IMPROVING WHEAT VARIETIES FOR NEBRASKA

2010 STATE BREEDING AND QUALITY EVALUATION REPORT

Report to the

NEBRASKA WHEAT DEVELOPMENT, UTILIZATION
AND MARKETING BOARD

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I. INTRODUCTION

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

II. THE 2009-2010 NEBRASKA WHEAT CROP

1. Growing Conditions

The 2009-2010 growing season was generally one of average to surplus moisture. The crops was generally planted on time, though the eastern NE crop was delayed by too much fall moisture leading to a lower planting in that region. In western NE we planted on time and the crop grew well. The winter was normal, but the spring and summer were wetter than normal in many parts of the state. The early summer was also cooler than normal. Harvest was delayed by excessive moisture in eastern NEDue to the abundant moisture, diseases requiring moisture were also abundant in many parts fo the state

2. Diseases

The predominant disease in 2010 was stripe rust. It occurred in all wheat growing regions in the state. Fusarium head blight occurred to moderate levels in isolated fields, mainly fields with corn stubble on the ground, irrigation, and highly susceptible cultivars. Fields with significant levels of scab were observed in southeast, south central, and southwest Nebraska. Overall, scab damage was minimal statewide. There were no reports of discounts at elevators due to *Fusarium*-damaged kernels or DON. Leaf spot diseases were mainly tan spot and Septoria tritici blotch. Stagonospora nodorum blotch was also observed. Bacterial leaf streak/black chaff occurred in some fields especially in southwest NE. Leaf rust also occurred at low levels, but its presence was overshadowed by stripe rust. Virus diseases observed were wheat streak mosaic, Triticum mosaic, wheat soilborne mosaic, and wheat spindle streak mosaic. Drs. Stephen Wegulo, Gary Hein (entomologist monitoring insect vectors of disease), and Roy French continue to be invaluable in disease identification, survey, and understanding.

3. Insects

No major outbreaks of wheat insects were noted in 2010-2011. Wheat stem sawfly in the panhandle appears to be continuing its regional expansion. All instances of severe infestations of wheat stem sawfly continue to occur in no-till wheat-fallow situations. Also in the panhandle, Russian wheat aphids were readily found, but they primarily remained at low levels. Most instances of “buggy whipped” wheat were abiotic and not the result of high aphid infestations. The presence of other cereal aphids was low across the state with few economic situations noted and little barley yellow dwarf noted. Spotty infestations of black grass bugs were noted in parts of the northern panhandle. Grasshoppers again increased and threatened emerging wheat in some areas of the western half of the state. Furthermore, the risk for grasshoppers in 2011 remains very high as many eggs were deposited in the fall and a dry year is predicted in the panhandle. Isolated areas of wheat curl mite presence were seen in the fall in the southern panhandle so some reports of significant virus presence are expected next spring. Dr. Jeff Bradshaw located at the Panhandle Research and Extension Center, along with Dr. Gary Hein continue to be invaluable in insect and disease vector identification, survey, and understanding.

4. Wheat Production

In 2010, 1,600,000 acres of wheat were planted in Nebraska and 1,490,000 were harvested with an average yield of 43 bu/a for a total production of 64,070,000 bu. In 2009, 1,700,000 acres of wheat were planted in Nebraska and 1,600,000 were harvested with an average yield of 48 bu/a for a total production of 76,800,000 bu. In 2008, 1,750,000 acres of wheat were planted in Nebraska and 1,670,000 were harvested with an average yield of 44 bu/a for a total production of 73,500,000 bu. 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). This is an economic reality in understanding wheat yields and productivity in NE.

5. Cultivar Distribution

In 2010, Pronghorn was the most widely grown wheat in Nebraska (13.7%). It and Goodstreak are tall (conventional height) wheat varieties that have consistently done well in the drought prone areas of western Nebraska. Interestingly, the Buckskin acreage increased slightly, indicating that tall wheats, which are adapted to drought in the west, remain very popular. Millennium continues to perform well and was the second most popular wheat in Nebraska in 2010, followed by Agrip04 Jagalene and TAM 111 marketed by AgriPro.(. Overland continues to increase in its acreage and became the most popular wheat in Nebraska in 2011.

While no wheat listed below has all of the characteristics of an ideal wheat, the diverse wheat varieties provide the grower an opportunity to choose high yielding, high quality wheat varieties 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 65.9% of the state acreage. Other public varieties occupied 10.5% and private varieties occupied 23.6% (note the private cultivars does not include TAM 111 that was developed by Texas A&M but is marketed by Agripro) of the state acreage.

---------------------------------------Percent-------------------------------------

Variety	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011

Agripro Art									**2.4**	
AgriPro Dumas						1.4	1.2			4.3
Agripro Hawken								1.2	**2.1**	
Agripro Jagalene			4.5	16.8	**23.8**	33.4	20.9	13.8	**8.5**	5.4
Agripro Postrock							1.1	4.1	**4.4**	3.3
Agripor Thunderbird									**1.1**	
Agripro Thunderbolt		2.0	3.0	1.9	**1.9**	2.0	2.4	1.6	**1.5**	2.2
Alliance	16.6	11.5	13.6	10.1	**10.1**	7.2	6.1	6.1	**6.0**	3.9
Arapahoe	13.0	8.7	6.8	5.2	**2.9**	2.0	3.4	2.2	**2.1**	1.5
Armour										1
Buckskin	6.2	7.3	4.9	3.7	**5.0**	3.5	3.4	3.3	**4.5**	5.9
Camelot										1.1
Goodstreak	0.0			1.7	**3.7**	3.6	5.1	5.0	**6.5**	4.4
Hatcher								1.2	**1.5**	1.8
Hawken										1.5
Infinity CL							2.3	3.5	**3.7**	3.3
Jagger	3.4	3.9	2.8	3.1	**2.5**	1.7	1.5	1.1		
Karl/Karl 92	3.3	3.8	3.3	2.7	**2.7**	1.6	2.9	2.5	**1.6**	2.1
Millennium	3.5	6.1	11.1	10.7	**9.5**	7.2	9.4	13.2	**11.9**	7.6
Overland								3.4	**5.6**	10.8
Overly						1.0	1.1			
Pronghorn	10.8	10.3	10.4	11.4	**10.1**	12.2	10.6	12.1	**13.7**	10.4
TAM 111					**1.2**	1.6	3.2	6.5	**7.4**	8.1
TAM 112										1.2
Wahoo	0.0	1.8	1.7	1.8	**1.8**	1.1	1.5	1.1		
Wesley	2.2	3.6	5.9	5.5	**5.8**	7.2	7.7	4.8	**4.1**	4.2
Winterhawk										1.3
Other Private Varieties	3.9	3.4	4.4	4.0	**3.8**	2.8	4.1	5.0	**3.6**	5.4
Other Public Varieties	6.5	4.9	8.8	7.2	**6.1**	4.6	5.7	6.6	**7.8**	9.3

6. New Cultivars

Two new cultivars were increased and formally released in 2010. They are NE01481 and NI04421. The first line is NE01481 which will be marketed as Husker Genetics Brand 'McGill" in honor of a legendary professor of genetics at the University of Nebraska. McGill recommended for release primarily due to its superior adaptation to rainfed wheat production systems in eastern and west central Nebraska and its excellent resistance to wheat soil borne mosaic virus (WSBMV), a trait that is very rare in recent Nebraska releases. Additional information can be found at: http://agronomy.unl.edu/c/document_library/get_file?uuid=af82c455-7c15-48b7-ac84-c84ec9a4332f&groupId=4128273

The second line is NI04421which will be marketed as Husker Genetics Brand 'Robidoux" in honor of a pioneer French trapper who had a trading post between Nebraska and Wyoming. Robidoux was released primarily for its superior performance under irrigation and rainfed conditions in western Nebraska (west of North Platte, where drought is common) and irrigated production sites in western Nebraska and eastern Wyoming. It seems to have good drought tolerance and does best in irrigated environments in the drier areas (eastern WY). Additional information can be found at:

http://agronomy.unl.edu/c/document_library/get_file?uuid=5d4eff93-65f7-4920-9849-2fd42919cccb&groupId=4128273

III. FIELD RESEARCH

1. Increase of New Experimental Lines

With our new release procedures of determining which lines will be released in January with the seed begin available in August for certified seed producers, two lines were under increase for possible release in 2010: NE03490 and NE04490. NE03490 is a bright chaff wheat with the pedigree of WI90-540W/*2 Culver that based upon current data is best suited for production in western NE in rainfed and irrigated conditions would be very similar in adaptation to Robidoux . NE04490 is a bronze chaff wheat with the pedigree of NE95589/NE94632//Abilene/Arapahoe where NE95589 has the pedigree of NE87457/Vista and NE94632 has the pedigree of Abliene/Norkan//Rawhide. It has soilborne mosaic virus resistance and seems broadly adapted to Nebraska, but is best adapted to the same region as McGill. Both lines have acceptable end-use quality. We decided that both lines should be tested for an additional year to ensure they add useful characteristics or diversity to our current lines, especially Robidoux and McGill, before the release decision should be made. Four lines were added for large scale increase in 2011. They are NE02558, NE05430, NE05496, and NW03666. The pedigree of NE02558 is Jagger/Alliance and it area of adaptation seems to be western NE. The pedigree of NE05430 is IN92823A1-1-4-5/NE92458 where the fist line was a soft wheat developed at Purdue University and the second line was a "near-miss" that was early and most likely photoperiod insensitive. Virtually all of our releases are photoperiod sensitive because photoperiod sensitivity increases winter survival (most likely due to photoperiod sensitivity prevents breaking dormancy prematurely). The pedigree of NE05496 is KS95HW62-6/Hallam and it seems best adapted to southwestern and western NE. NW03666 is a white wheat with the pedigree of N94S097KS/NE93459. At best it is expected to be a niche wheat because it is adapted to western NE, but growers have many excellent choices and it can have some softer kernels. A number of lines are under small-scale increase for possible release in 2012.

With the release of new varieties Anton, Camelot, Goodstreak, Infinity CL, NE01481, NI04421, and Settler CL, many of the most advanced current breeding lines are not expected to be released.

2. Nebraska Variety Testing

Numerous entries were included in some or all of the locations in the Fall Sown Small Grain Variety Tests in 2010. Thirteen dryland, four dryland organic, and three irrigated locations in Nebraska were harvested for yield data. In 2010, the top ten entries for dryland production were:

Entry	Yield bu/a	Entry	Yield bu/a
Armour	57.95	Infinity CL	54.66
Overland	57.79	NE01481 (McGill)	54.05
Settler CL	55.66	Wesley	54.05
Millennium	54.87	Expedition	53.36
NE06607	54.84	Camelot	53.35

Of the released lines tested in all dryland locations, Turkey (40.3 bu/a) and Scout 66 (472.4 bu/a) as expected were among the lowest yielding lines, however some more recently released lines such as Smoky Hill (42.3 bu/a) had poor years. Even the lowest yielding lines in these trials were on average very similar to the the state average production value indicating our nurseries are on better production ground than many parts of the state. The highest average trial yield occurred in Cheyenne County (75.8 bu/a) indicating moisture was not limited at that trial and production was very good. Note due to the small plot size used in this trial, any deviation in measurement of the plots will make a large difference on the calculated yield (e.g. if the row width varied between plots).

In 2009, the ten entries for dryland production were:

Entry	Yield (bu/a)	Entry	Yield (bu/a)
NE01481	63.9	Overland	62.2
Settler CL	63.5	Infinity CL	61.9
Westbred Armour	62.7	NE04490	61.7
NI04421	62.6	Millennium	61.6
Nupride Camelot	62.5	NE03490	61.4

In 2008, the top ten entries for dryland production were:

Entry	Yield (bu/a)	Entry	Yield (bu/a)
Overland (NE01643)	61.71	2137	59.09
Smokey Hill	60.71	NI04420	58.37
NE04490	59.96	Camelot	58.06
NE01481	59.26	Millennium	58.00
NE04424	59.17	NE03490	57.85

3. Irrigated Wheat Trials:

In 2010, there were three irrigated environments in NE and WY were used to evaluate irrigated wheat production. The top ten lines were:

	Yield		Yield
Entry	**bu/a**	**Entry**	**bu/a**
NI08708	82.1	NE06545	75.5
Settler CL	80.4	Wesley	75.4
Armour	80.0	Bond CL	75.0
NI07703	78.1	Expedition	75.0
NE06607	76.6	Camelot	74.3

It was a little surprising to see Settler Cl do as well as it did, but it performed extremely well in 2009 also. It is a line with excellent drought tolerance and evidently fairly good irrigated production. The highest yielding location was Albin, WY (82.0 bu/a).

In 2009, two irrigated environments in NE were used to evaluate irrigated wheat production. The top ten lines in 2009 were:

Variety	Yield bu/a	Variety	Yield bu/a
Settler CL	94.1	NI04420	89.4
Anton (W)	93.9	NX04Y2107	89.1
Wesley	93.0	Bond CL	86.5
NE02584	90.5	NE05426	85.5
NI04436	89.6	Bill Brown	85.1

In 2008, four irrigated environments (three in NE and one in WY) were used to evaluate irrigated wheat production. The top ten lines in 2008 were:

Variety	Yield bu/a	Variety	Yield bu/a
Anton (W)	76.13	Bond CL	73.33
Overland	74.90	Camelot	72.73
NI04421	73.90	Settler CL	72.20
NI04436	73.70	Hawken	72.17
NI04420	73.63	NI05714	71.03

The irrigated data this year continue to show the benefits of having a dedicated irrigated wheat development nursery to both select lines which have excellent performance (e.g NI08708, NI07703 and to identify lines from the rainfed breeding program that do well under irrigation (Settler CL, NE06607 and NE06545).

As in the past, we have an experimental line irrigated nursery, which is grown under irrigation in western Nebraska and under dryland conditions throughout the state. The goal of this nursery is to identify higher yielding lines under irrigation and under higher rainfall conditions, which periodically occur in Nebraska. In 2010, the irrigated nursery site in western NE was destroyed by hail, so the data were lost. In addition, the data from North Platte was affected by an underdetermined effect that led to poor stands and very low yields for some lines. As such, two averages are presented (the state average is for all l three sites and the Linc. All. Average is for the average of Lincoln and North Platte). We have made considerable progress in reducing height and lodging (1-9 scale where 1 is very good), but additional disease resistance (1-9 scale where 1 is very good) is needed. The 2010 data from rainfed sites are:

Variety	Yield Linc.	Lodg. Linc.	Hdate Linc	Dis. Linc.	Yield NP	Yield AL	State Avg	Rank	Linc. All. Avg	Rank	Height
	bu/a	score	May	score	bu/a	bu/a	bu/a		bu/a		in
NI09709	74.88	1.0	22.30	6.0	35.33	52.25	54.15	1	63.57	1	32.23
NI10713	70.79	2.0	23.81	4.0	34.65	47.88	51.11	2	59.34	2	35.30
TAM111	68.44	1.3	23.08	5.0	35.95	48.77	51.05	3	58.61	3	34.40
NI09714	61.25	1.3	24.35	6.0	34.81	53.34	49.80	5	57.30	4	31.87
NI10716	69.22	1.7	25.12	3.0	38.15	41.51	49.63	7	55.37	5	37.47
NI10707	60.80	1.3	24.47	5.0	29.58	48.74	46.37	16	54.77	6	33.83
NI09703	63.42	2.7	24.42	5.0	40.65	44.87	49.65	6	54.15	7	35.50
NI09706	53.35	1.3	23.25	8.0	39.12	54.72	49.06	9	54.04	8	32.93
NI10709	63.05	1.9	24.58	4.0	34.73	44.78	47.52	12	53.92	9	34.40
NI06731	60.17	1.7	23.95	7.0	29.98	46.63	45.59	18	53.40	10	33.13
NI08707	61.93	1.7	24.45	7.0	45.61	44.67	50.74	4	53.30	11	32.10
NI10717	59.10	1.4	24.36	7.0	34.40	46.59	46.70	15	52.85	12	33.13
NI10711	66.15	2.7	24.08	5.0	30.45	38.53	45.04	20	52.34	13	35.77
NI10718	59.46	1.3	24.19	5.0	37.97	44.77	47.40	13	52.12	14	33.07
NI10701	62.72	1.7	23.97	7.0	30.37	41.48	44.86	22	52.10	15	33.27
NI10706	56.64	1.2	24.62	4.0	42.46	46.91	48.67	10	51.78	16	34.43
NI09715	59.87	2.1	24.16	7.0	36.82	43.48	46.72	14	51.68	17	33.80
NI07703	58.46	2.0	23.65	7.0	24.04	44.34	42.28	28	51.40	18	33.80
NI04421	52.20	1.7	24.52	8.0	32.04	48.70	44.31	25	50.45	19	34.67
NI06736	64.53	2.3	22.47	6.0	26.01	36.04	42.19	29	50.29	20	30.90
NI10720	60.28	2.0	25.03	3.0	42.52	40.14	47.65	11	50.21	21	34.43
NI10714	57.85	2.0	23.49	5.0	31.79	41.84	43.83	27	49.85	22	33.70
NI10705	42.40	0.7	27.00	7.0	25.15	56.67	41.41	32	49.54	23	31.77
NI10704	49.10	2.3	24.36	8.0	36.13	49.78	45.00	21	49.44	24	33.97
NI08708	63.28	1.3	23.92	6.0	49.51	35.22	49.34	8	49.25	25	33.33
NI09710	55.95	1.7	24.01	6.0	21.82	41.94	39.90	33	48.95	26	33.03
NI10708	59.34	1.6	24.86	4.0	39.79	38.16	45.76	17	48.75	27	30.87
NI10702	53.10	1.3	24.93	6.0	37.87	44.31	45.09	19	48.71	28	33.60
NI10712	49.33	1.0	24.77	6.0	28.54	46.73	41.53	31	48.03	29	35.17
NI03427	55.94	1.7	23.56	5.0	38.31	38.96	44.40	24	47.45	30	33.57
NI06737	59.40	2.0	22.16	5.0	20.55	33.29	37.75	36	46.35	31	31.93
NI08715	49.91	1.4	23.73	7.0	42.67	41.92	44.83	23	45.92	32	33.00
WESLEY	55.22	1.3	25.21	5.0	41.65	35.49	44.12	26	45.36	33	32.30
NI10710	56.32	3.0	25.58	3.0	25.11	34.11	38.51	34	45.22	34	32.97
Antelope	61.62	1.0	24.08	6.0	34.68	28.81	41.70	30	45.22	35	32.20
NI08714	49.05	1.3	22.37	7.0	26.13	40.08	38.42	35	44.57	36	32.50
NI10719	46.52	2.0	25.69	7.0	25.42	39.48	37.14	39	43.00	37	34.60
NI10715	42.06	1.3	25.26	6.0	25.79	43.08	36.98	40	42.57	38	31.60
NI09707	43.73	0.7	21.18	8.0	30.05	39.18	37.65	37	41.46	39	31.70
NI10703	46.39	1.3	25.00	6.0	32.96	32.18	37.18	38	39.29	40	34.10
Average	**57.58**	**1.63**	**24.15**	**5.80**	**33.74**	**43.01**	**44.78**		**50.29**		**33.41**

The lines highlights in yellow are released varieties (NI04421 is Robidoux) and the line highlighted in green is an experimental line with excellence performance.

