

2006 Colorado Winter Wheat Variety Performance Trial Results

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Performance Trial Results Help Colorado Wheat Producers Make Better Variety Decisions

Colorado State University provides unbiased and reliable information to Colorado wheat producers to help them make better wheat variety decisions. Crop variety testing is only the tip of the iceberg of CSU and Colorado wheat industry investment in wheat improvement which includes excellent research faculty and staff, a focused breeding program, graduate and undergraduate students, and dedicated agricultural extension specialists. Wheat improvement in Colorado is made possible by the support and cooperation of the entire Colorado wheat industry.

Wheat variety performance trials represent the final stages of a wheat breeding program where experimental lines are tested under a broader range of conditions than is possible during earlier generations. On-going and strong support for a public breeding program at CSU is critical because the variety development is a long process, especially under the highly variable climatic conditions in Colorado. Variation in annual precipitation, as well as variable fall, winter, and spring temperature regimes, hail and spring freeze events, interact with disease and insect pests and variety maturity to affect wheat yields.

The following table, obtained from the National Agriculture Statistics Service (NASS), underscores the interacting effects of weather on Colorado wheat production and illustrates the severity of environmental conditions in 2006 compared to the previous ten years.

Table 1. Colorado winter wheat acreage, yield, price, and value of production – 1996 to 2006.

Year	Harvested acres (thousands)	Yield (bu/a)	Price (\$/bu)	Value of production (thousands)
1996	2,200	32	\$4.27	\$300,608
1997	2,700	32	\$3.17	\$273,888
1998	2,550	39	\$2.49	\$247,631
1999	2,400	43	\$2.23	\$230,136
2000	2,350	29	\$2.70	\$184,005
2001	2,000	33	\$2.72	\$179,520
2002	1,650	22	\$3.63	\$131,769
2003	2,200	35	\$3.32	\$255,640
2004	1,700	27	\$3.25	\$149,175
2005	2,200	24	\$3.35	\$176,880
2006 exp.	2,000	21	?	?

Relevant sections from the Colorado Agricultural Statistics Service Crop Progress Reports between April and July demonstrate the development of stress conditions during critical crop growth stages which resulted in a good crop at the beginning of April but, by late June and July, had evolved into one of the lowest yielding crops since 1968:

- March 12, 2006 - Winter wheat is rated in mostly fair to good condition with 6 percent of the crop being pastured.
- April 9, 2006 - Even with the recent snow and rain showers, statewide, Colorado recorded below normal levels of precipitation for the week. Evidence of wheat mite infestation is still being reported in areas around the state. Winter wheat is now rated in mostly good to fair condition with the crop being reported at 15 percent at or beyond the jointed stage.
- May 12, 2006 - Winter wheat production in Colorado is forecast at 54.0 million bushels. This is 2 percent above last year's production. Acreage for harvest, estimated at 2.0 million acres, is 200,000 acres less than a year ago. Average yield is forecast at 27.0 bushels per acre, up 3.0 bushels per acre from last year's crop. Conditions were favorable for fall seeding, but a dry winter followed by a dry spring reduced yield potential in most of the growing areas.
- June 9 2006 - Winter wheat production in Colorado is forecast at 46.0 million bushels, down 15 percent from the May 1 forecast and 13 percent below the 52.8 million bushels produced last year. Average yield is forecast at 23.0 bushels per acre, 1.0 bushel per acre below last year's average. Limited moisture received in May contributed to lower yield expectations as did record high temperatures. Currently, 59 percent of the crop is rated in poor to very poor condition.
- July 12 2006 - Winter wheat production in Colorado is forecast at 42.0 million bushels. This is down 9 percent from the June 1 forecast and is 10.8 million bushels below last year's production. The state's average yield is forecast at 21.0 bushels per acre, 3.0 bushels per acre below the previous year and 2.0 bushels per acre below the June forecast. If realized, the forecasted yield will be the lowest since 1968. Record hot temperatures in June combined with below average rainfall led to lower expected yields.

As these reports illustrate, drought stress, high temperature stress often with dry winds, spring freeze injury, and the interaction among these, were the major factors influencing 2006 wheat variety trial performance. The significant precipitation (2-3+ inches in most areas) received in early October, however, was extremely beneficial as this was the only appreciable precipitation received after planting in many areas. Wheat diseases, insects, and weed infestations were generally negligible in 2006, except for localized infestations of Russian wheat aphid, brown wheat mite, and wheat streak mosaic virus, the latter being widespread across the High Plains. Early reports in April of the lack of leaf and stripe rust in the southern Great Plains held true for Colorado as virtually no leaf or stripe rust pustules were observed on susceptible entries in the trials. A new strain of High Plains disease may have been detected in Kansas, though no confirmation of its presence in Colorado was made.

With regard to the lack of precipitation, the following table illustrates the severity and timing of the drought stress along with the average yields at Colorado's dryland variety trial locations. As the table demonstrates, the 63% average yield over locations in 2006 is approximated by 70% average precipitation from October 2005 through June 2006.

Table 2. Precipitation during critical crop growth stages during 2005 and 2006, trial location yield averages (1997-2005), and percent of average yields resulting from drought stress.

Location*	March	April	May	June	Avg (Mar-Jun)	Oct-May	Yield (bu/a)		Yield % Avg
							2006	97-05	
Walsh	75%	62%	43%	59%	60%	60%	18	38	48%
Lamar	113%	17%	79%	127%	84%	91%	23	33	69%
Arapahoe	107%	22%	23%	20%	43%	88%	14	30	48%
Burlington	50%	1%	19%	101%	43%	60%	16	29	56%
Genoa	47%	31%	29%	183%	73%	46%	28	38	72%
Akron	58%	65%	45%	6%	44%	85%	25	47	54%
Yuma**	56%	81%	43%	53%	58%	87%	.	.	.
Julesburg	35%	11%	28%	97%	43%	57%	8	42	18%
Orchard	122%	14%	32%	21%	47%	86%	40	32	125%
Bennett	59%	19%	11%	3%	23%	60%	34	43	80%
Sheridan Lake	37	33	112%
Average	74%	27%	34%	69%	51%	70%	23	37	63%

*Precipitation at Sheridan Lake/Brandon not available. Weather stations located at Cheyenne Wells for Arapahoe, Burlington South Station for Burlington, Holyoke for Julesburg, Briggsdale for Orchard, and Brighton for Bennett. No weather station located near the Sheridan Lake trial.

