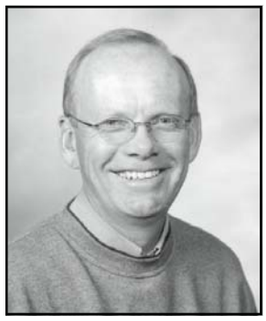
AGRONOMY NEWS

Grasslands For Tomorrow

Volume 3, Issue 2 **Spring 2003**



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Winter Wheat Nutrient Needs

The following table from the Western Triangle Ag Research Center, Conrad, Montana, shows the nitrogen requirement for winter wheat at various levels of protein. Applying nitrogen this spring will likely be necessary if you did not apply your nitrogen at seeding or last fall.

N Rate*	Yield	Protein	N/bu.
lbs N/Acre	bu/acre	%	lbs N/bu
30	28.8	8.74	1.0
50	33.9	9.83	1.5
70	38.4	10.80	1.8
90	42.4	11.66	2.1
110	45.9	12.41	2.4
130	48.8	13.05	2.7
150	51.1	13.58	2.9
170	52.9	13.99	3.2
190	54.2	14.29	3.5
210	54.9	14.48	3.8

*Fertilizer N + soil nitrate N in 3 feet of soil.

Several time of application options still remain for the nitrogen that needs to be applied. Many growers surface apply a majority of their nitrogen as early as possible in the spring to have better assurance of rainfall to incorporate the nitrogen and reduce loss.

Another option, when there is adequate soil nitrogen (approximately 40 lbs.) to reach the early joint stage of the winter wheat, is to apply a portion of the nitrogen at the late tiller to early joint stage. This may also cause a reduction in lodging as some growers noted last year. However, since the nitrogen is applied later, there is less probability of rainfall to incorporate the nitrogen.

Nitrogen needs to be applied early to stimulate tillering if winter wheat plant tiller counts are near zero coming out of winter dormancy and soil nitrogen levels are low.

Another nitrogen application window is for protein enhancement from flag leaf to post-anthesis or post-flowering stages.

Sulfur is another nutrient that has been showing deficiencies on a more common basis. Ammonium sulfate can be blended and spread with nitrogen products if soil tests identify a need. Nitrogen and sulfur are both quite soluble and readily move into the soil profile with rainfall.

To determine the amount of nitrogen to apply to this year's winter wheat fields, it may be a wise investment of your time to check the winter wheat protein premiums. Generally, protein price premiums above 12% are minimal for winter wheat, but discounts for protein levels below 12% can be hard to swallow.

Nitrogen can be applied using different sources and application methods in the spring. The volatility from greatest to least is urea (46-0-0), urea ammonium nitrate (28-0-0), and ammonium nitrate (34-0-0). These products can be broadcast or surface banded. Research trails in the U.S. and Canada show surface banding to be a more effective method of application compared to surface broadcast.

* * * * *

Winter Cereal Sponsors

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South Dakota Game, Fish and Parks

North Dakota Game & Fish Department

Syngenta Crop Protection

Natural Resources Conservation Service (NRCS)

Day, Marshall, James River, Ransom and Wild Rice Conservation Districts

North Dakota Dept. of Health 319 Program

NDSU and SDSU Cooperative Extension Service

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Research and Demonstration Sites for 2003

The following are the research and demonstration trials planned for the Winter Cereals Project area for 2003.

Day Co., SD: A winter wheat micronutrient trial was planted at Horsch-Anderson (Kevin Anderson), 9 miles west of Bristol, SD. Three varieties, Harding, CDC Falcon and Jagalene, were planted with four micronutrient treatments and 10-34-0 starter fertilizer as a check. TJ Technologies, Inc., Brookings, is providing the micronutrients.

Marshall Co., SD: Prairie Ag Research, with SDSU providing the seed, planted eighteen winter wheat varieties. The site is located immediately between the Marshall County Equipment dealers lot and the city of Britton on Highway 10.

