IMPROVING WHEAT VARIETIES FOR NEBRASKA

2004 STATE BREEDING AND QUALITY EVALUATION REPORT

Report to the

NEBRASKA WHEAT DEVELOPMENT, UTILIZATION
AND MARKETING BOARD

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February 2005

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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 2003-2004 NEBRASKA WHEAT CROP

1. Growing Conditions

The 2003-2004 crop was planted into mixed conditions with the western wheat production generally being dry and the eastern wheat production generally being planted into moister soils. The planting was completed in a timely manner. The fall was generally milder than normal, but did not lead to increased diseases such as fall infection of barley yellow dwarf virus or wheat soilborne mosaic virus. The winter was mild and there was little winterkilling. In the spring, moisture was adequate to below average (particularly in western Nebraska). Unfortunately at harvest, the rains that were so needed earlier came and sprouting was a concern in southwest and western Nebraska. Harvest was also cooler than normal. Hence the ripe grain was exposed to cool temperatures and moisture when they were fully ripe. In many ways, this simulated a “cold” temperature germination test. Many of our lines that were selected for rapid germination and emergence were listed among those that sprouted. Due to the generally dry conditions, diseases were generally low in the production season, though Fusarium head blight (scab) was prevalent in eastern NE. However, as western droughts often mean eastern dry conditions, the yields of wheat in eastern NE where adequate moisture occurred were excellent due to low levels of disease. In general, Jagalene, Harry, and Wesley performed well across or in specific sections of the state.

2. Diseases

Foliar diseases are highly dependent on moisture and somewhat on temperature. The spring and summer tended to be fairly normal for early season temperatures. There were adequate moistures and heavy dews in eastern Nebraska and low moisture in western Nebraska. In eastern Nebraska, leaf rust was the main disease and Fusarium head blight (scab) came in late in the season. Scab was not sufficiently important that wheat grain was tested for mycotoxin, but scab was certainly higher than in previous years.

Most virus diseases were minor. Karnal bunt was not found in Nebraska and we will continue to monitor this situation. Drs. John Watkins and Roy French continue to be invaluable in disease identification, survey, and understanding.

3. Insects

In general, most insect pests were at low levels on wheat in 2003-2004. Russian wheat aphid damage was small and required little spraying. Chinch bugs and Hessian fly were generally minor. Wheat curl mite, the vector for wheat streak mosaic virus, and aphids, the vectors for barley yellow dwarf virus, were generally unimportant insect pests though they can carry devastating diseases.

4. Wheat Production

The 2004 Nebraska Wheat Crop was estimated at 61,100,000 bu, which represented a 37 bu/a state average yield on 1,650,000 harvested acres. 1,850,000 acres were planted to winter wheat in the fall of 2003. The 2004 crop was 27% lower than the 2003 crop (79,900,000 bu, which represented a 47 bu/a state average yield on 1,700,000 harvested acres). 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).

5. Cultivar Distribution

The variety survey is being summarized at the time this report is being written. As such, 2003 is the most current data available. Alliance (11.3% of the state) was the most widely grown cultivar followed by 2137 (10.3%) and Pronghorn (10.3%). Alliance is 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. The acreage of 2137 should have peaked, as it is susceptible to both stripe and stem rust. Pronghorn is a tall wheat that is ideally suited for western Nebraska. It is expected that the former Arapahoe acreage will eventually be divided by three modern releases, Millennium, Culver, and Wahoo.

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 68% of the state acreage. Other public varieties occupied 19% and private varieties occupied 13% of the state acreage.

NEBRASKA—WHEAT VARIETIES Estimated acreage

	Percent							
Variety	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
2137	-----	-----	1.4	3.6	8.2	10.4	8.0	10.3
Agripro Abilene	4.2	2.2	2.4	2.7	2.7	2.5	1.3	1.4
Agripro Hondo						1.2	0.0	
Agripro Ogallala	2.2	1.5	1.6	1.2	1.4	2.2	1.5	3.6
Agripro Thunderbird	5.9	5.7	3.5	3.9	2.8	1.9	0.0	1.8
Agripro Thunderbolt								2.0
Agripro Tomahawk	2.9	2.5	2.6	1.6	1.0	0.0	1.8	

Akron	-----	-----	-----	1.6	1.5	0.0	1.8	1.2
Alliance	2.7	7.3	8.4	10.4	15.1	16.0	16.6	11.5
Arapahoe	31.7	30.1	28.3	25.0	19.8	13.4	13.0	8.7
Buckskin	5.8	6.0	6.5	5.0	2.9	4.7	6.2	7.3
Centura	9.2	9.8	7.7	7.7	6.9	3.7	3.4	1.8
Culver						3.1	2.8	2.5
Jagger	-----	-----	-----	1.1	2.9	2.4	3.4	3.9
Karl/Karl 92	7.3	6.9	6.6	5.5	4.4	4.1	3.3	3.8
Millennium							3.5	6.1
Niobrara	1.4	6.5	7.5	11.4	10.3	9.3	6.9	5.4
Platte								1.0
Pronghorn	-----	-----	4.6	7.8	6.9	10.9	10.8	10.3
Scout & Scout 66	2.4	1.6	2.3	1.0	-----	0.0	0.0	1.1
Siouxland	4.7	3.2	1.2	1.1	1.5	0.0	0.0	1.4
Vista	3.6	4.6	3.9	2.1	2.7	1.7	3.1	1.2
Wahoo								1.8
Wesley						1.1	2.2	3.6
Windstar	-----	-----	-----	1.3	1.6	1.6	0.0	
Other Public Varieties	4.9	5.4	5.9	4.1	5.4	7.6	6.5	4.9
Other Private Varieties	0.8	3.1	1.9	1.9	2.0	2.2	3.9	3.4

6. New Cultivars

In 2004, two new cultivars (Hallam and Infinity) were recommended for release. Infinity 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 2005 by the developing institutions. Infinity CL contains a patented gene owned by BASF and who retains ownership of the gene. Infinity CL was released primarily for its superior adaptation to rainfed wheat production systems in Nebraska and counties in adjacent states. The name Infinity CL was chosen because it is a Clearfield™ wheat that will be used with Beyond® herbicide.

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Infinity CL was selected from the cross Windstar//Millennium sib/Above sib. The cross between the Millennium sib (formerly NE94841) and the Above sib (TXGH125888-120*4/FS2) was made in the spring of 1997. The final cross to Windstar was made in fall, 1997. The F_1 plants were grown in the greenhouse in 1998 and the F_2 population in the field in 1998-1999 where heads were snapped prior to harvest. The initial selection was made in 1999-2000 in the head row nursery, which was sprayed with imidazolinone herbicide. The first observation plot was grown in 2000-2001. From 2001 and thereafter, the line was grown in replicated trials in Nebraska. Infinity CL is an F_2-derived line that was selected in the F_4 generation.

Infinity CL was evaluated as NH01046 in Nebraska yield nurseries starting in 2002, and in Nebraska and Wyoming cultivar performance trials in 2003 to 2004. In the Nebraska cultivar

performance trials, it has performed well throughout most of Nebraska. The average Nebraska rainfed yield of Infinity CL of 3870 kg ha^{-1} (27 environments from 2003 to 2004) was lower than the yield of Wesley (3990 kg ha^{-1}), but was similar to that of Millennium (3860 kg ha^{-1}), and higher than Wahoo (3790 kg ha^{-1}), and Alliance (3620 kg ha^{-1}). The average Wyoming rainfed yield of Infinity CL of 2220 kg ha^{-1} (5 environments from 2003 to 2004) was lower than Goodstreak (2350 kg ha^{-1}), but was similar to Buckskin (2280 kg ha^{-1}) and higher than Above (2080 kg ha^{-1}). Infinity CL has acceptable performance under irrigation, but other wheat cultivars with superior performance, especially with better straw strength (described below), would be recommended.

Other measurements of performance from comparison trials show that Infinity CL is medium in maturity (143 d after Jan.1, data from observations in NE), about 3.1 d and 0.6 d later flowering than Pronghorn and 'Wesley', respectively. Infinity CL is a semi-dwarf wheat cultivar. The mature plant height of Infinity CL (87 cm) is 1 cm shorter than Millennium and 8 cm taller than Wesley. In Wyoming heading height of Infinity CL (56 cm) was 8 and 5 cm shorter than the conventional wheats Goodstreak and Buckskin, respectively, and 3 cm taller than the semi-dwarf Above. Infinity CL has moderate straw strength (44% lodged), similar to Wahoo (46%), but worse than Wesley (34% lodged) in those environments where lodging occurred. The winter hardiness of Infinity CL is good to very good and comparable to other winter wheat cultivars adapted and commonly grown in Nebraska.

Infinity CL is moderately resistant to stem rust (caused by *Puccinia graminis Pers.: Pers. f. sp. tritici* Eriks & E. Henn; most likely containing *Sr6, Sr10* or *Sr17* [which are no longer effective) and *Sr24*] data provided by Y. Jin at the USDA Cereal Disease Laboratory). It is also moderately resistant to leaf rust (caused by *P. triticina* Eriks.; data obtained from field observations), and stripe rust (caused by *P. striiformis* Westendorp f. sp. t*ritici,* data obtained from field observations in NE). It is susceptible to Hessian fly (*Mayetiola destructor* Say, data provided by Ming-Shun Chen, USDA and Kansas State University) and wheat soilborne mosaic virus, but may contain a low level of tolerance to wheat streak mosaic virus, data obtained from field observations in NE).

Infinity CL has good grain volume weight (76.2 kg hl^{-1}), which is lower than Millennium (76.5 kg hl^{-1}), but higher than Wesley (74.6 kg hl^{-1}), Wahoo (74.1 kg hl^{-1}), and Alliance (75.7 kg hl^{-1}). Under the drier conditions of Wyoming (4 environments) Infinity maintained acceptable grain volume weight (74.4 kg hl^{-1}), which was lower Buckskin (75.9 kg hl^{-1}), and Goodstreak (75.9 kg hl^{-1}), and slightly higher than Above (74.2 kg hl^{-1}). The milling and baking properties of Infinity CL were determined for two years by the Nebraska Wheat Quality Laboratory. In these tests, Millennium was used as a check cultivar. The average wheat and flour protein content of Infinity CL (128 and 113 g kg^{-1}) was lower than Millennium (142 and 127 g kg^{-1}). The average flour extraction on the Buhler Laboratory Mill for Infinity (707 g kg^{-1}) was lower than Millennium (718 g kg^{-1}). The flour ash content (46 g kg^{-1}) was similar to Millennium (46 g kg^{-1}). Dough mixing properties of Infinity CL were acceptable and stronger than Millennium. Average baking absorption was slightly less than Millennium. The average loaf volume of Infinity (885 cm^3) was less than Millennium (925 cm^3). The scores for the internal crumb grain and texture were good, which was slightly better than Millennium. The overall end-use quality characteristics for Infinity CL should be acceptable to the milling and baking industries.

In positioning Infinity CL, based on performance data to date, it should be well adapted to most rainfed wheat production systems in Nebraska and in adjacent states with similar growing conditions where its medium maturity are favored except in times of drought. Where it is adapted, Infinity CL should be a good replacement for Arapahoe and Windstar and for currently available Clearfield™ wheat cultivars (Above and Agripro 502 CL) due to its similar to higher yield potential, better disease resistance, and superior end-use quality attributes. Infinity CL is genetically complementary to 2137,

Alliance, Buckskin, Jagger, and Pronghorn. It is non-complementary to Windstar, Above, Agripro 502 CL, TAM 110, Arapahoe, Culver, Millennium, Niobrara, and Vista.

Infinity is an awned, white-glumed cultivar. Its field appearance is most similar to Windstar. After heading, the canopy is moderately open and upright. The flag leaf is erect and twisted at the boot stage. The foliage is dark green with a waxy bloom on the flag leaf, leaf sheath, and spike at anthesis, though less so than for Windstar. The leaves are pubescent. The spike is tapering in shape, narrow, mid-long to long, and middense**.** The glume is midlong and midwide, and the glume shoulder is narrow to midwide and square. The beak is medium in length with an acuminate to acute tip. The spike is nodding at maturity. Kernels are red colored, hard textured, and ovate in shape. The kernel has no collar, a large brush of medium length, rounded cheeks, large germ, and a narrow and shallow crease.

Infinity CL has been uniform and stable since 2003**.** Less than 0.5 % of the plants were rogued from the Breeder's seed increase in 2004. The rogued variant plants were taller in height (10 - 15 cm) or were awnless 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 has foundation seed available to companies and/or marketing groups that hold a marketing license from BASF. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. The Registered seed class will be a nonsalable seed class. Infinity CL will be submitted for registration and plant variety protection under P. L. 10577 with the certification option. A research and development fee will be assessed on all certified seed sales. Because Infinity CL contains a patented gene, seed will be distributed for research purposes after approval by BASF. Approved distributions of seed may be obtained from the corresponding author and the Department of Agronomy and Horticulture, University of Nebraska-Lincoln for at least 5 yr from the date of this release. Infinity CL was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board and BASF Corporation.

Hallam is a hard red winter wheat cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS and released in 2005 by the developing institutions. Hallam was released primarily for its superior adaptation to rainfed wheat production systems in eastern Nebraska. The name Hallam was chosen to honor Hallam, NE, a town and its people rebuilding after a tornado.

Hallam was selected from the cross Brule/Bennett//Niobrara that was made in 1992. The F_1 generation was grown in the greenhouse and the F_2 to F_3 generations were advanced using the bulk breeding method in the field at Mead, NE. In 1995, single F_3-derived F_4 rows were planted for the selection. There was no further selection thereafter.

Hallam was evaluated as NE98471 in Nebraska yield nurseries starting in 1999, in the Northern Regional Performance Nursery in 2001 and 2002, and in Nebraska cultivar performance trials in 2002 to 2004. In the Nebraska cultivar performance trials, it appears to be narrowly adapted and performs best in eastern Nebraska. The average Nebraska rainfed yield of Hallam of 4110 kg ha^{-1} (41 environments from 2002 to 2004) was greater than the yields of Wahoo (4030 kg ha^{-1}), Alliance (3880 kg ha^{-1}), and Harry (4000 kg ha^{-1}), but was lower than Millennium (4180 kg ha^{-1}), and Wesley (4210 kg ha^{-1}). In its primary area of adaptation (eastern NE), Hallam (5 environments) has yielded 4540 kg ha^{-1}, which was greater than Wesley (4150 kg ha^{-1}), Millennium (4250 kg ha^{-1}), Wahoo (3940 kg ha^{-1}), and Alliance (3900 kg ha^{-1}). Hallam was tested in the Northern Regional Performance Nursery in 2001 and 2002. It ranked 14^{th} of 30 in 2001 (12 environments) and 4^{th} of 25 entries in 2002 (13 environments) and averaged 100 kg ha^{-1} more grain yield than Nekota. Hallam is not recommended for irrigation where

other wheat cultivars with superior performance, especially with better straw strength (described below), would be recommended.

Other measurements of performance from comparison trials show that Hallam is moderately early in maturity (142 d after Jan.1, data from observations in NE), about 2.5 d and 1.2 d later flowering than Millennium and 'Wesley', respectively. Hallam is a semi-dwarf wheat cultivar. The mature plant height of Hallam (86 cm) is 3 cm shorter than Millennium and 6 cm taller than Wesley. Hallam has moderate straw strength (45% lodged), similar to Wahoo (46% lodged), but worse than Wesley (34% lodged) in those environments where lodging was found. The winter hardiness of Hallam is good to very good, similar to Abilene and comparable to other winter wheat cultivars adapted and commonly grown in Nebraska.

Hallam is moderately resistant to stem rust (caused by *Puccinia graminis Pers.: Pers. f. sp. tritici* Eriks & E. Henn; most likely containing *Sr6* and *Sr24*; data provided by Y. Jin at the USDA Cereal Disease Laboratory), stripe rust (caused by *P. striiformis* Westendorp f. sp. t*ritici,* data obtained from field observations in NE), and Hessian fly (*Mayetiola destructor* Say, data provided by J. Hatchett and Ming-Shun Chen, USDA and Kansas State University). It is moderately susceptible to leaf rust (caused by *P. triticina* Eriks, data obtained from field observations in NE). It is susceptible to wheat soilborne mosaic virus and barley yellow dwarf virus, but may contain a low level of tolerance to wheat streak mosaic virus (data obtained from the Uniform Winter Wheat Northern Regional Performance Nursery, 2000-2001 and field observations in NE).