**Yuma is a new trial location starting in 2004 thus yield history unavailable.

***Yields at locations for years when trial results were not reported were estimated at 10 bu/a for computing 1997-2005 average yields.

Interactions of low precipitation, high temperatures, stand establishment, and altitude affected variety performance to a significant extent in 2006. General comments regarding the trials include the following:

- Low starting spring soil moisture content, drought from March through June in many locations and high temperatures in May and June, led to overall low trial average yields in 2006 compared to long term average trial yields.
- Late planting and thin stand establishment delayed maturity and led to reasonably high 2006 trial yields in some locations.
- Soil moisture levels were generally very low in early March which exacerbated the effects of subsequent months of low moisture.
- Even though some locations received above average March and June precipitation, total precipitation received at any trial is small by comparison to April, May, and June total precipitation.
- Much of June precipitation was not effective for increasing yield as it was received after wheat maturity.
- Otherwise, 2006 was characterized by strong windy conditions exacerbating drought and heat water losses and relatively few and weak hail events.
- Blowing soil caused wind erosion in wheat fields during fall 2005 and spring 2006 in some parts of Colorado.

There were 54 entries in the dryland performance trials (UVPT) and 40 entries in the irrigated performance trials (IVPT). All trials include a combination of public and private varieties and experimental lines from Colorado and surrounding states. Trials were planted in a randomized complete block design with four replicates (increased from three in previous years) in the dryland trials and three replicates in the irrigated trials. Yields are corrected to 13% moisture. All eleven dryland and three irrigated uniform variety performance trials were harvested. Three-year and the 2006 yield summary results are presented below.

Note that individual 2006 Variety Trial Results for both dryland and irrigated trials including test weight, grain moisture, height, and lodging information will be available on the following websites:

www.csucrops.com the CSU Crops Testing website for all Colorado crop performance results
<http://wheat.colostate.edu/vpt.html> the CSU Wheat Breeding Program web site (downloadable wheat variety database)

<http://www.coloradowheat.org> Colorado Wheat Administrative Committee, CAWG, and CWRF website

Description of Winter Wheat Varieties in Eastern Colorado Trials.

Name and Pedigree	Origin/Class	RWA	HD	HT	SS	SH	COL	WH	SR	LR	WSMV	PRO	TW	MILL	BAKE	Comments
Above TAM 110*4/FS2	CSU-TX 2001 Hard red winter	S	3	4	3	4	7	4	9	9	5	7	5	4	7	CSU/Texas A&M release (2001). Clearfield* winter wheat. Early maturing semidwarf, excellent dryland yield in CO.
Akron TAM 107/Hail	CSU 1994 Hard red winter	S	5	5	4	3	5	3	8	8	9	6	5	7	6	CSU release (1994). Vigorous growth pattern, closes canopy early in spring and competes well with weeds. Best adapted under higher production dryland conditions.
Alliance Arkan/Colt//Chisholm sib	NEB 1993 Hard red winter	S	5	4	4	4	4	2	6	8	9	8	5	6	7	Nebraska release (1993). Medium-early maturing semidwarf, short coleoptile, good tolerance to common dryland root rot.
Ankor Akron/Halt//4*Akron	CSU 2002 Hard red winter	R*	6	5	3	3	5	3	8	8	9	7	5	6	5	CSU release (2002). Backcross derivative of Akron with slightly higher grain yield under dryland conditions and improved straw strength.
Antelope Pronghorn/Arlin	NEB 2002 Hard white winter	S	5	5	2	5	5	3	2	7	8	5	5	7	7	Nebraska/USDA-ARS release (2002). Hard white wheat (HWW), best adapted under irrigation. Good stripe rust resistance.
Avalanche KS87H325/Rio Blanco	CSU 2001 Hard white winter	S	5	5	4	3	5	4	8	6	5	5	2	2	5	CSU release (2001). Hard white winter wheat (HWW), sister selection to Trego. High test weight, excellent dryland yield in CO and Western KS.
Bond CL Yumar//TXGH12588-120*4/ FS2	CSU 2004 Hard red winter	R*	5	5	4	2	5	4	8	7	8	8	6	7	3	CSU release (2004). Clearfield* winter wheat. Slightly later, slightly taller than Above. Excellent dryland yield in CO, very high irrigated yields, excellent baking quality.
CO00016 CO940606/TAM107R-2	CSU 2006 Hard red winter	R*	3	4	3	2	7	--	9	9	--	7	6	2	2	CSU hard red experimental, targeted toward release Aug 2006. Excellent stress tolerance, very high dryland yields in CO, excellent milling and baking quality.
Danby Trego/JGR 8W	KSU 2005 Hard white winter	S	6	4	5	3	4	4	4	3	5	5	2	2	7	KSU-Hays release (2005). Hard white wheat (HWW), similar to Trego, with improved stripe rust resistance and preharvest sprouting tolerance.
Endurance HBV756A/Siouxland//2180	OK 2004 Hard red winter	S	5	5	2	--	5	4	7	3	--	6	4	5	5	Oklahoma State release (2004). Dual-purpose (grain and grazing) wheat, excellent re-growth following grazing.
Goodstreak SD3055/KS88H164//NE89646 (=Colt*2/Patrizanka)	NEB 2002 Hard red winter	S	7	8	3	--	9	5	5	5	8	4	3	2	8	Nebraska release (2002). Tall, long coleoptile, medium-late maturing. Good test weight, good dryland yield in CO and NE. Marginal baking quality.
Guymon Intrada/WI89-163W F2:8	OK 2005 Hard white winter	S	6	3	6	--	4	5	8	3	--	6	2	4	4	Oklahoma State release (2005). Hard white wheat (HWW), first tested in CSU trials in 2006.
Harry NE90614/NE87612	NEB 2002 Hard red winter	S	7	4	5	--	5	5	7	5	8	7	8	7	7	Nebraska release (2002). Excellent dryland yield in CO and NE. Low test weight.
Hatcher Yuma/PI 372129//TAM 200/ 3/4*Yuma/4/KS91H184/Vista	CSU 2004 Hard red winter	R*	5	3	4	4	5	4	4	7	8	7	4	2	4	CSU release (2004). Medium maturing semidwarf. Good test weight, good stripe rust resistance. Excellent dryland and irrigated yield across the High Plains, good milling and baking quality.
Infinity CL Windstar/3/NE94481// TXGH125888-120*4/FS2	NEB 2004 Hard red winter	S	6	5	4	--	6	2	4	--	--	5	4	--	--	Nebraska release (2005). Clearfield* winter wheat. Better baking quality than Above.
Jagalene Abilene/Jagger	Agripro 2001 Hard red winter	S	5	4	2	6	4	3	3	7	4	6	3	2	5	Agripro release (2001). Good test weight, good stripe rust resistance. Good dryland and irrigated yield in CO, has been observed to shatter in CO and KS trials.
Jagger KS82W418/Stephens	KSU 1994 Hard red winter	S	2	5	5	5	5	8	2	8	4	4	5	5	3	KSU-Manhattan release (1994). Early maturing semidwarf, excellent baking quality, good WSMV tolerance and stripe rust resistance. Prone to spring freeze injury, breaks dormancy very early in the spring.
Keota Custer/Jagger	Westbred 2005 Hard red winter	S	6	6	4	--	5	5	2	8	5	4	5	6	6	Westbred release (2005). First tested in CSU trials in 2005. Good stripe rust resistance. Good dryland yields in CSU trials.

