

**Title (4W4635):** North Central Montana Off-Station Spring Wheat Variety Performance Evaluations

**Principal Investigator:** Peggy F. Lamb, Research Scientist, Northern Ag Research Center, Havre

**Project Personnel:** Luther E. Talbert, Breeder/Geneticist, Spring Wheat, Bozeman  
Susan P. Lanning, Research Associate, Spring Wheat, Bozeman  
Angela E. Sebelius, Research Associate, Havre  
Marko Manoukian, Phillips County Extension  
Tyler Layne, Chouteau County Extension

**Cooperators:** Max Cederberg, Landowner, Turner  
Pete Lumsden/John Flansaas, Landowners, Loring  
Lyle McKeever, Landowner, Loma  
Terry McKeever, Landowner, Loma

### **Objectives:**

Diverse cropping environments exist within the five-county area most closely served by Northern Agricultural Research Center. Winter wheat, spring wheat, barley, durum and oat production together in the five counties (Blaine, Chouteau, Hill, Liberty and Phillips) represents 31 percent of the 2008-2012 statewide totals (41 percent for winter wheat and 25 percent for spring wheat). Producers are keenly interested in variety performance data generated under local conditions. It is our objective, within budget and other resource limitations, to evaluate small grain variety performance, over time, under conditions representative of specific areas of northern Montana, yet differing from that of the Research Center. Growers in north central Montana are provided reliable, unbiased, up-to-date information to make comparisons among improved spring wheat varieties. This report provides producers in north central Montana the information necessary to select varieties best suited for their specific area and growing conditions.

In order to bring quality and quantity together, protein premium data are included to demonstrate the forces of market value on spring wheat varieties under varying cropping conditions at the off-station sites.

### **Methods:**

Standard off-station spring wheat variety performance trials were conducted in 2013 on chemical fallow at three locations in three northern Montana counties.

#### Dryland Spring Wheat Trials:

- |   |              |            |
|---|--------------|------------|
| 1. Cederberg Farm, Blaine County          | (3NE Turner) | 13-36N-25E |
| 2. Flansaas/Lumsden Farm, Phillips County | (1SW Loring) | 24-35N-29E |
| 3. McKeever Farms, Chouteau County        | (12N Loma)   | 32-27N-10E |

All three trials consisted of 20 entries and were seeded in replicated, 3-row, 22-foot plots on a 12-inch row spacing utilizing a self-propelled cone seeder with Atom Jet paired row openers. All rows of each plot were trimmed to a harvest length of 16.5 feet with a three-point rototiller. Plant height was measured and percent sawfly cutting was estimated for each plot immediately prior to harvest. A 'Wintersteiger Classic' plot combine, funded in part by the Montana Wheat and Barley Committee, was used to harvest each 3-row plot. Seed was cleaned prior to measuring plot weight, test weight and moisture content. Protein content was determined using a Foss Infratec 1241 near infrared analyzer. Other variables specific to each individual trial are listed with the current year data tables.

Average annual Pacific Northwest (PNW) quotes for dark northern spring wheat at 12 to 15 percent protein (2004-2009) and 13 to 16 percent protein (2005-present) are graphed in Figure 1. Values along the top axis of the graph reflect the average annual amount per bushel (\$/bu) price spread between the minimum and maximum protein levels for which quotes are consistently available. Historical daily bids issued can be accessed via the Montana Wheat and Barley Committee website at: <http://wbc.agr.mt.gov/wbc/Producers/Pricing.html>

Average price quotes at 0.25 percent increments of protein level were applied to the corresponding years' yield and protein production for each entry tested. Therefore, values included in individual off-station location figures are "actual" in terms of agronomic yield and associated gross return based on protein content and average annual market performance for each year.

**Results:**

Cropping environments in 2013 started out marginal, but with timely precipitation, ended up very good across north central Montana. The Turner, Loring and Loma locations went into the fall and started out early spring dryer than normal but then received large amounts of precipitation resulting in very good to excellent spring wheat seed yields.

At Havre, annual growing season precipitation (9/1/12 through 8/31/13) was 18.46 inches, 54 percent higher than the average for all years since 1916. April 1 through July 31 precipitation was 13.28 inches or 194 percent of the 98-year average. Heat units expressed as "Growing Degree Days" (GDD, base 50) from May through July totaled 1221, 95 percent of the average for the last 63 years (1951-2013). The last spring frost was earlier and first fall frost of 2013 was later than the 98-year average resulting in 150 frost-free days. The minimum winter temperature was -25 degrees F on December 25. Overall, the growing season was slightly cooler than normal. The April through July growing season saw an average daily temperature of 57.6 degrees F, only 1 degree below normal. July and August average temperatures were slightly higher than normal with the high for 2013 recorded on August 20 at 94 degrees F. There were 16 days with temperatures 90 degrees F or above, with no days over 100 degrees F.

Following a summer of substantial and timely rainfall, spring wheat yields at Turner averaged over 54 bu/ac (Table 1). 'Vida', a Montana State University release, was the highest yielding entry at over 66 bu/ac, with two experimental lines producing yields statistically equal to that of Vida. Test weight of all entries averaged over 62 lb/bu. Sawfly cutting was low in the spring wheat at Turner in comparison to previous years, averaging only 7.5 percent. Stand percent, plant height, yield, test weight, moisture, protein and sawfly cutting data for the 2013 Cederberg (Turner) dryland spring wheat trial are summarized in Table 1.

Comparable averages are calculated using a standard long-term check variety when not all entries are present in a specific trial for all years. Variety means are adjusted by multiplying the actual check mean by the ratio of the individual variety mean compared to the check mean for the same years as tested. All varieties are then directly comparable to each other when in the same nursery. A minimum of 3 years of data is necessary to be included in comparable average calculation. Ten-year comparable average for spring wheat seed yield and test weight at Turner are summarized in Table 2, while ten-year comparable averages for sawfly cutting are summarized in Table 3. Gross return information is illustrated in Figures 2 through 5.

Loring spring wheat yields averaged over 59 bu/ac with Montana State University experimental line 'MT1172' producing the highest yield at over 71 bu/ac (Table 4). Vida, 'Reeder' and one experimental line all produced yields statistically equal to that of MT1172. Sawfly cutting was virtually nonexistent at the Loring site with cutting in the spring wheat trial averaging only 0.7 percent. Stand percent, plant height, yield, moisture, test weight, protein and sawfly cutting data for the 2013 Loring dryland spring wheat trial are summarized in Table 4. Ten-year comparable averages for spring wheat seed yield and test weight at Loring are summarized in Table 5, while ten-year comparable averages for sawfly cutting are summarized in Table 6. Gross return information is illustrated in Figures 6 through 9.