Dickey Co., ND: This trial is located on the Larry Anderson farm 9.25 miles east of Ellendale, ND on Highway 11. There are 10 winter wheat varieties. Nitrogen will be applied as urea in early spring to two replications of the varieties and the remaining two variety replications will receive nitrogen between the 4 to 6 leaf-stage. Fungicides will also be applied to half of the variety trial. Eugene Elhard, Extension Agent, has helped with planting and Ben Hansen, Oakes Wheat Growers, will assist with the nitrogen and fungicide treatments.

Ransom Co., ND: Randy Mairs and Leonard and Pat Freeberg are cooperating with three trials. The Mairs Farm is hosting a NDSU winter wheat variety trial with 30 entries and a hard red spring wheat and barley variety trial. There will also be one variety each of a green and yellow pea planted. Peas now have a loan rate and interest is growing in peas because of their rotational benefits to many crops. Legume Logic is providing the pea seed and inoculant. The trial is located 6.75 miles south of the junction of Highways 32 and 27 in Lisbon. Dr. Joel Ransom, NDSU, is conducting these trials.

The Freeberg's are hosting a four-variety winter wheat trial with six fungicide treatments. The trial is located 7 miles south and 1.5 miles east of the junction of Highways 32 and 27 in Lisbon. Syngenta Crop Protection, Bayer CropScience and BASF are cooperating with Dr. Marcia McMullen and Dr. Ransom to conduct the fungicide study.

Sargent Co., ND: The Conservation Cropping Systems Project (CCSP) has winter wheat planted in the no-till crop rotation research farm one mile south of Forman, ND. They have also planted several varieties of winter wheat in soybean stubble. It will be interesting to see if any of the varieties survive the open winter they have experienced.

General Comments: The Dickey, Day and Marshall County sites have had little snow cover since early to mid-February. Temperatures have been very cold during the last month and winter injury or winterkill is very possible. It is fortunate that these sites had the best crown development. The Ransom County winter wheat trials had the poorest plant development due to dry fall soil conditions but have had the best snow cover. The CCSP site has been marginal for snow cover and is moderate in plant development.

Keys to Obtaining High Wheat Yields

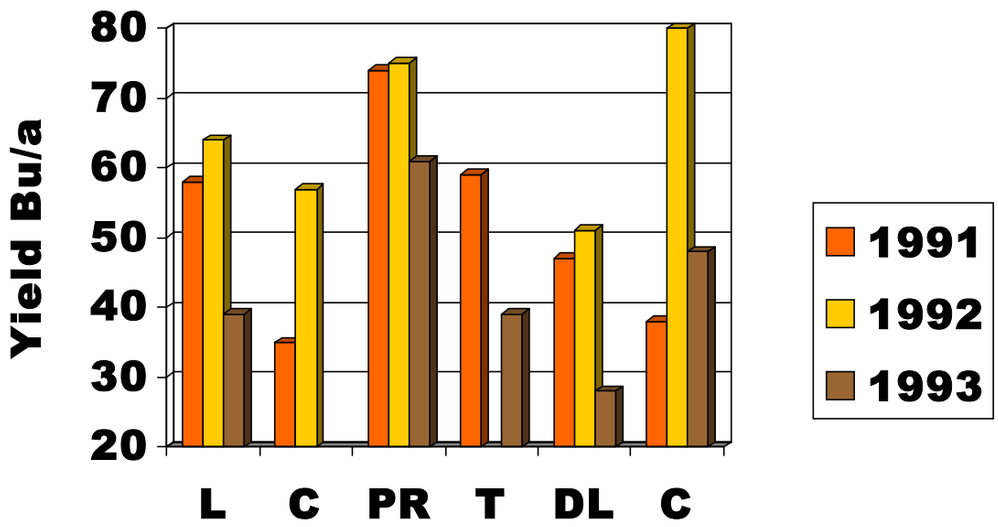
Terry Gregoire, NDSU Area Extension Specialist/Cropping Systems

The maximum wheat yield for a given year is going to depend on environment and management to coincide with the opportunities the environment brings. Wheat is a cool season plant and will yield better when the seasons are cool. The cool growing seasons of 1985 and 1992 were two of the highest yielding wheat seasons in North Dakota's recent history. When the season is favorable for wheat, good management needs to accompany favorable weather.