Data for 2009 are:

name	Lincoln bu/a	N.Platte bu/a	Alliance bu/a	**St. AVG. Dry bu/a**	**Alliance Irr bu/a**	St. Avg. All bu/a	Flowering d after Jan. 1	Height in.	Test Wt. lbs/bu
Antelope	72.3	48.7	75.8	**65.6**	**119.0**	78.9	141.6	32.7	59.2
TAM111	71.9	67.5	83.4	**74.3**	**132.6**	88.8	143.1	35.1	59.5
WESLEY	77.3	59.4	82.7	**73.1**	**127.9**	86.8	143.9	31.5	58.0
NI03427	82.5	59.1	81.8	**74.5**	**126.3**	87.4	142.9	33.4	58.9
NI04421	75.7	71.1	89.4	**78.7**	**105.9**	85.5	144.0	34.7	57.5
NI06731	81.2	47.0	79.0	**69.0**	**122.5**	82.4	139.9	33.5	57.3
NI06736	85.9	55.3	74.1	**71.8**	**126.4**	85.4	141.1	31.8	57.5
NI06737	78.4	57.7	74.0	**70.0**	**125.1**	83.8	140.1	31.9	58.7
NI07701	62.3	54.6	73.8	**63.6**	**130.3**	80.2	141.2	29.0	57.0
NI07703	80.0	53.6	77.4	**70.3**	**124.0**	83.7	141.2	33.7	57.4
NI07710	49.3	37.4	85.0	**57.2**	**97.4**	67.3	147.4	34.1	54.1
NI07712	49.1	40.5	82.7	**57.4**	**100.5**	68.2	145.0	33.8	54.8
NI07714	71.0	46.6	72.5	**63.4**	**117.3**	76.9	144.9	33.2	57.4
NI07717	73.2	57.3	88.3	**72.9**	**111.1**	82.5	147.3	35.3	56.1
NI08703	71.7	54.3	75.4	**67.1**	**108.7**	77.5	146.2	34.2	57.1
NI08707	88.1	64.5	94.3	**82.3**	**124.4**	92.8	141.1	32.4	57.6
NI08708	95.4	66.4	81.6	**81.1**	**116.1**	89.9	140.5	34.4	58.6
NI08714	84.7	62.8	87.6	**78.4**	**131.2**	91.6	139.9	33.2	57.8
NI08715	70.4	55.0	73.0	**66.1**	**117.1**	78.9	142.5	31.8	58.4
NI08716	71.2	55.5	79.2	**68.6**	**106.9**	78.2	142.5	32.9	58.3
NI08717	76.4	59.9	76.2	**70.8**	**110.2**	80.7	140.2	33.2	59.4
NI08719	53.9	53.5	68.1	**58.5**	**111.0**	71.6	145.1	32.3	56.3
NI09701	73.8	48.0	89.6	**70.5**	**119.0**	82.6	143.2	34.7	56.8
NI09702	78.6	51.6	77.0	**69.1**	**116.4**	80.9	143.4	34.6	58.2
NI09703	60.4	66.7	84.6	**70.6**	**126.9**	84.7	147.8	34.9	60.3
NI09704	91.9	57.0	84.3	**77.7**	**109.9**	85.8	145.7	38.2	57.2
NI09705	57.7	63.3	91.3	**70.8**	**113.3**	81.4	144.8	37.2	59.9
NI09706	78.8	53.6	79.0	**70.5**	**116.6**	82.0	141.3	32.0	58.2
NI09707	71.2	65.3	73.3	**69.9**	**121.4**	82.8	140.0	31.4	57.8
NI09708	80.4	57.1	72.9	**70.1**	**118.3**	82.2	141.1	32.8	59.2
NI09709	87.4	65.3	85.8	**79.5**	**116.7**	88.8	140.0	32.0	60.1
NI09710	87.8	58.3	76.0	**74.1**	**128.6**	87.7	142.3	32.8	56.7
NI09711	78.1	59.4	74.7	**70.7**	**116.0**	82.0	145.1	34.6	58.0
NI09712	75.7	56.7	85.7	**72.7**	**115.3**	83.3	139.5	33.0	56.9
NI09713	73.6	54.6	82.0	**70.1**	**114.0**	81.1	141.8	33.5	55.5
NI09714	68.8	54.2	93.5	**72.2**	**122.8**	84.8	143.2	33.2	55.8
NI09715	66.3	60.5	75.5	**67.4**	**118.8**	80.3	143.9	33.4	58.4
NI09716	82.1	51.1	80.4	**71.2**	**119.3**	83.2	144.0	34.0	56.3
NI09717	77.5	58.8	86.4	**74.2**	**119.1**	85.4	140.9	32.6	56.2
NI09718	74.0	51.9	92.7	**72.9**	**107.6**	81.5	141.2	35.9	54.3
Average	**74.64**	**56.52**	**81**	70.7	**117.8**	**82.5**	**22.77**	**33.5**	**57.6**
LSD	12.45	9.13	8.08		**11.2**	10.2	2.37	1.8	1.7

Data for 2008 are:

Variety	LINC Yield bu/a	N.PLATTE Yield bu/a	ALLIANCE Yield bu/a	Dryland Yield bu/a	Dryland Height in	Rank	**Sidney Irr. Yield bu/a**	**Irrigated Height in**	St. Avg Yield bu/a	St. Avg. Height in
WESLEY	40.1	102.0	62.3	68.10	33.07	13	**51.9**	**24.6**	64.0	31.0
Antelope	51.2	96.2	57.0	68.12	34.40	12	**50.6**	**27.2**	63.7	32.6
TAM111	47.6	99.0	60.3	68.96	35.67	9	**64.2**	**28.6**	67.8	33.9
NI04421	**52.3**	**106.2**	**63.0**	**73.86**	**34.97**	**1**	**68.6**	**27.6**	**72.6**	**33.1**
NI04436	49.4	105.1	59.6	71.37	34.17	3	**44.4**	**27.3**	64.6	32.5
NI05714	48.0	98.5	59.7	68.75	34.87	11	**56.3**	**30.1**	65.6	33.7
NI04427	61.5	94.4	53.8	69.93	32.23	5	**54.6**	**24.1**	66.1	30.2
NI03427	40.4	95.7	56.3	64.12	34.07	24	**58.8**	**26.3**	62.8	32.1
NI06721	51.9	86.7	57.2	65.24	29.87	20	**29.4**	**25.7**	56.3	28.8
NI06724	49.6	86.9	60.2	65.58	34.03	17	**58.2**	**28.6**	63.7	32.7
NI06726	53.7	77.1	54.0	61.55	33.50	29	**47.9**	**28.9**	58.1	32.4
NI06731	38.5	101.7	55.7	65.32	33.70	19	**61.2**	**25.1**	64.3	31.6
NI06736	56.4	96.8	54.0	69.08	32.33	8	**54.0**	**25.4**	65.3	30.6
NI06737	52.8	96.2	53.0	67.34	32.23	16	**63.7**	**24.7**	66.4	30.4
NI07701	47.2	90.5	57.8	65.13	30.50	21	**64.2**	**25.1**	64.9	29.2
NI07703	53.4	93.9	56.5	67.94	34.27	14	**61.9**	**27.3**	66.4	32.5
NI07710	45.0	81.9	46.6	57.80	34.07	35	**68.1**	**27.9**	60.4	32.5
NI07712	38.6	85.3	46.4	56.78	34.00	36	**49.1**	**27.2**	54.9	32.3
NI07713	35.8	78.5	51.6	55.30	31.70	38	**51.4**	**24.2**	54.3	29.8
NI07714	45.9	93.9	51.7	63.83	34.47	26	**58.4**	**24.7**	62.5	32.0
NI07717	36.8	92.9	64.8	64.79	34.90	22	**74.7**	**28.0**	67.3	33.2
NI08701	10.1	85.7	54.7	50.20	34.70	40	**47.8**	**28.7**	49.6	33.2
NI08702	34.1	95.2	59.0	62.79	34.23	28	**45.2**	**29.6**	58.4	33.1
NI08703	34.1	94.2	53.3	60.51	33.07	31	**73.8**	**29.1**	63.8	32.1
NI08704	27.8	98.6	50.5	58.97	32.03	33	**42.1**	**26.3**	54.7	30.6
NI08705	44.3	80.3	56.6	60.40	32.43	32	**56.3**	**26.7**	59.4	31.0
NI08706	42.2	74.6	52.1	56.29	32.33	37	**42.9**	**27.1**	52.9	31.0
NI08707	37.0	94.9	70.4	67.39	33.10	15	**67.1**	**27.4**	67.3	31.7
NI08708	39.4	105.4	63.1	69.29	34.23	7	**67.4**	**29.0**	68.8	32.9
NI08709	51.4	94.5	50.7	65.56	32.17	18	**61.5**	**24.7**	64.5	30.3
NI08710	37.7	100.5	54.8	64.33	34.47	23	**63.2**	**28.7**	64.1	33.0
NI08711	48.8	88.4	51.4	62.85	33.93	27	**54.4**	**27.4**	60.7	32.3
NI08712	49.4	78.7	53.5	60.55	33.50	30	**57.8**	**27.0**	59.9	31.9
NI08713	40.9	73.7	51.2	55.24	33.53	39	**59.3**	**28.4**	56.2	32.3
NI08714	47.4	101.9	57.5	68.95	32.73	10	**66.8**	**29.3**	68.4	31.9
NI08715	55.5	98.6	55.1	69.71	33.10	6	**63.5**	**26.3**	68.2	31.4
NI08716	55.9	100.9	58.8	71.87	33.80	2	**68.6**	**27.4**	71.1	32.2
NI08717	53.0	104.1	55.5	70.87	33.27	4	**49.4**	**26.1**	65.5	31.5
NI08718	43.4	87.4	61.0	63.91	33.00	25	**53.2**	**28.4**	61.2	31.9
NI08719	33.4	81.1	59.7	58.06	34.43	34	**67.4**	**28.1**	60.4	32.9
Mean	**44.6**	**92.5**	**56.3**	**64.42**	**33.43**		**57.5**	**27.1**	**62.68**	**31.85**

4. Nebraska Intrastate Nursery:

The 2010 Nebraska Intrastate Nursery (NIN) was planted at nine locations (Lincoln, Mead, Mead Organic, Clay Center, McCook (added due to generous support from ConAgra), North Platte, Sidney, Sidney Organic, and Hemingford, NE). The data from Mead and Mead Organic were low due to delayed harvest and extensive rain. As mentioned above, the yields at North Platte were hurt by spotty stands. Weeds are hard to control in organic systems and hurt the yields at Sidney Organic. The state averages are given for the seven conventional and two organic locations. The nursery means went from 36.0 bu/a to over 80 bu/a at McCook where a fungicide waws used to control disease. As in the past, the correlation between sites ranged from zero to a high of r =0.58 (n=60, McCook with Lincoln). However, even the highest correlation did not explain more than 40% of the variation between the two sites and generally less than 20% was explained. As such, it is important to continue testing at all of our sites to represent the possible growing areas for our advanced lines. Of the released lines, Camelot, Goodstreak, Settler CL, and Overland (NE01643) did well. The two newest lines, NE01481 performed well, but is narrowly adapted. NI04421 is adapted to irrigated conditions and did well across the state due to the its combining drought tolerance and ability to respond in irrigated conditions. Our newer experimental lines have performed very well compared to the previously released lines as would be hoped if continual progress were being made.

Data for the 2010 NIN are:

			Conventional								Organic		
	Yield MD	Yield LN	Yield CC	Yield NP	Yield SD	Yield All.	Yield MC	**Con. Avg.**	Rank	Yield MO	Yield SO	**Org. Avg.**	Rank
	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	**bu/a**		bu/a	bu/a	**bu/a**	
WESLEY	37.45	52.88	43.31	34.25	52.04	47.24	76.68	**44.53**	55	35.72	32.77	**45.82**	55
ALLIANCE	31.23	53.24	45.83	48.73	60.92	58.69	80.36	**49.77**	19	42.45	27.41	**49.87**	29
Overland	45.49	56.48	52.46	37.03	54.79	58.77	92.82	**50.84**	10	40.59	36.18	**52.73**	7
NE01481	36.97	61.26	52.04	34.46	57.33	50.55	91.74	**48.77**	25	40.17	39.10	**51.51**	17
NE02558	43.13	53.41	47.9	43.96	58.29	53.23	83.74	**49.99**	17	45.64	35.76	**51.67**	13
NE03490	33.32	57.38	52.79	33.23	53.51	49.32	81.11	**46.59**	42	38.40	29.63	**47.63**	49
NW03666	43.67	60.67	49.04	36.02	53.57	57.84	87.57	**50.14**	16	43.40	30.67	**51.38**	18
NE04490	35.41	57.1	39.48	37.47	50.02	58.15	77.05	**46.27**	44	46.53	33.91	**48.35**	45
NI04420	45.28	60.23	53.65	34.91	65.1	53.11	89.75	**52.05**	6	41.05	38.20	**53.48**	3
NI04421	41.17	56.39	46.26	35.28	63.87	58.71	89.78	**50.28**	15	40.75	37.33	**52.17**	9
NE05426	38.39	63.79	40.63	32.61	50.37	48.51	82.49	**45.72**	49	40.60	27.70	**47.23**	51
NE05430	38.35	59.2	47.92	26.91	57.17	45.55	85.88	**45.85**	48	41.50	29.33	**47.98**	47
NE05496	38.51	54.45	47.03	46.01	58.03	52.53	87.01	**49.43**	22	34.32	42.52	**51.16**	19
NE05548	28.17	56.02	45.13	41.28	61.71	58.56	80.32	**48.48**	26	40.27	31.99	**49.27**	35
NE06430	33.03	55.7	48.03	39.99	64.2	52.66	88.73	**48.94**	24	45.00	32.46	**51.09**	20
NE06469	39.7	58.72	48.07	46.72	53.1	47.42	84.21	**48.96**	23	50.94	38.41	**51.92**	12
NE06545	31.75	58.98	39.98	39.09	51.9	61.43	90.98	**47.19**	37	43.93	31.53	**49.95**	27
NE06607	43.71	58.86	54.17	44.47	63.39	58.86	88.61	**53.91**	1	47.85	54.64	**57.17**	1
NE07444	33.61	55.15	49.52	37.91	53.29	54.69	85.46	**47.36**	35	43.34	22.58	**48.39**	43
NE07486	40	66.27	54.44	34.52	60.24	62.67	88.54	**53.02**	3	45.46	31.76	**53.77**	2
NE07487	30.35	55.45	48.92	31.32	60.13	63.66	83.31	**48.31**	27	47.70	31.83	**50.30**	26
NW07505	40.7	59.5	55.46	43.58	63.11	59.42	78.72	**53.63**	2	42.48	30.34	**52.59**	8
NE07520	30.75	57.87	48.41	32.84	61.91	56.97	88.49	**48.13**	29	39.83	24.99	**49.12**	36
NE07521	39.67	56.79	47.46	35.52	50.75	50.71	85.64	**46.82**	41	42.01	19.95	**47.61**	50
NE07531	31.79	49.89	42.31	45.05	52.14	51.94	92.05	**45.52**	51	44.39	31.30	**48.98**	39
NW07534	35.49	55.38	38.41	34.14	44.41	46.88	81.67	**42.45**	58	41.26	22.05	**44.41**	58
NE07627	36.39	49.52	37.42	35.81	55.47	57.3	91.79	**45.32**	52	47.97	24.97	**48.52**	41
NE07668	31.35	56.54	43.68	34.32	56.17	48.89	82.33	**45.16**	53	34.55	32.46	**46.70**	52
NI07703	37.7	46.59	36.41	24.8	58.64	54.23	83.79	**43.06**	57	34.95	30.52	**45.29**	56
Camelot	43.66	57.36	49.89	39.06	64.93	53.15	81.74	**51.34**	8	52.50	35.43	**53.08**	5
Settler CL	38.48	56.92	43.89	45.53	61.09	57.46	83.17	**50.56**	11	42.67	25.92	**50.57**	25
Infinity CL	34.12	56.51	48.84	31.24	60.72	57.27	80.93	**48.12**	30	37.98	32.33	**48.88**	40
MILLENNIUM	39.13	54.08	49.46	30.48	58.75	57.44	82	**48.22**	28	38.85	31.43	**49.07**	37
NE08402	41.54	64.19	48.59	22.66	54.76	50.52	81.27	**47.04**	39	47.17	48.94	**51.07**	21
NE08407	46.06	63.22	46.25	29.22	52.83	47.77	82.66	**47.56**	32	48.57	28.63	**49.47**	34
NE08410	41.33	63.72	43.83	27.56	54.54	52.47	84.75	**47.24**	36	45.07	35.42	**49.85**	30
NE08435	39.09	60.81	44.32	23.21	55.93	49.83	85.18	**45.53**	50	45.20	32.15	**48.41**	42
NE08452	27.16	55.65	45.3	35.18	63.44	60.71	84.82	**47.91**	31	42.62	31.67	**49.62**	32
NE08457	42.6	60.12	44.11	40.91	55.93	54.59	84.49	**49.71**	20	42.39	30.88	**50.67**	23
NE08459	38.75	57.86	38.21	33.29	55.07	53.95	79.68	**46.19**	46	41.60	36.56	**48.33**	46
NE08470	35.19	51.82	43.01	32.73	58.77	46.08	83.8	**44.60**	54	35.18	30.96	**46.39**	54
NE08476	37.5	59.28	54.32	43.05	62.53	59.59	82.61	**52.71**	4	40.18	38.00	**53.01**	6
NE08499	33.3	61.89	52.73	38.39	61.75	60.85	83.31	**51.49**	7	39.36	33.32	**51.66**	15
NE08509	30.71	47.92	45.89	41.47	58.66	58.11	85.55	**47.13**	38	41.21	39.68	**49.91**	28
NE08523	31.39	59.39	62.56	37.19	60.49	50.73	76.21	**50.29**	14	43.59	37.25	**50.98**	22
NE08527	31.09	58.48	57.79	36.61	62.13	57.11	81.46	**50.54**	12	39.33	40.28	**51.59**	16
NE08531	36.12	54	53.52	40.81	55.73	44.2	79.78	**47.40**	34	40.53	40.80	**49.50**	33
NE08555	39.26	55.93	49.58	38.94	57.45	55.95	84.13	**49.52**	21	36.02	47.70	**51.66**	14
NE08651	35.3	51.81	43.56	43.35	56.16	50.94	81.57	**46.85**	40	47.28	37.45	**49.71**	31
NE08659	38.83	54.74	54.1	47.42	65.77	55.39	74.62	**52.71**	5	42.44	34.00	**51.92**	11
NW08460	29.76	58.86	42.24	30.65	60.8	56.77	84.98	**46.51**	43	35.78	31.90	**47.97**	48
NW08463	38.74	59.07	38.19	39.27	50.39	50.88	85.51	**46.09**	47	38.73	40.78	**49.06**	38
NI06731	36.77	59.99	45.28	33.01	56.1	54.03	78.76	**47.53**	33	38.97	32.62	**48.39**	44
NI06736	38.83	60.2	47.88	31.4	50.78	48.16	76.71	**46.21**	45	42.06	24.18	**46.69**	53
NI06737	31.83	62.37	45.75	29.07	50.36	45.46	74.78	**44.14**	56	39.55	27.28	**45.16**	57
NE07409	39.4	62.32	54.24	33.44	58.07	51.68	88.97	**49.86**	18	45.89	34.16	**52.02**	10
NI08708	38.2	61.21	51.52	41.9	62.04	47.59	90	**50.41**	13	48.28	38.37	**53.23**	4
GOODSTREAK	43.82	49.39	50.36	40.52	62.38	60.33	69.77	**51.13**	9	43.72	34.88	**50.57**	24
SCOUT66	28.65	40.77	37.28	29.68	50.31	40.52	57.63	**37.87**	59	22.49	40.48	**38.65**	59
CHEYENNE	27.67	23.55	33.06	37.02	47.06	44.18	51.98	**35.42**	60	29.77	42.41	**37.41**	60
Average	**36.78**	**56.45**	**47.03**	**36.44**	**57.19**	**53.54**	**82.72**	**47.90**		**41.63**	**33.80**	**49.51**	
LSD	**9.09**	**4.66**	**4.11**	**7.09**	**5.98**	**5.52**	**7.44**			**8.84**	**11.19**		
CV	**18.21**	**7.05**	**6.44**	**14.32**	**7.7**	**7.6**	**5.33**			**15.63**	**24.38**		

