IMPROVING WHEAT VARIETIES FOR NEBRASKA

2007 STATE BREEDING AND QUALITY EVALUATION REPORT

Report to the

NEBRASKA WHEAT DEVELOPMENT, UTILIZATION
AND MARKETING BOARD

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I. INTRODUCTION

Wheat variety development research in Nebraska is a cooperative effort between the Agricultural Research Division, IANR of the University of Nebraska-Lincoln, and the Agricultural Research Service/USDA, Northern Plains Area. Winter wheat breeding, which includes variety, line, and germplasm development, is a major component of the state wheat improvement research. This report will deal only with the state portion of the total wheat breeding effort (located in the Department of Agronomy and Horticulture at the University of Nebraska-Lincoln). Very important contributions come from state, and federal researchers in the department and at the Nebraska research and extension centers, from state and private researchers in South Dakota, Wyoming, Kansas, Oklahoma, Texas, and Colorado, from researchers in the Department of Plant Pathology (both state and federal), from plant pathologists located at the USDA Cereal Disease Laboratory, St. Paul, Minnesota, and USDA entomologists at Manhattan, Kansas and Stillwater, Oklahoma. All of these programs invest time and funds in this program. Grants from the Nebraska Wheat Development, Utilization and Marketing Board provide key financial support for this research. Without the Wheat Board's support, much of the state breeding efforts would be curtailed and many of the wheat quality analyses to evaluate our breeding material would not be available.

II. THE 2006-2007 NEBRASKA WHEAT CROP

1. Growing Conditions

The 2006-2007 crop was planted into generally good conditions with adequate moisture throughout the state. The planting was completed in a timely manner. The fall was generally conducive to good emergence across the state. Of the nurseries, only North Platte had emergence concerns and seemed a little thin. The winter was relatively mild with more snow than normal in western NE. Winterkilling was minor, however a late spring frost was damaging (surprisingly so) to early lines in areas of Nebraska where the wheat was advanced. Most of the wheat was in the rosette stage when the frost came, so it was assumed the damage would be minor, however some lines seemed to be weakened and became more susceptible to the onset of later diseases and stresses. The spring growing season began and stayed on the dry side in parts of western NE, thus reducing diseases other than viruses. However, much of eastern NE had ample moisture during flowering and grainfill leading to high yields, leaf diseases, and Fusarium head blight. At harvest, much of the rains stopped and the harvest seed quality was good. In general, NE01643 (Husker Genetics Brand Overland), Millennium, Arapahoe, and Infinity CL performed well across or in specific sections of the state. Many of these lines tend to be late, hence avoided some of the effects of the frost in late April. However, all of the lines have the reputation of being broadly adapted, which was again born out this year.

2. Diseases

As mentioned above, in the east, there was severe damage due to foliar diseases and Fusarium head blight. The main economic disease in eastern NE was Fusarium head blight because not only did it affect grain yield, but high levels of DON (vomitoxin) were found in some samples which led to up to $1.00/bu dockage at elevators. Hence the growers lost twice (lower yield and lower price). The other major diseases were leaf rust, Septoria leaf and glume blotch, barley yellow dwarf, tan spot, and a little stripe rust. Powdery mildew was

heavy in eastern and south central NE in susceptible lines. Black chaff, a bacterial disease, was severe in some irrigated fields in the North Platte/Ogallala area. In western NE, wheat streak mosaic virus was present as was common bunt (syn. stinking smut). Common bunt is probably in every soil throughout NE, but the conditions have to be right for its spread. One experimental line, NI04421 was very susceptible and will either need to be dropped or recommended for fungicide seed treatments. Seed treatments are effective ways of reducing seed borne smuts. Drs. Stephen Wegulo, Gary Hein (entomologist monitoring insect vectors of disease and the disease), and Roy French continue to be invaluable in disease identification, survey, and understanding.

3. Insects

In general, most insect pests were seen mainly at low levels on wheat in 2006-2007. We continued to see moderate increases in areas affected by wheat stem sawfly in the panhandle, primarily in Scotts Bluff and surrounding counties. Cereal aphids were present in low populations in the west but increased to the east where some significant problems with barley yellow dwarf virus were seen. Dr. Gary Hein continues to be invaluable in insect and disease vector identification, survey, and understanding.

4. Wheat Production

In 2007, 2,050,000 acres of wheat were planted in Nebraska and 1,960,000 were harvested with an average yield of 43 bu/a for a total production of 84,280,000 bu. The 2006 Nebraska Wheat Crop was estimated at 61,200,000 bu, which represented a 36 bu/a state average yield on 1,700,000 harvested acres. The 2007 crop was 38% higher than the 2006 crop. Despite continued genetic improvement, the main determinant in wheat production seems to be acres harvested, government programs, and weather (which also affect disease pressure and sprouting). This is an economic reality in understanding wheat yields and productivity in NE.

5. Cultivar Distribution

In 2008, the most popular wheat was Agripro Jagalene (20.9% of the state) was the most widely grown cultivar followed by Pronghorn (10.6%), Millennium (9.4%), Wesley (7.7%), Alliance (6.1%) and Goodstreak (5.1%). The rise of Jagalene was very rapid, going from 4.5% in 2004 to 33.4% in 2007 and then dropping off in to 20.9% in 2008 due to its being hurt by the freeze and diseases. Pronghorn and Goodstreak are tall (conventional height) wheats that have consistently done well in the drought prone areas of western Nebraska. Interestingly, the Buckskin and Centura acreage remained virtually constant, indicating that the drought in the west is causing more tall wheats to be planted. Millennium is an excellent wheat that is the replacement for Arapahoe with its broad adaptability, excellent disease resistance, and good end-use quality. Alliance is a semi-dwarf the variety having the greatest impact since the release of Arapahoe, but its impact is more localized, as Alliance does not have the broad adaptation in eastern Nebraska that Arapahoe had.

While no wheat listed below has all of the characteristics of an ideal wheat, the diverse wheats provide the grower an opportunity to choose high yielding, high quality wheats that have resistance or tolerance to the diseases or insects prevalent in his or her region. Cultivars developed by the University of Nebraska wheat improvement program occupied 56.2% of the state acreage. Other public varieties occupied 9.8% and private varieties occupied 34% (note this includes TAM 111 which was developed by Texas A&M but is marketed by Agripro) of the state acreage.

Variety	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
2137	3.6	8.2	10.4	8.0	10.3	7.8	4.3	3.5	1.4	2.1
2145								1.0	1.2	2.2
AgriPro Dumas									1.4	1.2
Agripro Ogallala	1.2	1.4	2.2	1.5	3.6	2.4	2.0	1.4	1.0	1.1
Agripro Postrock										1.1
Agripro Thunderbolt					2.0	3.0	1.9	1.9	2.0	2.4
Agripro Tomahawk	1.6	1.0	0.0	1.8						
Agripro Jagalene						4.5	16.8	23.8	33.4	20.9
Above								1.3		
Alliance	10.4	15.1	16.0	16.6	11.5	13.6	10.1	10.1	7.2	6.1
Arapahoe	25.0	19.8	13.4	13.0	8.7	6.8	5.2	2.9	2.0	3.4
Buckskin	5.0	2.9	4.7	6.2	7.3	4.9	3.7	5.0	3.5	3.4
Centura	7.7	6.9	3.7	3.4	1.8	2.1	2.4	1.9	1.3	1.0
Goodstreak				0.0			1.7	3.7	3.6	5.1
Infinity CL										2.3
Jagger	1.1	2.9	2.4	3.4	3.9	2.8	3.1	2.5	1.7	1.5
Karl/Karl 92	5.5	4.4	4.1	3.3	3.8	3.3	2.7	2.7	1.6	2.9
Millennium				3.5	6.1	11.1	10.7	9.5	7.2	9.4
Niobrara	11.4	10.3	9.3	6.9	5.4	3.5	2.2			
Overly									1.0	1.1
Pronghorn	7.8	6.9	10.9	10.8	10.3	10.4	11.4	10.1	12.2	10.6
TAM 111								1.2	1.6	3.2
Wahoo				0.0	1.8	1.7	1.8	1.8	1.1	1.5
Wesley			1.1	2.2	3.6	5.9	5.5	5.8	7.2	7.7
Other Public Varieties	4.1	5.4	7.6	6.5	4.9	8.8	7.2	6.1	4.6	5.7
Other Private Varieties	1.9	2.0	2.2	3.9	3.4	4.4	4.0	3.8	2.8	4.1

6. New Cultivars

In 2007, NE01604 and NH03614 CL (a herbicide tolerant wheat) were recommended for release. NE01604 will be licensed to NuPride Genetics Network and marketed as Camelot. The release of NH03614 CL has been approved by BASF, which owns the herbicide tolerance gene. NH03614 CL will have as its legal name of NH03614 CL and will be marketed as Husker Genetics Brand Compass. Forms for the American Organization of State Certifying Agencies (AOSCA) have been submitted for approval, which will allow the line to be sold with certification in adjacent states for both lines.

Camelot is a hard red winter wheat (*Triticum aestivum* L.) cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS and released in 2008 by the developing institutions. It was released primarily for its superior adaptation to rainfed wheat production systems in Nebraska and adjacent areas in the northern Great Plains. Camelot will be exclusively marketed by NuPride Genetics Network in keeping with their marketing plans.

Camelot was selected from the cross KS91H184/Arlin Sib//KS91HW29/3/NE91631/4/ VBF0168 that was made in 1995. KS91H184 is an experimental line from Kansas and is selection from a random mating population involving CI17884 (Wells et al., 1982; as cited by Haley et al. 2005). The pedigree of KS91HW29 is 84WS164/2157. The pedigree of NE91631 is NE82761/Redland where the pedigree of

NE82761 is CO725082 2*/Roughrider where CO7250582 was derived from IL21183/2643//Lancer/3/KS62. The line VBF0168 was originally developed by Pioneer Hi-Bred International, Inc. and given to Kansas State University, however the pedigree has been lost. The F_1 generation was grown in the greenhouse in 1996 and the F_2 to F_3 generations were advanced using the bulk breeding method in the field at Mead, NE in 1997 to 1998. In 1999, single F_3-derived F_4 rows were planted for the selection. There was no further selection thereafter. Camelot was identified in 2001 as the experimental line, NE01604, and selected for further testing.

Camelot was evaluated in Nebraska replicated yield nurseries starting in 2002, in the Northern Regional Performance Nursery in 2005 and 2006, and in Nebraska cultivar performance trials in 2005 to 2007. In the Nebraska cultivar performance trials, it is widely adapted and performs well throughout the state with better performance in western NE. In organic and irrigated trials, it performs well, though it tends to lodge more than popular irrigated cultivars such as Wesley and Agripro Jagalene. The average Nebraska rainfed yield of CAMELOT of 3855 kg ha^{-1} (36 environments from 2005 to 2007) was greater than or similar to the yields of other popular cultivars such as Antelope (3467 kg ha^{-1}), Infinity CL (33869 kg ha^{-1}), Agripro Brand Jagalene (3541 kg ha^{-1}), Millennium (3843 kg ha^{-1}), Wahoo (3669 kg ha^{-1}), and Wesley (3628 kg ha^{-1}). The highest yielding cultivar in those years was NE01643 (Husker Genetics Brand Overland, 4119 kg ha^{-1}). Though we have only two years (7 environments) of data, Camelot performed well in irrigated environments where its grain yield (6133 kg ha^{-1}) is similar to the popular cultivars Wesley (6234 kg ha^{-1}) and Agripro Jagalene (6187 kg ha^{-1}). Camelot (3968 kg ha^{-1}) has also performed well in organic production systems (2 environments), which was similar to Wahoo (3968 kg ha^{-1}) and slightly superior to Millennium (3833 kg ha^{-1}) and Wesley (3800 kg ha^{-1}). Camelot is broadly adapted to the Northern Great Plains as was evident by its performance in the Northern Regional Performance Nursery where it ranked 12th in 2005 (out of 32 lines tested) and 2006 (out of 30 lines tested) and consistently above the nursery mean (3858 kg ha^{-1}). Compared to the check cultivars in the Northern Regional Performance Nursery, Camelot (4222 kg ha^{-1}) was higher yielding than Harding (3507 kg ha^{-1}) and Nuplains (3719 kg ha^{-1}).

Other measurements of performance from comparison trials show that Camelot is moderately late in maturity (143 d after Jan.1, data from 6 observations in eastern NE), about 1 d later flowering than 'Alliance', similar to Wesley, and 1 day earlier than NE01643 and Millennium. Camelot is a semi-dwarf wheat cultivar and contains the *RhtB1b* (formerly *Rht1*, data provided by Dr. Guihua Bai). The mature plant height of Camelot (87 cm) is 1.3 cm shorter than Millennium and 9.5 cm taller than Wesley. Camelot has moderate straw strength (14% lodged), similar to Agripro Jagalene (12%), but less than Wesley (7%), Millennium (7%). The winter hardiness of Camelot (80%) is good to very good, slightly less than Nuplains (86%), similar to Nudakota (79%) and comparable to other winter wheat cultivars adapted and commonly grown in Nebraska.

Camelot is moderately resistant to stem rust (caused by *Puccinia graminis Pers.: Pers. f. sp. tritici* Eriks & E. Henn.) in field nursery tests inoculated with a composite of stem rust races (RCRS, QFCS, QTHJ, RKQQ, and TPMK). In greenhouse tests, it is moderately resistant to races QFCS, MCCF, RKQQ, TPMK and TTKS, but susceptible to race TTTT (data provided by Y. Jin at the USDA Cereal Disease Laboratory). It is moderately resistant to leaf rust (caused by *P. triticina* Eriks), stripe rust (caused by *P. striiformis* Westendorp f. sp. t*ritici*, data obtained from field observations in the Great Plains), and Hessian fly (*Mayetiola destructor* Say, data provided by Ming-Shun Chen, USDA and Kansas State University). Camelot also is slightly more tolerant to Fusarium head blight (caused by *Fusarium spp*., data obtained from misted screening nurseries in Nebraska and South Dakota) than many widely grown lines. It is moderately susceptible to wheat soilborne mosaic virus, and susceptible to barley yellow dwarf virus, and wheat streak mosaic virus (data obtained from the Northern Regional Performance Nursery, 2005-2006 and field observations in NE).

Camelot is a genetically intermediate in grain volume weight (71.9 kg hl^{-1}), which is lower than Millennium (72.7 kg hl^{-1}) and NE01643 (73.0 kg hl^{-1}), similar to Scout 66 (71.6 kg hl^{-1}), and higher than Wesley (69.7 kg hl^{-1}). The milling and baking properties of Camelot were determined for four years by the Nebraska Wheat Quality Laboratory. In these tests, Millennium, an excellent milling and baking wheat, was used for comparison. The average wheat and flour protein content of Camelot (135 and 126 g kg^{-1}) were similar to Millennium (139 and 123 g kg^{-1}) for the corresponding years. The similar grain protein content was confirmed by the Nebraska cultivar performance trials where Camelot had 122 g protein kg^{-1} compared to Millennium with a value of 120 g kg^{-1}. The average flour extraction on the Buhler Laboratory Mill for Camelot (715 g kg^{-1}) was slightly lower than Millennium (721 g kg^{-1}). The flour ash content (44 g kg^{-1}) was higher than Millennium (43 g kg^{-1}). Dough mixing properties of Camelot were acceptable (mixtime peak was 3.7 minutes and mixtime tolerance was scored as 3.3) which was weaker than Millennium (mixtime peak of 4.0 minutes and mixtime tolerance scored as 3.4). Average baking absorption (618 H_2O g $kg^{-1)}$ was slightly higher than Millennium (613 H_2Og kg^{-1}) for the corresponding years. The average loaf volume of Camelot (894 cm^3) was lower than Millennium (915 cm^3). The scores for the internal crumb grain and texture ranged from fair to very good, which was better than Millennium, which ranged from fair plus to good. The overall end-use quality characteristics for Camelot (scored as 4.3, where 5 is excellent) was better than Millennium (3.9) and similar to many commonly grown wheat cultivars. Camelot should be acceptable to the milling and baking industries.

In positioning Camelot, based on performance data to date, it should be well adapted to most rainfed wheat production systems in Nebraska and in adjacent areas of the northern Great Plains. Being a broadly adapted wheat line may explain its good agronomic performance in the Northern Regional Performance Nursery. Where it is adapted, Camelot should be a replacement for 2137, Wahoo, and Wesley (for rainfed production), though Wesley has better straw strength. Camelot is genetically complementary to Husker Genetic Brand Overland, Millennium, Infinity CL, and Antelope. It is non-complementary to Hatcher and 2137.

Camelot is an awned, ivory-glumed cultivar. Its field appearance is most similar to 2137**.** After heading, the canopy is moderately closed and nodding. The flag leaf is erect and twisted at the boot stage. The foliage is dark green with a light waxy bloom on the leaf sheath and spike at anthesis, but not on the leaves. The leaves are generally glaborous, but a few leaves have very short hairs parallel to the leaf veins. The spike is tapering to blocky, narrow, mid-long, and middense. The glume is long and narrow, and the glume shoulder is narrow and rounded to square**.** The beak is moderately long in length with an acuminate tip. The spike is predominantly inclined at maturity with some spikes nodding. Kernels are red colored, hard textured, and mainly ovate in shape. The kernel has no collar, a large brush of medium length, rounded cheeks, large germ, and a narrow and shallow crease.

Camelot has been uniform and stable since 2005. Less than 0.5 % of the plants were rogued from the Breeder's seed increase in 2005. The rogued variant plants were taller in height (5 - 15 cm) or were awnless and/or with red chaff. Up to 1% (10:1000) variant plants may be` encountered in subsequent generations. The Nebraska Crop Improvement Association and Mr. Roger Hammons provided technical assistance in describing the cultivar characteristics and accomplishing technology transfer. The Nebraska Foundation Seed Division, Department of Agronomy and Horticulture, University of Nebraska-Lincoln, Lincoln, NE 68583 will have foundation seed available to qualified certified seed enterprises in 2008. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. Camelot will be submitted for plant variety protection under P.L. 10577 with the certification option. A research and development fee will be assessed on all certified seed sales. Small quantities of seed for research purposes may be obtained from the Dr. P. S. Baenziger and the Department of Agronomy and Horticulture, University of Nebraska-Lincoln for at least 5 yr from the date of this release.

Camelot was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board.

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NH03614 CL is a hard red winter wheat (*Triticum aestivum* L.) cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS and released in 2008 by the developing institutions and the South Dakota Agricultural Experiment Station and the Wyoming Agricultural Experiment Station. NH03614 CL contains a patented gene owned by BASF. BASF retains ownership of the gene. NH03614 CL was released primarily for its herbicide resistance and superior adaptation to rainfed wheat production systems in Nebraska, Wyoming, and South Dakota, and wheat producing counties in adjacent states. NH03614 CL is a Clearfield™ wheat that will be used with Beyond® herbicide (active ingredient imazamox (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid) BASF Corp., Triangle Park, NC).

NH03614 was selected from the cross Wesley sib//Millennium sib/Above sib. The cross between the Millennium sib (formerly NE94481) and the Above sib (TXGH125888-120*4/FS2) was made in the spring of 1997. The final cross to Wesley sib (formerly N95L164) was made in Fall, 1997. The F_1 generation was grown in the greenhouse in 1998 and the F_2 to F_3 generations were advanced using the bulk breeding method in the field at Mead, NE in 1999 to 2000. In both years, the bulks were sprayed with imidazolinone herbicide to select for the herbicide resistant segregants. In 2000, a single F_3-derived F_4 rows were planted for harvest and selection in 2001. In 2001 to 2002, the line was evaluated as a single plot in an observation nursery. In 2002 to 2003, the line was grown at six locations in Nebraska and given the designation of NH03614 where the H acknowledges its herbicide tolerance. There was no further selection thereafter.

NH03614 was evaluated in Nebraska replicated yield nurseries from 2004 to 2007, in Nebraska State Variety Trials in 2007 where is continues to be tested, and in the Northern Regional Performance Nursery in 2006 and 2007. As a Clearfield wheat, the line that is most important to compare it with is Infinity CL as both are herbicide tolerant. Based upon the Nebraska data, NH03614 seems to be superior in western NE (e.g. yield data from North Platte, Sidney, and Alliance) to Infinity CL, which is superior in eastern NE (e.g. data from Mead, Lincoln, and Clay Center). The Nebraska State Variety Trials in 2007 agreed with these results. Both lines would be considered broadly adapted and have been grown successfully throughout the state in rainfed conditions. NH03613 CL and Infinity CL were not grown together in the Northern Regional Performance Nursery, but NH03614 CL performed well there as can be seen by it being the 2^{nd} (out of 30 lines) and 11^{th} (out of 32 lines) in the 2006 and 2007 trials, respectively. In both years, it was not statistically different from the highest yielding line in the trial. Of the 10 lines tested in both 2006 and 2007, NH03614 (4159 kg ha^{-1}) was second only to NW03681 (4171 kg ha^{-1}) and compared favorably to the recently released AgriPro Hawken (4074 kg ha^{-1}) and the popular line Wesley (4069 kg ha^{-1}). As expected, it also outperformed the check cultivars; Harding (3765 kg ha^{-1}) and Nuplains (3434 kg ha^{-1}). Though

NH03614 has excellent grain yield in rainfed environments, its grain yield (6187 kg ha^{-1}) in irrigated environments (tested in 3 environments) is slightly above the test average (6046 kg ha^{-1}).

Other measurements of performance from comparison trials show that NH03614 is moderately late in maturity (149.9 d after Jan.1, data from observations in NRPN), which is very similar to Wesley (149.7 after Jan. 1), about 1 d earlier flowering than 'Harding' (150.9 d after Jan. 1). NH03614 is a semi-dwarf wheat cultivar and contains *RhtB1b* (formerly *Rht1*, data provided by Dr. Guihua Bai). The mature plant height of NH03614 (73.7 cm) is 0.7 cm taller than Wesley and 9.6 cm shorter than Harding. Using data from the 2007 Nebraska State Variety Trials in locations where lodging occurred, NH03614 has moderate straw strength (24% lodged), which is superior to Infinity CL (39%) and less than Wesley (19%). The winter hardiness of NH03614 is good to very good and comparable to other winter wheat cultivars adapted and commonly grown in Nebraska.