Why do wheat yields vary from year to year?

Studies over the years have shown locations planted by the same operator can have wheat yields differing as much as 45 bushels per acre with the same variety. Even though these studies were planted at the same seeding rates with the same equipment, the same weed control, the same fertility program there is still wide variability in yield. There are many environmental and management reasons why this might occur. Rainfall patterns, soil type, previous rotations, inherent soil fertility and many other factors contribute to how a wheat variety may respond. The genetic potential of wheat is exceeds 200 bushels per acre. In many situations wheat fields at planting time using ordinary production practices in North Dakota have 100 bushel yield potentials.

Average Yields of Langdon Planting Rate Studies with Grandin HRS 1991-93.



L=Langdon, C=Cavalier, PR= Park River,
T=Tolna, DL=Devils Lake, C=Cando

What takes away from these yield potentials?

Stress due to environment or to management during the various stages of wheat growth remove yield potential one kernel at a time. The goal of the manager is to reduce the stresses and to preserve each kernel of yield potential. If there were 13,000 seeds per pound of wheat, it would take around 78 million seeds to equal 100 bushels. When good management and environment come together good to excellent yields are obtained.

POTENTIAL SEEDS OF WHEAT PER ACRE	
Bu/A (12,000 seeds/lb)	Kernels/acre
1	780,000
25	19,500,000
50	39,000,000
75	58,500,000
100	78,000,000
1.4 million plants **X** 2.3 heads per plant **X** 12 spikelets/head **X** 2 kernels per spikelet = 77,280,00 kernels	

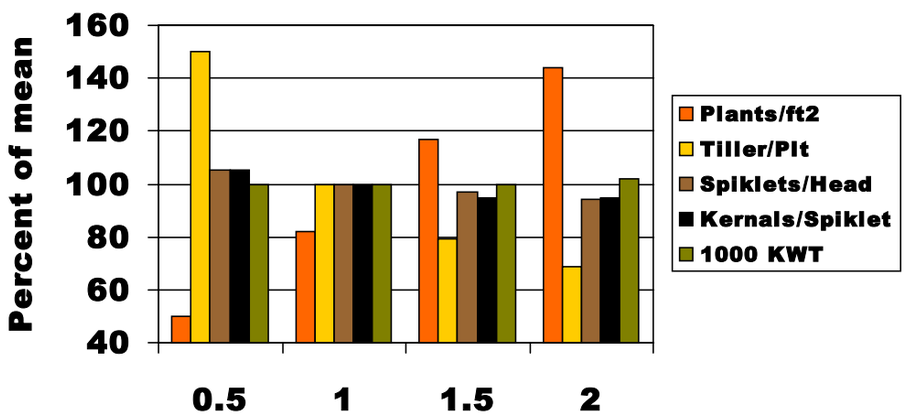
Wheat will adjust yield potential due to stress at various points throughout its life cycle. Wheat yield components are total heads per acre, number of spikelets per head, number of kernels per spikelet

and the weight of the kernels developed. Total heads produced is the most important factor in producing high yields. Planting rate studies in northeast North Dakota and northern Minnesota have established that about 35 plants per square foot (range of 26 to 41 plants) would be the optimal population for wheat in that environment. Obtaining a minimum of 26 plants per square foot will require a seeding rate that exceeds that number due to less than 100 percent germination and a 15 to 25% loss of seedlings in the emergence process. To obtain 26 plants per square foot it would require seeding 1.5 to 1.6 million seeds per acre depending on seedbed quality and percent germination. Every seed lot varies in its seeds per pound and each producer needs to know the seed per pound of the seed lot in order to determine an adequate seeding rate.