Hallam is a genetically lower in grain volume weight (74.0 kg hl^{-1}), which is lower than Millennium (76.5 kg hl^{-1}) and Wesley (74.6 kg hl^{-1}), and Alliance (75.7 kg hl^{-1}), but similar to Wahoo (74.1 kg hl^{-1}).

The milling and baking properties of Hallam were determined for six years by the Nebraska Wheat Quality Laboratory. In these tests, Arapahoe (4 years) and Millennium (2 years) were used as check cultivars. The average wheat and flour protein content of Hallam (133 and 121 g kg^{-1}) was lower than Arapahoe and Millennium for the corresponding years. The average flour extraction on the Buhler Laboratory Mill for Hallam (711 g kg^{-1}) was higher than Millennium and similar to Arapahoe for the corresponding years. The flour ash content (40 g kg^{-1}) was lower than Millennium and Arapahoe for the corresponding years. Dough mixing properties of Hallam were acceptable, slightly stronger than Millennium and slightly weaker than Arapahoe. Average baking absorption (605 H_2Og kg^{-1}) was less than Millennium and Arapahoe for the corresponding years. The average loaf volume of Hallam (947 cm^3) was greater than Millennium and Arapahoe for the corresponding years. The scores for the internal crumb grain and texture were good to very good, which was better than Millennium and Arapahoe. The overall end-use quality characteristics for Hallam is superior to the commonly grown wheat cultivars and should be acceptable to the milling and baking industries.

In positioning Hallam, based on performance data to date, it should be well adapted to most rainfed wheat production systems in eastern Nebraska. Being a narrowly adapted wheat line may explain its above average to very good performance in the Northern Regional Performance Nursery. Where it is adapted, Hallam should be a good replacement for Arapahoe, as it has a higher yield potential and similar or superior disease and insect resistances. Hallam **is** genetically complementary to Wesley and 2137. It is non-complementary to Arapahoe, Culver, Millennium, Wahoo, and Niobrara.

Hallam is an awned, white-glumed cultivar. Its field appearance is most similar to Niobrara and Brule. After heading, the canopy is moderately closed and inclined to nodding. The flag leaf is erect and twisted at the boot stage. The foliage is dark green with a light waxy bloom on the flag leaf, leaf sheath, and spike at anthesis. The leaves are pubescent with very short hairs. The spike is tapering in shape, narrow, mid-long to long, and middense. The glume is midlong and narrow, and the glume shoulder is narrow to midwide and square. The beak is medium in length with an acuminate tip. The

spike is inclined to nodding at maturity. Kernels are red colored, hard textured, and mainly elliptical in shape. The kernel has no collar, a large brush of short length, rounded cheeks, large germ, and a narrow and middeep crease.

Hallam has been uniform and stable since 2001. Less than 0.5 % of the plants were rogued from the Breeder's seed increase in 2001. The rogued variant plants were taller in height (10 - 15 cm) or were awnless 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 had foundation seed available to qualified certified seed enterprises in 2002. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. The Registered seed class will be a nonsalable seed class. 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 corresponding author and the Department of Agronomy and Horticulture, University of Nebraska-Lincoln for at least 5 yr from the date of this release. Hallam was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board.

III. FIELD RESEARCH

1. Increase of New Experimental Lines

Based on last year's results and our recent releases, we have decided to increase one line, NE99495. NE99495 is a hard red winter wheat with the pedigree Alliance/Karl 92. The cross was made in 1993. NE99495 is an F_3-derived line that was selected in the F_4 generation. The F_1 generation was grown in the greenhouse in 1993-94. The F_2 and F_3 generations were grown in bulk at the Agricultural Research and Development Center at Ithaca, Nebraska in 1995 and 1996, respectively. Random heads were chosen from the F_3 bulk and planted as head rows, which were harvested in 1997. The F_3-derived F_5 family was harvested as a single observation plot in 1998. NE99495 was identified in 1999 and was grown at six unreplicated locations in 1997. It has been tested in replicated trials at six to seven locations per year from 2000 to present. In addition, NE99495 was tested in the Northern Regional Performance Nursery in 2002 and 2003, and in Nebraska cultivar performance trials in 2003 and 2004. NE99495 is semidwarf wheat with medium plant height for a semidwarf cultivar and acceptable winterhardiness for production in Nebraska. It is slightly later than Alliance and slightly earlier than Millennium for flowering date. It is susceptible to wheat streak mosaic and wheat soilborne virus and stripe rust; and moderately resistant to Hessian fly and stem rust. It is moderately susceptible to moderately resistant to leaf rust. It has good yield potential and has genetically lower test weight.

With the release of new varieties Antelope, Arrowsmith, Goodstreak, Hallam, Harry, Infinity, Millennium, Nuplains, Wahoo, and Wesley many of the most advanced current breeding lines are not expected to be released.

2. Nebraska Variety Testing

Numerous entries and three seed treatments were included in some or all of the locations in the Fall Sown Small Grain Variety Tests in 2003. Eleven dryland (including one ecofallow) and two irrigated, were harvested for yield data. In 2003, the top ten entries for dryland production were:

Entry	**Yield (bu/a)**	Entry	**Yield (bu/a)**
Jagalene	**57.1**	Harry	**52.1**
Blend #10	**55.1**	Infinity CL	**51.8**
NuHills	**54.6**	NE99495	**51.7**
2137	**53.8**	Trego	**51.6**
W99-194	**52.6**	Wesley	**51.6**

In 2003, the top ten entries for dryland production were:

Entry	**Yield (bu/a)**	Entry	**Yield (bu/a)**
Wahoo	**64.2**	NuFrontier	**62.3**
Millennium	**63.4**	Harry	**62.3**
Wesley	**62.9**	NW99L7068	**62.2**
Jagalene	**62.5**	Trego	**62.0**
NH01046	**62.5**	NW99L7083	**61.6**

In 2002, the top ten entries for dryland production were:

Entry	**Yield bu/a**	Entry	**Yield bu/a**
Jagalene	**50.65**	NE98439	**46.85**
Trego	**48.07**	2137	**46.50**
NE97426	**47.49**	NE97638	**45.84**
Millennium	**47.28**	Alliance	**45.70**
NE98471	**47.03**	Wahoo	**45.45**

Of the released lines tested in all dryland locations, Turkey (37.6 bu/a), as expected, and NW97S218-lt (38.2 bu/a) had the lowest grain yields. These yield levels are higher than the state average yield indicating our nurseries tend to be on better production areas than many parts of the state.

3. Irrigated Wheat Trials:

A major improvement in our irrigated trials occurred in 1999 with the coordination of irrigated testing between Nebraska and Wyoming (thanks to Drs. D. Baltensperger and J. Krall). Because we believe that irrigated wheat production will increase in Nebraska, a third irrigated nursery site was added in Southwest Nebraska in cooperation with Drs. Bob Klein and Len Nelson. The additional site should prove invaluable in helping identify lines adapted to Nebraska's irrigated wheat production environments. The top ten lines for 2004 in Nebraska and Wyoming were:

Entry	Yield bu/a	Entry	Yield bu/a
Yumar	121.2	NW99L7068	115.2
NW97S139-1	120.4	Blend #10	113.9
NI03427	117.9	Halt	113.5
NW98S097	116.0	NuHorizon	113.3
Wesley	115.7	NE97V121	112.9

The top ten lines for 2003 were:

Entry	**Yield (bu/a)**	Entry	**Yield (bu/a)**
	bu/a		**bu/a**
Wesley	**97**	Antelope	**93**
NuFrontier	**96**	2145	**93**
NI02402	**94**	NE97V121	**92**
Jagalene	**94**	Wahoo	**90**
NH01046	**93**	Halt	**89**

The top ten lines for 2002 were:

Entry	Yield	Entry	Yield
	bu/a		bu/a
Dumas	98	Yumar	93
NW97S278	97	Lakin	93
Jagalene	96	NE97V121	92
NI01824	94	Wesley	92
NI01808	94	NI01823	92

The irrigated data this year showed the benefits of having a dedicated irrigated wheat development nursery. One of the top ten lines 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.

As in the past, we have an experimental line irrigated nursery. The nursery 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. Of the check varieties, Jagalene performed well. As in the past Wesley performed very well. A number of experimental lines also performed well. One concern that we have is that relatively few lines seem to perform well for two consecutive years in the irrigated trials. As such, we have decided to rely more on the combined analysis over locations. In addition, we may have had too few replications to give a sufficiently precise estimate of the variety yield. As such, beginning in 2005 we changed the nursery from 50 lines and 2 replications to 40 lines and 3 replications. The total number of plots changed from 100 to 120, but the lines will be more accurately evaluated. The data for the 2004 nursery is:

					----------bu/a----------					bu/a		bu/a	
VARIETY	HD04L	HT04L	Dis.	Lodg.	Lincoln	N. Platte	Hemming.	St. Avg	**Rank**	Sidney	**Rank**	St. Avg.	Rank
	May	(in)						Dry		Irr.			
NI01824	10.5	33.5	5.5	1.0	89.48	62.10	60.30	70.6	**11**	97.3	**43**	77.3	**26**
NI03415	13.5	34.0	7.5	1.0	67.88	53.45	60.05	60.5	**47**	99.9	**41**	70.3	**47**
NI03418	14.0	33.0	5.0	1.0	92.65	54.38	59.08	68.7	**16**	104.8	**33**	77.7	**20**
NI03419	14.0	33.0	5.5	0.0	82.23	55.90	54.50	64.2	**40**	107.5	**24**	75.0	**38**
NI03424	14.0	35.5	4.5	0.5	94.23	53.53	53.53	67.1	**28**	92.8	**47**	73.5	**39**
NI03426	14.5	34.0	5.0	0.0	94.30	54.75	52.83	67.3	**27**	105.6	**30**	76.9	**29**
NI03427	18.0	37.0	4.0	1.0	95.55	67.20	57.03	73.3	**4**	110.8	**18**	82.6	**9**
NI03434	16.5	38.0	4.5	0.5	88.40	50.78	47.25	62.1	**46**	101.7	**37**	72.0	**44**
NI04401	16.0	32.0	6.5	0.0	80.58	62.55	59.05	67.4	**25**	103.6	**35**	76.5	**30**
NI04402	18.0	31.0	6.0	0.0	66.83	46.20	50.15	54.4	**50**	100.5	**40**	65.9	**50**
NI04403	18.5	34.0	4.5	0.0	91.13	49.83	51.50	64.2	**41**	112.1	**12**	76.2	**32**

NI04404	17.5	39.5	5.5	1.0	82.33	49.85	55.60	62.6	**45**	88.4	**49**	69.1	**49**
NI04405	17.0	39.0	5.5	1.0	79.78	57.80	54.38	64.0	**43**	96.4	**44**	72.1	**43**
NI04406	17.5	35.0	5.0	0.0	80.78	56.63	61.08	66.2	**33**	106.6	**27**	76.3	**31**
Jagalene	16.0	32.5	4.0	0.0	90.78	61.93	61.98	71.6	**9**	124.5	**1**	84.8	**2**
NI04407	17.5	33.5	5.5	0.0	77.05	55.83	63.15	65.3	**37**	105.4	**31**	75.4	**35**
NI04408	18.5	35.5	4.5	0.0	84.85	57.53	60.73	67.7	**23**	108.9	**22**	78.0	**18**
NI04409	18.0	35.5	5.5	0.5	97.08	63.13	57.68	72.6	**6**	117.9	**3**	83.9	**5**
NI04410	18.0	33.5	7.0	0.0	78.30	55.23	63.28	65.6	**36**	93.8	**46**	72.7	**40**
NI04411	18.5	32.5	4.0	0.0	96.60	70.68	60.13	75.8	**2**	106.6	**28**	83.5	**6**
NI04412	18.5	37.5	3.0	0.5	99.83	61.00	60.03	73.6	**3**	117.3	**4**	84.6	**4**
NI04413	19.5	40.0	4.5	0.0	96.88	51.98	52.23	67.0	**29**	99.4	**42**	75.1	**36**
NI04414	17.0	36.0	5.0	0.0	98.70	62.38	56.00	72.4	**7**	115.0	**8**	83.0	**7**
NI04415	19.0	37.0	4.5	0.5	88.10	51.33	52.53	64.0	**42**	89.8	**48**	70.4	**46**
NI04416	17.5	37.0	4.5	0.0	104.33	48.58	55.73	69.6	**13**	107.0	**26**	78.9	**14**
NI04417	18.0	35.0	5.0	0.5	84.33	59.38	60.10	67.9	**22**	100.7	**39**	76.1	**33**
NI04418	12.0	37.5	5.5	1.0	84.20	58.63	59.33	67.4	**26**	85.6	**50**	71.9	**45**
NI04419	13.0	32.5	7.0	1.5	88.10	64.05	59.55	70.6	**12**	114.0	**10**	81.4	**10**
NI04420	13.0	35.0	5.5	1.0	94.45	56.25	65.53	72.1	**8**	115.4	**6**	82.9	**8**
Antelope	17.0	35.5	6.0	0.0	78.78	43.75	68.10	63.5	**44**	109.8	**20**	75.1	**37**
NI04421	16.5	36.0	6.0	0.5	96.50	67.45	71.45	78.5	**1**	115.4	**7**	87.7	**1**
NI04422	17.0	35.5	5.0	0.0	86.63	49.50	64.13	66.8	**30**	107.4	**25**	76.9	**28**
NI04423	12.0	35.5	6.0	1.0	84.23	60.73	61.18	68.7	**15**	104.2	**34**	77.6	**22**
NI04424	18.0	32.5	6.0	0.0	71.98	47.03	57.95	59.0	**49**	112.3	**11**	72.3	**42**
NI04425	16.0	32.0	5.5	0.0	91.63	48.80	57.08	65.8	**35**	112.1	**13**	77.4	**24**
NI04426	14.0	35.5	5.5	0.5	100.28	43.58	59.18	67.7	**24**	110.2	**19**	78.3	**17**
NI04427	13.0	33.5	5.0	0.0	89.45	50.55	64.78	68.3	**18**	115.6	**5**	80.1	**12**
NI04428	13.5	33.0	6.5	0.0	96.48	55.23	60.78	70.8	**10**	111.8	**14**	81.1	**11**
NI04429	13.5	33.0	6.5	0.0	93.78	50.70	59.43	68.0	**21**	105.2	**32**	77.3	**27**
NI04430	18.0	34.5	4.5	0.5	93.78	50.28	54.85	66.3	**32**	114.4	**9**	78.3	**16**
NI04431	19.5	34.0	4.5	1.0	84.45	49.80	59.08	64.4	**39**	110.8	**17**	76.0	**34**
NI04432	18.5	36.5	4.0	1.0	98.38	52.33	55.18	68.6	**17**	111.5	**16**	79.3	**13**
NI04433	16.0	37.0	4.5	0.5	74.88	48.90	55.83	59.9	**48**	101.4	**38**	70.3	**48**
NI04434	17.0	37.0	5.5	0.5	96.53	44.05	58.80	66.5	**31**	109.8	**21**	77.3	**25**
Wesley	17.0	33.5	4.0	0.0	94.38	47.20	56.83	66.1	**34**	111.6	**15**	77.5	**23**
NI04435	17.0	35.5	5.0	1.0	98.03	47.08	63.10	69.4	**14**	103.1	**36**	77.8	**19**
NI04436	14.0	36.0	6.0	0.0	96.88	59.60	62.78	73.1	**5**	119.6	**2**	84.7	**3**
NI04437	18.0	39.5	5.5	1.0	88.40	52.40	53.05	64.6	**38**	95.8	**45**	72.4	**41**
NI04438	17.0	35.0	6.0	0.0	91.33	53.88	59.58	68.3	**19**	108.8	**23**	78.4	**15**
NI04439	12.0	37.5	5.0	1.0	97.43	48.75	57.85	68.0	**20**	106.5	**29**	77.6	**21**
Average	**16.1**	**35.5**	**5.2**	**0.5**	**91.4**	**52.8**	**59.4**	**67.9**		**108.0**		**77.9**	

The results for 2003 are:

			Linc.	N. Platte	Sidney						
VARIETY	Hdate	YRUST	Yield	Yield	Yield	Rank	Height Avg.	Yield Avg. Dry	Rank	Yield Avg.	Rank
			bu/a	bu/a	bu/a		in.	bu/a		bu/a	
NI02402	21.00	9	78.68	68.13	104.73	2	32.75	73.41	16	83.85	6
NI02401	22.50	4	93.60	65.80	68.15	45	31.50	79.70	7	75.85	21
NI02414	21.00	3	87.60	51.53	82.51	26	33.00	69.57	25	73.88	28
NI02416	21.00	9	67.28	57.43	72.72	42	33.00	62.36	34	65.81	41
NI02418	21.50	5	76.20	62.35	73.20	41	35.25	69.28	26	70.58	32
NI02419	27.00	9	45.35	67.60	97.58	7	32.00	56.48	43	70.18	33
NI02420	24.50	8	66.38	66.75	91.91	13	32.00	66.57	27	75.01	23
NI02422	21.00	9	79.18	52.10	77.90	37	30.75	65.64	28	69.73	34
NI01828	27.00	2	82.73	64.23	89.13	18	32.25	73.48	15	78.70	12
NI01803	20.00	7	79.33	39.73	104.65	3	31.50	59.53	39	74.57	26
NI01824	20.50	1	94.65	70.75	117.04	1	34.75	82.70	3	94.15	1
NI03401	24.50	8	42.15	58.48	81.54	28	33.75	50.32	48	60.72	43
NI03402	20.50	9	76.78	66.73	78.68	35	33.00	71.76	20	74.06	27
NI03403	21.50	9	85.20	66.58	94.97	11	34.25	75.89	10	82.25	8
WESLEY	25.50	1	84.40	75.65	91.68	14	33.25	80.03	6	83.91	5
NI03404	22.00	3	78.05	63.10	96.19	10	35.50	70.58	23	79.11	10
NI03405	28.50	7	63.78	55.80	88.89	19	31.75	59.79	38	69.49	36
NI03406	26.50	8	53.85	53.20	71.46	44	33.75	53.53	46	59.50	47
NI03407	26.50	8	28.15	57.38	78.35	36	29.25	42.77	50	54.63	49
NI03408	21.50	8	69.98	57.93	80.07	33	32.25	63.96	31	69.33	37
NI03409	25.50	8	63.35	52.25	65.17	49	32.75	57.80	41	60.26	44
NI03410	23.00	7	46.00	52.98	57.15	50	32.00	49.49	49	52.04	50
NI03411	22.00	9	50.93	62.70	88.80	20	31.50	56.82	42	67.48	39
NI03412	22.00	9	66.45	49.28	67.92	46	35.00	57.87	40	61.22	42
NI03413	23.50	4	82.40	67.43	85.03	23	36.25	74.92	12	78.29	14
NI03414	27.00	5	64.60	62.23	75.94	40	33.50	63.42	33	67.59	38
NI03415	21.00	6	60.55	70.08	103.59	5	34.50	65.32	29	78.07	15
NI03416	21.00	9	81.53	63.10	87.27	22	35.25	72.32	19	77.30	18
NI03417	21.50	3	84.13	58.25	84.99	24	33.25	71.19	22	75.79	22
NW97S278	27.00	2	57.68	65.30	90.15	17	34.25	61.49	36	71.04	31
NI03418	21.50	1	87.05	66.38	97.27	8	33.75	76.72	8	83.57	7
NI03419	22.50	1	74.88	52.35	104.02	4	32.25	63.62	32	77.08	19
NI03420	27.50		66.28	57.65	94.27	12	32.75	61.97	35	72.73	30
NI03421	21.00	1	77.80	67.73	82.12	27	33.50	72.77	17	75.88	20
NI03422	27.00	7	80.68	66.78	88.40	21	32.00	73.73	14	78.62	13
NI03423	26.50	5	85.53	59.15	76.08	38	31.25	72.34	18	73.59	29
NI03424	25.00	1	90.43	58.70	90.39	15	31.75	74.57	13	79.84	9
NI03425	23.50	8	74.95	68.08	81.03	29	33.00	71.52	21	74.69	25
NI03426	26.00	1	96.53	67.53	90.20	16	33.25	82.03	4	84.75	4
NI03427	26.00	1	98.75	71.95	96.27	9	35.50	85.35	2	88.99	3
NI03428	28.00	3	91.15	60.60	80.19	31	33.25	75.88	11	77.31	17

NI03429	27.00	3	84.43	68.55	80.42	30	28.00	76.49	9	77.80	16
NI03430	26.00	9	66.90	62.83	79.08	34	32.75	64.87	30	69.60	35
NI03431	26.00	9	48.88	60.45	65.23	48	33.00	54.67	45	58.19	48
JAGALENE	23.00	1	104.98	74.48	97.63	6	32.00	89.73	1	92.36	2
NI03432	27.50	5	71.60	69.13	84.11	25	34.00	70.37	24	74.95	24
NI03433	28.00	9	54.40	56.53	67.62	47	28.75	55.47	44	59.52	46
NI03434	23.50	1	96.93	67.08	72.18	43	34.00	82.01	5	78.73	11
NI03435	26.50	9	50.95	51.73	75.97	39	34.00	51.34	47	59.55	45
NI03436	25.50	9	58.58	63.08	80.12	32	33.00	60.83	37	67.26	40

The results for 2002 are:

VARIETY	Linc.	N.Platte	Alliance	Dryland	Dryland	Sidney IR	Test Wt.	State. Avg.	State
	bu/a	bu/a	bu/a	bu/a	rank	bu/a	lbs/bu	bu/a	Rank
NI02401	76.15	50.68	27.03	51.29	18	116.23	59.50	67.52	2
NI02402	95.26	57.77	19.71	57.58	1	108.96	59.00	70.43	1
NI02403	78.99	51.36	18.91	49.75	28	101.70	58.00	62.74	24
NI02404	72.05	46.32	18.47	45.61	46	94.99	61.00	57.96	44
NI02405	74.71	44.90	26.80	48.80	34	100.02	57.50	61.61	31
NI02406	72.53	51.09	28.57	50.73	22	97.23	59.00	62.36	28
NI02407	77.14	48.30	17.42	47.62	39	108.40	60.50	62.82	23
NI02408	77.75	45.85	20.66	48.09	37	107.84	61.50	63.03	20
NI02409	87.44	51.45	17.58	52.16	13	98.90	59.50	63.84	16
NI02410	80.92	44.22	21.27	48.80	35	102.26	58.00	62.17	29
NI02411	75.60	44.56	22.23	47.46	40	99.46	59.50	60.46	39
NI02412	82.95	48.90	24.12	51.99	14	101.70	61.50	64.42	12
NI02413	69.74	38.32	17.90	41.99	49	94.44	59.00	55.10	48
NI02414	79.73	45.47	25.35	50.18	25	105.05	60.00	63.90	15
WESLEY	84.53	53.13	23.65	53.77	6	102.82	59.50	66.03	7
NI02415	82.94	48.04	25.74	52.24	10	84.93	60.00	60.41	41
NI02416	85.90	49.94	23.04	52.96	9	108.41	60.00	66.82	3
NI02417	81.35	50.87	19.61	50.61	24	91.64	59.00	60.87	35
NI02418	86.73	42.15	21.01	49.96	26	105.05	59.50	63.74	17
NI02419	84.99	56.16	11.39	50.85	20	107.28	59.00	64.96	10
NI02420	91.15	46.51	21.79	53.15	8	106.17	59.00	66.41	5
NI02421	86.83	48.99	16.99	50.94	19	96.67	59.00	62.37	27
NI02422	78.14	41.80	25.80	48.58	36	103.94	61.50	62.42	26
NI02423	84.85	52.20	19.49	52.18	12	94.99	60.50	62.88	22
NI02424	64.19	43.60	9.37	39.05	50	92.76	60.00	52.48	50
NI02425	90.55	54.35	23.03	55.98	2	98.35	60.50	66.57	4
NI02426	78.61	57.72	19.03	51.79	16	104.49	56.50	64.96	11
NI02427	88.79	53.66	21.08	54.51	3	79.91	57.00	60.86	36
NI02428	83.44	47.04	19.12	49.87	27	95.55	59.50	61.29	32
ABILENE	83.50	44.85	19.77	49.37	32	102.26	62.00	62.60	25
NI02429	78.29	46.84	15.64	46.92	41	106.17	58.50	61.74	30
NI02430	80.12	51.60	14.77	48.83	33	84.38	61.50	57.72	45

NI02431	84.43	42.43	22.04	49.63	29	92.76	62.00	60.42	40
NI02432	60.62	45.07	22.78	42.82	48	85.49	60.00	53.49	49
NI02433	77.14	40.93	21.89	46.65	42	104.49	58.00	61.11	34
NI02434	79.85	54.61	26.02	53.49	7	93.32	59.00	63.45	19
NI02435	73.37	46.04	16.21	45.21	47	98.35	61.50	58.49	43
NI02436	77.17	46.94	30.94	51.68	17	100.58	58.00	63.91	14
NI02437	79.71	45.06	14.82	46.53	43	99.46	59.50	59.76	42
NI02438	69.69	43.35	24.24	45.76	45	85.50	56.50	55.70	47
NI02439	76.38	46.64	19.89	47.64	38	87.17	62.00	57.52	46
NI01808	84.71	53.73	24.15	54.20	4	93.32	55.50	63.98	13
NI01828	82.48	46.71	23.14	50.78	21	110.64	61.00	65.74	9
NI01803	75.74	41.84	21.02	46.20	44	104.49	60.00	60.77	38
2137	83.93	53.19	24.88	54.00	5	103.37	59.50	66.34	6
NI01812	77.85	57.17	17.00	50.67	23	100.02	57.00	63.01	21
NI01823	75.40	47.23	25.48	49.37	31	94.99	60.00	60.78	37
NI01824	84.55	49.03	22.13	51.90	15	107.84	62.00	65.89	8
NI99416	76.22	51.43	28.92	52.19	11	97.79	59.00	63.59	18
NI98436	78.30	47.84	22.07	49.40	30	96.67	58.50	61.22	33
CV	6.14	5.97	15.72			7.22	1.51		
LSD	8.23	4.84	5.61			12.00	1.51		

In 2004, 12 lines were continued for further testing in the irrigated nursery and 10 lines were advanced to the Nebraska Triplicate Nursery (NTN). In 2003, 8 lines were continued for further testing in the irrigated nursery and 5 lines were advanced to the NTN. In 2002, 12 lines were continued for further testing in the irrigated nursery and 4 lines were advanced to the NTN. Two samples were received from 2003 Irrigated Dry Studies in the Nebraska Wheat Quality Laboratory. 1) NI02425 was submitted with the 2003 Triplicate Nursery. The Buhler Mill flour yield was good with a 73% flour extraction. Flour protein was 11.0% (reported on 14-moisture base). The dough was noted to be sticky when removed from the mixer, and the bread texture was noted to be "gummy". Both of these are undesirable quality traits. The bread quality scores were external characteristics: Good-, Crumb grain structure: Good- and Texture: Fair+.2) NI01828 was submitted with the 2003 NIN sample group. This entry had desirable quality characteristics. Buhler Mill flour yield was 71.7% extraction. Flour protein was 12.9%. The loaf volume was 945cc (good), and bread score for crumb grain structure was Very good-. The bread texture score was Good+. This appears to be a promising line for quality.

4. Nebraska Intrastate Nursery:

The 2004 Nebraska Intrastate Nursery (NIN) was planted at eight locations (Lincoln, Clay Center, North Platte, Sidney, Alliance, Mead, Julesburg, CO, and Winner SD) and harvested at seven locations (Julesburg was lost). As a cost savings, Lincoln had four replications, but all other trials had three replications, except Winner, which had two replications. Dr. Amir Ibrahim grew and harvested the trial at Winner, SD and we are thankful for his cooperation. The 2004 data are listed below:

VARIETY	Linc	Mead	C.Center	N.Platte	Sidney	Alliance	STAVG04	St. Rank	Winner, SD	TWT
WESLEY	91.71	23.79	70.20	60.93	50.00	54.18	58.47	38	39.9	53.2
ALLIANCE	95.56	30.35	63.12	64.39	49.95	49.40	58.80	33	45.0	57.6

N97V121	95.51	30.03	71.57	66.18	56.58	54.03	62.32	10	45.8	54.2
Hallam	**100.68**	**36.71**	**70.86**	**54.27**	**49.43**	**46.06**	**59.67**	**27**	42.7	55.6
NE99464	84.76	29.78	64.93	61.29	51.57	50.21	57.09	44	42.8	54.8
NE99495	96.65	35.82	50.80	62.52	54.86	51.60	58.71	35	32.3	53.9
NE99543	91.82	41.15	60.17	59.47	51.05	53.60	59.54	28	40.8	58.5
NE00403	86.62	30.99	59.97	55.92	53.21	55.01	56.95	45	47.2	55.1
NE00564	92.83	23.45	60.77	49.32	55.27	53.69	55.89	50	36.5	53.4
NE00633	87.97	26.78	67.12	64.36	51.14	49.43	57.80	42	39.2	56.9
NE00658	91.63	28.56	41.28	58.53	53.14	49.69	53.81	54	44.0	56.5
NE01422	100.73	41.79	78.05	49.23	48.62	47.61	61.01	16	53.1	57.4
NE01481	105.84	29.96	62.29	56.16	49.12	47.64	58.50	37	46.5	55.7
NE01508	85.37	25.10	83.52	58.08	53.59	46.96	58.77	34	25.4	53.7
NE01533	97.81	39.71	76.41	49.71	50.69	45.62	59.99	24	49.4	57.7
NE01603	98.53	29.91	70.92	71.68	46.65	48.34	61.01	17	45.5	58.6
NE01550	91.74	28.79	66.90	63.42	47.93	53.09	58.65	36	39.4	57.3
NE01604	95.86	41.15	66.26	61.39	56.70	59.71	63.51	7	42.7	55.8
NE01564	98.82	36.19	52.05	56.37	52.81	53.66	58.32	41	49.1	56.3
NE01643	93.92	34.63	75.34	60.39	51.91	56.75	62.16	12	57.4	58.0
NE01709	90.75	31.40	72.62	55.99	47.72	48.10	57.76	43	41.7	56.0
NI01828	96.71	16.82	54.66	53.08	50.78	45.03	52.85	56	38.9	55.0
NE99533-3	83.35	23.53	47.43	64.12	54.38	59.28	55.35	52	38.2	53.5
NE99533-5	83.00	18.12	61.86	61.17	55.69	53.26	55.52	51	45.1	59.2
NE99656-1	104.93	28.70	58.56	58.37	54.93	50.12	59.27	29	46.8	57.7
NE99489	110.09	28.97	75.67	57.73	51.86	50.87	62.53	9	49.6	55.6
NE99656	102.86	30.60	66.56	60.43	53.93	49.08	60.58	22	48.9	56.7
NE00435	88.30	11.34	63.84	60.55	41.61	54.91	53.43	55	34.7	56.6
HARRY	99.44	34.65	54.14	63.40	58.66	54.62	60.82	20	41.4	52.0
MILLENNIUM	91.76	31.95	71.93	62.50	49.79	50.26	59.70	26	51.7	57.5
WAHOO	101.60	30.14	54.58	63.85	53.49	47.10	58.46	39	53.0	56.0
NE02484	93.92	21.69	79.94	61.05	51.16	52.23	60.00	23	35.6	53.8
NE02495	94.39	48.53	67.45	64.97	52.84	57.71	64.32	4	44.5	55.9
NE02496	91.46	37.67	78.86	54.19	53.65	50.81	61.11	14	40.0	52.0
NE02513	93.50	36.09	69.18	57.56	52.75	55.50	60.76	21	44.1	58.3
NE02528	91.89	35.33	63.62	61.75	53.78	59.91	61.05	15	42.0	58.2
NE02533	102.03	28.46	68.45	63.78	53.60	57.32	62.27	11	47.1	56.8
NE02545	91.83	28.90	52.95	55.79	50.17	47.82	54.58	53	45.2	56.4
NE02549	95.24	30.46	62.45	61.55	55.49	54.04	59.87	25	58.7	58.9
NE02558	103.94	47.39	70.37	61.26	53.22	56.23	65.40	2	58.3	58.2
NE02584	99.26	37.18	83.17	70.23	57.11	59.91	67.81	1	51.9	59.5
NE02588	102.54	33.40	66.81	63.84	50.07	49.97	61.11	13	51.0	55.1
NE02592	106.29	40.35	63.87	59.98	52.29	43.30	61.01	19	53.5	57.6
NE02647	88.61	14.61	66.57	57.89	44.52	43.05	52.54	57	36.9	54.0
NE02672	96.75	23.32	62.20	57.60	55.90	41.99	56.29	48	43.5	55.1
NI02425	96.54	39.36	82.50	59.06	57.98	54.88	65.05	3	43.6	55.1
Infinity CL	**103.62**	**35.86**	**70.38**	**63.00**	**55.46**	**57.42**	**64.29**	**5**	45.3	58.3
NE02465	97.68	22.17	79.25	54.63	47.09	53.72	59.09	31	19.9	49.8
NE02501	86.28	34.54	71.39	55.67	51.70	53.50	58.85	32	38.5	56.3

