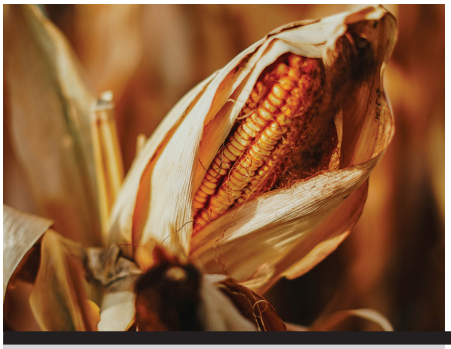


AGVISE LABORATORIES

Timely Information for Agriculture

WINTER 2022-2023

INSIDE

NORTHERN NOTES

JOHN BREKER
SOIL SCIENTIST,
CCA, 4R NMS

In recent memory, I can recall wet years (2019) and dry years (2021), but I cannot recall such a rollercoaster year that flipped between both extremes in less than six months! After record-breaking precipitation in April and May (that officially ended the 2021 drought), many parts of the region became dry again in late summer and into fall. Meanwhile, other parts stayed wet all year. All in all, the late planting season, stretching into June, still produced some surprising crop yields for many producers. Looking back, who would have thought that harvest would be nearly complete before November? I guess that is life on the northern Great Plains.

These extremes in weather remind us that there is no "normal" year, but we instead adapt to what Mother Nature provides us. An easy way that we can manage the year to year variability is soil nitrate testing. Each year, weather and crop yield influence the amount of soil nitrate remaining after harvest, which decades of research and experience has shown is one of the most reliable nitrogen management tools in the northern Great Plains and Canadian Prairies. Inside the newsletter, you will find regional soil nitrate-nitrogen summary and trend data after wheat in 2022. In response to weather, we saw a large change in the amount of residual soil nitrate from 2021 to 2022.

Continued on Page 2

AGVISE Soil Fertility Seminars: January 3-5, 2023

The AGVISE Soil Fertility Seminars are scheduled for January 3-5, 2023. These seminars cover soil fertility and plant nutrition topics along with other issues that currently challenge our region. You will not want to miss the great program lineup, so mark your calendar now!

You can find the seminar program and schedule at https://www.agvise.com/resources/seminars-and-events/. Please make sure you register early for these seminars. Space is limited and there is usually a waiting list. To register for the Soil Fertility Seminars, please call 701-587-6010 and ask for Emily or Patti. Please note the seminar dates for the Watertown and Willmar seminars are swapped.

Date	Location	CCA CEUs applied for
Tuesday, Jan. 3	Watertown, SD	3.0 NM, 2.5 SW, 0.5 PM
Wednesday, Jan. 4	Willmar, MN	3.0 NM, 2.5 SW, 0.5 PM
Thursday, Jan. 5	Grand Forks, ND	3.0 NM, 2.5 SW, 0.5 PM

Northern Notes cont...

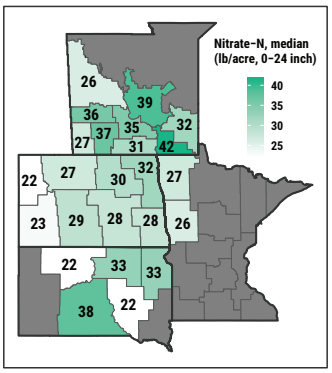
How do we manage such changes from year to year? You would not want to apply nitrogen at the same nitrogen rates for next year's crop in 2022 and 2023 and expect to get the same crop yields or profitability. This is where annual soil testing unlocks these changes from year to year and from zone to zone within fields, allowing us to adapt to whatever Mother Nature delivers.

Our winter newsletter also takes a deep dive on soil acidity and liming, which is an increasing problem across large expanses of the region. We continue to receive more questions about acid soil management, so we decided to take a closer look at the problem and hope you will too.

