

AGVISE

FALL 2014

LABORATORIES

SOUTHERN TRENDS

In many parts of our trade area, the planting season was late, cool, wet and long. Some areas of southern Minnesota even had “Prevent Plant” acres, which is very rare. Soils were water-logged and saturated for much of the early growing season. This fall, soybean yields were surprisingly good and corn yields in general were about “average.” With very good harvest conditions, the fall soil sampling season has progressed very fast in South Dakota and Minnesota. The Benson, MN lab had record early-summer topsoil grid sample volumes this year and the fall sample volume of 1 and 2-depth precision sampling (zone and grid samples) has been high as well.

Early this growing season, yellow-striped corn was very common, very much like 2013. A summary of the corn tissue samples from the past three years showed 2013 and 2014 had a much higher percentage of samples testing low in nitrogen compared to 2012. We summarized all corn tissue samples from V8-V10 stage and found 46% of these samples were below the sufficiency range for nitrogen and 21% below the sufficiency range for sulfur. Maybe 2015 will bring us more normal spring temperatures and rainfall.

We have a great line up of topics and speakers at our seminars coming up January 6, 7, 8. We hope to see you there. I hope everyone has a great time during the holidays with friends and family!



RICHARD JENNY
AGRONOMIST/CCA

AGVISE Soil Fertility Seminars Jan. 6, 7, 8

AGVISE soil fertility seminar dates and locations are set. The dates and locations for our 2015 Soil Fertility Seminars are listed below and a registration letter was sent to AGVISE customers in early November. If you did not receive the mailing, please call 701-587-6010 and we will send it to you. Please make sure you register early for these seminars if you plan on attending. Space is limited and there is usually a waiting list. An email was also sent to everyone on our mailing list in mid-November to let people know about these seminars. If you received this newsletter, you are on our mailing list, but you may not be on our email list. If you want to receive future emails on our seminars, newsletters and technical information, please call Teresa at our Northwood office and give her your current email (701-587-6010). To register for our Soil Fertility Seminars, call 701-587-6010 and ask for Shelly or Patti.

One Million Soil Samples Submitted Online!

AGVISE introduced our online sample submission system 3 years ago. We wanted our customers to take advantage of the technology available from our web site and reduce the amount of time spent filling out paper forms. As it turns out, most of our customers have really embraced the online submission for soil samples. They really like the fact that once they have their grower names and fields in the system, it is very easy and fast to submit a sample online. They also like the



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Seminar Locations	CEU Credits applied for
Jan. 6, Granite Falls, MN	1.0 - SW, 4.0 NM
Jan. 7, Watertown, SD	1.0 - SW, 4.0 NM
Jan. 8, Grand Forks, ND	1.0 - SW, 4.0 NM
Mar. 19, Portage, MB	To be determined

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Tillage Effects on Soil Test Values

The best soil core quality and the best quality soil samples come from an undisturbed soil profile. Tillage can have quite an effect on soil test levels. Sampling an undisturbed soil can be done in the early summer or after harvest before any tillage. Soil core quality is very important for getting the most accurate and repeatable soil test results.

In 2013, AGVISE did a project to show the effect tillage can have on the variability of soil test values. We grid sampled (topsoil only) an 80-acre field after harvest and prior to tillage (stubble). Then we waited until the field had been chisel plowed and sampled the same 16 GPS points again. The results in the table show tillage can have quite an effect on soil test results. If you look at the field average for each soil test, they are fairly comparable. But you can see that some points had quite different soil test levels at each point for samples taken before or after tillage. For example, the phosphorus test results were quite different on a few points. This can be caused by the lumpy tilled top soil not flowing into the soil probe evenly, resulting in a different soil core than if the soil had not been tilled. You can see the same variability with the other tests, but to a smaller degree.

Sample ID	P- ppm		K ppm		pH		OM	
	Tilled	Stubble	Tilled	Stubble	Tilled	Stubble	Tilled	Stubble
1	28	20	291	289	6.7	7	5.9	5.6
2	10	10	201	278	7.4	7.8	5.1	4.8
3	12	9	312	343	7.8	7.9	5	5.2
4	8	7	336	349	7.9	8.1	5.3	4.8
5	4	8	202	267	7.9	8.1	3.5	3.6
6	11	6	275	278	7.8	7.9	4.6	3.9
7	6	6	335	421	7.9	8.2	4.6	4.9
8	12	11	208	311	7.4	7.5	5.4	5.7
9	18	11	483	369	7.7	7.9	6.7	5.9
10	4	9	267	326	7.8	7.8	5.3	5.2
11	11	7	237	220	7.7	8	4.7	4.1
12	10	15	218	222	6.7	6.7	3.5	3.6
13	26	34	437	371	7.7	6.9	5.3	5.3
14	4	4	232	217	8	7.9	3.1	3.7
15	36	15	489	435	6.4	7.1	6.2	5.4
16	15	6	229	236	7.4	7.4	5	5.4
Average	13	11	297	308	7.5	7.6	5.0	4.8