NH03614 is moderately resistant to stem rust (caused by *Puccinia graminis Pers.: Pers. f. sp. tritici* Eriks & E. Henn.) in field nursery tests inoculated with a composite of stem rust races (RCRS, QFCS, QTHJ, RKQQ, and TPMK) and to wheat soilborne mosaic virus. In greenhouse tests, it is moderately resistant to races QFCS, MCCF, RKQQ, and has a heterogeneous reactions (e.g. some plants are resistant and others are susceptible) to races TPMK, TTTT, and TTKS (data provided by Y. Jin at the USDA Cereal Disease Laboratory). NH03614 is moderately resistant to moderately susceptible to Hessian fly (*Mayetiola destructor* Say, data provided by Ming-Shun Chen, USDA and Kansas State University). It is moderately susceptible to leaf rust (caused by *P. triticina* Eriks), stripe rust (caused by *P. striiformis* Westendorp f. sp. t*ritici*, data obtained from field observations in the Great Plains). NH03614 is slightly less susceptible to *Fusarium* head blight (caused by *Fusarium graminearum* Schwabe) than many widely grown lines, based on disease severity ratings obtained from misted screening nurseries in Nebraska and South Dakota,. It is susceptible to wheat streak mosaic virus (data obtained from the Northern Regional Performance Nursery, 2006 and field observations in NE).

NH03614 is genetically high in grain volume weight (75.4 kg hl^{-1}), similar to Harding (75.2 kg hl^{-1}) and higher than Wesley (74.2 kg hl^{-1}) based upon 25 environments in the Northern Regional Performance Nursery. The milling and baking properties of NH03614 were determined for three years by the Nebraska Wheat Quality Laboratory. In these tests, Scout 66, a good milling and baking wheat, was used as for comparison. The average wheat and flour protein content of NH03614 (141 and 115 g kg^{-1}) were similar to Scout 66 (150 and 130 g kg^{-1}) for the corresponding years. The slightly lower grain protein content was confirmed by the Nebraska cultivar performance trials where NH03614 had 122 g protein kg^{-1} compared to Millennium with a value of 124 g kg^{-1}. The average flour extraction on the Buhler Laboratory Mill for NH03614 (725 g kg^{-1}) was lower than Scout 66 (739 g kg^{-1}). The flour ash content (4.5 g kg^{-1}) was higher than Scout 66 (4.1 g kg^{-1}). Dough mixing properties of NH03614 were strong (mixtime peak was 4.9 minutes and mixtime tolerance was scored as 4.2) which was stronger than Scout 66 (mixtime peak of 3.5 minutes and mixtime tolerance scored as 3.9). Average baking absorption (600 H_2O g kg^{-1}) was slightly lower than Scout 66 (610 H_2Og kg^{-1}) for the corresponding years. The average loaf volume of NH03614 (881 cm^3) was higher than Scout 66 (830 cm^3). The scores for the internal crumb grain and texture ranged from fair to good plus, which was slightly better than Scout 66 which ranged from fair to good). The overall end-use quality characteristics for NH03614 are acceptable and similar to many commonly grown wheat cultivars, which are well received by to the milling and baking industries.

In positioning NH03614, based on performance data to date, it should be well adapted to most rainfed wheat production systems in Nebraska, Wyoming, and South Dakota, and in adjacent areas of the northern Great Plains. Being a broadly adapted wheat line may explain its excellent agronomic performance in the Northern Regional Performance Nursery. Where it is adapted, NH03614 should provide growers with an additional choice to Infinity CL for their production systems. Because NH03614 and Infinity CL have

similar parentage, they would be considered non-complementary. Both are complementary to 2137, Alliance, Buckskin, Goodstreak, and Pronghorn. It is non-complementary to Windstar, Above, Agripro 502 CL, TAM 110, Arapahoe, and Millennium.

NH03614 is an awned, ivory-glumed cultivar. The flag leaf is erect and twisted at the boot stage. The foliage is gray-green to green with a moderate waxy bloom on the leaves, leaf sheath and spike at anthesis. The leaves are glaborous, though a few plants have very few and very short hairs. The spike is tapering in shape, narrow, mid-long, and middense. The glume is long and narrow to midwide, and the glume shoulder is wide and elevated. The beak is medium in length with an acuminate tip. Kernels are red colored, hard textured, and mainly oval in shape. The kernel has no collar, a large brush of medium length, rounded cheeks, midsized germ, and a narrow and shallow crease.

NH03614 has been uniform and stable since 2006. Less than 1 % of the plants were rogued from the Breeder's seed increase in 2004. The rogued variant plants were taller in height (8 - 15 cm) or darker or black chaff which may be due to disease. Up to 2% (0:1000) variant plants may be encountered in subsequent generations. The Nebraska Crop Improvement Association and Mr. Roger Hammons provided technical assistance in describing the cultivar characteristics and accomplishing technology transfer. The Nebraska Foundation Seed Division, Department of Agronomy and Horticulture, University of Nebraska-Lincoln, Lincoln, NE 68583 has Foundation seed available to companies or marketing groups that hold a marketing license from BASF in 2008. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. Registered seed will be a nonsalable class. NH03614 CL will be submitted for U.S. Plant Variety Protection under P. L. 10577 with the certification option. A research and development fee will be assessed on all certified seed sales. The variety, NH03614 CL, contains a patented herbicide tolerance trait owned by BASF that confers tolerance to imidazolinone herbicides, such as imazamox. Any use of this variety requires a Material Transfer Agreement (for research use only) or a Commercial License to the trait, as well as permission from the variety originator. Contact Dr. P. S. Baenziger, Department of Agronomy and Horticulture, University of Nebraska-Lincoln for all seed requests; no seed will be distributed without written permission from both BASF and the University of Nebraska for at least 20 years from the date of this release. The corresponding author will forward the request for seed to BASF Corporation. The Nebraska Foundation Seed Division, Department of Agronomy and Horticulture, University of Nebraska-Lincoln, Lincoln, NE 68583 had foundation seed available to qualified certified seed enterprises in 2008. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. A research and development fee will be assessed on all certified seed sales. NH03614 was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board and BASF Corporation.

Development team: P. S. Baenziger (breeder-inventor), R. A. Graybosch, A. Ibrahim, D. D. Baltensperger, R. N. Klein, L. A. Nelson, J. Krall, Y. Jin, Stephen Wegulo, Ming-Shun Chen, Guihua Bai, Lan Xu, D. Lyon, and M. L. Bernards.

Two lines, recommended for release, were developed with USDA-ARS leadership. Anton is a new hard white wheat with very low PPO activity, which is a highly desirable trait in the Asian noodle market and for making bread. The second line is Mace, which is a new hard red winter wheat that has the best wheat streak mosaic virus tolerance of any line currently available. Mace will be the line of choice for any situation where the grower needs to reduce his or her risk to this potentially devastating disease.

One experimental line NE01481, which has exceptional end-use quality, is being testing by the Kansas Organic Producers in 2007-08 for possible licensing. If it continues to perform well for the organic growers, it will be an excellent complementary wheat for NE99495, which was previously licensed by Kansas Organic Producers. The organic effort is part of our effort to ensure that the germplasm developed at the University of Nebraska for the public good is broadly available to interested parties. The ability to develop high end-use quality with good disease resistance that has acceptable yield potential is a natural complement to conventional lines which emphasize exceptional high yield performance that can be protected by fungicides, insecticides, and herbicides if needed. A major grant for breeding wheat varieties organic production has been funded by the USDA and Mr. Richard Little has been hired to coordinate our organic breeding effort.

III. FIELD RESEARCH

1. Increase of New Experimental Lines

With our new release procedures of determining which lines will be released in January with the seed begin available in August for certified seed producers, three lines are under increase, NH03614 CL, Camelot, and Mace. Anton is available for someone to purchase and develop the market. NE01481 is being evaluated for the organic market and if it is successful will be increased by the organic producers. **,** A number of lines are under small-scale increase for possible release in 2009.

With the release of new varieties Antelope, Anton, Arrowsmith, Camelot, Goodstreak, Harry, Infinity CL, and NH03614 CL and many of the most advanced current breeding lines are not expected to be released.

2. Nebraska Variety Testing

Numerous entries were included in some or all of the locations in the Fall Sown Small Grain Variety Tests in 2007. Thirteen dryland, one dryland organic, and four irrigated locations were harvested for yield data. In 2007, the top ten entries for dryland production were:

Entry	Yield (bu/a)	Entry	Yield (bu/a)
Overland (NE01643)	62.65	2137	59.10
NH03614	60.35	NE02584	58.58
NI04420	59.95	Arapahoe	58.43
Camelot	59.70	AgriPro Postrock	58.23
Millennium	59.53	Infinity CL	58.20

Of the released lines tested in all dryland locations, Turkey (46.83 bu/a) and Scout 66 (46.58 bu/a) as expected were low yielding, but the Lowest yielding lines were Jagalene (46.30 bu/a) and NuPlains (42.58 bu/a) that may indicate the frost and disease severity. These yield levels are higher than the state average yield (43 bu/a) indicating our nurseries are on better production areas than many parts of the state. In Lincoln, some varieties had some lines with yields over 85 bu/a, which would be unusual in most fields and represents a very high yielding environment.

In 2006, the top ten entries for dryland production were:

Entry	Yield (bu/a)	Entry	Yield (bu/a)
Jagalene	52.57	NE02584	50.80
NE01643	52.85	Harry	52.82
Infinity CL	52.14	Expedition	51.06
Trego	50.70	2137	49.70
NE01481	50.51	Wahoo	51.72

In 2005, the top ten entries for dryland production were:

Entry	Yield (bu/a)	Entry	Yield (bu/a)
NE01643	56.7	Goodstreak	50.4
Infinity CL	52.4	Blend 1	50.1
NE01481	51.4	NE01604	50.1
Millennium	51.4	NE00403	50.1
NuFrontier	50.9	Gen. Mills 10006	49.8

3. Irrigated Wheat Trials:

In 2007, four irrigated environments (three in NE and one in WY) were used to evaluate irrigated wheat production. The top ten lines in 2007:

Variety	Yield bu/a	Variety	Yield bu/a
CO01385-A1	93.90	NH03614	87.75
Bond CL	91.65	NE02584	87.48
NE01604	91.63	Hatcher	87.08
NI04421	90.95	Wesley	87.03
Overland (NE01643)	88.58	RonL	86.50

The top ten lines in 2006:

Variety	Yield bu/a	Variety	Yield bu/a
TAM 111	102	NE01422	99
Bond CL	102	NuDakota	99
NI04421	100	2137	98
NuFrontier (W)	99	Jagalene	97
Blend #10	99	Wesley	97

The top ten lines in 2005:

Variety	Yield bu/a	Variety	Yield bu/a
NuHorizon (W)	97.1	NI01824	90.0
N02Y5117	93.5	Dumas	89.6
NI02425	92.1	TAM 111	89.4
Blend #10	91.1	NuFrontier (W)	88.7
NW97S139-1 (W)	90.1	Gen. Mills 10006 (W)	87.7

The irrigated data this year continue to show the benefits of having a dedicated irrigated wheat development nursery. NI04421 came directly from the irrigated wheat development nursery. In addition, it is good to see a number of experimental lines in the best lines group. We hope that with the four locations there will be more consistent performance among the irrigated wheat lines. Currently there is a yearly shuffle among the top lines and it is hard for growers to choose the most consistent performer.

As in the past, we have an experimental line irrigated nursery, which is grown under irrigation in western Nebraska and under dryland conditions throughout the state. The goal of this nursery is to identify higher yielding lines under irrigation and under higher rainfall conditions, which periodically occur in Nebraska.

name	Heading Date	Height in	Rainfed Lincoln bu/a	Rainfed North. Platte bu/a	Rainfed Alliance bu/a	Rainfed Average bu/a	Rainfed Rank	Irri. Sidney bu/a	Irri. Rank	State Avg. bu/a	Rank
Jagalene	17	33.6	53.63	76.60	49.33	59.85	18	**102.48**	**37**	70.51	21
WESLEY	20	33.5	48.82	80.08	51.83	60.24	16	**103.46**	**36**	71.05	18
Antelope	18	35.1	50.83	77.97	46.52	58.44	20	**100.44**	**39**	68.94	25
NI04421	20	36.0	61.47	73.98	51.17	62.21	11	**118.74**	**4**	76.34	8
NI04428	18	32.2	63.27	88.72	51.78	67.92	1	**107.89**	**26**	77.92	2
NI04436	21	36.3	48.50	72.17	45.82	55.50	25	**109.46**	**22**	68.99	24
NE03486	20	35.2	66.23	71.13	47.20	61.52	13	**108.64**	**23**	73.30	12
NI05714	22	36.2	42.22	62.82	48.57	51.20	32	**110.57**	**17**	66.05	30
NI05718W	20	38.3	41.02	72.35	41.98	51.78	30	**100.57**	**38**	63.98	34
NI05720W	23	36.5	37.58	54.18	43.63	45.13	39	**105.31**	**30**	60.18	40
NI04427	18	33.3	55.32	77.63	50.02	60.99	15	**105.06**	**32**	72.01	15
NI03427	21	37.7	59.07	81.45	49.73	63.42	8	**110.22**	**18**	75.12	10
NI06721	16	34.3	62.23	78.85	49.47	63.52	7	**116.48**	**7**	76.76	7
NI06724	17	35.4	51.18	78.60	48.07	59.28	19	**109.87**	**19**	71.93	16
NI06726	17	35.8	48.52	78.73	44.05	57.10	22	**112.23**	**13**	70.88	19
NI06731	16	34.0	63.47	80.00	47.75	63.74	6	**119.9**	**1**	77.78	3
NI06732	22	36.7	56.93	78.10	48.93	61.32	14	**106.73**	**28**	72.67	14
NI06736	17	33.9	62.13	85.67	48.80	65.53	4	**113.58**	**11**	77.55	4
NI06737	17	32.1	56.03	84.97	47.60	62.87	10	**119.62**	**2**	77.06	5
NI07701	17	29.3	40.77	68.23	50.93	53.31	28	**118.61**	**5**	69.64	23
NI07702	18	33.1	72.58	65.90	46.78	61.75	12	**99.75**	**40**	71.25	17
NI07703	18	32.2	61.88	84.67	52.77	66.44	2	**116.96**	**6**	79.07	1
NI07704	18	34.5	50.37	71.87	44.50	55.58	24	**107.54**	**27**	68.57	27
NI07705	18	34.6	69.92	74.55	49.82	64.76	5	**104.46**	**33**	74.69	11

NI07706	18	33.9	45.02	79.40	48.37	57.60	21	**109.68**	**20**	70.62	20
NI07707	21	36.3	64.23	85.10	49.22	66.18	3	**109.62**	**21**	77.04	6
NI07708	21	35.8	47.88	66.33	43.27	52.49	29	**103.52**	**35**	65.25	33
NI07709	21	34.9	35.28	54.82	51.60	47.23	37	**112.61**	**12**	63.58	35
NI07710	21	35.5	45.43	57.25	43.67	48.78	34	**114.81**	**9**	65.29	32
NI07711	18	32.4	56.82	80.67	51.55	63.01	9	**114.18**	**10**	75.81	9
NI07712	20	35.6	36.93	72.88	51.35	53.72	27	**118.96**	**3**	70.03	22
NI07713	21	32.0	38.50	60.97	51.98	50.48	33	**110.78**	**15**	65.56	31
NI07714	20	35.8	55.42	73.97	50.70	60.03	17	**111.85**	**14**	72.99	13
NI07715	21	33.2	52.07	61.20	55.25	56.17	23	**106.6**	**29**	68.78	26
NI07716	20	34.4	50.68	62.48	51.57	54.91	26	**103.68**	**34**	67.10	29
NI07717	21	36.4	44.50	53.48	56.13	51.37	31	**115.75**	**8**	67.47	28
NI07718	18	31.3	39.08	61.68	43.67	48.14	36	**105.19**	**31**	62.41	38
NI07719	22	35.9	34.90	59.48	50.52	48.30	35	**108.39**	**25**	63.32	36
NI07720	20	33.5	35.43	55.52	50.17	47.04	38	**108.61**	**24**	62.43	37
NI07721	17	32.0	34.73	61.18	38.40	44.77	40	**110.71**	**16**	61.26	39
Average	**19.23**	**34.5**	**51.02**	**71.64**	**48.61**	**57.09**		**109.84**		**70.28**	

In 2007, none of the check varieties performed well which was surprising as either the new lines are particularly good or something affected the check varieties. One of the more interesting aspects was that the rainfed North Platte yields were actually greater than the Lincoln rainfed yields, indicating North Platte was a very favorable environment this year. Of note is that a number of lines (e.g. NI04421) continue to do well in both rainfed production. These lines are exactly the type of lines that we hope this nursery can identify. Also, it should be noted that the average performance is highly biased by those nurseries having the highest yield when your compare means. In this case, North Platte performance, were there was the highest values for rainfed grain yield, was 20 bu/a higher than the average for the other rainfed trials which gave its line mean an 6.7 bu/a advantage in the average over all locations. We correlated the yield data from Lincoln, North Platte, Sidney Irrigated, and Alliance. Lincoln was positively correlated with North Platte, but weakly correlated with Alliance and not at all with Sidney Irrigated, indicating lines that do well at Lincoln do well at North Platte. That the four sites are generally not correlated indicates that they represent four different environments and that each are needed to evaluate our lines.

The data for 2006 are:

VARIETY	Flowering date	Height (in)	Linc. bu/a	N. Platte bu/a	Allian. bu/a	Rainfed Avg. bu/a	Rank	Sidney Irr **bu/a**	Rank	Avg. bu/a	Rank
Jagalene	22.2	31.2	83.69	41.25	43.67	56.20	36	**74.32**	**37**	60.73	39
Wesley	21.1	31.6	92.12	43.69	42.79	59.53	23	**83.83**	**16**	65.61	18
Antelope	21.5	31.2	75.48	49.55	41.02	55.35	38	**87.71**	**6**	63.44	32
NI04414	21.8	31.5	92.05	45.56	39.66	59.09	27	**69.39**	**40**	61.67	37
NI04421	21.9	31.8	97.20	53.89	40.84	63.98	8	**78.90**	**31**	67.71	14
NI04428	21.4	31.1	104.93	59.52	40.89	68.45	4	**75.02**	**36**	70.09	6
NI04430	20.0	31.7	84.52	46.95	42.61	58.03	31	**80.31**	**27**	63.60	30
NI04436	20.9	32.4	104.01	43.59	42.82	63.47	10	**92.64**	**1**	70.77	4
NE03486	20.5	32.6	94.22	45.12	41.32	60.22	19	**81.01**	**23**	65.42	20

NI05706	22.4	32.7	103.25	47.70	42.32	64.42	6	**80.31**	**26**	68.40	10
NI05711	22.5	31.5	99.20	46.45	45.00	63.55	9	**82.07**	**21**	68.18	12
NI05713	22.9	33.1	93.02	42.13	44.27	59.81	21	**78.19**	**32**	64.40	25
NI05714	22.4	31.9	78.58	51.38	44.49	58.15	30	**87.35**	**8**	65.45	19
NI05718W	21.7	32.7	87.94	52.81	46.94	62.56	13	**70.44**	**39**	64.53	24
NI05720W	21.8	33.3	95.94	49.66	49.06	64.89	5	**79.60**	**29**	68.57	9
NI05722W	20.8	31.9	82.21	38.94	42.72	54.62	40	**73.97**	**38**	59.46	40
NI04427	21.3	31.3	111.32	51.98	43.86	69.05	3	**87.35**	**7**	73.63	2
NI03427	21.3	31.7	89.59	47.82	45.12	60.84	18	**90.17**	**3**	68.18	13
NI06719	22.3	31.9	91.88	43.31	42.52	59.24	25	**77.49**	**33**	63.80	28
NI06720	21.6	32.0	80.60	48.19	46.08	58.29	29	**79.95**	**28**	63.71	29
NI06721	22.0	31.7	82.54	54.97	49.30	62.27	14	**83.48**	**17**	67.57	15
NI06722	21.1	32.2	84.61	46.75	46.19	59.18	26	**75.38**	**35**	63.23	33
NI06723	21.6	32.4	77.43	52.10	43.95	57.83	32	**82.07**	**20**	63.89	27
NI06724	21.1	32.6	97.20	52.27	40.63	63.37	11	**84.88**	**14**	68.75	7
NI06725	21.7	32.6	87.40	37.63	44.58	56.54	35	**82.42**	**19**	63.01	36
NI06726	22.3	32.4	100.29	49.16	40.06	63.17	12	**85.24**	**13**	68.69	8
NI06727	22.1	30.6	81.65	46.32	41.81	56.59	34	**83.12**	**18**	63.23	34
NI06728	22.9	32.0	85.81	46.91	39.26	57.33	33	**85.24**	**12**	64.31	26
NI06729	22.3	32.6	96.18	46.83	40.37	61.13	16	**89.47**	**4**	68.21	11
NI06730	22.7	31.1	91.04	48.96	38.99	59.66	22	**84.53**	**15**	65.88	17
NI06731	20.7	31.2	92.31	49.71	40.70	60.91	17	**86.65**	**9**	67.34	16
NI06732	21.9	31.5	88.89	52.42	44.34	61.88	15	**75.73**	**34**	65.35	21
NI06733	20.5	32.0	75.44	52.98	46.66	58.36	28	**79.25**	**30**	63.58	31
NI06734	22.7	31.7	76.19	43.60	45.77	55.19	39	**81.01**	**22**	61.64	38
NI06735	21.7	31.6	82.34	43.00	42.10	55.81	37	**85.24**	**11**	63.17	35
NI06736	22.3	31.2	113.01	50.45	43.82	69.09	2	**85.94**	**10**	73.31	3
NI06737	20.5	32.0	107.74	43.46	41.51	64.24	7	**88.06**	**5**	70.19	5
NI06738	21.5	30.5	120.27	50.04	39.02	69.78	1	**90.87**	**2**	75.05	1
NI06739	22.3	31.4	88.57	46.44	44.82	59.94	20	**80.66**	**25**	65.12	22
NI06740	21.3	31.5	91.09	45.38	41.29	59.25	24	**80.66**	**24**	64.61	23
Average	**21.7**	**31.8**	**91.54**	**47.72**	**43.08**	**60.78**		**82.00**		**66.09**	