Soil Nitrogen Trends

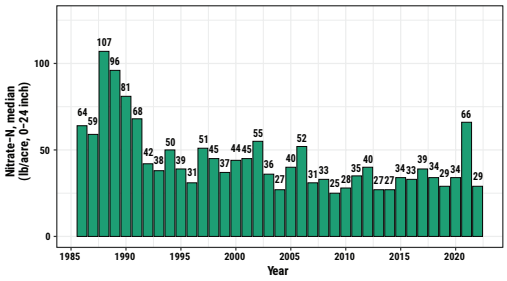
What a difference one year can make. 2021 was an exceptional drought year, and residual soil nitrate-nitrogen after harvest was much higher than normal across the region. The higher amounts of soil nitrate-nitrogen were caused in part by reduced crop yield, little to no soil nitrogen losses, and more nitrogen mineralization from soil organic matter due to warmer temperatures. In 2022, cool and wet weather delayed spring planting into June, and some fields were never planted.

Residual nitrate following wheat in 2022



Residual nitrate following wheat

Trend from 1986 to 2022



With wheat harvest completed, we summarized the amount of soil nitrate-nitrogen (0-24 inch soil profile) following wheat harvest in 2022. Across the region, soil nitrate-nitrogen is closer to the long-term trend of 25 to 40 lb/acre nitrate-N after wheat. These more typical amounts of nitrate-nitrogen resulted from good to exceptional wheat yields, some nitrogen losses from wet spring conditions, and cooler summer temperatures that may have reduced nitrogen mineralization.

With fertilizer prices remaining high, soil testing is the first step in making fertilizer plans for 2023. With less soil nitrogen remaining than 2021, some people have asked if soil testing for nitrogen is even worth it, but a small difference in nitrogen fertilizer savings translates to a lot of money in the real world. The real world savings of 29 lb/acre N for next year equals $140 million of nitrogen fertilizer, based on $0.90/lb N and 5.4 million acres of wheat in North Dakota alone. The dollars speak for themselves. Soil nitrate testing is more important than ever!

Are You Using a Third-party Data Platform? Let Us Know!

Third-party data platforms are more popular than ever for retrieving and sharing soil and plant analysis data with clients. AGVISE has partnered with many third-party data platforms to transfer soil and plant data directly to their programs, where you can access the data, track soil test trends, and make variable-rate application maps.

The Modus XML Standard is the most common format to send soil test results to third-party platforms. Modus is the universal data standard for soil and plant analysis, and it was developed by the soil testing industry. In order to send Modus XML files, we do need to know that you require Modus data transfers and there are a few settings to change in your customer account. Please let us know if you are thinking about using a Modus-type platform, and we can get you started.

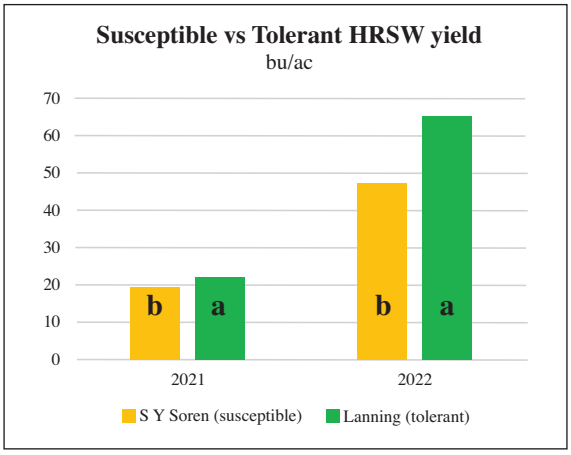
AGVISE also allows easy access to soil and plant data and integration through our online AGVISOR program. AGVISOR is an API-enabled platform that allows automatic and seamless integration between programs, allowing them to access data from our server and import them directly into their programs. An API is the fastest and most efficient data transfer type. For over 45 years, AGVISE has been a leader not only in soil and plant analysis methodology but also in data delivery. Such advances in data transfer allow us to deliver the soil and plant analysis results you need to keep you going in the field.