Soil sampling in the early summer (topsoil only) or after harvest but before tillage will give you the most accurate and repeatable test results. If you have to sample tilled fields, remember to collect the soil cores from a compressed wheel track to help overcome the effects of tillage.

Online Samples continued...

fact that the grower and field information comes back to them error free!

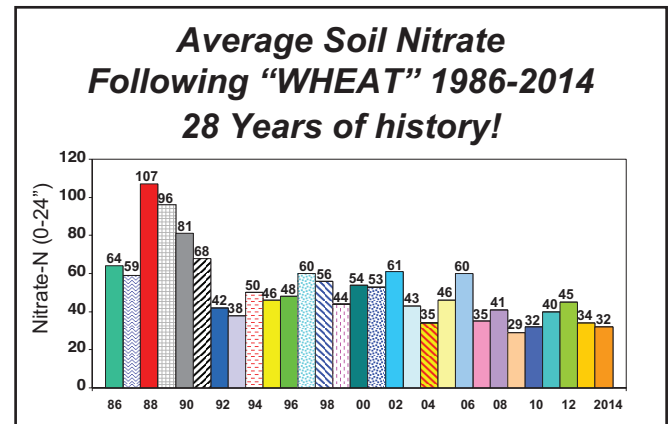
In the past year we have added a feature that allows the FSA map to be linked to each field when it is submitted online and have that map on the finished soil report. Adding the FSA map to the soil report really adds a professional touch. All of these features have resulted in a dramatic increase in the number of samples submitted online. This fall we told our customers we were going to give a \$500 check to the customer who submitted the 1,000,000th sample online. The winner was Michael Flint with CSA in Elbow Lake, MN (see picture). Congratulations to Mike and his staff. We hope you have a lot of fun with that big check!

Rule of Thumb: Low Soil N = Lost Yield

The last couple growing seasons have been very wet in many areas and growers have a lot of questions on nitrogen management. Recently a grower called AGVISE and asked if there was a “Rule of Thumb” he could use with the soil nitrate test, to determine if he had applied enough nitrogen fertilizer to his wheat and corn fields. This grower is from an area where the 0-24” soil nitrate test is done on all his fields after harvest each year.

We looked for university research we could use as a rule of thumb on the soil nitrate test but weren’t able to find that kind of research. While searching for this information, I had a conversation with Ron Gelderman (retired Extension Soil Specialist – SDSU Brookings). I asked Ron about this and he said “If the 0-24” soil nitrate test is less than about 30-40 lb/a following corn or wheat, SDSU research would show that some yield was lost for corn. For wheat, Ron said, “there was probably yield lost and protein as well.” His comments were based on over 30 years of soil fertility research at SDSU.

So far this year AGVISE has tested soil samples from over 27,000 wheat fields in this region. The average soil N following wheat for the past 28 years is shown in the figure. From these 27,000 samples from wheat fields there is a large



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Liming in North Dakota?

Liming is not a routine practice in North Dakota as it is in many areas of the eastern Corn Belt. Most soils in North Dakota have a pH higher than 6.0 which do not generally require liming to raise the soil pH. Zone soil sampling, which breaks fields into several areas for variable rate nutrient application is revealing many areas of fields with very low pH, even in eastern North Dakota.

We recently discovered an area of very low soil pH in a field just a few miles from our laboratory in Northwood ND. The topsoil pH was 4.8 and the subsoil pH less than 6.0!

Effect of Beet lime on Soil pH (so far!)	
Beet Lime Rate	Soil pH (Oct 1)
Check	4.8
2500 lb/a ENP	5.5
5000 lb/a ENP	5.6
10000 lb/a ENP	7.4

Initial soil pH 4.8 - May 22, 2014

This low pH area in the field is over 20 acres and is certainly big enough to consider for a lime application. This spring we applied three rates of lime to a demonstration project in this field. We used spent beet lime as it is available locally at no charge in areas where there is sugarbeet production. Sugarbeet lime has an ENP (effective neutralizing power) of about 80.