The wheat plant can add additional heads per acre by initiating tillers at the 3-5 leaf stage and if favorable weather allows 1-2 tillers will survive to produce heads. If stress occurs between tiller initiation and heading, tillers are often lost and yield potential is reduced. Additional opportunities for enhancing yield occur at the 4-leaf stage to 5-leaf stage in wheat when head size is determined. Cooler weather at this stage generally results in larger heads with spikelet counts up to 16-18 per head being very favorable. Average head size over the years in ND is 12-14 spikelets.

A fourth opportunity for the wheat plant to adjust yields is at flowering when total number of kernels is determined. Five seeds can be formed in each spikelet of wheat. Generally, two to three are formed and in a good season four and occasionally five kernels are set in each spikelet. And finally after kernel set, seed weight is the final determinant of yield. Cool weather that favors a long filling period will allow wheat kernels to fill to their maximum amount and maximize yield potential.

Langdon Planting Rate Studies 1991-93
Affect of Seeding Rate on Grandin Yield Components -16 sites

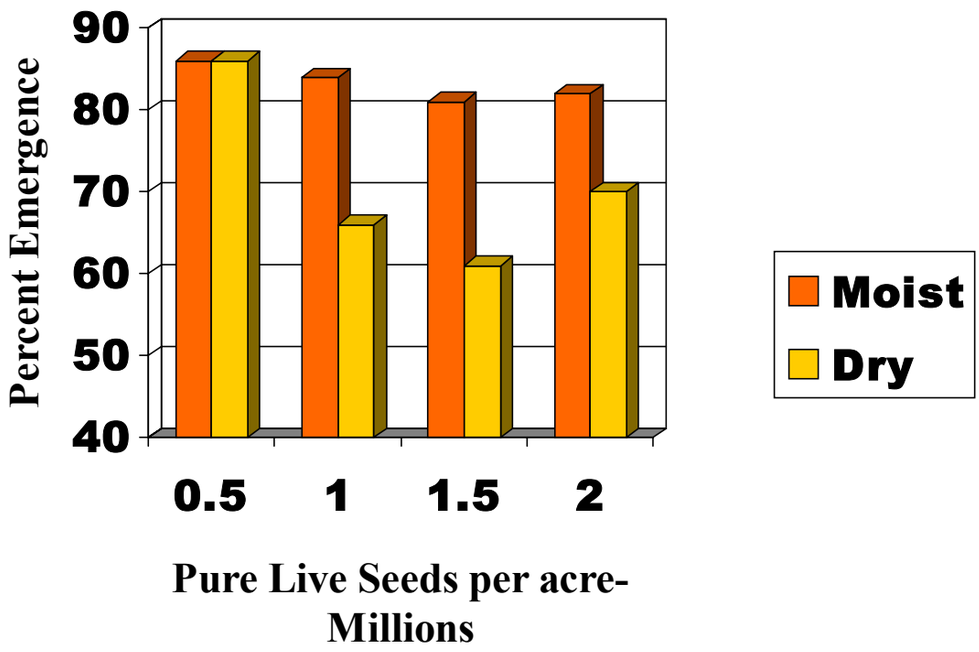


Stresses at any one of these stages can result in fewer heads per acre or smaller heads or fewer kernels or lighter kernels. If the environment is favorable, all that is needed is good management to continue to preserve the potential wheat yield that is there. Some of the key management decisions to obtaining and preserving high yields are crop rotation, securing a good seedbed, obtaining adequate plant population, having a good fertility program, using good seed of a correct variety, early planting to allow time for more development in the cool season and good pest control. High wheat yields often increase the potential for plant lodging. Choosing a strong straw variety is a key to high yields, as lodging will reduce yield and quality.