Name and Pedigree	Origin/Class	RWA	HD	HT	SS	SH	COL	WH	SR	LR	WSMV	PRO	TW	MILL	BAKE	Comments
NuDakota JaggerxRomanian	Agripro 2005 Hard white winter	S	5	3	3	3	4	3	2	2	4	5	6	7	5	Agripro release (2005), first tested in CSU trials in 2006. Hard white wheat (HWW), good dryland yield, lower test weight.
NuFrontier Pioneer bulk selection (HBK0927)	Agripro 2000 Hard white winter	S	6	6	4	4	5	4	3	7	8	6	4	4	5	Agripro release (2000). Hard white wheat (HWW), medium-late maturing, tall. Good stripe rust resistance, best adapted to dryland conditions.
NuGrain Platte/W92-456W	Agripro 2005 Hard white winter	S	6	5	4	3	5	4	8	3	5	5	3	--	--	Agripro release (2005), first tested in CSU trials in 2005 as GM10006. Hard white wheat (HWW), best adapted to irrigated conditions, though moderately susceptible to stripe rust.
NuHills Abilene/Jagger	Agripro 2003 Hard white winter	S	4	3	2	3	4	5	2	8	4	4	6	2	5	Agripro release (2003). Hard white wheat (HWW), sister selection to Jagalene. Good straw strength, good stripe rust resistance.
Platte N84-1104/Abilene	Agripro 1995 Hard white winter	S	6	2	1	4	3	5	9	--	7	5	3	3	1	Agripro release (1995). Hard white wheat (HWW), excellent test weight and milling and baking quality. Best adapted under irrigation, very susceptible to stripe rust.
Postrock Ogallala/KSU94U261//Jagger	Agripro 2005 Hard red winter	S	4	4	4	--	5	5	2	2	4	5	3	3	4	Agripro release (2005), first tested in CSU trials in 2006. Good disease resistance, good test weight.
Prairie Red CO850034/PI372129// 5*TAM 107	CSU 1998 Hard red winter	R*	3	3	3	3	6	4	9	9	5	6	5	4	7	CSU release (1998). Backcross derivative of TAM 107. Excellent stress tolerance, poor end-use quality reputation.
Prowers 99 CO850060/PI372129// 5*Lamar	CSU 1999 Hard red winter	R*	7	8	4	3	8	2	5	6	7	5	3	5	1	CSU release (1999), reselection from Prowers. Tall, long coleoptile, medium-late maturity, high test weight, excellent milling and baking quality characteristics.
RonL TREGO/CO960293	KSU 2006 Hard white winter	S	6	2	--	3	4	--	7	--	2	7	2	2	2	KSU-Hays release (2006). Hard white wheat (HWW), first tested in CSU trials in 2006. Excellent resistance to wheat streak mosaic virus.
TAM 111 TAM-107//TX78V3630/ CTK78/3//TX87V1233	TX 2002 Hard red winter	S	6	6	3	3	6	5	2	9	5	6	3	3	4	Texas A&M release (2002), marketed by Agripro. High test weight, good straw strength, good milling and baking quality characteristics. Good stripe rust resistance.
Trego KS87H325/Rio Blanco	KSU 1999 Hard white winter	S	6	3	4	3	5	4	8	4	5	6	2	2	6	KSU release (1999). Hard white winter wheat (HWW), medium-late maturity, semidwarf, high test weight.
Wesley KS831936-3//Colt/Cody	NEB 1998 Hard red winter	S	5	2	2	6	7	3	3	3	7	1	6	3	4	Nebraska/USDA-ARS release (1998). Later maturing, short, excellent straw strength, good stripe rust resistance. Best adapted under irrigation.
Yuma NS14/NS25/2*Vona	CSU 1991 Hard red winter	S	5	3	3	4	2	4	6	8	6	7	5	7	3	CSU release (1991). Medium maturity, semidwarf, short coleoptile, good baking quality characteristics. Tough to beat under irrigation.

R* Russian Wheat Aphid resistance (RWA) rating denotes resistance to the original biotype (biotype 1) of RWA. All available cultivars are susceptible to the new biotypes of RWA.