Data for the 2009 NIN are: NIN 2009	Linc.	Mead	Mead Org.	Clay Cen.	N. Platte	Sidney	Alliance	**State Avg**	St. Rank	Flowering
name	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	**bu/a**		d after 1/1
WESLEY	77.4	66.0	71.8	63.5	74.1	72.5	87.3	**73.2**	37	145.0
ALLIANCE	78.2	61.5	68.2	41.6	74.8	83.5	90.6	**71.2**	49	144.7
OVERLAND	94.4	69.2	88.8	53.0	72.3	79.1	82.3	**77.0**	9	145.7
NE01481	79.3	74.3	83.4	60.6	74.5	79.9	74.5	**75.2**	23	144.0
NE02533	80.3	57.6	73.9	51.0	73.0	78.9	81.2	**70.9**	50	144.3
NE02558	82.8	60.0	75.1	67.2	77.6	81.4	87.4	**75.9**	15	144.7
NE02584	81.0	70.3	64.1	60.6	69.6	79.0	69.8	**70.6**	53	144.7
NE03490	72.1	64.3	79.8	28.1	72.2	91.9	87.3	**70.8**	52	145.0
NW03666	80.2	70.0	78.1	57.9	75.2	89.0	79.9	**75.7**	18	145.0
NE04490	75.0	69.1	65.1	63.3	82.1	78.5	80.5	**73.4**	34	143.3
NI04420	82.4	72.2	72.5	54.7	78.3	79.5	83.4	**74.7**	25	144.7
NI04421	82.8	67.3	70.3	66.2	76.6	87.2	86.9	**76.8**	10	144.7
NI04427	76.8	69.5	68.4	58.9	77.8	74.9	90.3	**73.8**	30	144.0
NE05403	69.3	70.5	74.7	64.0	69.4	70.9	84.0	**71.8**	46	143.3
NE05418	79.2	64.5	72.3	53.1	72.1	71.1	69.3	**68.8**	56	143.3
NE05426	78.5	73.0	74.0	54.8	68.6	80.5	73.9	**71.9**	45	144.0
NE05430	84.8	81.2	78.2	68.1	77.2	76.4	77.9	**77.7**	7	142.7
NE05496	89.1	78.0	83.8	66.7	72.7	82.6	95.7	**81.2**	2	142.7
NE05548	85.3	75.8	74.4	50.4	74.3	81.3	87.3	**75.6**	21	145.0
CAMELOT	84.2	71.5	77.1	43.9	76.7	83.4	84.9	**74.5**	26	145.3
SETTLER CL	77.2	66.8	73.1	74.6	71.3	77.0	94.9	**76.4**	13	144.0
Infinity	78.8	67.9	75.9	47.4	70.9	83.4	85.7	**72.9**	39	144.3
NE05549	78.9	64.3	78.8	64.7	85.7	87.1	96.0	**79.4**	5	145.0
NE05459	71.5	71.9	73.3	58.2	67.8	79.1	88.3	**72.9**	38	144.0
NE06430	67.9	78.3	74.5	55.5	75.1	96.1	80.4	**75.4**	22	141.0
NE06469	71.5	72.9	76.0	47.7	73.6	85.1	86.0	**73.2**	36	141.7
NE06471	70.2	81.2	74.9	37.2	67.2	85.9	85.7	**71.7**	47	143.0
NE06545	82.8	79.2	86.0	70.4	87.7	97.8	87.3	**84.5**	1	142.7
NE06548	70.3	68.4	73.0	57.7	74.3	84.3	78.2	**72.3**	44	144.7
NE06552	68.0	56.4	70.9	59.9	73.5	80.9	84.3	**70.6**	54	144.3
NE06607	74.8	73.3	78.8	38.8	78.3	85.8	84.2	**73.4**	32	143.7
NE07409	79.2	77.9	78.3	44.9	70.5	82.2	80.1	**73.3**	35	143.0
NE07410	73.2	61.7	68.7	48.8	59.2	77.5	77.7	**66.7**	57	143.3
NE07444	87.4	83.6	81.4	45.4	73.1	76.8	87.1	**76.4**	14	142.3
NE07457	72.5	67.3	69.5	61.2	76.2	87.1	80.1	**73.4**	33	145.0
NE07458	86.7	70.0	72.0	59.0	64.6	76.3	80.6	**72.7**	41	144.7
NE07469	74.2	76.1	72.8	57.9	65.7	73.1	73.8	**70.5**	55	144.7
NE07477	80.2	75.9	72.6	58.1	74.6	76.2	80.5	**74.0**	28	143.0
NE07479	80.5	73.8	68.7	70.4	66.5	77.3	77.0	**73.4**	31	142.7
HARRY	70.6	76.0	77.8	45.4	75.7	89.0	96.0	**75.8**	17	146.3
MILLENNIUM	66.1	71.0	79.8	49.5	69.3	76.9	83.5	**70.8**	51	144.3
NE07484	55.6	81.0	70.4	47.9	62.9	69.0	79.6	**66.6**	58	144.3
NE07486	78.2	73.4	73.0	60.8	75.8	83.8	79.1	**74.9**	24	142.7
NE07487	76.9	70.3	75.4	64.2	72.5	86.8	83.4	**75.6**	19	143.7

NE07490	79.5	68.3	74.0	32.1	75.3	88.9	89.6	**72.5**	42	144.0
NW07505	82.8	76.6	77.4	66.6	78.7	85.5	88.6	**79.5**	4	144.0
NE07520	85.2	58.5	70.2	72.4	76.4	82.4	86.4	**75.9**	16	144.3
NE07521	78.3	72.6	72.0	46.6	81.4	86.9	83.1	**74.4**	27	144.7
NE07531	74.6	84.0	81.5	35.5	82.8	89.1	88.1	**76.5**	12	144.0
NW07534	81.7	71.1	79.6	77.1	76.8	84.1	79.5	**78.6**	6	145.3
NW07539	79.8	59.2	70.8	66.2	72.5	78.5	79.8	**72.4**	43	144.7
NE07569	81.9	71.2	75.3	72.4	69.6	76.4	70.7	**73.9**	29	146.0
NE07627	83.6	77.7	80.8	76.0	75.5	82.8	86.3	**80.4**	3	144.3
NE07663	79.2	60.7	73.7	54.4	72.9	79.9	89.2	**72.8**	40	144.3
NE07668	85.3	55.5	76.0	69.2	79.3	85.9	85.8	**76.7**	11	146.0
NE07695	80.6	68.3	74.6	69.3	73.0	67.1	66.8	**71.4**	48	144.3
NI07703	84.8	66.7	76.6	54.9	74.8	91.6	79.8	**75.6**	20	143.7
GOODSTREAK	87.8	82.0	80.9	47.8	73.3	80.0	90.4	**77.5**	8	144.7
SCOUT66	54.7	51.9	69.9	29.1	51.7	61.7	66.5	**55.1**	60	144.0
CHEYENNE	76.0	62.1	70.4	34.9	62.4	71.0	77.3	**64.9**	59	145.0
Average	**78.0**	**70.2**	**74.9**	**56.0**	**73.3**	**81.1**	**82.9**	**73.8**		
LSD	9.6	10.0	6.6	3.3	7.0	7.1	8.4			

The 2010 NIN consists of lines advanced from the 2009 NIN and 2009 Triplicate (NTN). Our quality samples come from those nurseries as they can only be analyzed after they have been harvested for the previous year. In 2009 NIN, fifty four wheat varieties composites were analyzed in wheat quality characteristics. The single kernel hardness index was 66.0±7.4. 45 varieties were classified as HARD with normal size and weight. The flour yield was 73.2±1.6%. The flour protein at 14% mb was 12.2±0.6%. The protein of most varieties (85.1%) was between 10.0% and 12.0%. The flour ash at 14% mb was 0.39±0.40%. Most varieties had low ash (< 0.45%). The flour protein was significantly correlated with rheological dough strength. The water absorption of mixograph was 60.0%. The mixograph peak time was 4.0±1.2 min. Most varieties (57.4%) had peak time between 3 and 5 min. The tolerance evaluated visually according to standard mixograph scale was 4.0±1.0. Most varieties had good dough strength. The dough strength was significantly correlated with baking performance.

There was significant difference in baking performance of NIN wheat lines. The water absorption at 14% mb of optimum dough was 61.9±0.9%. The mixing time of optimum dough was 5.1±1.2 min. The loaf volume was 822±40 mL. Most varieties (81.4%) had from good to excellent bread quality with average 12.1% protein and 0.39% ash. The dough water absorption and mixing time were in normal range. They were given good rheological dough strength. They were given creamy or white crumb color, larger cell number, elongated and uniform cell distribution. They had smooth and resilient texture. They achieved high loaf volume (> 800 mL). Only three varieties had unacceptable bread quality accompanied by weak dough strength, shorter mixing time, and fine lower volume. They were NE08555, NE08523 and OVERLAND.

In 2009 Triplicate, sixty-two wheat variety composites were analyzed for wheat quality characteristics. The single kernel hardness index was 69.6±8.6. The kernels of sixty varieties were classified as HARD with normal size and weight. The single kernel harnesses was significantly correlated with milling properties. One SOFT kernel variety produced only 67.0% flour yield. The rest of varieties had flour yield between 70.0% and 80.0%. The flour protein at 14% mb was 11.2±0.2%. Most varieties (83.9%) had protein between 10.0% and 12.0%. The flour ash at 14% mb was 0.42±0.03%. Most varieties (77.4%) had ash between 0.35% and 0.45%. The flour protein and ash were significantly correlated with rheological dough strength. The water absorption of mixograph at 14% mb was 60%. The mixograph peak time was 3.2±0.8 min. About half varieties (51.6%) had peak time between 3 and 5 min. The tolerance evaluated visually according to standard mixograph scale was 3.4±1.1. Most varieties were given fair to good dough strength. The dough strength was significantly correlated with baking performance.

There was significant difference in baking performance in triplicate wheat lines. The water absorption at 14% mb of optimum dough was 63.7±1.2%. The mixing time of optimum dough was 4.2±0.9 min. The loaf volume was 838±50 mL. Among which, most varieties (80.7%) received good to excellent bread quality with average 11.2% protein and 0.41% ash. The dough water absorption and mixing time of these varieties were in normal range. They were given good rheological dough strength. They were given creamy or white crumb color, larger cell number, elongated and uniform cell distribution. They were given smooth and resilient texture. Loaf volume was > 850 mL. Only three variety composites had unacceptable bread quality accompanied by weak dough strength, shorter mixing time, and relative lower loaf volume. They were NE09559, NE09637 and NW09618.

Data for 2008 are:

NIN	MEAD	LINC.	Clay Center	North Platte	Sidney	Alliance	State Avg.	State Avg. *	Height	Flowering	Rank	Rank *
2008	Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield		(Days	6	4
name	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	(in)	after 4/30)		
WESLEY	34.3	49.0	37.7	82.8	49.9	51.6	48.85	54.18	36.76	31.97	55	47
ALLIANCE	28.7	42.5	40.4	89.0	55.1	54.6	51.02	58.01	40.36	31.9	45	21
Overland	36.8	49.7	52.9	82.6	53.1	56.4	52.04	59.38	40.38	34.4	38	10
NE01481	27.6	77.1	43.1	90.8	50.3	52.2	56.50	58.56	40.52	32.2	5	16
Camelot	32.9	58.4	43.2	88.7	53.8	51.4	53.97	58.23	40.17	32.1	22	19
NE02533	28.1	72.8	33.0	87.5	55.7	51.8	55.77	56.74	40.86	32.4	10	34
NE02558	29.7	71.8	33.7	90.1	60.6	55.1	57.67	59.42	41.61	31.4	3	9
NE02584	34.4	65.0	47.9	82.7	45.5	53.7	52.85	56.53	38.53	31.2	33	35
NE03490	28.9	47.9	36.0	85.9	56.3	55.6	51.22	56.98	39.49	33.2	43	33
Settler CL	29.8	65.7	39.0	77.7	47.8	54.7	51.78	54.21	38.98	31.8	41	46
NW03654	36.9	63.4	42.7	86.4	57.5	54.2	56.10	59.38	41.49	31.3	7	11
NW03666	29.5	70.6	36.4	89.1	57.5	51.4	55.90	58.06	41.07	31.3	9	20
NW03681	35.4	65.9	42.6	74.2	53.9	45.5	52.05	53.64	40.86	32.3	37	50
NE04424	38.3	73.6	45.8	73.6	54.9	58.4	55.94	57.75	40.69	31.8	8	23
NE04490	44.9	72.2	41.0	81.0	57.7	54.1	57.69	58.30	40.60	30.9	2	18
NI04420	40.2	68.5	49.7	72.3	53.8	57.2	54.89	57.57	40.59	31.8	14	28

NI04421	34.1	65.6	41.5	77.5	52.0	62.4	54.50	57.58	39.86	32.4	16	26
NI04427	34.1	63.2	57.6	81.4	50.0	54.1	52.98	59.22	39.03	31.4	30	13
NE05403	35.9	70.6	53.0	81.0	47.9	53.0	54.03	57.79	38.53	31.9	19	22
HARRY	22.0	46.7	29.3	77.1	55.6	52.1	48.03	52.39	39.18	34.8	58	55
MILLENNIUM	31.3	46.5	40.9	73.1	49.5	53.2	48.51	53.05	39.80	33.8	56	54
NE05418	31.6	75.4	42.0	84.1	42.3	50.9	54.26	54.72	34.31	30.5	18	43
NE05425	36.0	68.2	49.0	84.2	52.3	55.2	55.73	59.28	40.16	30.8	11	12
NE05426	36.3	70.0	52.6	87.7	54.9	52.2	56.44	60.78	40.35	31.1	6	3
NE05430	29.1	68.3	36.3	79.4	47.1	55.1	52.88	54.16	39.21	32.7	31	48
NE05496	26.3	65.5	45.3	82.4	55.5	56.4	53.82	58.66	40.13	31.2	24	15
NE05548	26.8	74.4	50.7	88.5	50.2	58.4	56.54	60.86	41.07	32.0	4	1
NE05549	26.8	73.1	37.9	80.3	55.4	52.4	54.41	56.08	40.51	32.3	17	38
NE05459	32.9	66.9	45.9	76.0	45.7	50.6	51.83	54.02	39.86	31.8	40	49
NE05569	24.8	63.2	38.9	93.1	55.6	56.1	54.85	59.70	39.82	32.1	15	8
NE06430	34.6	68.4	45.8	83.8	55.8	52.2	55.12	58.54	40.35	30.8	12	17
NE06432	32.4	41.5	46.7	88.8	59.2	53.5	51.65	59.96	42.08	32.7	42	6
NE06436	40.4	67.2	37.4	77.3	54.7	48.3	53.72	54.28	38.45	31.5	25	45
NW06452	24.8	41.7	29.7	84.2	51.3	53.0	48.32	53.29	39.23	32.1	57	51
NE06460	21.6	72.9	29.1	80.3	52.4	51.8	52.87	53.28	39.66	31.1	32	52
NE06462	32.9	66.9	44.2	76.7	48.5	59.0	53.99	56.46	40.24	31.2	21	36
NE06469	33.0	49.4	49.6	90.3	56.1	52.3	52.60	60.18	40.29	32.4	35	5
NE06471	36.5	39.3	56.2	87.8	56.4	49.1	50.35	59.95	40.73	32.9	48	7
NE06472	34.2	50.6	41.3	87.9	53.5	52.9	52.76	57.66	40.23	32.0	34	25
NE06474	36.1	38.3	42.4	81.8	57.2	56.5	50.52	57.68	40.75	31.4	47	24
Infinity	32.0	47.2	34.7	78.8	52.2	50.8	49.06	53.10	39.78	33.8	52	53
WAHOO	21.8	50.1	21.7	80.9	55.1	53.3	49.42	52.09	40.37	34.0	50	56
NE06499	29.0	65.2	32.3	80.1	56.8	52.2	53.06	54.89	39.01	30.4	29	42

NE06537	29.4	67.5	43.8	84.5	48.9	54.3	53.93	57.09	39.80	32.1	23	32
NE06545	39.0	84.3	43.5	90.0	55.7	52.4	59.83	60.30	39.86	30.5	1	4
NE06548	40.4	59.5	40.2	81.9	57.7	53.0	55.09	57.57	41.04	31.7	13	27
NE06549	41.7	38.7	43.1	90.9	57.7	51.8	52.04	59.09	39.23	32.4	39	14
NE06552	36.1	63.4	41.6	79.7	55.1	55.1	54.03	57.10	39.23	31.2	20	31
NE06607	39.3	42.5	45.2	94.8	56.5	54.3	53.38	60.83	39.58	32.1	28	2
NE06619	39.2	61.9	40.3	81.7	53.3	48.9	53.39	55.53	40.17	32.0	27	40
NE06622	43.6	49.0	43.0	82.8	52.2	46.5	51.06	55.12	38.05	31.1	44	41
NW06630	31.2	68.7	40.9	81.4	49.5	47.2	52.58	54.30	38.68	30.8	36	44
NW06635	30.4	62.0	26.8	76.7	45.8	49.3	49.95	49.70	37.96	31.9	49	58
NW06649	24.0	64.5	32.6	77.0	48.9	43.7	49.02	50.25	38.82	32.0	53	57
NW06655	31.2	64.8	45.1	88.3	48.5	50.6	53.40	57.18	40.11	31.8	26	29
NE06672	25.3	40.3	36.6	88.1	55.2	52.5	49.31	56.33	39.51	34.2	51	37
NE06683	23.3	38.7	41.2	94.0	49.3	52.2	48.99	57.11	39.46	34.7	54	30
GOODSTREAK	26.2	46.6	34.8	83.7	54.0	56.4	50.79	55.94	41.64	34.1	46	39
SCOUT66	20.2	33.8	21.1	68.3	48.5	46.8	42.68	45.47	40.50	33.4	60	60
CHEYENNE	14.6	34.5	22.4	69.3	48.9	51.8	42.75	47.02	40.75	35.0	59	59
Mean	**31.8**	**59.2**	**40.6**	**82.9**	**52.9**	**52.9**	**52.6**	**56.4**	**39.8**	**32.1**		
CV	**14.86**	**12.7**	**13.98**	**6.71**	**9.28**	**8.05**						

* Data and rank from data at Clay Center, North Platte, Sidney, and Alliance to avoid the difficulties at Lincoln and Mead.