In 2013, off-station spring wheat trials were re-established at Loma. Following timely rainfall, spring wheat yields at Loma averaged over 56 bu/ac. Vida and experimental line MT1172 were the highest yielding entries at 70.8 bu/ac (Table 7) with no other entry producing yields statistically equal. Sawfly cutting in the small plot situation was minimal, averaging only 8 percent cutting. Plant height, yield, test weight, moisture, protein and sawfly cutting data for the 2013 Loma dryland spring wheat trial are summarized in Table 7. Comparable averages for spring wheat at the Loma site will not be available until the 2015 crop year. There will also be no gross return figures available until three years of data are collected.

**Summary:**

This work has been strongly supported by producers near each of the locations, and by the Northern Agricultural Research Center Advisory Council. With budget and other resources allowing, it is planned to continue off-station cereal variety investigations in the five-county area. The Loring location is entering its nineteenth year, and the cooperators and area producer interest and support has been outstanding. The Turner location is only 32 miles from the Loring site, but growing conditions there are quite different. Cooperator and producer support in the Big Flat area have been outstanding through the years with 2013 marking 26 years at the present Turner site. Various winter and spring cereal trials have been conducted with great producer support at the Chouteau County location, between Big Sandy and Loma, since 1998.

**FUNDING SUMMARY:**

Expenditure information for grant index 4W4635 is to be provided by Montana State University, Office of Sponsored Programs. There is no other grant support for this project.

**MWBC FY2015 GRANT SUBMISSION PLANS:**

It is planned to submit this project for funding consideration in the next fiscal year.

**TABLE 1. Dryland Fallow Spring Wheat Cultivar Evaluation Nursery Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2013. (Exp# 13-9951-SW)**

ID	CULTIVAR or SELECTION	STAND %	PLNT HT Inches	1/	TEST WT Lbs/Bu	MOISTURE %	2/	3/
				YIELD Bu/Ac			PROTEIN %	SAWFLY %
MT 1142	06SR49/06SR175	99.3	26.1	55.0	61.8	12.1	14.0	8.7
AGRIPRO8	AP604CL	97.4	24.4	55.1	63.3	11.5	14.4	10.0
PI633974	CHOTEAU	98.3	24.6	52.5	61.3	11.5	14.4	6.7
BZ996434	CORBIN	98.6	25.4	54.1	62.2	11.5	14.0	2.0
PI660981	DUCLAIR	98.3	26.5	55.7	60.8	11.4	14.1	4.0
CI 13596	FORTUNA	99.3	31.5	48.4	61.6	11.3	14.3	3.7
BZ992322	HANK	99.0	26.1	46.7	60.4	10.8	13.6	8.3
BZ9M1044	JEDD	98.0	22.7	49.5	62.7	12.1	13.4	3.7
AGRIPRO6	KELBY	98.7	25.8	46.4	62.8	11.2	15.3	3.3
PI574642	MCNEAL	99.3	26.7	50.4	62.2	11.3	13.9	21.7
NDSW0449	MOTT	99.3	30.1	56.2	62.6	11.5	14.4	0.0
MT 1172	MT0245/IMI8209-1//MT0245	97.7	27.3	<b>63.8</b>	61.5	12.1	13.6	0.7
BZ999592	ONEAL	99.7	27.3	61.7	63.2	11.5	13.6	5.0
ND 695	REEDER	98.7	26.5	59.0	62.8	11.9	14.4	5.3
AGRIPR12	SY TYRA	98.7	25.9	54.6	63.8	11.6	13.4	3.7
PI642366	VIDA	98.6	26.8	<b>66.8</b>	61.3	11.5	13.8	3.3
MT 1053	VIDA/MTHW0202	98.7	24.8	<b>62.6</b>	62.2	11.6	13.1	8.3
ACS52610	VOLT	100.0	25.7	48.5	63.5	12.1	12.9	48.3
BZ92413R	WB GUNNISON	97.0	27.2	50.3	62.8	11.7	13.8	0.3
WB9879CL	WB9879CLP	100.0	27.2	54.7	61.8	11.9	14.6	2.0
EXPERIMENTAL MEANS		98.7	26.4	54.6	62.2	11.6	14.0	7.5
LSD (0.05)		3.1	2.3	4.7	0.9	1.2	0.4	5.5
C.V.%		1.9	5.3	5.2	0.9	6.1	1.9	44.4
P-VALUE (Varieties)		0.9210	<.0001	<.0001	<.0001	0.7692	<.0001	<.0001

1/ Volumetric yields are based on plot weights adjusted to uniform 12 percent grain moisture and 60 lbs/bu as the standard test weight for wheat

2/ Protein values are adjusted to 12 percent grain moisture.

3/ Sawfly rating is reported as the percentage of cut stems.

**Bold** indicates highest value within a column.

**Bold** indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05).

Management Information (13-9951-SW)

Seeding Date: May 8, 2013

Harvest Date: September 5, 2013

Fertility: 100-20-10 side banded

System: no till

Herbicide: none

Insecticide: none

Previous Crop: Chemical Fallow - Durum

Precipitation: not available

**TABLE 2. Ten-Year Yield and Test Weight Summary on Selected Entries from Dryland Fallow Spring Wheat Variety Nurseries Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2004-2013. (Exp# 9951-SW)**