The data for the 2005 Nursery is:

VARIETY	Linc.	Rank	N.Platte	Rank	Hemming.	Rank	**Irrigated**	**Rank**	Dryland Avg.	Rank	**State Avg.**	Rank
	bu/a		bu/a		bu/a		**bu/a**		bu/a		**bu/a**	
Jagalene	66.93	27	64.32	2	89.38	3	**101.44**	**7**	73.54	3	**80.52**	2
NI04403	69.08	21	26.60	40	83.41	16	**68.88**	**40**	59.70	34	**61.99**	37
NI04414	74.51	9	49.50	21	86.99	8	**82.66**	**26**	70.33	7	**73.42**	15

NI04421	81.72	1	71.81	1	88.09	6	**110.63**	**1**	80.54	1	**88.06**	1
NI04424	56.69	35	43.18	29	79.93	19	**83.49**	**24**	59.93	33	**65.82**	33
NI04425	66.50	29	30.71	38	79.64	20	**91.84**	**19**	58.95	35	**67.17**	29
NI04426	67.67	26	44.40	28	88.17	5	**92.26**	**18**	66.75	20	**73.13**	16
NI04427	72.03	14	43.31	30	83.59	14	**98.53**	**10**	66.31	22	**74.37**	13
NI04428	76.21	8	42.54	33	88.31	4	**101.03**	**9**	69.02	12	**77.02**	11
NI04430	78.81	5	50.32	19	86.99	9	**96.85**	**11**	72.04	4	**78.24**	6
NI04436	77.29	7	48.27	24	83.42	15	**93.10**	**17**	69.66	8	**75.52**	12
NI03427	79.47	4	52.36	17	79.49	21	**101.44**	**8**	70.44	5	**78.19**	7
NI04419	66.54	28	40.02	35	78.61	24	**78.48**	**32**	61.72	28	**65.91**	32
NI04431	61.58	33	42.54	32	89.70	2	**90.59**	**20**	64.61	26	**71.10**	23
NE03486	80.69	2	60.80	4	81.91	17	**93.93**	**15**	74.47	2	**79.33**	3
NE03581	71.86	15	33.99	37	95.46	1	**75.14**	**37**	67.10	19	**69.11**	28
NI05701	52.24	38	54.52	11	62.83	39	**72.64**	**39**	56.53	37	**60.56**	38
NI05702	69.22	20	47.81	25	81.30	18	**82.66**	**25**	66.11	23	**70.25**	25
NI05703	68.53	24	49.54	20	65.08	38	**75.15**	**36**	61.05	30	**64.58**	34
NI05704	65.71	30	27.06	39	76.67	29	**80.99**	**30**	56.48	38	**62.61**	36
Wesley	73.71	11	40.01	34	61.84	40	**76.82**	**35**	58.52	36	**63.10**	35
NI05705	70.69	16	56.03	9	77.68	26	**85.58**	**22**	68.13	17	**72.50**	18
NI05706	69.35	19	49.15	22	83.63	12	**95.18**	**13**	67.38	18	**74.33**	14
NI05707	68.89	23	52.59	16	85.80	11	**82.24**	**28**	69.09	11	**72.38**	19
NI05708	67.96	25	51.36	18	86.20	10	**80.99**	**31**	68.51	16	**71.63**	21
NI05709	42.19	40	53.81	13	65.30	37	**77.23**	**34**	53.77	40	**59.63**	39
NI05710	51.76	39	45.53	27	65.62	36	**73.89**	**38**	54.30	39	**59.20**	40
NI05711	69.84	17	62.31	3	75.61	32	**104.37**	**3**	69.25	10	**78.03**	8
NI05712	79.75	3	48.62	23	77.72	25	**82.24**	**29**	68.70	15	**72.08**	20
NI05713	77.68	6	54.63	10	78.85	23	**101.86**	**6**	70.39	6	**78.26**	5
NI05714	74.32	10	47.07	26	87.46	7	**108.13**	**2**	69.62	9	**79.25**	4
NI05715W	64.57	31	53.80	12	76.88	28	**86.42**	**21**	65.08	25	**70.42**	24
NI05716W	54.73	36	57.64	8	71.36	35	**93.51**	**16**	61.24	29	**69.31**	26
NI05717W	73.08	12	34.71	36	78.92	22	**78.07**	**33**	62.24	27	**66.20**	31
NI05718W	60.31	34	58.58	6	76.39	30	**95.60**	**12**	65.09	24	**72.72**	17
NI05719W	72.33	13	53.32	15	74.40	33	**85.16**	**23**	66.68	21	**71.30**	22
NI05720W	69.36	18	60.51	5	77.03	27	**101.86**	**5**	68.97	13	**77.19**	10
NI05721W	53.26	37	58.02	7	71.40	34	**82.66**	**27**	60.89	31	**66.34**	30
NI05722W	68.93	22	54.02	14	83.62	13	**103.53**	**4**	68.86	14	**77.53**	9
Antelope	62.65	32	43.26	31	76.30	31	**94.77**	**14**	60.74	32	**69.25**	27
GRAND MEA	**68.22**		**48.96**		**79.52**		**89.05**		**65.57**		**71.44**	
CV	6.80		11.73		5.96		**9.94**		0.00			
LSD	6.31		7.81		6.45		**12.03**		0.00			

In 2007, 18 lines were continued for further testing in the irrigated nursery and 4 lines were advanced to the Nebraska Triplicate Nursery (NTN). In 2006, 16 lines were continued for further testing in the irrigated nursery and 1 line was advanced to the Nebraska Triplicate Nursery (NTN). In 2005, 15 lines were continued for further testing in the irrigated nursery and 3 lines were advanced to the Nebraska Triplicate Nursery (NTN). Currently in the NIN there are 5 lines from this nursery.

In the 2007, two IRR/DRY lines were advanced for small-scale foundation seed increase (NE04421 and

NI03427). A total of 15 lines including two check lines (Wesley and Antelope) were analyzed in SKCS, Buhler milling, protein content, ash, Mixograph for dough strength, and baking properties. The top five varieties that had best baking properties were NI07713, NI06724, NI07714, NI06736, and NI07703, respectively. They were all better than WESLEY and Antelope. They had mixed hardness and hardness with good kernel diameter and weight. They have good milling properties with an average of 73.5% flour yield and good plus flour from the mill. Their protein content was about 11.7%. They had medium dough strength, had medium long mixing times, higher loaf volume, good to very good exterior, and very good crumb grain. They had smooth and resilient texture. They had higher slice brightness and better distributed cells. They had average slice area, number of cells, cell diameter, and cell elongated. Only one line NI07701 was characterized as being a softer wheat with the lowest flour yield and milling properties. However, its other tested characteristics were fine.

4. Nebraska Intrastate Nursery:

The 2007 Nebraska Intrastate Nursery (NIN) was planted at six locations (Lincoln, Clay Center, North Platte, Sidney, Hemingford, and Mead, NE). Unfortunately, Clay Center was damaged by the late freeze (considerable sterility in otherwise good looking plants) and then by Fusarium head blight. In reviewing the data, the locations nearest to each other tended to have the highest correlations with a gradual decrease as the locations were separated further apart. Though all the correlations were positive, the correlations also indicated rarely did one location explain 50% of the variation in another location, again indicating the importance of testing across the state. Of the released lines, NE01643 (Overland) did the best across the state and was only ranked 5th out of 60 entries, indicating a continued excellent performance and it will be hard to identify superior lines to NE01643 (Overland). Camelot (6th, 1st if Clay Center is excluded) and NH03614 (2nd, 3rd if Clay Center is excluded) also performed very well. However, our newer lines have performed very well compared to the previously released lines.

Name	Mead	Lincoln	Clay Cen.	N. Platte	Sidney	Alliance	St.Avg.	Rank	State-CC	Rank
	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a			Avg.	
WESLEY	53.13	60.81	29.13	73.25	38.77	44.68	**49.96**	51	**54.13**	50
ALLIANCE	52.38	59.7	28.08	80.57	54.98	54.42	**55.02**	29	**60.41**	19
NE01643	68.05	70.49	47.08	78.25	53.12	43.03	**60.00**	5	**62.59**	5
NE01481	60.75	77.01	44.68	76.47	55.03	39.17	**58.85**	7	**61.69**	11
Camelot	**55.93**	**69.63**	**30.63**	**88.73**	**54.4**	**55.68**	**59.17**	**6**	**64.87**	**1**
NE02513	56.98	65.84	42.27	83.93	52.17	49.78	**58.50**	10	**61.74**	10
NE02533	53.43	59.04	38.3	72.2	57.32	50.58	**55.15**	27	**58.51**	33
NE02558	49.5	65.14	31.97	81.15	49.47	50.98	**54.70**	32	**59.25**	26
NE02584	52.45	61.2	42.78	77.23	55.93	53.98	**57.26**	18	**60.16**	21
NE03458	46.37	62.65	28.87	60.45	51.77	56.2	**51.05**	45	**55.49**	45
NE03488	56.22	73.24	39.7	63.95	44.23	48.17	**54.25**	35	**57.16**	39
NE03490	49.08	70.08	35.42	85.95	53.68	53.83	**58.01**	12	**62.52**	6
NH03614	**57.55**	**69.88**	**49.48**	**85.4**	**46.32**	**57.98**	**61.10**	**2**	**63.43**	**3**
NI03427	53.6	59.93	35.35	69	49.1	53.1	**53.35**	41	**56.95**	40
NW03654	60.32	67.71	50.95	74.57	54.6	55.23	**60.56**	4	**62.49**	7
NW03666	51.62	63.98	29.67	75.9	54.45	48.52	**54.02**	38	**58.89**	30
NW03670	42.38	62.38	39.53	58.62	53.13	47.63	**50.61**	47	**52.83**	54
NW03681	53.12	65.38	32.57	68.65	51.63	48.25	**53.27**	42	**57.41**	38

NE04424	55.62	69.66	48.52	79.73	57.6	54.65	**60.96**	3	**63.45**	2
NE04449	51.57	64.88	38.25	68	43	50.37	**52.68**	44	**55.56**	43
NE04490	50.85	60.45	44.15	67.2	46.82	57.75	**54.54**	33	**56.61**	41
NE04550	39.42	65.26	32.95	54.45	46.9	34.65	**45.61**	57	**48.14**	58
NE04653	50.55	63.83	41.12	68.63	46.02	48.47	**53.10**	43	**55.50**	44
NI04420	51.8	70.35	41.83	81.25	48.53	52.97	**57.79**	14	**60.98**	13
NI04421	52.55	67.91	33.3	66.1	53.4	56.83	**55.02**	30	**59.36**	25
NI04427	49.85	61.3	36.57	71.1	55.18	51.62	**54.27**	34	**57.81**	35
NE03457	42.55	60.85	39.9	56.38	53.48	48.97	**50.36**	49	**52.45**	55
NE05403	62.82	77.33	44.45	67.95	48.47	47.9	**58.15**	11	**60.89**	15
HARRY	46.5	63.33	36.22	63.17	40.13	54	**50.56**	48	**53.43**	53
MILLENNIUM	59	70.69	45.88	61.58	48.97	48.68	**55.80**	23	**57.78**	36
Hallam	49.45	72.6	38.62	68.55	50.52	51.58	**55.22**	25	**58.54**	32
Infinity	58.18	72.79	41.12	67.27	51.8	54.75	**57.65**	16	**60.96**	14
WAHOO	60.15	67.44	31.93	70.02	53.28	57.5	**56.72**	21	**61.68**	12
NE05418	60.43	75.93	52.12	68.37	43.45	52.7	**58.83**	8	**60.18**	20
NE05425	56.27	74.43	41.85	77.27	47.43	48.93	**57.70**	15	**60.87**	16
NE05426	55	71.88	37.58	76.15	48.4	51.45	**56.74**	20	**60.58**	17
NE05427	51.95	70.73	34.5	77.03	43.93	46.1	**54.04**	37	**57.95**	34
NE05430	65.6	84.36	55.2	76.58	45.58	41.87	**61.53**	1	**62.80**	4
NE05495	48.83	63.64	40.58	65.72	50.45	53.62	**53.81**	40	**56.45**	42
NE05496	51.08	73.36	42.4	70.17	53.97	54.03	**57.50**	17	**60.52**	18
NW05518	40.05	58.55	27.68	60.13	45.88	51.4	**47.28**	56	**51.20**	56
NE05523	40.78	61.1	28.3	72.78	49.88	47.25	**50.02**	50	**54.36**	48
NE05537	51.9	65.28	28.87	79.05	52.18	47.52	**54.13**	36	**59.19**	28
NE05548	56.5	75.54	41.3	72.38	51.37	55.73	**58.80**	9	**62.30**	8
NE05549	44.33	71.15	31.12	82	58.95	43.37	**55.15**	26	**59.96**	23
NE05558	50.65	69.98	36.48	69.38	54.63	50.23	**55.23**	24	**58.97**	29
NE05578	47.15	65.66	30.5	62.02	46.25	47.3	**49.81**	52	**53.68**	52
NW05589	62.9	68.15	29.27	72.92	44.93	45.15	**53.89**	39	**58.81**	31
NW05643	45.3	65.51	17.97	61.48	45.3	56.55	**48.69**	55	**54.83**	47
NE05699	38.35	45.31	13.13	56.62	42.33	38.05	**38.97**	60	**44.13**	60
NI05713	51.95	62.85	25.02	67.5	39.78	46.68	**48.96**	54	**53.75**	51
NE05453	58.58	72.11	35.18	79.42	42.05	47.73	**55.85**	22	**59.98**	22
NE05459	52.03	70.16	50.88	73.32	53.52	47.13	**57.84**	13	**59.23**	27
NE05567	49.98	58.09	25.63	63.75	49.27	49.67	**49.40**	53	**54.15**	49
NE05568	53.58	59.36	41.53	74.42	49.88	51.2	**55.00**	31	**57.69**	37
NE05569	52.18	64.35	32.87	72.4	58.08	50.3	**55.03**	28	**59.46**	24
Millennium-27 CL	56.48	60.09	27.45	65.27	49.55	45.3	**50.69**	46	**55.34**	46
GOODSTREAK	61.35	70.51	32.12	82.02	50.3	46.48	**57.13**	19	**62.13**	9
SCOUT66	47.97	51.74	13	53.3	47.02	47.68	**43.45**	58	**49.54**	57
CHEYENNE	41.22	50.44	20.8	52.22	42.1	45.35	**42.02**	59	**46.27**	59
	52.44	**66.22**	**36.08**	**70.82**	**49.68**	**49.84**	**54.18**		**57.80**	

Sixty-one lines including nine check lines. were analyzed in SKCS, Buhler milling, protein content, ash, Mixograph for dough strength, and baking properties. The top fifteen varieties that had best baking properties was NE02558 = WESLEY < NI04421 < NW03666 < NH03614 < NE06607 < NE04490, NW03681 < NE06430 < NE05496 < NE05425 < NE02533 < NE05418 < NI04427 < NW06655 < NE05426. They had mixed to hard kernel hardness with good kernel diameter and weight. They have good milling

properties with an average flour yield of 70.5% and a “fair” mill type. They had average protein content 12.2%, and medium to very strong dough strength. They had relatively longer mixing times, higher loaf volume, good to very good exterior, and very good crumb grain. They had very smooth and resilient texture. They had higher slice brightness (creamy to white crumb) and better distributed cells. They average slice area, number of cells, cell diameter, and cell elongated. The poorest three varieties that had the worst baking properties were NE07572 < NE07498 < NE07521. They had an average protein content 12.4%, but medium to lower dough strength. They had shorter mixing times, lower loaf volumes, and poorer exterior and crumb grain. They had harsh texture. They had lower slice brightness (yellow crumb) and denser cells. They had lower slice area and irregular cell shape. Lines in the 2008 NIN are retained from the 2007 NIN and advanced from the 2007 TRP.

The 2006 data are:

VARIETY	Lincoln Yield bu/a	Rank	Mead Yield bu/a	Rank	Clay Yield bu/a	Center Rank	North Yield bu/a	Platte Rank	Alliance Yield bu/a	Rank	State Yield bu/a	Rank
WESLEY	**79.72**	**25**	68.80	47	**80.06**	**15**	42.35	10	**44.41**	**44**	63.07	29
ALLIANCE	**75.43**	**44**	70.55	42	**70.19**	**48**	41.73	14	**47.45**	**34**	61.07	39
NE00403	**71.87**	**53**	67.29	55	**78.21**	**20**	41.87	12	**51.86**	**11**	62.22	32
NE01422	**73.29**	**48**	63.17	56	**73.20**	**38**	37.02	40	**40.43**	**55**	57.42	54
NE01481	**87.31**	**3**	78.78	13	**73.75**	**35**	39.52	22	**49.39**	**25**	65.75	11
NE01481-1	**70.09**	**55**	58.17	58	**71.22**	**44**	29.21	59	**44.61**	**43**	54.66	58
NE01604	**78.62**	**27**	69.75	45	**75.39**	**28**	37.90	32	**46.63**	**36**	61.66	35
NE01643	**80.78**	**21**	**84.31**	**2**	**83.82**	**7**	**39.47**	**23**	**50.34**	**15**	**67.74**	**4**
NE02465	**78.63**	**26**	73.77	31	**70.67**	**46**	35.35	47	**30.93**	**60**	57.87	52
NE02513	**72.44**	**52**	69.27	46	**81.74**	**10**	27.87	60	**42.51**	**49**	58.77	50
NE02528	**75.94**	**41**	76.80	18	**74.23**	**32**	32.88	56	**43.89**	**46**	60.75	42
NE02532	**76.14**	**39**	81.62	7	**79.53**	**18**	34.85	50	**43.03**	**48**	63.03	30
NE02533	**86.11**	**5**	76.37	20	**86.95**	**1**	37.48	37	**49.66**	**21**	67.31	5
NE02549	**77.30**	**36**	67.55	50	**72.27**	**41**	40.46	18	**47.48**	**32**	61.01	40
NE02558	**83.28**	**13**	72.26	38	**77.38**	**23**	40.99	17	**54.46**	**3**	65.67	12
NE02584	**82.43**	**16**	79.39	11	**77.54**	**22**	35.39	46	**50.26**	**18**	65.00	17
NE02588	**72.50**	**51**	76.09	23	**67.80**	**52**	37.87	33	**44.64**	**42**	59.78	47
NE02592-1	**74.59**	**46**	80.51	9	**62.01**	**57**	33.24	54	**38.50**	**59**	57.77	53
NI02425	**83.89**	**9**	77.29	16	**81.10**	**13**	36.18	43	**41.68**	**53**	64.03	22
NI02425-1	**77.89**	**29**	82.60	5	**74.56**	**30**	35.23	49	**39.85**	**57**	62.03	34
NE03457	**69.36**	**57**	60.70	57	**69.88**	**49**	34.43	52	**46.41**	**37**	56.16	55
NE03458	**79.90**	**23**	74.02	29	**41.97**	**60**	37.92	**31**	**41.95**	**52**	55.15	57
NE03488	**75.97**	**40**	72.84	34	**79.08**	**19**	37.51	**36**	**49.98**	**20**	63.08	28
NE03490	**85.95**	**7**	67.47	52	**70.64**	**47**	44.39	**3**	**59.83**	**1**	65.66	13
NH03609	**81.16**	**20**	76.20	22	**85.63**	**4**	38.10	**29**	**42.40**	**50**	64.70	18
NH03614	**83.55**	**10**	74.64	27	**79.65**	**17**	41.51	**16**	**49.65**	**22**	65.80	10
NI03418	**75.78**	**42**	67.37	53	**70.72**	**45**	35.64	**44**	**43.51**	**47**	58.60	51
HARRY	**77.64**	**32**	73.93	30	**67.96**	**51**	37.70	**34**	**48.32**	**29**	61.11	38
MILLENNIUM	**69.87**	**56**	75.15	25	**72.24**	**42**	38.92	**25**	**47.47**	**33**	60.73	43
Hallam	**77.48**	**35**	78.38	14	**65.44**	**55**	42.71	**8**	**52.18**	**9**	63.24	27
Infinity	**80.45**	**22**	81.20	8	**74.60**	**29**	38.85	**26**	**47.39**	**35**	64.50	20