Three rates of lime were applied and tilled into the soil (see figure). Soybeans were planted on this field late this spring. Even though the lime has only been applied for five months, the soil pH has already increased on all of the treatments as shown in the table. This demonstration project will be a long term project as we measure the effects of the lime application on the soil pH and on the growth of subsequent crops on these areas for several years. Liming may become a routine practice in parts of fields effected by very low soil pH. Zone soil sampling is a tool which will help reveal areas which may require lime to reach top yield potential.

Rule of Thumb continued...

percentage of the soil samples testing very low in nitrogen this fall. If we used the conservative end of the rule of thumb range, say 30 lb/ac, you can see that there is a larger percentage of fields testing less than 30 lb/ac the past few years. I included 2012 and 1988 so you have some reference to dry years when wheat yields were limited by moisture and not nitrogen. We will have the 2014 data on corn fields later this fall.

So based on the conservative rule of thumb of 30 lb/a, 62% of wheat fields probably suffered yield and or protein loss this year. New high yielding wheat varieties are likely part of the reason. Many growers have not increased their N fertilizer rates to account for the high yield potential and N losses from excessive spring moisture made the problem worse. If your fields consistently test lower than 30 lb/ac of soil nitrate following wheat or corn harvest, you are probably losing yield. Sampling corn fields for soil nitrate after harvest is a good way to evaluate your N fertilizer program, even though these fields may be planted to soybeans next year. Fall soil nitrate testing is a valuable tool for evaluating your nitrogen fertilizer program to make sure you will supply enough N for your corn and wheat crop next year.

Giant Pumpkins—Nice Pics from 2014

While AGVISE didn't officially have a giant pumpkin contest this year, we did get some nice pictures from our customers who try to break the world record each year! In such a trying year to grow giant pumpkins in this region, these are pumpkins to really be proud of! Congratulations to Ethan Hulst and Adam Johnson!



Adam Johnson's 1,154 lb and 1,285 lb pumpkins. Daughter Hannah sits atop the pumpkin in the foreground, and son Zach sits on the pumpkin in back.



Ethan Hulst with fiancé Samantha, Mom Cindy and Dad Robbie.

AGVISE Laboratories - Soil Test results from 27,000 wheat fields tested fall 2014

Year	% wheat fields <30 lb/a	% corn fields testing <30 lb/a
2014	62%	----
2013	59%	42%
2012	34%	28%
1988	6%	na

Tile Drainage Reduces Salinity

Increasing salinity (salts) has been a big problem in many areas the past 15-20 years. Excessive rainfall and poorly drained soils are a bad combination. These two factors are a big part of the reason salinity is increasing in our region. As the water table gets closer to the surface in wet years, water is wicked to the surface. Once the water evaporates, the dissolved salts are left behind on the soil surface and reduce plant growth and yield. If this situation occurs for many years, the soluble salts can accumulate on the soil surface to a high level and reduce crop yields.

Surface drainage along with tile drainage and continuous cropping are the only way to reduce the salt level in soils over time. There are no magical soil amendments that will reduce the salt level in soil (wish there were!). With good surface drainage, tile drainage and good crop growth, the water table is lowered. Once the water table is lowered, this stops the capillary action which brings water to the soil surface and reduces salinity over time.

AGVISE has been monitoring the salinity (salts) of a tile drained field near our laboratory in Northwood, ND since 2002. The salinity level in parts of this field were very high when it was tiled in 2002. In October 2002, the field was tiled and we established 10 GPS points to monitor the change in

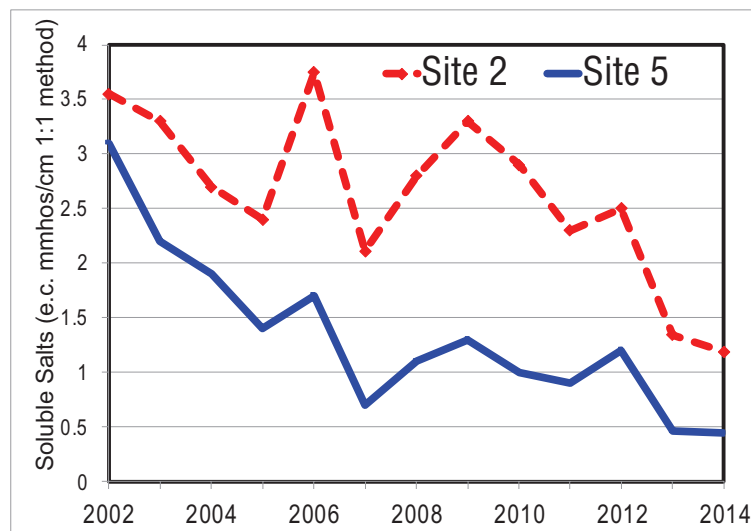
salinity over time. Each fall after harvest we collect 0-6" and 6-24" soil samples and test them for salinity and all other nutrients.

