

## NORTHERN NOTES

This past spring, we had some areas with extremely dry conditions to the north and excessively wet conditions not that far to the south! So, I guess if you consider both extremes, it was about average? Some northern areas were planted on time, while other areas left many acres unplanted. They are still counting the acres that were not planted, and the effect on yields will only be known when the combines roll. We are all hoping Mother Nature has a sense of humor and will give us an extra 30 days of growing season this fall!

Dry conditions in some areas has pushed crop maturity and harvest will begin soon. Fall soil testing will begin right after wheat harvest, and we want to make sure you have the right tools for the job. We are running our fall soil sampling equipment special again! This will save you \$200 on a new 24-inch electric-hydraulic sampling system! If you have any questions on equipment or want to see a demonstration of the equipment let me know. At our Northwood laboratory, we have a pickup set up with the electric-hydraulic and the Honda-powered systems as well as 24-inch and 48-inch cylinders. If you want to see how our soil sampling system can obtain high-quality soil cores in sticky, wet soil conditions, check out this video (<https://www.agvise.com/sampling-system-demo/>). If you have any questions on soil sampling equipment or need some soil sampling supplies, please give us a call.

We hope you have a smooth harvest season and please stay safe!



**JOHN LEE**  
SOIL SCIENTIST, CCA



## Soil Nitrate Testing on Unplanted Acres (Prevented Plant)

With millions of acres unplanted in the region this year, there are many questions about when soil testing should start and what kind of residual soil nitrate levels to expect. The extremely wet soil conditions in these fields (or unplanted parts of fields) may have incurred considerable N loss via leaching or denitrification. As the growing season progressed, the warmer and drier weather will have added N from mineralization of soil organic matter. The residual soil nitrate level will depend on numerous environmental and management factors, which vary from field to field and zone to zone.

### Management Factors

- What was the crop grown in the previous year?
- What was the N fertilizer rate and application timing? Was it applied last fall?

*Continued on page 2*

## Fall Special on 24" Hydraulic Sampling System

AGVISE is offering special pricing on the first 25 soil sampling systems sold this fall. This special price applies to our 24-inch electric-hydraulic soil sampling system. AGVISE will credit \$200 of free laboratory analysis to your account with the purchase of one \$3,000.00 soil sampling system. This offer is only good for the first 25 sampling units sold this fall. Our sampling system includes two stainless steel probes (solid and slotted), two heavy-duty (HD) probes (solid and slotted), and the whole set of 5/8-inch, 3/4-inch, and wet tips for each probe type. The HD probe is best for wet and frozen soils. You can view all components of this sampling system on our website <https://www.agvise.com/equipment>.

For customers who collect deep soil samples for crops such as sugarbeet, we also have a 42-inch telescoping cylinder system. This system is powered by an 8-HP Honda hydraulic pump or a large-capacity electric-hydraulic pump. Please call for details on these systems.

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## Soil Nitrate Testing on Unplanted Acres (Prevented Plant) Cont...

- Did you do any summer tillage? More tillage promotes N mineralization.
- How was your weed control? Did the weeds get too big and acquire substantial N?
- Did you plant a cover crop?  
*See article on cover crop N credits.*

### Environmental Factors

- Did excessive rainfall cause nitrate leaching on well drained soils?
- Did excessive rainfall cause denitrification on poorly drained soils?
- Were summer temperatures warm? Warm temperatures promote N mineralization.

Soil testing on these unplanted fields can begin as soon as good quality soil samples can be collected after mid-August. There is no reliable way to guess how much residual soil nitrate may be present in these unplanted fields or unplanted parts of fields. Soil testing is the only accurate way to learn how much residual soil nitrate remains in the soil profile.

To obtain the best information for nitrogen management, we recommend splitting fields into management zones for soil testing this fall. The unplanted field areas can vary considerably from the rest of the field, which will skew the field-average soil test result and resulting nitrogen fertilizer rate.