WAHOO	**74.89**	**45**	67.50	51	**71.42**	**43**	42.07	**11**	**50.31**	**16**	61.24	37
NI03427	**84.66**	**8**	79.99	10	**81.57**	**12**	36.94	**41**	**42.07**	**51**	65.05	16
NW03638	**70.28**	**54**	77.12	17	**73.58**	**36**	36.24	**42**	**50.78**	**14**	61.60	36
NW03654	**77.58**	**33**	76.21	21	**73.78**	**34**	43.94	**4**	**49.62**	**23**	64.23	21
NW03666	**77.28**	**37**	79.33	12	**81.81**	**9**	43.45	**6**	**52.89**	**6**	66.95	6
NW03670	**72.90**	**50**	69.87	44	**73.36**	**37**	35.48	**45**	**51.45**	**12**	60.61	44
NW03681	**77.85**	**30**	67.71	49	**80.37**	**14**	40.32	**19**	**44.24**	**45**	62.10	33
NE04424	**87.04**	**4**	71.16	40	**79.80**	**16**	45.83	**2**	**50.30**	**17**	66.83	7
NE04435	**73.52**	**47**	69.91	43	**72.76**	**39**	34.79	**51**	**48.20**	**31**	59.84	46
NE04449	**82.59**	**15**	73.50	32	**86.34**	**3**	38.19	**28**	**45.78**	**39**	65.28	15
NE04466	**81.28**	**19**	72.62	36	**75.46**	**27**	42.51	**9**	**45.20**	**41**	63.41	25
NE04475	**76.99**	**38**	67.89	48	**67.52**	**53**	37.46	**38**	**48.88**	**26**	59.75	48
NE04490	**77.55**	**34**	83.02	4	**86.70**	**2**	43.39	**7**	**52.90**	**5**	68.71	3
NE04537	**73.23**	**49**	72.79	35	**65.61**	**54**	38.05	**30**	**52.52**	**7**	60.44	45
NE04550	**86.05**	**6**	74.61	28	**77.97**	**21**	41.72	**15**	**48.65**	**28**	65.80	9
NE04465	**83.10**	**14**	76.59	19	**69.61**	**50**	39.09	**24**	**50.19**	**19**	63.72	23
NE04653	**81.54**	**18**	76.01	24	**82.15**	**8**	37.64	**35**	**50.84**	**13**	65.64	14
NE04662	**75.70**	**43**	72.56	37	**53.56**	**59**	32.67	**57**	**45.53**	**40**	56.00	56
NE04665	**81.74**	**17**	77.59	15	**76.13**	**26**	38.85	**27**	**38.73**	**58**	62.61	31
NW04673	**83.48**	**11**	73.23	33	**74.36**	**31**	40.17	**20**	**46.06**	**38**	63.46	24
NW04685	**78.22**	**28**	70.76	41	**81.71**	**11**	33.43	**53**	**40.35**	**56**	60.89	41
NI04411	**77.72**	**31**	74.66	26	**76.38**	**25**	39.88	**21**	**48.28**	**30**	63.38	26
NI04416	**83.40**	**12**	83.09	3	**74.13**	**33**	32.53	**58**	**49.54**	**24**	64.54	19
NI04420	**89.33**	**2**	85.23	1	**77.28**	**24**	43.63	**5**	**48.71**	**27**	68.84	2
NI04421	**90.01**	**1**	81.63	6	**84.21**	**5**	53.00	**1**	**52.04**	**10**	72.18	1
NI04427	**79.75**	**24**	71.87	39	**83.84**	**6**	41.84	**13**	**53.27**	**4**	66.11	8
GOODSTREAK	**62.31**	**59**	67.37	54	**72.63**	**40**	37.18	**39**	**55.72**	**2**	59.04	49
SCOUT66	**55.92**	**60**	51.86	60	**57.86**	**58**	35.34	**48**	**40.82**	**54**	48.36	60
CHEYENNE	**64.52**	**58**	57.20	59	**62.07**	**56**	33.23	**55**	**52.29**	**8**	53.86	59
GRAND MEAN	**77.93**		**73.32**		**74.39**		**38.39**		**47.29**		**62.26**	
CV	4.94		5.31		9.80		7.54		9.89			
LSD	4.50		5.27		9.87		3.92		6.33			

The 2005 data are listed below:

VARIETY	QUAL	Linc.	Rank	Mead	Ran	C.Center	Ran	N. Platte	Ran	Sidney	Ran	Hemm.	Ran	State Avg.	**Rank**
		Bu/a		Bu/a		Bu/a		Bu/a		Bu/a		Bu/a			
WESLEY	**2.0**	**69.61**	**39**	**72.90**	**35**	**68.65**	**39**	**42.58**	**40**	**22.00**	**60**	**57.63**	**59**	**55.56**	**57**
ALLIANCE	**2.0**	**69.78**	**38**	**63.08**	**54**	**67.83**	**42**	**41.10**	**45**	**52.50**	**28**	**80.23**	**8**	**62.42**	**42**
N97V121	2.0	64.27	50	83.89	5	68.74	38	43.22	37	36.83	59	64.73	51	60.28	**47**
NE99489	1.0	79.07	5	57.87	57	59.24	55	41.61	42	54.50	24	76.92	17	61.54	**44**
NE99495	1.0	77.38	8	72.83	36	63.81	49	36.19	53	47.83	46	79.26	11	62.88	**39**
NE99656-1	1.0	76.01	12	71.50	40	60.54	52	40.16	47	51.83	31	80.37	6	63.40	**36**
NE00403	2.0	74.87	17	62.33	55	73.69	29	37.97	52	54.50	23	82.02	5	64.23	**31**
NE01422	2.0	69.15	41	78.63	16	68.11	41	51.94	14	56.83	12	76.39	19	66.84	**18**
NE01481	2.0	79.56	2	82.94	6	75.32	24	42.71	39	49.67	41	79.26	12	68.24	**12**
NE01508	1.0	53.43	59	81.94	11	60.00	54	45.84	31	44.67	51	67.56	44	58.91	**52**

NE01533	1.0	65.23	48	73.65	33	76.73	20	51.34	15	44.50	52	71.04	37	63.75	35
NE01550	1.0	73.22	25	66.21	52	70.61	36	50.15	21	41.33	55	63.09	55	60.77	46
NE01603	1.0	73.71	22	73.26	34	78.53	15	41.57	43	40.67	56	64.45	54	62.03	43
NE01604	1.0	73.84	20	86.09	3	78.10	16	47.74	25	55.50	18	73.08	27	69.06	10
NE01643	3.0	79.30	3	76.91	20	88.13	3	45.89	30	62.50	2	78.42	13	71.86	4
NE02465	1.0	66.69	47	77.41	17	75.59	23	44.62	33	56.33	14	76.70	18	66.22	23
NE02484	2.5	55.33	58	67.52	49	71.80	34	43.14	38	51.00	34	71.45	35	60.04	48
NE02495	9.0	85.80	1	85.98	4	76.90	18	50.42	20	52.17	30	75.45	24	71.12	7
NE02513	2.0	70.11	37	74.66	24	85.29	4	47.83	24	51.00	35	71.41	36	66.72	20
NE02528	2.0	70.29	35	74.53	25	80.00	12	57.24	5	55.67	17	71.80	34	68.26	11
NE02532	2.0	64.84	49	65.42	53	71.28	35	50.66	19	55.00	21	77.86	15	64.18	33
NE02533	2.0	70.87	33	74.31	26	74.34	26	46.65	28	55.33	20	84.28	3	67.63	16
NE02549	2.0	73.03	27	68.23	47	75.97	22	52.69	11	53.33	25	77.58	16	66.81	19
NE02558	2.0	70.49	34	74.03	29	81.21	10	64.38	2	60.50	7	79.60	9	71.70	5
NE02584	2.0	69.24	40	82.81	7	90.49	2	54.51	8	50.83	36	67.37	46	69.21	9
NE02588	2.0	73.40	24	69.47	42	81.38	9	52.71	10	51.33	32	72.03	31	66.72	21
NE02592	9.0	72.81	28	94.00	1	82.85	5	68.66	1	49.67	40	74.59	25	73.76	1
HARRY		**78.71**	**7**	**66.47**	**51**	**49.83**	**59**	**22.37**	**60**	**50.50**	**37**	**83.70**	**4**	**58.60**	**55**
MILLENNIUM		**76.44**	**10**	**73.88**	**30**	**78.73**	**14**	**44.97**	**32**	**53.33**	**26**	**76.38**	**20**	**67.29**	**17**
Hallam	**1.0**	**73.11**	**26**	**68.34**	**46**	**72.77**	**33**	**39.58**	**48**	**49.00**	**43**	**73.69**	**26**	**62.75**	**41**
Infinity	**2.0**	**72.54**	**30**	**80.57**	**12**	**73.79**	**28**	**49.71**	**23**	**55.00**	**22**	**76.34**	**21**	**67.99**	**14**
WAHOO		**68.47**	**43**	**69.16**	**43**	**67.23**	**44**	**50.82**	**17**	**57.17**	**11**	**78.01**	**14**	**65.14**	**27**
NH01036	2.5	62.00	54	66.69	50	52.63	58	35.20	55	45.83	49	67.79	43	55.02	59
NH01037	2.5	76.23	11	61.21	56	60.85	51	32.21	57	49.33	42	71.92	32	58.63	54
NI02425	2.0	76.97	9	88.34	2	77.20	17	59.61	4	57.50	10	71.90	33	71.92	3
NE03417	2.0	56.65	57	73.80	32	60.05	53	35.36	54	49.67	39	62.90	56	56.41	56
NE03424	2.0	63.96	51	76.23	21	58.61	56	34.95	56	52.83	27	66.01	50	58.77	53
NE03432	1.0	61.42	55	71.80	39	64.12	48	47.62	26	48.33	45	62.16	57	59.24	50
NE03435	1.0	73.71	23	79.27	15	81.55	8	46.47	29	38.17	58	59.91	58	63.18	38
NE03457	2.0	63.65	53	75.23	22	75.14	25	51.16	16	64.67	1	79.54	10	68.23	13
NE03458	1.0	78.89	6	68.49	44	80.30	11	52.04	13	61.50	3	88.45	1	71.61	6
NE03488	2.0	74.10	19	68.38	45	73.09	32	43.99	34	60.83	6	70.09	39	65.08	28
NE03490	2.0	75.43	13	75.22	23	73.59	30	38.76	50	49.83	38	70.05	40	63.81	34
NE03522	3.0	73.84	21	71.99	38	73.28	31	38.99	49	48.67	44	69.79	42	62.76	40
NH03609	2.0	74.34	18	82.41	8	76.73	21	40.53	46	46.67	48	64.71	52	64.23	32
NH03614	1.0	72.08	32	70.24	41	68.54	40	41.15	44	61.33	4	75.84	23	64.86	30
NI01824	2.0	47.45	60	77.09	19	67.03	45	54.38	9	45.00	50	64.52	53	59.25	49
NI03418	2.0	67.66	45	74.15	27	76.80	19	46.66	27	56.17	15	69.84	41	65.21	26
NI03427	2.0	74.99	16	73.82	31	79.81	13	43.24	36	51.00	33	67.53	45	65.07	29
NW03637	1.0	72.19	31	79.53	13	66.01	46	38.11	51	40.33	57	70.46	38	61.11	45
NW03638	3.0	67.77	44	77.22	18	68.94	37	55.71	6	55.67	16	72.40	29	66.29	22
NW03654	2.5	66.82	46	72.73	37	67.71	43	50.13	22	56.50	13	80.30	7	65.70	24
NW03665	2.0	68.75	42	82.25	9	63.37	50	50.81	18	47.17	47	67.23	48	63.26	37
NW03666	2.0	72.70	29	79.50	14	81.99	7	42.23	41	43.33	53	72.03	30	65.30	25
NW03670	1.0	75.24	14	67.55	48	74.09	27	54.58	7	60.50	8	75.98	22	67.99	15
NW03681	3.0	70.29	36	82.03	10	82.30	6	59.98	3	58.83	9	67.27	47	70.12	8
NW03698	3.0	79.30	4	54.92	58	64.50	47	26.75	59	55.50	19	72.92	28	58.98	51

GOODSTREAK		**75.12**	**15**	**74.08**	**28**	**93.36**	**1**	**52.35**	**12**	**61.00**	**5**	**84.38**	**2**	**73.38**	**2**
SCOUT66		**60.33**	**56**	**54.44**	**59**	**45.45**	**60**	**30.53**	**58**	**41.83**	**54**	**54.66**	**60**	**47.87**	**60**
CHEYENNE		**63.87**	**52**	**49.08**	**60**	**56.56**	**57**	**43.78**	**35**	**52.33**	**29**	**66.54**	**49**	**55.36**	**58**
GRAND MEAN		**70.61**		**73.31**		**71.85**		**45.80**		**51.39**		**72.50**			
CV	0.000	7.29		6.39		8.73		10.22		8.47		6.76			
LSD	0.000	6.02		6.34		8.49		6.34		5.89		6.64			

All of the testing sites had very good grain yields. Hemingford was sprayed with fungicides so this is a "disease-free" nursery. Goodstreak, Millennium, and Infinity CL performed very well among the "released" varieties, but a number of excellent experimental lines are progressing well towards future release (the previously mentioned NE01643 with minimally acceptable end-use quality and NI02425 with better quality).

Data from 2005 to 2007 from the Nebraska Intrastate Nursery for Grain Yield (bu/a)

Name	Mead	Lincoln	Clay Cen.	N. Platte	Sidney	Alliance	St.Avg.	**State**	State-CC07	**Rank-CC07**
	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	**Rank**	Avg.	
NE01643	76.42	76.86	85.98	54.54	57.81	57.26	66.53	**1**	68.14	**1**
NE01481	74.16	81.29	74.54	52.90	52.35	55.94	64.28	**2**	65.20	**6**
NE02558	65.26	72.97	79.30	62.17	54.99	61.68	64.02	**3**	66.06	**2**
NH03614	67.48	75.17	65.89	56.02	53.83	61.16	63.92	**4**	63.26	**10**
NE02584	71.55	70.96	84.02	55.71	53.38	57.20	63.82	**5**	65.47	**5**
NW03654	69.75	70.70	64.15	56.21	55.55	61.72	63.50	**6**	63.01	**12**
Infinity CL	73.32	75.26	74.20	51.94	53.40	59.49	63.38	**7**	64.60	**8**
NE02533	68.04	72.01	80.65	52.11	56.33	61.51	63.36	**8**	65.11	**7**
NE01604	70.59	74.03	76.75	58.12	54.95	58.46	63.30	**9**	65.48	**4**
GOODSTREAK	67.60	69.31	83.00	57.18	55.65	62.19	63.18	**10**	65.82	**3**
NE03490	63.92	77.15	72.12	56.37	51.76	61.24	62.49	**11**	63.76	**9**
NW03666	70.15	71.32	64.49	53.86	48.89	57.81	62.09	**12**	61.09	**19**
NW03681	67.62	71.17	65.08	56.32	55.23	53.25	61.83	**13**	61.45	**15**
NE02513	66.97	69.46	83.52	53.21	51.59	54.57	61.33	**14**	63.22	**11**
MILLENNIUM	69.34	72.33	75.49	48.49	51.15	57.51	61.27	**15**	62.39	**13**
NI03427	69.14	73.19	65.58	49.73	50.05	54.23	61.16	**16**	60.32	**21**
WAHOO	65.60	70.27	56.86	54.30	55.23	61.94	61.03	**17**	60.70	**20**
NE03488	65.81	74.44	76.09	48.48	52.53	56.08	60.80	**18**	62.24	**14**
Hallam	65.39	74.40	69.11	50.28	49.76	59.15	60.40	**19**	61.35	**17**
NW03670	59.93	70.17	62.33	49.56	56.82	58.35	59.74	**20**	59.53	**23**
ALLIANCE	62.00	68.30	69.01	54.47	53.74	60.70	59.50	**21**	61.37	**16**
NE03458	62.96	73.81	61.14	50.14	56.64	62.20	59.27	**22**	61.15	**18**
NE03457	59.49	64.62	72.51	47.32	59.08	58.31	58.25	**23**	60.22	**22**
HARRY	62.30	73.23	58.90	41.08	45.32	62.01	56.76	**24**	57.14	**24**
WESLEY	64.94	70.05	59.28	52.73	30.39	48.91	56.20	**25**	54.38	**25**
CHEYENNE	49.17	59.61	59.32	43.08	47.22	54.73	50.41	**26**	52.19	**26**
SCOUT66	51.42	56.00	38.77	39.72	44.43	47.72	46.56	**27**	46.34	**27**

5. Nebraska Triplicate Nursery (NTN):

The same comments about the NIN data apply to the NTN. In this nursery, the check lines performed very well compared to the experimental lines. Again the locations tended to be weakly or not correlated indicating the need to test at different locations within the state. Probably the biggest surprise was the poor performance of Jagalene, the most popular wheat grown in Nebraska. It was severely hurt by various diseases in 2007. It was interesting to see the better performance of Wesley and similar performance of Goodstreak in the NTN compared to the NIN. The lines in the NTN have less performance history, so it is expected that some experimental lines will out yield them, but that most lines will have poorer performance. The 2007 data are:

Name	Mead	Lincoln	Clay Cen.	N.Platte	Sidney	Alliance	St.Avg	St.Avg-CC	**St. Avg.**	**St. Avg-CC**
	bu/a	bu/a	bu/a	bu/a	bu/a	Bu/a	bu/a	bu/a	**Rank**	**Rank**
Jagalene	44.58	52.43	34.28	57.97	60.08	48.75	49.68	52.76	**55**	**56**
WESLEY	53.48	57.65	34.75	84.22	62.87	45.42	56.40	60.73	**22**	**17**
GOODSTREAK	53.08	63.83	30.77	87.15	56.72	44.13	55.95	60.98	**26**	**14**
NE06404	48.18	62.20	26.35	83.02	63.60	47.00	55.06	60.80	**32**	**16**
NE06415	47.83	64.25	40.32	77.02	59.40	50.35	56.53	59.77	**20**	**25**
NE06430	49.00	59.65	39.45	87.22	63.63	45.23	57.36	60.95	**14**	**15**
NE06431	40.47	61.10	34.25	78.70	62.57	40.05	52.86	56.58	**42**	**42**
NE06432	57.27	61.05	31.67	77.17	67.17	47.73	57.01	62.08	**15**	**7**
NE06433	44.00	60.07	36.70	76.67	63.75	51.32	55.42	59.16	**30**	**28**
NE06436	54.05	66.27	41.95	84.97	64.52	48.47	60.04	63.66	**4**	**6**
NE06441	52.62	56.67	33.32	73.52	58.70	44.20	53.17	57.14	**41**	**36**
NW06452	48.62	63.17	41.55	75.98	64.55	46.77	56.77	59.82	**18**	**24**
NE06454	42.55	57.35	26.18	64.38	60.88	45.90	49.54	54.21	**56**	**54**
NE06460	51.32	60.12	40.67	77.30	57.60	46.98	55.67	58.66	**28**	**29**
NE06462	55.95	67.47	43.52	86.90	62.47	48.68	60.83	64.29	**2**	**2**
NE06469	51.68	64.00	39.08	76.35	72.05	45.00	58.03	61.82	**10**	**9**
NE06471	53.10	60.15	42.83	74.55	68.02	45.95	57.43	60.35	**13**	**20**
NE06472	50.58	57.78	43.08	67.48	64.38	50.88	55.70	58.22	**27**	**33**
NE06474	48.57	69.38	40.75	74.07	61.95	45.92	56.77	59.98	**19**	**22**
NW06476	40.30	62.95	36.80	73.70	59.80	54.73	54.71	58.30	**33**	**32**
NW06477	41.63	66.05	33.98	65.13	61.98	50.85	53.27	57.13	**40**	**38**
NW06479	46.20	59.12	32.85	62.57	66.93	39.95	51.27	54.95	**47**	**50**
NE06497	47.38	59.22	36.73	65.65	63.52	49.90	53.73	57.13	**37**	**37**
NE06499	45.80	63.65	42.58	68.18	68.33	49.87	56.40	59.17	**21**	**27**
NE06507	46.88	59.58	32.38	59.80	61.78	44.95	50.90	54.60	**50**	**53**
NE06537	47.43	69.48	43.72	78.75	65.05	48.93	58.89	61.93	**7**	**8**
NE06543	50.80	56.90	29.02	67.22	59.55	43.55	51.17	55.60	**48**	**47**
NE06544	53.57	51.37	30.58	67.65	68.43	52.03	53.94	58.61	**35**	**30**
NE06545	54.63	61.23	33.63	81.25	71.50	50.62	58.81	63.85	**8**	**4**
NE06547	43.15	49.60	24.30	56.57	57.50	51.28	47.07	51.62	**57**	**57**
NE06548	48.95	62.88	40.78	72.15	64.77	48.53	56.34	59.46	**24**	**26**
NE06549	47.18	59.88	40.57	82.75	61.58	49.98	56.99	60.27	**17**	**21**
NE06552	47.23	61.58	39.70	77.13	67.43	48.97	57.01	60.47	**16**	**19**
NH06558	39.48	50.72	25.30	52.75	63.00	48.30	46.59	50.85	**58**	**58**
NH06559	39.60	50.02	19.70	53.80	57.73	29.92	41.80	46.21	**60**	**60**
NE06580	43.67	53.52	35.62	76.63	57.00	48.30	52.46	55.82	**44**	**44**
NE06591	46.83	49.95	38.43	83.72	45.03	47.93	51.98	54.69	**46**	**52**

NE06599	47.23	57.00	38.60	67.60	57.40	46.22	52.34	55.09	**45**	**48**
NE06602	51.42	47.05	31.33	75.80	61.75	49.50	52.81	57.10	**43**	**39**
NE06607	56.87	69.92	42.25	82.82	55.80	55.18	60.47	64.12	**3**	**3**
NE06619	58.67	76.30	43.05	88.50	63.48	53.47	63.91	68.08	**1**	**1**
NE06622	54.80	62.22	34.42	76.92	58.08	51.60	56.34	60.72	**25**	**18**
NW06630	51.58	70.97	41.33	76.65	62.05	46.88	58.24	61.63	**9**	**10**
NW06631	44.80	50.50	27.70	63.17	67.00	48.07	50.21	54.71	**52**	**51**
NW06635	55.60	65.62	36.90	77.03	58.40	51.25	57.47	61.58	**12**	**11**
NW06641	52.57	50.82	21.05	71.10	54.97	48.70	49.87	55.63	**54**	**46**
NW06649	56.45	60.12	38.73	70.37	61.52	50.97	56.36	59.89	**23**	**23**
NW06652	61.25	61.52	43.37	76.48	51.38	39.40	55.57	58.01	**29**	**35**
NW06653	48.77	55.10	27.23	70.83	59.93	44.23	51.02	55.77	**49**	**45**
NW06654	57.68	65.75	49.48	75.70	56.75	49.25	59.10	61.03	**6**	**13**
NW06655	59.45	67.32	36.73	79.07	59.60	53.38	59.26	63.76	**5**	**5**
NE06658	46.67	59.28	40.28	71.23	68.57	45.80	55.31	58.31	**31**	**31**
NW06666	38.87	42.73	28.75	54.58	57.82	56.05	46.47	50.01	**59**	**59**
NE06672	46.73	61.20	37.53	65.28	65.23	45.70	53.61	56.83	**38**	**40**
NI06436	53.42	58.97	32.92	78.88	58.68	40.77	53.94	58.14	**34**	**34**
NE06683	55.55	60.58	39.70	83.37	60.97	46.23	57.73	61.34	**11**	**12**
NE06687	49.88	54.45	27.85	72.93	58.52	39.52	50.53	55.06	**51**	**49**
NW06691	55.87	63.72	37.48	63.98	65.02	34.50	53.43	56.62	**39**	**41**
NW06693	48.92	55.68	41.80	59.72	73.43	43.20	53.79	56.19	**36**	**43**
NW06694	38.42	54.37	31.42	66.67	65.38	43.62	49.98	53.69	**53**	**55**
	49.49	**59.72**	**35.80**	**72.98**	**61.96**	**47.18**	**54.52**	**58.27**		

Fifty-three lines were analyzed in SKCS, Buhler milling, protein content, ash, Mixograph for dough strength, and baking properties. The top twenty lines that had best baking properties were NE07457 < NE07408 < NE07517 < NW07539 < NE07628 < NE07511 < NE07665 < NE07480 < NE07486 = NE07668 < NE07435 = NE07577 < NE07484 = NE07614 < NE07426 < NE07490 < NW07534 < NE07487 < NE07619 < NW07505. They had an average protein content 12.6%, and medium to very strong dough strength. They had relatively longer mixing times, higher loaf volume, good to very good exterior, and very good crumb grain. They had very smooth and resilient texture. They had higher slice brightness (creamy to white crumb) and better distributed cells. They average slice area, number of cells, cell diameter, and cell elongated. The poorest five lines that had worst baking properties were SCOUT66 < NE05548 < GOODSTREAK < NE06683 < MILLENNIUM = NE06545. They had an average protein content 12.7%, but low to medium dough strength. They had shorter mixing times, very lower loaf volume, poor exterior and crumb grain. They had harsh texture. They had lower slice brightness (yellow crumb) and denser cells. They lower slice area and irregular cell shape. It should be noted that the quality samples were from the 2006 Nebraska Duplicate Nursery, hence some of the checks were not in data presented above. The greatest surprise was the poor performance of the check cultivars (Scout 66, Goodstreak, and Millennium), all of which have a reputation of being acceptable for end-use quality in most years. Perhaps environmental conditions did not favor their growth and development leading to poorer end-use quality. Twenty-six lines were advanced to the 2008 NIN.