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)					TEST WEIGHT (Pounds Per Bushel)					10-YR COMP. AVE YIELD 5/	10-YR COMP. TEST WT 5/				
		2009	2010	2011	2012	2013	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	2009	2010	2011			2012	2013	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/
BZ999592 ONEAL (P+)	6	47.8	37.1	30.1	23.4	61.7	36.7	126.8	<b>36.9</b>	61.6	57.8	61.9	60.8	63.2	60.5	101.6	<b>59.6</b>
PI642366 VIDA (++)	10	50.7	25.6	34.7	23.4	66.8	38.5	125.4	<b>36.5</b>	60.8	55.6	61.7	60.7	61.3	58.8	99.2	<b>58.2</b>
MT 0832 DUCLAIR (++)	4		36.7	31.3	24.0	55.7	36.9	122.5	<b>35.6</b>		54.8	59.9	58.9	60.8	58.6	97.5	<b>57.2</b>
BZ992588 CONAN (P+)(saw fly tol)	8	39.1	31.4	30.5			32.8	116.1	<b>33.7</b>	61.2	56.8	62.6			59.4	100.7	<b>59.1</b>
NDSW0449 MOTT (++)	4		30.3	31.9	19.6	56.2	34.5	114.4	<b>33.2</b>		55.0	61.7	60.3	62.6	59.9	99.7	<b>58.5</b>
BZ996434 CORBIN	7	38.2	32.7	32.5	22.6	54.1	32.1	113.8	<b>33.1</b>	61.4	55.6	61.9	60.4	62.2	59.0	100.1	<b>58.8</b>
BZ9M1044 JEDD (P+)	6	40.6	41.5	26.5	18.5	49.5	32.9	113.6	<b>33.0</b>	62.1	57.0	61.4	62.1	62.7	60.6	101.7	<b>59.7</b>
ND695 REEDER (+)	10	45.1	30.9	27.3	22.8	59.0	34.7	113.1	<b>32.9</b>	61.3	56.5	61.4	60.5	62.8	59.3	100.1	<b>58.8</b>
AGRIPRO8 AP604 CL	5	40.4	31.8	29.4	19.9	55.1	35.3	113.0	<b>32.8</b>	61.2	55.7	62.1	61.2	63.3	60.7	100.7	<b>59.1</b>
PI633974 CHOTEAU (+)(saw fly res)	10	38.2	32.6	30.6	22.5	52.5	34.5	112.5	<b>32.7</b>	60.1	53.7	61.1	59.0	61.3	58.0	97.9	<b>57.5</b>
PI574642 McNEAL	10	41.4	32.7	28.0	19.6	50.4	33.8	110.3	<b>32.1</b>	60.6	55.2	60.2	59.5	62.2	58.4	98.6	<b>57.9</b>
BZ992322 HANK (P+)	10	49.3	36.5	24.2	20.9	46.7	33.6	109.6	<b>31.9</b>	60.7	54.7	60.4	60.2	60.4	58.3	98.4	<b>57.8</b>
BZ902413 WB GUNNISON (P+)	3			33.0	21.5	50.3	35.0	109.0	<b>31.7</b>			62.3	61.0	62.8	62.0	101.2	<b>59.4</b>
PI632252 OUTLOOK (++) (RWA res)	9	38.6	26.9	30.3	22.6		31.3	108.8	<b>31.6</b>	59.9	54.5	60.8	59.7		57.8	97.9	<b>57.5</b>
AGRIPRO7 KUNTZ (P+)	4	40.0	32.4	24.8			28.7	107.3	<b>31.2</b>	61.2	56.3	61.7			59.0	100.2	<b>58.8</b>
AGRIPR12 SY TYRA	3			25.6	19.6	54.6	33.3	103.8	<b>30.2</b>			62.7	61.6	63.8	62.7	102.2	<b>60.0</b>
ACS53610 VOLT (P+)	6	42.5	27.2	26.3	16.6	48.5	29.5	102.0	<b>29.6</b>	62.2	56.8	62.2	61.3	63.5	60.5	101.4	<b>59.6</b>
AGRIPRO3 FREYR (P+)	5	39.8	31.6				26.1	99.8	<b>29.0</b>	61.3	56.5				57.3	98.6	<b>57.9</b>
AGRIPRO6 KELBY (P+)	6	33.3	32.9	24.6	15.8	46.4	28.7	98.9	<b>28.8</b>	61.4	56.8	62.6	61.4	62.8	60.3	101.2	<b>59.4</b>
CI13596 FORTUNA (saw fly res)	10	35.8	24.4	29.2	18.6	48.4	30.7	100.0	<b>27.9</b>	61.0	56.4	61.7	60.7	61.6	59.3	100.0	<b>59.0</b>
MEANS (For Entries Listed)		41.3	31.9	29.0	20.7	53.5			<b>32.2</b>	61.1	55.9	61.6	60.5	62.3			<b>58.7</b>
6/ Growing Season Precipitation (in.)		6.0	10.3	8.3	7.5	n/a	7.9										
Soil PAW (in.) to SD @ Planting		7.8	9.0	7.9	8.9	7.8	7.9										
Total Plant Available Water (in.)		13.8	19.2	7.9	8.9	12.4	13.7										
Soil NO3 (lbs.) to SD at Planting		94	162	51	15	11	80										
SD (Sampling Depth in Inches)		48	48	48	48	48	48										
Fertilizer Applied	(# N)	70	70	70	70	100	73										
	(# P <sub>2</sub> O <sub>5</sub> )	40	40	40	40	20	38										
	(# K <sub>2</sub> O)	25	25	25	25	10	24										

Check Variety is Fortuna.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 or Title 5 Pending, HW = Hard White Wheat.

3/ Only the most recent 5 years are shown, but summary calculations include all years noted.

4/ Percent of Fortuna yield or test weight for the same data years as those in which a given entry was tested.

5/ 10-Yr Comparable Average = (x/y) \* z where x = average yield or test weight of a given entry for years tested, y = average yield or test weight for Fortuna for the same years, and z = 10-Yr average yield or test weight for the check variety Fortuna.

6/ Seeding to 14 days prior to harvest maturity.

**TABLE 3. Ten-Year Sawfly Summary on Selected Entries from Dryland Fallow Spring Wheat Variety Nurseries Grown Off-Station at the Leon Cederberg Farm, Turner. Northern Agricultural Research Center. Havre, Montana. 2004-2013. (Exp# 9951-SW)**