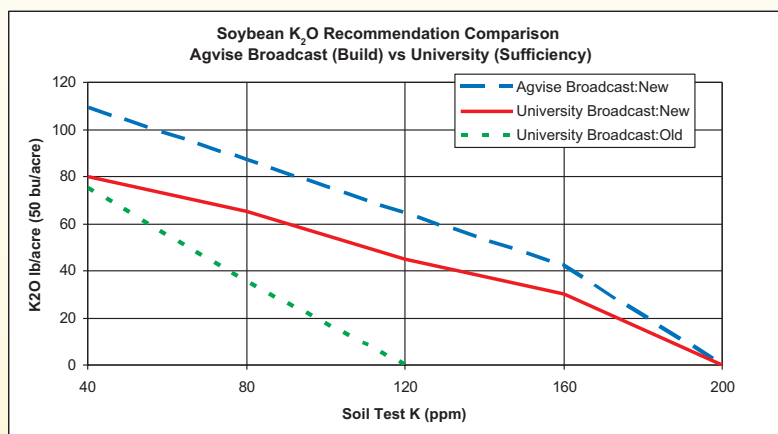
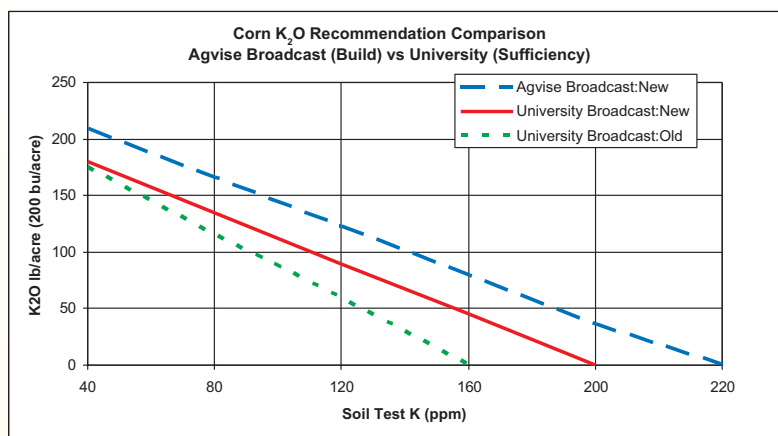
## Revised potassium fertilizer guidelines

In the past two years, soil fertility specialists for North Dakota State University (NDSU) and the University of Minnesota (UMN) have updated their potassium fertilizer recommendations for corn and soybean. Based on this research, we have made some changes to our potassium fertilizer guidelines.

The soil test potassium (STK) critical level for corn and soybean has been increased from 160 ppm to 200 ppm for medium- and fine-textured soils. The soil test critical level is the point where crop response to fertilization is unlikely. The AGVISOR potassium equations reflect this change for annual corn, soybean, and 2-year corn/soybean crop choices.

For coarse-textured soils (e.g., sand, loamy sand) with cation exchange capacity (CEC) around  $5 \text{ cmol}_c \text{ kg}^{-1}$ , the STK critical level is 120 ppm. UMN research indicated that low CEC soils do require as much potassium and increasing STK on sandy soils is difficult. AGVISOR does not automatically adjust potassium fertilizer guidelines for low CEC soils; therefore, the adjustment for low CEC soils should be made manually.

While the new potassium recommendations from NDSU and UMN have increased the STK critical level on certain soils, there are limitations to excessively high potassium rates. NDSU research documented occasional corn yield reduction with potash rates greater than 200 lb/acre (120 lb/acre  $\text{K}_2\text{O}$ ). In addition, UMN research noted potential soybean yield reduction with similar high potash rates, possibly loading too much salinity or chloride, causing yield loss. If you are trying to build STK, any potash application before corn or soybean should be limited to 200 lb/acre potash (120 lb/acre  $\text{K}_2\text{O}$ ). This will limit some short-term, high-rate potassium building strategies, but these research findings will help you avoid yield loss and such cases where we ultimately hurt crop yield rather than help it.