Acid Soils and No-Till: What We've Learned So Far

RYAN BUETOW
NDSU Extension Cropping Systems Specialist, Dickinson, ND

Across the northern Great Plains, more and more acres of acidic soils are being found in no-till cropping systems paired with heavy nitrogen (N) fertilizer use. Where soil pH is less than 5.5, there is an impact on soil nutrient availability, soil microbial activity, herbicide efficacy, stunted plant root systems from aluminum (Al) toxicity, and other soil-plant interactions. The acidic soil problems can be improved with liming (applied in tons per acre), but liming can be costly. Incorporation of lime does allow the lime to react faster and deeper, but tillage can negate the hard-built gains of long-term no-till systems. We have a lime trial in Hettinger County, ND that showed that lime incorporation with tillage fostered a nice and green plant stand, but the tillage strips started to dry much faster as drought returned and crop yield was greatly reduced.

Figure 1. Selecting an acid-tolerant variety, such as Lanning HRSW, can be one of the most effective short-term strategies for acidic soils.



There are numerous factors that go into decisions to manage these acidic areas of fields or, in some cases, whole fields. Each farm is different and comes with different challenges, and you will need to decide what works best for your operation. However, without lime, the acidity problem will continue to worsen. We are searching for potential alternatives to limit crop yield loss without liming, which is an attractive option for many producers, especially those with rented land. Some of our trials in western North Dakota have included variety selection, in-furrow amendments, and seed treatments. The most effective strategy is proper variety selection, and there are some strong defensive varieties adapted to our region (Figure 1). We have also evaluated in-furrow calcium amendments (pelletized lime, gypsum, calcium amendments), which had no significant effect on crop yield. High rates of seed-placed P fertilizer (60 lb/acre P2O5 as 0-45-0) was the most effective in-furrow amendment, showing an average spring wheat yield increase of 1.5 bushel/acre in 2021 and 9.3 bushel/acre in 2022 (Table 1). These findings match work in Kansas and Oklahoma, where producers are similarly battling soil acidity with limited liming options.

Table 1. P fertilizer across HRSW varieties, Dickinson 2021 and 2022.

	Yield	
Treatment	2021	2022
Control	20.1b	51.8b
60 lbs additional P	21.6a	61.1a
LSD (0.05)	1.2	3.2

In 2021, we tried a wide assortment of seed treatments and foliar products on wheat, including plant growth regulators (PGR) and biologicals, that showed no responses at two locations. Our research so far suggests that acid-tolerant varieties with in-furrow P fertilizer can help alleviate crop yield losses in small grains on acidic soils. However, the ideal situation is still liming and raising pH above 5.5. The right variety and more in-furrow fertilizer may help with crop yield loss, but it does not fix the problems with herbicide breakdown and carryover, reduced soil microbiological activity, and nutrient tie-up; all problems persisting with low soil pH.

The problems of soil acidity reach far beyond reduced crop yield, but an overall attack on input management and profitability. Soil pH and acidity is not a problem to ignore because the problem will continue to worsen with each passing year, as continued nitrogen fertilizer application will acidify the soil more. This requires lime and possible reevaluation of our nitrogen fertilizer management to make sure we use each pound of nitrogen applied in the most efficient way possible.

