decisions. AGVISE Laboratories routinely tests for soil carbonate (CCE) and salinity, which are the main soil properties that increase IDC risk. Other soil and

management factors that increase IDC are listed below:

Soil properties that increase IDC risk are:

1. Carbonates (CCE): Any soil with pH > 7.0 can have carbonates. A soil test is required to determine the percentage of calcium carbonate in soil (e.g., 5% CCE).
2. Salinity (soluble salts, EC): Soils with elevated salts will increase IDC

risk. A soil test is required to determine the salinity level.

3. Nitrate: Soils with high carryover nitrate will increase IDC risk.

4. Wet soil: Carbonates dissolve to form bicarbonate, which prevents soybean roots from converting iron from Fe³⁺ to Fe²⁺, the form required for uptake.

Management decisions to mitigate IDC risk:

Soybean IDC — Better Strategies for 2018 Cont...

1. IDC tolerant varieties: Choosing an IDC tolerant variety is the most practical method to reduce IDC on high IDC risk soils (those with carbonates and salinity). Choose varieties that have been rated in respected IDC-rating trials, such as the NDSU variety trials.

2. Wider row spacing: Soybeans seeded in wider rows that place soybean plants closer together reduce IDC risk. Narrow row soybeans (solid-seeded) are more likely to get IDC.

3. Reduce herbicide injury/stress: Post-emergent herbicide stress is now a factor as glyphosate is no longer a standalone herbicide. Choose products and application timings to reduce additional stress on soybean during the first- and second-trifoliolate growth stages.

4. In-furrow, chelated iron fertilizer: High-quality chelated iron fertilizer (e.g., ortho-ortho EDDHA) applied in-furrow at planting has been shown in university research to reduce IDC when used with other good management decisions (IDC tolerant variety, wider rows, etc.).

| Carbonates - (CCE) % | Soluble Salt Level (1:1) mmhos/cm | IDC Risk and Severity Relative Level |
|-------------------------|--------------------------------------|---|
| 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% | 0.51-1.0 | High |
| 2.6-5.0% | >1.0 | Very High |
| >5.0% | 0-0.25 | Moderate |
| >5.0% | 0.26-0.50 | High |
| >5.0% | 0.51-1.0 | Very High |
| >5.0% | >1.0 | Extreme |



To help your growers manage soybean IDC effectively, you need to start by testing all growers' fields for carbonates and salinity. This will allow you to evaluate which fields will be most suitable for soybean production. If you are zone/grid soil sampling, you can better define the parts of a field with higher IDC risks. The table below shows IDC risk based on carbonate and soluble salts in soil. While 2017 was an ugly year for IDC in many areas, having a better plan will help greatly with this issue in 2018.

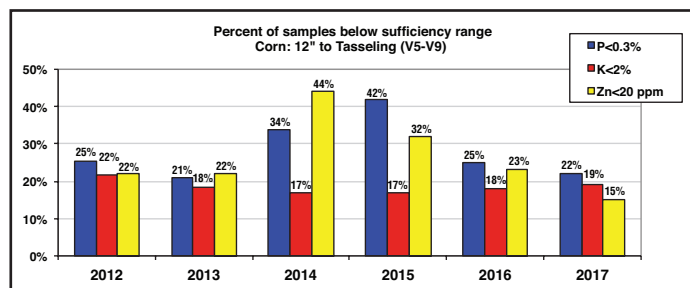
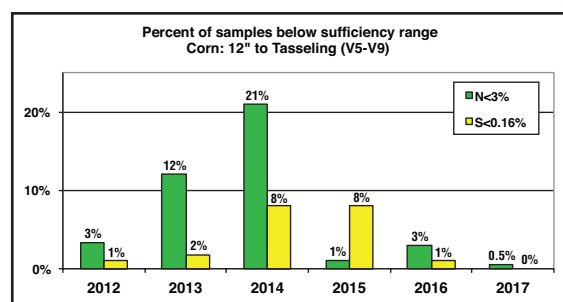
Nutrient Trends in Early Season Corn Tissue Samples

With the large amount of corn plant tissue testing that has occurred the past few years, we have accumulated a substantial dataset of corn nutrient analyses. Using 12 inch-tall to tasseling corn (generally V5 to V9 growth stages) sampled in June each year, we compiled an annual summary of corn nutrient analyses since 2012, the year of the last major drought. These samples came mainly from southern MN and eastern SD, which were analyzed at our Benson, MN laboratory.

