❖Dakota Dirt❖

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A newsletter from the Soil Testing Laboratory at SDSU
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Lab Notes

It's late winter. Fertilizer application has begun as has seeding spring wheat in Western SD. It hasn't been much of a winter. Perhaps our spring will be wet. Many places could still use some runoff for livestock water and the subsoils can store some more water as well.

Samples have been coming into the lab from all over the state this winter, testifying to the lack of snow we have had. Carryover N is lower than it has been in several years reflecting the generally good yields in 2004.

The big story in soil fertility is still the high price of nitrogen. (See Table 1). Soil testing can do more for managing your producers limited nutrient dollar than anything else. If they have only so much to spend, they should spend it wisely.

Have a good Easter and a safe spring.

Prepared by Keri Skroch, Carolyn Hoffman, Lisa Ulvestad, Chris Morris, and Ron Gelderman

Table 1. Nitrogen Prices, 2002[1] vs. 2005[2]

fertil-izer	Price				
	$ per lb N		$ per ton		in-crease
	2002	2005	2002	2005	
	$				%
28%	0.23	0.39	129	218	70
Urea	0.20	0.33	184	304	65
82%	0.14	0.23	230	377	64

[1] From NASS. [2] Brookings Co. local

Managing Fertilizer Costs

We are all aware nitrogen prices have gone thru the roof (Table1). But we also know, we can't live without it. In addition, demand has recently pushed potash prices from $0.11 per pound of K_2O to about $0.17 per pound. Phosphorus prices have stayed relatively stable over the past few years. With higher rents, seed, fertilizer, and other input costs, the breakeven bottom line for crop production is even more tentative. How do you manage fertilizer so we don't apply unneeded nutrients and yet not limit our yield potential? SOIL TEST. There is no substitute for knowing what we already have in the feed bunk – especially for carryover nitrogen. Nitrate-N can change dramatically from year to year and field to field. If soil testing is not a part of your crop input management strategy, then you are not really serious about controlling input costs and producing the highest net return possible. Here are some guidelines.

- Having a deep (2') carryover nitrate soil test allows a producer with limited fertilizer dollars to bring each field to a similar relative level for crop nitrogen sufficiency.

- For increased efficiency of applied N in tillage situations consider applying closer to planting or even after planting as a sidedress. Inject or incorporate the N fertilizer. For no-till apply earlier in the season when temperatures are cooler and chances of rainfall are greater.

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- Consider urea to replace 28% or if available, anhydrous to replace urea or liquid. Anhydrous is about a dime cheaper than urea. For 100 lb of N/a, that is $10/a or $10,000 for 1000 acres! If it works for your system, it is an economical alternative.

- Make sure to credit any nitrogen from manure and legumes.

- If P tests are medium or high, apply 15-20 lbs P_2O_5 as a starter for corn or wheat. No application for soybeans. If soil P tests are very high apply no phosphorus.

- Apply recommended potassium for corn and wheat and nothing for soybean unless K soil test is less than 100 ppm.

- There is still plenty of time to take a soil sample, have it analyzed and apply the recommended nutrients.

Prepared by Ron Gelderman

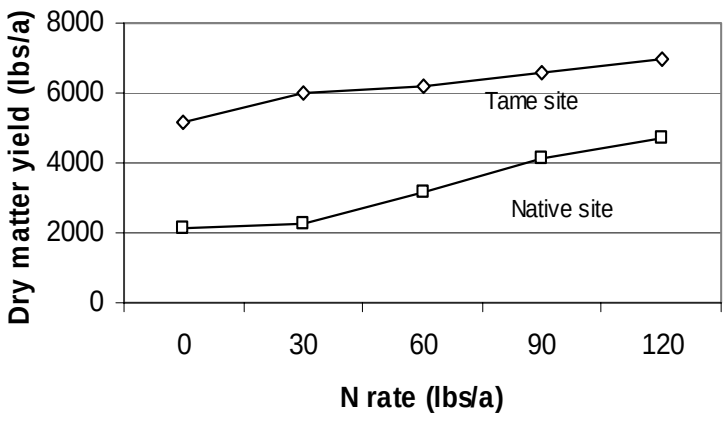


Figure 1. N rate influence on dry matter yield of pasture grass in McPherson Co. SD in 2004.