Heading date (HD), plant height (HT), straw strength (SS), shatter (SH), coleoptile length (COL), winterhardiness (WH), stripe rust (SR), leaf rust resistance (LR), wheat streak mosaic virus tolerance (WSMV), protein content (PRO), test weight (TW), milling quality (MILL), and baking quality (BAKE).

Rating scale: 0 - very good, very early, or very short to 9 - very poor, very late, or very tall; WH-winterhardiness; WSMV - wheat streak mosaic virus tolerance.

Colorado Dryland Winter Wheat Variety Performance Trial Summary For 2006.

Variety ¹	2006 Trial Locations											2006 Yield	Grain Moisture	Test Weight	Plant Height
	Akron	Arapahoe	Bennett	Burlington	Genoa	Julesburg	Lamar	Orchard	Sheridan Lake	Walsh	Yuma				
	Yield (bu/ac)											%	lb/bu	in	
CO00016*	30.7	15.0	34.7	13.1	30.5	4.8	28.8	42.3	36.5	24.7	44.7	27.8	9.7	56.9	19.7
NuDakota	39.7	16.3	35.3	19.8	28.9	8.5	24.6	40.3	29.6	21.0	41.9	27.8	9.9	56.4	20.0
Infinity CL	33.8	12.7	33.5	16.9	34.3	10.7	25.4	43.4	32.6	20.7	38.0	27.5	10.3	57.5	22.6
Goodstreak	27.3	17.0	35.8	18.7	27.5	10.5	21.5	46.5	43.9	14.0	38.3	27.4	10.3	58.6	23.3
Endurance	29.9	16.6	34.5	22.6	27.5	7.4	20.6	42.6	40.6	19.0	36.8	27.1	10.7	58.6	20.5
Harry	21.5	16.6	34.2	16.6	29.0	6.7	23.8	44.3	48.3	16.2	39.3	27.0	9.4	55.9	20.7
Keota	29.6	11.7	38.9	20.3	26.7	4.8	21.0	43.7	37.4	21.0	41.4	26.9	10.5	58.7	22.0
Hatcher	17.1	13.4	43.3	21.7	28.7	2.2	23.0	43.7	38.7	21.2	39.5	26.6	10.4	58.6	20.4
Alliance	26.1	15.8	34.5	19.5	32.2	2.9	22.4	38.0	43.5	15.9	38.2	26.3	10.3	57.8	21.7
Avalanche	28.5	13.7	35.8	17.4	27.7	7.5	26.7	37.6	35.2	19.5	39.0	26.2	10.7	58.9	21.0
Yuma	23.2	16.6	34.9	19.0	27.5	6.4	23.1	42.6	36.2	20.8	38.0	26.2	9.8	57.4	20.3
Ankor	20.8	14.7	37.6	19.8	27.6	3.8	23.9	42.0	39.3	19.2	39.6	26.2	10.4	57.6	20.7
Trego	18.3	16.1	33.8	15.2	30.2	8.3	24.8	44.2	38.1	18.8	40.1	26.2	10.7	59.5	19.9
Jagger	34.9	10.0	31.1	22.0	27.2	13.6	23.4	36.3	31.7	18.3	38.5	26.1	10.0	57.5	22.2
Bond CL	19.3	15.4	36.8	14.0	24.8	10.9	28.3	41.9	32.9	17.7	43.8	26.0	10.1	56.7	22.2
Akron	20.3	16.1	35.4	19.0	26.8	4.1	23.6	41.4	39.4	22.0	35.6	25.8	10.3	58.0	20.6
KS03HW6-6	20.3	13.8	34.1	13.3	30.1	7.5	24.9	42.4	50.3	9.0	35.3	25.5	10.4	58.1	20.0
Above	26.9	13.5	35.6	21.0	30.5	5.3	26.2	36.2	38.8	19.3	26.9	25.5	10.2	57.7	20.6
Danby	15.8	13.1	40.4	16.4	30.6	3.8	21.0	38.6	36.0	28.5	33.1	25.2	11.0	60.0	21.0
Prairie Red	27.3	10.4	30.3	19.6	28.9	6.0	25.5	36.7	30.7	20.6	35.0	24.6	10.0	57.9	20.4
Jagalene	28.4	14.2	32.2	19.0	28.2	4.3	20.9	34.1	33.0	20.1	35.6	24.5	10.5	59.3	20.9
NuHills	25.4	12.3	33.4	13.5	25.9	11.9	26.3	33.9	37.2	20.1	28.1	24.4	10.2	58.1	19.8
NuGrain	23.6	13.9	28.6	14.9	26.1	8.7	23.3	40.5	35.2	16.7	36.3	24.3	11.0	59.6	20.0
TAM 111	17.6	11.7	35.9	18.8	28.4	4.2	22.8	43.0	34.3	15.6	34.8	24.3	10.9	58.7	22.2
Guymon	24.0	14.0	28.7	14.0	23.2	8.7	23.6	40.2	39.5	16.5	31.6	24.0	10.0	59.5	19.4
NuFrontier	27.7	15.3	31.3	12.5	25.0	13.8	17.1	28.3	37.7	17.0	37.8	24.0	9.4	58.6	19.8
Prowers 99	20.4	12.6	31.4	13.8	24.8	6.7	19.1	39.5	38.3	15.3	38.2	23.6	10.3	58.9	22.6
Postrock	24.3	13.0	32.0	20.3	20.5	5.4	23.5	36.0	29.2	18.3	34.9	23.4	10.5	58.0	21.0
RonL	14.6	13.2	32.1	10.1	26.5	8.6	24.3	37.1	35.5	20.4	30.3	23.0	11.0	59.7	18.5
Average	24.7	14.1	34.4	17.3	27.8	7.2	23.6	39.9	37.2	18.9	36.9	25.6	10.3	58.2	20.8
LSD _(0.30)	4.8	2.1	2.3	2.6	3.5	3.7	2.4	3.9	3.9	2.2	5.0				

¹Varieties in table ranked by the average yield over 11 locations in 2006.