In the figure you can see that over the past 12 years the topsoil salinity has decreased significantly at site 2 and site 5. These two sites had the highest initial salinity of the ten sites. You can see in this figure that in the dry years, the salinity stayed the same or increased a little, but over several years, the salinity at these two sites has decreased greatly.

The salinity has been reduced, because the tile drainage has lowered the water table and excessive rainfall has leached some of the salts out of the topsoil.

Improving crop growth through the years has also helped remove more water from the soil profile each year, helping to keep the water table further from the surface. This field now produces high yields of many different crops without losing yield to salinity. We expect the salt levels in this field to continue to decrease slowly for many years.

Salinity Decline of Site 2 and Site 5 Tile Drained Feld (2002 – 2014)



President's Corner continued...

may allow for lower cost per acres of fertilizer for this coming year. Eventually the P & K fertilizer rates will have to be increased to account for crop removal.

So cutting fertilizer rates in general as the "Expert" said may not be the best advice. Spend your dollars wisely by starting with a soil test and applying nutrients based on realistic yields and using band and starter applications for P & K where you can will help you spend your fertilizer dollars wisely.

Soil Amendment – Beet Lime

Beet lime has become a common soil amendment in the sugarbeet growing areas of this region. Beet lime is a byproduct of the process of extracting sugar from sugarbeets. The primary reasons for applying beet lime are to reduce Aphanomyces root disease in sugarbeets and for the 20 lb/a P₂O₅ phosphorus per ton of lime. In areas with very low pH, beet lime is used to increase the soil pH just like other ag lime sources.

Questions from customers prompted us to start a beet lime demonstration project in 2008. In 2008, rates of 1 to 6 tons of beet lime were applied to a high pH soil and then tilled into the soil. Each fall we soil test these sites to measure any changes in soil pH and salt levels. As you can see in the tables, there have been no significant changes in soil pH or soluble salt levels over 6 years. Since the soil pH of this site was high to begin with (>7.0), there is no chemical reaction taking place between the beet lime and the soil, and we did not expect the soil pH to increase. If beet lime were applied to an acid soil (pH less than 7.0), the beet lime would react with the hydrogen (acid) in the soil and increase the soil pH, the same as any other liming material (see liming low pH soils in ND article). Since the soil pH of this soil has not increased and the soluble salt level has not decreased in the six years, we will conclude this project and assume that beet lime does not have an effect on the pH of high pH soils or on the salinity level of soils in general.

Does Beet Lime Increase pH on High pH Soils? (No!)

Lime Rate	Sample date	Sample date	Sample date	Sample date	Sample date	Sample date	Sample date
	9-08	10-09	08-10	11-11	10-12	10-13	10-14
1 ton	7.8	7.7	7.9	7.8	7.7	8.0	7.7
2 ton	7.9	7.9	8.1	7.9	7.9	8.0	7.9
3 ton	7.9	7.9	8.1	7.9	7.9	8.1	7.9
4 ton	7.8	7.8	7.9	7.7	7.8	8.1	7.9
5 ton	7.8	7.8	8.0	7.9	7.9	8.0	7.9
6 ton	8.0	7.9	8.2	8.0	8.0	8.1	7.9

Beet lime applied September of 2008 1:1 routine soil pH method

Does Beet Lime Reduce Soluble Salts? (NO)

Lime Rate	Sample date	Sample date	Sample date	Sample date	Sample date	Sample date	Sample date
	9-08	10-09	08-10	11-11	10-12	10-13	10-14
	mmhos/cm	mmhos/cm	mmhos/cm	mmhos/cm	mmhos/cm	mmhos/cm	mmhos/cm
1 ton	1.5	1.2	1.8	1.7	1.6	1.2	1.8
2 ton	1.9	2.1	2.3	2.5	2.3	2.0	2.3
3 ton	1.9	2.0	2.6	2.5	2.4	1.9	2.2
4 ton	1.0	1.3	1.4	1.2	1.5	1.9	1.0
5 ton	1.7	2.2	2.3	2.3	2.2	1.7	2.3
6 ton	2.6	2.1	2.7	2.9	2.5	1.9	2.6

Beet lime applied September of 2008 1:1 routine salt test method

High Wheat Yield with High Protein Too?