These graphs show the percentage of samples that tested below the sufficiency range for each nutrient. In 2013 and 2014, a high percentage of samples tested below the sufficiency range for nitrogen (N) and sulfur (S). Areas of yellowish corn were widespread in these years due to very wet early growing seasons. Yellow-colored corn is usually an indicator of low/poor N and/or S uptake. In contrast, 2012, 2015, and 2017, when corn fields were much

healthier looking with dark green color, few samples tested below the sufficiency range for N or S. Although 2017 had been wetter than usual for southern MN, it was also one of the warmest Junes on record, which may have resulted in increased soil N and S mineralization and increased plant uptake.

Phosphorus, potassium, and zinc (P, K, and Zn, respectively) have tested below their sufficiency ranges more consistently than N and S. Each year about 15 to 25% of samples tested low in P, K, and Zn. In 2014 and 2015, more samples tested low in P and Zn, which aligns with two years of higher P fertilizer prices following the commodity price decline that may have



resulted in lower P application rates and less chelated Zn with starter fertilizer.

For other macronutrients and micronutrients (calcium, magnesium, manganese, copper, and boron), less than 5% of samples tested below their sufficiency range in most years (data not shown).

HD (Heavy Duty) Probe and tip—Customers Choice!

AGVISE has offered our Heavy Duty (HD) probe and tip for our hydraulic sampling systems for 6 years. We designed this probe body and tip to handle very wet heavy soil conditions and even frozen soil. We have learned from our customers that the HD probe and tip actually is the one probe and tip combination for most soil conditions. The HD body is made from chromoly steel which makes it harder to bend than a stainless steel probe body. The HD probe body also has a larger diameter which reduces the chance of plugging by having more room for the soil core. The HD tip has a cutting edge, a lip inside the end (see figure). The relief allows wet soil to expand after passing through the tip, not touching the probe wall due to the larger diameter of the HD body.

If you haven't had a chance to try our HD probe, you really need to give it a try. It will save you time and frustration and result in better quality soil samples. If you have any questions on the HD probe and tip, please give us a call.



Postcards and Poster to Promote Soil Testing!

This is the 14th year that AGVISE has provided customers with free postcard mailers to send to their growers to promote soil testing. These postcards are used to direct growers' attention to soil testing right after harvest begins. Customers who use these cards tell us they get their growers attention, and they can start soil testing earlier and soil test more fields. We will customize the message on your postcards to tell growers exactly what you want! Here is an example of what one customer had us print on his postcards:

"Give our Agronomy Staff a call today to sign up for soil testing (320-123-4567). Soil testing is the first step towards a profitable crop in 2018!"

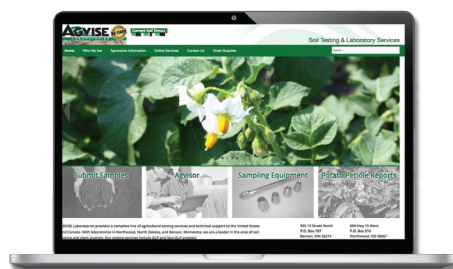
Once you receive customized postcards, put your growers' names and addresses, add postage, and mail. These postcards also fit into most statement envelopes, so you can include them with statements if you want. If you want us to personalize some postcards to send to your growers (at no charge), please call our Northwood office at 701-587-6010 and ask for Mary. We will ask what you want printed on your postcards and how many postcards you want. If you have any questions about the postcards, please call John Lee or Richard Jenny.

Do not forget to request our colorful poster to promote soil testing as well!



Online Soil Sample Submission—Still waiting to try it?

Since 2011, AGVISE has offered online sample submission as a feature within AGVISOR. Over half of AGVISE customers have taken advantage of the timesaving benefits of online submission, now having submitted over 1.5 million soil samples online. Over 70% of soil samples were submitted online last year. Online submission is quicker, easier, and more accurate than paper forms. When using the online system, grower and field information is entered and saved within AGVISOR, so there is no more writing the same information onto paper forms year after year! You simply select the grower, field, and soil test option, then



print the barcode reference stickers for each soil sample bag. You can also save default crop choices, P & K guidelines, sample depths, and default soil test packages to streamline the entire process. Online sample submission saves time and prevents mistakes (e.g., spelling mistakes, missing information).