2/ VARIETY or SELECTION	No. of YEARS TESTED	1/ SAWFLY RATING (% of cut and lodged stems)										AVE. for YEARS TESTED	% of CHECK SAWFLY 3/	10-YR COMP. AVE SAWFLY 4/
		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
NDSW0449 MOTT (++)	4							3.7	5.0	1.0	0.0	2.4	16.0	<b>2.0</b>
BZ902413 WB GUNNISON (P+)	3								6.7	2.3	0.3	3.1	17.9	<b>2.3</b>
BZ996434 CORBIN	7				5.0	11.7	3.7	10.3	21.7	18.3	2.0	10.4	84.2	<b>10.6</b>
BZ992588 CONAN (P+)(saw fly tol)	8	15.0	5.0	26.7	11.7	10.0	3.7	3.7	23.3			12.4	96.4	<b>12.2</b>
CI 13596 FORTUNA (saw fly res)	10	11.7	5.0	23.3	16.7	8.3	1.0	8.3	28.3	20.0	3.7	12.6	100.0	<b>12.6</b>
PI633974 CHOTEAU (+)(saw fly res)	10	15.0	5.0	21.7	6.7	13.3	3.7	13.3	36.7	28.3	6.7	15.0	119.0	<b>15.0</b>
AGRIPRO6 KELBY	6					21.7	7.0	8.7	30.2	21.7	3.3	15.4	132.8	<b>16.8</b>
MT 0832 DUCLAIR (++)	4							13.7	33.3	30.0	4.0	20.3	134.3	<b>17.0</b>
BZ9M1044 JEDD	6					23.3	3.7	3.7	43.3	16.7	3.7	15.7	135.4	<b>17.1</b>
AGRIPR12 SY TYRA	3								46.7	23.3	3.7	24.6	141.7	<b>17.9</b>
BZ999592 ONEAL	6					21.7	7.0	2.3	40.0	35.0	5.0	18.5	159.3	<b>20.1</b>
PI642366 VIDA (++)	10	18.3	0.0	53.3	38.3	20.0	2.3	18.3	26.7	33.3	3.3	21.4	169.4	<b>21.4</b>
AGRIPRO8 AP604 CL	5							13.3	20.0	38.3	28.3	10.0	22.0	<b>22.7</b>
ND 695 REEDER (+)	10	28.3	5.0	81.7	35.0	18.3	6.7	16.7	53.3	33.3	5.3	28.4	224.5	<b>28.4</b>
BZ992322 HANK	10	36.7	6.7	78.3	38.3	20.0	5.7	8.3	58.3	28.3	8.3	28.9	228.8	<b>28.9</b>
PI632252 OUTLOOK (++) (RWA res)	9	31.7	8.3	81.7	41.7	30.0	13.3	21.7	46.7	36.7		34.6	254.1	<b>32.1</b>
AGRIPRO7 KUNTZ	4					35.0	13.3	18.3	61.7			32.1	279.0	<b>35.2</b>
PI574642 McNEAL	10	43.3	16.7	73.3	56.7	46.7	18.3	25.0	80.0	61.7	21.7	44.3	350.9	<b>44.3</b>
AGRIPRO3 FREYR	6		8.3	90.0	41.7	31.7	18.3	31.7				36.9	353.8	<b>44.7</b>
ACS53610 VOLT	6					70.0	25.0	38.3	93.3	76.7	48.3	58.6	504.8	<b>63.8</b>
MEANS (For Entries Listed)		25.0	6.7	58.9	29.2	25.4	9.1	14.8	40.7	29.1	8.1			<b>23.3</b>
5/ Growing Season Precipitation (in.)		13.7	9.7	2.5	7.0	6.6	6.0	10.3	8.3	7.5	n/a	7.9		
Soil PAW (in.) to SD @ Planting		7.4	8.0	8.8	5.8	8.1	7.8	9.0	7.9	8.9	7.8	7.9		
Total Plant Available Water (in.)		21.1	17.7	11.3	9.6	14.6	13.8	19.2	7.9	8.9	12.4	13.7		
Soil NO3 (lbs.) to SD at Planting		160	84	64	81	n/a	94	162	51	15	11	80		
SD (Sampling Depth in Inches)		48	48	48	48	48	48	48	48	48	48	48		
Fertilizer Applied	(# N)	70	70	70	70	70	70	70	70	70	100	73		
	(# P <sub>2</sub> O <sub>5</sub> )	40	40	40	40	40	40	40	40	40	20	38		
	(# K <sub>2</sub> O)	25	25	25	25	25	25	25	25	25	10	24		

Long-term check variety is Fortuna.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 or Title 5 Pending, HW = Hard White Wheat.

3/ Percent of Fortuna cut for the same data years as those in which a given entry was tested.

4/ 10-Yr Comparable Average = (x/y) \* z where x = average saw fly rating of a given entry for years tested, y = average saw fly rating for Fortuna for the same years, and z = 10-Yr average saw fly rating for the check variety Fortuna.

5/ Seeding to 14 days prior to harvest maturity.

**TABLE 4. Dryland Fallow Spring Wheat Cultivar Evaluation Nursery Grown Off-Station at the Flansaas-Lumsden Farm, Loring. Northern Agricultural Research Center. Havre, Montana. 2013. (Exp# 13-9955-SW)**

ID	CULTIVAR or SELECTION	STAND %	PLNT HT Inches	1/	MOISTURE %	TEST WT Lbs/Bu	2/	3/
				YIELD Bu/Ac			PROTEIN %	SAWFLY %
MT 1142	06SR49/06SR175	98.8	28.4	53.6	10.5	59.9	13.8	0.3
AGRIPRO8	AP604CL	98.5	28.6	63.6	10.2	61.0	13.6	0.3
PI633974	CHOTEAU	99.1	26.8	55.7	10.1	59.6	13.9	0.7
BZ996434	CORBIN	97.8	25.4	58.8	10.4	60.8	13.7	0.7
PI660981	DUCLAIR	98.5	27.9	56.4	10.2	59.3	13.1	0.0
CI 13596	FORTUNA	97.2	34.2	54.4	10.5	60.9	13.3	0.7
BZ992322	HANK	97.5	25.8	53.4	10.0	58.8	13.6	0.7
BZ9M1044	JEDD	96.9	25.0	50.8	10.2	60.9	13.1	0.0
AGRIPRO6	KELBY	96.0	25.1	53.0	10.2	61.6	14.6	0.0
PI574642	MCNEAL	99.1	28.0	55.0	10.0	61.3	13.4	1.0
NDSW0449	MOTT	96.6	31.7	57.1	10.1	60.6	13.9	0.0
MT 1172	MT0245/IMI8209-1//MT0245	97.8	28.3	<b>71.6</b>	10.3	59.9	12.7	0.3
BZ999592	ONEAL	97.2	28.3	61.4	10.3	62.0	13.2	0.0
ND 695	REEDER	97.5	29.2	<b>70.3</b>	10.1	61.8	13.5	0.7
AGRIPR12	SY TYRA	95.7	24.5	59.3	10.4	61.3	13.5	0.0
PI642366	VIDA	98.8	28.4	<b>71.4</b>	10.3	60.5	13.0	0.3
MT 1053	VIDA/MTHW0202	97.2	27.0	<b>70.4</b>	10.5	60.8	12.7	0.7
ACS52610	VOLT	97.8	27.0	57.8	10.5	62.4	12.7	6.7
BZ92413R	WB GUNNISON	96.3	26.7	55.4	10.3	61.7	13.5	1.0
WB9879CL	WB9879CLP	98.5	29.9	59.2	10.2	59.6	13.6	0.3
EXPERIMENTAL MEANS		97.6	27.8	59.4	10.3	60.7	13.4	0.7
LSD (0.05)		2.9	2.2	4.5	0.2	0.7	0.6	1.2
C.V.%		1.8	4.8	4.6	1.1	0.7	2.9	103.2
P-VALUE (Varieties)		0.4998	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

1/ Volumetric yields are based on plot weights adjusted to uniform 12 percent grain moisture and 60 lbs/bu as the standard test weight for wheat

2/ Protein values are adjusted to 12 percent grain moisture.