The 2006 data are:

	Lincoln	Mead	Clay Center	N. Platte	Alliance	Average	Rank
VARIETY	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	
Goodstreak	**73.58**	**62.32**	**69.19**	**38.54**	**49.04**	**58.53**	**40**
Jagalene	**86.29**	**71.62**	**91.66**	**39.12**	**48.40**	**67.42**	**3**
Wesley	**84.42**	**61.89**	**93.96**	**43.21**	**44.78**	**65.65**	**11**
NE05403	89.94	75.95	80.70	38.07	41.35	65.20	15
NE05418	74.56	71.47	84.58	35.03	42.65	61.66	25
NE05425	86.45	65.51	93.14	37.76	48.30	66.23	9
NE05426	90.03	73.61	89.04	37.10	45.20	67.00	5
NE05427	78.23	70.42	101.44	34.77	46.56	66.28	6
NE05430	86.92	81.56	81.00	45.38	42.76	67.52	2
NE05434	82.64	69.69	90.22	33.76	40.79	63.42	19
NE05435	70.56	60.16	65.17	26.27	34.12	51.26	59
NE05442	80.09	66.14	55.96	33.61	47.98	56.76	50
NE05443	81.11	62.28	66.59	38.35	44.26	58.52	41
NE05453	88.56	71.72	81.13	36.36	50.93	65.74	10
NE05454	79.63	65.50	61.76	31.08	44.01	56.40	53
NE05458	85.93	75.17	82.67	40.27	47.22	66.25	7
NE05459	82.32	69.02	89.62	42.54	47.71	66.24	8
NE05462	74.13	59.91	64.62	38.62	49.47	57.35	46
NE05463	81.70	58.26	80.24	35.60	42.57	59.67	35
NE05468	81.11	69.01	68.61	41.59	44.23	60.91	28
NE05481	65.22	59.42	73.90	36.41	47.35	56.46	52
NE05489	74.60	64.68	81.78	36.95	42.61	60.12	32
NE05495	84.70	68.14	81.96	42.21	50.65	65.53	12
NE05496	89.03	66.83	88.73	49.26	50.31	68.83	1
NW05502	71.34	58.53	80.86	38.13	35.73	56.92	49
NW05517	86.80	63.59	95.05	35.73	46.38	65.51	13
NW05518	82.70	61.45	84.76	40.05	46.10	63.01	21
NE05523	83.13	57.24	74.12	36.51	47.21	59.64	36
NE05529	84.82	75.70	60.69	35.48	46.57	60.65	30
NE05532	79.52	60.93	80.14	39.07	36.80	59.29	37
NE05537	75.12	61.81	91.70	27.55	42.87	59.81	34
NE05538	82.55	63.92	83.17	33.82	37.90	60.27	31
NE05548	81.01	62.67	87.10	36.59	48.68	63.21	20
NE05549	82.11	64.20	81.85	39.54	45.84	62.71	22
NE05558	81.83	64.62	88.80	44.37	41.39	64.20	17
NE05564	80.83	65.88	69.04	43.84	47.06	61.33	27
NE05566	71.58	64.59	64.49	42.13	44.00	57.36	45
NE05567	87.30	72.06	74.35	34.00	41.88	61.92	24
NE05568	77.19	66.54	73.37	40.04	46.67	60.76	29
NE05569	82.56	62.80	92.21	40.24	49.56	65.47	14
NE05572	73.49	49.71	73.71	27.85	42.25	53.40	58
NE05578	69.64	66.45	85.10	32.47	42.04	59.14	38

NW05584	70.18	48.81	83.14	40.94	46.30	57.87	43
NW05589	71.71	61.31	97.61	35.06	26.33	58.40	42
NW05601	73.03	60.43	77.09	32.85	42.22	57.12	48
NW05605	78.76	59.46	72.64	30.93	38.81	56.12	54
NW05608	78.85	57.38	77.96	31.81	40.55	57.31	47
NW05617	90.69	57.50	91.78	35.29	46.00	64.25	16
NE05625	72.24	54.42	76.82	38.49	46.59	57.71	44
NE05627	82.88	62.89	54.24	35.07	47.80	56.58	51
NE05629	79.46	70.65	90.51	43.97	50.50	67.02	4
NE05631	66.13	51.60	81.60	38.41	41.26	55.80	55
NE05638	78.38	67.78	78.59	35.67	47.03	61.49	26
NW05643	83.39	61.27	79.59	44.77	50.76	63.96	18
NE05652	88.78	70.31	69.95	31.09	39.89	60.00	33
NE05674	71.55	74.24	87.23	35.39	42.35	62.15	23
NE05699	57.64	56.44	60.75	35.57	40.69	50.22	60
NI05713	72.59	58.59	81.56	37.27	45.19	59.04	39
NI05714	79.00	62.39	53.17	33.76	43.73	54.41	57
NI05722W	78.21	52.96	55.55	38.41	51.35	55.30	56
GRAND MEAN	**79.31**	**64.19**	**78.80**	**37.23**	**44.49**	**60.81**	
CV	6.95	6.47	8.49	8.23	7.52		
LSD	7.47	5.62	9.05	4.15	4.53		

The 2005 data are:

VARIETY	Linc.	RK	Mead	RK	C.Cen.	RK	N. Plat	RK	Sidn.	RK	Hemm.	RK	St. Avg.	RK	HT	HD
	bu/a		bu/a		bu/a		bu/a		bu/a		bu/a		bu/a		in	d
NE04424	77.0	20	85.3	3	91.9	2	56.9	5	52.2	13	75.5	46	73.1	4	35.8	17.2
NE04435	49.8	54	86.1	1	93.4	1	50.4	18	47.6	29	72.1	50	66.6	17	35.2	19.2
NE04449	69.8	34	76.5	15	81.3	9	39.8	42	49.1	26	87.5	3	67.3	13	32.8	19.4
NE04466	56.0	49	84.3	5	77.6	14	48.5	24	55.5	7	86.3	6	68.0	11	33.2	21.8
NE04475	42.7	58	85.3	2	75.6	22	53.7	12	55.8	6	90.1	2	67.2	14	35.3	21.4
NE04488	49.0	55	84.7	4	62.3	53	33.6	51	31.1	60	63.0	59	53.9	58	34.4	20.6
NE04490	99.0	1	82.0	8	84.6	6	64.5	2	59.7	2	86.6	5	79.4	1	36.4	20.4
NE04495	77.8	18	75.2	18	54.4	58	35.9	46	44.4	40	79.2	30	61.1	43	35.3	19.4
NE04496	86.7	4	68.4	43	70.9	38	34.3	50	40.7	52	81.8	19	63.8	33	33.6	20.1
NE04437	67.3	39	62.5	57	73.0	33	46.1	27	56.0	5	81.5	21	64.4	30	33.0	17.7
NE04499	81.3	13	62.5	56	56.3	57	29.2	59	41.8	48	79.9	28	58.5	55	35.7	20.0
NE04508	41.8	59	69.3	39	58.2	56	25.4	60	43.7	42	83.3	16	53.6	59	36.9	22.2
NE04509	51.8	52	72.3	30	70.7	39	33.0	52	49.8	23	77.9	33	59.3	52	43.0	21.2
NE04529	82.8	10	75.8	17	77.2	16	30.9	56	41.3	50	79.8	29	64.6	27	53.7	23.1
NE04537	62.2	43	77.9	10	85.1	5	56.9	4	54.2	9	83.6	12	70.0	6	39.8	20.9
NE04544	81.7	12	77.6	13	52.1	60	32.4	53	43.2	45	85.5	9	62.1	41	37.0	21.3
NE04547	71.3	30	74.6	22	75.8	21	47.4	25	38.1	56	71.6	52	63.2	38	31.6	20.8
NE04548	74.7	24	69.7	36	70.9	37	45.9	28	36.8	57	63.4	58	60.2	47	25.2	22.0
NE04549	71.2	31	76.4	16	69.1	45	47.3	26	36.3	58	65.4	57	60.9	44	30.5	22.3
Jagalene	**74.5**	**25**	**79.2**	**9**	**87.3**	**3**	**61.4**	**3**	**57.2**	**4**	**84.3**	**10**	**74.0**	**3**	**32.1**	**19.2**
NE04550	93.8	2	67.4	45	73.5	30	35.2	49	52.7	11	86.0	7	68.1	10	38.2	21.0
NE04574	56.7	48	61.3	59	61.5	54	49.8	21	62.0	1	76.9	40	61.4	42	34.9	22.3

NE04583	59.5	47	73.5	26	73.7	29	44.0	34	52.2	14	78.7	32	63.6	35	34.6	21.6
NE04584	61.8	44	75.1	19	70.0	43	35.8	47	49.2	25	83.4	14	62.6	40	36.8	22.2
NE04465	60.5	46	77.9	11	83.1	8	50.9	17	51.3	16	80.4	26	67.3	12	32.8	20.1
NE04587	48.8	56	66.2	48	73.0	34	39.0	43	42.4	47	66.8	56	56.0	57	30.4	21.6
NE04607	67.5	38	74.7	21	77.0	17	30.8	57	38.6	54	75.7	45	60.7	45	35.0	21.3
NE04613	70.1	33	73.9	23	75.9	20	50.4	19	46.3	30	70.7	54	64.6	28	33.9	22.6
NE04615	55.7	50	72.1	31	75.2	24	31.1	55	45.0	37	81.9	18	60.2	48	31.4	22.5
NE04617	62.3	42	73.5	27	74.7	25	44.6	32	50.5	21	78.9	31	64.1	31	37.7	24.5
NE04636	78.7	16	65.9	49	64.3	51	51.5	15	50.6	20	80.9	22	65.3	24	40.9	23.6
NE04653	85.0	5	72.1	32	73.8	28	50.0	20	38.2	55	77.6	34	66.1	19	36.1	21.9
NE04662	73.0	26	62.9	55	75.3	23	53.8	11	50.8	19	80.5	24	66.0	20	35.8	22.4
NE04665	83.8	7	71.9	33	79.0	12	54.9	8	49.8	24	76.9	39	69.4	7	36.7	23.1
NE04667	64.8	40	65.1	52	73.1	32	55.7	7	43.8	41	77.3	37	63.3	37	35.1	23.1
NW04668	62.8	41	67.0	46	62.8	52	38.9	44	43.3	44	82.0	17	59.5	50	33.4	17.8
NW04673	79.0	15	69.6	37	80.6	11	49.5	22	52.3	12	83.3	15	69.1	8	35.3	20.0
NW04679	75.0	23	68.8	40	76.9	18	54.6	10	43.7	43	69.2	55	64.7	26	36.8	21.0
NE04477	52.2	51	73.9	24	73.4	31	45.3	30	41.2	51	75.8	44	60.3	46	33.6	20.7
Pronghorn	**48.2**	**57**	**69.6**	**38**	**70.2**	**41**	**38.8**	**45**	**53.4**	**10**	**80.4**	**25**	**60.1**	**49**	**38.4**	**20.0**
NW04685	75.5	22	73.4	28	76.3	19	51.1	16	45.5	34	76.7	41	66.4	18	34.5	20.9
NW04686	71.5	28	74.8	20	69.6	44	44.0	33	45.7	33	77.3	36	63.8	32	33.8	21.2
NW04687	82.0	11	68.2	44	66.7	48	45.7	29	45.3	35	83.5	13	65.2	25	34.8	21.1
NW04688	89.8	3	69.8	35	74.0	27	44.7	31	44.7	38	85.6	8	68.1	9	34.5	20.9
NW04689	83.3	8	64.6	53	69.1	46	43.3	37	41.4	49	80.8	23	63.7	34	35.4	20.5
NW04693	40.2	60	66.5	47	65.9	50	32.0	54	39.7	53	72.3	49	52.8	60	34.6	21.4
NW04697	61.3	45	71.1	34	83.9	7	42.2	38	44.5	39	77.2	38	63.4	36	35.3	22.9
NW04698	76.8	21	68.5	42	59.2	55	30.6	58	48.6	27	71.7	51	59.2	53	33.2	23.5
NW04699	50.0	53	82.0	7	78.5	13	43.6	36	50.8	18	72.6	48	62.9	39	32.9	24.3
NI04411	80.0	14	61.5	58	72.2	35	51.5	14	54.8	8	75.2	47	65.9	21	30.4	23.5
NI04412	72.5	27	68.5	41	66.2	49	43.8	35	51.8	15	84.2	11	64.5	29	35.5	23.3
NI04414	77.0	19	73.7	25	74.0	26	52.1	13	48.2	28	76.1	43	66.9	15	35.5	22.9
NI04416	68.0	36	77.8	12	77.6	15	54.6	9	45.2	36	76.6	42	66.6	16	34.8	21.2
NI04419	78.0	17	64.5	54	54.1	59	35.8	48	46.3	31	77.5	35	59.4	51	32.9	17.8
NI04420	83.2	9	82.7	6	86.5	4	56.2	6	50.0	22	86.9	4	74.3	2	35.5	17.3
NI04421	70.8	32	65.4	51	81.0	10	71.3	1	57.5	3	92.6	1	73.1	5	37.1	20.4
NI04428	84.8	6	72.5	29	68.1	47	41.0	40	45.7	32	80.1	27	65.4	23	32.8	19.1
NI04439	67.8	37	60.3	60	70.1	42	41.0	39	43.2	46	71.3	53	58.9	54	35.3	20.6
NI04427	71.5	29	76.6	14	72.0	36	41.0	41	51.3	17	81.7	20	65.7	22	33.9	19.8
Wesley	**69.3**	**35**	**65.8**	**50**	**70.4**	**40**	**49.0**	**23**	**33.3**	**59**	**59.8**	**60**	**57.9**	**56**	**31.7**	**21.9**
GRAND MEA	**69.4**		**72.3**		**72.8**		**44.9**		**47.1**		**78.3**		**64.1**		**35.0**	**21.1**
CHECK MEA	**64.0**		**71.5**		**76.0**		**49.7**		**48.0**		**74.8**		**64.0**			
CV	16.5		6.1		7.3		10.2		7.8		7.5					
LSD	15.5		6.0		7.2		6.2		5.0		7.9					

The nursery mean is near the check line mean, indicating there are many high yielding experimental lines. Jagalene continues to perform at many locations. Nineteen lines were advanced to the 2005 NIN.

6. Regional Nurseries

In 2007, we continued to combine into one larger nursery the Southern Regional Performance Nursery (SRPN), the Northern Regional Performance Nursery (NRPN), which were planted at Lincoln, North Platte, Sidney, and Alliance. At Clay Center, only the SRPN was planted. To fill out the nursery, we added a few other lines mainly to compare selections out of lines to see if the selection (often for disease or end-use quality) was an improvement agronomically compared to original line. The data for 2007 are:

	Lincoln	N. Platte	Sidney	Alliance	St. Avg	State	SRPN-Clay Cen
name	bu/a	bu/a	bu/a	bu/a	bu/a	Rank	bu/a
Kharkof	35.57	50.67	42.47	47.95	44.17	90	13.96
Scout 66	40.73	58.45	52.62	53.78	51.40	87	23.54
TAM-107	39.20	60.32	64.83	55.72	55.02	84	37.84
Trego	55.37	75.05	62.20	37.47	57.52	74	46.91
OK Bullet06ERU	55.53	73.92	58.63	53.67	60.44	64	37.47
OK05737W	55.82	70.02	56.52	53.88	59.06	70	33.92
OK03305	46.77	66.65	58.40	56.08	56.98	77	25.25
OK03522	66.57	92.90	61.20	53.65	68.58	33	39.92
OK02522W	55.70	79.68	57.88	53.60	61.72	61	30.28
OK02125	73.62	95.35	66.52	53.90	72.35	12	40.20
KS04HW47-3-4	62.93	86.25	67.55	60.25	69.25	25	39.76
T151	67.93	90.12	69.68	59.90	71.91	15	47.02
T153	56.12	75.47	73.00	54.03	64.66	54	36.38
T154	61.88	85.45	70.85	55.23	68.35	34	39.60
T158	76.17	80.08	71.60	63.88	72.93	8	56.90
98x0338-13	71.80	81.83	70.08	57.08	70.20	22	38.88
98x0435-15	57.15	75.55	64.88	60.70	64.57	55	29.64
99x0212-2	62.57	85.12	67.63	59.05	68.59	32	39.50
BC98331-03$-2W	63.77	92.87	81.93	64.07	75.66	4	46.11
BC98334-10W-8W	60.93	74.28	74.52	62.12	67.96	37	32.02
BC98334-04-02	59.77	83.53	60.65	55.65	64.90	50	37.28
HV9W96-1271R-1	71.42	98.27	72.85	61.02	75.89	2	41.35
HV9W02-267W	67.00	71.65	73.17	60.82	68.16	36	43.53
HV9W02-112W	61.37	69.58	66.33	56.28	63.39	58	39.64
HV9W02-271W	69.95	85.67	75.63	58.83	72.52	10	38.60
KS990498-3-&~2	71.50	76.55	67.93	60.33	69.08	26	35.59
KS970093-8-9-#1	81.43	90.60	64.47	39.62	69.03	27	54.50
KS980512-2-2	73.43	82.77	62.88	62.35	70.36	21	46.23
KS980512-11-22	60.58	80.75	64.50	53.92	64.94	49	27.46
CO01385-A1	65.38	80.10	63.57	65.38	68.61	31	40.38
CO02W280	62.08	72.87	62.88	58.80	64.16	57	38.24
CO03W054	74.93	85.18	62.33	59.07	70.38	20	42.14
CO03W239	54.43	77.03	71.07	64.37	66.73	41	29.90
CO03W269	58.37	49.12	60.55	54.80	55.71	83	34.36
CO03443	55.02	57.35	72.35	56.88	60.40	65	24.42
NI04420	**78.22**	**88.02**	**71.38**	**62.35**	**74.99**	**6**	**44.58**
NI04421	**67.18**	**75.22**	**65.68**	**64.80**	**68.22**	**35**	**39.77**
NE04424	**77.00**	**86.47**	**78.30**	**61.58**	**75.84**	**3**	**47.56**
NI04428	**62.20**	**69.63**	**72.45**	**56.58**	**65.22**	**47**	**38.06**