NE02512	82.86	28.99	37.30	52.12	45.16	48.39	49.14	60	37.0	58.1
NE02532	95.27	37.81	82.27	63.93	50.25	55.41	64.16	6	49.8	58.0
NH01036	95.60	33.07	79.83	59.20	51.24	47.11	61.01	18	43.4	54.4
NH01037	100.30	27.44	74.67	50.50	51.96	49.81	59.11	30	39.7	53.8
NH01048	97.60	26.88	67.16	53.52	56.04	49.23	58.41	40	52.3	55.4
NH01049	92.16	19.54	72.24	55.52	50.39	45.73	55.93	49	37.6	51.5
NH01042	87.45	20.98	71.59	60.11	50.67	47.83	56.44	47	45.1	54.4
CHEYENNE	86.33	22.98	51.71	50.21	50.00	46.40	51.27	58	46.3	56.4
SCOUT66	75.40	25.07	47.97	52.19	48.71	46.51	49.31	59	44.0	59.7
PRONGHORN	93.03	21.53	61.20	55.91	50.60	57.96	56.71	46	41.2	57.2
GOODSTREAK	100.98	40.64	67.83	57.05	54.67	56.06	62.87	8	50.3	57.8
GRAND MEAN	**94.66**	**30.52**	**66.13**	**58.98**	**51.93**	**51.48**	**58.95**		**44.02**	
CV	4.33	11.44	9.65	8.32	5.85	6.99			13.8	
LSD	4.80	4.72	8.64	6.65	4.11	4.87			9.8	

With the exception of Mead where we had a very unexpected wheat streak mosaic virus infection, all nurseries would be considered as being average to above average for the conditions. In particular, the nursery at Lincoln was very good. Goodstreak and the proposed release Infinity CL performed very well among the "released" varieties, but a number of excellent experimental lines are progressing well towards future release.

Sixty entries were received from the 2003 NIN and 2003 NTN at the Nebraska Wheat Quality Laboratory for large-scale analyses. Fifty-one were experimental lines. Nine samples were released varieties. These varieties are grown as checks to compare performance with experimental entries. Evaluating these released lines also provides a continuous monitoring of their quality in varying growing conditions. The varieties were Wesley, Alliance, Harry, Millennium, Wahoo, Goodstreak, Scout 66, Pronghorn, and Cheyenne. In the 2003 NIN the following samples were noted for desirable quality characteristics: NE99489, NE99495, and NE99656. All three had note-worthy strong dough properties during bread production process. This is desirable for dough machining and fermentation requirements. The following are bread scores for NE99656: External was: Good+, Crumb Grain Structure and Texture were both: Very Good . One entry from the 2003NTN was noted to have promising bread production potential. NE02528 had strong dough characteristics. Although several lines from these nurseries had less desirable performance, no lines were specifically recommended to be dropped.

Twenty-eight experimental were retained for continued testing in the 2004 NIN. Nine released varieties (if you include Hallam and Infinity CL) were also retained to represent the primary varieties grown in Nebraska.

Data for 2003 NIN are given below:

					----------Yield----------								
VARIETY	H.date	Height	Dis	Dis	Linc.	Mead	C. Center	N.Platte	Sidney	Julesburg	**Average**	**Rank**	Tst.Wgt
		(in)			bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a		lbs/bu
WESLEY	26.00	31.58	3	BYD	85.39	24.65	74.01	55.95	51.01	63.60	**59.10**	**16**	57.65
ALLIANCE	26.00	31.29	4	BYD	76.43	34.88	65.92	51.58	52.56	74.45	**59.30**	**14**	59.00
HARRY	27.00	32.09	3	BYD	78.98	44.37	63.85	53.56	68.36	69.90	**63.17**	**5**	56.10
NE96737	24.00	32.81	5	TS	77.88	31.09	55.34	58.20	46.61	61.20	**55.05**	**37**	58.40
N97V121	23.67	32.15	6	BYD	74.12	45.70	65.07	62.27	44.64	64.50	**59.38**	**12**	58.80
NE98466	23.67	32.61	4	TS	68.86	29.27	68.11	43.72	46.91	61.30	**53.03**	**45**	58.50

NE98471	26.00	33.52	4	TS	67.63	41.32	74.98	39.93	54.26	66.60	**57.45**	**22**	57.55
NE98632	27.33	33.77	5	YR	66.84	42.01	57.88	50.54	48.54	61.05	**54.48**	**40**	58.60
NI98439	26.67	33.11	3	BYD	72.14	22.30	65.61	54.22	42.04	68.40	**54.12**	**42**	58.90
NE99464	26.33	32.52	1		65.96	36.44	62.83	47.34	64.51	65.60	**57.11**	**24**	59.80
NE99489	27.67	34.83	3	YR	78.72	36.12	67.88	53.63	43.73	56.85	**56.16**	**28**	57.95
NE99495	26.33	33.86	4	TS	77.34	49.12	69.87	54.88	59.44	56.40	**61.18**	**7**	58.70
NE99543	25.00	34.19	5	YR	75.67	50.19	65.07	51.96	43.24	57.65	**57.30**	**23**	58.00
NE99656	26.33	33.15	3	YR	71.30	46.98	65.80	55.15	52.12	54.35	**57.62**	**20**	58.70
NE99579	26.33	32.52	3	TS	72.07	28.21	59.32	53.11	55.31	63.30	**55.22**	**36**	57.75
CULVER	26.33	33.44	5	YR	68.64	33.83	52.34	53.73	46.86	61.60	**52.83**	**47**	58.60
MILLENNIUM	26.67	33.52	1	BYD	84.99	47.27	73.48	58.31	56.47	60.75	**63.55**	**3**	58.30
WAHOO	27.00	33.40	3	TS	80.48	27.45	61.39	57.17	66.96	62.60	**59.34**	**13**	57.95
NE00403	25.33	30.31	5	TS	74.33	32.73	71.42	49.67	48.91	72.55	**58.27**	**18**	59.00
NE00429	21.67	31.33	3	TS	76.24	23.28	64.64	52.29	39.51	55.80	**51.96**	**50**	58.00
NE00435	22.33	31.73	5	YR	68.67	27.42	54.60	47.04	51.26	61.65	**51.77**	**51**	57.55
NE00479	25.33	32.67	1	BYD	87.00	40.05	78.42	44.70	51.36	60.15	**60.28**	**8**	57.00
NE00481	27.33	34.52	2		72.88	32.44	70.18	51.07	49.79	59.65	**56.00**	**32**	58.30
NE00507	25.67	32.88	8	YR, TS	58.98	35.21	47.30	51.70	47.88	56.90	**49.66**	**56**	56.05
NE00544	26.00	35.44	4	BYD	74.29	40.67	60.89	52.76	48.83	59.10	**56.09**	**30**	58.80
NE00564	24.00	32.29	5	YR	83.58	29.52	80.60	50.31	42.92	60.85	**57.96**	**19**	59.00
NE00633	25.33	33.65	5	TS	72.80	36.89	66.22	53.22	49.29	62.05	**56.75**	**25**	58.60
NE00658	26.67	33.92	5	TS	69.09	33.25	41.95	55.09	47.68	61.10	**51.36**	**54**	58.80
NE00679	27.33	33.33	3	TS	71.36	29.55	53.16	42.41	55.30	63.00	**52.46**	**49**	56.65
NE01422	26.00	32.44	3	TS	77.87	39.71	76.14	49.88	55.71	60.40	**59.95**	**9**	58.10
NUPLAINS	28.33	31.69	9	YR	56.45	19.93	50.00	37.27	54.96	48.40	**44.50**	**59**	59.55
NIOBRARA	26.33	35.31	7	YR	56.64	29.99	58.87	49.94	55.06	65.30	**52.63**	**48**	58.95
NE01435	25.33	32.73	3	TS	79.59	22.50	68.49	56.32	36.88	54.00	**52.96**	**46**	59.30
NE01481	25.33	34.13	2	TS	73.50	35.65	78.46	55.62	40.71	65.70	**58.27**	**17**	58.80
NE01506	23.00	32.46	6	YR	76.11	45.18	62.38	40.25	41.61	54.45	**53.33**	**44**	59.00
NE01508	21.67	31.98	6	YR	79.63	36.99	79.51	47.42	52.43	59.45	**59.24**	**15**	59.70
NE01509	22.33	31.38	7	YR	72.91	32.33	53.51	56.16	54.52	57.05	**54.41**	**41**	57.10
NE01533	26.33	33.06	2	YR	86.06	50.34	75.92	58.93	42.19	62.05	**62.58**	**6**	58.85
NE01602	26.00	32.56	3	YR	74.32	35.31	67.04	54.63	46.78	55.80	**55.65**	**33**	58.80
NE01534	23.67	32.17	3	YR	73.26	41.05	64.57	47.75	46.35	56.85	**54.97**	**39**	59.50
NE01603	27.33	32.60	7	BYD, YR	76.64	36.28	67.19	52.14	48.91	55.70	**56.14**	**29**	59.15
NE01550	26.00	33.65	5	YR	80.55	30.84	71.39	49.44	44.59	55.50	**55.39**	**34**	58.85
NE01604	26.00	35.61	4	TS	91.20	52.73	77.34	59.33	45.34	59.40	**64.22**	**2**	59.80
NE01564	26.33	32.98	6	YR	65.72	37.85	62.12	60.30	55.90	54.25	**56.02**	**31**	57.65
NE01552	26.00	33.15	6	YR	83.41	31.52	69.27	46.38	42.93	49.40	**53.82**	**43**	57.75
GOODSTREAK	26.33	35.27	3	TS	85.34	50.60	75.87	51.31	46.41	48.05	**59.60**	**11**	59.50
PRONGHORN	24.00	36.00	3	TS	79.73	31.64	65.67	64.23	44.46	54.05	**56.63**	**26**	58.40
SCOUT66	25.67	35.50	6	TS	63.20	32.55	38.51	40.03	35.97	46.60	**42.81**	**60**	59.15
CHEYENNE	27.33	35.88	6	TS	76.12	32.02	47.60	49.03	44.34	60.05	**51.53**	**52**	59.30
NE01601	26.33	33.02	7	TS	70.65	25.27	65.64	51.63	44.10	51.20	**51.42**	**53**	58.30
NE01643	27.33	34.37	6	YR	87.62	41.42	76.81	62.39	58.59	60.45	**64.55**	**1**	58.50
NE01709	25.33	32.44	2	TS	78.69	29.96	79.61	51.99	41.76	50.20	**55.37**	**35**	58.20

NI01808	28.00	32.19	1		68.17	14.68	60.96	59.03	47.07	41.15	**48.51**	**57**	56.70
NI01828	28.00	32.29	3	YR	79.40	24.24	71.21	52.75	52.16	50.55	**55.05**	**38**	59.60
NE99533-1	26.33	32.88	8	YR	70.33	35.02	61.21	49.06	32.22	51.40	**49.87**	**55**	61.30
NE99533-2	26.67	31.38	8	YR	47.51	24.60	56.53	56.74	45.67	53.50	**47.43**	**58**	60.00
NE99533-3	27.00	32.31	9	YR	67.82	30.46	63.56	54.78	66.94	61.55	**57.52**	**21**	59.05
NE99533-4	26.33	31.19	7	YR	77.63	37.17	73.59	57.76	34.81	56.80	**56.29**	**27**	60.10
NE99533-5	27.00	31.63	3		79.33	32.80	79.29	47.59	59.04	59.70	**59.63**	**10**	60.00
NE99656-1	27.67	33.92	8	YR	69.75	41.84	81.01	69.33	59.11	58.85	**63.32**	**4**	58.75
GRAND MEAN	25.84	**33.08**			**74.30**	**34.91**	**65.62**	**52.42**	**49.23**	**58.68**	**55.86**		**58.58**

Data for 2002 are given below.

NIN 2002			Yield (bu/a)						
VARIETY	Linc.	ClayCen	N.Platte	McCook	Grant	Mead	Alliance	STAVG	STRANK
WESLEY	90.51	78.61	43.56	42.40	25.86	63.15	28.59	53.240	2
ALLIANCE	87.32	67.97	38.92	45.70	28.99	47.44	28.71	49.293	23
NE96737	72.54	71.24	43.07	49.10	24.46	52.86	27.17	48.634	33
GOODSTREAK	84.32	63.27	37.99	46.00	24.43	46.15	26.96	47.017	47
NE98425	84.94	63.73	43.01	47.25	24.89	55.28	26.09	49.313	22
NE97638	85.42	79.48	40.67	41.18	27.75	36.62	28.54	48.523	36
NE97669	83.06	65.24	44.44	44.35	29.25	39.50	26.27	47.444	43
HARRY	85.69	72.02	41.36	35.88	23.40	42.67	26.86	46.840	48
N97V121	96.54	68.61	42.59	35.18	31.66	49.38	27.42	50.197	13
NE97426	88.67	66.13	43.07	39.53	29.69	63.34	27.56	51.141	8
NE98466	82.79	72.26	41.01	37.28	21.37	61.77	25.45	48.847	31
NE98471	85.29	60.07	47.85	37.10	28.30	52.06	24.83	47.929	40
NE98503	70.99	63.87	39.11	39.30	29.39	51.97	29.94	46.367	52
NE98589	86.49	68.46	37.96	39.08	21.45	43.95	26.96	46.336	53
CULVER	79.35	71.86	43.38	46.35	21.06	43.56	26.46	47.431	44
MILLENNIUM	83.32	67.30	43.47	43.23	27.87	50.22	29.57	49.283	24
WAHOO	90.26	69.17	48.47	41.93	26.46	41.52	26.37	49.169	26
ARAPAHOE	77.34	72.77	42.74	43.45	23.07	41.87	28.03	47.039	46
NE98632	89.62	65.69	37.98	50.98	28.06	45.78	25.54	49.093	29
NE98692	89.63	48.31	35.86	49.00	23.99	41.58	26.31	44.954	56
NI98439	86.56	70.62	35.61	49.40	28.90	50.21	24.74	49.434	18
NI98414	81.36	74.56	38.28	40.05	23.48	42.18	26.25	46.594	50
NE99445	78.92	69.26	35.39	48.20	27.73	49.05	27.06	47.944	39
NE99464	81.40	61.09	36.04	46.20	29.49	56.11	33.84	49.167	27
NE99469	86.07	71.26	40.15	46.60	28.18	46.74	19.68	48.383	37
NE99489	85.81	77.76	40.33	42.88	26.28	49.08	25.56	49.671	17
NE99495	86.67	66.21	47.91	45.98	28.72	58.53	23.27	51.041	11
NE99533	83.31	74.86	51.66	47.38	25.19	58.40	27.25	52.579	4
NE99543	84.95	75.10	41.57	38.85	26.94	62.71	27.54	51.094	10
NIOBRARA	81.46	68.78	42.90	43.83	28.05	53.62	27.08	49.389	20
NUPLAINS	88.26	78.94	38.68	36.65	27.64	57.44	21.26	49.839	16
NE99554	89.26	64.53	42.27	38.38	29.96	32.46	26.44	46.186	54