Fertilizer for pastures

Pastures typically get very little inputs – perhaps some weed control and sometimes added nutrients. We have done a number of fertility studies on grass hay but not too many on pastures. The fertility group and several extension educators looked at the effect of added fertilizer nutrients on two pasture sites in McPherson County, SD in 2004. Site one was a typical "native" site consisting of a moderately grazed bluegrass pasture. The second site was an improved site that had been planted to the "tame" species of intermediate wheatgrass, smooth brome, and perhaps 25-35 % alfalfa. Both sites had near neutral pH, high K, and very low P soil tests. These tests are very typical of many pasture soils in eastern South Dakota.

Urea treatments were broadcast in early spring at rates of 0, 30, 60, 90, and 120 lb N/a. Also broadcast on each plot was 40 lb P_2O_5/a as 0-46-0. Both sites were fenced to prevent grazing. Dry matter yields were measured to determine the effect of fertilizer N rate. The dry matter yields increased with added N at both sites (Figure 1). With 120 lb/a of N, yields at the native site increased about 2 1/2 times over the zero N treatment. At the tame pasture site 120 lb/a of N increased forage about 2000 lb/a.

In a side study, phosphorus response was also studied. The treatments and yields from both pasture sites are listed in Table 2. There was about 330 lbs of native forage increase to added P where no N was applied and about 740 lb increase with 90 lb/a of N. For the tame site there was no P response with no N and about 500 lbs with 90 lb/a of N. Obviously, the plants can utilize the added P better if they have adequate nitrogen. Other data has shown limited P response for grass unless the P soil test is very low as was the case in these studies. Bottom line - fertilizer application for pastures are usually extremely profitable.

Table 2. Fertilizer effect on pasture grass yields, 2004.

Fertilizer Treatment		Yields	
N	P_2O_5	Tame	Native
—— lb/a —-		—-dry matter, lb/a —	
0	0	5108	1771
0	40	5167	2115
90	0	6110	3383
90	40	6608	4127

Prepared by Ron Gelderman

Nitrogen Timing for Wheat

Nitrogen for excellent wheat yields should be applied either before or at tillering. If you wait to apply N until late tiller and we have a period of wet weather, this application delay could result in reduced yields. Or if applied in late tiller and we

have a period of no or little rainfall, the N will not move into the soil and be available for plant uptake. Again, the result of this would be a delay in the plants getting needed N and lower yields often result. The following graph (Figure 2) shows four years of timing data for spring wheat. If you follow the data for each year (note the symbols), the highest yield in any given year is usually at planting, followed closely by tillering. Later applications usually produced lower yields. In 2001, timing made little difference in yield. You will also note as yields decrease grain protein increases. This is quite common. We suggest applying your nitrogen needs to meet your yield goals. Our data has indicated another 30 lbs/a of N is usually needed to maximize protein. However, this may not be profitable in many years unless there is a significant protein premium. We will discuss increasing grain protein in the next issue.

Prepared by Anthony Bly and Ron Gelderman

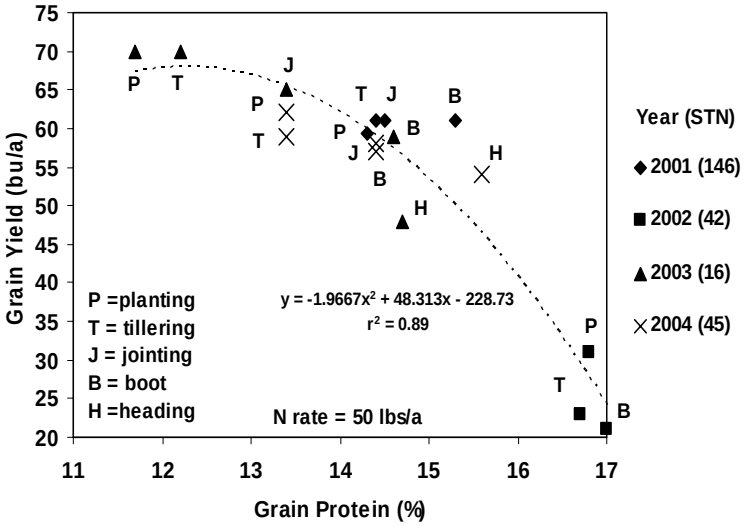


Figure 2. **N application timing and Soil Test N (STN=NO_3-N lbs/a, 0-2 foot sample depth) influence on spring wheat grain yield and protein near Brookings SD during 2001-2004.**