Data from 2008 to 2010 (three year average) from the Nebraska Intrastate Nursery for Grain Yield (bu/a)

	MEAD	MEADO	LINC.	C.CENTER	N.PLATTE	SIDNEY	ALLIANCE	McCook	**ST-AVG**	**RANK**
	Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield	**Yield**	
	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	**bu/a**	
NE06545	49.96	57.20	75.36	51.29	72.28	68.46	67.05	90.98	**64.35**	**1**
NE05496	47.59	54.05	69.67	53.01	67.03	65.37	68.20	87.01	**61.90**	**2**
NE06607	52.11	55.41	58.74	46.05	72.54	68.57	65.78	88.61	**61.19**	**3**
NI04420	52.59	49.48	70.35	52.65	61.85	66.11	64.58	89.75	**61.03**	**4**
NW03666	47.72	54.73	70.49	47.77	66.78	66.69	63.05	87.57	**60.88**	**5**
NE02558	44.26	52.63	69.33	49.61	70.53	66.77	65.22	83.74	**60.85**	**6**
Camelot	49.37	57.48	66.64	45.67	68.17	67.37	63.15	81.74	**60.69**	**7**
Overland	50.47	51.68	66.84	52.75	63.97	62.31	65.81	92.82	**60.65**	**8**
NE06430	48.64	52.26	64.00	49.76	66.31	72.03	61.74	88.73	**60.59**	**9**
NI04421	47.50	46.81	68.26	51.31	63.13	67.68	69.33	89.78	**60.54**	**10**
NE01481	46.30	53.34	72.55	51.91	66.57	62.53	59.05	91.74	**60.39**	**11**
NE05548	43.62	51.04	71.89	48.75	68.04	64.39	68.07	80.32	**60.35**	**12**
Settler CL	45.01	53.94	66.58	52.51	64.85	61.97	69.05	83.17	**60.22**	**13**
NE06469	48.52	59.07	59.87	48.45	70.19	64.76	61.90	84.21	**60.11**	**14**
GOODSTREAK	50.70	56.38	61.25	44.32	65.86	65.47	69.05	69.77	**59.49**	**15**
NE05430	49.55	54.46	70.77	50.77	61.17	60.20	59.51	85.88	**59.33**	**16**
NE04490	49.80	49.60	68.10	47.90	66.85	62.07	64.27	77.05	**59.22**	**17**
NE05426	49.24	49.15	70.76	49.34	62.96	61.91	58.19	82.49	**58.51**	**18**
ALLIANCE	40.48	49.96	57.99	42.59	70.86	66.48	67.96	80.36	**57.70**	**19**
Infinity CL	44.67	54.32	60.83	43.64	60.31	65.43	64.59	80.93	**57.38**	**20**
NE03490	42.19	54.77	59.09	38.95	63.75	67.24	64.04	81.11	**56.87**	**21**
WESLEY	45.90	50.11	59.75	48.17	63.74	58.13	62.07	76.68	**56.38**	**22**
MILLENNIUM	47.11	50.54	55.55	46.62	57.61	61.73	64.71	82.00	**56.07**	**23**
CHEYENNE	34.78	43.60	44.67	30.13	56.23	55.64	57.76	51.98	**46.38**	**24**
SCOUT66	33.60	40.55	43.10	29.17	49.87	53.49	51.28	57.63	**43.67**	**25**
Average	**46.47**	**52.10**	**64.10**	**46.92**	**64.86**	**64.11**	**63.82**	**81.84**	**58.59**	

As can be seen the excellent three-year yields of released lines (highlighted in yellow), our released lines continue to do well, but we have many experimental lines with excellent grain yields in the east, central, or west parts of Nebraska. Both broadly and more narrowly adapted lines have value in wheat production.

5. <u>Nebraska Triplicate Nursery (NTN):</u>

The same comments about the NIN data apply to the NTN. In this nursery, the check lines performed reasonably well (especially in the organic trials) compared to the experimental lines, but clearly based upon this year's data there are a number of lines that have promise continued testing for new cultivar releases. The lines in the NTN have less performance history, so it is expected that some experimental lines will out yield the checks, but that most lines will have poorer performance. As in the NIN, there was low but positive correlations among the closer locations, but in all cases the variation in one location could not explain one-half of the variation in the other location, again indicating the value of extensive testing in NE. The 2010 data are:

Variety	Mead	Linc	CC	NP	Sid	Alliance	Mc Cook	on. Av	Conv.	Mead Org	Sid Org.	Average	Org.	HT	Hdate	Lod Lin
	Yield	Yield	Yield	Yield	Yield	Yield	Yield	**Yield**	**Rank**	Yield	Yield	Org Avg	**Rank**			
	bu/a	bu/a	bu/a	bu/a	bu/a	Bu/a	bu/a	**bu/a**		bu/a	bu/a	bu/a		in	May	1-9
Camelot	40.14	58.56	50.03	38.25	53.85	54.46	71.79	**52.44**	**34**	36.79	20.68	28.74	**60**	36.32	25.63	3.2
GOODSTREAK	39.56	50.17	45.45	40.41	61.61	63.32	75.10	**53.66**	**17**	37.48	76.91	57.20	**4**	41.18	25.80	6.1
Overland	39.90	60.07	56.25	31.31	49.74	67.31	86.66	**55.89**	**11**	41.51	77.40	59.46	**2**	36.07	26.26	3.0
NE09406	31.83	55.56	45.37	35.47	44.69	65.28	83.34	**51.65**	**37**	42.05	49.48	45.77	**36**	33.81	25.67	2.1
NE09417	45.90	61.72	49.68	33.34	48.58	54.56	84.47	**54.04**	**16**	44.84	44.70	44.77	**42**	35.00	24.74	4.8
NE09422	36.25	58.78	40.87	26.56	49.28	50.29	74.00	**48.00**	**55**	36.75	63.43	50.09	**23**	34.34	23.94	2.9
NE09426	41.95	65.91	43.31	23.84	53.47	58.78	88.18	**53.63**	**18**	45.05	61.49	53.27	**12**	33.08	21.62	2.2
NE09429	37.84	49.58	40.18	35.72	49.12	50.18	78.85	**48.78**	**53**	42.62	62.69	52.66	**13**	37.92	25.34	2.1
NE09437	39.42	60.82	47.96	41.74	61.71	68.25	81.80	**57.39**	**6**	40.40	67.68	54.04	**10**	35.59	25.34	2.0
NE09460	27.20	51.12	43.43	35.91	50.34	61.82	78.06	**49.70**	**49**	36.53	53.78	45.16	**39**	34.83	25.00	3.1
NE09462	36.87	52.36	36.94	33.24	53.64	59.69	85.35	**51.16**	**39**	36.67	52.01	44.34	**43**	35.36	24.50	1.8
NE09470	26.43	45.21	41.47	30.16	58.18	62.36	82.95	**49.54**	**50**	38.49	49.66	44.08	**44**	32.54	24.37	2.1
NE09474	38.25	62.69	40.74	23.70	59.87	55.14	80.82	**51.60**	**38**	42.82	47.89	45.36	**37**	32.02	24.25	1.8
NE09476	38.75	61.22	44.09	35.98	56.55	59.80	75.31	**53.10**	**25**	45.98	38.30	42.14	**52**	34.34	25.06	4.5
NE09477	43.07	61.12	51.45	37.52	65.94	62.34	83.72	**57.88**	**3**	42.18	41.26	41.72	**55**	36.53	25.11	1.2
NE09478	45.68	50.32	35.98	34.08	47.10	58.68	79.24	**50.15**	**43**	41.15	49.12	45.14	**40**	35.38	23.96	2.3
NE09480	38.23	56.67	46.30	25.88	58.09	62.50	82.49	**52.88**	**28**	38.69	48.04	43.37	**50**	35.72	24.21	2.6
NE09481	41.74	66.88	48.35	29.53	63.51	64.48	92.20	**58.10**	**2**	42.96	47.66	45.31	**38**	32.70	23.52	2.0
NE09482	41.47	64.66	54.95	29.28	57.23	59.90	79.78	**55.32**	**12**	40.92	59.66	50.29	**21**	34.48	24.50	2.0
NE09483	37.23	56.91	49.40	31.06	60.14	62.79	83.84	**54.48**	**13**	42.02	60.17	51.10	**19**	34.12	23.20	2.0
NE09484	35.25	56.61	49.03	33.14	56.72	57.09	83.84	**53.10**	**26**	42.27	59.23	50.75	**20**	36.02	24.31	2.8
NE09487	39.53	47.93	35.01	38.38	50.37	52.14	64.41	**46.82**	**57**	39.85	57.46	48.66	**27**	39.90	26.32	3.5
NE09491	41.69	53.51	44.34	31.06	59.64	64.15	79.76	**53.45**	**20**	43.59	67.78	55.69	**7**	37.76	26.22	3.1
NE09495	46.19	54.39	51.53	41.27	72.05	65.69	82.71	**59.12**	**1**	47.70	71.23	59.47	**1**	36.11	26.42	2.8
NE09498	32.70	66.85	51.46	32.90	62.40	52.17	82.87	**54.48**	**14**	45.75	68.58	57.17	**5**	35.94	25.88	0.9
NE09499	31.53	63.50	47.88	35.85	60.10	61.91	90.61	**55.91**	**10**	48.17	61.62	54.90	**8**	35.96	25.56	2.4
NE09515	43.50	41.66	37.86	33.22	54.50	54.48	85.69	**50.13**	**44**	44.26	45.51	44.89	**41**	37.18	25.93	1.7
NE09517	41.67	60.08	48.35	29.60	61.93	64.84	88.77	**56.46**	**9**	35.56	52.48	44.02	**45**	35.76	25.16	2.3
NE09521	42.36	63.61	55.44	31.61	67.44	59.65	83.03	**57.59**	**4**	44.32	72.26	58.29	**3**	36.28	24.83	4.7
NE09527	47.12	63.38	52.71	43.26	49.56	44.40	74.72	**53.59**	**19**	42.42	60.85	51.64	**15**	37.88	22.97	3.2
NE09537	37.18	55.17	40.22	25.01	59.03	66.46	86.86	**52.85**	**30**	41.13	54.04	47.59	**32**	35.42	25.70	3.2
NE09540	38.76	49.37	40.35	27.27	52.71	62.85	78.83	**50.02**	**45**	41.86	61.23	51.55	**16**	35.62	26.93	4.8
NE09547	52.29	57.63	44.89	40.88	55.31	62.43	82.03	**56.49**	**8**	52.98	38.71	45.85	**35**	36.61	24.95	3.5
NE09559	45.75	58.62	46.30	40.15	62.42	66.19	83.54	**57.57**	**5**	46.13	48.99	47.56	**33**	36.66	25.87	0.8
NE09563	39.70	41.21	36.83	38.62	59.04	66.21	92.38	**53.43**	**21**	35.26	61.69	48.48	**28**	35.74	25.10	3.5
NE09582	36.67	51.27	41.76	32.20	49.98	48.31	64.84	**46.43**	**58**	35.23	48.25	41.74	**54**	37.42	24.50	4.2
NE09583	40.10	56.27	43.04	24.02	52.77	61.26	76.49	**50.56**	**42**	49.77	50.17	49.97	**24**	35.73	25.11	3.7
NE09584	34.08	42.37	35.50	34.31	51.84	65.21	86.11	**49.92**	**46**	38.43	48.73	43.58	**48**	32.54	24.00	3.1
NE09586	39.02	57.30	51.37	24.47	53.53	62.73	83.56	**53.14**	**24**	24.24	52.95	38.60	**57**	34.21	23.68	2.4
NE09587	33.46	49.79	45.88	28.09	53.50	57.31	77.54	**49.37**	**51**	44.39	60.16	52.28	**14**	33.80	24.85	2.8
NH09591	44.47	46.99	34.64	29.81	48.72	58.02	79.22	**48.84**	**52**	31.78	38.59	35.19	**58**	34.27	24.75	2.8
NE09599	41.44	62.84	52.53	22.15	53.35	58.21	78.93	**52.78**	**31**	39.28	70.24	54.76	**9**	35.09	24.22	2.6
NE09601	35.86	68.42	56.43	27.91	48.19	54.45	78.80	**52.87**	**29**	39.51	56.85	48.18	**30**	34.66	24.41	3.1
NW09615	39.07	33.08	28.45	30.53	48.23	59.83	82.36	**45.94**	**59**	30.95	31.20	31.08	**59**	32.92	24.17	5.6
NW09617	27.44	53.36	42.86	33.36	59.90	59.33	80.69	**50.99**	**40**	44.90	50.69	47.80	**31**	35.20	24.68	2.1
NW09618	27.30	62.65	52.68	28.59	48.90	54.37	81.81	**50.90**	**41**	35.22	56.77	46.00	**34**	34.39	24.31	3.2
NW09622	34.51	46.90	36.09	29.64	46.14	55.78	82.35	**47.34**	**56**	45.27	42.65	43.96	**46**	34.00	23.34	2.8
NW09627	30.94	54.44	36.75	29.61	61.80	70.66	88.04	**53.18**	**23**	34.33	43.54	38.94	**56**	33.81	24.05	2.7
NW09632	36.52	52.95	43.23	34.83	52.55	65.89	80.04	**52.29**	**35**	35.36	48.71	42.04	**53**	34.86	24.97	3.1
NE09636	46.78	57.33	42.99	27.43	54.13	61.82	80.47	**52.99**	**27**	38.74	63.85	51.30	**17**	34.87	25.07	2.1
NE09637	26.70	53.63	35.99	36.98	55.61	71.60	82.45	**51.85**	**36**	46.72	55.62	51.17	**18**	37.69	26.68	2.1
NE09638	40.15	45.01	43.29	48.84	54.62	57.82	78.03	**52.54**	**33**	48.65	63.44	56.05	**6**	39.18	27.29	3.1
NE09641	27.98	36.79	38.37	31.25	59.24	67.05	80.01	**48.67**	**54**	40.56	45.72	43.14	**51**	35.79	25.47	3.8
NE09680	26.02	47.49	50.32	29.52	51.13	57.88	86.90	**49.89**	**47**	44.80	54.98	49.89	**25**	35.18	25.32	3.6
NE09684	38.72	56.50	51.38	36.79	62.46	66.74	83.89	**56.64**	**7**	49.27	58.07	53.67	**11**	35.82	26.36	2.0
NE09506	25.83	46.04	37.62	33.30	52.26	46.85	68.74	**44.38**	**60**	37.42	59.06	48.24	**29**	38.51	26.28	4.9
NE09522	28.39	55.47	49.64	37.79	61.79	55.46	80.12	**52.67**	**32**	39.09	61.21	50.15	**22**	36.12	24.76	3.8
NW09532	31.43	47.49	41.47	33.23	51.67	61.51	81.73	**49.79**	**48**	33.24	53.88	43.56	**49**	35.04	25.05	2.6
NE09560	44.14	56.81	46.57	39.16	55.61	55.96	82.26	**54.36**	**15**	37.75	60.81	49.28	**26**	38.71	26.26	3.5
NHH09655	35.23	46.54	42.69	37.22	56.99	65.51	88.75	**53.28**	**22**	33.41	54.48	43.95	**47**	33.71	26.46	1.1
CV	12.65	8.82	7.67	16.18	8.15	7.03	4.26			18.39	19.64	19.02				
GRAND MEAN	**37.59**	**54.53**	**44.60**	**32.94**	**55.51**	**60.04**	**81.37**	52.37		**40.76**	**54.74**	**47.75**		**35.56**	**25.00**	**2.9**
LSD	6.46	6.53	4.64	7.24	6.14	5.73	5.84			10.18	14.60				1.04	1.7

The 2009 data are:

Variety	Linc. bu/a	Mead bu/a	Mead Org. bu/a	Clay Cen. bu/a	N. Platte bu/a	Sidney bu/a	Alliance bu/a	**State Avg bu/a**	**Rank**	Flowering d after 1/1	Height in
GOODSTREAK	96.8	77.9	96.3	44.5	68.5	76.1	89.8	**78.6**	**6**	144.3	40.2
Overland	97.8	77.8	81.4	48.1	70.4	77.9	90.4	**77.7**	**8**	145.3	35.3
WESLEY	84.6	61.3	76.4	52.0	75.7	71.1	89.6	**73.0**	**34**	144.3	31.5
NE08402	98.2	72.7	90.2	54.5	64.2	77.0	85.0	**77.4**	**9**	143.3	31.6
NE08404	84.3	78.7	87.7	29.0	67.2	59.9	87.7	**70.6**	**48**	144.0	32.5
NE08405	81.2	70.2	75.2	57.9	67.6	66.7	75.8	**70.6**	**49**	142.0	32.3
NE08406	75.5	65.9	77.7	47.3	69.7	65.7	79.3	**68.7**	**52**	143.7	31.4
NE08407	92.9	76.8	95.1	59.0	66.8	84.2	86.8	**80.2**	**2**	143.0	32.0
NE08408	72.9	72.9	79.8	42.0	59.1	63.8	74.1	**66.4**	**59**	142.3	34.1
NE08410	91.5	76.3	93.5	59.4	64.8	85.4	79.5	**78.6**	**5**	143.0	32.1
NE08414	84.5	71.8	84.0	52.4	68.1	84.7	79.0	**74.9**	**24**	141.7	29.9
NE08417	88.7	68.5	81.9	63.5	66.6	76.9	79.2	**75.0**	**23**	142.3	31.5
NE08418	73.3	58.9	84.9	40.3	73.4	78.3	87.3	**70.9**	**47**	144.3	34.5
NE08435	95.7	83.0	85.5	58.6	65.7	83.1	89.0	**80.1**	**3**	142.7	32.4
NE08438	97.1	66.8	87.7	56.2	60.1	83.8	82.7	**76.3**	**14**	142.3	31.9
NE08440	92.0	64.5	86.5	55.5	75.0	81.5	85.0	**77.2**	**11**	143.7	34.7
NE08443	85.5	57.1	76.8	57.5	69.6	73.5	82.8	**71.8**	**44**	144.0	33.3
NE08445	69.3	76.6	79.4	40.2	59.4	74.9	75.9	**68.0**	**58**	142.7	34.0
NE08446	86.9	58.2	79.8	59.4	72.4	77.4	83.9	**74.0**	**29**	144.0	33.5
NE08447	86.9	69.2	79.1	58.8	68.6	66.8	78.8	**72.6**	**39**	144.0	34.1
NE08448	80.8	53.3	76.1	66.5	66.6	76.7	88.6	**72.6**	**38**	143.0	31.9
NE08449	90.8	66.5	79.8	64.8	63.1	77.6	85.7	**75.5**	**19**	144.3	36.8
NE08451	67.5	57.4	74.3	36.8	64.9	80.7	80.7	**66.0**	**60**	143.3	32.8
NE08452	95.0	72.5	82.3	74.8	66.8	84.5	78.6	**79.2**	**4**	142.7	32.6
NE08454	81.1	71.3	81.7	52.2	60.2	86.3	72.1	**72.1**	**42**	142.0	31.4
NE08457	87.8	75.5	90.1	69.0	74.7	74.6	90.2	**80.3**	**1**	143.7	33.6
NE08459	84.4	62.4	81.3	67.8	70.1	72.4	87.2	**75.1**	**22**	143.3	31.2
NW08460	87.5	75.7	83.5	68.5	62.2	86.6	77.0	**77.3**	**10**	143.3	33.4
NE08462	80.1	71.6	87.2	45.7	76.7	85.8	86.7	**76.3**	**15**	144.0	35.0
NW08463	81.0	60.9	85.1	53.7	78.4	80.3	80.8	**74.3**	**28**	143.3	32.1
NE08465	80.6	68.7	81.8	34.1	66.6	84.8	87.9	**72.1**	**43**	144.3	35.1
NE08466	71.3	63.8	86.1	37.7	71.8	87.6	84.5	**71.8**	**45**	142.7	32.2
NE08467	85.6	71.0	82.3	39.2	66.5	60.7	86.4	**70.2**	**51**	144.3	32.1
NE08468	82.8	51.2	85.5	56.2	67.4	75.5	75.5	**70.6**	**50**	143.3	33.3
NE08469	86.3	43.1	74.0	66.6	71.3	80.8	89.3	**73.1**	**33**	144.7	32.6
NE08470	87.1	66.2	78.8	47.1	71.0	82.9	87.9	**74.4**	**27**	143.7	32.1
NE08472	87.0	67.0	78.8	48.6	69.1	81.4	80.3	**73.2**	**32**	143.7	30.5
NE08476	95.0	71.2	84.1	59.5	63.3	71.0	85.9	**75.7**	**18**	144.0	33.3
NE08495	83.7	54.8	77.4	69.5	71.2	74.0	84.1	**73.5**	**31**	143.0	30.8
NE08499	85.9	79.6	88.7	43.4	67.2	77.3	89.4	**75.9**	**16**	143.7	34.2
NE08507	86.0	60.2	79.1	49.9	61.8	61.8	80.4	**68.4**	**54**	143.3	32.9