SD05W012	77.37	76.15	68.85	53.35	68.93	29	42.44
SD05W138	69.38	68.25	63.92	55.88	64.36	56	34.56
T159	75.32	84.73	57.53	57.13	68.68	30	35.18
TX99A0153-1	48.20	70.38	62.35	59.15	60.02	66	37.33
TX03M1096	75.53	88.32	71.52	55.65	72.76	9	37.46
TX01V5136RC	63.42	77.27	67.42	57.75	66.47	43	31.42
TX01A7340	56.47	80.98	54.67	51.47	60.90	63	31.65
TX02A0252	41.93	82.03	77.17	66.32	66.86	40	23.76
TX04M410068	52.80	89.37	61.78	55.57	64.88	51	21.00
TX03A0148	54.67	64.27	60.38	60.38	59.93	68	26.64
TX03A0563	58.10	64.52	61.30	59.95	60.97	62	45.83
Harding	52.47	72.15	50.60	49.85	56.27	81	
NUPLAINS	59.90	50.97	63.48	53.90	57.06	76	
WESLEY	63.32	79.67	52.48	51.77	61.81	60	
Jerry	48.28	65.58	60.02	51.67	56.39	80	
HV9W98A-1002R	68.10	71.53	76.25	60.05	68.98	28	
HV9W02-846R	72.78	92.30	72.52	63.47	75.27	5	
Millennium-27, ALS-	**69.90**	**75.57**	**63.50**	**53.77**	**65.69**	**45**	
NE03458	**61.48**	**73.23**	**75.42**	**56.37**	**66.63**	**42**	
NE04490	**79.73**	**87.45**	**68.63**	**58.52**	**73.58**	**7**	
NE04537	**76.60**	**89.18**	**65.65**	**56.30**	**71.93**	**14**	
NH03614	**68.27**	**81.23**	**76.00**	**53.72**	**69.81**	**23**	
NI05711	**48.50**	**74.87**	**68.52**	**44.58**	**59.12**	**69**	
NI05714	**67.17**	**69.32**	**67.23**	**55.25**	**64.74**	**53**	
NI05720W	**44.02**	**55.67**	**60.38**	**43.62**	**50.92**	**88**	
NW03681	**64.87**	**85.72**	**59.28**	**51.43**	**65.33**	**46**	
N98L20040-44	**49.00**	**64.15**	**64.28**	**54.98**	**58.10**	**72**	
SD96240-3-1	58.05	73.70	62.93	45.05	59.93	67	
SD98W175-1	52.42	63.22	60.58	51.62	56.96	78	
SD05W018	77.98	91.23	75.95	61.33	76.62	1	
SD05W030	71.70	79.17	66.72	61.62	69.80	24	
SD05W140	59.98	77.60	57.50	52.35	61.86	59	
SD02804-1	41.20	47.22	63.15	60.57	53.04	86	
SD05004	55.42	64.37	59.05	55.38	58.56	71	
SD05118	68.72	77.93	66.52	56.67	67.46	39	
SD05179	72.48	74.50	71.97	67.37	71.58	17	
SD05210	63.67	74.22	41.53	47.42	56.71	79	
BZ9W02-2051	46.27	49.20	74.92	59.13	57.38	75	
NX03Y2489	**74.00**	**66.35**	**65.58**	**53.52**	**64.86**	**52**	
NWX03Y2459	**59.80**	**69.13**	**54.97**	**46.97**	**57.72**	**73**	
MT0419	58.45	62.27	57.03	47.32	56.27	82	
MTCL0477	30.42	47.45	55.90	51.07	46.21	89	
MT0495	40.40	59.27	66.82	48.40	53.72	85	
NI04414	**70.42**	**76.00**	**61.90**	**52.38**	**65.18**	**48**	
NI05706	**67.37**	**64.53**	**80.78**	**57.97**	**67.66**	**38**	
NI06722	**76.48**	**79.82**	**70.90**	**60.20**	**71.85**	**16**	
NI05711	**58.33**	**73.98**	**69.68**	**61.65**	**65.91**	**44**	
NE01643	**84.70**	**74.33**	**70.25**	**60.40**	**72.42**	**11**	

NI06738	**71.78**	**79.13**	**78.87**	**59.37**	**72.29**	**13**	
Millennium	**81.03**	**75.02**	**65.52**	**60.90**	**70.62**	**19**	
NI04221	**71.45**	**76.05**	**72.00**	**66.23**	**71.43**	**18**	
CV	10.25	10.32	14.75	13.01	12.08		15.72
GRAND MEAN	**62.42**	**74.90**	**65.60**	**56.29**	**64.80**		**36.92**
Heritability	0.74	0.65	0.23	0.22	0.46		0.99
LSD	8.64	10.44	13.06	9.89	10.51		7.90

One of the pleasant surprises with this nursery is that three of the top 10 lines were developed in Nebraska. It appears that moderately early lines were favored in this nursery, most likely due to the drought and earlier than normal finish in many parts of NE. In addition, the recent release NE10643 was 11th indicating it will perform well against the upcoming releases. As NE lines tend to be later than most SRPN lines, having three very good lines gives optimism to the program. In looking at the two data sets (combined RPN and SPRN separately), a number of points are clear. The Nebraska early germplasm needs better straw so it can complete better in the south central region (e.g. Clay Center) where yields are often very high. Our irrigated wheat breeding efforts will help here. In order to focus on this region, we will probably have to modify our Lincoln and Clay Center selection nurseries to look for "race-horse" wheats that can really perform when conditions are right. Perhaps the fertility level at Lincoln needs to be increased to eliminate some of the taller lines with weaker straw. If this were done, then Mead will become the selection nursery for the later and taller lines that are well adapted to the longer season of western Nebraska. Also, the regional white wheat efforts continue to expand, thus increasing the germplasm available for parent use in creating new white wheat lines.

7. Multiple-Location Observation Nursery

Six replications (locations) in Nebraska (Lincoln, Mead, Clay Center, North Platte, Sidney, and Hemingford) and one in Kansas of this nursery were harvested and used for selection. The table gives the grain yields for all of the locations, the line average, and the rank Due to the frost and disease at Clay Center, the means and ranks with that location not included is also given. Of the top 22 highest yielding lines, two lines were Millennium checks, indicating we have very competitive new lines coming. Note the top fifteen lines were higher yielding than any plot of the replicated check lines. Fifty-three lines were advanced for further testing.

	Lincoln	Mead	Clay Cen.	N. Platte	Sidney	Hemming.	St. Avg.	St. Rank	Stavg-CC	Strank-CC
VARIETY	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a		bu/a	
NE07486	68.30	56.15	47.65	79.15	86.90	54.95	65.52	1	69.09	2
NE07477	69.20	55.10	46.75	70.05	89.75	61.50	65.39	2	69.12	1
NE07485	66.35	51.50	39.80	87.95	81.65	51.15	63.07	3	67.72	4
NE07693	70.30	58.55	36.80	75.80	89.25	42.80	62.25	4	67.34	5
NE07531	73.05	61.95	41.70	69.60	62.35	63.00	61.94	5	65.99	9
NE07443	67.45	54.45	41.05	93.30	68.10	46.05	61.73	6	65.87	10
NE07487	61.90	56.05	37.45	88.30	77.15	49.55	61.73	7	66.59	6
NW07505	77.95	61.80	48.75	67.15	57.35	55.35	61.39	8	63.92	15
NE07520	64.85	60.75	37.30	85.25	66.50	53.40	61.34	9	66.15	8
NE07435	63.55	58.95	35.35	66.80	86.45	55.70	61.13	10	66.29	7
NE07694	65.85	58.35	26.00	82.95	86.25	45.25	60.78	11	67.73	3

NW07534	77.85	53.60	44.00	81.90	66.30	40.40	60.68	12	64.01	14
NE07458	77.05	56.80	40.50	80.75	61.15	47.65	60.65	13	64.68	12
NE07616	64.40	57.75	36.35	70.15	82.05	52.70	60.57	14	65.41	11
NE07488	70.35	49.95	49.75	73.45	70.65	44.65	59.80	15	61.81	29
NE07695	63.65	58.05	41.00	60.10	92.05	42.90	59.63	16	63.35	19
Millennium	**74.40**	**61.30**	**38.10**	**60.45**	**74.00**	**49.25**	**59.58**	**17**	**63.88**	**16**
NW07544	61.15	45.30	35.20	89.45	69.75	56.05	59.48	18	64.34	13
NE07426	59.45	49.95	38.30	74.20	77.05	57.35	59.38	19	63.60	17
Millennium	**63.10**	**61.85**	**39.30**	**58.05**	**82.30**	**51.55**	**59.36**	**20**	**63.37**	**18**
NE07517	61.80	59.45	43.55	73.90	69.55	43.95	58.70	21	61.73	30
NE07577	76.80	41.35	48.85	77.65	65.90	41.40	58.66	22	60.62	45

8. Early Generation Nurseries

a. Single-plot Observation Nursery

Nineteen hundred ninety-eight lines were evaluated at Lincoln in 2007. Of the 1998 lines and checks, 1676 where red or mixed red and white seeded (including 58 herbicide tolerant lines) and 322 where white seeded. Of this group, 532 were harvested and 372 samples were submitted for Quadrumat Junior milling, flour protein content, and dough mixing properties. As in the past, the turn-around time in the Wheat Quality Laboratory was excellent (all quality evaluations completed by the end of August). On the basis of agronomic and quality performance, 272 red and 16 white lines were selected for further testing. In future more white lines will need to be selected.

b. Headrow Nursery

Over 45,000 headrows were planted at Lincoln. In general, the headrow nursery had an excellent start due to early planting (our two planting crew effort) and adequate moisture with little winter injury. Due to having adequate field space, the plantings were well separated to better see the lines. Harvest went very well with no rain delays during the Lincoln harvest. We harvested over 1850 lines and planted 1850 (1376 red or segregating red and white; 305 white wheat; and 169 herbicide tolerant lines). Of the red and white wheat lines, 422 where sent to Scottsbluff for planting at in our irrigated observation nursery, and 69 lines to Gary Hein to test for wheat steak mosaic virus tolerance.

c. F_3 bulk hybrids

The F_3 bulk hybrid nursery contained 691 red or red and white segregating bulks. All plots were planted at Mead and most were planted at Sidney. Most bulks survived the winter and the bulks grew well with little lodging, hence we could select for bulks that should do well in western NE where straw strength is less important may have been lost. The number of F_3 bulks is normal. Over 39,600 head rows were selected for fall planting. The headrows were planted relatively late (October 4 to 11) on one large field due to rain delays. In general, their emergence and stands were better than expected due to the rainy fall. The project goal remains to have sufficiently good segregating F_3 material to select about 40 - 45,000 headrows.

b. F_2 bulk hybrids

The F_2 bulk hybrid nursery contained 844 bulks and check plots with most of them planted at Mead. Sixty-four bulks were planted at Lincoln for herbicide selection. The bulks generally survived the winter, but some were winterkilled (those involving wintertender parents). As in the past, we continue to share our bulks with other programs and receive bulks from other programs. Due to the large number of bulks, about 805 bulks (64 herbicide tolerant bulks) were advanced as individual bulks for further consideration in 2007 from our program.

9. Winter Triticale Nursery

In 2007, no new triticale lines were recommended for release; however, we selected ten lines for increase (5 small and 5 large) as possible replacements or to complement NE426GT and NE422T which continue to perform well. Because triticale is a small market crop, we are carefully deciding how best to release new triticale cultivars so as to not cause inventory problems with the previously released cultivars. We are now beginning to move to higher and more consistent grain yield levels. With the interest in maize for ethanol, we believe that the future is very bright for triticale in that it can be grown over the winter as forage or grain crop in areas where maize cannot be grown successfully. The grain will substitute for maize in animal rations and the forage can be used as forage, cellulosic ethanol feed stocks, or as a ground cover. Cooperation with Iowa State University continues to provide excellent efforts in the grain and we believe in the future bioenergy uses of triticale. The forage data for the 2007 triticale variety trial was provided by Dr. Ken Vogel and the USDA-ARS. Again NE426GT and NE422T performed well, but other experimental lines are equal or better to these lines. An awnless wheat line that can be used for grazing or hay (NE97426) does not have the forage potential of triticale.

The triticale-breeding program received about $6265.09 this year in research and development fees, which is less than last year ($8,589.20) and less the $10,000, which was received in 2004. These funds will be extremely important in developing a sustainable triticale-breeding program. A growing concern is that some producers are saving seed and replanting it on their farms or selling it to others. This practice will hinder the development of new triticale varieties and an ethical seed business. The practice of brown bagging is historically common in triticale and the University needs to protect its intellectual property rights. Marketing in nearby states will become increasingly important if triticale emergences as an important alternative small grains crop. The results of the 2007 triticale variety grain and forage trial were:

	Lincoln	Average	Average	Lincoln	Mead	Sidney	State Avg.	State	Mead
	Winter Survival	Heading	Height	Grain Yield	Grain Yield	Grain Yield	Grain Yield	Rank	Forage Yield
Variety	%	Date	in	lbs/a	lbs/a	lbs/a	lbs/a		lbs/a
NE426GT	**100.0**	**20.0**	**42.1**	**4398**	**2765**	**3233**	**3465**	**2**	**9253**
NE422T	**100.0**	**25.5**	**58.1**	**4171**	**1828**	**1899**	**2633**	**25**	**7383**
JAGGER	90.0	16.5	31.3	2995	1594	2465	2351	28	6811
NT01451	100.0	21.0	42.6	4557	1734	3085	3125	11	7743
NT02421	96.7	20.5	44.4	4109	2923	3134	3389	4	7534
NE03T416	96.7	18.5	42.2	4653	2806	3519	3659	1	7263
NT02458	100.0	21.0	44.1	4582	2245	1328	2718	22	7459
NT01435	100.0	21.5	47.2	4040	2413	2489	2981	17	7103
NT02435	86.7	21.0	45.7	4274	2504	2325	3034	15	6277
NE03T449	100.0	26.0	59.8	3669	1579	769	2006	30	7723

NT04432	83.3	21.0	43.9	4598	2118	2410	3042	14	7611
NE03T407	93.3	19.0	43.7	4313	2405	3046	3255	8	7390
NT04424	100.0	20.0	44.4	4299	2276	3507	3361	6	7529
NT05414	100.0	21.5	51.9	3872	1558	2317	2582	27	7395
NT05421	100.0	19.5	49.9	4755	2242	2273	3090	12	8006
NT05429	86.7	18.5	41.3	4464	2062	3291	3272	7	7894
NT05433	80.0	20.5	43.0	4640	2067	3391	3366	5	6790
NT05442	96.7	20.5	40.9	4568	2833	2937	3446	3	8073
NT05443	100.0	21.0	41.8	4416	2731	2429	3192	10	6369
NT05444	96.7	21.0	42.4	3969	2169	3028	3055	13	7720
NT06419	100.0	18.5	42.1	4109	1951	2517	2859	20	5593
NT06422	80.0	18.5	42.6	4584	2212	2300	3032	16	7394
NT06423	90.0	20.5	45.5	4015	1606	2505	2709	23	7656
NT06424	80.0	19.0	43.2	3658	2043	3937	3213	9	7133
NT06425	83.3	19.0	39.0	3654	1914	3018	2862	19	6693
NT06426	66.7	17.5	36.7	3332	1379	3282	2664	24	7845
NT06427	83.3	19.5	40.7	4204	1692	2785	2894	18	7568
NT06429	63.3	18.0	38.6	3174	1635	3022	2610	26	7497
NT06433	80.0	19.0	42.8	3861	2031	2271	2721	21	7085
NT06434	93.3	20.5	44.6	3341	1057	2633	2344	29	8269
Mean	**90.9**	**20.1**	**43.9**	**4109.1**	**2079.1**	**2704.8**	**2964.3**		**7402**
LSD	**21**			**770**	**1516**	**964**			**710**

The results of the 2006 triticale variety grain and forage trial were:

VARIETY	Flowering	Height	Lincoln	Mead	Average	Grain	Dry Forage	IVDMD	Forage
	May	in	lbs/a	lbs/a	lbs/a	Rank	lbs/a	%	Rank
NE426GT	**23.2**	**52.5**	**5665**	**4817**	**5241.0**	**4**	5766	59.8	12
NE422T	**26.8**	**57.8**	**4179**	**3671**	**3925.0**	**29**	5372	65.3	24
JAGGER	19.0	41.9	5006	3412	4209.0	28	4610	55.4	30
NT01451	23.5	52.0	5793	4635	5214.0	6	5826	61.3	8
NT02421	23.0	54.7	5482	4605	5043.5	9	5333	58.9	25
NT02431	22.8	52.4	5028	3774	4401.0	21	5557	60.4	18
NE03T416	21.2	54.0	5830	4818	5324.0	1	5467	58.5	22
NT02458	23.4	50.9	5285	4600	4942.5	13	5744	58.8	13
NT00421	24.2	54.3	5151	3567	4359.0	22	5324	61.9	27
NT01435	24.8	52.9	5099	4350	4724.5	17	6510	61.6	1
NT02435	23.2	56.9	5614	3744	4679.0	18	5796	59.0	10
NE03T449	25.7	60.3	3688	3615	3651.5	30	5671	63.2	14
NT02456	24.5	56.3	4547	3934	4240.5	26	5591	62.9	16
NT04417	23.7	51.4	5027	4793	4910.0	14	5598	61.9	15
NT04432	23.5	50.4	5256	4518	4887.0	15	5917	60.8	5
NE03T407	21.5	55.8	5732	4683	5207.5	7	5888	58.8	6
NT04403	24.0	55.9	4801	3832	4316.5	23	5814	61.5	9
NT04424	22.2	55.0	5693	4304	4998.5	10	5329	60.5	26
NT05414	24.0	58.7	4472	4129	4300.5	25	6150	62.7	3

NT05417	24.7	58.5	4864	3590	4227.0	27	5783	61.4	11
NT05421	22.8	58.2	5028	4113	4570.5	19	6175	62.1	2
NT05425	25.5	58.3	4730	3897	4313.5	24	5383	62.7	23
NT05426	19.3	49.0	5724	4210	4967.0	11	5300	59.0	28
NT05429	20.9	51.9	6072	4489	5280.5	2	5298	59.7	29
NT05433	23.2	51.7	5737	4773	5255.0	3	6133	57.4	4
NT05434	21.9	53.2	5625	4291	4958.0	12	5577	57.2	17
NT05442	24.0	52.4	5631	4562	5096.5	8	5479	60.2	21
NT05443	23.7	52.2	5717	4711	5214.0	5	5552	61.1	19
NT05444	23.5	49.9	5292	4249	4770.5	16	5853	58.6	7
NT05448	25.0	58.3	4771	4068	4419.5	20	5523	63.5	20
GRAND MEAN			**5217.97**	**4225.13**	**4721.55**		**5643.91**	**60.54**	
CV			8.63	9.74			8.0	3.629	
LSD			614.91	561.85			528.7	2.583	

The results of the 2005 triticale variety grain trial were:

2005	**Linc.** ---------		**Mead** ---------		**Sidney--** -------		---------	---------	**State** ---------		
	Yield	Rank	Yield	Rank	Yield	Rank	Heading	Height	**Yield**	**Rank**	
VARIETY	lbs/a		lbs/a		lbs/a		Date	(in)	**lbs/a**		TYPE
NE426GT	5366	2	3333	27	3354	15	20.2	43.3	**4018**	**12**	GR
NT00428	4521	23	3546	20	3549	10	20.0	44.1	**3872**	**20**	GR
NT01410	5030	10	4100	8	3192	21	20.2	45.3	**4108**	**7**	GR
NT01451	5529	1	4103	7	4099	2	20.9	45.5	**4577**	**1**	GR
NT02403	5342	3	3597	18	3120	25	20.0	45.7	**4020**	**11**	GR
NT02410	5265	5	3430	25	3110	26	20.7	47.8	**3935**	**16**	GR
NT02419	5120	8	4453	3	2736	36	21.1	46.4	**4103**	**8**	GR
NT02421	5218	6	4690	1	2957	30	20.3	47.4	**4288**	**3**	GR/FO
NT02431	4566	22	4297	5	3600	8	21.4	44.4	**4154**	**5**	GR/FO
NT02454	4754	15	3602	17	3301	17	20.6	46.1	**3885**	**19**	GR
NE03T407	4631	17	3441	23	3959	4	20.0	47.0	**4010**	**13**	GR
NE03T411	4454	26	4253	6	3130	24	20.1	43.9	**3946**	**15**	GR
NE03T416	5128	7	3887	12	3367	14	19.4	43.5	**4127**	**6**	GR
NE03T432	4866	12	2446	38	3172	22	20.6	45.2	**3495**	**27**	GR
NE03T451	4691	16	3495	22	3353	16	20.7	45.6	**3846**	**21**	GR
JAGGER	3685	37	3703	13	2145	39	16.6	33.1	**3178**	**37**	GR, wheat
NE03T456	3953	33	3662	14	3468	12	22.1	48.4	**3694**	**24**	GR
NT02458	5314	4	3639	15	3540	11	21.0	46.2	**4165**	**4**	GR.FO
NE03T452	4504	24	2708	34	2984	29	19.0	44.9	**3399**	**33**	3SEED FLORET
NT00421	4317	28	2043	40	2881	34	20.8	47.6	**3080**	**38**	A-/FO
NT01435	4971	11	3170	28	4065	3	23.2	46.9	**4069**	**9**	F/G
NE422T	3785	36	2735	33	3229	19	25.4	55.9	**3249**	**36**	FO
NT00449	3613	38	3371	26	3138	23	20.9	50.8	**3374**	**34**	FO
NT02435	4619	19	4361	4	4309	1	20.9	50.1	**4429**	**2**	FO
TRICAL	2899	40	2074	39	2915	32	25.6	52.7	**2629**	**40**	FO
NE03T413	4477	25	3966	10	3052	28	20.7	52.0	**3831**	**22**	FO
NE03T449	4021	31	3579	19	2633	37	25.2	57.4	**3411**	**32**	FO
NE03T454	3806	35	3081	29	3376	13	24.3	54.1	**3421**	**30**	FO

NT02456	4215	30	2909	32	2926	31	22.5	49.3	**3350**	**35**	FO.A-
NE03T447	3599	39	3011	30	2122	40	24.1	55.1	**2911**	**39**	FO?
NT04403	4277	29	2591	35	3890	5	21.1	48.5	**3586**	**26**	F
NT04407	4330	27	4043	9	2829	35	22.3	51.9	**3734**	**23**	F
NT04415	4007	32	3431	24	3585	9	19.6	45.3	**3675**	**25**	G
NT04417	4597	20	3950	11	3291	18	21.2	43.5	**3946**	**14**	G
NT04424	4804	13	4502	2	2895	33	20.3	44.9	**4067**	**10**	G
NT04427	5105	9	3638	16	3057	27	20.9	45.3	**3933**	**17**	G
NT04429	4795	14	2938	31	2510	38	20.8	46.2	**3415**	**31**	G
NT04431	4623	18	2589	36	3219	20	21.3	45.1	**3477**	**28**	G
NT04432	4587	21	3504	21	3637	7	20.7	43.4	**3909**	**18**	G
NT04451	3878	34	2555	37	3841	6	23.4	44.8	**3425**	**29**	G
GRAND MEA	**4310**		**3234**		**3214**		**22.0**	**48.8**	**3586**		
CV	8.9		13.5		9.3						
LSD	547.7		636.2		408.0						

The 2005 forage data are:

2005		---------	**Mead----**	--------	--------	--------	**Sidney**	------	-------	---------	------	**Average**	-------
		Dry	Dry	Rank	H date	Height	Dry	Dry	Rank	Height	Dry	Dry	Rank
		Matter	Matter				Matter	Matter			Matter	Matter	
VARIETY	TYPE		Ton/a			in		Ton/a		in		Ton/a	
NE426GT	GR	0.384	5.479	13	22.0	38.4	0.392	4.032	4	39.1	0.388	**4.756**	7
NT00428	GR	0.380	6.072	5	22.1	42.2	0.336	2.755	29	34.0	0.358	**4.414**	19
NT01410	GR	0.398	5.959	6	21.5	42.8	0.353	2.931	28	39.5	0.376	**4.445**	18
NT01451	GR	0.372	5.822	7	22.4	42.5	0.360	3.517	17	40.4	0.366	**4.670**	10
NT02403	GR	0.368	5.533	11	21.4	43.8	0.353	3.715	11	41.7	0.361	**4.624**	11
NT02410	GR	0.363	5.188	20	21.9	41.0	0.370	3.370	22	42.6	0.367	**4.279**	23
NT02419	GR	0.360	5.600	10	22.4	43.7	0.380	3.392	21	42.0	0.370	**4.496**	14
NT02421	GR	0.432	6.651	2	22.4	40.1	0.401	3.522	16	42.3	0.417	**5.087**	2
NT02431	GR	0.440	6.897	1	22.2	40.1	0.362	3.430	19	38.1	0.401	**5.164**	1
NT02454	GR	0.405	6.509	3	22.3	43.6	0.382	3.262	24	39.6	0.394	**4.886**	5
NE03T407	GR	0.361	5.199	19	21.9	45.4	0.361	3.702	13	46.2	0.361	**4.451**	16
NE03T411	GR	0.405	5.648	8	21.9	45.6	0.362	3.247	25	39.8	0.384	**4.448**	17
NE03T416	GR	0.395	5.526	12	22.0	47.3	0.393	3.994	5	40.6	0.394	**4.760**	6
NE03T432	GR	0.379	5.417	14	21.9	44.9	0.368	3.711	12	40.3	0.374	**4.564**	12
NE03T451	GR	0.365	5.118	22	22.3	40.9	0.347	3.610	14	42.0	0.356	**4.364**	21
NE97426	GR-wheat	0.389	4.692	28	22.0	40.9	0.346	2.743	30	34.1	0.368	**3.718**	30
NE03T456	GR	0.337	5.013	25	23.3	44.2	0.332	3.217	26	44.2	0.335	**4.115**	28
NT02458	GR.FO	0.359	5.128	21	22.6	40.2	0.373	3.834	6	40.8	0.366	**4.481**	15
NE03T452	3 seed Flor.	0.414	5.035	24	20.2	36.3	0.360	2.995	27	37.9	0.387	**4.015**	29
NT00421	A-/FO	0.359	5.340	17	23.5	38.3	0.361	3.486	18	42.9	0.360	**4.413**	20
NT01435	F/G	0.365	6.342	4	25.0	47.0	0.335	3.798	9	42.5	0.350	**5.070**	3
NE422T	FO	0.327	5.074	23	28.7	46.9	0.354	3.327	23	48.2	0.341	**4.201**	26
NT00449	FO	0.365	5.004	26	23.2	44.2	0.360	3.526	15	45.4	0.363	**4.265**	24
NT02435	FO	0.358	4.838	27	22.5	43.4	0.387	3.403	20	43.4	0.373	**4.121**	27
TRICAL	FO	0.326	4.549	30	29.3	40.9	0.347	4.097	3	48.4	0.337	**4.323**	22
NE03T413	FO	0.313	4.632	29	23.4	37.6	0.346	3.800	8	48.2	0.330	**4.216**	25

NE03T449	FO	0.349	5.351	15	28.4	51.3	0.373	4.539	1	53.6	0.361	**4.945**	4
NE03T454	FO	0.350	5.275	18	27.6	45.0	0.347	4.109	2	50.0	0.349	**4.692**	9
NT02456	FO.A-	0.349	5.342	16	24.5	43.4	0.357	3.767	10	45.5	0.353	**4.555**	13
NE03T447	FO?	0.369	5.635	9	27.3	42.2	0.382	3.833	7	50.8	0.376	**4.734**	8
GRAND MEA		**0.371**	**5.462**		**23.4**	**42.8**	**0.363**	**3.555**		**42.8**	**0.367**	**4.509**	
CV		8.125	10.738		2.7	11.8	11.220	14.739		7.0			
LSD		0.035	0.690		0.8	5.9	0.048	0.616		3.5			

10. Wheat Transformation and Tissue Culture Studies

Wheat transformation has been greatly reduced though it continues to be a key strategic effort in the wheat improvement overall effort. Mr. Neway Mengistu, a graduate student on the project, is leading this effort which is done in collaboration with Dr. T. Clemente and Ms. S. Sato of the Transformation Core facility (does our wheat transformation), Dr. S. Wegulo, Ms. J. Breathnach, and J. Counsell of the Department of Plant Pathology (does the screening of conventionally bred and transgenic wheat lines with FHB). We are looking at two new transgenes to see if they have merit in reducing the level of FHB damage in wheat.

11. Chromosome Substitution Lines

This research was undertaken with the expectation as we learn more about the wheat genome; we would be able to develop better breeding strategies. It is done in collaboration with Drs. Kent Eskridge, Kulvinder Gill (now the Vogel Chair at Washington State University), and Ismail Dweikat. Dr. Md. Liakat Ali is the postdoctoral scientist who headed up the project until September, 2007 when our grant funds ended and Dr. Ali accepted a position with the University of Arkansas on rice genomics. In 2005, 2006, and 2007, we evaluated 230 recombinant inbred chromosome lines in a Cheyenne background for chromosome 3A (CNN(RICL3A)) in a four-replicated trial in three environments (Lincoln, Mead, and Sidney). Unfortunately, Sidney, 2006 was lost to hail. Currently we have two good trials (Mead, 2005, 2006, and 2007; Sidney, 2005; Lincoln, 2006, North Platte, 2007). We harvested the trials at Mead and North Platte in 2007. We continue testing in replicated trials recombinant chromosome lines involving both chromosomes 3A and 6A in a Cheyenne background (CNN(RICL3A+6A)) to study epistasis. We planted in replicated trials at Lincoln, Mead, and North Platte, 90 WI(RICL3A)s to compare to our CNN(RICL3A)s and CNN(RICL3A+6A)s. Mr. Neway Mengistu is leading the WI(RICL3A)s research as part of his Ph.D. dissertation. Dr. Mujeeb Kazi created these lines for us using doubled haploid techniques and we are very appreciative of his efforts. We will continue our large field tests to identify where the genes affecting agronomic performance are found on chromosome 3A. This research was supported by a grand from the USDA-CSREES-NRI competitive grants program.

12. White Wheat

Dr. Bob Graybosch, USDA-ARS and I continue our orderly transfer of white wheat germplasm to the state wheat breeding. The cooperation has been excellent and the goal will be to continue the University of Nebraska wheat improvement effort, while building a unified cultivar release program. Nuplains, Antelope and Arrowsmith have been release and are available to growers. Interestingly, many of these white wheat lines have found a niche market with organic wheat producers. The first white wheat developed from this program was entered into the Nebraska State Variety Trials in 2005. However the line did not have sufficient end-use quality or agronomic performance to continue its testing. Additional lines are currently

being tested. The progress on this front has been slower than we would like and we continue to try to find ways to speed up the effort. As in the past, we have just begun screening all of the lines advanced in 2005 for low polyphenol oxidase, an enzyme that is believed to discolor wet noodles and other wheat products.

To enhance the percentage of lines that may have low PPO, Ms. Laura Teihen, an undergraduate student supported by a UCARE (undergraduate creative activities and research experience) scholarship, is developing a system where we can determine on a single kernel basis the PPO level. The selected low PPO seed is vernalized and we have transplanted many of the selected seed in greenhouse to determine if this selection practice will allow us to select for low PPO plants. The idea will be to select for low PPO seeds in F_2 or F_3 populations to enrich the subsequent generations for low PPO.

The results were as follows:

Nursery 2006	Total Number of Lines	Low PPO Lines	Higher PPO Lines	Low PPO Percent of Lines
NIN	60	1	59	1.67
Triplicate	60	2	58	3.33
Duplicate	300	8	292	2.67
Irrigated-Dry	40	2	38	5.00
Triticale Variety	30	6	24	20.00

* Low PPO is scored on a 0-5 scale with 0 having no discoloration and 5 being virtually black in the assay. Lines with scores of 2 or below were considered as being low PPO for this summary.

13. Collaborative Research on Wheat Diseases

Dr. Stephen Wegulo, Department of Plant Pathology, and their staff continue to inoculate our experimental lines with wheat stem rust and Fusarium head blight (FHB, research funded by the U.S. Wheat and Barley Scab Initiative), and as time permits with wheat leaf rust. We continue to improve the greenhouse tests for stem rust, as we seem to be using a slightly more virulent race of the disease than in the past. The major event in stem rust research is the emergence of a new race Ug99 (Ug 99---for its being first found in Uganda in 1999) that can overcome some of the previously very durable resistance genes in wheat (e.g. *Sr6* and more recently *Sr24, Sr36, Sr_{tmp},* and *Sr_{amigo}*). *Sr6, Sr24, Sr_{tmp},* and *Sr_{amigo}* are the main genes used in our program, hence this is a huge potential loss for our breeding efforts. In addition, *Sr36* (found in Vista and possibly the new Colorado line Ripper), and *Sr_{amigo}* (associated with Amigo derived lines) were genes that we were rapidly incorporating as they were effective until this year. It appears that *Sr2* (found in Scout 66 but is associated with false black chaff), is one of the few commonly used genes available. We are rapidly incorporating new stem rust genes (*Sr25* and *Sr26*), but the rapid loss of resistance genes is unprecedented in my life time. Interestingly *Sr_{Tmp}* which is found in many of our lines, including NE01643 is resistant to Ug99, but not to some of the races found in the United States. Much of the world is very concerned about Ug99 because it has moved from Africa to the Arabian Peninsula and recently to Iran as was expected. Its most likely path will be from Kenya/Ethiopia to North Africa (Egypt) and the Middle East to Central Asia. Virtually all of the wheat varieties in this area are susceptible and the consequences would be dire for small, barely self-sufficient farmers. Even where there are resistant varieties, the seed industry is weak and it would be impossible to rapidly change varieties. With diseases, eternal vigilance is the key and we are very fortunate to have continued our breeding efforts on this potentially devastating disease despite the last major epidemic in the Great Plains occurring in 1986. Mr. Javed Sidiqi, a Fulbright scholar from Afghanistan, will be screening Afghanistan lines for stem rust resistance. In his research, he screened 505 lines from Central Asia (430 from Afghanistan, 25 from Pakistan, 25 from Iran, 25

from Tajikistan) and only 2 modern lines from Afghanistan were resistant to stem rust race TPMK (a surrogate race that is present in the U.S.). We do not use race Ug99 because it might escape our testing confines, a risk that is too great to try. Working with Dr. Yue Jin, the four most resistant lines were screened to Ug99 in his carefully confined testing facility and all were found to be susceptible to Ug99. This result confirms the extreme vulnerability of the Central Asian wheat crop to this new race.

Work continues on introgressing the resistance from *Agropyron* (the first real resistance/tolerance to wheat streak mosaic virus developed by Dr. Joe Martin, Kansas State University at Hays, Kansas and his co-workers) into adapted wheat varieties. A number of lines that may have this source of resistance were given to Gary Hein who is testing them in the field in Scottsbluff, NE. The frequency of lines carrying virus resistance remains lower than expected and it is our hope that molecular markers will be used to enrich our populations and enhance our frequency of elite lines with resistance.

Molecular markers will be an important aspect of our research on developing Fusarium head blight (FHB, syn. scab) resistant lines. Working with FHB is hard because the disease assay must be done when the plants are at flowering (hence it is a very long assay) and it is very environmentally sensitive. Hence anything that can be done to select for plants in the seedling stages (as molecular markers would allow you to do) is very important. In 2006, we began making a series of crosses that should have fixed FHB QTLs, hence assuring that we will have at least one FHB QTL in the resultant populations. For example, we will cross hard red spring wheat lines with the 3BS QTL from Sumai 3 to soft red winter lines from Virginia with the 3BS QTL from Sumai 3 to one of the four currently identified Nebraska lines which have the marker at the 3BS QTL. The three way crosses will have two hard wheat parents and two winter wheat parents. We will use molecular markers to enrich the 3-way cross population (score the F_1 plants) with other molecular markers for possible segregating FHB QTLs to ensure we have plants than truly contain the 3BS QTL from Sumai 3 and additional FHB QTLs. In the F2 and possibly F3 bulk generations, we will use optical sorting to enrich the populations for kernel hardness (remove the soft kernel genotypes) and for elevated kernel protein level. Currently experiments to determine the efficacy of optical sorting for hardness and protein content are underway with Dr. Floyd Dowell of the USDA-ARS, Manhattan, KS. In this approach, minimally we should create populations that are fixed for the 3BS QTL (*Fhb1*), enriched for other FHB QTLs, and selected for hardness and protein content prior to visual selection.

As the early generation selection is based upon visual selection (at best only moderately effective selection system), we do weight our early generation selection indices heavily towards sampling for FHB tolerant populations to insure we have numerous potentially FHB tolerant lines in later generations. To test if this approach has merit, we will be screening a number of our head row populations for known FHB tolerant QTLs using molecular markers and harvesting those with and without the known FHB QTLs to determine how different our selections will be if they are based upon QTL markers and on visual selection. In the next generation we will harvest the FHB QTL lines and the non-FHB QTL lines to see if the FHB QTL lines that were not visually selected will survive the agronomic performance selection or become only parents. Mr. Neway Mengistu (who received a partial scholarship from Pioneer HiBred International) will be working on the FHB project. The scab research is supported by a grant from the USDA-National Wheat and Barley Scab Initiative program which also funds part of Mr. Mengistu's research.

14. <u>Plant Height and Diversity in Wheat</u>

Mr. Zakaria Aj-Alouni has worked with Dr. Guihua Bai (USDA-ARS, Genotyping Center) and Drs. Ali and Dweikat to determine the frequency or semi-dwarfing genes in our breeding lines. We are interested in knowing if *Rht_1* or *Rht_2* may have better height characteristics in our tall and short plant height environments. Rht are "reduced height" genes that are the basis of the Green Revolution. Virtually all of our lines appear to have the

Rht$_1$ gene and only two may have had *Rht$_2$*. The most surprising result was that while many of lines have markers associated major dwarfing genes, the gene effects were missing (hence the markers were not diagnostic of the gene). None was more surprising than Cheyenne having the marker for Rht8, a gibberellic sensitive dwarfing gene. However, even Norin 10, which had had the *Rht$_1$* and *Rht$_2$* alleles, had the marker for *Rht$_8$* but did not have the *Rht$_8$* gene. Basically in our germplasm, the *Rht$_8$* marker is not linked to the *Rht$_8$* gene. There are many different responses to the environment for lines with *Rht$_1$* which we believe can best be explained by unknown modifier genes in the background that affect of *Rht$_1$*. Mr. Aj-Alouni successfully completed his Ph.D. and will be returning to Jordan after the May graduation ceremony.

15. <u>Coordinated Agriculture Project: Applied Wheat Genomics</u>

As part of a large multistate project, we are developing a mapping population and adding molecular markers. In collaboration with Pat Byrne and Scott Haley of Colorado State University, we are using a mapping population of 154 F_6-derived recombinant inbred lines (RILs) of TAM107-R7 x Arlin. Our goal of adding at least 350 SSR and DArT markers to cover all linkage groups is largely complete. The markers will be used for QTL mapping once we obtain field data. We plan to focus on collecting phenotypic data on drought tolerance, end-use quality, stem and stripe rust, yield and components of yield, winter hardiness, lodging, heading, flowering, and plant height. Field trials will include randomized complete block experiments with three replications in three locations in Nebraska in 2008 and 2009. In 2009, we will also have locations in South Dakota and Texas. Mr. Nick Crowley will lead this research as part of his M.S. degree research. This research is supported by a grand from the USDA-CSREES-NRI competitive grants program.

16. <u>Genetic Diversity in Turkish and Nebraska Cultivars</u>

Ms. Anyamanee Auvuchanon (who is supported by a scholarship from the government of Thailand) will be working on the relationship between U.S. and Turkish wheat lines. In her study, she is evaluating 23 U.S. Great Plains wheat and 22 Turkish wheat lines (sent to us by a former visiting scientist, Mr. Sahin Dere). In 1874, Turkey red winter wheat was brought to the Great Plains and became the most widely grown wheat in the United States. Since then the Turkish and U.S. breeding programs have interacted, but often used different germplasm. The goal of this research is to see if there are molecular markers or traits that consistently found in both groups of lines, which would indicate that breeding for similar environments has lead to selecting for similar genes and the two regions have not diversified genetically greatly. If the two gene pools are greatly different, each gene pool could be a valuable resource for improving the other gene pool. So far Anyamanee has identified over 50 polymorphic markers and has evaluated the lines for agronomic performance and end-use quality in one replicated trial in 2007. Her preliminary results indicate the Turkish and U.S. gene pools are somewhat distinct, but every major cluster based upon molecular markers included both U.S. and Turkish lines. The clusters based upon agronomic performance separated U.S. and Turkish wheats slightly more, but again many clusters included both U.S. and Turkish lines. The clusters based upon end-use quality showed the least separation among U.S. and Turkish wheat lines, but every major cluster based upon molecular markers included both U.S. and Turkish lines. End-use quality is a highly selected trait and the end-use quality clusters may indicate breeders in the U.S. and Turkey select for similar traits.

17. <u>Organic Wheat Breeding Efforts</u>

The long-term goal of this effort is to develop small grains cultivars and cropping systems incorporating small grains that will improve the profitability and competitiveness of organic producers. This research is

highly multidisciplinary and the organic team includes: P. Stephen Baenziger, Charles Shapiro, Drew Lyon, Stevan Knezevic, Ken Russell, Gary Hein, Stephen Wegulo, Rolando Flores, Vicki Schlegel, Randy Wehling, and Liz Sarno. We hired Mr. Richard Little to be the project coordinator. He is a highly skilled wheat researcher with over 10 years of wheat and sustainable agriculture experience. We will involve the organic community and have identified previously the need for high quality organic wheat varieties and management practices specific to organic farms. The specific objectives of our research are to: 1. Determine if current advanced experimental wheat lines and released cultivars have potential for organic wheat production, and 2. Based upon what we learn in the organic wheat trials, augment our wheat-breeding program to develop wheat cultivars ideally suited to organic production. Others will attempt to 3. Develop an integrated organic soil fertility management program to increase grain protein content, and 4. Reduce tillage or increase organic matter in organic systems by the use of small grains cover crops to suppress weeds, or to suppress weeds by flaming. IN our first year of organic research we planted the wheat state variety trials at 4 organic locations (Concord, Mead, Clay Center, and Sidney) and targeted our organic breeding effort at 2 locations (Mead and Sidney) complete with end-use quality and nutrient quality evaluations, soil fertility trials at two locations (Concord and Sidney), and cover crop research at one location (Concord). Our outreach efforts will include the development of workshops and web-based materials to explain the wheat breeding process and variety selection, prioritizing the desirable traits for organic production and marketing, involving organic producers in the planning and on-farm evaluation (using on-farm demonstration plots) of an integrated organic farm package involving the best cultivar(s) grown using the best fertility regime and cover crops. This project should be very complementary to our conventional wheat breeding effort in that organic producers emphasize the need for excellent end-use quality and disease resistance, but can accept lower yields. Conventional wheat producers emphasize the need for higher yield and can accept average disease resistance and end-use quality. Hence each set of lines can be used as parents to develop improved lines or the complementary program.

IV. GREENHOUSE RESEARCH

In 2007, the majority of F_1 wheat populations were grown at Yuma, AZ. Only populations needing additional crosses are being grown in the Lincoln Greenhouses. This change reduced our greenhouse space and greenhouse labor, and provided much greater quantities of F_2 seed.

V. PROPRIETARY RESEARCH

With the advent of plant biotechnology, the necessity and desirability of interacting with commercial companies has increased. We continue to breed herbicide tolerant wheat with one company as can be seen by the release of Infinity CL wheat, the development of NH03614 CL which will be marketed under as Husker Genetics Brand Compass, and the development of two-gene Clearfield wheat lines. Historically, the University of Nebraska has been reticent to aggressively enforce its intellectual property rights under the Plant Variety Protection Act, but this will have to change. Non-enforcement or weak enforcement will jeopardize all future collaborations with companies who have the reasonable expectation that their intellectual property will be handled in accordance to the material transfer agreements, the law, and in an ethical manner.

We received our sixth year of research and development fees from an agreement with Paramount Seed Farms (a commercial seed company) for the exclusive release of our winter barley germplasm. They continue to build a viable market for our germplasm and we are fortunate that they took the initial risk of building a market when no one else was interested. With the interest in feed grains due to the ethanol market, it appears they chose wisely. We are increasing a number of barley lines for further testing and as possible new products.