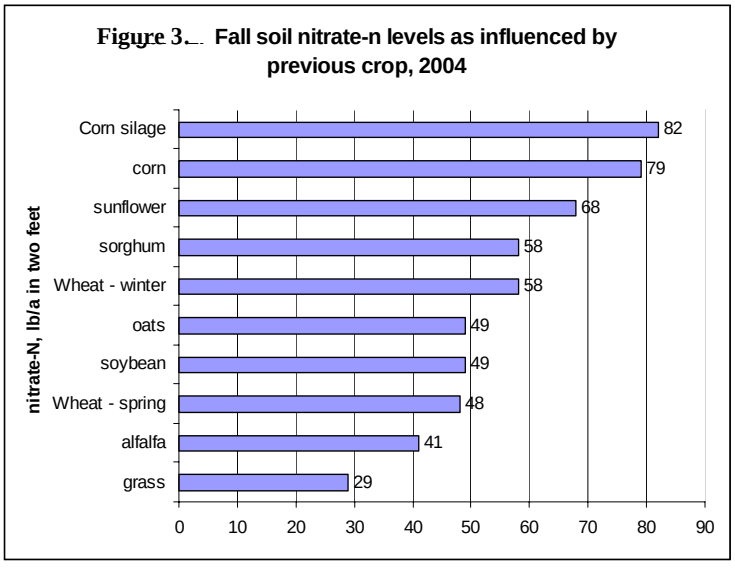
Non Conventional Products

Jim has been bombarded this winter about questions on products that have claims "to good to be true". Historically, as conventional fertilizer prices rise, sales of these unconventional products also tend to rise. Much of the following discussion was gleaned from a recent SD Dept. of Ag. Newsletter article.

When considering a purchase of a non conventional product the consumer should consider if the company is licensed to distribute fertilizer or registered to sell a soil amendment in SD. Some vendors may claim to have registration or a license when in fact they do not. To find out, contact the SD Dept. of Ag directly at 1-800-228-5254. When evaluating a product note if claims made for the product are reasonable. Again follow the old adage " If it sounds too good to be true it probably is". Also note if the company has any scientific data to prove claims of the product. Beware of testimonials and be

Carryover Soil Nitrogen

Average carryover levels are down compared to last year. For the samples that were received last Fall (2004), the average was 59 lb/a of nitrate-N as compared to 73 lb/a for the fall of 2003. This is not good when trying to save money on expensive N. On the other hand it indicates that we had good crop yields last year. The NE and NC had the biggest drop from last year's carryover levels. The carryover levels by crop are listed in Figure 3.



Spring Soil Testing at Your SDSU Lab

skeptical of any non-university data. Deal with a well known reputable company. You know they will be there and will stand behind their products.

With regard to the above discussion, a committee of State Extension Soil Specialists from the 12 north central states has developed two web sites to help provide information concerning non conventional products that claim to improve soil qualities and or plant growth.

One web site lists the products that have been sold in the Midwest and the claims and or ingredients for these products if known. It also lists references to research on the products if available. The list contains over 400 products that are listed alphabetically. This site, known as the "Label and Claims File" can be accessed at http://www.soils.wisc.edu/extension/hottopics/nonconventional.pdf

A second web site is a collection of research abstracts and reports released by scientists in State Agricultural Experiment Stations that report on products other than fertilizer that claim to improve soil qualities and or plant growth. It is called the "Compendium of Research Reports on Use of Non-Traditional Materials for Crop Production". It is a searchable site and can be accessed at http://extension.agron.iastate.edu/compendium/index.aspx

Prepared by Jim Gerwing and Ron Gelderman

Yields and Yield Goals – They are a Changing

All of us want as much yield as we can get from each field. Yet we don't want to spend expensive input costs for a few bushels that won't cover those costs. Therefore most of us set yield goals for each field that are above average but still realistic. The SDSU Soil Testing Laboratory believes each producer is best able to set these goals for their own fields. The producer or crop advisor has much more knowledge of those fields than the laboratory.

As average yields have increased over the years we wondered how our producers yield goals have changed. To answer this we looked at a five-year period from 1983-1987 and compared it with the five year period from 2000-2004.