*CO00016 is being advanced toward variety release in fall 2006.

Specific comments about individual dryland variety trial locations:

- Walsh – low starting soil moisture and low precipitation in May led to low trial yields. Some plots were lost to drought stress resulting from prior bindweed patches.
- Lamar – very early maturity and low April moisture lead to low yields.
- Arapahoe – looked good at the end of March but very low April-June precipitation led to very low yields.
- Burlington – poor and uneven emergence due to crusting and low April-May precipitation led to very low trial yields.
- Genoa – late emergence, average stands, and high altitude led to better yields in 2006, albeit only 72% of long term average yields.
- Akron – timely planting, excellent stands and fall growth, looked terrific until May when very high tillering and drought stress led to much lower than expected yields.
- Julesburg – late planting following October moisture, stand establishment was good, but consistently low precipitation from March through May led to very low yields.
- Orchard – uniformly thin stand establishment and near average October to May precipitation led to higher than average yields.

Colorado Dryland Winter Wheat 3-Yr and 2-Yr Variety Performance Trial Summary.

Variety ¹	Averages						
	3-Yr	2-Yr	2006	2005	2004	3-Yr	2-Yr
	-----Yield (bu/ac)-----					--Twt (lb/bu)--	
CO00016*	36.7	33.1	27.8	38.9	52.1	56.9	56.9
Bond CL	35.3	32.2	26.0	39.0	48.4	56.3	56.5
Hatcher	34.3	31.0	26.6	35.8	48.3	57.8	58.0
Avalanche	33.5	29.4	26.2	33.0	50.6	58.6	58.7
Jagalene	33.5	28.6	24.5	33.1	54.1	58.1	58.1
Above	33.4	29.1	25.5	33.1	51.4	57.7	58.0
Harry	33.3	29.1	27.0	31.4	51.2	54.9	55.1
Goodstreak	32.9	28.6	27.4	30.0	51.0	58.3	58.4
Jagger	32.7	29.3	26.1	32.7	47.3	56.8	56.9
Alliance	32.4	29.1	26.3	32.2	46.4	57.4	57.8
Prairie Red	32.4	28.7	24.6	33.1	48.0	57.6	57.7
Yuma	32.2	28.4	26.2	30.8	48.4	56.8	56.9
NuHills	31.9	28.1	24.4	32.2	48.1	56.5	56.3
Ankor	31.8	27.9	26.2	29.7	48.3	57.3	57.3
NuFrontier	31.5	27.8	24.0	32.0	47.3	57.8	57.9
TAM 111	31.3	26.7	24.3	29.4	50.2	57.9	58.0
Akron	30.4	26.5	25.8	27.2	46.7	57.5	57.6
Trego	30.3	26.2	26.2	26.2	47.7	59.0	58.9
Prowers 99	30.1	27.3	23.6	31.3	42.2	58.1	58.2
Varieties that have only been in the trial for two years.							
Keota		30.2	26.9	33.7			57.3
Infinity CL		29.2	27.5	31.1			57.0
Endurance		28.8	27.1	30.7			58.3
NuGrain		28.2	24.3	32.5			58.8
Danby		27.9	25.2	30.9			58.8
Average	32.6	28.8	25.8	32.1	48.8	57.4	57.6

¹Varieties in table ranked based on 3-Yr average yields.

*CO00016 is being advanced toward variety release in fall 2006.

Discussion of Dryland Wheat Variety Trial Results

The aforementioned effects of drought, high temperatures, and windy conditions greatly affected 2006 trial yields and led to a compression of average variety performance which meant that, when 2006 yields are averaged with yields from 2005 and 2004, there was little change in the rank of varieties over the three years 2004-2006 as compared to rank of varieties from 2003-2005 trials. Consequently, for prediction purposes and variety selection for fall 2006 plantings, the 3-Yr average performance is the most reliable. CO00016 is being advanced toward variety release in fall 2006 and proved to be high yielding in the past three years as well as this year. The impressive average performance of NuDakota in the 2006 trials will need to be confirmed by trial results in future years before it should be considered by Colorado producers. Variety trial results should be used to avoid varieties that are lower-yielding unless they have some characteristic that makes them otherwise desirable. Avalanche has pulled away from Trego in terms of recent average yield under Colorado conditions. Producers who choose to plant Prowers 99 should expect to suffer yield loss, though Goodstreak may be a good option for those interested in a standard height (tall) wheat. Ankor, the RWA-resistant version of Akron, is proving to yield approximately 2 bu/ac better than Akron over the past three years even though its resistance has been rendered ineffective by the prevalence of new RWA biotypes. Alliance, Prairie Red, Yuma, NuHills, TAM 111, NuFrontier, and Akron can be replaced by higher yielding varieties in Colorado.

Colorado Irrigated Winter Wheat Variety Performance Trial Summary For 2006.