3/ Sawfly rating is reported as the percentage of cut stems.

**Bold** indicates highest value within a column.

**Bold** indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05).

Management Information (13-9955-SW)

Seeding Date: May 8, 2013

Harvest Date: September 4, 2013

Fertility: 100-20-10 side banded

System: no till

Herbicide: Axial, 16.4 oz/ac; Brox-M, 16 oz/ac

Insecticide: none

Previous Crop: Chemical Fallow - Spring Wheat

Precipitation: 9.46"

**TABLE 5. Ten-Year Yield and Test Weight Summary on Selected Entries from Dryland Fallow Spring Wheat Variety Nurseries Grown Off-Station at the Flansaas/Lumsden Farm, Loring. Northern Agricultural Research Center. Havre, Montana. 2004-2013. (Exp# 9955-SW)**

2/ VARIETY or SELECTION	No. of YEARS TESTED 3/	1/ YIELD (Bushels Per Acre)							TEST WEIGHT (Pounds Per Bushel)								
		2009	2010	2011	2012	2013	AVE. for YEARS TESTED 3/	% of CHECK YIELD 4/	10-YR COMP. AVE. YIELD 5/	2009	2010	2011	2012	2013	AVE. for YEARS TESTED 3/	% of CHECK TEST WT 4/	10-YR COMP. AVE. TEST WT 5/
PI642366 VIDA (++)	10	33.3	37.0	38.0	29.7	71.4	40.6	128.1	<b>40.6</b>	60.5	56.5	61.2	60.8	60.5	58.9	100.3	<b>58.9</b>
BZ999592 ONEAL (P+)	6	31.4	36.3	40.5	28.7	61.4	39.5	122.6	<b>38.9</b>	62.6	58.2	62.2	60.4	62.0	60.8	102.9	<b>60.5</b>
ND 695 REEDER (+)	10	30.4	32.9	34.9	26.6	70.3	37.1	116.8	<b>37.1</b>	61.5	56.7	61.7	60.2	61.8	59.2	100.7	<b>59.2</b>
BZ996434 CORBIN	7	30.0	30.5	36.6	29.3	58.8	35.9	114.6	<b>36.4</b>	61.4	55.8	61.5	60.9	60.8	59.1	100.6	<b>59.1</b>
AGRIPRO8 AP604 CL	5	33.9	29.8	31.9	27.4	63.6	37.3	113.8	<b>36.1</b>	60.8	55.4	62.1	60.6	61.0	60.0	101.1	<b>59.4</b>
PI632252 OUTLOOK (++) (RWA res)	9	32.7	28.6	37.0	29.1		33.2	113.7	<b>36.1</b>	59.5	55.3	60.6	60.0		57.7	98.6	<b>58.0</b>
BZ9M1044 JEDD (P+)	6	31.2	36.2	32.5	27.6	50.8	36.3	112.8	<b>35.8</b>	62.4	57.8	62.8	60.5	60.9	60.7	102.7	<b>60.4</b>
AGRIPRO7 KUNTZ (P+)	4	30.4	30.1	32.9			32.0	110.3	<b>35.0</b>	61.4	56.5	61.9			59.5	101.8	<b>59.8</b>
PI633974 CHOTEAU (+) (saw fly res)	10	26.1	29.6	34.2	25.1	55.7	34.8	109.6	<b>34.8</b>	59.2	54.5	60.5	59.7	59.6	57.9	98.5	<b>57.9</b>
MT 0832 DUCLAIR	4		34.9	33.5	26.1	56.4	37.7	109.5	<b>34.7</b>		55.3	59.3	60.3	59.3	58.6	98.4	<b>57.8</b>
NDSW0449 MOTT (++)	4		32.8	37.4	23.3	57.1	37.7	109.3	<b>34.7</b>		56.2	61.1	60.4	60.6	59.6	100.1	<b>58.8</b>
AGRIPR12 SY TYRA	3			34.0	26.8	59.3	40.0	107.9	<b>34.2</b>			62.5	57.9	61.3	60.6	100.0	<b>58.7</b>
BZ992322 HANK (P+)	10	31.5	30.2	32.9	25.4	53.4	34.0	107.2	<b>34.0</b>	61.0	55.1	60.6	60.5	58.8	58.0	98.7	<b>58.0</b>
ACS53610 VOLT (P+)	6	27.0	34.7	34.6	21.5	57.8	34.2	106.4	<b>33.8</b>	62.1	57.8	62.5	60.6	62.4	60.6	102.6	<b>60.3</b>
AGRIPRO3 FREYR (P+)	5	28.4	26.1				27.5	106.3	<b>33.7</b>	62.0	56.3				57.8	101.0	<b>59.3</b>
BZ992588 CONAN (P+) (saw fly tol)	8	25.3	32.8	32.4			31.8	105.8	<b>33.6</b>	61.6	57.4	61.6			59.4	101.7	<b>59.8</b>
PI574642 McNEAL	10	27.8	29.3	33.2	22.9	55.0	33.5	105.7	<b>33.5</b>	60.4	55.7	60.3	60.1	61.3	58.2	99.1	<b>58.2</b>
AGRIPRO6 KELBY (P+)	6	24.0	35.1	33.3	22.4	53.0	33.6	104.6	<b>33.2</b>	61.2	57.0	62.7	61.0	61.6	60.3	102.1	<b>60.0</b>
BZ902413 WB GUNNISON (P+)	3			34.8	23.1	55.4	37.8	101.8	<b>32.3</b>			61.8	59.4	61.7	61.0	100.7	<b>59.2</b>
CI 13596 FORTUNA (saw fly res)	10	26.2	26.4	34.2	22.7	54.4	31.7	100.0	<b>31.7</b>	58.5	56.4	61.0	59.8	60.9	58.8	100.0	<b>58.8</b>
MEANS (For Entries Listed)		29.3	31.8	34.7	25.7	58.4			<b>33.1</b>	61.0	56.3	61.5	60.2	60.9			<b>58.2</b>
6/ Growing Season Precipitation (in.)		5.3	11.6	n/a	n/a	9.5	8.0										
Soil PAW (in.) to SD @ Planting		10.5	7.7	7.1	8.8	8.8	8.2										
Total Plant Available Water (in.)		15.7	19.3	n/a	8.8	14.6	14.1										
Soil NO3 (lbs.) to SD at Planting		42	94	50	34	34	60										
SD (Sampling Depth in Inches)		48	48	48	48	48	48										
Fertilizer Applied	(# N)	70	70	70	70	100	73										
	(# P <sub>2</sub> O <sub>5</sub> )	40	40	40	40	20	38										
	(# K <sub>2</sub> O)	25	25	25	25	10	24										