You can also link an FSA map to each field (Surety Online Mapping subscription required). The FSA map prints onto the sample information sheet and final soil test report, which adds a professional touch for your growers to see on their soil test reports. If you want to start using the online sample submission system, please call John Lee or John Breker at Northwood, ND (701-587-6010) or Richard Jenny at Benson, MN (320-843-4109). We can show you how the system works, help you get started by importing grower and field information from last year, and make soil sampling great again!

Two Methods for Monitoring Soil Salinity... Which One to Choose?

Heather Dose, Research Scientist, ARS Morris MN

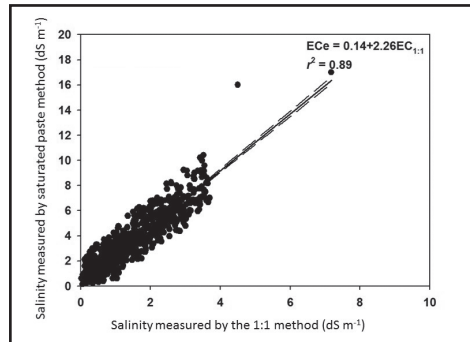
Soil salinity is a major issue for producers resulting in \$12 billion annual losses around the globe. In the Northern Great Plains, the number of acres affected by salinity is increasing. Salts are naturally found in soils of this region due to its recent geologic history. Increased rainfall patterns over the last 20 to 25 years has mobilized many salts to move with higher water tables toward the soil surface. In spring, you can notice patches of white soil are common in fields. Why are salts a problem in soil? Salts compete with plant roots for water, essentially making plants think they are suffering from drought.

Just for fun: Put table salt on cabbage and watch what happens. In addition to starting a batch of sauerkraut, you will notice that salt draws water from the cabbage tissue. The same phenomenon happens in soil. Salts draw water away from plant roots, which causes additional crop stress. Salinity can lower crop yields and even result in complete crop failure. Managing your fields for soil salinity will depend on the amount of salts you have. But, how do you know how much salt you have in your soil? What soil test options are there?

The gold standard for determining the amount of salt in your soil is the saturated paste extract method. The saturated paste method requires a lab technician to add water to the soil until the soil shines and plops off a spoon without leaving a muddy mess. The paste then must sit overnight before the water and salts are extracted. Although the method is straightforward, it has many drawbacks. Each sample needs a different amount of water added to achieve saturation. This means that automation is nearly impossible as the saturated paste method requires a trained technician to ensure the proper amount of water is added. Finally, the method takes over 24 hours, so this is a special test for many soil testing labs. Although the saturated paste method is accurate for evaluating soil salinity, the method is expensive, ranging from \$15 to \$20 per sample.

An alternative method to measure soil salinity uses the routine 1:1 soil-to-water ratio method. In this method, a standard volume of water (10 ml) is added to a standard weight of soil (10 g). After 30 minutes, the electrical conductivity is measured and the soil salinity level is determined. This method is fast, inexpensive (between \$1.65 and \$5.00 per sample), and allows you to get a good idea of the salinity levels in your field. Due to the lower cost of this routine 1:1 method, you can split fields into sampling zones for a better idea of the salinity range across each field.

The main issue with the 1:1 method is that it underestimates salinity levels compared to the saturated paste method. The test value for the 1:1 method will be lower than the test value for saturated paste method on the same sample because of a greater soil-to-water dilution. Nevertheless, the test results from both methods for testing salinity are highly related. Over 2,300 soil samples from the Northern Great Plains were tested with both methods (AGVISE Laboratories provided data from over 1,000 samples to this research). Researchers determined that you can multiply the results of the 1:1 method by 2.26 to obtain an accurate estimation of the salinity level measured by the saturated paste method (see figure). Monitoring the test level of salts in your fields is a key part in managing salinity. Using the routine 1:1 salinity method provides growers with valuable information at reasonable cost. *This article is based on work conducted by Dose, H.L., Y. He, R. Kerns, D. Hopkins, B. Deutsch, J. Lee, D.E. Clay, C. Reese, D. Malo and T.M. DeSutter*



Soil salinity measured by the 1:1 soil:water ratio method can be multiplied by 2.26 to convert soil salinity levels to those measured by the saturated paste method.