NE99579	79.12	76.48	40.71	49.50	25.20	57.15	23.07	50.176	14
NE99656	89.64	61.91	52.55	46.43	29.51	58.99	24.82	51.979	6
NE00403	85.55	80.99	49.00	47.18	32.20	66.40	29.63	55.850	1
NE00429	92.44	73.51	49.32	46.95	32.54	40.50	25.02	51.469	7
NE00435	88.71	67.92	48.96	50.48	25.76	61.58	26.93	52.906	3
NE00439	78.23	63.28	44.41	46.73	25.40	75.18	24.67	51.129	9
NE00456	77.50	61.22	42.64	43.55	26.36	63.34	30.16	49.253	25
PRONGHORN	78.88	63.69	37.42	42.10	27.86	56.35	26.25	47.507	42
SCOUT66	69.21	51.89	29.52	43.75	20.82	45.27	27.93	41.199	60
NE00469	78.41	56.37	40.20	46.43	26.20	51.01	27.74	46.623	49
NE00479	75.22	79.34	40.66	47.85	19.34	59.61	23.54	49.366	21
NE00481	87.28	64.99	37.34	51.10	25.83	54.61	22.54	49.099	28
NE00507	88.71	72.23	45.16	56.50	28.18	41.70	23.65	50.876	12
NE00525	83.79	67.53	34.65	59.33	24.00	50.33	23.00	48.947	30
NE00544	71.07	60.65	36.52	56.83	24.88	57.80	25.17	47.560	41
NE00556	87.20	71.16	36.16	46.85	19.44	55.44	24.32	48.653	32
NE00564	86.22	65.91	46.10	36.65	30.21	50.09	30.82	49.429	19
NE00611	92.71	60.12	42.99	47.78	28.74	43.57	23.94	48.550	35
NE00616	87.69	67.15	39.50	37.70	25.79	47.86	24.32	47.144	45
NE00624	78.97	71.31	38.89	40.45	29.58	27.32	21.47	43.999	57
NE00633	85.71	66.28	41.33	57.95	28.51	60.70	24.19	52.096	5
NE00639	71.18	67.94	46.25	48.43	25.52	39.89	26.04	46.464	51
NE00658	82.09	65.14	43.11	47.63	23.50	61.63	26.09	49.884	15
NE00679	82.86	59.59	48.09	47.55	28.68	46.43	27.06	48.609	34
NE00687	78.36	56.51	37.27	41.73	28.60	53.58	27.08	46.161	55
NE00698	84.27	66.16	42.62	48.53	20.43	52.29	21.84	48.020	38
CHEYENNE	70.06	44.28	40.49	49.80	22.55	46.38	26.31	42.839	58
BUCKSKIN	68.17	42.23	40.98	44.03	25.41	50.14	26.77	42.533	59
GRAND MEAN	83.12	66.91	41.67	45.14	26.38	51.04	26.13	48.629	

5. Nebraska Triplicate Nursery (NTN):

The same comments about the NIN data apply to the NTN with the exception that it was not planted a Winner, SD. The 2004 data is:

VARIETY	HD AVG	HT. Avg.	Dis.Avg.	Linc.	Mead	Cl. Center	N. Platte	Sidney	Hemming.	St. Avg.	Rank
NW03405	15.0	27.9	5.2	96.94	35.03	78.33	70.85	49.67	61.93	65.46	6
NE03417	15.1	29.9	5.3	89.15	42.12	67.19	60.88	47.88	55.24	60.41	33
NE03424	15.0	30.2	5.9	90.81	36.06	73.88	62.35	54.69	60.02	62.97	11
NE03426	13.8	28.8	5.9	87.36	40.49	59.25	52.62	44.96	58.33	57.17	54
NE03428	15.5	27.3	6.4	93.38	40.06	74.91	50.89	50.39	51.98	60.27	35
NE03432	15.1	29.7	6.4	99.29	32.27	54.59	60.06	54.25	63.39	60.64	32
NE03434	14.8	25.6	6.9	75.49	27.83	49.45	51.18	37.99	55.82	49.63	60
NE03435	17.3	27.1	5.9	96.68	33.00	75.56	62.51	47.42	59.84	62.50	14
NE03439	14.4	28.4	6.1	92.81	31.91	69.35	51.00	50.73	53.47	58.21	49
NE03442	15.0	28.3	5.4	91.01	36.98	67.82	59.84	51.04	54.84	60.26	36

NE03452	13.5	29.3	6.1	80.16	37.17	66.04	53.21	44.09	52.17	55.47	56
NE03454	17.6	27.4	6.7	84.86	30.18	64.96	50.04	43.28	53.21	54.42	58
NE03457	17.7	25.9	5.7	93.01	35.64	71.21	61.06	50.39	60.95	62.04	16
NE03458	17.3	25.8	5.3	95.78	39.80	70.20	72.37	56.11	69.11	67.23	2
NE03473	16.5	26.7	6.7	95.82	30.46	68.13	60.58	55.82	58.52	61.56	22
NE03482	18.1	28.0	5.9	95.74	32.78	61.16	64.57	50.64	59.84	60.79	30
NE03486	18.3	27.5	5.2	102.94	25.23	65.58	64.86	48.01	55.59	60.37	34
NE03488	18.3	27.5	5.1	100.18	37.61	70.45	67.40	49.29	58.77	63.95	8
NE03490	17.5	26.5	5.3	106.62	35.57	64.79	66.31	55.07	65.89	65.71	5
Jagalene	16.5	26.1	4.8	95.77	23.77	78.28	62.65	53.33	51.26	60.84	29
NE03491	16.4	28.1	6.8	98.40	29.31	68.81	62.25	51.68	59.14	61.60	21
NE03511	14.6	27.4	6.8	88.01	31.76	72.43	56.96	49.70	55.35	59.04	41
NE03515	17.4	29.8	6.4	93.97	31.58	58.28	68.13	52.84	56.11	60.15	37
NE03518	16.4	29.1	5.2	100.03	42.30	76.27	59.13	56.56	60.21	65.75	4
NE03520	17.7	31.0	5.1	89.05	32.64	59.71	59.79	48.78	55.14	57.52	53
NE03522	17.3	30.7	5.0	97.81	38.14	59.96	60.50	55.22	60.33	61.99	17
NE03524	17.5	28.0	5.5	89.22	30.03	67.68	59.80	42.65	53.42	57.13	55
NE03531	14.2	27.1	7.5	83.15	35.40	58.54	61.83	50.02	62.21	58.53	45
NE03532	18.7	28.0	5.7	90.88	38.74	55.13	64.02	49.73	56.04	59.09	40
NE03535	18.8	27.6	5.9	97.18	33.05	62.74	60.48	51.16	61.44	61.01	26
NE03580	19.6	28.9	7.2	97.59	25.92	63.79	65.80	52.05	60.81	60.99	27
NE03581	20.5	27.2	5.1	107.77	29.27	54.72	63.92	41.04	59.36	59.35	39
NE03582	20.3	27.9	6.2	93.53	18.24	75.18	61.62	43.93	59.97	58.75	42
NE03595	20.0	28.2	7.0	97.74	21.80	56.00	60.09	49.49	61.34	57.74	51
NH03609	18.4	27.3	6.0	97.00	32.85	78.37	66.55	53.80	58.94	64.59	7
NH03614	16.5	27.0	5.8	99.49	33.81	90.56	69.50	53.74	65.08	68.70	1
NW03621	13.8	27.6	5.0	85.96	39.53	68.22	57.32	45.51	55.07	58.60	44
NW03631	16.7	29.9	7.1	98.66	22.83	63.05	57.65	46.27	61.80	58.38	47
NW03637	17.7	28.8	6.1	95.62	36.67	62.55	63.97	46.41	62.53	61.29	24
Millennium	18.9	30.0	5.0	98.84	29.24	70.62	65.55	55.33	57.39	62.83	12
NW03638	16.3	29.4	5.9	99.07	35.81	68.15	68.06	51.62	57.56	63.38	10
NW03640	17.6	28.7	6.3	92.10	33.18	57.86	63.10	47.89	56.41	58.42	46
NW03642	15.9	28.6	6.7	84.13	27.70	73.85	58.06	48.15	58.01	58.32	48
NE03643	17.7	26.0	6.1	92.79	36.26	77.42	59.10	47.13	57.27	61.66	20
NW03644	18.5	28.7	6.6	82.88	27.21	48.89	60.26	51.23	61.61	55.35	57
NW03647	17.9	30.7	5.9	90.82	22.79	54.58	53.14	44.63	55.30	53.54	59
NW03654	15.1	28.5	5.6	95.61	35.29	56.34	60.61	52.48	65.36	60.95	28
NW03665	18.1	29.3	6.2	99.08	26.03	66.30	61.68	47.73	66.75	61.26	25
NW03666	18.8	28.8	5.8	99.28	32.79	57.10	65.53	51.05	64.62	61.73	19
NW03670	18.1	29.9	6.2	93.54	34.99	69.51	61.46	54.55	62.22	62.71	13
NW03671	17.6	28.3	6.0	93.39	31.74	43.78	61.64	59.53	55.86	57.66	52
NW03681	19.3	28.0	4.9	102.15	39.92	82.37	65.68	51.45	53.33	65.82	3
NW03694	20.9	29.1	6.0	105.91	29.77	64.26	59.93	48.78	55.83	60.75	31
NW03698	21.6	29.1	5.0	98.01	23.31	56.73	64.20	53.10	60.82	59.36	38
NI01824	13.6	27.6	6.4	95.17	33.20	69.31	63.62	52.17	57.17	61.77	18
NI03418	15.3	26.9	6.6	96.25	30.97	76.46	62.26	55.62	58.99	63.43	9

NI03426	17.7	26.8	5.7	98.86	18.88	69.25	64.78	47.90	52.50	58.70	43
NI03427	19.8	26.7	5.3	97.52	23.90	73.73	69.36	48.44	56.03	61.50	23
NI03434	18.4	27.3	5.7	86.56	25.65	81.48	59.28	48.20	46.64	57.97	50
Pronghorn	16.0	29.4	6.2	92.07	38.48	69.64	62.71	50.41	59.97	62.21	15

From the 2003 Duplicate Nursery, fifty-three entries were submitted to the Nebraska Wheat Quality Laboratory for large-scale analyses. This nursery is the initial year with sufficient grain to do large-scale evaluation. The first test is Buhler Milling. Approximately 2.5kg of grain are conditioned to 15.2% moisture content 18-20 hours prior to milling. All samples in this nursery had good to very good flour yield. Some entries had flour yields above 74%. This is very good from the Buhler Mill. These were NE03435, NE03582, NE03609, and NW03681. The flour proteins ranged from 9.3% (NW03644) to 13.6%(NE03424). The protein results are reported on 14% moisture base. Several entries received good to very good bread baking scores for external crumb grain structure, and texture qualities. Among these were: NE03424, NE03435, NE03452 (also noted for bright white color), NE03491, NE03614, NW03637, and NW03670. However, as is to be expected from the first year of bread production analysis, several lines had less-than-desirable performance in the bake tests. NE03644 and NW03694 were noted to be very sticky out of the mixer and during bread production processes. Both also received poor bread quality scores. Additionally,NE03405, NE03426, NE03642, NW03643, NW03647 were all noted for sticky dough handling out of the mixer. Sticky dough properties are an enormous detriment for machining processes in commercial bread production.

In this nursery, the major surprise was that the variety checks ranked only 12 (Millennium), 15 (Pronghorn), and 29 (Jagalene) indicating that a number of very good experimental lines were identified. Nineteen lines were advanced to the 2005 NIN.

The data for 2003 was:

VARIETY	H.date	Height	Linc.	Mead	C.Center	N. Platte	Sidney	Ave.	Rank	SR
NE02423	24.5	31.5	70.1	51.76	65.50	55.71	41.86	56.99	36	2-
NE02427	23.3	39.5	84.8	53.51	46.32	54.55	54.28	58.69	30	2
NE02462	23.5	37.2	79.3	56.21	47.30	53.74	45.85	56.48	37	2,S
NE02463	22.8	36.8	77.8	46.73	75.31	54.70	40.59	59.03	27	2-
NE02464	24.0	36.6	64.3	47.73	47.12	58.69	44.19	52.41	49	2=
NE02465	23.0	35.9	81.5	43.93	70.44	61.39	46.64	60.78	20	23
NE02484	21.0	35.8	85.8	59.26	68.00	61.43	37.90	62.48	15	0
NE02495	25.0	37.3	83.6	57.71	70.49	63.16	46.67	64.33	10	0
NE02496	25.0	35.1	88.4	55.10	80.86	61.15	55.16	68.13	4	0
NE02497	23.2	37.7	79.6	42.29	52.42	61.12	39.83	55.05	43	0
NE02498	23.3	35.6	85.5	54.12	71.58	66.73	58.71	67.33	5	2-
NE02501	21.7	37.0	89.7	55.42	59.39	58.51	49.68	62.54	14	0
NE02504	23.3	39.4	81.5	46.28	66.76	52.74	44.04	58.26	32	2=
NE02511	24.5	37.4	60.8	50.87	37.38	51.93	58.10	51.82	50	2=
NE02512	22.0	36.0	90.9	50.63	60.69	57.71	32.87	58.56	31	;
NE02513	23.5	34.5	99.1	46.11	70.10	70.33	59.48	69.02	2	;
NE02515	22.2	34.8	73.5	43.02	70.30	59.92	40.85	57.52	35	23
NE02528	25.0	36.3	90.0	50.26	68.85	67.01	52.13	65.65	9	0
NE02529	23.3	38.0	60.2	48.82	59.36	62.02	49.72	56.02	39	;

Jagalene	24.3	34.7	91.4	50.50	98.28	66.49	47.00	70.73	1	
NE02530	26.0	37.6	74.4	52.12	56.46	64.67	50.68	59.67	24	2=
NE02532	24.5	34.7	70.4	50.63	65.06	64.76	54.45	61.06	18	2-
NE02533	24.3	38.3	89.9	49.29	87.65	61.76	41.42	66.00	8	---
NE02537	25.0	33.7	71.2	46.83	64.58	57.44	48.49	57.71	34	2
NE02538	26.2	35.4	73.0	46.93	51.86	52.48	47.13	54.28	46	0
NE02541	26.2	35.7	57.5	46.38	29.09	50.15	44.33	45.49	57	23
NE02543	25.3	36.8	31.9	42.74	30.18	53.26	49.00	41.42	59	23
NE02545	26.7	36.3	78.9	50.84	65.45	57.12	54.70	61.40	17	2=
NE02549	27.2	35.8	85.3	46.83	68.24	65.18	49.09	62.93	12	0
NE02558	25.2	37.3	78.3	68.86	57.45	66.17	47.79	63.71	11	2
NE02568	23.3	34.7	71.0	51.16	66.61	63.38	48.68	60.17	22	2=
NE02584	24.2	35.7	91.1	54.66	87.28	64.12	47.14	68.86	3	2=
NE02586	25.3	31.4	73.3	46.62	64.64	63.26	41.74	57.91	33	2-
NE02588	26.8	37.7	89.3	34.65	65.26	65.04	54.73	61.80	16	2=
NE02592	26.5	39.4	88.4	54.24	78.34	63.07	46.71	66.15	7	23
NE02593	27.8	34.6	67.2	43.16	43.95	54.30	44.53	50.63	53	0
NE02594	27.7	34.5	47.6	35.22	31.85	47.44	44.17	41.26	60	23
NE02603	27.3	37.8	60.3	42.86	36.82	49.93	45.59	47.10	55	0
NE02605	26.7	36.7	75.7	45.96	57.39	50.51	48.85	55.68	41	0,S
Pronghorn	23.8	41.2	72.8	35.47	46.08	56.74	44.16	51.05	51	
NE02615	28.3	37.3	85.1	50.55	60.57	59.28	47.27	60.55	21	;
NE02616	28.8	36.4	61.7	44.98	59.57	64.37	47.49	55.62	42	0
NE02629	23.3	34.8	55.0	43.74	43.13	54.00	31.67	45.51	56	0
NE02636	25.7	34.2	70.5	37.74	52.94	59.89	46.23	53.46	48	2
NE02647	22.8	34.4	94.6	49.47	73.67	58.97	28.34	61.01	19	0
NE02648	28.3	34.1	64.9	35.86	39.24	62.78	41.57	48.87	54	0
NE02656	25.2	39.8	72.4	47.82	54.39	63.04	42.22	55.97	40	2-,S
NE02660	27.8	39.5	82.7	49.71	56.71	62.54	46.21	59.57	25	2
NE02662	29.8	37.2	54.9	48.73	48.72	63.63	55.56	54.31	45	2-
NE02665	27.2	34.1	76.9	41.22	70.55	54.27	51.98	58.98	28	;
NE02672	27.2	37.0	80.2	37.80	68.38	69.55	56.87	62.56	13	0
NE02680	30.2	33.2	55.1	33.42	28.58	52.97	42.85	42.58	58	0,2=
NE02683	26.7	36.3	83.6	44.76	67.70	60.54	37.84	58.89	29	2
NI02402	23.7	36.3	76.8	42.89	55.36	64.00	43.00	56.41	38	
NI02425	24.2	36.3	86.0	58.52	71.58	63.72	52.54	66.47	6	
NI02427	26.8	35.0	65.1	27.80	58.06	61.09	42.81	50.97	52	
NI01808	28.0	34.9	74.9	32.75	45.03	64.07	52.05	53.76	47	
NH01045	25.2	38.1	62.2	53.70	50.14	56.33	51.18	54.71	44	1
NH01046	28.2	37.7	66.5	51.29	63.62	66.95	52.21	60.11	23	3
Wesley	26.5	34.2	80.5	42.30	69.11	58.84	45.36	59.22	26	
Mean	**25.3**	**36.2**	**75.2**	**47.2**	**59.6**	**59.8**	**46.9**	**57.8**		