Check Variety is Fortuna.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 or Title 5 Pending, HW = Hard White Wheat.

3/ Only the most recent 5 years are shown, but summary calculations include all years noted.

4/ Percent of Fortuna yield or test weight for the same data years as those in which a given entry was tested.

5/ 10-Yr Comparable Average = (x/y) \* z where x = average yield or test weight of a given entry for years tested, y = average yield or test weight for Fortuna for the same years, and z = 10-Yr average yield or test weight for the check variety Fortuna.

6/ Seeding to 14 days prior to harvest maturity.

**TABLE 6. Ten-Year Sawfly Summary on Selected Entries from Dryland Fallow Spring Wheat Variety Nurseries Grown Off-Station at the Flansaas/Lumsden Farm, Loring. Northern Agricultural Research Center. Havre, Montana. 2004-2013. (Exp# 9955-SW)**

2/ VARIETY or SELECTION	No. of YEARS TESTED	1/ SAWFLY RATING (% Cut and Lodged)										AVE. for YEARS TESTED	% of CHECK SAWFLY 3/	10-YR COMP. AVE SAWFLY 4/
		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013			
NDSW0449 MOTT (++)	4							1.0	5.0	1.0	0.0	1.8	27.2	<b>2.6</b>
BZ902413 WB GUNNISON (P+)	3								5.0	1.0	1.0	2.3	49.9	<b>4.8</b>
BZ996434 CORBIN	7				2.3	2.3	2.3	5.3	10.0	3.7	0.7	3.8	69.0	<b>6.7</b>
BZ9M1044 JEDD (P+)	6					1.0	2.3	2.3	10.0	11.7	0.0	4.6	78.0	<b>7.6</b>
BZ999592 ONEAL (P+)	6					1.0	3.7	2.3	16.7	8.3	0.0	5.3	91.2	<b>8.9</b>
BZ992588 CONAN (P+)(saw fly tol)	8	16.7	35.0	13.3	1.0	2.3	1.0	1.0	13.3			10.5	93.3	<b>9.1</b>
CI 13596 FORTUNA (saw fly res)	10	20.0	30.0	8.3	3.7	4.0	5.3	11.7	6.7	0.7	0.7	9.7	100.0	<b>9.7</b>
PI633974 CHOTEAU (+)(saw fly res)	10	28.3	26.7	5.0	2.3	2.3	3.7	8.3	16.7	6.7	0.7	10.1	103.8	<b>10.1</b>
AGRIPRO6 KELBY (P+)	6					5.3	2.3	3.7	15.0	15.0	0.0	6.9	118.0	<b>11.4</b>
MT 0832 DUCLAIR	4							10.0	15.0	6.7	0.0	7.9	123.2	<b>12.0</b>
PI642366 VIDA (++)	10	20.0	33.3	23.3	3.7	6.7	8.3	10.0	18.3	10.0	0.3	13.4	138.1	<b>13.4</b>
AGRIPRO8 AP604 CL	5						3.7	8.3	15.0	18.3	0.3	9.1	147.0	<b>14.3</b>
AGRIPRO7 KUNTZ (P+)	4					5.3	5.0	10.0	20.0			10.1	145.8	<b>14.1</b>
AGRIPR12 SY TYRA	3								15.0	11.7	0.0	8.9	190.0	<b>18.4</b>
ND 695 REEDER (+)	10	68.3	33.3	55.0	10.0	3.7	3.7	10.3	18.3	15.0	0.7	21.8	225.0	<b>21.8</b>
BZ992322 HANK	10	86.7	31.7	63.3	20.0	2.3	6.7	5.0	11.7	11.7	0.7	24.0	247.0	<b>24.0</b>
PI632252 OUTLOOK (++) (RWA res)	9	66.7	38.3	68.3	10.0	8.3	8.3	13.3	15.0	16.7		27.2	254.3	<b>24.7</b>
AGRIPRO3 FREYR (P+)	5			71.7	13.3	6.7	6.7	11.7				22.0	333.4	<b>32.3</b>
PI574642 McNEAL	10	63.3	88.3	71.7	16.7	6.7	21.7	20.0	20.0	25.0	1.0	33.4	344.6	<b>33.4</b>
ACS53610 VOLT (P+)	6					23.3	26.7	15.0	23.3	26.7	6.7	20.3	347.4	<b>33.7</b>
MEANS (For Entries Listed)		46.3	39.6	42.2	8.3	5.4	7.0	8.3	14.2	11.5	0.8			<b>15.7</b>
5/ Growing Season Precipitation (in.)		10.9	n/a	2.4	7.4	8.9	5.3	11.6	n/a	n/a	9.5	8.0		
Soil PAW (in.) to SD @ Planting		4.9	9.1	8.3	8.3	8.2	10.5	7.7	7.1	8.8	8.8	8.2		
Total Plant Available Water (in.)		15.8	9.1	10.7	15.7	17.2	15.7	19.3	n/a	8.8	14.6	14.1		
Soil NO3 (lbs.) to SD at Planting		60	54	81	89	n/a	42	94	50	34	34	60		
SD (Sampling Depth in Inches)		48	48	48	48	48	48	48	48	48	48	48		
Fertilizer Applied (# N)		70	70	70	70	70	70	70	70	70	100	73		
(# P <sub>2</sub> O <sub>5</sub> )		40	40	40	40	40	40	40	40	40	20	38		
(# K <sub>2</sub> O)		25	25	25	25	25	25	25	25	25	10	24		

Long-term check variety is Fortuna.