Variety ¹	Haxtun				Fort Collins					Rocky Ford					2006 ave
	Grain	Test	Plant		Grain	Test	Plant			Grain	Test	Plant			Test
	Yield	Moist	Wt	Ht	Yield	Moist	Wt	Ht	Head ²	Yield	Moist	Wt	Ht	Head	Wt
	bu/ac	%	lb/bu	in	bu/ac	%	lb/bu	in	date	bu/ac	%	lb/bu	in	date	lb/bu
Bond CL	133.0	10.5	57.2	36	44.8	10.6	54.4	21	141	60.6	10.5	56.6	37	134	56.1
TAM 111	119.9	11.9	59.5	37	66.5	11.9	61.1	26	144	68.1	9.0	57.3	37	136	59.3
Keota	119.4	11.4	58.6	39	59.8	11.2	59.6	27	143	70.4	9.4	57.5	37	134	58.5
Danby	118.8	11.9	60.5	36	55.3	10.9	56.6	26	142	56.5	8.7	58.1	33	134	58.4
Platte	116.1	11.4	60.1	32	55.0	8.2	59.3	23	144	71.0	8.7	56.7	34	137	58.7
Ankor	115.4	11.1	57.6	33	50.7	12.4	58.6	23	143	58.1	8.6	56.1	35	134	57.5
NI03427	111.8	12.0	59.8	34	66.2	11.3	60.6	23	142	60.5	9.7	58.3	32	135	59.6
Hatcher	111.4	11.0	58.3	32	47.3	11.4	59.8	21	143	54.2	9.7	56.9	33	134	58.4
Yuma	110.4	10.9	58.5	35	45.2	10.0	58.2	20	144	60.6	9.8	56.7	33	136	57.8
Prairie Red	109.9	10.7	58.7	36	44.6	8.3	60.0	28	141	59.2	10.4	56.7	32	128	58.5
NuFrontier	107.9	11.1	59.1	38	47.7	12.2	60.0	27	142	54.4	9.2	58.0	35	136	59.0
NuDakota	106.7	10.9	57.9	34	39.5	11.0	53.7	22	141	62.0	8.7	54.3	34	136	55.3
NuGrain	105.4	11.1	59.8	32	46.1	11.1	60.8	24	142	64.9	8.8	57.5	34	135	59.4
Guymon	104.8	11.2	59.8	34	49.0	10.2	59.4	23	142	60.6	10.0	56.9	32	136	58.7
Antelope	103.6	10.9	57.9	35	43.1	10.5	58.2	23	141	58.3	9.5	56.4	31	133	57.5
NuHills	101.9	11.1	59.2	35	47.4	4.7	53.6	19	140	66.6	10.3	57.7	33	133	56.8
NI02425	101.8	10.4	58.3	34	43.4	2.4	51.4	21	141	44.3	10.8	55.7	31	132	55.1
Jagalene	99.1	11.4	58.9	35	53.1	11.0	60.5	23	142	62.1	9.1	57.8	36	132	59.1
NW98S097	98.5	10.9	59.2	35	43.9	8.8	59.3	22	146	47.6	10.4	57.2	31	137	58.6
Wesley	92.1	10.5	57.8	33	41.1	4.4	55.1	21	142	47.6	9.8	55.7	32	136	56.2
Postrock	86.5	11.0	59.1	33	50.9	9.5	60.6	22	140	60.9	9.5	56.9	35	134	58.9
Average	108.3	11.1	58.8	35	49.5	9.6	58.1	23	142	59.5	9.5	56.9	34	134	58.0
LSD _(0.30)	5.2				5.5					6.6					

¹Varieties in table ranked by the average yield at Haxtun.

²Julian date from January 1.

Specific comments about individual irrigated variety trial locations:

- Haxtun (Irrigated) – Early planting after pinto bean crop, good stand establishment, good fall and spring tillering, and excellent fertilizer and water management produced a superlative trial for comparing variety performance near maximum yield capability.
- Fort Collins (Irrigated) – timely planting, excellent fall stands and growth, very little spring precipitation and problems with sprinkler irrigation system resulted in drought stress and shortened plant height.
- Rocky Ford (Irrigated) – In mid-June this trial looked like it would average 100-110 bu/ac as plant stands were good, tillering was excellent, RWA was controlled by spraying and there were no diseases. Some plots were starting to lodge. However, high winds and heavy rainfall led to severe lodging subsequently causing estimated losses of 30-40 bu/ac.

Colorado Irrigated Winter Wheat 3-Yr and 2-Yr Variety Performance Trial Summary.

Variety ⁴	Haxtun ¹		Variety ⁴	Fort Collins ²		Variety ⁴	Rocky Ford ³		
	2006	2-Yr ave		2006	2-Yr ave		2006	2-Yr ave	3-Yr ave
	Yield (bu/ac)			Yield (bu/ac)			Yield (bu/ac)		
Bond CL	133.0	131.8	NuGrain	46.1	69.9	NuHills	66.6	82.9	89.3
Yuma	110.4	121.9	Bond CL	44.8	69.8	TAM 111	68.1	82.8	-----
TAM 111	119.9	119.9	TAM 111	66.5	67.7	Jagalene	62.1	77.3	78.7
Ankor	115.4	118.0	Jagalene	53.1	64.2	NuGrain	64.9	76.9	-----
Hatcher	111.4	114.9	Ankor	50.7	64.0	NuFrontier	54.4	76.7	81.9
Antelope	103.6	112.6	Hatcher	47.3	63.8	Bond CL	60.6	76.3	82.5
Platte	116.1	112.0	NuFrontier	47.7	61.8	Hatcher	54.2	75.7	78.7
NuFrontier	107.9	109.8	Platte	55.0	60.2	Platte	71.0	74.4	75.3
Prairie Red	109.9	109.5	Yuma	45.2	59.7	Yuma	60.6	71.3	79.5
Jagalene	99.1	109.5	NuHills	47.4	57.1	Antelope	58.3	71.1	73.9
NuGrain	105.4	105.4	Antelope	43.1	56.6	Prairie Red	59.2	70.1	82.1
Wesley	92.1	102.9	Prairie Red	44.6	45.7	Ankor	58.1	69.8	79.0
NuHills	101.9	102.8	Wesley	41.1	42.7	Wesley	47.6	68.1	73.2
Average	109.7	113.2	Average	48.6	60.3	Average	60.4	74.9	79.5
LSD _(0.30)	5.2		LSD _(0.30)	5.5		LSD _(0.30)	6.6		

¹The irrigated trial was not conducted at Haxtun in 2005 so results from 2004 and 2006 were used for the 2-Yr averages.

²The Fort Collins 2004 trial results were not reported so data are only available for the 2005 and 2006 results.

³At Rocky Ford, 3-Yr averages could not be computed for TAM 111 and NuGrain because they were not entered in the 2004 trial.

⁴Varieties are ranked at each location according to 2-Yr average yields.