NE08509	87.3	56.6	80.4	55.2	72.2	75.2	94.2	**74.4**	**26**	144.7	31.7
NE08523	91.6	78.5	79.9	46.0	65.3	67.0	81.5	**72.8**	**36**	143.3	39.7
NE08527	88.3	69.7	80.7	57.8	67.3	75.7	90.5	**75.7**	**17**	144.7	36.4
NE08530	82.1	52.7	71.9	47.3	67.3	89.0	96.2	**72.4**	**40**	144.7	34.6
NE08531	88.6	63.8	86.3	61.7	69.2	72.7	85.7	**75.4**	**20**	144.3	35.7
NE08535	80.0	71.2	77.1	41.3	61.1	65.6	80.5	**68.1**	**55**	144.7	33.9
NE08555	90.0	64.3	80.0	67.5	71.4	72.9	79.9	**75.2**	**21**	144.3	35.6
NE08559	84.7	61.2	82.0	37.0	68.5	67.5	75.3	**68.0**	**57**	146.7	37.8
NE08578	86.5	61.1	93.7	45.5	70.4	77.3	87.1	**74.5**	**25**	145.0	35.8
NE08592	94.2	59.2	81.1	70.0	72.3	77.3	82.1	**76.6**	**12**	144.7	33.5
NE08622	82.6	52.8	77.6	67.9	69.3	79.8	86.6	**73.8**	**30**	145.0	35.5
NE08634	84.4	54.8	85.8	63.6	70.7	71.8	79.6	**72.9**	**35**	144.7	36.6
NE08643	86.7	62.2	75.1	56.4	67.9	72.6	85.5	**72.3**	**41**	145.0	37.5
NW08645	76.9	63.9	78.8	38.1	61.6	73.3	84.1	**68.1**	**56**	144.7	36.1
NE08646	86.0	59.2	93.1	39.8	69.4	71.8	89.7	**72.7**	**37**	144.7	36.9
NE08648	86.4	54.1	77.7	54.0	64.8	77.8	85.6	**71.5**	**46**	144.7	35.8
NE08651	94.0	61.9	85.5	43.9	78.0	81.7	89.8	**76.4**	**13**	145.7	33.0
NE08655	86.0	48.6	81.6	62.3	67.6	59.5	75.2	**68.7**	**53**	146.3	37.2
NE08659	95.3	59.0	81.8	70.5	70.0	77.5	93.0	**78.1**	**7**	145.7	37.1
Average	**85.9**	**65.4**	**82.5**	**53.6**	**68.1**	**76.0**	**84.0**	**73.6**		**143.9**	**33.9**
LSD	9.66	11.6 4	7.57	3.35	8.21	7.39	6.84				
CV	8.28	13.1 1	6.76	4.60	8.87	7.17	6.00				

The 2008 data are:

2008	MEAD	LINC.	C.CENTER	N.PLATTE	SIDNEY	ALLIANCE	**ST.YIELD**	**ST.RANK**
name	(bu/a)	(bu/a)	(bu/a)	(bu/a)	(bu/a)	(bu/a)	(bu/a)	
Goodstreak	34.0	45.7	37.6	83.7	67.8	79.1	57.97	**48**
Overland	51.6	50.2	58.5	79.4	69.2	76.7	64.26	**23**
WESLEY	47.9	72.9	45.9	87.9	66.3	72.5	65.56	**15**
NE07402	52.8	41.8	50.0	81.3	67.0	69.0	60.30	**40**
NE07408	56.1	49.7	55.6	81.8	73.5	75.1	65.31	**18**
NE07409	38.3	53.7	48.1	78.9	81.9	73.8	62.46	**30**
NE07410	44.8	65.2	54.0	77.5	67.0	61.3	61.62	**35**
NE07424	40.4	40.5	33.6	81.2	74.3	72.2	57.03	**52**
NE07426	40.4	57.3	36.4	78.8	69.8	70.2	58.82	**46**
NE07435	48.6	50.7	44.1	83.6	80.3	67.3	62.43	**31**
NE07436	35.7	34.1	38.8	77.9	65.3	74.5	54.37	**58**
NE07444	46.6	81.5	54.3	83.1	65.0	72.6	67.17	**8**
NE07457	37.7	54.4	32.5	93.8	77.3	74.4	61.70	**34**
NE07458	49.9	75.7	59.6	71.9	74.2	70.2	66.92	**9**
NE07463	46.7	81.1	51.0	81.4	64.3	80.1	67.43	**7**
NE07465	52.0	65.9	42.4	79.6	72.5	65.9	63.04	**27**
NE07466	44.3	40.8	52.8	84.1	70.3	75.6	61.31	**36**
NE07469	43.9	79.2	39.7	82.6	70.2	71.1	64.44	**21**
NE07474	49.6	75.4	45.4	88.8	63.6	69.9	65.44	**16**
NE07477	41.7	68.1	51.6	88.0	65.2	72.7	64.55	**20**

NE07479	51.7	83.7	54.6	75.2	72.8	60.4	66.40	10
NE07480	33.9	79.0	39.0	82.5	65.8	62.5	60.44	38
NE07483	30.6	53.5	36.8	85.6	68.1	78.4	58.83	45
NE07484	48.5	41.6	59.3	80.3	66.0	70.6	61.05	37
NE07486	50.6	84.8	60.6	92.3	77.7	76.1	73.70	1
NE07487	48.1	76.6	52.0	80.4	68.4	66.3	65.30	19
NE07488	57.8	76.7	61.9	80.7	69.7	73.3	70.02	3
NE07490	54.4	43.5	53.2	90.5	75.9	77.2	65.78	13
NE07498	60.2	40.8	55.6	82.3	68.9	68.1	62.64	28
NW07505	41.7	76.2	57.7	92.4	68.2	73.8	68.35	4
NE07511	35.3	34.8	22.8	82.1	73.9	77.9	54.47	57
NE07517	42.4	48.6	44.7	76.3	63.4	68.7	57.35	50
NE07520	41.8	69.2	49.7	78.2	74.4	71.5	64.13	24
NE07521	48.8	48.0	58.0	94.2	75.8	80.3	67.52	6
NE07531	54.4	46.4	65.8	92.7	68.0	79.2	67.74	5
NW07534	51.9	77.0	63.4	91.9	79.3	74.0	72.90	2
NW07539	45.3	69.4	55.6	84.6	69.8	72.9	66.27	11
NE07561	41.8	43.7	45.2	84.5	67.0	70.3	58.73	47
NE07567	43.4	39.3	54.6	85.2	68.0	71.5	60.31	39
NE07569	41.2	54.4	38.3	88.1	77.6	76.2	62.63	29
NE07570	43.6	70.9	48.3	75.0	67.9	67.7	62.23	32
NE07572	50.6	50.7	59.1	87.3	71.7	77.0	66.06	12
NE07577	33.0	45.0	40.3	76.4	66.3	71.4	55.38	54
NE07604	41.2	39.0	39.3	85.3	70.5	70.8	57.68	49
NE07614	44.5	61.1	47.1	72.6	67.4	68.2	60.13	41
NE07616	30.3	71.7	32.9	67.6	74.1	76.6	58.87	44
NE07617	34.7	66.3	35.7	64.1	70.6	66.6	56.33	53
NE07619	40.9	63.6	50.7	79.1	65.1	60.6	60.01	42
NE07622	40.0	68.1	48.0	82.8	74.4	73.2	64.40	22
NE07627	41.5	80.6	44.5	87.9	69.9	67.9	65.36	17
NE07628	37.8	70.1	45.7	68.6	60.3	60.9	57.23	51
NE07663	44.2	60.4	51.0	88.8	76.5	72.7	65.59	14
NE07665	32.7	36.9	40.0	81.0	68.7	68.7	54.67	55
NE07668	33.7	68.4	48.4	88.0	77.5	65.4	63.56	25
NE07670	34.1	49.8	39.0	77.2	59.6	67.5	54.52	56
NE07695	44.0	62.6	52.7	80.3	64.7	68.6	62.14	33
NI07703	43.7	68.2	39.6	82.6	69.6	76.5	63.36	26
NI07705	37.3	37.9	46.7	78.9	57.7	61.5	53.34	59
NI07707	48.5	51.8	45.9	78.1	70.1	61.3	59.30	43
NI07711	27.2	40.0	37.5	75.4	74.8	57.2	52.01	60
Mean	**43.50**	**58.90**	**47.55**	**82.03**	**70.02**	**70.89**	**62.15**	
CV	21.22	17.36	14.31	7.41	8.39	6.75		
LSD	12.53	13.88	9.24	8.25	7.97	6.5		

Regional Nurseries

In 2010, we continued to combine into one larger nursery the Southern Regional Performance Nursery

(SRPN), the Northern Regional Performance Nursery (NRPN), which were planted at Lincoln, North Platte, Sidney, and Alliance. At Clay Center, only the SRPN was planted. To fill out the nursery, we added a few other lines mainly to compare selections out of lines to determine if they had merit. In general our Nebraska developed lines did well, but many lines from other states were favored by the above average disease and rainfall. At Lincoln and Clay Center there were severe wheat soilborne mosaic virus (WSBMV) infections which hurt lines that are susceptible. Note WSBMV susceptibility also manifested itself as winterkilling.

	Alliance	Lincoln	North Platte	Sidney	Avg.		Clay Cen.	Avg.	
	bu/a	bu/a	bu/a	bu/a	bu/a	Rank	bu/a	bu/a	Rank
Kharkof	33.44	34.43	40.03	43.31	37.80	88	25.53	35.76	49
Scout 66	36.98	50.49	29.94	49.19	41.65	82	32.25	40.08	46
TAM-107	43.39	39.51	21.45	46.16	37.63	89	31.17	36.55	48
FULLER	42.15	70.47	31.47	46.85	47.74	71	34.40	45.51	41
KS07HW52-5	43.53	69.19	25.03	40.55	44.58	76	35.64	43.09	42
KS08HW176-4	53.96	65.90	37.83	52.09	52.45	51	32.57	49.13	37
OK05526	49.64	87.82	19.35	57.16	53.49	45	52.18	53.27	21
OK05212	43.02	81.29	49.45	55.62	57.35	19	53.11	56.64	6
OK05204	51.48	84.08	41.61	55.12	58.07	15	47.92	56.38	8
OK05511	54.17	84.32	39.21	55.27	58.24	14	46.40	56.27	9
OK07231	44.93	89.46	41.83	55.80	58.01	16	49.75	56.63	7
T150-1	47.49	63.72	40.13	61.26	53.15	47	42.46	51.37	30
T166	45.34	64.98	17.10	49.16	44.15	78	36.62	42.89	43
T167	51.93	73.74	40.03	58.44	56.04	26	44.02	54.03	20
T168	47.40	86.85	28.40	55.32	54.49	39	59.16	55.27	13
NE06545	57.42	81.97	42.98	53.64	59.00	9	39.59	55.77	12
NE07444	49.91	75.48	31.49	57.71	53.65	44	48.29	52.75	23
NI07703	50.13	80.27	33.37	61.11	56.22	24	50.38	55.25	14
NI08708	39.74	76.77	46.55	63.83	56.72	22	47.58	55.20	15
BC01007-7	51.11	76.93	33.79	51.42	53.31	46	35.13	50.28	33
BC01131-24	48.37	86.17	40.31	50.78	56.41	23	43.12	54.19	17
BC01139-1	45.19	83.46	35.85	46.16	52.67	50	46.70	51.67	28
00X0100-51	43.31	73.33	32.89	50.74	50.07	65	37.44	47.96	38
HV9W06-1046	50.00	73.27	42.03	54.10	54.85	36	50.46	54.12	19
HV9W06-509	43.35	89.18	36.23	52.88	55.41	31	49.02	54.35	16
HV9W06-262	44.55	58.09	34.60	36.77	43.50	80	29.89	41.23	45
HV9W04-1594R	45.23	54.32	34.90	29.36	40.95	83	23.80	38.09	47
CO04393	56.97	73.06	32.40	58.11	55.14	34	49.36	54.17	18
CO04499	50.12	63.63	31.98	58.44	51.04	60	45.83	50.17	34
CO050270	47.99	63.50	29.12	55.88	49.12	69	38.18	47.30	40
CO050303-2	56.15	71.34	47.38	68.68	60.89	5	45.41	58.31	4
CO050322	70.02	69.68	37.34	77.17	63.55	1	46.24	60.67	1
CO050337-2	66.43	74.26	37.24	65.46	60.85	6	49.79	59.00	2
KS010990M~8	57.30	75.55	37.52	50.08	55.11	35	35.97	51.92	26
KS06O3A~50-3	38.30	85.31	28.46	46.52	49.65	66	36.45	47.45	39
KS06O3A~58-	46.52	90.81	33.39	58.67	57.35	18	48.17	55.82	10

2									
KS011327M~2	45.74	83.70	29.31	50.08	**52.21**	**53**	35.77	**49.47**	**35**
OK07209	50.70	92.48	35.37	62.32	**60.22**	**8**	49.20	**58.38**	**3**
TX05A001822	48.95	76.22	34.42	41.67	**50.32**	**63**	44.87	**49.41**	**36**
TX06A001263	39.96	88.14	30.75	57.72	**54.14**	**40**	47.02	**52.96**	**22**
TX06A001132	44.54	89.70	39.68	53.87	**56.95**	**21**	49.92	**55.78**	**11**
TX06A001281	37.57	80.30	28.76	55.09	**50.43**	**62**	59.05	**51.87**	**27**
TX06A001386	46.56	81.93	29.54	50.38	**52.10**	**55**	48.03	**51.42**	**29**
TX05V7259	47.93	86.93	32.72	57.24	**56.21**	**25**	62.02	**57.17**	**5**
TX05V7269	33.26	90.04	30.65	54.77	**52.18**	**54**	54.47	**52.56**	**24**
TX05A001188	37.29	90.83	29.89	48.69	**51.68**	**59**	55.30	**52.28**	**25**
BC01138-5	46.03	78.09	33.36	50.65	**52.03**	**56**	43.68	**50.64**	**31**
AP06T3621	38.42	64.37	33.79	38.73	**43.83**	**79**	29.15	**41.38**	**44**
Overland	57.14	80.95	39.29	58.13	**58.88**	**11**			
WESLEY	42.46	70.92	40.70	56.78	**52.72**	**48**			
Jerry	40.10	61.48	31.39	58.38	**47.84**	**70**			
NX05M4180-6	37.49	69.77	14.69	40.84	**40.70**	**84**			
NE06469	45.40	77.20	44.34	54.72	**55.42**	**30**			
NE06607	47.14	77.11	42.64	69.00	**58.97**	**10**			
NE07521	43.69	74.19	33.95	55.65	**51.87**	**57**			
NE07531	51.08	69.75	46.70	56.41	**55.99**	**28**			
NW07534	48.61	79.47	34.57	46.36	**52.25**	**52**			
NE07627	56.36	62.16	36.95	51.81	**51.82**	**58**			
00X0100-51	47.63	76.09	31.20	45.90	**50.21**	**64**			
HV9W04-1594R	38.97	53.40	30.95	35.58	**39.73**	**87**			
HV9W05-1125R	54.70	85.33	40.55	61.50	**60.52**	**7**			
CA9W06-788	49.89	68.34	34.67	67.81	**55.18**	**32**			
CA9W07-817	52.45	59.23	41.67	62.36	**53.93**	**43**			
CA9W08-856	52.96	55.29	40.08	54.09	**50.61**	**61**			
BZ9W05-2039	43.60	26.38	25.98	44.30	**35.07**	**90**			
BZ9W05-2043	46.10	33.61	26.09	53.94	**39.94**	**86**			
SD05085-1	51.34	83.81	36.62	63.71	**58.87**	**12**			
SD05118-1	49.95	75.10	36.89	53.95	**53.97**	**41**			
SD05W030	51.40	70.35	29.15	46.38	**49.32**	**67**			
SD06069	66.17	76.28	42.52	69.03	**63.50**	**2**			
SD06158	64.03	71.67	45.21	71.32	**63.06**	**3**			
SD07056	60.97	74.65	35.35	58.87	**57.46**	**17**			
SD07126	62.22	71.26	27.32	63.15	**55.99**	**27**			
SD07165	61.37	72.39	44.60	71.29	**62.41**	**4**			
SD07184	48.76	72.58	38.12	58.81	**54.57**	**38**			
SD07W053	57.05	69.10	36.47	58.02	**55.16**	**33**			
MTS0532	37.04	54.05	38.13	50.95	**45.04**	**74**			
MTS0713	40.99	52.47	28.47	47.22	**42.29**	**81**			
MTS0721	53.73	31.88	38.78	59.85	**46.06**	**73**			
TA001	38.76	52.78	24.73	44.05	**40.08**	**85**			
TA0024	40.78	60.25	30.99	47.62	**44.91**	**75**			

TA0030	53.51	58.36	29.78	46.70	47.09	72			
Camelot	48.11	76.63	38.93	55.57	54.81	37			
Settler CL	46.91	72.52	40.14	63.51	55.77	29			
NE04490	50.79	78.41	29.56	51.91	52.67	49	38.91	50.37	32
MACE	39.92	61.52	25.70	50.34	44.37	77			
NE08622	49.58	61.16	46.98	58.07	53.95	42			
NE05549	45.20	72.10	40.35	70.19	56.96	20			
NI08717	40.37	64.38	33.14	58.82	49.18	68			
NE08440	53.37	72.70	40.45	68.42	58.74	13			
CV	10.85	10.13	16.08	9.77	11.71		8.88		
GRAND MEAN	48.13	71.25	34.95	54.57	52.23		43.64		
LSD	7.06	9.76	7.61	7.21	7.91		5.27		

In considering how our germplasm compares to the region's, the Nebraska early germplasm needs better resistance to WSBMV and straw strength so it can complete better in the south central region (e.g. Lincoln and Clay Center) where yields are often very high. Our irrigated wheat breeding efforts will help here. We may need to increase the fertility level at Lincoln to identify stronger strawed wheat lines. If this were done, then Mead will become the selection nursery for the later and taller lines that are well adapted to the longer season of western Nebraska. In addition, the regional white wheat efforts are extremely useful for increasing the germplasm available for parent use in creating new white wheat lines.

7. Multiple-Location Observation Nursery

Nine replications (locations) in Nebraska (Lincoln, Mead, Mead Organic, Clay Center, North Platte, Sidney, Sidney Organic, and Hemingford) were harvested and used for selection. A nursery in Kansas was also harvested and used for information. The table below gives the grain yields for all of the locations, the line average, and the rank of the top 10 highest yielding lines that were selected. A high yielding line that was not advanced was due to stem rust susceptibility, poor quality, or other detrimental traits. We changed this nursery to have two replicated (10 replications each) checks (Camelot and Goodstreak) to get a better estimate of field variation. They ranked 56 (Camelot) and 68 (Goodstreak). We put DArT molecular markers on this nursery and using multiple algorithms and breeder selections selected 57 lines for further testing. We will continue to for as long as we can afford to do this as it is allowing us to better understand our germplasm in this gateway nursery.