1/ See MCES Bulletin 1093 or the Plant Sciences & Plant Pathology website at <http://plantsciences.montana.edu/> for evaluation of other important variety performance characteristics to include protein, quality, disease resistance, etc. before making cultivar selection decisions.

2/ P = Private Variety, + = Protected Variety, ++ = PVP Title 5 or Title 5 Pending, HW = Hard White Wheat.

3/ Percent of Fortuna cut for the same data years as those in which a given entry was tested.

4/ 10-Yr Comparable Average = (x/y) \* z where x = average saw fly rating of a given entry for years tested, y = average saw fly rating for Fortuna for the same years, and z = 10-Yr average saw fly rating for the check variety Fortuna.

5/ Seeding to 14 days prior to harvest maturity.

**TABLE 7. Dryland Fallow Spring Wheat Cultivar Evaluation Nursery Grown Off-Station at McKeever Farm & Seed, Inc., Loma. Northern Agricultural Research Center. Havre, Montana. 2013. (Exp# 13-9957-SW)**

ID	CULTIVAR or SELECTION	STAND %	PLNT HT Inches	1/	TEST WT Lbs/Bu	MOISTURE %	2/	3/
				YIELD Bu/Ac			PROTEIN %	SAWFLY %
MT 1142	06SR49/06SR175		27.3	62.5	60.3	10.4	15.1	6.7
AGRIPRO8	AP604CL		26.1	52.5	61.1	10.7	15.1	13.3
PI633974	CHOTEAU		27.2	54.7	58.9	10.4	14.8	5.7
BZ996434	CORBIN		27.5	60.0	60.3	10.5	14.3	3.7
PI660981	DUCLAIR		28.1	56.3	58.0	10.3	14.6	7.0
CI 13596	FORTUNA		32.0	44.7	60.4	10.5	14.8	5.0
BZ992322	HANK		24.2	47.5	58.8	10.2	14.2	18.3
BZ9M1044	JEDD		21.7	44.8	60.5	10.5	13.9	8.7
AGRIPRO6	KELBY		22.7	35.6	61.2	10.6	15.6	13.3
PI574642	MCNEAL		28.3	53.6	60.1	10.1	14.8	20.0
NDSW0449	MOTT		29.9	61.2	60.8	10.8	15.0	1.0
MT 1172	MT0245/IMI8209-1//MT0245		28.1	<b>70.8</b>	59.8	10.4	14.4	5.0
BZ999592	ONEAL		29.3	58.6	61.0	10.1	14.3	6.7
ND 695	REEDER		28.0	60.8	60.6	10.2	15.0	15.0
AGRIPR12	SY TYRA		24.6	57.1	61.9	10.8	13.5	7.0
PI642366	VIDA		28.2	<b>70.8</b>	60.0	10.5	14.0	6.7
MT 1053	VIDA/MTHW0202		27.3	62.4	60.7	10.8	13.2	3.7
ACS52610	VOLT		28.2	57.9	61.2	10.5	13.6	15.0
BZ92413R	WB GUNNISON		27.3	58.6	62.0	10.5	13.9	1.0
WB9879CL	WB9879CLP		26.3	59.2	60.7	10.6	14.7	3.7
EXPERIMENTAL MEANS			27.1	56.5	60.4	10.5	14.4	8.3
LSD (0.05)			1.6	7.3	1.0	0.4	0.4	7.2
C.V.%			3.6	7.8	1.0	2.1	1.6	52.7
P-VALUE (Varieties)			<.0001	<.0001	<.0001	0.0013	<.0001	<.0001

1/ Volumetric yields are based on plot weights adjusted to uniform 12 percent grain moisture and 60 lbs/bu as the standard test weight for wheat

2/ Protein values are adjusted to 12 percent grain moisture.

3/ Sawfly rating is reported as the percentage of cut stems.

**Bold** indicates highest value within a column.

**Bold** indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05).

Management Information (13-9957-SW)

Seeding Date: May 7, 2013

Harvest Date: August 26, 2013

Fertility: 100-20-10 side banded

System: no till

Herbicide: pending

Insecticide: none

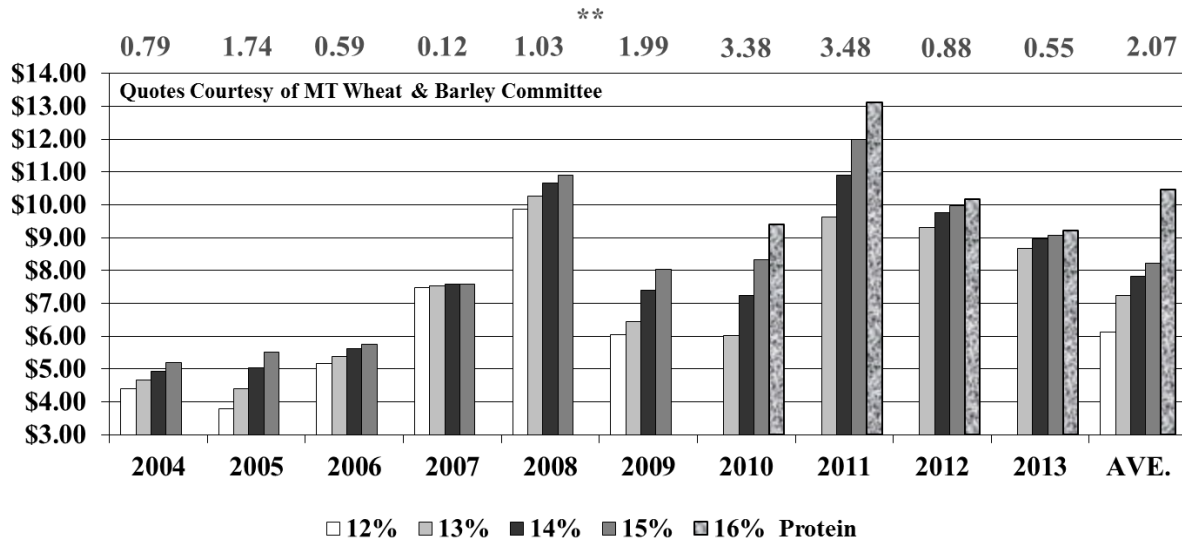
Previous Crop: Chemical Fallow - Spring Wheat

Precipitation: 9.03"

## Average Annual Market Quotes

\* (\$/Bu - Dark Northern Spring Wheat)