# Nitrogen credit from cover crop? None so far!

Dave Franzen, North Dakota State University

Most information on cover crops in textbooks, and even some farmer-speakers, indicate that if the carbon (C) to nitrogen (N) ratio (C:N ratio) of the cover crop is less than 30:1, then N will be released to the next crop. The amount of N released to the next crop is iffy, but if the residues are incorporated, maybe 50% and, if no-till, probably 25 to 33% of total N in the cover crop might be credited to the following crop. There is an adage not often followed in soil fertility: “If you want to get excited, do a study for one year. If you want to know the truth, do it the second year.” That is also the meaning of “research,” which essentially means, “Don’t believe it until you test it.”

Several researchers in the Midwest have conducted cover crop studies over the past several years, using cereal rye and forage radish. This is the dominant cover crop mix in North Dakota. These researchers have found that no N credit should be given following cover crops. The first published work came from Wisconsin, which you can read here (<https://www.agronomy.org/science-news/radish-cover-crop-traps-nitrogen>). In this research, cover crop N was not released to the following corn crop, even though the C:N ratio was low.

At NDSU, Dr. Abbey Wick and I have conducted several years of cover crop N cycling research using cereal rye, forage radish, winter camelina, field pea (only 2017), and faba bean (only 2018). In 2017, more N was required to grow corn following a winter wheat-field pea-flax-forage radish cover crop (2 ton/acre dry matter with 18:1 C:N ratio) than corn without prior cover crop (Figure 1).

At Rutland in 2018, corn was grown after a spring wheat-flax-forage radish-faba bean cover crop established in August 2017 and grown until freeze-up. Total biomass was about 2 ton/acre dry matter with 20:1 C:N ratio. The cover crop N deficit was about 40 lb/acre N, compared to N required without cover crop (Figure 2).

In each experiment, more N was required following a cover crop, whether cereal rye or oat, mixed with forage radish and camelina, or even with field pea or faba bean. The cover crop C:N

ratio was low enough that N should be released to the following grain crop, not tied up! The cover crop N was not found in the fall soil nitrate test following corn, and these were not years for nitrate leaching or denitrification. So, where did the cover crop N go?

Considering recent North Dakota research on clay mineralogy and potassium, we know that nonexchangeable K is a factor in corn K nutrition. Ammonium has similar ionic radius as K, and nonexchange ammonium can be similarly held in 2:1 clay layers like nonexchangeable K. We analyzed the Rutland 2018 corn site for nonexchangeable ammonium in October 2018, collecting 24-inch soil samples. We found 19 ppm greater nonexchangeable ammonium-N after cover crop than the non-cover crop treatments! This equals 152 lb/acre ammonium-N. The overlying fertilizer N rates made no difference in nonexchangeable ammonium. More research needs to be done, but right now, it appears the N does not just evaporate. There may be substantial N retained between 2:1 clay layers, at least temporarily. When it is released, I still do not know.

*Dave Franzen. NDSU Extension Soil Specialist. 701-799-2565. david.franzen@ndsu.edu*