Putting My Money Where My Mouth Is: Applying lime in the northern Great Plains

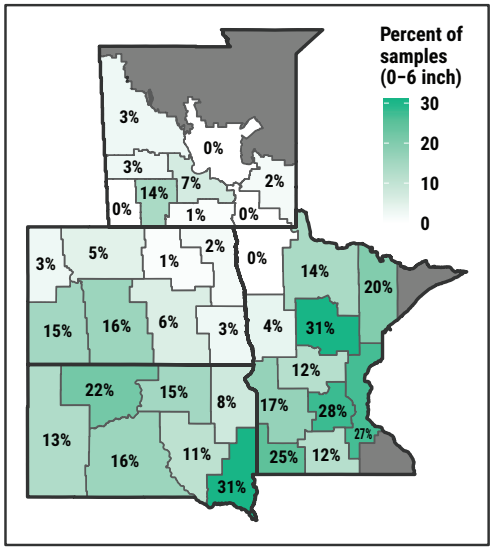
JODI BOE
AGRONOMIST, CCA

It is no soil fertility secret. If you have an acid soil (soil pH less than 6.0), lime is the only solution to raise soil pH. Acidic soils decrease phosphorus availability, increase the risk of aluminum and manganese toxicity, reduce legume nitrogen fixation, and reduce weed control. Liming, or applying crushed limestone, is the tried and true method to increase soil pH, restoring soil conditions for better crop growth.

This is a very real problem for me because I farm in western North Dakota, and a majority of our fields have acid soils in either pockets or across whole fields. Until we started soil testing, we had no idea that some of our problem areas were caused by acid soils and that we could possibly fix them. Liming will become a common management practice in the northern Great Plains so I want to share my experience in mapping soil pH, procuring lime, and making a variable rate lime application.

Although correcting low soil pH is straightforward (i.e., apply lime), the difficult part for us comes in sourcing the lime. North Dakota is the only state (besides Delaware) without a limestone production facility, with the closest quarries existing near Minneapolis, the Black Hills, Winnipeg, and Billings. This means access to lime is quite a haul for many producers in eastern Montana, North Dakota, and Saskatchewan. Instead, we use byproduct lime sources. In the northern Great Plains, the most readily available lime source (and cheapest, depending on distance and equipment options) is spent lime, a byproduct of sugar beet processing and municipal water purification. Sugar beet plants and water treatment facilities stockpile spent lime, and most of these facilities need to dispose of the byproduct lime. The barrier to using spent lime is hauling the material to the farm and obtaining the equipment to spread it. Spent lime is typically a wet material, varying in moisture content, and is often very fine and powdery when applied. Spent lime should be spread with a manure spreader or dedicated lime spreader.

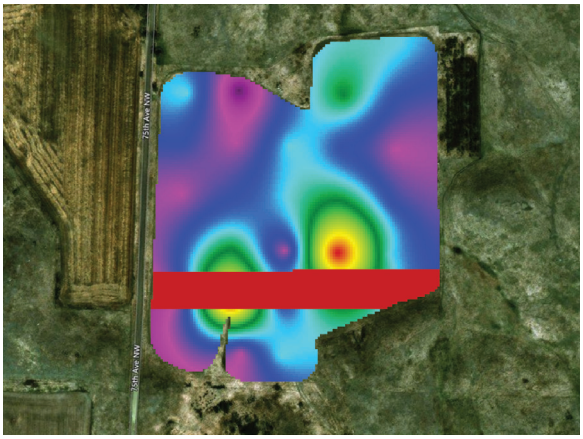
Soil samples with soil pH below 6.0 in 2022



For more soil test summary data, access our soil test summaries online: https://www.agvise.com/resources/soil-test/summaries

This fall, I hired a custom lime spreader to apply lime to five fields, totaling around 300 acres. The custom applicator used a manure spreader with a cyclone attachment that allowed him to spread spent sugar beet lime in 40-foot wide passes. We obtained the sugar beet lime from Sidney Sugar in Sidney, MT. I took zone soil samples in all five fields. Using the pH and buffer pH, three fields received a flat rate of 2 ton/acre spent lime (about 1,200 lb/acre ENP). One field received an on-off rate at 2 ton/acre spent lime. For the last field, I took 1.0-acre grid soil samples with a Wintex 1000. This was the most variable field from previous zone soil samples, so I wanted to learn more with grid soil sampling. The soil pH ranged from 4.7 to 6.8, which produced a variable-rate lime map with rates from 0 to 4 ton/acre spent lime. This field also houses the AGVISE long-term no-till lime trial (started in 2021).