	Linc.	Mead	Mead Org.	Clay C.	N. Platte	McCook	Sidney	Sid Org.	All.	AVG.	Coleoptile	Rank	Test Wt.	Dis	H.date	Ht
Entry	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a	bu/a			lbs/bu	(1-9)	May	(in)
NE10456	67.01	68.18	47.61	50.31	37.25	94.76	58.53	84.79	50.65	62.12	6.61	1	56.61	5.00	23.00	37.67
NE10514	55.79	56.40	48.59	41.40	45.55	84.45	68.52	75.99	51.54	58.69	8.39	2	60.46	5.00	25.33	35.66
NE10529	68.39	58.08	55.36	48.57	38.05	86.30	65.21	62.62	43.45	58.45	8.67	3	57.67	3.67	26.00	37.02
NW10401	67.04	54.46	42.64	64.98	32.71	85.14	57.51	73.51	47.14	58.35	7.86	4	59.66	3.67	23.33	36.91
NE10575	68.76	68.03	55.95	38.33	40.60	77.13	53.23	71.15	49.79	58.11	7.26	5	58.24	3.33	25.33	35.91
NE10642	74.19	58.70	53.94	50.19	37.18	74.70	55.40	66.40	44.62	57.26	7.25	6	59.01	4.00	27.00	38.92
NE10671	65.32	59.90	45.71	46.36	41.19	81.69	56.26	61.33	55.08	56.98	7.88	7	58.59	4.33	25.67	35.66
NE10478	68.12	59.08	50.43	58.06	30.98	82.05	47.29	75.34	39.38	56.75	7.59	8	57.99	5.33	24.00	34.29
NE10517	55.65	61.46	41.91	43.13	39.78	75.49	61.00	77.07	53.66	56.57	9.55	10	57.22	5.00	25.67	34.78
NE10628	62.65	59.10	51.30	44.59	38.90	79.39	52.99	69.03	48.62	56.29	8.36	11	57.85	3.67	24.67	38.04

8. Early Generation Nurseries

a. Single-plot Observation Nursery

Eigtheen hundred and forty one lines were evaluated at Lincoln in 2009. Of the 1841 lines and checks, 1397 where red or mixed red and white seeded (including 214 one and two gene herbicide tolerant lines and 79 Hessian fly tolerant lines) and 331 where white seeded. Of this group, 5230 were harvested and a similar number of 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). The above numbers are higher than in the past, but due to rain at harvest and not every plot being harvested under the same conditions, we decided to get the quality data before selecting on performance and quality. Based on agronomic and quality performance, 183 red, 55 herbicide tolerant lines (mainly red), and 42 white lines were selected for further testing. .

b. Headrow Nursery

In 2009-10, 40,600 (31,700 where red or white and 8900 where herbicide tolerant) headrows were planted at Lincoln. In general, the headrow nursery was considered as larger average at Lincoln. In general the headrown nusery, despite rain at harvest, looked fairly good. We harvested over 2000 lines and planted 1980 (1426 red or segregating red and white; 554 white wheat; 113 lines for wheat streak mosaic virus testing, and 301 herbicide tolerant lines—note the total will be higher than 1980 due some wheats are red and wheat streak mosaic virus tolerant and herbicide tolerant). Of the red and white wheat lines, 250 where sent to Scottsbluff for planting at in our irrigated observation nursery, and 113 lines to Gary Hein to test for wheat steak mosaic virus tolerance.

c. F_3 bulk hybrids

The F_3 bulk hybrid nursery contained 897 red, red and white segregating, or white seeded bulks. The herbicide tolerant bulks are included int his number. All plots were planted at Mead (our main and best winter killing site) and most were planted at Sidney. At Mead the plots were very good, one of the better F_3 nurseries in recent history. Heads were selected before most of the rains came, so the stands were good, the heads clean, and the plot still standingThe number of F_3 bulks is above normal. Over 49,000 head rows were selected for fall planting in 2010. The headrows were planted on time on one large field due to due to having the space in one field. In general, their emergence and stands were very good in the fall. The project goal remains to have sufficiently good segregating F_3 material to select about 40 - 45,000 headrows.

b. F_2 bulk hybrids

The F_2 bulk hybrid nursery contained 1023 bulks and check plots that were planted at Mead NE. Fifty-eight F_2 bulks with one or two genes for herbicide resistance were planted at Lincoln for selection. The bulks generally survived the winter, but some were winterkilled (those involving wintertender parents). We effectively ended our bulk sharing this year as there seems to be no consensus within the region on how to share early generation material fairly. Our approach had been that once we made the cross, we could share the germplasm because it the genes were scrambled and the crosses were 50% - 75% Nebraska germplasm. While this is unfortunate and in many ways a waste of resources (groups making the same crosses or not having access to crosses they wished they had made) , the alternative concern is that some program prefer not to share their germplasm in crosses with Nebraska germplasm with other institutions and businesses. Due to the large number of bulks, about 1042 bulks (including 45 herbicide tolerant bulks) were advanced as individual bulks for further consideration in 2001-11 from our program.

9. Winter Triticale Nursery

In 2010, no new triticale lines were recommended for release; however, we selected nine lines for increase as possible replacements or to complement NE426GT and NE422T, which continue to perform well. Because triticale is a small market crop, we are carefully deciding how best to release new triticale cultivars so as to not cause inventory problems with the previously released cultivars. Our current thoughts are that we will most likely partner with a triticale seed supplier to merchandise our next release. Jeff Noel handles our licensing arrangements and has contacted a number of companies.

We are now beginning to move to higher and more consistent grain yield levels, but identifying excellent forage types requires forage harvesting which is expensive and difficult for widespread trials. Though the markets for biofuels fluctuate with the price of oil and other geologically based fuels, we believe that there is a future for triticale in a biobased energy system. Triticale can be grown over the winter as forage or grain crop in areas where maize cannot be grown successfully. The grain will substitute for maize in animal rations and the forage can be used as forage, cellulosic ethanol feed stocks, or as a ground cover. Due to personnel changes and emphasis on other crops, cooperation with Iowa State University has considerably lessened. The forage data for the 2010 triticale variety trial will be provided by Dr. Ken Vogel and the USDA-ARS.

The triticale-breeding program received $10060.50 in 2010 compared with $8829.00 research and development fees for 2009We believe that new merchandising arrangements can improve the impact of these varieties. These funds will be extremely important in developing a sustainable triticale-breeding program. The results for the 2010 grain triticale trials are:

	Linc.	Linc.	Sid.	Avg.	Linc.	Sid.	Avg	
Entry	Hdate	Height	Height	Height	Grain	Grain	Grain	Rank
	May				Yield	Yield	Yield	
	d	in	in	in	lbs/a	lbs/a	lbs/a	
JAGGER	21.00	37.70	34.00	35.85	2289	3186	2737.5	30
NE422T	28.33	54.30	58.00	56.15	2981	4160	3570.5	27
NE426GT	24.33	49.70	39.00	44.35	3609	4816	4212.5	7
NT01451	24.33	49.00	44.00	46.50	3532	4884	4208.0	9
NT02421	24.33	52.30	46.00	49.15	3608	4720	4164.0	12
NE03T416	23.67	51.00	43.00	47.00	3332	4805	4068.5	15
NT04424	25.00	52.70	45.00	48.85	3018	4625	3821.5	23
NT05421	23.67	56.30	53.00	54.65	3695	4086	3890.5	22
NT05429	23.00	48.30	41.00	44.65	4296	4657	4476.5	2
NT06422	22.67	52.00	48.00	50.00	3849	4612	4230.5	6
NT06423	23.67	52.70	49.00	50.85	3402	4913	4157.5	13
NT06427	24.33	51.70	44.00	47.85	3105	5306	4205.5	10
NT07403	22.00	48.70	43.00	45.85	3841	4958	4399.5	3
NT07410	23.67	50.00	47.00	48.50	2645	4550	3597.5	26
NT08414	24.67	46.30	39.00	42.65	3216	4703	3959.5	20
NT08425	24.33	45.30	44.00	44.65	3186	4613	3899.5	21

NT09404	24.00	53.00	48.00	**50.50**	4066	4646	**4356.0**	**4**
NT09411	23.33	51.00	45.00	**48.00**	3673	4903	**4288.0**	**5**
NT09414	24.00	60.00	51.00	**55.50**	2551	3699	**3125.0**	**29**
NT09416	24.67	47.00	45.00	**46.00**	3180	4889	**4034.5**	**17**
NT09418	24.00	53.30	44.00	**48.65**	3679	4508	**4093.5**	**14**
NT09419	24.33	54.00	44.00	**49.00**	3435	3861	**3648.0**	**25**
NT09420	25.33	52.30	47.00	**49.65**	3683	4707	**4195.0**	**11**
NT09423	24.67	50.00	44.00	**47.00**	3694	5549	**4621.5**	**1**
NT09426	26.33	50.70	45.00	**47.85**	3339	4764	**4051.5**	**16**
NT09428	24.67	51.70	45.00	**48.35**	3630	4795	**4212.5**	**8**
NT09429	25.67	51.70	44.00	**47.85**	2810	4652	**3731.0**	**24**
NT09435	25.67	53.30	47.00	**50.15**	3308	4761	**4034.5**	**18**
NT09436	24.67	50.00	45.00	**47.50**	3201	4755	**3978.0**	**19**
NT09438	24.67	58.70	58.00	**58.35**	2867	3504	**3185.5**	**28**
CV	3.59	7.95			8.95	6.02		
GRAND MEAN	24.30	51.16			3357	4586		
LSD	1.19	5.55			413	379		

The results of the 2010 triticale forage trials at Mead, NE (done in cooperation with Dr. Ken Vogel, USDA-ARS) are:

	Dry Matter	**Dry Forage**	**RANK**	**NDF**	**ADL**	**ADF**	**IVDMD**	**NITROGEN**
		Yield						
NAME		**lbs/a**		**%**	**%**	**%**	**%**	**%**
JAGGER	0.575	5438	**30**	50.765	4.494	29.376	61.226	1.284
NE422T	0.395	8286	**14**	58.439	4.757	34.511	60.289	1.16
NE426GT	0.462	7894	**20**	51.441	4.522	30.918	64.048	1.067
NT01451	0.47	8211	**15**	52.473	4.608	31.326	62.49	1.06
NT02421	0.456	9292	**3**	53.723	4.544	31.488	63.095	1.03
NE03T416	0.474	7322	**26**	52.647	4.517	31.777	62.522	1.019
NT04424	0.473	7797	**22**	55.386	5.017	32.947	61.523	0.963
NT05421	0.476	8940	**6**	53.471	4.532	32.016	63.174	0.96
NT05429	0.497	6923	**28**	52.054	4.317	30.055	63.169	1.025
NT06422	0.51	7620	**25**	51.949	4.646	31.656	61.434	1.04
NT06423	0.514	8099	**17**	54.406	4.641	31.217	61.658	1.019
NT06427	0.431	6160	**29**	52.474	4.469	30.154	63.213	0.985
NT07403	0.503	7032	**27**	54.719	4.356	30.788	61.174	0.993
NT07410	0.495	8795	**7**	52.996	4.678	31.13	63.667	1.023
NT08414	0.484	9199	**4**	54.023	4.694	31.448	63.133	1.068
NT08425	0.456	8043	**18**	55.021	4.886	32.727	60.952	1.067
NT09404	0.416	9101	**5**	52.569	4.26	30.698	63.475	1.15
NT09411	0.51	8003	**19**	52.473	4.281	29.951	62.341	1.032
NT09414	0.594	8164	**16**	55.225	4.742	32.945	59.257	0.973
NT09416	0.499	7893	**21**	52.974	4.657	31.551	61.736	0.945
NT09418	0.5	8662	**9**	50.26	4.316	29.909	64.241	0.951
NT09419	0.44	9597	**1**	55.05	4.821	33.229	62.153	0.973

NT09420	0.476	7663	**24**	52.412	4.247	29.741	62.488	1.05
NT09423	0.449	7727	**23**	53.78	4.324	30.229	61.706	1.027
NT09426	0.459	8650	**10**	55.549	4.619	31.818	60.82	1.05
NT09428	0.466	8771	**8**	52.529	4.382	30.686	62.381	1.027
NT09429	0.447	8316	**13**	54.948	4.882	32.651	61.27	1.043
NT09435	0.476	8418	**12**	53.697	4.744	31.675	62.12	1.18
NT09436	0.479	9339	**2**	52.471	4.501	31.088	63.37	0.998
NT09438	0.527	8515	**11**	55.67	4.733	33.045	59.567	1.071
GRAND MEAN	0.48	8129		53.52	4.57	31.42	62.12	1.04
LSD	0.05	1024		1.91	0.26	2.02	1.37	0.09
CV	8.41	11		3.04	4.85	3.84	1.88	7.12

The results of the 2010 triticale forage trials at Sidney, NE (done in cooperation with Dr. Dipak Santra and Ward Laboratories) are:

	Height	**Wet Forage**	**Dry Matter**	**Dry Forage**	**RANK**	**ASH**	**NDF**	**ADF**	**PROTEIN**
		Yield		**Yield**					
NAME	**in**	**lbs/a**		**lbs/a**		**%**	**%**	**%**	**%**
NE422T	57.00	23616	0.56	12912	**3**	7.80	61.50	40.50	7.05
NE426GT	43.50	20156	0.56	11461	**10**	7.25	51.90	32.40	7.85
NT01451	42.30	21235	0.60	13031	**2**	7.80	53.60	33.95	7.40
NE03T416	44.70	20053	0.66	12235	**7**	7.05	48.85	29.90	8.10
NT04424	42.60	20670	0.58	12635	**5**	8.01	53.05	33.10	8.45
NT05421	46.40	20456	0.54	12049	**8**	8.17	51.10	32.35	8.30
NT05429	42.20	15828	0.64	10199	**12**	7.66	50.65	31.40	7.65
NT06422	43.40	19653	0.62	12426	**6**	7.97	50.00	31.40	7.85
NT06423	46.40	19323	0.66	11912	**9**	6.83	53.15	33.10	7.20
NT06427	40.60	16691	0.70	11103	**11**	7.83	51.85	32.55	5.55
NT07403	43.00	21408	0.68	14481	**1**	8.04	52.75	33.35	7.15
NT07410	42.20	20151	0.59	12698	**4**	8.39	55.75	34.80	7.15
GRAND MEAN	44.52	19937	0.62	12262		7.73	52.85	33.23	7.48
LSD	1.56	3266	0.08	1881		1.45	9.10	6.49	2.87
CV	2.91	13.7	4.57	12.8		6.28	6.33	7.18	14.15

What is clear from these trials are that: 1. triticale produces more biomass than wheat, 2.there is considerable GxE for forage yield, and 3. How difficult it is to couple grain yield with forage yield. For example, NT07403 ranked 27 at Mead, but first at Sidney. Note this is somewhat of a difficult comparison as we do not have all the lines at Sidney that we had at Mead, however, other lines show similar changes in rank. The comparison was probably also affected by different stages of harvest as seen by the different dry matter contents. Of the lines tested in all the grain and forage trials, NT07403 had good grain yield across the state, excellent forage yield in western NE, but poor forage yield in eastern NE. This highlights the need for testing our forage triticale lines in grain and forage trials across the state.

The results for the 2009 triticale grain trials are:

Variety	Linc. lbs/a	Mead lbs/a	Sidney lbs/a	St. Avg. lbs/a	State Rank	Linc. Hdate	Mead hdate	Avg. hdate May	Linc. height	Sidney height	Avg height in
NE422T	4484	3343	4963	4263	20	24.7	26.3	25.5	40.7	39.6	40.2
NE426GT	3367	2806	4194	3456	29	28.7	30.0	29.3	53.9	53.5	53.7
JAGGER	2855	3120	4054	3343	30	20.3	23.8	22.1	33.4	31.8	32.6
NT01451	5354	3601	5090	4682	4	25.3	26.3	25.8	41.2	37.9	39.6
NT02421	5401	3532	4914	4616	7	23.0	27.0	25.0	43.6	41.7	42.7
NE03T416	5008	3521	5075	4535	9	21.3	25.9	23.6	40.7	38.4	39.6
NT04424	5006	2921	5132	4353	15	25.3	26.3	25.8	43.1	40.5	41.8
NT04432	4211	3407	5131	4250	21	25.3	27.7	26.5	40.0	38.9	39.5
NT05421	5178	3952	4214	4448	12	25.0	26.5	25.7	46.9	42.8	44.9
NT05429	5044	4047	5032	4708	3	22.7	25.5	24.1	39.2	36.8	38.0
NT05442	4383	3628	4786	4266	19	25.7	26.6	26.1	39.4	36.9	38.2
NT05444	4498	3558	4962	4339	16	24.7	27.7	26.2	41.6	38.9	40.3
NT06422	5619	4122	5066	4936	2	21.3	25.5	23.4	42.7	38.7	40.7
NT06423	4341	3241	4663	4082	24	24.7	27.1	25.9	44.3	41.6	43.0
NT06427	4304	3790	4884	4326	17	25.7	25.3	25.5	41.4	35.2	38.3
NT07403	5170	4312	5420	4967	1	23.7	24.6	24.1	42.5	38.1	40.3
NT07410	4971	3662	4686	4440	13	22.7	25.7	24.2	41.1	40.3	40.7
NT07434	3831	3843	4461	4045	26	25.3	25.9	25.6	39.9	38.5	39.2
NT07438	3060	3129	4285	3491	28	26.3	28.7	27.5	44.2	45.6	44.9
NT08402	4201	4008	5373	4527	10	24.7	25.9	25.3	40.8	36.3	38.6
NT08408	4110	3793	3840	3914	27	26.0	27.5	26.7	45.1	46.2	45.7
NT08411	4078	3746	4479	4101	23	26.3	25.9	26.1	35.9	38.5	37.2
NT08414	5414	3438	5170	4674	5	24.7	26.2	25.4	38.8	36.3	37.6
NT08421	4514	3011	4924	4150	22	26.3	25.8	26.0	42.4	37.8	40.1
NT08425	5128	3675	5081	4628	6	24.3	26.1	25.2	41.9	39.9	40.9
NT08426	4684	3071	5216	4324	18	25.3	25.9	25.6	39.1	37.6	38.4
NT08428	4843	3889	5042	4591	8	23.3	26.0	24.7	41.5	39.0	40.3
NT08430	4801	3332	4047	4060	25	25.0	26.6	25.8	45.9	43.0	44.5
NT08432	5315	4025	3726	4355	14	24.7	25.5	25.1	41.6	37.2	39.4
NT08450	5056	3653	4693	4467	11	26.0	27.0	26.5	43.9	41.9	42.9
Average	**4608**	**3573**	**4753**	**4311**		**24.6**	**26.4**	**25.5**	**41.9**	**39.6**	**40.8**

The results of the 2008 triticale variety grain and forage trial were:

2008 VARIETY	Flowering Date d after May 31	Height (in)	Forage Yield Dry lbs/a	Forage Rank	Variety	Lincoln Winter Survival 9=Good	Lincoln Grain Yield (lbs/a)	Sidney Grain Yield (lbs/a)	**State Grain Yield (lbs/a)**	**State Rank**
JAGGER	2.00	34.0	4726	30	JAGGER	7.9	2087	3762	**2925**	22
NE03T416	4.75	39.8	5751	23	NE03T416	5.6	2696	4470	**3583**	4
NE03T449	6.00	41.3	6684	6	NE03T449	6.4	2894	2647	**2771**	26