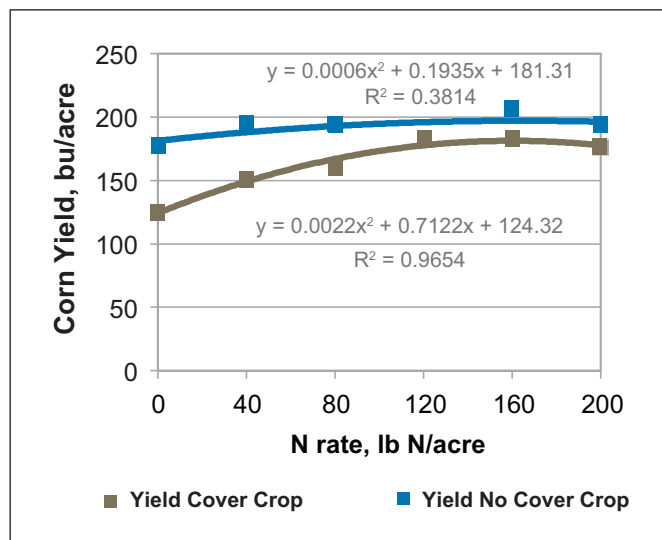


Figure 1. Corn yield at Rutland, ND 2017 following winter wheat-field pea-flax-forage radish cover crop (2 ton/acre DM with 18:1 C:N ratio, including forage radish roots). The N deficit after cover crop was about 100 lb/acre N to achieve corn yield of 0 N rate without cover crop.

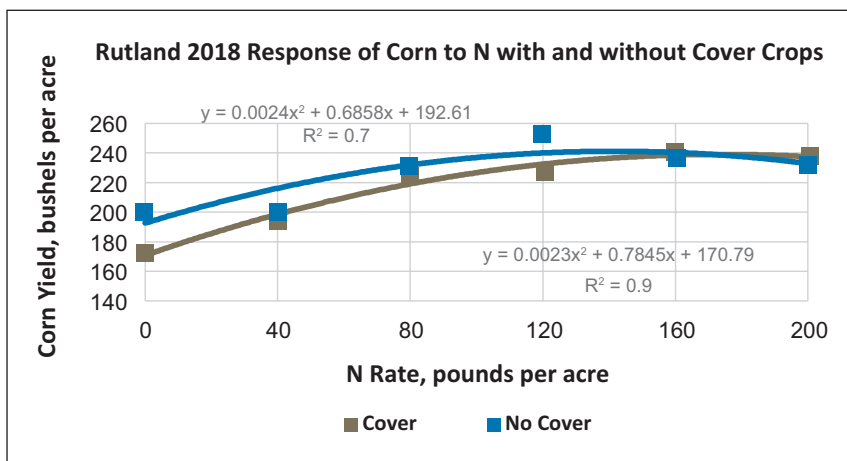


Figure 2. Corn yield at Rutland, ND 2018 following spring wheat-flax-forage radish-faba bean cover crop (2 ton/acre DM with 20:1 C:N ratio, including forage radish roots). The N deficit after cover crop was about 40 lb/acre N to achieve corn yield of 0 N rate without cover crop.



# Soil Testing Right Behind the Combine

Dave Franzen, North Dakota State University

It is more the rule than the exception that soil sampling begins in mid-September, rather than starting immediately following small grain harvest. However, many growers miss an excellent window for soil testing by waiting too long. The reason for waiting is the hope that additional nitrogen will be made available through mineralization (decomposition of crop residue and organic matter). A review of research has shown that soil nitrate levels change very little, up or down, following small grain harvest. Soil sampling right after harvest is recommended and has numerous advantages:

1. Growers are more likely to use the actual soil test results for deciding fall nitrogen rates if the soil test results are in their hands soon enough to consider before fall fieldwork begins.
2. Soil testing prior to fall tillage provides more consistent 0-6 inch soil cores, which gives the best soil sample quality for phosphorus, potassium, zinc, organic matter, and other non-mobile soil nutrients tested on topsoil.
3. Regrowth of volunteer grain will not hide available nitrogen. Early sampling will show the nitrate that will be available for next year's crop.
4. Sampling right after harvest guarantees that fields will be soil tested and not missed due to weather problems that could happen later in the fall.



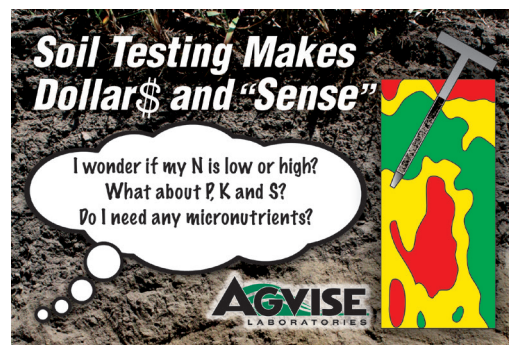
## Postcards and Poster Promote Soil Testing!