The data for 2002 are:

	----------yield (bu/a)----------									
VARIETY	Linc.	Mead	Clay C.	N.Platte	McCook	Sidney	Alliance	Grant	STAVG	STRANK
NE01417	63.58	44.09	58.32	17.70	42.40	20.52	18.86	28.81	36.785	59
NE01422	74.34	65.25	78.15	35.66	45.70	30.34	22.75	27.42	47.451	4
NE01431	73.26	63.75	74.50	26.29	49.10	21.26	20.05	27.61	44.478	22
NE01434	63.92	60.35	65.72	37.84	46.00	20.50	19.26	22.61	42.025	36
NE01435	64.07	67.17	66.17	36.68	47.25	23.82	28.79	27.26	45.151	17
NE01453	62.46	67.01	52.01	36.26	41.18	13.42	21.84	12.97	38.394	54
NE01458	58.00	55.17	74.90	34.09	44.35	16.05	23.18	26.91	41.581	40
NE01459	65.47	53.88	75.42	36.05	35.88	18.11	20.70	25.36	41.359	41
NE01463	64.76	46.11	62.68	34.27	35.18	17.04	18.50	22.96	37.688	58
NE01466	66.61	51.29	65.59	34.12	39.53	18.74	18.57	18.73	39.148	53
NE01468	61.84	45.81	63.75	33.58	37.28	16.89	20.38	23.54	37.884	56
NE01469	66.43	39.55	62.52	38.60	37.10	18.71	20.10	21.65	38.083	55
NE01472	66.30	50.15	61.42	34.27	39.30	18.24	18.69	24.95	39.165	52
NE01473	66.49	51.35	63.71	35.43	39.08	17.54	19.76	25.65	39.876	50
ALLIANCE	76.82	67.72	66.64	33.27	46.35	21.76	22.95	25.74	45.156	16
NE01474	69.22	53.27	66.07	34.62	43.23	19.46	18.88	21.65	40.800	46
NE01475	68.39	59.42	53.98	35.06	41.93	20.05	16.47	27.22	40.315	47
NE01479	60.18	53.09	61.79	18.98	43.45	21.21	20.76	23.15	37.826	57
NE01481	75.51	70.84	71.53	36.36	50.98	25.60	24.12	22.49	47.179	6
NE01482	70.79	63.49	58.00	25.12	49.00	22.56	23.39	23.69	42.005	37
NE01483	68.02	63.23	56.57	26.79	49.40	20.78	24.24	28.56	42.199	35
NE01484	72.40	48.92	64.64	31.20	40.05	18.89	18.95	25.95	40.125	49
NE01485	75.93	68.81	57.56	20.03	48.20	25.11	24.51	27.58	43.466	26
NE01490	73.38	54.90	61.05	35.86	46.20	19.01	24.62	26.37	42.674	30
NE01502	58.72	62.21	73.00	23.35	46.60	11.52	18.54	21.87	39.476	51
NE01504	74.12	64.21	49.06	30.68	42.88	21.47	28.20	28.13	42.344	34
NE01506	69.33	69.73	64.94	30.69	45.98	27.98	20.41	28.01	44.634	21
NE01507	72.41	65.21	75.61	25.11	47.38	27.00	19.99	27.15	44.983	20
NE01508	72.63	75.16	80.29	31.15	38.85	15.57	22.46	24.18	45.036	19
PRONGHOR	66.81	55.01	58.12	25.45	43.83	28.73	21.64	28.54	41.016	43
NE01509	84.77	57.03	68.57	34.58	36.65	13.85	22.35	26.43	43.029	28
NE01532	68.11	70.51	60.62	24.65	38.38	15.91	19.18	24.19	40.194	48
NE01533	68.34	77.09	73.35	24.93	49.50	23.61	15.92	29.78	45.315	15
NE01534	79.65	70.63	71.96	33.24	46.43	18.34	19.30	29.13	46.085	13
NE01550	66.74	71.83	71.10	42.80	47.18	22.15	24.72	33.02	47.443	5
NE01551	77.20	67.17	62.18	32.90	46.95	21.39	19.88	23.79	43.933	24
NE01552	61.04	59.37	78.18	36.64	50.48	19.76	24.07	31.35	45.111	18
NE01553	62.16	60.35	64.99	30.76	46.73	15.22	21.98	25.22	40.926	44
NE01564	77.32	67.06	75.30	39.58	43.55	25.75	20.04	26.89	46.936	8
NE01581	64.01	69.46	64.13	27.77	42.10	19.27	22.10	26.36	41.900	38
NE01582	63.76	62.33	72.06	24.93	43.75	29.07	20.59	22.58	42.384	33
NE01583	70.24	58.56	65.64	22.27	46.43	30.27	22.56	27.08	42.881	29

NE01584	63.23	65.01	64.29	21.73	47.85	23.50	24.81	28.77	42.399	31
NE01601	66.72	68.23	78.49	36.35	51.10	16.38	25.25	27.24	46.220	12
WESLEY	74.73	75.16	62.70	40.24	56.50	14.97	21.92	24.85	46.384	11
NE01602	67.18	65.23	80.53	28.68	59.33	28.19	19.69	28.24	47.134	7
NE01603	73.35	72.51	80.00	42.94	56.83	23.45	22.10	26.68	49.733	2
NE01604	73.76	63.73	70.69	34.58	46.85	20.97	25.86	29.85	45.786	14
NE01609	71.23	61.48	56.26	30.63	36.65	20.14	21.04	29.61	40.880	45
NE01617	74.33	63.77	69.33	32.21	47.78	17.65	23.67	24.40	44.143	23
NE01638	74.52	63.93	66.42	27.00	37.70	17.27	19.11	22.33	41.035	42
NE01639	52.31	52.17	53.59	20.18	40.45	15.33	20.30	22.23	34.570	60
NE01643	80.23	76.95	75.09	41.19	57.95	28.09	23.22	31.50	51.778	1
NE01681	70.35	70.40	64.65	25.30	48.43	20.26	20.73	18.98	42.388	32
NE01704	74.85	55.37	73.46	17.50	47.63	19.64	23.60	33.31	43.170	27
NE01709	68.17	74.18	70.70	42.95	47.55	18.74	22.90	26.99	46.523	9
NE01712	60.26	76.35	41.14	40.98	41.73	23.18	23.58	27.40	41.828	39
NI01808	77.86	68.79	65.89	36.45	48.53	26.82	20.48	27.04	46.483	10
NI01828	75.53	72.54	76.40	41.10	49.80	21.63	22.29	23.24	47.816	3
NE01578	61.89	68.12	66.60	32.80	44.03	26.54	25.62	25.41	43.876	25
GRAND MEAN	69.10	62.69	66.47	31.71	45.14	20.92	21.67	25.84	42.943	
CV	7.24	5.46	9.86	12.38	5.22	9.17	11.56	6.01		
LSD	6.77	5.72	8.87	6.56	3.94	2.60	3.39	2.59		

6. Regional Nurseries

In 2004, 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. Because there were no additional lines added to the larger nursery, we have presented the data as the two nurseries and the means from Lincoln, North Platte, Sidney, and Alliance are directly comparable. Trial to trial variation is common in our diverse locations. Yields for 2004 were as follows:

2004 NRPN Entry	Line/selection	Lincoln bu/a	N. Platte bu/a	Sidney bu/a	Hemming. bu/a	St. Avg bu/a	Rank
1	Kharkof	67.7	39.8	44.0	36.1	46.9	40
2	Harding	98.3	44.3	59.0	38.0	59.9	30
3	Nuplains	99.2	56.2	61.9	38.9	64.1	14
4	Nekota	83.9	48.2	65.4	41.8	59.8	31
5	Moreland	85.3	52.9	65.3	49.0	63.1	19
6	DW (IDO513)	86.9	53.9	66.3	40.4	61.9	25
7	NW97S412-1	106.1	49.5	64.6	43.4	65.9	10
8	NW97S139-1	92.2	57.9	64.0	50.9	66.3	9
9	NW98S097	93.4	47.3	62.5	44.1	61.8	26
10	NW97S218-lt	90.9	46.7	54.0	34.0	56.4	35
11	NW98S104	89.9	57.1	65.1	41.8	63.5	16
12	N02Y5065	70.2	44.4	60.4	37.3	53.1	39

13	N02Y5072	66.6	50.5	56.5	39.8	53.3	38
14	N02Y5075	67.9	55.0	64.6	35.9	55.8	36
15	N02Y5078	71.2	51.4	61.0	36.6	55.0	37
16	N02Y5106	75.6	60.5	64.4	40.2	60.2	28
17	N02Y5117	86.3	56.3	69.6	41.3	63.4	18
18	SD97059-2	94.5	52.3	66.2	37.7	62.7	23
19	SD97380-2	100.6	59.4	65.6	40.3	66.5	6
20	SD97394-1	104.3	59.5	59.0	44.8	66.9	5
21	SD99073	96.8	56.1	63.5	42.2	64.7	11
22	SD00032	91.2	58.0	63.3	35.6	62.0	24
23	SD00111	97.3	56.9	66.4	33.1	63.4	17
24	SD00258	98.8	66.0	65.3	47.2	69.3	2
25	SD97W609	83.1	49.1	63.1	42.8	59.5	32
26	SD97W671-1	96.2	58.9	55.9	44.9	64.0	15
27	SD98102	95.3	62.9	74.9	45.3	69.6	1
28	NE00633	91.7	65.8	66.5	41.8	66.5	7
29	NE01422	101.5	56.6	60.3	46.9	66.3	8
30	NE01564	91.6	47.4	71.1	41.0	62.7	22
31	NE01643	99.6	60.9	67.7	48.1	69.1	3
32	NE99533-3	81.7	58.2	60.2	44.0	61.0	27
33	NE99533-5	88.6	54.4	70.1	43.8	64.2	13
34	NE99656-1	103.4	47.9	66.0	40.9	64.5	12
35	NE00658	95.5	44.5	62.0	49.3	62.8	21
36	NE99464	85.6	58.3	61.3	46.5	62.9	20
37	NE99489	104.4	56.6	67.7	44.4	68.3	4
38	MTR9997	72.0	56.0	71.9	40.1	60.0	29
39	MT0097	89.1	45.1	64.9	37.2	59.1	33
40	MT00159	77.1	55.2	58.9	44.9	59.0	34

2004 Entry	SRPN Line/selection	Linc. bu/a	N. Platte bu/a	Sidney bu/a	Hemming. bu/a	Avg.	Rank	C. Center bu/a	NE Avg bu/a	NE Rank
1	Kharkof	67.7	39.8	44.0	36.1	46.9	50	45.7	46.6	50
2	Scout 66	75.8	49.1	57.0	43.1	56.3	48	50.7	55.2	48
3	TAM-107	79.8	50.8	56.7	51.1	59.6	43	66.5	61.0	43
4	Trego	94.4	47.9	63.8	47.8	63.5	28	72.7	65.3	30
5	G990191	100.5	46.4	63.1	44.2	63.6	26	65.9	64.0	34
6	G982238-2	94.7	40.6	66.1	42.1	60.9	40	65.1	61.7	41
7	G991324	102.6	53.7	70.8	51.6	69.7	3	64.5	68.6	13
8	G980143	90.6	48.2	64.9	55.0	64.7	19	79.8	67.7	17
9	AP01T1112	99.6	36.1	40.8	47.8	56.1	49	75.1	59.9	47
10	AP01T1114	90.2	48.0	54.6	48.2	60.3	42	79.0	64.0	35
11	AP01T3131	93.6	44.3	60.8	55.5	63.5	27	51.3	61.1	42
12	NW99L7068	100.3	56.5	57.2	55.5	67.4	8	68.8	67.7	18
13	T135	92.3	47.0	57.1	45.2	60.4	41	61.2	60.6	46
14	T136	85.6	55.8	60.0	50.7	63.0	31	72.0	64.8	31
15	T140	91.8	51.6	62.4	42.6	62.1	35	69.6	63.6	36
16	T141	86.0	52.8	53.4	45.7	59.5	44	65.6	60.7	45

17	OK00611W	89.1	36.1	57.9	52.3	58.9	45	74.8	62.0	40
18	OK00618W	96.8	52.3	63.7	45.2	64.5	22	72.5	66.1	25
19	OK00514	90.8	48.1	59.6	50.9	62.4	34	79.4	65.8	29
20	OK99212	85.4	49.3	46.3	45.8	56.7	47	76.9	60.7	44
21	OK00614	85.2	53.6	50.7	45.2	58.7	46	37.6	54.5	49
22	KS950811-5-1	89.4	44.7	53.6	57.3	61.2	38	77.9	64.6	32
23	KS00F5-14-7	99.4	51.3	57.1	48.3	64.0	25	90.8	69.4	8
24	KS00F5-20-3	93.4	61.2	57.8	46.0	64.6	20	87.8	69.3	9
25	KS00F5-57-8	96.3	58.6	59.3	43.7	64.5	21	71.4	65.9	28
26	CO970547-7	92.4	52.6	68.0	53.4	66.6	9	80.8	69.5	7
27	CO980607	90.7	61.0	64.7	57.3	68.4	6	86.5	72.0	4
28	CO00D007	92.2	49.4	61.5	48.3	62.8	33	78.5	66.0	26
29	CO00016	82.1	60.2	62.2	54.5	64.7	18	71.7	66.1	24
30	CO00698	94.5	53.8	58.4	49.8	64.1	24	80.7	67.4	19
31	TX96D1073	80.6	50.5	66.2	47.2	61.1	39	73.0	63.5	37
32	TX00V1117	103.0	65.3	70.7	54.4	73.4	1	79.5	74.6	1
33	TX00V1131	104.9	55.2	63.1	47.2	67.6	7	84.0	70.9	5
34	TX01D3232	93.2	56.2	57.6	53.8	65.2	16	78.5	67.9	16
35	TX00D1390	100.7	52.5	54.6	44.1	63.0	32	84.8	67.4	20
36	TX01A5936	99.1	46.8	68.7	50.7	66.3	10	80.7	69.2	11
37	NE00403	86.6	56.5	68.9	52.9	66.2	12	64.8	66.0	27
38	NE00435	92.3	57.8	49.6	47.9	61.9	36	63.9	62.3	39
39	NE01481	108.9	53.7	59.0	41.4	65.8	13	70.1	66.6	22
40	NE00564	94.0	45.5	68.2	45.9	63.4	29	68.5	64.4	33
41	W99-194	102.2	56.8	65.0	50.9	68.7	5	77.6	70.5	6
42	W96x1311-01	98.8	50.7	54.6	43.3	61.8	37	69.9	63.5	38
43	W98-159-7	99.8	57.3	65.3	42.9	66.3	11	80.8	69.2	10
44	W03-20	91.7	49.4	72.1	48.7	65.5	15	78.7	68.1	15
45	KS01HW152-6	98.4	57.5	75.1	56.5	71.9	2	75.3	72.6	3
46	KS01HW163-4	85.4	49.6	70.9	47.2	63.3	30	80.1	66.6	21
47	KS02HW34	102.2	58.7	72.8	42.3	69.0	4	88.9	73.0	2
48	SD97W604	93.4	59.3	63.9	41.1	64.4	23	87.1	69.0	12
49	CO991132	94.4	45.1	67.3	52.6	64.9	17	72.7	66.4	23
50	NW98S097	97.5	53.6	66.5	45.1	65.7	14	79.0	68.3	14
	Grand Mean	**93.0**	**51.6**	**61.1**	**48.3**	**63.5**		**73.2**	**65.4**	

In reviewing the 2004 data, it is obvious that the early lines were favored in these trials.