Discussion of Irrigated Wheat Variety Trial Results

For several reasons, the presentation of the irrigated variety trial results is different this year than in previous years when we averaged variety performance across years and locations. Three locations per year is a very small sample and ranking varieties according to differences among variety mean yields can easily misrepresent good performance of some varieties at specific locations where the trial has been repeated for multiple years. More importantly, each of the irrigated variety trial locations represents a very different agro-climatic environment that might account for different variety performance.

Yields at the Fort Collins trials in 2005 and 2006 are lower than what we would like to see in order to evaluate the maximum yield potential of irrigated wheat varieties on the Front Range. While we strive to manage the Fort Collins for high yields, the lack of natural precipitation, abnormally high temperatures, and mechanical difficulties with the linear move irrigation system resulted in low yields. Similarly, excessive early lodging at Rocky Ford due to severe storms reduced all variety yields approximately 30-40 bu/ac below their potential yield in the Arkansas Valley. The 2004 and 2006 trials at Haxtun were indicative of the maximum irrigated yield potential in northeastern Colorado. Bond CL stands out for its superlative yield potential in these two trials followed by TAM 111, Platte, Ankor, Hatcher, and Yuma that all averaged over 110 bu/ac.

Irrigated variety selection should also take into consideration stripe rust resistance and lodging. For variety ratings for these characteristics, see the Making Better Decisions Winter Wheat Variety Selection in Colorado for Fall 2006 tables below."

Collaborative On-Farm Tests (COFT) complement performance trial results to help Colorado wheat producers make better variety decision

Over half of Colorado's 2006 wheat acreage was planted to winter wheat varieties that have been tested in the COFT program which is in its eighth year of testing. With on-farm testing, wheat producers get to evaluate new varieties on their own farms before seed of the new varieties is available on the market to all farmers. On-farm testing directly involves agents and producers in the variety development process, thereby speeding adoption of superior, new varieties.

Colorado State University Cooperative Extension specialists have a large responsibility for the success of this program - recruiting volunteer growers, delivering seed, planning test layout and operations, helping with planting, keeping records, coordinating visits, communicating with growers and campus coordinators, coordination of weighing plots and measuring yields. COFT would not be possible without the collaboration of so many dedicated wheat producers throughout eastern Colorado.

Eastern Colorado Cooperative Extension Wheat Educators and On-Farm Test Coordinators

Name	Title	Office Location
Bruce Bosley	Platte River agronomist	Sterling
Scott Brase	SE Area agronomist	Lamar
Alan Helm	Golden Plains specialist	Holyoke
Ron Meyer	Golden Plains agronomist	Burlington

In the fall of 2005, twenty eastern Colorado wheat producers planted collaborative COFT trials in Baca, Prowers, Kiowa, Cheyenne, Lincoln, Kit Carson, Phillips, Sedgwick, Logan, Morgan, Adams, and Weld counties. Working with local Extension specialists, each producer/collaborator received 100-150 pounds seed of each variety and planted the five varieties in side-by-side strips. The objective of the 2006 COFT was to compare performance and adaptability of newly-released varieties to varieties they might replace in Colorado. Comparisons of interest were:

- Compare CSU's new *CLEARFIELD** variety, Bond CL CSU *CLEARFIELD** wheat variety, Above.
- Compare the CSU's new variety, Hatcher, with all other varieties in the test, including Bond CL, Ankor, Above, and Avalanche.
- Compare Avalanche hard white wheat to four hard red wheat varieties.
- Put CSU's new releases, Hatcher and Bond CL, to a 'trial by fire' test under actual farm conditions in two-acre size strips, and multiple locations throughout eastern Colorado.

Variety Performance in the 2006 Collaborative On-Farm Test

Location	Hatcher	Avalanche	Bond CL	Above	Ankor	Test Average
	Yield (bu/ac) at 13% moisture					
SE Baca	8.5	8.2	5.6	7.1	9.3	7.7
SE Baca II	13.7	17.2	16.1	16.0	16.9	16.0
WC Baca	7.8	14.9	12.7	12.1	12.6	12.0
SE Prowers	5.0	4.2	4.6	3.8	6.7	4.9
EC Kiowa	41.9	38.9	34.6	30.7	38.9	37.0
SE Lincoln	16.6	20.2	21.7	20.1	18.2	19.4
NC Cheyenne	12.2	11.4	11.6	10.8	9.7	11.1
EC Kit Carson	20.4	26.8	26.2	24.6	24.1	24.4
NW Kit Carson	38.4	33.3	33.3	25.9	33.6	32.9
SC Kit Carson	9.8	13.3	11.7	9.5	9.5	10.8
WC Washington	41.2	38.1	37.7	38.4	35.8	38.2
NW Yuma	33.7	30.4	43.4	34.7	29.0	34.3
WC Phillips	26.5	25.1	22.3	26.1	25.5	25.1
NC Logan	36.1	35.8	35.1	38.9	37.2	36.6
SC Logan	25.8	22.9	21.9	22.0	22.7	21.7
WC Logan	19.1	17.8	15.5	17.2	15.1	16.9
NW Morgan	35.8	37.6	34.8	37.1	37.0	36.5
NW Adams	31.3	23.1	26.1	25.9	25.4	26.4
SE Adams	28.0	16.8	22.6	21.0	21.5	22.0
SW Weld	21.0	19.6	15.1	21.3	21.9	19.8
Variety Yield	23.6	23.0	22.8	22.3	22.5	22.9
Variety Test Wt	58.0	58.2	54.9	56.6	56.7	56.9
Variety % moisture	11.1	11.3	11.0	11.0	11.2	11.1

COFT Results and Discussion

Results were obtained from all of the COFT plots that were planted. This is the highest percent of success of COFT plots during the eight-year history due to the excellent collaborative efforts of extension specialists and COFT producers. All of the climatic conditions described above that influenced yields of the variety performance trials also affected COFT yields.

CSU's new *CLEARFIELD** release, Bond CL, yielded a half bu/ac more than CSU's *CLEARFIELD** wheat variety, Above, under 2006 wheat production conditions. Bond CL is a higher quality wheat than Above and it is the highest yielding irrigated wheat variety in Colorado. It seems reasonable to assume that, if normal precipitation patterns are received in future years, that Bond CL will yield well under higher dryland yield situations as it has under the dry 2006 yield conditions. Our chief concern with Bond CL is that its test weights are lower than the test weights of varieties that it might replace which should be considered by producers in making variety selections.