Rotation is probably the number one management key to assist in high yield production. Rotations with broadleaf crops and especially legume broadleaf crops often produce the best wheat yield as compared to planting on other grassy crops such as barley, oats or wheat. Good rotations allow for better pest management of weeds, insects and root diseases as well as provide enhanced residue management. Previous crop residues take two to three years to breakdown in North Dakota conditions. Thus if there is a severe disease infection present on residue, this disease will take a minimum of two cropping seasons to dissipate to low levels. A well-planned and executed rotation will reduce many yield robbing pest populations and set the stage for maximum wheat yields.

Obtaining a good seedbed is critical to assist in management decisions in the 90 days that wheat grows. A good firm seedbed is needed to allow capillary action to continue wetting the bed to provide the best germination and emergence when rainfall is inadequate. Good seedbed management begins in the fall with residue management and tillage decisions that consider the quality of the spring seedbed. Good seedbeds provide the opportunity to seed at the correct depth of 1.5 to 2 inches and increase the chances for uniform emergence of the crop. Good stands will increase uniformity of wheat growth, which allows for better pesticide application timing.

Langdon Planting Rate Studies 1991-93
Effect of Seedbed Moisture on Percent Emergence — 16 site ave.

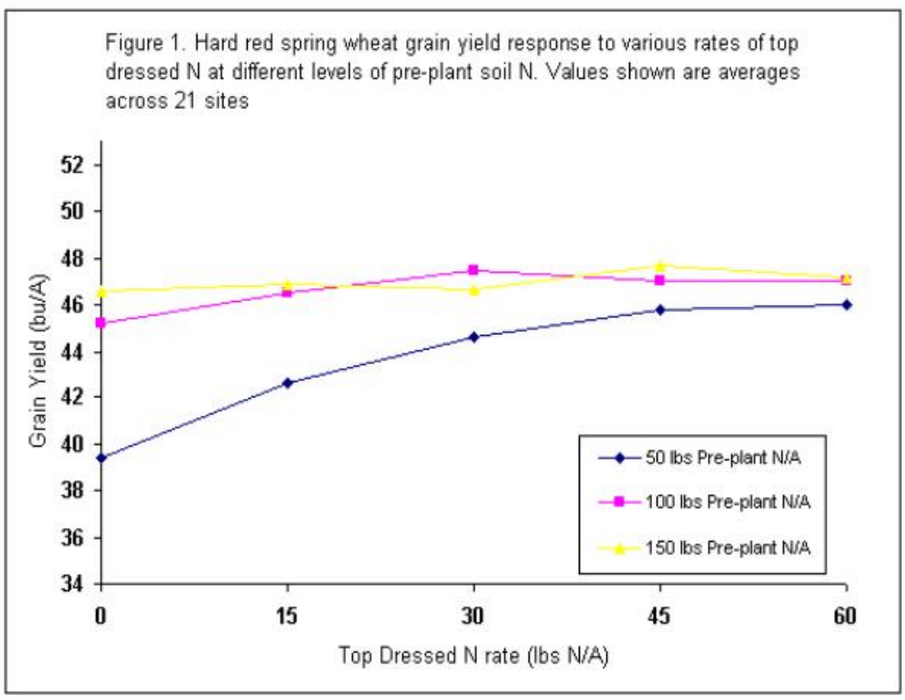


A comprehensive fertility program is one of the important keys to producing high yielding wheat. Adequate phosphorus and nitrogen are essential for optimum yields.

Wheat planted into very low and low testing phosphorus situations responds well to seed row starter fertilizer of around 30 pounds of P^2O^5 per acre. Obtaining medium or higher levels of soil phosphorus would be desirable but often can be expensive. In medium or higher levels of soil phosphorus, placement is not as critical and wheat response to starter is less but can still be significant in cold spring soils.

Nitrogen management is critical to obtain high yields and good protein in wheat. A traditional approach of applying 2.5 pounds of N per bushel of wheat preplant either in the fall or spring is the norm in North Dakota. Most studies show that at yield levels up to 60 bushels per acre, fertilizing at 125-150 pounds per acre preplant will be as good as other application methods. Leaching or de-nitrification of nitrogen may require supplemental nitrogen applications.