NE422T	5.75	42.0	6506	9	NE422T	6	1877	3451	2664	28
NE426GT	4.00	41.0	6182	16	NE426GT	5.1	1998	3113	2556	30
NT01435	2.75	39.5	5256	27	NT01435	7.4	2155	3900	3028	18
NT01451	5.00	38.3	6196	15	NT01451	6.8	2373	3976	3175	12
NT02421	3.75	42.0	6296	12	NT02421	5.7	2413	3694	3054	16
NT04424	4.25	40.0	6330	11	NT04424	5.9	2509	4099	3304	10
NT04432	3.50	40.3	6795	3	NT04432	6.4	2336	4309	3323	8
NT05421	4.00	45.0	7137	1	NT05421	6.3	3011	3618	3315	9
NT05429	3.00	39.8	5552	24	NT05429	6.3	3941	3611	3776	3
NT05442	4.75	40.0	6179	18	NT05442	5	1723	3833	2778	25
NT05443	4.50	38.8	5844	22	NT05443	3.6	2032	3864	2948	21
NT05444	4.25	41.0	6224	14	NT05444	6	1605	3832	2719	27
NT06422	3.25	42.0	6718	5	NT06422	8.3	3599	4255	3927	2
NT06423	4.00	41.0	6518	8	NT06423	5.9	2903	4099	3501	5
NT06426	3.00	37.8	5436	25	NT06426	4.7	2116	3181	2649	29
NT06427	4.00	41.8	7083	2	NT06427	7	2722	4226	3474	6
NT06429	3.50	40.3	5015	28	NT06429	7.8	3176	3023	3100	15
NT06434	4.00	40.5	5406	26	NT06434	4.2	2443	3237	2840	23
NT07403	2.00	42.0	6753	4	NT07403	7.5	3778	4153	3966	1
NT07410	3.25	40.5	6181	17	NT07410	4.5	2026	4326	3176	11
NT07411	3.50	38.8	4969	29	NT07411	5.2	1965	4364	3165	13
NT07413	4.50	39.5	4577	31	NT07413	5	1613	3970	2792	24
NT07415	2.75	41.0	6088	19	NT07415	5.7	2282	3646	2964	20
NT07427	4.00	41.0	5890	21	NT07427	4.9	2419	3656	3038	17
NT07433	4.00	42.8	6044	20	NT07433	5.1	1938	4085	3012	19
NT07434	3.50	42.5	6270	13	NT07434	7.4	2426	4242	3334	7
NT07438	5.50	40.0	6669	7	NT07438	5.3	2123	4146	3135	14
Pika	8.00	39.5	6406	10						
CV	11.80	6.0	13.98		CV	23.44	21.83	12.54		
Grand Mean	4.03	40.4	6054.1		Grand Mean	5.97	2439.3	3826.2		
LSD	0.56	2.8	994.79		LSD	1.91	727.03	655.25		

The colored lines indicate their being released or under increase.

The three year grain data summary for locations where we were able to harvest trials is presented below:

		Linc.	Mead	Sidney	St. Avg.	State
	name	Grain	Grain	Grain	Grain	Rank
		Yield	Yield	Yield	Yield	
	name	lbs/a	lbs/a	lbs/a	lbs/a	
2008-2010	JAGGER	2410	3120	3667	3002	14
2008-2010	NE03T416	3679	3521	4783	4062	4
2008-2010	**NE422T**	**2782**	**2806**	**3822**	**3194**	13
2008-2010	**NE426GT**	**3323**	**3343**	**4410**	**3713**	12
2008-2010	NT01451	3753	3601	4650	4021	5
2008-2010	NT02421	3807	3532	4443	3944	7

2008-2010	NT04424	3511	2921	4619	3826	**10**
2008-2010	NT05421	3961	3952	3973	3884	**9**
2008-2010	NT05429	4427	4047	4433	4320	**3**
2008-2010	NT06422	4356	4122	4644	4364	**2**
2008-2010	NT06423	3549	3241	4558	3913	**8**
2008-2010	NT06427	3377	3790	4805	4002	**6**
2008-2010	NT07403	4263	4312	4844	4444	**1**
2008-2010	NT07410	3214	3662	4521	3738	**11**

It is clear that we have made great progress in grain yields in triticale. Marketing remains the major limitation to improving triticale's impact in modern agriculture.

13. <u>Collaborative Research on Wheat Diseases</u>

Dr. Stephen Wegulo, Department of Plant Pathology, and their staff continue to inoculate our experimental lines with wheat stem rust and Fusarium head blight (FHB, research funded by the U.S. What and Barley Scab Initiative), and as time permits with wheat leaf rust. We continue to improve the greenhouse tests for stem rust.. With the advent of the new race of stem rust, Ug99 that can overcome some of the previously very durable resistance genes in wheat which were the main genes used in our program, we have greatly increased our efforts to introgress and pyramid new genes with our existing genes (*Sr2, SrR, Sr6, Sr22, Sr,24, Sr25, Sr26, Sr 36, Sr39*, and *Sr 40*),. .

Work continues on introgressing the resistance from *Agropyron* (the first real resistance/tolerance to wheat streak mosaic virus [WSMV] 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 and to Bob Graybosch for testing with molecular markers. . The frequency of lines carrying virus resistance remains lower than expected and it is our hope that molecular marker will be used to enrich our populations and enhance our frequency of elite lines with resistance.

14. **Use of Wheat Synthetics to Expand our Genepool:** K. Onweller, R. Ward, P.S. Baenziger, Y. Jin, R. Bowden, S. Wegulo, C. Baker, R. Graybosch, and P. Byrne

A collaborative effort with Colorado State University to use CIMMYT developed wheat synthetic lines as sources for drought tolerance led us to further characterize six synthetic CIMMYT wheat lines. In our characterization studies, we discovered some lines were resistant to *Puccinia graminis*, *P. striiformis*, and *Schizaphis graminum.* Two of the six lines possessed resistance to stem rust races in the Ug99 family. Studies to determine the identity of the genes are underway. Based on phenotyping of the synthetic parental lines at the Cereal Disease Laboratory in Minnesota, it has been hypothesized that the resistance in the synthetic parental lines may be from *Sr33*. *Sr45* will be tested for as well, as *Sr33* and *Sr45* are both derived from *Aegilops tauschii* and are located on chromosome 1DS. Both genes have been shown to confer resistance to numerous races of stem rust, including Ug99. All synthetic lines exhibited seedling resistance and five exhibited adult resistance to *P. striiformis* race PST-100. Two different synthetic lines conferred excellent resistance to greenbug biotypes E, I and K. A detailed inheritance study was undertaken with the assistance of Cheryl Baker (USDA-ARS, OK) to identify the genetic constitution of the resistance. Preliminary data suggest that single dominant genes are acting in each synthetic line. In addition to resistance, the synthetic lines were assayed for high molecular weight glutenin and gliadin composition. The work revealed protein subunit compositions not commonly found in the Great Plains wheat cultivars.

15. **Understanding the Stem Rust Resistance in 'Gage' Wheat:** T. Kumsa, P.S. Baenziger, S. Wegulo, M. Rouse, and Y. Jin.

With the advent of stem rust, caused by *Puccinia graminis*, race Ug99, understanding and developing better stem rust resistance is again in the attention of wheat community. In this project we are interested in understanding the Sr2 complex in Gage (a Nebraska cultivar released in 1965) which historically was superior to Scout 66 (a wheat cultivar that also carried the Sr2 gene). Our goal is to understand the nature of Gage's superior resistance to stem when compared to that found in many other Sr2 cultivars With a newly developed marker csSr2 we confirmed the presence of Sr2 in this cultivar. We are advancing generation to obtain F2:3 families from crosses made between Bill Brown (susceptible cultivar) and Gage. These families will be used for phenotyping and genotyped to understand the Sr2 complex. As part of this research we are also collecting additional sources of resistance and pyramiding effort these genes. For example, using molecular markers it is hypothesized that some of the Nebraska lines contain both Sr2 and Sr24. Crossing these lines to lines with Sr36 and Sr 26 source have been made to pyramid the resistance genes. We have collected useful germplasm for Sr39, Sr40 and SrR. Molecular markers and phenotyping will be used for selection and backcrossing.

16. **Association Mapping for Important Biotic & Abiotic Related Traits in a Structured Wheat Breeding Population.** I. Salah, D. Wang, K. Eskridge, J. Crossa, and P.S. Baenziger

The main objectives of this research are to: 1. Apply association mapping and whole genome selection approaches to identify DArT and SSR markers associated with important traits in structured wheat breeding population and determine a marker-based kinship matrix, and 2. Study the impact of selection (decreasing the number of lines as is commonly done in breeding programs) on genetic diversity. Two hundred eighty genotypes of hexaploid winter wheat plus two check cultivars in our preliminary nursery were grown and harvested in 9 environments during 2009/ 2010 season. Based on the phenotypic and molecular marker data we clustered these lines into three groups. Then, we selected the best 57 genotypes from the 280 lines for advancement to the intermediate nursery (Nebraska Triplicate Nursery, year 2). We will evaluate the 57 genotypes using the same molecular markers, and obtain new phenotypic data at similar locations throughout NE, but in replicated experiments. In the following year, approximately 25 lines will be advanced to the Nebraska Intrastate Nursery (year 3). We will also repeat this process for an additional 280 new genotypes in year 2 which will be advanced to 57 genotypes in year 3.

17. **Pre-harvest Sprouting derived from Red / White Wheat (*Triticum aestivum*) mating populations:** Juthamas Fakthongphan, R. Graybosch, P. S. Baenziger

Pre-harvest Sprouting (PHS) of wheat (*Triticum* spp.), the premature germination of wheat heads, takes place in a field under conditions of delayed harvest, high humidity or wet conditions. This problem has a high economic impact on farmers and end-users. Wheat breeders have tried to diversify the wheat production system in Nebraska by introducing hard white winter wheat cultivars. The grain yield potential and disease resistance have been increased but the current germplasm of hard white winter wheat lacks some essential quality traits such as low levels of grain enzyme polyphenol oxidase, and resistance to pre-harvest sprouting. Both traits will be important issues once the U.S. exports white wheat to the world markets. This research will focus on (1) identifying red wheat parents capable of donating genes for tolerance to PHS. (2) mapping or confirming which markers are applicable for the Great Plains hard white wheat gene pool. (3) analyzing the ABA sensitivity in these materials to correlate the misting assay for PHS to ABA response.

18. **Organic Wheat Breeding**

a. Planting and Harvesting

Organic State Variety yield trials, with 21 varieties and 15 experimental lines, were conducted at Mead, Clay Center, Sidney (HPAL) and Concord (HAL). NIN, Triplicate and Duplicate nurseries, with the same entries as in the conventional trials, were conducted at Mead and Sidney. Clay Center was no-till planted after soybeans on Oct. 5 and harvested July 14. Mead was no-till planted into soybeans October 15 and harvested July 22 and 23. HAL was planted after oats/clover on September 18 and harvested July 10. HPALwas planted after fallow on September 17. Combine equipment failure at Sidney after the OSVT harvest on July 16 resulted in a drawn-out harvest for NIN, TRP and DUP nurseries with some harvested July 22 and the rest harvested on July 26 after rain. The NIN and TRP nurseries were further compromised by blue mustard infestation resulting from atypical rainfall. Sidney yield data for NIN and TRP (reported earlier in this document) was not reliable enough for selection decisions. Seed was retained from all nurseries and locations for quality tests.

b. Organic State Variety Trials

Western Nebraska-- top 50 % lines for grain yield of those entered in 2010 Organic State Variety Trial (HPAL), ranked in order of cumulative z-score for grain yield (†):

ID	2008 to 2010 yield	z-score	yield rank	2009 to 2010 yield	z-score	yield rank	2010 yield	z-score	yield rank	cumulative z-scores for yield†
NW07505							76.4	1.5	4	1.5
WAHOO	55.5	1.4	3	58.9	1.7	1	72.4	0.7	9	1.3
OVERLAND	56.0	1.5	1	54.2	0.4	13	76.8	1.5	2	1.1
NW03681	50.1	-0.3	11	57.7	1.4	2	79.3	2.0	1	1.0
SNOWMASS							73.9	1.0	6	1.0
EXPEDITION							73.0	0.9	8	0.9
MILLENNIUM	53.7	0.8	6	53.6	0.2	14	76.5	1.5	3	0.8
NE04424	53.2	0.7	7	54.2	0.4	12	74.4	1.1	5	0.7
NE06469				55.5	0.8	6	70.7	0.4	15	0.6
NE05548				55.1	0.6	8	71.2	0.5	13	0.6
NE05496							71.3	0.5	12	0.5
ANTELOPE	54.2	1.0	4	56.4	1.0	3	65.8	-0.5	26	0.5
GOODSTREAK	54.2	0.9	5	54.4	0.5	9	68.7	0.1	16	0.5
CAMELOT	51.0	0.0	9	55.7	0.8	5	71.6	0.6	11	0.5
NE01481 (MCGILL)	50.8	-0.1	10	56.2	1.0	4	70.9	0.5	14	0.5
HATCHER	56.0	1.5	2	53.3	0.1	16	65.3	-0.5	27	0.4
SD05118-1				54.4	0.5	10	68.6	0.1	17	0.3
PRONGHORN	50.1	-0.3	12	53.5	0.2	15	71.9	0.7	10	0.2
NURSERY MEAN	51.4			54.0			67.7			
C.V.	17.5			11.6			10.7			
L.S.D.	9.1			6.5			7.9			

†Z-score is the standard deviation from the average for the entries listed. The cumulative z-scores (the

average of z-scores in the other columns) give a greater weight to yield for the current year (2010), and elevates new top-performing entries, such as NW07505, Snowmass, Expedition and NE05496, while retaining lines that performed very well in previous years such as Antelope and Hatcher.

Eastern Nebraska--top 50 % lines for grain yield of those entered in 2010 Organic State Variety Trial (Mead, HAL, and Clay Center), ranked in order of cumulative z-score for grain yield (†):

ID	2008 to 2010 yield	z-score	rank	2009 to 2010 yield	z-score	rank	2010 yield	z-score	rank	cumulative z-scores for yield†
NE02558							51.7	1.8	1	1.8
NW07505 (W)							50.3	1.4	2	1.4
NE06545							49.1	1.1	4	1.1
NE07444							48.7	1.1	5	1.1
WAHOO	52.0	1.1	3	54.3	1.4	1	46.8	0.6	13	1.0
GOODSTREAK	53.9	1.9	1	52.7	0.9	6	44.8	0.1	19	1.0
NW03666 (W)				53.6	1.1	4	47.5	0.8	9	1.0
CAMELOT	50.7	0.6	5	54.0	1.3	2	48.1	0.9	7	0.9
NE03490	52.4	1.3	2	53.7	1.2	3	45.0	0.2	17	0.9
OVERLAND	51.3	0.9	4	51.9	0.6	7	48.2	0.9	6	0.8
SNOWMASS (W)							47.6	0.8	8	0.8
NE04424	49.4	0.2	9	51.8	0.6	9	50.3	1.4	3	0.7
EXPEDITION							47.2	0.7	10	0.7
NE05548				52.9	0.9	5	45.4	0.3	15	0.6
SD07165							46.8	0.6	12	0.6
NE01481 (MCGILL)	49.7	0.3	7	51.8	0.6	8	46.3	0.5	14	0.5
NE99495	49.5	0.2	8	51.3	0.5	10	44.2	0.0	21	0.2
NE05425				48.5	-0.4	17	47.1	0.7	11	0.2
NURSERY MEAN	49.0			49.7			44.2			
C.V.							15.6			
L.S.D.	4.6			4.9			6.2			

b. Varietal protein response to top-dressed nitrogen

For the second year, top-dressing trials within the Organic State Variety Trials at Haskell Ag Lab provided positive results for protein response. Twenty pounds per acre nitrogen from an approved organic liquid fertilizer were applied in a split treatment at jointing and boot stages. Leaf spotting diseases increased in most plots, but to varying degrees; and yield response was highly varied. Half of the 36 lines increased protein content by more than 0.7 % on a 12 % moisture basis. Of those lines, twelve increased to above an 11.5% protein content threshold that would position them for a higher value market. Some of the increased protein content may be attributed to lower grain yield. However, five varieties increased in both protein content and yield (shown below). Based on yields and quality data, of these five, only McGill and SD07165 are of commercial interest.

ENTRY	Change (treated minus untreated)			
	Leaf Spotting (Scale 1-9)	Maturity (days)	Protein (13% moisture basis)	Grain Yield (bu/ac)
WESLEY	1.0	1.8	0.83	10.4
SD07165	1.0	0.7	1.68	11.5
NE01481 (MCGILL)	0.0	1.7	1.05	10.2
NE05430	2.0	0.7	0.73	3.8

DANBY (W)	2.5	3.7	1.15	15.9
NURSERY LSMEAN	1.4	0.0	0.60	-3.7
L.S.D.	0.3	0.3	0.14	2.7

c. Milling and Bread Baking Quality

Thirty-nine organic wheat varieties, composited from Mead and Sidney locations, were analyzed for single kernel characteristics, milling properties, protein content, ash content, rheological dough strength, and bread production in the UNL Wheat Quality Lab. To increase our level of confidence for making direct comparisons between the lines for mixing and baking quality, changes were made in the mixograph protocol and sample preparation. The mixograph method was changed from a constant absorption basis to an absorption adjusted for protein content and mixing type. The sampling method was changed to provide samples with nearly equivalent protein contents. Since soil fertility has not been uniform in our organic plots, the grain protein has been known to fluctuate widely among reps. Therefore, grain protein content was measured for each entry in each rep for each location. Then samples were blended to obtain 11.9 ± 0.1%, except for four higher protein lines between 12.1 and 12.4 %. In the past, it was necessary to consider the protein quality as defined as the ratio between quality scores and protein content. As an indication of how well we met the goal, the flour protein content ranged from 9.6 to 10.6 % (after removing anomalous values for NW07505 of 11.2% and Danby of 11.0 %) with a standard deviation among SVT entries in 2010 of 0.27, compared to 0.63 in 2009 and 0.74 in 2008.

Of the top 15 for bread score this year, eight were also in the top 15 last year: NW03666, NE01481 (MCGILL), PRONGHORN, NE04424, NE02558 , NW03681, NE07569, and NE05425. Three lines—NE05548, ALLIANCE AND DARREL--had the lowest bread scores for the nursery. In the past, Alliance was thought to bake poorly because of its low protein content. This year the flour protein content of Alliance was only slightly less than the nursery average. Six entries were flagged for having extremely long peak mixograph mixing times (greater than nine minutes). These six entries were in the top ten for bread score (4.9 or greater on a scale of 1-6). Of these six, NW03666, MILLENNIUM and NE05425 had the top crumb scores for the nursery. MCGILL had the best loaf volume, slice area, and exterior score. NW03666 had the top baking absorption (63% compared to 61.9% nursery average), but had an extremely long baking mix time of 15.4 minutes. Unlike for conventional markets, where long mix times are avoided because of excessive equipment wear, long mix times may be favorable for making whole wheat bread (which dominates organic wheat markets) to compensate for the effect of sharp bran particles on dough development.