More Buffer pH testing in Northern Region

With more soil samples having a pH less than 6.0 in the northern region, lime applications are becoming more common. Making an accurate lime recommendation requires a buffer pH test on samples with pH less than 6.0. To better address the low pH samples received at our Northwood lab, we now have a way for customers to decide if they want us to do buffer pH on their samples. For composite whole field soil samples that have pH less than 6.0, we will automatically do a buffer pH test (at no charge to the customer).

For zone and grid samples, customer will be charged an extra \$1.40/sample for a buffer pH test. Each customer can tell us at what soil pH they want us to add the buffer test to their zone/grid samples. For example, a customer may want us to do a buffer pH test on any zone/grid sample that has a soil pH less than 6.0 (this is recommended). As zone sampling becomes the norm in the northern region, we expect more samples having a pH less than 6.0 and possibly requiring lime application. If you want to stay on top of low pH soils in your area, it is a good idea to start doing a buffer pH test on your zone/grid samples with pH less than 6.0. If you want us to do the buffer test on your zone/grid samples, you need to let us know what soil pH you want us to add the buffer pH test. One quick phone call to Teresa at 701-587-6010 and she can add this information into your account so you get the buffer pH test on your zone/grid samples with pH less than 6.0.

AGVISE

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PRESIDENT'S CORNER

I grew up on a farm about 40 miles southwest of Minot, ND. The worst drought I remember was 1961. My dad worked down barley fields in mid-summer; there was nothing to harvest. I remember riding in the combine; Dad did not harvest the hilltops of wheat fields. The field farthest from the farm was planted to 35 acres of oats and 35 acres of rye. Dad harvested the rye first and dumped the grain in the front of a single-axle truck box. Dad then combined the oats. We used a tarp to cover the 50 bushels of rye in the front and dumped the oats in the back. Even with both rye and oats in the truck, we only had a half of a load.

The second worst drought I experienced was 1988. When scouting grain fields for AGVISE in the Northwood area for weeds, I noted drought-affected crops as soon as late May and early June. I thought if I were smart, I would play the grain futures market and get rich! At that time of year, the traders were unaware of the doomed crops to come. Unfortunately I was not that brave!

My brother still operates the home farm. As it stands right now, the 2017 Drought will be the second or third worst drought in that part of North Dakota in my lifetime. Hopefully, the drought-stricken areas of our region will recover by the 2018 growing season. I really don't want to write another President's Column in 2018 discussing a lingering drought.



BOB DEUTSCH
PRESIDENT
SOIL SCIENTIST/CCA

SOUTHERN TRENDS

What a difference one year can make. It would be highly unlikely that crop yields could be higher than 2016, especially for soybeans with all the IDC problems this year. It seemed like almost everything went great last season, but this has been a completely different growing season. It has been too wet to the east and too dry to the west. We'll know the results of this crazy season for sure in a couple of months after harvest!



RICHARD JENNY
AGRONOMIST/CCA

Each year AGVISE tries to do a demonstration project that covers a current topic. This year we focused on the PSNT in-season soil nitrate test, due to high interest in in-season nitrogen management for corn. We have coordinated some different PSNT projects with both labs and a couple consultants. Preliminary results will be shown at our upcoming Fall Dealer Update meetings and final data at Soil Fertility seminars in January.

For those requesting the Haney Soil Test, we have been able to incorporate the Haney test as an additional test in our online soil sample submission system. For faster service on Haney samples, we encourage customers to collect Haney samples prior to October 1st. Haney samples submitted after that date will take longer to test as we concentrate our efforts on regular soil samples that are used to make nutrient application decisions.

Hopefully everyone has an excellent fall harvest season.

AGVISE Soil Fertility Seminars January 9, 10, 11

The dates and locations for our 2018 Soil Fertility Seminars are set. We will send a registration letter to AGVISE customers in early November. Hope to see you there!

Seminar Locations

January 9, Granite Falls, MN

January 10, Watertown, SD

January 11, Grand Forks, ND