The 2007 data for the Barley Variety Trial were:

	Anthesis		Colby	Colby	Colby	Colby	Lincoln	Lin. Winter	Mead	Sidney	Average	
VARIETY	Date	Height	Lodging	Yield	Moisture	Test Wt.	Yield	Survival	Yield	Yield	Yield	
	in May	in	%	lbs/a	%	lbs/bu	lbs/a	%	lbs/a	lbs/a	Lbs/a	
NB99845	16.3	28.3	7.50	5836.3	14.00	46.50	4378.5	91.3	3010.5	2178.0	**3850.8**	**2**
NB018199	18.9	29.8	17.50	4890.7	13.25	46.75	4084.5	96.3	3108.0	2356.0	**3609.8**	**9**
NB99874	20.8	27.9	26.25	4488.5	13.25	46.25	3639.8	53.8	2955.0	2267.0	**3337.6**	**16**
NB99875	17.3	29.1	11.25	4654.6	13.25	48.00	4373.3	97.5	3133.5	1704.0	**3466.4**	**14**
NB04427	17.4	29.1	10.00	5007.8	13.00	48.25	3971.3	67.5	2620.5	2781.0	**3595.2**	**10**
NB018131	16.5	27.3	18.75	4774.1	13.50	48.75	3615.0	77.5	2238.0	1435.0	**3015.5**	**33**
NB018187	17.7	27.6	8.75	4871.0	13.00	48.75	4361.3	93.8	3156.0	2741.0	**3782.3**	**5**
NB03439	18.4	27.7	15.00	4390.1	13.00	50.25	2835.0	46.3	2851.5	2183.0	**3064.9**	**31**
NB04436	17.9	28.2	17.50	4595.0	13.00	49.00	3291.0	100.0	2428.5	2227.0	**3135.4**	**26**
P-713	**17.5**	**26.9**	**16.25**	**5413.9**	**12.00**	**46.50**	**3457.5**	**66.3**	**2839.5**	**2646.0**	**3589.2**	**11**
NB03440	17.6	28.5	15.00	4140.5	13.00	48.50	4101.8	85.0	2484.0	2596.0	**3330.6**	**17**
NB04418	17.9	29.1	32.50	4217.3	12.00	47.75	2478.8	26.3	2092.5	1450.0	**2559.7**	**38**
NB04428	17.6	28.6	6.25	4730.9	11.75	44.50	3227.3	70.0	2754.0	2358.0	**3267.6**	**21**
NB018163	17.2	26.5	11.25	4589.3	12.25	49.00	4020.8	95.0	2622.0	1918.0	**3287.5**	**20**
NB03402	16.5	29.1	12.50	5313.6	12.50	48.75	3918.0	90.0	2899.5	678.0	**3202.3**	**24**
NB03437	17.8	26.8	7.50	5720.6	12.75	49.25	5211.8	98.8	2755.5	2526.0	**4053.5**	**1**
NB03429	17.4	27.0	18.75	5113.0	12.50	49.00	4410.0	97.5	3235.5	2260.0	**3754.6**	**7**
TAMBAR 501	16.6	25.7	13.75	5369.3	11.75	45.75	2592.0	46.3	1515.0	1782.0	**2814.6**	**36**
NB05417	17.3	26.9	23.75	4799.5	11.75	45.00	1256.3	21.3	1375.5	1717.0	**2287.1**	**40**
P-954	**17.6**	**25.5**	**10.00**	**5156.2**	**12.25**	**48.00**	**4412.3**	**83.8**	**3526.5**	**2070.0**	**3791.3**	**4**
NB05420	16.4	27.1	5.00	6236.2	11.50	47.00	2176.5	21.3	2920.5	1935.0	**3317.1**	**19**
NB05418	17.3	25.8	26.25	4722.2	12.00	46.25	999.8	13.8	2254.5	1611.0	**2396.9**	**39**
NB05419	17.8	26.1	17.50	5858.4	12.00	47.50	2296.0	36.8	1884.0	1542.0	**2895.1**	**35**
NB05410	16.5	25.3	8.75	5446.1	12.00	47.00	3855.0	77.5	2661.0	1318.0	**3320.0**	**18**
NB06403	17.4	25.4	6.25	6260.2	12.00	47.75	3225.0	42.5	2842.5	1676.0	**3500.9**	**13**
NB06410	17.7	26.8	6.25	6141.6	12.75	49.50	2045.0	22.8	2320.5	1821.0	**3082.0**	**28**
NB06411	17.4	28.8	72.50	5118.7	13.00	48.00	1963.5	43.8	2671.5	2060.0	**2953.4**	**34**
NB06414	16.9	27.6	23.75	5191.7	12.00	46.50	1070.0	11.3	1716.0	2523.0	**2625.2**	**37**
NB06417	16.6	26.2	13.75	5919.4	11.75	45.25	2382.0	23.0	2695.5	1776.0	**3193.2**	**25**
P-721	**17.1**	**22.9**	**11.25**	**5287.2**	**12.50**	**47.50**	**4449.0**	**87.5**	**2892.0**	**2606.0**	**3808.6**	**3**
NB06419	16.0	30.0	12.50	5275.7	12.25	45.75	2479.5	52.5	2490.0	2112.0	**3089.3**	**27**
NB06420	16.4	26.9	15.00	5492.6	12.50	48.50	2734.5	62.5	2557.5	1532.0	**3079.2**	**29**
NB06423	16.7	27.3	11.25	5310.7	12.25	45.00	2940.8	60.0	3105.0	2490.0	**3461.6**	**15**
NB06425	17.0	28.6	8.75	5906.9	12.25	47.75	3655.5	48.8	3805.5	1759.0	**3781.7**	**6**
NB06426	19.2	27.4	12.50	5198.9	13.25	49.00	3102.0	50.0	2583.0	2182.0	**3266.5**	**22**
NB06427	17.4	25.2	11.25	5425.9	13.00	49.50	2214.8	32.5	2439.0	2210.0	**3072.4**	**30**
NB06432	16.4	28.3	7.50	5842.1	12.00	46.50	1430.0	10.0	3460.5	2282.0	**3253.7**	**23**
NB06435	17.6	27.8	13.75	5353.0	12.75	48.25	1949.3	28.8	2839.5	2014.0	**3039.0**	**32**
NB06437	16.7	25.4	13.75	5604.0	12.75	48.50	3734.3	50.0	2884.5	1964.0	**3546.7**	**12**
NB06444	14.9	25.4	3.75	6587.0	13.00	48.00	2812.5	45.0	3600.0	2007.0	**3751.6**	**8**

Mean	**17.3**	**27.3**	**15.0**	**5256.3**	**12.5**	**47.6**	**3128.8**	**58.1**	**2705.6**	**2032.3**	**3280.7**
CV			62.62	11.3	6.03	2.03	20.4	32.7	22.1	27.0	
LSD			8.58	542.6	0.69	0.88	581.4	17.3	780.5	578.2	
REPS			4.00	4.0	4.00	4.00	4.0	4.0	2.0	3.0	

The 2006 data for the Barley Variety Trial were:

VARIETY	Heading Date May	Height (in)	Colby Yield lbs/a	Moist. %	Test Wt lbs/bu	Linc. Yield lbs/a	Mead Yield lbs/a)	**Average Yield Lbs/a**	Rank
NB99845	11.3	32.4	3728	10.0	44.0	4795	4349	**4290**	25
NB018199	13.8	35.0	3350	10.3	43.5	4874	5262	**4495**	8
NB99874	18.5	35.4	3335	10.3	38.8	4706	4773	**4271**	26
NB99875	14.2	34.7	3602	10.8	43.3	4505	4976	**4361**	19
NB04427	12.8	35.3	3574	10.5	45.0	4902	4248	**4241**	27
NB018131	10.4	34.7	3283	10.0	44.5	4864	4778	**4308**	24
NB018211	10.9	34.0	3314	10.5	46.8	4517	3255	**3695**	40
NB97891	12.1	33.6	3520	10.0	44.8	5039	4397	**4319**	23
NB018187	11.8	33.6	3979	10.5	45.5	5195	4652	**4608**	4
NB03439	13.8	35.8	3643	11.0	48.3	4607	4920	**4390**	17
P-713	9.9	34.9	4034	10.3	43.8	5505	4893	**4811**	1
NB04436	13.2	35.0	4262	10.5	47.8	4331	4829	**4474**	9
NB03440	13.6	35.8	3743	11.0	47.0	4715	4770	**4409**	13
NB04442	13.5	37.5	3498	10.3	43.3	4113	3876	**3829**	38
NB018180	10.9	36.4	3505	10.5	46.5	4427	4215	**4049**	33
NB04418	10.6	36.0	3740	10.0	44.8	5222	4392	**4451**	11
NB04428	12.2	36.0	3293	10.3	43.5	5135	4760	**4396**	16
NB018163	11.2	36.5	3745	10.8	47.0	5183	4851	**4593**	5
P-954	13.3	33.6	3537	10.8	44.3	5170	4707	**4471**	10
NB03402	10.6	32.4	3889	10.5	46.3	5336	4755	**4660**	3
NB04412	14.4	36.9	3417	10.3	45.5	4241	4323	**3994**	35
NB03437	14.9	34.3	3584	10.3	44.8	5108	4893	**4528**	6
NB03403	9.9	34.9	3301	10.8	47.8	5015	4080	**4132**	30
NB03429	14.0	31.9	4014	10.3	45.5	5055	5063	**4711**	2
P-721	12.8	33.8	3814	10.8	45.3	4301	4203	**4106**	32
TAMBAR 501	9.5	35.3	2546	9.0	35.5	4136	4575	**3752**	39
NB04439	15.4	37.0	3841	11.0	47.0	4535	4752	**4376**	18
NB03435	13.6	34.2	3712	10.3	43.8	4891	4587	**4397**	15
NB99881	13.7	34.4	3562	11.5	45.8	4731	4917	**4403**	14
NB05417	9.7	34.6	3743	10.0	45.8	4386	4947	**4359**	20
NB05432	11.3	34.8	3834	10.8	46.3	5018	3275	**4042**	34
NB05420	11.3	31.6	2947	10.0	44.5	5262	4848	**4352**	21
NB05418	9.8	34.6	4013	10.3	45.3	5127	4367	**4502**	7

NB05428	11.7	35.8	3523	10.0	44.0	4621	4197	**4114**	31
NB05419	8.8	34.0	3743	10.0	46.3	4964	4295	**4334**	22
NB05423	7.8	34.3	3459	9.5	42.0	4862	4337	**4219**	28
NB05412	17.0	32.8	3872	10.8	45.0	4046	4574	**4164**	29
NB05407	12.8	34.0	3346	10.3	46.8	4064	4088	**3833**	37
NB05409	9.9	34.0	2845	10.3	43.5	4519	4365	**3910**	36
NB05410	10.0	33.9	3176	9.8	45.8	5240	4902	**4440**	12
GRAND MEAN			**3572**	**10.4**	**44.9**	**4781**	**4531**	**4295**	
CV			9.0	4.7	2.8	9.74	13.1		
LSD			376.1	0.6	1.5	545.91	1003		

The 2005 data for the Barley Variety Trial were:

2005	**Lincoln**	-----	**Mead**	-----	**Sidney**	------	--------	**Colby, KS**	------	------				
VARIETY	Yield	Rk	Yield	Rk	Yield	Rk	Lodg.	Yield	Rk	Most.	Hdavg.	Htavg.	**Average**	**Rank**
	(lbs/a)		(lbs/a)		(lbs/a)			(lbs/a)			d	in	**(lbs/a)**	
Perkins	**3755.3**	**40**	**3391.5**	**21**	**2499.8**	**29**	**6.3**	**3856.8**	**38**	**13.75**	**16.8**	**30.8**	**3376**	**39**
TAMBAR 501	**4645.5**	**36**	**2287.5**	**38**	**2830.5**	**22**	**1.3**	**4437.8**	**34**	**11.75**	**10.6**	**30.4**	**3550**	**37**
P-721	**4273.5**	**38**	**2907.0**	**27**	**3039.8**	**12**	**3.8**	**4927.3**	**20**	**13.25**	**13.5**	**29.5**	**3787**	**30**
P-954	**5322.8**	**9**	**3763.5**	**15**	**1496.3**	**39**	**1.3**	**5067.0**	**12**	**13.75**	**13.0**	**28.2**	**3912**	**21**
P-713	**4981.5**	**27**	**3850.5**	**14**	**3052.5**	**11**	**10.0**	**5029.3**	**14**	**11.75**	**12.0**	**31.9**	**4228**	**11**
NB97891	5160.0	14	4075.5	9	2603.3	26	11.3	5613.8	1	12.75	11.2	30.3	4363	8
P-919	**5016.0**	**24**	**4048.5**	**10**	**2859.8**	**21**	**3.8**	**3646.8**	**40**	**12.25**	**9.4**	**32.4**	**3893**	**25**
NB98936	5043.0	22	3747.0	16	1707.8	38	5.0	4942.0	18	13.00	12.1	29.2	3860	27
NB99845	5734.5	1	4299.0	4	3857.3	2	1.3	5245.3	7	12.50	10.7	29.0	4784	1
NB99874	5511.0	4	4260.0	6	3294.0	7	10.0	5170.3	9	13.50	16.9	31.7	4559	3
NB99875	5220.8	13	4308.0	3	3508.5	4	15.0	4880.5	23	14.75	13.4	31.5	4479	4
NB99881	4645.5	35	2899.5	28	2175.8	33	6.3	4896.5	22	13.50	13.9	29.9	3654	34
NB99885	5304.0	11	3513.0	19	1881.8	37	7.5	5375.3	5	12.00	10.9	30.1	4019	17
NB018131	5304.8	10	4162.5	7	3073.5	9	3.8	5229.3	8	12.00	9.6	33.3	4443	6
NB018163	5110.5	18	3157.5	23	2535.8	27	11.3	5062.3	13	12.25	10.5	31.8	3967	19
NB018180	4700.3	33	3933.0	11	2769.0	23	5.0	4703.0	27	12.75	11.1	33.7	4026	15
NB018187	5088.8	19	3861.0	13	2716.5	24	18.8	5381.8	4	12.25	12.8	30.4	4262	9
NB018199	5580.8	3	4690.5	1	3390.0	6	6.3	5119.0	10	12.75	10.9	31.8	4695	2
NB018211	4981.5	26	4111.5	8	3455.3	5	12.5	4923.5	21	12.00	11.3	33.1	4368	7
NB03402	5301.8	12	2986.5	26	2516.3	28	2.5	4812.0	24	12.00	10.3	27.5	3904	22
NB03403	5424.8	7	2080.5	40	3058.5	10	2.5	4981.3	16	12.25	10.3	32.2	3886	26
NB03423	5066.3	20	2563.5	33	2475.8	30	8.8	5003.5	15	13.00	11.9	31.6	3777	31
NB03429	5118.0	17	2530.5	35	2109.8	34	0.0	5399.5	3	12.25	13.2	27.0	3789	29
NB03435	4712.3	32	2347.5	36	2878.5	19	10.0	4941.0	19	12.25	14.1	28.8	3720	32
NB03437	5672.3	2	2551.5	34	1991.3	36	3.8	5362.3	6	12.50	14.9	29.6	3894	24
NB03439	5462.3	6	3088.5	24	3944.3	1	3.8	4521.8	31	13.00	12.9	33.9	4254	10
NB03440	5355.8	8	3556.5	18	3162.0	8	3.8	4386.0	36	13.25	13.1	32.5	4115	13
NB04427	5469.8	5	4387.5	2	2898.8	16	0.0	5074.8	11	12.75	11.9	32.8	4458	5
NB04439	5059.5	21	3399.0	20	912.8	40	1.3	4554.3	30	13.00	15.8	30.8	3481	38
NB04440	5016.8	23	3918.0	12	2221.5	32	2.5	4596.5	29	13.75	14.0	32.5	3938	20
NB04442	4892.3	28	2676.0	32	3028.5	13	0.0	5544.0	2	12.50	13.1	32.8	4035	14

NB04428	5139.8	16	4272.0	5	2017.5	35	2.5	4644.3	28	12.75	11.8	31.1	4018	18
NB04418	5158.5	15	3630.0	17	2886.8	18	3.8	4403.8	35	11.75	11.8	32.4	4020	16
NB04416	4673.3	34	2308.5	37	2987.3	14	5.0	4498.3	32	11.75	12.8	32.0	3617	35
NB04412	4869.8	29	3082.5	25	2867.3	20	6.3	4778.0	25	12.75	12.8	33.3	3899	23
NB04436	4624.5	37	3390.0	22	3687.8	3	1.3	4956.0	17	13.00	15.2	31.9	4165	12
NB04422	3868.5	39	2763.0	30	2346.8	31	2.5	3708.3	39	11.00	12.3	32.9	3172	40
NB04426	4810.5	31	2683.5	31	2934.8	15	0.0	4742.8	26	13.00	12.9	31.9	3793	28
NB04424	5015.3	25	2766.0	29	2685.0	25	1.3	4216.0	37	13.25	13.4	30.8	3671	33
NB04420	4860.0	30	2215.5	39	2892.8	17	1.3	4454.0	33	12.00	12.9	32.1	3606	36
GRAND MEAN	**5023.8**		**3361.6**		**2731.3**		**5.1**	**4827.1**		**12.66**	**12.6**	**31.2**	**3986**	**0**
CV	8.3		22.1		17.0		87.2	11.6						
LSD	489.3		1250.6		544.4		5.2	657.5						

With the current level of private sector investments in research, additional public-private interactions are to be expected. A key goal will be to develop working relationships that benefit the producer, the customer, and the public good.

VI. ALLIED RESEARCH

The wheat breeding or variety development project is only one phase of wheat improvement research at the University of Nebraska-Lincoln. The project interacts and depends on research in wheat germplasm development, wheat quality, wheat nutritional improvement, wheat cytogenetics, plant physiology and production practices, and variety testing. Much of the production research is located at the research and extension centers. All components are important in maintaining a competitive and improving wheat industry in Nebraska. The allied research is particularly necessary as grain classification and quality standards change and as growers try to reduce their production costs.

The program also depends on interactions and collaborations with the Wheat Board, Nebraska Wheat Growers Association, regional advisory boards, Foundation Seeds Division, Nebraska Crop Improvement Association, the milling and baking industry, and other interested groups and individuals. The Nebraska Seed Quality Laboratory cooperates closely with the Wheat Quality Council and baked the large-scale cooperator samples. Numerous groups have visited the laboratory and participated in discussions on quality and marketing. Through these interactions, the program is able to remain focused and dedicated to being a premier provider of quality varieties, information, and technologies to help maintain the Nebraska Wheat Industry.

VII. Comings and Goings

Rarely has this report commented about staff changes. However all projects are more than crosses, selections, evaluations, data, and seed. At its heart, it is the people that make this research possible. Mr. Javed Sidiqi successfully completed his M.S. degree. Mr. Zakaria Aj-Alouni successfully completed his Ph.D. degree. Dr. Liakat Ali completed his postdoctoral assignment and accepted a position with the University of Arkansas. We welcome Mr. Richard Little to his new position as Organic Wheat Breeding Project Coordinator. We also welcome Ms. Somrudee Onto and Mr. Ali Bakhsh as new graduate students to our program.

Summary

In 2007, 2,050,000 acres of wheat were planted in Nebraska and 1,960,000 were harvested with an average yield of 43 bu/a for a total production of 84,280,00 bu. The 2006 Nebraska Wheat Crop was estimated at 61,200,000 bu, which represented a 36 bu/a state average yield on 1,700,000 harvested acres. The 2007 crop was 38% higher than the 2006 crop. Despite continued genetic improvement, the main determinant in wheat production seems to be acres harvested, government programs, and weather (which also affects disease pressure and sprouting).

In 2007, NE01604 and NH03614 CL (a herbicide tolerant wheat) were recommended for release. NE01604 will be licensed to NuPride Genetics Network and marketed as Camelot. The release of NH03614 CL has been approved by BASF which owns the herbicide tolerance gene. NH03614 CL will have as its legal name of NH03614 CL and will be marketed as Husker Genetics Brand Compass.

Camelot is a hard red winter wheat (*Triticum aestivum* L.) cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS and released in 2008 by the developing institutions. It was released primarily for its superior adaptation to rainfed wheat production systems in Nebraska and adjacent areas in the northern Great Plains. Camelot will be exclusively marketed by NuPride Genetics Network in keeping with their marketing plans. Camelot was selected from the cross KS91H184/Arlin Sib//KS91HW29/3/NE91631/4/ VBF0168 that was made in 1995. In the Nebraska cultivar performance trials, it is widely adapted and performs well throughout the state with better performance in western NE. In organic and irrigated trials, it performs well, though it tends to lodge more than popular irrigated cultivars such as Wesley and Agripro Jagalene. The average Nebraska rainfed yield of Camelot of 3855 kg ha^{-1} (36 environments from 2005 to 2007) was greater than or similar to the yields of other popular cultivars such as Antelope (3467 kg ha^{-1}), Infinity CL (33869 kg ha^{-1}), Agripro Brand Jagalene (3541 kg ha^{-1}), Millennium (3843 kg ha^{-1}), Wahoo (3669 kg ha^{-1}), and Wesley (3628 kg ha^{-1}). The highest yielding cultivar in those years was NE01643 (Husker Genetics Brand Overland, 4119 kg ha^{-1}). Camelot should be acceptable to the milling and baking industries.

NH03614 CL is a hard red winter wheat (*Triticum aestivum* L.) cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS and released in 2008 by the developing institutions and the South Dakota Agricultural Experiment Station and the Wyoming Agricultural Experiment Station. NH03614 CL contains a patented gene owned by BASF. BASF retains ownership of the gene. NH03614 CL was released primarily for its herbicide resistance and superior adaptation to rainfed wheat production systems in Nebraska, Wyoming, and South Dakota, and wheat producing counties in adjacent states. NH03614 CL is a Clearfield™ wheat that will be used with Beyond® herbicide (active ingredient imazamox (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid) BASF Corp., Triangle Park, NC). NH03614 was selected from the cross Wesley sib//Millennium sib/Above sib. As a Clearfield wheat, the line that is most important to compare it with is Infinity CL as both are herbicide tolerant. Based upon the Nebraska data, NH03614 seems to be superior in western NE (e.g. yield data from North Platte, Sidney, and Alliance) to Infinity CL, which is superior in eastern NE (e.g. data from Mead, Lincoln, and Clay Center). The Nebraska State Variety Trials in 2007 agreed with these results. Both lines would be considered broadly adapted and have been grown successfully throughout the state in rainfed conditions.

Two lines, recommended for release, were developed with USDA-ARS leadership. Anton is a new hard white wheat with very low PPO activity, which is a highly desirable trait in the Asian noodle market and for making bread. The second line is Mace, which is a new hard red winter wheat that has the best wheat streak mosaic virus tolerance of any line currently available. Mace will be the line of choice for any situation where the grower needs to reduce his or her risk to this potentially devastating disease.

The generous support of the Nebraska Wheat Board is gratefully acknowledged.