When comparing 2010 results with 2008 and 2009 Organic results and multiple years of data from conventional trials in regional nurseries (USDA tests), the rejection of DANBY and OVERLAND for the organic bread market was again supported in 2010. However, if Danby is top-dressed to increase protein content (as indicated in the above table), it is possible that Danby would be adequate for the organic bread market. On the other hand, GOODSTREAK, which was rejected in previous years was adequate this year. ARROWSMITH baked well this year, whereas in previous years the range was from good to very poor. The long-term poor milling of Antelope was confirmed this year; whereas milling for NE01481 was not a concern in 2010 as it had been in previous years.

IV. GREENHOUSE RESEARCH

In 2010, the majority of F_1 wheat populations were grown at Yuma, AZ. Mainly 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. We made over 100 triticale crosses, over 100 barley crosses and over 1000 wheat crosses in last year's fall, winter, and spring greenhouses.

V. PROPRIETARY RESEARCH

Public Private (University of Nebraska) Collaborations:

In 2009, the University of Nebraska decided to sustain the wheat breeding project via enhanced collaborations with commercial companies spanning the value chain. The University of Nebraska-Lincoln (UNL) has had a long standing arrangement with BASF, providing access to the Clearfield technology. In 2009 UNL began a collaboration with ConAgra. In 2010, UNL developed a collaboration with Bayer Crop Science that allows non-exclusive access to UNL germplasm and is in accordance with the principles for collaboration approved by the National Association of Wheat Growers and with the U.S. Wheat Associates Joint Biotechnology Committee.

USDA-ARS projects at the University of Nebraska are not party to these agreements.

We received our nineth year of research and development fees from an agreement with Paramount Seed Farms (a commercial seed company) for the exclusive release of our winter barley germplasm. They continue to try to build a viable market for our germplasm and we are fortunate that they took the initial risk of building a market when no one else was interested. The trials at Lincoln and Colby continue to perform very well. Sidney continues to have more winterkilling, but the greatest difficulty is timely harvest as the barely crop ripens when we are cutting wheat in eastern NE. Barley not cut on time often loses its heads. The 2010 data are:

	Source			Lincoln					Colby					Across Locations	
VARIETY	Exp't	07Plot#	PEDIGREE	Anthesis	PHT	YLD	WinSur	Rank	HD	PHT	Test weight	YLD	Rank	YLD	Rank
				(after May 1)	*Inch*	*lbs/a*	*%*		*(after Ap*	*Inch*	lbs/bushel	*lbs/a*		*Lbs/a*	
P-713	BVT08L	1	**P-954/Pennco**	22	35	4646	82	15	28	34	46	4751	22	4698	17
P-721	BVT08L	2	**Dundy/OK77559**	21	32	3997	65	35	27	32	41	4716	25	4357	34
P-954	BVT08L	3	**Hitchcock/Maury//Hitchcock**	23	33	4122	67	32	28	34	41	4820	18	4471	27
TAMBAR 501	BVT08L	4		17	36	4422	85	23	22	35	44	4746	24	4584	20
NB018187	BVT08L	5	NB93760/NB94723	21	36	4557	78	20	27	34	46	4715	26	4636	19
NB018199	BVT08L	6	NB94723/NB93727	24	35	4469	78	21	31	33	45	4430	33	4449	30
NB03437	BVT08L	7	NB92711/NB86954	20	34	4600	80	18	28	32	46	5035	12	4818	13
NB99845	BVT08L	8	Krasnodar K304/2//NB90701	18	33	4685	97	12	24	32	43	5170	7	4927	8
NB99875	BVT08L	9	Robust/Perkins//Dundy	19	37	4670	98	14	24	37	45	5555	1	5112	2
NB03429	BVT08L	10	NB92711/NB86954	22	33	4257	83	29	29	32	46	4685	27	4471	28
NB05419	BVT08L	11	NE98890/NE98885	20	33	4141	82	30	26	33	44	4448	32	4294	36
NB07407			NE95711/Legacy	22	34	4303	77	26	28	34	46	5152	8	4728	16
NB07410			NE95711/NE99868	18	36	5047	93	3	25	35	48	5220	5	5133	1
NB07411			NE95713/NE99881	25	36	4712	87	11	29	33	45	5151	9	4931	7
NB07412	BVT08L	22	NE95713/NE99881	21	35	5040	88	4	29	34	45	5007	14	5024	3
NB07442	BVT08L	23	NE98893//TX-15/Hitchcock	21	35	4797	90	9	27	35	47	4919	16	4858	11
NB08402	BVT08L	24	NE95711/Legacy/NE95711	22	35	4356	88	24	26	35	47	5266	3	4811	15
NB08403	BVT08L	25	NE95711/Legacy/NE95711	21	35	4279	82	27	27	34	48	4878	17	4578	22
NB08409	BVT08L	26	NE95711/Legacy/NE95711	24	34	4123	68	31	30	35	46	4786	20	4454	29
NB08410	BVT08L	29	NE95711/Legacy/NE95711	22	34	4273	73	28	27	34	48	5070	11	4671	18
NB08411	BVT08L	30	NE95711/Legacy/NE95711	21	34	4304	80	25	25	34	48	5320	2	4812	14
NB08413	BDUP08L	402	NE95711/Legacy/NE95711	24	35	3974	73	37	29	35	47	5188	6	4581	21
NB08428	BDUP08L	403	NE98888/NE98936	23	34	4840	82	6	28	33	45	5072	10	4956	4
NB09402	BDUP08L	405	NE98890/ NE97891	21	35	4002	78	34	29	33	45	4394	34	4198	38
NB09404	BDUP08L	409	NE98890/ NE97891	21	35	4577	83	19	29	36	46	4514	30	4546	23
NB09405	BDUP08L	410	P-954/ NE94737	20	38	5086	88	1	26	38	44	4779	21	4933	6
NB09409	BDUP08L	411	NE99820/ NE94737	24	35	3993	82	36	28	34	48	4959	15	4476	26
NB09410	BDUP08L	412	NE99820/ NE94737	21	39	4675	87	13	29	36	50	5224	4	4949	5
NB09425	BDUP08L	413	HITCHCOCK/ NE94737	23	33	3744	78	40	30	30	49	4266	35	4005	40
NB09427	BDUP08L	414	Legacy/ P-713	23	35	4817	80	7	31	34	44	4036	39	4427	33
NB09430	BDUP08L	419	94Ab1274/ NE94738	19	36	3892	82	39	24	37	45	4749	23	4321	35
NB09432	BDUP08L	423	NE97891/ P-713	22	36	4806	88	8	28	35	45	5023	13	4914	9
NB09433	BDUP08L	428	NE97891/ P-713	21	35	5059	88	2	28	34	47	4611	28	4835	12
NB09434	BDUP08L	430	P-954/ NE94737	22	34	4944	78	5	27	35	47	4800	19	4872	10
NB09436	BDUP08L	436	VA97B-388/ PERKINS	23	35	4028	78	33	30	34	47	3993	40	4011	39
NB09437	BDUP08L	437	VA97B-388/ PERKINS	21	36	4446	75	22	29	33	47	4509	31	4477	25
NB09439	BDUP08L	438	VA00H-137/ NE94738	22	33	4633	77	16	29	31	45	4228	38	4431	31
NB09440	BDUP08L	440	VA01H-124/ P-919 (NE98919)	15	36	4720	95	10	24	31	42	4264	36	4492	24
NB09441	BDUP08L	441	TX00D525/ NE98936	17	36	4606	92	17	23	34	45	4252	37	4429	32
NB09442	BDUP08L	444	TX00D525/ NE98936	22	35	3920	83	38	27	33	45	4609	29	4264	37
Mean				**21.25**	**34.83**	**4464.00**	**82.30**		**27.30**	**33.73**	**45.56**	**4782.69**			
Coeff Var				**7.63**	**4.96**	**8.83**	**12.10**		**3.85**	**4.45**	**5.78**	**8.27**			
Root MSE				**1.62**	**1.73**	**394.36**	**9.96**		**1.05**	**1.49**	**2.64**	**395.49**			
R-Square				**0.72**	**0.52**	**0.57**	**0.47**		**0.86**	**0.62**	**0.44**	**0.59**			
LSD (p=0.05)				**2.64**	**2.81**	**641.04**	**16.18**		**1.47**	**2.10**	**3.69**	**553.85**			
P-value				**<0.0001**	**0.0029**	**0.0002**	**0.0184**		**<0.0001**	**<0.0001**	**0.0010**	**<0.0001**			

2009	Mead		Sidney	Colby	Colby	Over All Average			
VARIETY	**Yield**	**WinSur**	**Yield**	**Test weight**	**Yield**	**Yield**	**Rank**	**Flowering Date**	**Height**
	lbs/a	*%*	*lbs/a*	lbs/bushel	*lbs/a*	***Lbs/a***		***(after May 1)***	***Inch***
P-713	2282	92	3326	47.1	3331	**2980**	**12**	**23.2**	**28.0**
P-721	2094	72	3121	47.2	2923	**2713**	**23**	**23.3**	**25.8**
P-954	2388	73	3111	45.9	2838	**2779**	**22**	**24.4**	**27.2**
TAMBAR 501	1377	72	2456	46.9	2984	**2272**	**40**	**22.1**	**27.8**
NB018187	2136	67	3768	48.4	3050	**2985**	**11**	**23.7**	**27.0**
NB018199	2381	77	3810	47.8	2978	**3056**	**7**	**26.5**	**27.2**
NB03437	2397	75	3012	48.3	3253	**2887**	**15**	**25.0**	**27.4**
NB99845	2241	80	3267	45.2	3078	**2862**	**17**	**22.3**	**25.9**
NB99875	3406	80	3129	46.8	2926	**3154**	**3**	**23.0**	**27.5**

NB03429	2649	78	2982	47.9	2922	**2851**	**18**	**24.6**	**25.8**
NB05419	1702	77	2422	45.8	2996	**2373**	**38**	**21.3**	**27.9**
NB05420	2274	77	1814	45.6	3047	**2378**	**37**	**22.0**	**27.2**
NB06417	1982	72	2369	45.3	3127	**2493**	**33**	**20.3**	**27.7**
NB06444	2029	68	2664	47.9	3178	**2624**	**27**	**22.7**	**26.0**
NB07407	2734	68	3049	49.6	2748	**2844**	**20**	**24.1**	**27.6**
NB07410	2798	73	3057	48.3	2890	**2915**	**13**	**23.1**	**30.8**
NB07411	3220	82	4746	47.8	2841	**3602**	**1**	**25.0**	**29.1**
NB07412	3244	75	3752	48.8	3147	**3381**	**2**	**24.0**	**27.6**
NB07416	2080	62	2924	49.2	3070	**2691**	**24**	**22.9**	**28.5**
NB07442	2466	65	2116	48.9	3229	**2604**	**30**	**23.3**	**28.9**
NB07443	2504	77	2272	47.6	2769	**2515**	**31**	**22.0**	**28.7**
NB08402	3188	70	2961	48.8	3005	**3051**	**8**	**23.4**	**28.5**
NB08403	3414	80	2558	50.1	3098	**3023**	**9**	**22.5**	**28.9**
NB08405	3150	83	2403	50.4	3059	**2871**	**16**	**24.6**	**29.2**
NB08409	3229	85	3164	49.6	2992	**3128**	**4**	**24.1**	**29.6**
NB08410	3631	73	2608	49.0	3056	**3098**	**6**	**23.3**	**28.9**
NB08411	3334	72	2673	49.7	2949	**2985**	**10**	**23.3**	**28.9**
NB08412	2429	55	2723	48.9	3188	**2780**	**21**	**24.4**	**28.2**
NB08413	3062	75	3290	49.2	2957	**3103**	**5**	**24.8**	**28.2**
NB08414	2757	73	3003	47.8	2788	**2849**	**19**	**23.8**	**29.1**
NB08419	2993	70	1502	49.6	2748	**2414**	**35**	**21.9**	**30.0**
NB08423	2255	78	2473	46.3	3101	**2610**	**29**	**21.8**	**26.2**
NB08428	2450	78	2375	48.5	3068	**2631**	**26**	**23.7**	**26.9**
NB08430	1836	78	3481	49.3	2521	**2613**	**28**	**24.6**	**31.7**
NB08436	2505	78	2115	47.4	2897	**2506**	**32**	**23.5**	**28.0**
NB08437	1791	65	2501	47.1	2867	**2386**	**36**	**21.9**	**26.6**
NB08438	2235	85	2135	46.2	2574	**2315**	**39**	**22.7**	**27.1**
NB08440	2422	77	2836	46.3	2781	**2680**	**25**	**22.1**	**27.9**
NB08441	2444	78	2203	46.9	2812	**2486**	**34**	**21.7**	**27.3**
NB08444	3258	75	2747	47.4	2696	**2900**	**14**	**24.0**	**27.5**
Mean	**2569.2**	**74.8**	**2823.0**	**47.9**	**2962.0**	**2940**		**23.6**	**27.7**
CV	**13.7**	**13.4**	**20.1**	**1.6**	**6.9**				
LSD (p=0.05)	**572.4**		**924.0**	**1.1**	**284.1**				

The 2008 Barley Variety Trial was:

VARIETY	Lincoln				Sydney	Colby			State Average	
	Anthesis	Plant height	Grain yield	Winter survival	Grain yield	Anthesis	Grain yield	Test weight	Grain yield	Rank
	(after May)	cm	lbs/a	%	lbs/a	(after May)	lbs/a	lbs/bu	Lbs/a	
P-713	23	33	2569	83	4463	23	2939	47	3323	17
P-721	24	33	2485	80	4631	24	2628	48	3248	18
P-954	24	31	3114	81	4541	24	2756	49	3470	11
TAMBAR 501	20	33	2780	79	3641	23	2114	44	2845	29
NB018187	22	33	2830	80	4647	23	2955	49	3477	10
NB018199	25	34	3186	85	4937	27	3397	47	3840	3

NB03437	25	33	2595	73	4846	24	2893	49	3445	13
NB99845	22	32	2824	75	4685	23	2885	47	3465	12
NB99875	24	32	3040	76	4546	22	2968	49	3518	8
NB03429	24	30	3344	73	4968	23	2723	50	3678	7
NB05419	20	34	3833	81	5022	21	2651	49	3835	4
NB05420	20	32	3708	88	4151	22	2443	46	3434	15
NB06419	20	32	2595	81	3906	23	2569	48	3023	26
NB06403	24	32	2516	73	4297	25	2424	43	3079	24
NB06410	23	32	2807	79	4040	22	2552	49	3133	22
NB06417	20	33	3273	86	3815	20	2622	46	3236	19
NB06425	21	33	2201	75	3792	22	2114	48	2703	30
NB06432	21	33	2609	70	3976	24	2074	48	2886	28
NB06444	21	30	2997	75	3848	22	2609	48	3151	21
NB07404	24	33	2246	76	3828	24	3058	44	3044	25
NB07405	23	32	2189	83	4444	22	2729	47	3121	23
NB07407	21	33	3170	91	5132	22	2905	51	3736	6
NB07410	22	34	3840	84	4835	21	3200	51	3958	2
NB07411	27	33	3362	86	5379	24	3315	47	4019	1
NB07412	24	33	3419	80	4910	23	3172	48	3834	5
NB07416	22	33	3622	85	4173	23	2508	50	3434	14
NB07420	20	31	3438	75	3778	22	2306	47	3174	20
NB07426	22	25	2627	58	4541	26	1705	47	2958	27
NB07442	23	35	2912	78	4500	23	2566	48	3326	16
NB07443	20	32	4010	94	4046	20	2427	47	3494	9
Mean	22	32	3005	79	4411	23	2674	48		
CV	4.29	4.14	22.91	15.08	13.12	5.19	14.81	5.02		
LSD	0.95	1.33	688.39	11.96	578.82	1.18	395.88	2.39		

Color shaded lines are under increase for possible release.

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

VI. ALLIED RESEARCH

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

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

VII. Comings and Goings

All projects are more than crosses, selections, evaluations, data, and seed. At its heart, it is the people that make this research possible. Anyamanee Auvachanon (currently a lecturer in Thailand), Neway Mengistu (currently a corn breeder with Pioneer Hibred), and Nicholas Crowley (currently a corn breeder with Pioneer Hibred) successfully completed their Ph.D. Juthamas Fakthongphan and Santosh Rajput began their Ph.D. program. Russell Ward and Sumardi bin Haji Abdul Hamid began their M.S. program. Dr. Devin Rose was hired with a joint appointment in the Food Science and Agronomy and Horticulture Departments as a cereal chemist who will oversee our wheat quality laboratory.

Summary

In 2010, 1,600,000 acres of wheat were planted in Nebraska and 1,490,000 were harvested with an average yield of 43 bu/a for a total production of 64,070,000 bu. In 2009, 1,700,000 acres of wheat were planted in Nebraska and 1,600,000 were harvested with an average yield of 48 bu/a for a total production of 76,800,000 bu. In 2008, 1,750,000 acres of wheat were planted in Nebraska and 1,670,000 were harvested with an average yield of 44 bu/a for a total production of 73,500,000 bu. 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). This is an economic reality in understanding wheat yields and productivity in NE.

In 2010, two new wheat lines were formally released. The first line is NE01481 which will be marketed as Husker Genetics Brand ‘McGill” in honor of a legendary professor of genetics at the University of Nebraska. McGill recommended for release primarily due to its superior adaptation to rainfed wheat production systems in eastern and west central Nebraska and its excellent resistance to wheat soil borne mosaic virus (WSBMV), a trait that is very rare in recent Nebraska releases. The second line is NI04421which will be marketed as Husker Genetics Brand ‘Robidoux” in honor of a pioneer French trapper who had a trading post between Nebraska and Wyoming. Robidoux was released primarily for its superior performance under irrigation and rainfed conditions in western Nebraska (west of North Platte, where drought is common) and irrigated production sites in western Nebraska and eastern Wyoming. It seems to have good drought tolerance and does best in irrigated environments in the drier areas (eastern WY). Two additional lines are under increase for possible release in 2011 (NE03490 and NE04490), however, NE03490 is adapted to the same environments as Robidoux and NE04490 is adapted to the same environments as McGill.

In 2009, we decided that the way to sustain our wheat breeding project was to develop enhanced collaborations with commercial companies spanning he value chain. We have had a long standing arrangement with BASF, providing us access to the Clearfield technology. In 2009 we began a collaboration with ConAgra (thanks in large part to efforts from the Nebraska Wheat Board) and added a new testing site at McCook. In 2010, we developed a collaboration with Bayer Crop Science that allows non-exclusive access to our germplasm and is in accordance with the principles for collaboration approved by the National Association of Wheat Growers and with the U.S. Wheat Associates Joint Biotechnology Committee. We hope to continue working with companies and public programs as we develop our future.

Thanks to a grant which we received from USDA-NIFA, we initiated an association mapping program with the long-term goal of genomic selection. Basically, our preliminary nursery, the Duplicate (DUP10), was genotyped with approximately 1500 polymorphic DArT markers of which about 1000 were useful. In collaboration with Drs. Dong Wang (UNL) and Jose Crossa (CIMMYT) we gave breeding values to each marker and selected the best 57 lines for advancement to the intermediate nursery (Triplicate 11; TRP11) based primarily on grain yield. What was interesting was that the models used by Dr. Wang and Crossa were in good agreement for about 40-45 lines. These lines clearly included the top 30 lines based upon breeder selection (which was based upon yield, test weight, maturity, plant height, disease and insect resistance, and end-use quality). However, after the first 30 best lines, the three methods (Wang, Crossa, and breeder selection) diverged, most likely due to model assumptions, or in the case of breeder selection having additional information. In the future, we hope to develop breeding values for each part of the genome, so we can select on markers with less phenotypic testing. If this procedure proves successful, it will great improve the efficiency of our conventional, irrigated, organic, disease, and NUE and WUE breeding efforts.

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