7. Multiple-Location Observation Nursery

Six replications (locations) in Nebraska (Lincoln, Mead, Clay Center, North Platte, Sidney, and Alliance) of this nursery were harvested and used for selection. Forty-seven lines were advanced for further testing. One of the interesting aspects of this nursery was that the replicated check varieties ranked 38th (Jagalene), 66th (millennium), 89th (Wesley), and 141st (Alliance) when averaged over all locations. Hence many experimental lines performed very well.

8. Early Generation Nurseries

a. Single-plot Observation Nursery

Sixteen hundred forty lines including checks were evaluated at Lincoln in 2004. Of the 1640 lines and checks, 1383 where red or mixed red and white seeded and 41 were herbicide tolerant, 257 where white seeded. Of this group, 486 were harvested and 366 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, 202 red and 83 white were selected for further testing.

b. Headrow Nursery

Over 38,000 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. Unfortunately, our harvest was hindered by intermittent rain that led to sprouting among the later harvested lines. We harvested over 1700 lines and planted 1711 (1331 red or segregating red and white; and 380 white wheat lines). Of the red and white wheat lines, 334 where sent to Dr. Baltensperger for planting at Scottsbluff in our irrigated observation nursery, 119 for herbicide tolerance testing, and 115 lines to Gary Hein to test for wheat steak mosaic virus tolerance.

a. F3 bulk hybrids

The F3 bulk hybrid nursery contained 782 red or red and white segregating bulks. All plots were planted at Mead and most were planted at Sidney. Most bulks survived the winter, but were hurt by wheat streak mosaic virus(WSMV) in the spring. While we hope that we were able to select for lines with better WSMV tolerance, the spotty nature of the infection probably means that we were able to "enrich" our selections for WSMV tolerance, but a number of susceptible lines were also selected. The number of F3 bulks is large. Over 41,000 head rows were selected for fall planting. The headrows were planted early into good moisture while we were planting our western nurseries. Their emergence and stand was excellent. The project goal remains to have sufficiently good segregating F3 material to select about 40 - 45,000 headrows.

b. F2 bulk hybrids

The F2 bulk hybrid nursery contained 811 bulks and check plots with most of them planted at Mead. Twenty-nine bulks were plants at Lincoln for herbicide selection. The bulks generally survived the winter, but some were winterkilled (those involving wintertender parents) and those at Mead were damaged by WSMV. 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 672 bulks (including 26 from Colorado State University) were advanced as individual bulks for further consideration in 2005 from our program.

9. Winter Triticale Nursery

In 2004, no new triticale lines were recommended for release, however, NE426GT [formerly tested as NE95T426 (WB-UW24/TxTcl #50//Fain Tcl/Ctk 78//NE69150/6TA876 x Unknown (probably 6A365/NE69150) which was recommended for release in 2003 and described in that annual report] was formally released. The triticale-breeding program received about $10,000 this year in research and development fees. This amount is similar to previous year and indicated over 20,000 units of seed were sold. 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. This practice will hinder the development of new triticale varieties and an ethical seed business. While the future is always uncertain, triticale continues to be given a careful look to determine if it can aid producers. The results of the 2004 triticale variety trial harvested for grain were:

GRAIN

	---	--- Mead---		---	--- Lincoln---		--- Sidney---		State	
	Hdate	Height	Grain Yield	Hdate	Height	Grain Yield	Heights	Grain Yield	Average	St. Rank
VARIETY	In May	in	lbs/a	In May	in	lbs/a	in	lbs/a	lbs/a	
NE426GT	**19.0**	**37.5**	**3805**	**13.3**	**44.7**	**6913**	**34.6**	**4082**	**4933**	**1**
NT00428	18.4	38.6	3476	13.0	46.7	7217	34.1	3876	4857	2
NT01410	17.5	42.0	3876	13.0	46.7	6535	33.7	3976	4796	3
NT01451	19.9	38.2	3825	13.3	43.7	6326	33.1	4106	4752	6
NT02403	17.9	39.6	3596	13.0	44.0	5836	33.6	3437	4290	17
NT02410	17.8	42.5	2770	13.0	47.0	6350	33.7	3588	4236	18
NT02419	19.0	42.4	3910	13.7	48.7	6671	33.8	3755	4779	4
NT02421	17.2	43.0	3375	12.7	47.3	6464	34.8	3819	4552	13
NT02431	19.1	42.4	3456	14.0	48.3	6917	33.8	3578	4650	8
NT02454	18.1	41.9	3884	13.0	45.3	6097	33.2	4173	4718	7
NE03T407	17.5	42.0	3716	11.0	49.0	6410	34.1	3709	4612	10
NE03T411	18.2	40.5	3734	13.3	46.3	6081	33.3	4009	4608	11
NE03T416	14.8	38.1	3179	12.0	45.0	6272	32.4	4160	4537	14
NE03T432	20.5	40.3	2610	13.7	45.3	5518	32.1	3839	3989	22
NE03T451	18.9	40.9	3456	14.0	47.7	6105	33.1	4359	4640	9
JAGGER	15.2	27.0	619	10.0	34.7	3975	31.0	3424	2673	30
NE03T456	21.0	43.2	2498	15.7	46.7	6601	33.7	4433	4511	15
NT02458	19.3	42.7	3478	14.0	45.0	6611	34.4	4227	4772	5
NE03T452	14.7	39.6	3397	10.7	43.7	5895	34.2	3672	4321	16
NT00421	20.7	41.0	2110	13.0	47.3	5917	35.0	3655	3894	24
NT01435	21.9	41.5	2715	15.7	48.3	4958	32.5	3691	3788	26
NE422T	**25.2**	**53.1**	**2822**	**20.3**	**54.7**	**6129**	**39.2**	**3464**	**4139**	**20**
NT00449	18.6	45.3	2904	12.3	51.3	5820	37.5	3581	4102	21
NT02435	18.4	41.3	3062	13.7	50.0	5955	35.0	3605	4208	19
TRICAL	**26.1**	**49.6**	**1374**	**22.0**	**51.3**	**4556**	**37.1**	**2864**	**2931**	**29**
NE03T413	18.6	47.5	3414	12.7	53.7	6488	39.6	3808	4570	12
NE03T449	23.6	52.8	1625	17.0	59.3	6425	40.8	3230	3760	27
NE03T454	23.6	51.0	2084	16.7	58.3	5360	39.3	3449	3631	28
NT02456	20.7	40.2	2307	16.0	51.7	5774	35.3	3785	3955	23

NE03T447	21.8	49.6	2105	16.7	60.0	5665	38.6	3667	3812	25
GRAND MEA	19.4	42.5	2972.8	14.1	48.4	6061.4	34.9	3767.4	4267.2	
CV	3.7	3.1	10.26	5.4	3.3	8.9	4.8	5.7		
LSD	1.0	1.8	416.40	1.0	2.2	738.7	2.3	295.0		

The forage data for the 2004 triticale variety trial was provided by Dr. Ken Vogel and the USDA-ARS. The 2004 data are:

	----------	---------	Mead----------	----------	'----Sidney-------	----------	State	State
	Hdate	Height	Dry matter	Forage YLD	Dry matter	Forage YLD	Average	Rank
VARIETY	In May	in	At Cutting (%)	t/a	At Cutting (%)	t/a	t/a	
NE426GT	**19.0**	**39.9**	**0.347**	**4.92**	**0.455**	**2.96**	**3.94**	**2**
NT00428	19.0	41.0	0.327	4.50	0.500	2.91	3.71	12
NT01410	18.1	41.8	0.335	4.50	0.468	2.78	3.64	18
NT01451	20.7	39.1	0.334	4.45	0.473	2.87	3.66	16
NT02403	18.6	40.9	0.334	4.71	0.465	2.88	3.80	5
NT02410	18.8	42.9	0.338	4.66	0.455	2.89	3.78	6
NT02419	18.5	43.2	0.342	4.54	0.443	2.93	3.74	8
NT02421	18.9	43.5	0.334	4.66	0.470	2.76	3.71	11
NT02431	19.0	41.7	0.330	4.21	0.460	2.65	3.43	26
NT02454	19.3	40.5	0.324	4.50	0.460	2.80	3.65	17
NE03T407	15.9	44.2	0.334	4.59	0.468	3.06	3.83	4
NE03T411	16.9	41.6	0.343	4.58	0.493	2.85	3.72	9
NE03T416	15.9	41.5	0.346	4.41	0.453	2.65	3.53	22
NE03T432	19.3	38.8	0.326	4.11	0.488	2.74	3.43	27
NE03T451	18.9	40.5	0.332	4.41	0.460	2.71	3.56	20
NE97426	18.4	31.5	0.364	3.37	0.580	2.41	2.89	30
NE03T456	21.6	42.1	0.315	4.60	0.428	2.95	3.78	7
NT02458	19.8	40.9	0.334	4.50	0.445	2.88	3.69	13
NE03T452	16.3	40.7	0.350	4.89	0.490	2.83	3.86	3
NT00421	21.7	41.1	0.336	4.26	0.430	2.81	3.54	21
NT01435	22.9	42.4	0.303	4.61	0.443	2.74	3.68	15
NE422T	**25.9**	**51.0**	**0.311**	**4.43**	**0.420**	**2.83**	**3.63**	**19**
NT00449	18.9	45.2	0.349	4.47	0.465	2.95	3.71	10
NT02435	19.9	42.1	0.348	4.44	0.463	2.93	3.69	14
TRICAL	**25.4**	**50.3**	**0.327**	**4.27**	**0.410**	**2.16**	**3.22**	**29**
NE03T413	20.3	47.4	0.348	5.04	0.445	2.88	3.96	1
NE03T449	23.5	53.1	0.341	4.33	0.450	2.61	3.47	24
NE03T454	24.5	51.5	0.300	4.30	0.433	2.62	3.46	25
NT02456	21.8	41.7	0.319	4.00	0.438	2.67	3.34	28
NE03T447	22.0	49.9	0.338	4.52	0.450	2.47	3.50	23
GRAND MEA	20.0	43.1	0.334	4.46	0.460	2.77	3.62	
CV	3.7	3.4	3.351	7.29	4.248	8.85		
LSD	0.9	1.7	0.013	0.38	0.023	0.29		

NE97426 is an awnless wheat that has potential for good grain yield and for hay production. One of the surprises of the forage data was the excellent performance of NE426GT for late season for forage. Additional testing is need to determine if this lines can continue to be both outstanding in grain and

forage production. Mr. Lekgari A. Lekgari joined the project as an M.S. student to study triticale forage yields. Ms. Chatuporn Kuleung, in collaboration with Dr. Ismail Dweikat and as part of her Ph.D. studies, is determining if the considerable molecular genetic resources in one crop (for example, wheat) can be used to study a crop with less developed molecular genetic resources (for example, triticale). She is also studying the genetic diversity within triticale.

The grain yield data for 2003 are:

VARIETY	TYPE	H. Date	Height	Lodging	Linc.	Mead	Sidney	**Avg.**	**Rank**
NE95T426	GR	25.49	49.67	4.15	5618.2	3098.5	3735.9	**4150.9**	**1**
NE95T427	GR	25.15	51.32	2.95	5908.1	3148.2	3395.3	**4150.5**	**2**
NE96T422	FO	29.84	62.84	5.77	4010.2	1693.1	1879.2	**2527.5**	**27**
NE96T441	FO	30.34	59.82	6.11	3920.9	1387.8	1734.3	**2347.7**	**28**
NE98T424	GR	25.00	51.35	3.07	4596.9	2995.4	3032.1	**3541.5**	**9**
NE98T425	FO/GR	26.02	53.17	4.22	3941.0	2785.8	2157.3	**2961.4**	**21**
NE99T440	GR/FO	25.52	53.17	3.73	4638.3	2549.2	2351.2	**3179.6**	**19**
NE99T441	FO	28.15	53.69	4.98	3969.2	2798.1	1887.8	**2885.0**	**23**
NT00421	A-/FO	27.15	53.19	5.47	4208.8	2462.4	1968.3	**2879.8**	**25**
PRESTO	GR	26.17	52.34	3.59	4858.3	2415.6	2544.6	**3272.8**	**17**
NT00428	GR	24.99	49.67	3.65	5016.8	3236.0	2706.0	**3652.9**	**6**
NT00449	FO	24.65	56.34	4.70	4684.5	2531.3	2756.9	**3324.2**	**16**
NT01402	gr?	23.67	50.17	4.98	3531.2	2781.3	2421.2	**2911.2**	**22**
NT01410	GR	25.67	50.82	3.88	4462.1	3139.4	2795.2	**3465.6**	**12**
NT01435	F/G	27.99	52.50	7.55	4321.6	3129.8	3049.2	**3500.2**	**10**
NT01446	gr?	25.00	50.82	4.79	3776.4	2631.0	2114.6	**2840.7**	**26**
NT01451	GR	26.69	49.49	5.12	5321.6	2345.5	3212.2	**3626.4**	**7**
NT01456	GR	27.82	50.85	7.17	3662.7	2027.6	2963.7	**2884.7**	**24**
NT02403	GR	25.65	51.65	6.40	5020.0	3181.3	3568.0	**3923.1**	**3**
ARAPAHOE	GR	26.17	42.69	5.07	4440.9	2477.7	2874.4	**3264.3**	**18**
NT02410	GR	25.32	51.52	2.55	4904.5	2402.8	2931.8	**3413.0**	**14**
NT02419	GR	26.02	51.19	3.19	5235.9	1939.8	3494.1	**3556.6**	**8**
NT02421	GR	25.49	53.50	3.09	5128.4	2708.1	2460.3	**3432.3**	**13**
NT02431	GR	26.99	50.65	3.36	5316.0	1818.6	2970.1	**3368.2**	**15**
NT02435	FO	26.69	54.50	4.74	5547.4	3078.9	2952.0	**3859.4**	**4**
NT02451	FO?	27.84	53.32	6.48	4280.9	2215.6	2592.5	**3029.7**	**20**
NT02454	GR	25.82	51.17	4.70	4711.8	2625.3	3776.7	**3704.6**	**5**
NT02456	FO.A-	28.32	56.82	6.88	3379.0	1659.7	1690.5	**2243.1**	**29**
NT02458	GR.FO	26.67	49.67	3.54	5497.0	2555.4	2408.2	**3486.9**	**11**
TRICAL	FO	31.84	61.85	6.79	3120.4	1145.8	2186.5	**2150.9**	**30**
GRAND MEAN		**26.60**	**52.65**	**4.76**	**4567.6**	**2498.8**	**2687.0**	**3251.2**	

Data for 2002 are:

VARIETY	TYPE	Linc.	Mead	Sidney	NE.AVG	NE. Rank	IA. AVG	IA. Rank	AVG.
		lbs/a	lbs/a	lbs/a	lbs/a		lbs/a		lbs/a
PRESTO	GR	2956	3304	1904	2721	17	5308	18	4015
NE95T426	GR	3823	4445	1960	3409	2	6358	3	4883
NE95T427	GR	3626	4500	1542	3223	6	6344	4	4784
NE96T422	FO	2679	3059	1594	2444	23	4838	26	3641
NE96T441	FO	2620	2835	1487	2314	25	4913	25	3613
NE98T424	GR	3959	4259	1589	3269	5	6115	6	4692
NE98T425	FO/GR	3196	3913	1619	2909	11	5629	9	4269
NE99T440	GR/FO	3598	3277	1969	2948	9	5396	14	4172
NE99T441	FO	3038	3845	1476	2787	14	5380	15	4083
NEWCALE	GR	3112	3419	1645	2725	16	5618	10	4172
NE99T448	FO	2358	2491	1663	2171	27	5015	24	3593
NT00418	GR	2473	3873	1462	2603	21	5375	16	3989
NT00419	GR	3065	3139	1269	2491	22	5667	8	4079
NT00421	A-/FO	2379	3348	941	2223	26	5446	12	3835
NT00428	GR	3428	3987	1444	2953	8	6517	1	4735
NT00449	FO	3220	3519	1887	2875	12	5158	22	4017
NT01402	0	3132	3530	1611	2758	15	5217	21	3987
NT01410	GR	3388	3710	1727	2941	10	5742	7	4342
NT01411	GR	3216	3240	1640	2699	18	5364	17	4031
ARAPAHOE	GR	2285	2959	1010	2085	28	4753	27	3419
NT01417	0	3128	3503	1328	2653	20	5265	19	3959
NT01421	F0	2019	2437	1262	1906	30	4729	28	3317
NT01422	0	1626	2991	1294	1970	29	4412	30	3191
NT01435	F/G	3691	4498	1940	3376	3	6378	2	4877
NT01443	0	3196	3385	1480	2687	19	5157	23	3922
NT01444	0	3797	3032	1630	2820	13	5230	20	4025
NT01446	0	4212	3604	1461	3092	7	5504	11	4298
NT01451	GR	3933	4811	1925	3556	1	6189	5	4873
NT01456	GR	3755	4367	1751	3291	4	5443	13	4367
TRICAL	FO	2592	3259	1135	2328	24	4594	29	3461
GRAND MEAN		3117	3551	1555					
CV		24.06	7.98	14.96					
LSD		1024	482	317					

Spring triticale nurseries the past several years have helped us identify six lines for testing in multi-environment trials for forage production and grain yield to select the best for release.