This is the 16th 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 postcards tell us that the postcards get their growers’ attention, which allows them to start soil testing earlier and ultimately test more fields. We will customize your postcard message so you can tell growers exactly what you want! Here is an example of what one customer had us print on his postcards last year:

**“Give our Agronomy Staff a call today to sign up for soil testing (320-123-4567). Soil testing is the first step toward a profitable crop in 2020!”**

Once you receive your customized postcards, all you have to do is put the grower’s name and address on the postcard, add a stamp, and put them in the mail. These postcards also fit into most statement envelopes so you can include them with statements if you want. If you want us to personalized some postcards to send to your growers at no charge, please call our Northwood office at 701-587-6010 and ask for Mary. She will ask what you want printed on your postcard and how many postcards you want. If you have any questions, please call John Lee or Richard Jenny.

Don’t forget, we also have a new poster that promotes soil testing with 4R Nutrient Stewardship. Of course, we all know that good nutrient stewardship begins with soil testing! After you have done the proper soil testing, you can follow the 4Rs: Right Rate, Right Source, Right Place, Right Time. If you want us to send you a new poster to promote soil testing, please call our office (Benson 320-843-4109; Northwood 701-587-6010).



# Three New Soil Health Tests Offered

Soil health is no longer a new topic to producers and crop consultants. The diversity of ideas and opinions on the subject have grown, but the basic components of improved soil management have remained the same: reduce soil erosion, improve soil structure, enhance nutrient use efficiency, and of course, increase crop yield! While many important soil properties can be measured with routine soil testing methods, some soil health goals require analysis methods outside the soil fertility wheelhouse. AGVISE Laboratories is offering three new soil health tests that help measure and track improvements in soil quality as you change soil management practices.

**Active Carbon (permanganate-oxidizable carbon, POXC):** the biologically active carbon fraction, that is particulate organic matter, involved in nutrient cycling. Recall that soil organic matter is a gross measurement that encompasses microbial biomass, recently decomposed plant materials, and stable humus. Active carbon responds to changes in crop and soil management much sooner than total organic matter, which is why this is considered a “leading” soil health indicator. Active carbon increases with reduced tillage and greater organic matter inputs (e.g., plant biomass, manure).

**Soil Protein (autoclave citrate-extractable protein, ACE protein):** the protein-like organic nitrogen fraction in soil organic matter accessible for microbial mineralization. Not all soil organic matter is created equal; some soils contain more organic nitrogen (higher ACE protein, lower C:N ratio) available for nitrogen mineralization than others. While the ultimate amount of mineralized nitrogen depends on environmental factors (e.g., soil water, temperature), ACE protein provides an indicator of soil organic matter quality. This becomes more important if you have been relying more and more on nitrogen mineralization to meet crop nitrogen requirements. Just like phosphorus and potassium, you do not want to completely mine the organic nitrogen pool in soil organic matter available for mineralization.

**Soil Aggregate Stability (water-stable aggregate):** the strength of soil aggregates to resist physical degradation and maintain soil structure. Good soil structure starts with good soil aggregates. Soils with high soil aggregate stability have less soil erosion, better equipment trafficability, faster water infiltration, less surface crusting, and more diverse habitat for soil microorganisms. Multiple soil management practices come together to improve soil aggregate stability such as reduced tillage, greater crop rotation diversity (including cover crops), more plant roots, greater earthworm and microbial activity, and more soil organic matter. In this way, soil aggregate stability literally aggregates these key components of improved soil management.

Soil quality researchers have utilized soil aggregate stability for decades, but the manual laboratory methods were time-consuming, expensive, and only used in research. This winter, AGVISE Laboratories engineered an automated system to perform soil aggregate stability. The automated procedure closely matches the manual procedure and results, and it also removes the person-to-person error in the manual method! If I had to choose just one soil health test, I’d pick soil aggregate stability. Soil aggregate stability is a real soil property measurement that encompasses these changes in soil health and productivity.

