

NORTHERN NOTES

This year has been a year of wide swings in the weather. Spring started early with very dry soil conditions in most areas. The crop got seeded nice and early and then came a frost that was hard enough to freeze corn in the ground! Ouch! Heavy rain in early June stretched to the north and damaged many acres. Some areas in SE ND missed the June rain, but caught up quickly with 6-8 inches the second week of July! So it has been a season of wide swings in the weather, which I guess means it has been an average year overall!

As harvest approaches we are expecting a very busy fall soil testing season. With commodity prices still low, growers are watching every input very closely. Soil testing is one tool that helps growers get a good handle on what they need for fertilizer inputs for next year. Zone and grid sampling are becoming the norm in many areas and this information is very valuable for agronomists and growers to make fertility decisions for next year.

We are ready to provide our customers with great service and support as always! If you have not

tried our online sample submission, please give me a call. Online submission of soil samples will save you time and eliminate mistakes in grower's names and field information. Online submission is easy and I will walk you through each step! If you need soil testing supplies or equipment please give us a call.



JOHN LEE
SOIL SCIENTIST/CCA

P & K in soil (Are they really immobile?)

Phosphorus (P) and Potassium (K) are primary nutrients used by plants in large amounts. We generally think about these nutrients as being "immobile in the soil. When phosphorus fertilizer is applied to the soil it precipitates with elements like aluminum in acidic soils and calcium in soils with pH higher than 7.0. These compounds have very low solubility, so the P does not move much in the soil. When K fertilizer is applied to the soil it doesn't move much because potassium has a positive charge (K+) and is held by the soil particles which have a negative charge.

This past year AGVISE did a demonstration project where we applied various rates of P & K fertilizer on several sites. All sites were in conventional tillage systems. This spring we sampled these same sites to a depth of 0-6" and 6-12". We wanted to confirm what we all learned in college, that P & K do not move very much in the soil.

The data in the tables show that the P & K soil test levels increased in the 0-6" soil profile with higher rates of fertilizer, but test levels in the 6-12" profile changed very little. Even the sandy loam site showed very little movement of P & K into the 6-12" profile at high rates of P & K. It is important to note that all of these sites are in dryland production.

P Fertilizer Movement in Soil

Treatment lb/a P ₂ O ₅	Sample depth	*Sandy loam ppm	*Loam ppm	*Silty Clay Loam ppm	*Clay ppm
0	0-6"	4	4	42	14
	6-12"	2	3	3	3
50 lb/a	0-6"	8	6	54	16
	6-12"	2	2	6	4
100 lb/a	0-6"	8	7	54	22
	6-12"	2	2	7	5
200 lb/a	0-6"	15	18	88	28
	6-12"	4	2	6	4

*Sandy Loam - Rose Isle MB, Loam - Northwood ND, Silty Clay Loam - Benson MN, Clay - Hillsboro ND.

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P&K in Soil Cont...

Recent research from Carl Rosen at the U of M shows that Potassium can move in the soil profile when you have very sandy soil which is irrigated and very high rates of K fertilizer are applied. So we can't say that K is always immobile in the soil, but it does take a certain set of circumstances for this to happen. (See bottom figure.)

K Fertilizer Movement in Soil

Treatment lb/a K ₂ O	Sample depth	*Sandy loam	*Loam	*Silty Clay Loam	*Clay
		ppm	ppm	ppm	ppm
0	0-6"	100	200	320	460
	6-12"	40	150	140	370
50 lb/a	0-6"	60	220	290	480
	6-12"	45	160	140	390
100 lb/a	0-6"	140	240	320	510
	6-12"	35	160	155	370
200 lb/a	0-6"	90	280	430	520
	6-12"	40	150	160	390
1000 lb/a	0-6"	270	420	Na	740
	6-12"	50	200	Na	400

*Sandy Loam - Rose Isle MB, Loam - Northwood ND, Silty Clay Loam - Benson MN, Clay - Hillsboro ND,