10. Wheat Transformation and Tissue Culture Studies

Wheat transformation continues to be a key strategic effort in the wheat improvement overall effort. We continue to emphasize developing wheat lines with improved Fusarium head blight (FHB) resistance as part of the US Wheat and Barely Scab Initiative. This is a collaborative effort between Dr.

T. Clemente and Ms. S. Sato of the Transformation Core facility (does our wheat transformation), Dr. J. Watkins and Ms. J. Schimelfenig of the Department of Plant Pathology (does the screening of conventionally bred and transgenic wheat lines with FHB) and Drs. A. Mitra and M. Dickman, also of the Department of Plant Pathology who are studying new concepts in disease resistance. We have sufficient transgenic lines and seed that we are now emphasizing the need to obtain field data. In greenhouse and preliminary field trials, the level of inhibition in our transgenic lines is generally less than that of Alsen (an elite FHB tolerant spring wheat with resistance derived from Sumai 3). However, the tolerance indicates our concept is good. We have begun crossing the best transgenes based on our greenhouse screening results into adapted winter wheat germplasm. These crosses are ongoing. Clearly great care is need to insure that the no transgenic wheat co-mingle with our breeding program. This concern was minor when the transgenic wheat was being done in spring wheat backgrounds (spring is killed by our winter, hence should never appear in our winter wheat breeding lines, but will require a higher level of scrutiny with the winter wheat crosses.

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. In 2003 we received over 130 CNN(RICLs3A) derived by doubled haploidy from Dr. Mujeeb Kazi. We increased the seed and have begun a large field test to continue to identify where the genes affecting agronomic performance are found on chromosome 3A.

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. As mentioned previously, Antelope and Arrowsmith were recommended for release with foundation seed available in the fall of 2003. We are continuing our efforts to increase the number of crosses made, the number of segregating populations sampled, and the number of white wheat lines that are tested. In addition, we added a new assay to our project. It is the polyphenol oxidase (PPO) assay. Low PPO is believed to indicate which wheat flours will discolor less in wet noodles and potentially give brighter white bread. Hence low PPO is very important in white wheat and until it is shown to have detrimental effects, low PPO would be preferred in red wheats. With the help of an undergraduate worker, we were able to screen every line in our NIN, Triplicate, Duplicate, Irrigated-Dry (the nursery looking for better irrigated varieties or high yield rainfed varieties), and Observation nurseries (also known as the WS4R8, wheat single 4 row 8 foot plot) nursery. The results were as follows:

Nursery	Total Number of Lines	Red Seeded Lines Low PPO	White Seeded Lines Low PPO	Total Red or White Seeded Lines* Low PPO
NIN	60	2	5	7
Triplicate	60	3	6	9
Duplicate	300	27	62	89
Irrigated-Dry	40			10
Observation	1777			499

* In the irrigated-dry nursery the lines are not listed as red or white and in the Observation nursery, there were so many lines as to not separate them for this table. Low PPO is scored on a 0-5 scale with) having no discoloration and 5 being virtually black in the assay. Lines that scores of 2 or below were considered as being low PPO for this summary.

The interesting aspect of the PPO assays is that while the majority of lines with low PPO were white seeded as would be expected because the source of low PPO was from white wheat parents, a number of red lines also had low PPO. Even in red wheat germplasm where low PPO is not critical, we believe it will be preferred. Hence we seem to have rapidly moved this trait into our germplasm.

13. Collaborative Research on Wheat Diseases

Dr. John Watkins, Department of Plant Pathology, and his staff continue to inoculate our experimental lines with wheat stem rust and Fusarium head blight (FHB, research funded by the U.S. What and Barley Scab Initiative), and as time permits with wheat leaf rust. The greenhouse tests were good for stem rust with Ms. Julie Schimelfenig (works with Dr. Watkins). In 2004, inclement weather and the wide spread WSMV infection, prevented a successful stem rust field inoculation and screen. John's efforts to determine the virulence patterns of leaf rust in Nebraska have greatly helped understand this important disease and why some previously resistant lines became susceptible and other previously susceptible lines are becoming for resistant. His efforts are closely coordinated with Dr. Yue Jin, USDA-ARS, Cereal Disease Lab, who also tests our lines with a set of stem rust races to identify the resistance genes in those lines. In addition, John is the "eyes and ears" of the program when it comes to knowing what diseases are affecting wheat production in Nebraska.

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.

14. Considerations on Nursery Sites

Due to reduced funding, we made the decision in 2002 to drop our testing sites at Grant and McCook. Both sites will be missed as Grant provides a useful back up site for western Nebraska and McCook was an ideal southwestern Nebraska site to complement North Platte. In the future as we develop sustainable funding sources (e.g. our research and development fees to augment our other sources of funding), we hope to return to McCook. Using our incomplete block designs, we have decided to use three replications at all of our sites except Lincoln, which continues to be our main early generation seed increase site. We (Dr. Kent

Eskridge and I) believe that alpha-lattices with very small incomplete blocks (2 to 4 entries per block) will greatly help our data evaluation. So far, incomplete blocks of 2 were too small. We are looking at blocks of 5 to see if that can help our field designs.

15. Global Change Research

Our global change efforts continue to evolve. We are now working as part of a broad based team to see if we can use climate and weather data to predict wheat phenology (specifically wheat heading date). Our idea is that the cumulative wheat data sets from regional nurseries provide excellent historical data that can be matched with good weather data to help us understand why we can see a 10 to 14 day fluctuation in wheat heading and maturity in the Great Plains.

16. Plant Height and Diversity in Wheat

Mr. Zakaria Aj-alouni will be working 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.

IV. GREENHOUSE RESEARCH

In 2004, the majority of F_1 wheat populations were grown at Yuma, AZ. We gratefully acknowledge the support of the Nebraska Foundation Seed Division for financially supporting this effort. 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 proposed release of Infinity CL wheat. Our work with a second company that had negotiated their having access to our germplasm for developing herbicide tolerant wheat using transformation technology has be shelved due to difficulties in bring the technology to market. In cooperation with a company skilled in creating mutations and with the owner of the herbicide tolerant trait, we received Millennium (2003), Wahoo (2003), and Goodstreak (2004) and additional lines with both of the most common herbicide tolerant mutants. This new germplasm is a major step forward in two ways. First we now have lines adapted to Nebraska carrying the needed genes. Hence in future crosses we will use the elite, adapted lines as parents. Secondly, as we try to develop double mutant lines, they can be easily created within Wahoo, Goodstreak, and Millennium by simply intercrossing Wahoo, Goodstreak, or Millennium with the two genes.

We received our fourth year of research and development fees from an agreement with a commercial seed company for the exclusive release of our winter barley germplasm. A number of new barley lines were sent to the company as possible new products. The 2004 data for the Barley Variety Trial were:

VARIETY	HD Day after 4/30	HT in.	Lincoln Yield Lbs/a	Mead Yield Lbs/a	Sidney Yield Lbs/a	Colby,KS Yield Lbs/a	Average lbs/a	Rank
NE99845	**11.17**	**26.92**	**6822**	**3174**	**2955**	**3617**	**4142**	**2**
NE99875	**13.67**	**28.17**	6773	3548	2927	3203	4112	4
NE99881	**14.92**	**27.42**	6900	3770	2575	2666	3978	10
NE99874	**16.42**	**30.33**	6394	3518	2518	3049	3870	14
NE018131	**10.92**	**30.33**	5849	2876	2268	3340	3583	31
NE018163	**12.17**	**28.42**	6779	3477	2866	3252	4094	5
NE018180	**9.92**	**30.83**	6491	3660	2843	3127	4030	9
NE018187	**14.33**	**26.67**	5450	3863	2504	3255	3768	21
NE018199	**16.42**	**27.75**	**6032**	**4014**	**3002**	**3163**	**4053**	**8**
NE018211	**11.75**	**28.33**	5567	3839	2532	2987	3731	22
NB03423	**12.00**	**28.00**	5915	3444	2864	3020	3811	15
NB03429	**14.58**	**26.67**	6083	3480	3110	3126	3950	11
NB03435	**14.50**	**28.25**	6754	3461	3693	3454	4340	1
NB03437	**15.92**	**25.33**	6137	3561	3296	3319	4078	7
NB03439	**13.33**	**29.75**	6259	3843	3239	3153	4123	3
NB98919	**8.50**	**30.08**	6109	575	2048	2980	2928	40
NE97891	**11.75**	**27.33**	**5891**	**3198**	**2735**	**3368**	**3798**	**17**
NE99885	**9.33**	**28.08**	6465	2229	2544	3398	3659	25
NE98936	**13.83**	**26.92**	6300	2933	2726	3189	3787	20
NB03402	**10.25**	**26.00**	5930	1415	2643	3608	3399	34
NB03403	**11.67**	**29.83**	6498	3381	2970	2631	3870	13
NB03440	**14.17**	**29.33**	6482	3144	2840	2761	3807	16
P-954	**13.50**	**26.58**	6462	1772	3074	3326	3658	26
P-713	**12.17**	**28.83**	6377	3264	3219	3490	4087	6
P-721	**13.33**	**26.50**	6146	3084	3251	3036	3879	12
Perkins	**17.17**	**27.58**	5119	3002	1608	3010	3185	37
TAMBAR 501	**8.83**	**28.33**	6017	1779	1477	3153	3106	38
NE95711	**12.92**	**28.25**	6091	3003	2484	3117	3674	24
NE94738	**11.33**	**29.67**	5420	2897	2966	3080	3591	30
NE99838	**13.50**	**26.75**	6196	2481	2316	3138	3533	33
NE99820	**9.83**	**29.67**	6314	2909	2946	3006	3794	18
NE98934	**12.17**	**28.83**	5670	2310	2393	3086	3365	36
NE018030	**14.17**	**25.92**	6159	2708	2655	3095	3654	27
NE018100	**15.08**	**25.92**	5673	3797	2218	2844	3633	28
NE018161	**12.58**	**27.33**	6077	3513	2768	2796	3789	19
NE018177	**9.92**	**29.00**	6104	3312	2300	3199	3729	23
NE018196	**11.83**	**27.92**	5726	3408	2426	2877	3609	29
NB03410	**10.08**	**26.50**	6303	2117	2552	2622	3399	35
NB03413	**11.42**	**26.92**	4243	1832	2544	3295	2978	39
NB03419	**10.33**	**28.67**	5327	3191	2812	2971	3575	32
GRAND MEAN			**6082.5**	**3019.3**	**2692.6**	**3120.1**	**3728.7**	
CV			8.8	17.2	18.7	13.2		
LSD			628.3	877.7	589.0	482.1		

Spring Barley has been decimated the last several years by Russian wheat aphids. Burton, the first release of a RWA resistant spring barley was made this year as a multi-state cooperative effort. Burton will greatly enhance the ability of producers in the High Plains to utilize spring barley as part of their rotations. Additional releases are anticipated as two more heat tolerant lines are being increased by Foundation Seed this spring.

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. Spring-Sown Wheat Research

A small spring-sown wheat breeding effort was initiated in 1997 by Drs. Baltensperger (project leader) and Baenziger and due to lack of funds was greatly scaled back in 2002-2003. Dr. D. Baltensperger works closely with Dr. D. Lyon on intensified cropping systems as it is expected that spring wheat will be used in new cropping systems. More than 40 advanced spring wheat lines were evaluated for hardness by the wheat quality lab and those evaluated as hard were tested for other quality parameters. Since these lines all have excellent grain yield based on results from the past two years, those with adequate quality will be advanced to final stages of pre-release multi-location testing including increases this spring. The imi-tolerant lines are being recrossed to add a second gene for resistance, but are at least five years from release without fast tract nurseries, which are not currently planned.

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 Wheat 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.

Summary

The 2004 Nebraska Wheat Crop was estimated at 61,100,000 bu, which represented a 37 bu/a state average yield on 1,650,000 harvested acres. 1,850,000 acres were planted to winter wheat in the fall of 2003. The 2004 crop was 27% lower than the 2003 crop (79,900,000 bu, which represented a 47 bu/a state average yield on 1,700,000 harvested acres). 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 2004, two new cultivars (Infinity and Hallam) were recommended for release. Infinity CL is a hard red winter wheat (*Triticum aestivum* L.) cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS. Infinity CL contains a patented gene owned by BASF and who retains ownership of the gene. Infinity CL was released primarily for its superior adaptation to rainfed wheat production systems in Nebraska and counties in adjacent states. The name Infinity CL was chosen because it is a Clearfield™ wheat that will be used with Beyond® herbicide. Infinity CL was selected from the cross Windstar//Millennium sib/Above sib. Infinity CL was evaluated as NH01046 in Nebraska yield nurseries starting in 2002, and in Nebraska cultivar performance trials in 2003 to 2004. In the Nebraska cultivar performance trials, it has performed well throughout most of Nebraska. The average Nebraska rainfed yield of Infinity CL of 3870 kg ha^{-1} (27 environments from 2003 to 2004) was lower than the yield of Wesley (3990 kg ha^{-1}), but was similar to that of Millennium (3860 kg ha^{-1}), and higher than Wahoo (3790 kg ha^{-1}), and Alliance (3620 kg ha^{-1}). Infinity CL is moderately resistant to stem, leaf, and stripe rust. It is susceptible to Hessian fly and wheat soilborne mosaic virus, but may have a low level of tolerance to wheat streak mosaic virus, data obtained from field observations in NE). Infinity CL has good grain volume weight and the end-use quality characteristics for Infinity CL should be acceptable to the milling and baking industries. Hallam is a hard red winter wheat cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS. Hallam was released primarily for its superior adaptation to rainfed wheat production systems in eastern Nebraska. The name Hallam was chosen to honor Hallam, NE, a town and its people rebuilding after a tornado. Hallam was selected from the cross Brule/Bennett//Niobrara. In its primary area of adaptation (eastern NE), Hallam (5 environments) has yielded 4540 kg ha^{-1}, which was greater than Wesley (4150 kg ha^{-1}), Millennium (4250 kg ha^{-1}), Wahoo (3940 kg ha^{-1}), and Alliance (3900 kg ha^{-1}). Hallam is moderately resistant to stem rust, stripe rust, and Hessian fly. It is moderately susceptible to leaf rust and is susceptible to wheat soilborne mosaic virus and barley yellow dwarf virus, but may contain a low level of tolerance to wheat streak mosaic virus. Hallam is a genetically lower in grain volume weight and the overall end-use quality characteristics for Hallam is superior to the commonly grown wheat cultivars and should be acceptable to the milling and baking industries.

On experimental line, NE99495, has the pedigree Alliance/Karl 92 and is under increase for possible release in 2005. It is slightly later than Alliance and slightly earlier than Millennium for flowering date. It is susceptible to wheat streak mosaic and wheat soilborne virus and stripe rust; and moderately resistant to Hessian fly and stem rust. It is moderately susceptible to moderately resistant to leaf rust. It has good yield potential and has genetically lower test weight. Additional white wheat cultivars are under increase from the USDA-ARS lead white wheat program. Basic and applied research studies continue in developing wheat germplasm with superior noodle characteristics, transgenic wheat, herbicide tolerant wheat, disease and insect resistant wheat, superior data analytical techniques, and how to better understand how weather affects wheat grain yield and agronomic performance. The generous support of the Nebraska Wheat Board is gratefully acknowledged.