AGVISE Laboratories was recently chosen as the analytical laboratory for a multi-state, multi-year soil health project, evaluating new and existing soil health test methods. Over the next few years, we will learn which soil management tools help enhance soil health and crop production. AGVISE Laboratories has provided soil and plant analysis to university researchers in the United States and Canada for decades. We appreciate the confidence that these researchers have placed in AGVISE Laboratories and the opportunity to advance our scientific understanding of soil resources.



**JOHN BREKER**  
SOIL SCIENTIST, CCA

## AGVISE Soil Fertility Seminars January 7, 8, 9

The 2020 AGVISE Soil Fertility Seminar dates and locations are set. We will send a registration letter to AGVISE customers in early November. We have a great line up of topics and speakers so mark your calendar now!

### Seminar Locations

**January 7 – Granite Falls, MN | January 8 – Watertown, SD | January 9 – Grand Forks, ND**



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## PRESIDENT'S CORNER

You likely flipped to this page expecting to see Bob's photo and column, but we have some changes to announce! In April, Robert Deutsch stepped down as AGVISE President after 22 years leading the company; he started working for AGVISE in 1977. Bob now works part-time and still helps with updating fertilizer guidelines and computer programming. Does anyone in agriculture ever really retire? I will be taking on the new leadership role as AGVISE President, having managed the Benson laboratory since 1997.

In addition, we had several talented employees appointed to the AGVISE Board of Directors. Nancy Schilling (Benson Laboratory Coordinator), Amber Storey (Northwood Laboratory Manager), and John Breker (Northwood Soil Scientist) joined the Board and will lend their talents to help guide AGVISE Laboratories in the future.

I grew up on a small farm in Iowa, and soil was always my passion. I graduated from Iowa State University with a degree in agronomy. While in college, I worked in the ISU Seed Lab and a research soil laboratory. I also competed in FFA and collegiate soil judging. After college, my dream job was to work in the soil testing industry. You could say I landed in the right place! Since joining AGVISE in 1992, I have held multiple roles. The early years were spent in technical support and laboratory equipment set-up. In 1997, I was promoted to Benson laboratory manager. In Benson, I have overseen four building expansion projects, numerous equipment upgrades, instrumentation changes, advances in automation, and assisted in customer support. I will still manage the Benson laboratory while overseeing company operations. I look forward to AGVISE's continued role as an industry leader in agricultural testing.

High-quality results, rapid turnaround, automation, and excellent customer support will continue to be our focus at AGVISE Laboratories. Our talented professional staff make these goals attainable. I am thrilled and honored to lead such a great company and its dedicated team of employees.



**CINDY EVENSON**  
PRESIDENT  
AGRONOMIST, CCA

## SOUTHERN TRENDS

The 2019 planting and growing season will be one for the record books! It will be memorable in the sense, "Do you remember how crazy 2019 was?" Hopefully, a warmer and drier weather pattern will continue for South Dakota and southern Minnesota through harvest.



**RICHARD JENNY**  
AGRONOMIST, CCA

In 2019, the University of Minnesota released new potassium fertilizer recommendations for corn and soybean. North Dakota State University had updated their potassium fertilizer recommendations in 2018. After 5-6 years of potassium field trials, the UMN soil fertility researchers decided to split the potassium guidelines based on soil texture. For medium- and fine-textured soils, the soil test K critical level is increased from 160 ppm to 200 ppm. For coarse-textured soils, the soil test K critical level was decreased to 120 ppm. These updated potassium guidelines further demonstrate that proper potassium management is not as simple as we learned in textbooks years ago!

We are preparing for a very busy fall soil testing season, and we are ready to provide you with excellent service and technical support. If you need any soil sampling supplies or want to upgrade your soil sampling equipment, please give us a call. We hope the harvest season goes well for everyone, as we finish a most extraordinary year.