K movement on Loamy Sand Soil U of Minnesota – Rosen 2014-15

Treatment K ₂ O lb/a	0-6" K - ppm	6-12" K - ppm	12-24" K - ppm
Check	38	25	29
90 lb/a	50	27	32
180 lb/a	58	28	33
270 lb/a	78	25	37
360 lb/a	113	33	69
180 + 180 lb/a ¹	81	30	39

Sand Plain Research Farm Becker MN - Loamy Sand - %OM 1.3% ¹ 180 preplant and 180 at hilling KCl (0-0-60) applied before planting and tilled to depth of 3-4"

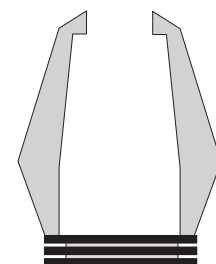
HD (Heavy Duty) Probe and Tip – Customers Choice!

AGVISE has offered our HD (Heavy Duty) probe and tip for our hydraulic sampling systems for five years. We designed this probe body and tip to handle very wet heavy soil conditions and even frozen soil. What we have learned from our customers is the HD probe and tip are the best 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, but it also has lip of relief just inside the end (see figure). This relief allows wet soils to expand after they pass through the tip and not touch the probe wall due to the larger diameter of the HD body.

If you haven't had a chance to try one of the HD probes, you really need to give it a try. It will save you a lot of 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.



Heavy Duty Wet Tip Design



Soybean IDC – Observations From 2016

This has been a year of extremes in our region. Too dry, too wet, too cold! Take your pick! As a result of these conditions, there have been quite a bit of IDC symptoms (iron deficiency chlorosis) in soybeans across the region this year.

This summer, we did a demonstration project to determine which soil properties were different between areas in fields with yellow soybeans (IDC) and adjacent green soybeans in the same field. We did a similar project to this in 2001. We collected soil samples from 41 sites covering eastern ND, NW MN, SW MN and eastern SD. When we summarized the differences in the soil properties between areas with yellow and green soybeans, we found there were differences in carbonates (CCE),

salinity (E.C.) or nitrate-nitrogen. Research has shown that as each of these soil properties tests higher, the risk and severity of IDC symptoms increases. Some sites had all three of these factors contributing to the severity of the IDC and others sites had only one or two factors. (See table to right.) There were a few sites where the soil properties were not different between the area with yellow soybeans and green soybeans, which was a little surprising. We are in the process of testing all of these samples for SCN as well. We want to see if SCN is also a contributing factor in IDC in soybeans in the sites that could not be explained by differences in these three soil properties.



IDC Contributing factors	Number of sites
Carbonates (CCE)	14
Carbonates (CCE) plus Salinity (e.c.)	5
Carbonates (CCE) plus salinity (e.c.) plus higher nitrate	9
Small or no differences between soil properties	2

Soil Organic Matter Supplies Nitrogen

Nitrogen in soil is always changing. Frequently, this dynamic, ever-changing, system is described by what is known as the “nitrogen cycle.” Many educational programs that focus on nitrogen refer to this “cycle” as being very complex. Potential sources of nitrogen for crop growth include animal manures, nitrogen from a previous legume crop in the rotation, crop residues, nitrogen from the atmosphere, soil organic matter, and of course commercial fertilizers. Over time, each source of nitrogen input has been researched at several Land Grant universities. As a result of this research, there is a relatively good understanding of the various transformations affecting nitrogen in soils. However, it is more difficult to quantify the various inputs.

In Minnesota, soils formed from prairie vegetation are characterized by a high organic matter content. This organic matter, present in all soils, can be a significant source of nitrogen for crop production. This organic matter is broken down (mineralized) by bacteria to form usable nitrate-nitrogen ($\text{NO}_3\text{-N}$). However, the amount of nitrate-nitrogen derived from organic matter each year can vary over a wide range. The rate of nitrogen mineralization from organic matter is affected mostly by soil moisture and temperature. But, just how important is this source of nitrogen in crop production and how long can it be effective?