Corn, soybean, spring, and winter wheat data for South Dakota are presented in Table 3 for both of these 5-year periods. The average yield from the Crop Reporting Service is given as well as the average yield goals from the SDSU Soil Testing Laboratory for each crop for each of these time periods. Average yields increased over this time period, 35% greater for corn to only 8% for soybean with wheat in between. This indicates relative soybean yields have not kept pace with corn. This explains why we see a number of producers growing corn on corn.

In this same span of time, corn yield goals have increased about 40% - which closely reflects actual yield increases. However, average soybean yield goals have jumped 18%. Clearly producers are expecting higher soybean yields than they have been producing. Spring wheat yields have actually gone up more than the relative yield goals have for this period of time.

The other point from these numbers is that yield goals are always higher than average yields. This would be expected as we are always striving for yields higher than average – we could never raise our average if we didn't. Weather, disease, insects, and a host of other factors will limit our actual yields compared to our yield goals. The table shows that the average yield goals are 28%, 45%, 33%, and 51% higher than the average yields for corn, soybean, spring, and winter wheat, respectively. Perhaps we are too optimistic. We recommend on each field that we aim for 10 – 15%

Table 3. Average yields and yield goals for SD.

Crop	Ave. yields[1]			Ave. yield goals[2]		
	83-87	00-04	In-crease	83-87	00-04	In-crease
	— bu/a —		%	— bu/a —		%
Corn	79	107	35	98	137	40
Soybean	29	32	8	38	45	18
Sp. Wht	29	36	24	43	48	12
W. Wht	33	37	12	48	56	17

[1] Crop Reporting Service.
[2] SDSU Soil Testing Lab

higher yield than the average of the last 3-5 years that we've grown that crop.
Prepared by Ron Gelderman

Corn after Corn – fertility concerns

As the previous article points out, soybean yields have not kept up with corn yields in recent years. Because of this trend, some growers are doing more corn after corn rotations rather than the traditional corn after soybeans. What nutrient items do we need to be concerned with when we go to this rotation?

- Carryover nitrogen. A deep (2') soil test should be taken for nitrate-N. As the carryover N article points out, there is usually much more carryover N following corn than when following soybean. This carryover needs to be known for a correct fertilizer N application.

- Legume credits. There will be no legume N credit in a corn on corn rotation.

- Heavier residues. Early corn growth can be poor when residue is present in the row. Tillage should remove much of the residue. If not or if no-till is used, move residue out of the planting zone with residue managers or use of strip till. Heavy residue can lead to lower soil temperatures and could reduce early root growth. To help with nutrient uptake, banding of at least some (10-15 lb P_2O_5/a) of the recommended P is advised.
Prepared by Ron Gelderman

Chloride Response for Corn

In South Dakota we have used the chloride soil test to predict response of wheat or barley to added chloride for almost twenty years. A few studies in the 1980's with chloride on corn indicated little response of corn to chloride additions. In the last few years work in Kansas has documented corn grain yield response from added chloride. We decided that we should look at this again. We set up three experiments on soils testing low in chloride (at least for wheat). Two sites were located in Brown and one in Brookings Co. Sixty lbs/a of chloride was applied either as $CaCl_2$ or KCl. We compared both sources so a possible response to K could be detected.

Corn grain yields were excellent. There were some differences in treatment yield means but they were attributed to site variability and not due to the treatment itself (Table 4). Therefore there was no significant corn grain yield response to added chloride. The bottom line is SD data to date has only documented consistent yield responses to chloride from only barley and wheat. If these two crops are to be planted, the two foot soil sample used for nitrate-N can also be analyzed for chloride. These Cl test results can provide an excellent guide for making chloride recommendations. Additional chloride studies on corn are planned for 2005.
Prepared by Ron Gelderman

Table 4. Chloride Effect on Corn Yield, Brown and Brookings Co., 2004

Chloride (Cl)	Columbia	Hecla	Aurora
lb/a		——— bu/a ——-	
No Cl	189	204	169
60 Cl[1]	201	202	170
60 Cl[2]	191	190	172
Stats			
Prob > F	0.18	0.08	0.90
CV %	6.2	4.3	4.5
$LSD_{.05}$	NS	NS	NS
Soil Test			
Chloride, lb/a 2'	10	12	8
Potassium, ppm	361	472	170
Texture	medium	coarse	medium

[1] Cl source: $CaCl_2$
[2] Cl source: KCl

What's Happening

Date	Event
Apr. 5	Manure management Training, Ramkota, Pierre.