Effects of Post Applied Dry Ammonium Nitrate to 4-5 leaf Wheat
in Western and Northwest Minnesota
Early 1990's. Lamb and Rehm. Source: Minnesota Crop News May 14, 2002. Wiersma et al.



Split applications of nitrogen offer the grower a chance to respond to high yield potentials without applying large quantities of preplant nitrogen. A yield goal of 80 bushel per acre requires a total nitrogen need of around 200 lbs per acre. Large nitrogen amounts for high yields can increase plant lodging. Some studies have shown reduced lodging or a tendency to reduce lodging when nitrogen is split applied as compared to all nitrogen applied preplant. Very little data is available for 80-bushel yield levels as these yield levels are seldom reached in ND conditions.

Responses to split applications of nitrogen applied post emergence for high yield situations are dependent on the nitrogen fertilizer being incorporated adequately, generally by rainfall or irrigation into the soil for absorption by the roots. Studies have shown that when soil nitrogen levels are adequate for average yields, application after the 5 leaf stage generally contributes to protein rather than to wheat yields. The wheat plant requires about 25 pounds of N until canopy closure at about 5 leaf stage. From the 5th leaf stage to heading, 60 to 70 pounds of N are taken up by the plant or two to three pounds of nitrogen per acre per day. This is a tremendous need by the plant and deficiencies at this time will create stresses that reduce yield potential. When supplementing nitrogen, be sure that the post application of nitrogen is applied early enough to be incorporated by a timely rain so that the plant is not deficient at any stage. If higher seed protein is needed, numerous studies have shown that post anthesis foliar nitrogen application, when protein premiums warrant the expense, will increase wheat protein two-tenths to one-half percent.

Pest management of course is also an essential when pests are present and cause stress and reduce yields. When pest levels warrant, fungicides, herbicides, and insecticides have all been shown to be keys to good quality and high yields. Pest problems vary over the years and require close scrutiny and management decisions need to correspond with the severity of the problem. Varietal resistance when available should be used to prevent stresses to pests.

In summary, wheat has the potential to yield 70-80 bu/acre in North Dakota if environment and the management coincide. If either are lacking, average yields are the result. Paying attention to details, having good timely rains and generally cooler weather will produce the maximum yields for that year.

* * * * *

The Money Farm by Mike Krueger

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The next USDA reports that will be significant to the markets will be the March 31 planting intentions. This report will be the first official estimate of wheat crops farmers will plant in 2003. Analysts have been anticipating a two to three million acre increase in corn acres and a corresponding decline in soybean acres for the past several months. These ideas have been based on the adjustments in the corn and soybean loan rates (corn increased, soybean decreased) as well as the fact that corn yields the last two years have generally been very good while soybean yields have been below expectations in the heart of the Corn Belt. The soaring cost of nitrogen fertilizer and fuel and the ongoing bearish talk in the corn market might lead to only a slight change in the corn/soybean acreage estimates. It's also likely that hard red spring wheat acres will decline sharply in 2003 while barley acres should be significantly larger than last year. The March 31 USDA reports will also include a quarterly stocks estimate. The trade uses these stocks estimates to measure feed and residual consumption.

ND EQIP Modifications Under Review

North Dakota NRCS is modifying No Till, Mulch Till, Nutrient Management and other practices in EQIP (Environmental Quality Incentives Program). The following table indicates the proposed new and old incentive payment rates per acre and maximum acreage. (P.S. The no-till incentive would work great with a DU winter cereal incentive payment in the project counties of Dickey, Ransom and Sargent Counties in ND.) These are the rates currently being considered and may change before the rules are finalized.

Practice	Old Rate	New Rate	Old Acreage Cap	New Acreage Cap
No Till	$12.00	$6.00	160	800
Mulch Till	12.00	6.00	160	800
Nutrient Mgmt.	5.00	2.00	40	800