A recent special project of Discovery Farms in Kandiyohi County Minnesota provided an opportunity to get some measure of the amount of nitrogen supplied from the organic matter of prairie soils each year. For this project, a small field on a cooperating farm (3.27 acres) was planted to soybeans in 2007 and then to continuous corn thereafter. Since 2007, there has been no substantial application of manure or commercial

fertilizers. Only a pop-up fertilizer was applied at 3 gallons per acre at planting each year (about 3.5 pounds of N/a). Other management practices conducive for optimum corn yields were used each year. The field is tile drained and water in the lines was collected and analyzed for nitrate-nitrogen each year. Using the same practices and procedures, this field has been in continuous corn since 2007. The soil is calcareous (pH 7.6 to 8.0) and tests high in P and K. Soil organic matter content ranges from 4.0% to 5.0% and soil texture varies from clay loam to silty clay loam.

For the 2015 growing season, corn yield was 112 bu/acre which was higher than anticipated. Other fields on the same farm with similar soil texture produced yields in the range of 205 bu/acre, where adequate nitrogen was used. Except for the popup fertilizer at planting, and in the absence of nitrogen from manure or fertilizer, the mineralization (breakdown) of organic

matter supplied all of the nitrogen needed for this yield. Considering nitrogen uptake of approximately 1.5 lb./bushel of corn, a total of about 160 lb. of nitrogen per acre would have been supplied by the soil organic matter. The yield achieved in the absence of no other nitrogen inputs highlights the importance of soil organic matter for supplying nitrogen for crop needs.

Each year water flowing through the tile lines was analyzed for nitrate nitrogen. In 2015, a total of 1.62 pounds of nitrate-nitrogen per acre moved in the tile water. This occurred primarily in May (1.08 lb./acre) and

June (0.54 lb./acre) These measurements correspond with 5.0 and 2.7 inches of rainfall in May and June respectively.

Soil organic matter is a mixture of organic compounds. Some are simple; some are complex. This mixture includes, but is not limited to proteins, amino acids, and other related compounds containing nitrogen. Some of these nitrogen containing compounds in organic matter mineralize (breakdown) over several years and can be considered to be slow release sources of nitrogen and other compounds mineralize more quickly in months. The 2015 measurements provide evidence that some N-containing compounds do persist in soils and supply nitrogen for at least nine years and counting.

It would be nice if we could use soil testing methodologies to predict the amount of nitrogen released from the soil organic matter. Research is ongoing in this area. There are routine analytical procedures for measuring soil organic matter and nitrate-nitrogen. However,

as stated earlier, the nitrate-nitrogen in the soil can originate from several sources—not just soil organic matter.

In conversations about this project, some people expected that the tile water should have “zero” nitrate-nitrogen when no nitrogen fertilizer is applied each year. This is not a reasonable expectation and is not what this study has shown so far. Even though no manure or commercial fertilizer was added to this soil for nine years, the organic matter in this prairie soil was able to supply some nitrogen for a low yielding corn crop. In spite of the high crop demand for nitrogen from the soil,



GEORGE REHM
DISCOVERY FARMS
COORDINATOR



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Soil Organic Matter Cont...

some nitrate-nitrogen was not taken up by the corn crop and was found in the tile water. This project proves that whenever there is mineralization of nitrogen from soil organic matter, there will always be some nitrate-nitrogen present in tile water. The crop is not able to take up 100% of the N

mineralized from the organic matter.

This special project of Discovery Farms-Minnesota is not being conducted for the purpose of predicting the amount of nitrate-nitrogen released from soil organic matter. Instead, this project shows that in a prairie soil, soil organic matter is

an important source of nitrogen. Many thanks to the excellent farmers and crop consultants who are cooperating in the Discovery Farms Initiative in Minnesota. With their help, this project will continue and provide more insight in the future. Stay tuned.

Online Soil Sample Submission (FSA Maps on Soil Reports!)

Most AGVISE customers have been submitting samples online for a few years now and others will give it a try for the first time this fall. When you submit your first soil samples online and realize that is the last time you have to enter that grower and field information (no more writing on forms) you will wonder why you waited so long.