The newly released CSU variety Hatcher yielded relatively more (and had relatively higher test weights) than the other COFT varieties. Hatcher is also a high yielding irrigated wheat variety, implying that it, like Bond CL, might be expected to maintain relatively high yields under higher yielding dryland conditions as well when we return to normal precipitation patterns.

Avalanche white wheat performed admirably under tough conditions and is still the recommended dryland white wheat variety for Colorado.

Finally, CSU's new releases, Hatcher and Bond CL, passed the 'trial by fire' test in 2006 with flying colors by their performance under COFT's varied farm conditions.

The COFT test will be conducted in 2007 and 2008 to verify the results above under different (and hopefully more favorable) production conditions, however it seems that our small plot performance trial results and this year's COFT results indicate that Colorado producers growing Ankor and Above might consider replacing them with Hatcher and Bond CL respectively.

Making Better Decisions Winter Wheat Variety Selection in Colorado for Fall 2006

Jerry Johnson and Scott Haley (July 2006)

Hard white wheat (HWW) - HWW represents the most promising future for wheat production and marketing in Colorado. The HWW variety, Avalanche, has performed well since it was initially tested in 1999. CSU is aggressively pursuing improved HWW variety development in its breeding program and various other public and private HWW varieties also show promise for production in Colorado. A HWW variety should be high on the list for variety selection in 2006.

CLEARFIELD* wheat - The *CLEARFIELD** variety, Bond CL, has performed extremely well under dryland conditions over the past three years although lower test weight is a concern. It has also proven to be high yielding under irrigated conditions. It is important to remember that you can't save seed of *CLEARFIELD** varieties - even to plant on your own farm. The Plant Variety Protection Act and a U.S. Utility Patent protect them from unauthorized sale and replanting for another commercial crop.

Selecting your variety

Dryland wheat producers: **Our first suggestion is to plant more than one variety in order to spread your risk.** Secondly, with the variability among trial locations in 2006, as well as variability among locations across years, **producers are strongly encouraged to consider**

multiple-year summary yield results and other trait information instead of single-location, or single-year results to make better variety decisions.

The dryland yield table below is based on three-year average performance in our trials and varieties are alphabetically ranked within a column. Under our normal low rainfall conditions, wheat streak mosaic virus will probably be a more consistent threat than stripe rust and worthy of consideration when selecting a variety.

Irrigated wheat producers: The irrigated yield table below is based the 2004 and 2006 average yields at Haxtun because these results most accurately predict the high yield potential of varieties under consistently good management. All of the varieties tested at Haxtun for these two years are capable of yielding over 100 bu/ac. Varieties are alphabetically ranked within a column. The most important variety selection criteria are yield, straw strength, and stripe rust resistance from the tables below. The Platte program has returned profit to many irrigated wheat producers through the protein content incentive package, although some yield loss might be expected when stripe rust is a problem and is not effectively controlled with fungicides. Bond CL has performed very well and it has above average straw strength (as do Yuma and Jagalene), but lower test weight remains a concern.

2006 Colorado Winter Wheat Variety Decision Tables

High Performance Varieties for Dryland Eastern Colorado				
Higher Yielding		Intermediate		Lower Yielding
Above Avalanche Bond CL	Hatcher Jagalene	Alliance Ankor Goodstreak Harry	Jagger Prairie Red Yuma NuFrontier	Akron Prowers 99 TAM 111 Trego
High Performance Varieties for Colorado Irrigated Conditions				
Highest Yielding (over 130 bu/ac)		Intermediate (over 110 bu/ac)		Lower Yielding (over 100 bu/ac)
Bond CL		Ankor Antelope Hatcher Jagalene NuFrontier	Platte Prairie Red TAM 111 Yuma	NuGrain Wesley NuHills
Stripe Rust				
Moderately Resistant-Resistant		Intermediate	Moderately Susceptible-Susceptible	
Antelope Jagger Keota NuDakota	NuHills TAM 111 Postrock	All Others	Above Akron Ankor Avalanche Bond CL	Guymon NuGrain Platte Prairie Red Trego
Wheat Streak Mosaic Virus				
Moderately Resistant-Resistant		Intermediate	Moderately Susceptible-Susceptible	
RonL		Above Avalanche Danby Jagalene Jagger Keota	NuDakota NuGrain NuHills Postrock Prairie Red TAM 111 Trego	All Others

Test Weight					
Highest		Average		Lowest	
Avalanche Danby Guymon	RonL Trego	All Others		Bond CL Harry NuDakota NuHills Wesley	
Heading Date					
Earliest		Medium		Latest	
Above Jagger	NuHills Prairie Red	All Others		Harry Goodstreak Prowers 99	
Height					
Shortest		Medium		Tallest	
Above Danby Harry Hatcher Jagalene NuDakota NuHills	Platte Postrock Prairie Red RonL Trego Wesley Yuma	All Others		Goodstreak Prowers 99	
Coleoptile Length					
Shortest		Medium		Longest	
Alliance Danby Guymon Jagalene NuDakota	NuHills RonL Platte Yuma	All Others		Above Goodstreak Prowers 99 Wesley	
Winter Hardiness					
Good		Average		Fair	
Akron Alliance Ankor Antelope	Infinity CL Jagalene NuDakota Prowers 99 Wesley	All Others		Jagger	
Protein Content					
Highest		Average		Lowest	
Goodstreak Jagger Keota NuHills Wesley		All Others		Above Alliance Ankor Bond CL Harry	Hatcher RonL Yuma
Straw Strength (Irrigated Only)					
Best		Good		Poorer	
Antelope Endurance Jagalene NuHills	Platte Wesley	Above Ankor Goodstreak NuDakota	Prairie Red TAM 111 Yuma	All Others	

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