We incorporated the lime with a tandem disk to 3 inches. I was apprehensive about tillage on our no-till farm, but I decided that a one-time tillage pass to get the most effective use from the lime was a valid trade-off if it means getting better plant stands and residue cover in the future. After the tillage, we received about 2 inches of rain so that alleviated some of the initial concerns about soil water loss and soil erosion.



VRT lime map created using GK Technology Inc.'s ADMS 32 program, using buffer pH and 1.0-acre grid soil samples. Lime check strip in red; a tillage check strip was also included in the field.

So, what did this all cost? The trucking cost from Sidney, MT to the farm near Golden Valley, ND was $39/ton. The variable-rate application cost was $16.00 for one ton/acre plus $5.00/acre for each additional ton. In total, the cost was around $100/acre. This is not an insignificant sum, but I expect the increased crop yield, better nutrient availability, and improved weed control to pay dividends over the next decade and into the future. I really look forward to collecting more data from these fields and sharing what we learn. Acid soils are not a problem to ignore, but a problem that actually has a solution.

New Front Office Staff

We have some new team members and roles to announce. In Benson, Brittany Giese has been promoted to Office Manager. Brittany has served as a receptionist at the Benson laboratory since 2016. Pam Wilson has joined the Benson office staff as a receptionist. In Northwood, Jody Knoblauch has joined the Northwood office staff as a receptionist. We welcome our new team members in their new roles. When you call or stop by the office, please extend them a warm welcome too!

SOUTHERN TRENDS

BRENT JAENISCH
AGRONOMIST

Wow, what a crazy year it was in southern and western Minnesota. Heavy rains and storms in May made a late start to the spring planting season. Back then, nobody would have thought that the May rainfall was going to be most of the annual rainfall for the entire 2022 growing season! In the fall, I think we set another one for the record books with a very speedy harvest. Most soybean crops were harvested in 10 to 14 days or less. Once the soybean harvest was complete, corn harvest began the same week or, in some cases, the same day! An older farmer once told me, "You know it is a great fall when I get to watch the World Series at home."

In soybean fields across the region, soybean cyst nematode (SCN) continues to increase because the major SCN-resistance trait PI88788 is failing or has already failed as a resistance source. The SCN egg counts (some are greater than 10,000 eggs/cc) will force producers to rotate to other crops or plant a soybean variety with a different resistance source, such as Peking. More and more soybean varieties with the Peking resistance source are being released; however, it is still a small share of the market. I highly recommend continuing to collect SCN samples because it is our best tool to help you make SCN management decisions for future growing seasons.

I wish to thank you all for a very productive fall soil sampling season. We got a lot done! I hope you have a great winter and maybe will run into you at a winter trade show or two.

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PRESIDENT'S CORNER

CINDY EVENSON
PRESIDENT
AGRONOMIST, CCA

Fall is always a busy time for soil sampling and soil testing, but this was one for the record books. This past fall, dry weather and few if any rain delays allowed harvest and soil sampling to clip along at a record pace. As a result, the month of October was a very busy month of soil testing for both the Benson and Northwood laboratories. In fact, both locations broke all previous records for soil samples received in October, including recent drought years like 2017 and 2021. Unlike the spring 2022 weather, when Mother Nature cooperates, it is amazing how much work in the field we can accomplish in so little time.

Now that the fall crunch has passed and both laboratories are running within normal turnaround times again, I want to extend a special thank you to all our customers for trusting AGVISE Laboratories with your agricultural testing needs. It is our privilege to serve you and provide you with the highest standards in laboratory testing and quality. This winter, I hope to see many of you again at winter trade shows and agronomy update meetings. From all of us at AGVISE, we wish you and your company a very successful year, a Merry Christmas, and a Happy New Year.