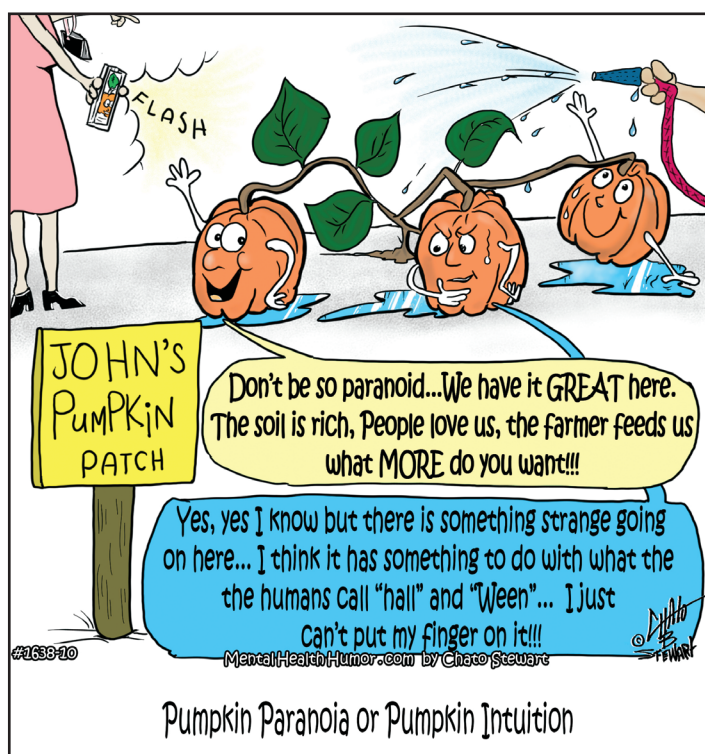
One recent added feature of the online system is the ability to add the FSA map to the grower and field information (A subscription to Surety Mapping is required to have the FSA map on your soil reports). With the FSA map linked to the field ID, every time you submit the sample online, the FSA map with the field outlined will be printed on the AGVISOR soil report. Field maps can now be displayed on soil reports for Canadian customers as well.

If you haven't started using the Online sample system yet and have questions please call John Lee at the Northwood, ND lab (701-587-6010) or Richard Jenny at the Benson, MN lab (320-843-4109). We can show you how it works, help you start doing online sample submission and make your job a lot easier with fewer mistakes!

Older Online Sample Forms – Harder to Use

Most soil samples are now submitted using our online system. Customers love the way the system eliminates errors in the information on each sample and saves them time as well. AGVISE provides the online forms which are used to print the barcoded stickers placed on each soil sample bag for tracking and quality control. One of the things we have learned about the online forms is that they don't last forever. As the forms get older or if the forms have been stored in a warm area for a long time, the glue on the form actually gets stronger. This makes the stickers a little harder to remove from the backer. On older forms, sometimes when you are peeling a sticker from the backer, the sticker will rip, or part of the sticker will stay on the backer. This is a sign that the form is a little past its prime.

If you have any stickers that are ripping when you try to peel them off the online form, please give us a call so we can send you new online forms. We are now storing our inventory of online forms in air conditioned storage so they should last even longer.



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Postcards and Poster Promote Soil Testing!

This is the 13th year that AGVISE has provided customers with free “Post Card Mailers” to send to their growers to promote soil testing. These post cards 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 are able to start testing earlier which allows them to soil test more fields for their growers. We will customize the message on your post cards so you can tell the growers exactly what you want! Here is an example of what one customer had us print on his post cards last year:

“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 2017!”

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

Don't forget to request our colorful poster which promotes soil testing as well!



AGVISE SOIL FERTILITY SEMINARS JANUARY 10, 11, 12

AGVISE soil fertility seminar dates and locations are set. The dates and locations for our 2017 Soil Fertility Seminars are listed below. We will send a registration letter to AGVISE customers in early November.