High spring wheat yields have many farmers bragging to their neighbors the past several years. Unfortunately, they are not bragging about high protein as well. The 2014 variety trials from NDSU Carrington Research Extension Center show just how high some of the yields have been the past three years. You can see the details of these variety trials at this link: <http://www.ag.ndsu.edu/CarringtonREC/center-points/overview-of-crec-2014-spring-wheat-variety-performance-trials>

In short, the spring wheat variety trials averaged 91.7 bu/a and 60.5 lb/bu test weight from 48 varieties in 2014. 10 varieties yielded more than 100 bu/a and one variety has averaged 72.4 bu/a

over the past three years. These yields are pretty impressive.

In these trials the 10 highest yielding varieties average 13.8% protein. While that is not high protein, it is quite a bit higher than most growers are achieving with these high yielding varieties. If you take a closer look at the nitrogen fertility of these trials, you will see that the previous crop was lentils and the soil nitrate test was 215 lb/a, with a history of manure application.

There are probably not many growers who have a Nitrogen budget of 215 lb/a N applied on top of a legume credit when growing spring wheat. Having enough N on up front without causing lodging before heading is like

walking a tight rope. To avoid lodging before heading some people will hold back on the preplant N and make a topdress application. There are years this works well, but Mother nature must cooperate. For growers with large wheat acreage this can be difficult to do on all their wheat acres. Another alternative is to use some slow release N as part of the preplant N. This slow release N should become available a little later and help the crop to achieve higher protein without lodging before heading. Research has shown that a slow release N fertilizer like ESN can help to increase protein in spring wheat in years when nitrogen losses are high early in the spring due to excessive moisture.

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PRESIDENT'S CORNER

Every Saturday morning I get up early and watch my favorite weekly farm show. This show usually has a couple of marketing experts talking about how they would market crops if they farmed. This past Saturday I was caught off guard when one expert suggested farmers should consider cutting fertilizer rates to improve their bottom line!

I would like to address this marketing expert's comments. Cutting fertilizer rates without hurting yield may not be possible. If rates are cut, you may expect yield reduction next season or down the road. Here are some suggestions I have if a grower must cut rates due to limited capital.

Apply fertilizer based on current soil test and a realistic yield goal. Using a variable rate approach to nitrogen fertilization may be one way a grower can maximize his return to dollars spent on fertilizer. Make sure the nitrogen fertilizer products and placement are done in a manner to minimize losses due to leaching and denitrification. This may require a split application of nitrogen in some situations.

A high percentage of wheat and corn fields tested this fall tested less than 30 lb/a of nitrate (0-24"). Fields testing this low in nitrogen very likely lost yield and quality due to N deficiency. Based on so many fields testing low in N this fall, I don't think it will be possible for farmers to cut rates of N fertilizer and maximize returns next year.

Placing P & K fertilizer in a band for wheat and corn can reduce the rate needed in the short term. If phosphorus and potassium soil test levels happen to be in the high range, only a starter application may be needed. Applying lower rates of P & K in a band will result in lower soil test levels over time, but



BOB DEUTSCH
PRESIDENT
SOIL SCIENTIST/CCA

NORTHERN NOTES

The year 2014 was crazy in the northern region. Spring planting was delayed by wet conditions and acres in the region did not get planted again! The crops that did get seeded progressed nicely through a cool summer. Small grain yields were off the charts in many areas, but the protein levels were low in many areas. With the recent history of high yields and low protein, we may have to rethink the rate, source and timing of N applied for spring wheat and how we can reduce losses in wet years like this. Markets around the world want higher protein spring wheat and we have to figure out how to do that consistently with the new high yielding varieties. Soybeans yields were very respectable across the region and corn yields are all over the board. Considering all of the hurdles the crops had this year, the yields were pretty surprising. Hopefully, next year goes like clock work: seed early, timely rains, warm temps and great harvest weather! I am not asking for that much, am I?

Soil testing this fall has been a mad rush. Late harvest limited the days for soil sampling, so having an efficient soil testing operation was critical. Many AGVISE customers have recently updated their hydraulic sampling systems, so the new equipment really helped this fall.

The winter meeting season is just around the corner and we have our "Soil Fertility Seminars" scheduled for January 6, 7, 8 (see article on seminars). We mailed the seminar announcement to our customers so they have the first opportunity to sign up. In past years, we usually have had a waiting list, so please sign up early to reserve your spot. We hope you to see you all there!

We hope everyone has a fun and safe Holiday season with family and friends!



JOHN LEE
SOIL SCIENTIST/CCA

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