SEMINAR LOCATIONS

January 10, Granite Falls, MN

January 11, Watertown, SD

January 12, Grand Forks, ND

President's Corner Cont...

Through this time we added many critical staff members at both our Northwood and Benson locations (too many names to mention!) Many of our employees have now been with AGVISE more than 25 years. In late August of 2007, calamity struck a second time, when an EF-4 tornado leveled our laboratory in Northwood. We again called on the staff of both our labs to help rebuild the lab in Northwood and keep our customers happy by testing all soil samples at our Benson, MN lab for several months. Every employee performed like a superhero as they served our customers and rebuilt the Northwood lab again; a task which seemed impossible at times!

AGVISE continues to grow quickly in the areas of soil and plant analysis. Our annual soil sample volume alone now exceeds 500,000 between both laboratories. The advanced computer technology used in all aspects of our laboratory testing, and the ability to deliver test results through the internet to our customers is quite amazing. This year over 50% of all soil samples will be submitted online (no paper work needed!) and tracked with unique bar-coded reference number stickers. Who would have thought we could come this far in only 40 years!

We would like to thank to all of our customers and especially our loyal employees. With your help and support we will be able to continue serving you for many years to come!

AGVISE

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PRESIDENT'S CORNER

Most of you may not know that AGVISE Laboratories is celebrating 40 years of service to our customers this year. AGVISE has a rich history of providing agronomic testing services to customers across North America and even as far away as China!

AGVISE was founded in 1976 by Dr. Ed Lloyd, who was a professor in plant pathology at NDSU in Fargo, ND. Ed saw an opportunity to provide research services to chemical companies for product development and crop consulting programs to area growers. He purchased some land near Northwood, ND for the research business and Jeeps to sample fields for the crop consulting program. In the winter of 76-77 Ed approached me to setup a soil testing lab for his operation. The soil testing laboratory was up and running by the spring of 1977 and I'm still here 39 years later. A second AGVISE location was started in Benson, MN in 1979. As the years went by, AGVISE chose to concentrate on the research and laboratory portion of the business and phase out the crop consulting. Many former AGVISE consultants are some of our best and oldest customers today!

Just after Christmas In December of 1996, a fire destroyed our laboratory in Northwood. It was at that time that AGVISE was split into two companies. The research portion of the company was renamed AGVISE Research and was kept by Ed Lloyd and his sons. The laboratory portion of the business was launched by the employees involved in the testing lab, and was renamed AGVISE Laboratories. AGVISE Laboratories was established as an ESOP (Employee Stock Ownership Plan) company, with every full-time employee becoming a partial owner. As the Northwood lab was being rebuilt, our Benson MN laboratory was able to test soil samples normally tested in Northwood. They saved our bacon!



BOB DEUTSCH
PRESIDENT
SOIL SCIENTIST/CCA

SOUTHERN TRENDS

Most crops were planted early and in good soil conditions in our area, with prospects of high yields like in 2015. But, as we are all aware, no two-years are identical. Many areas look good, but some areas have received excessive rainfall and hail while others have been short of moisture.



RICHARD JENNY
AGRONOMIST/CCA

There has been a tremendous amount of interest in in-season nitrogen management for corn this year. This is probably driven by numerous companies promoting their N-management modeling programs. We've tested many more PSNT (pre-sidedress nitrate test) soil samples than in past years. The PSNT test was developed as a 12-inch deep soil sample, collected when the corn is about V4-V6 stage (6-12 inches tall). The PSNT test results are used to make decisions on whether to sidedress N at that time. While the PSNT test is not perfect, agronomists can use this information when making decisions about N rates to sidedress. With growers working on tight margins, I can see the use of the PSNT test increasing in the future.

Soybean IDC is very apparent this year. We've done a soybean IDC survey project this year since it is so prevalent, and we will be reporting on it in our upcoming newsletters. This will be a topic at our winter fertility seminars in 2017, so please mark your calendars for Jan. 10, 11 or 12th (Granite Falls, MN, Watertown, SD and Grand Forks, ND).

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