Pacific Northwest Delivery



**Figure 1.**  
MSU/MAES/NARC

\* Average of All Market Days/Market Year

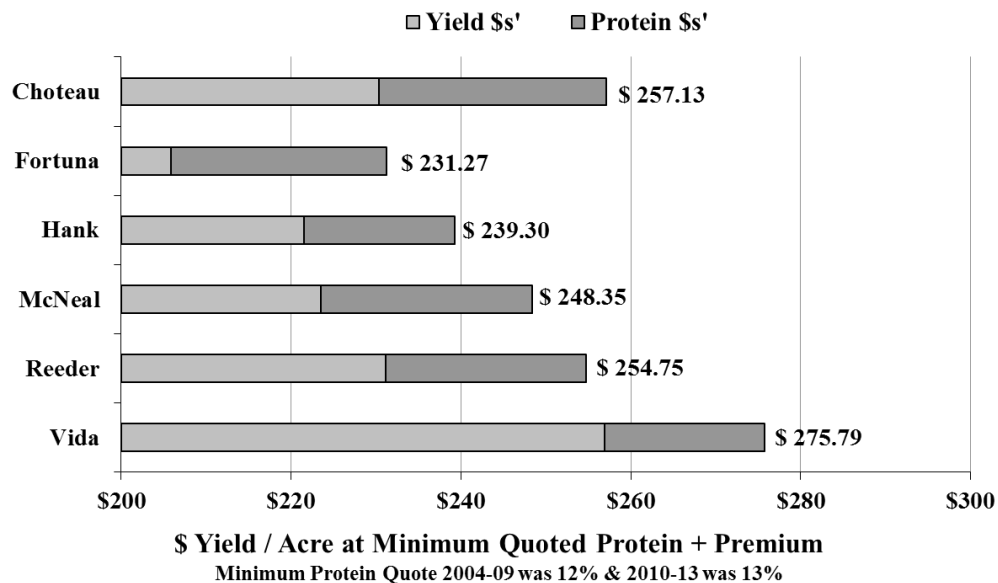
\*\* \$/Bu Difference Between 12 & 15% Protein for 2004-09

\*\* \$/Bu Difference Between 13 & 16% Protein for 2010-13

## Gross Return - Fallow Spring Wheat

Leon Cederberg Farm – Turner, Montana

10-Yr Means (2004-2013)

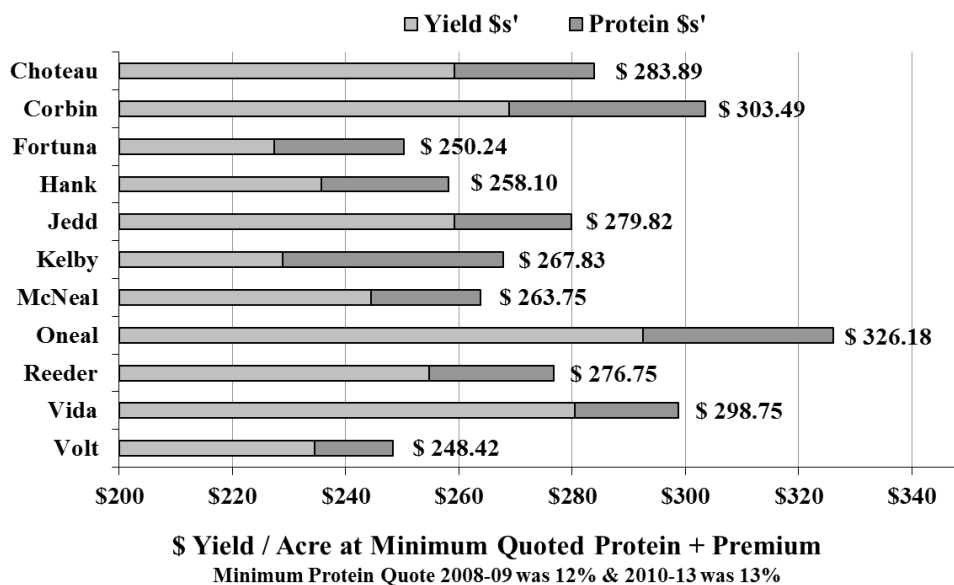


**Figure 2.**

MSU/AES/NARC-Havre  
Ref=13-995110 P=.0272 CV=11.63%

LSD (P<=.05), Gross Return = \$ 26.32 / ac  
Prices = PNW Average Annual Market/Year

## Gross Return - Fallow Spring Wheat Leon Cederberg Farm – Turner, Montana 6-Yr Means (2008-2013)

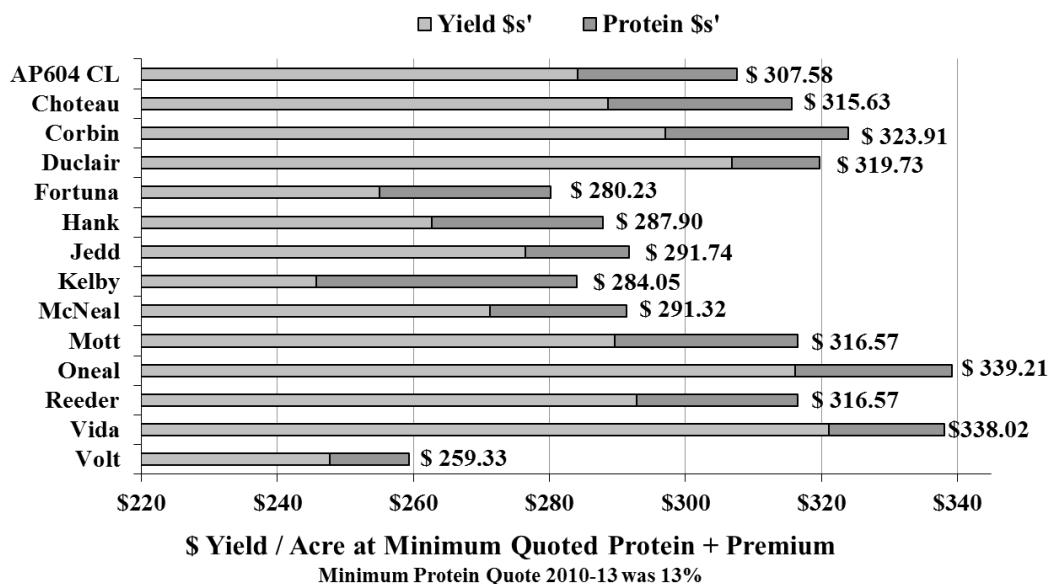


**Figure 3.**

MSU/AES/NARC-Havre  
Ref=13-99516 P=.0214 CV=13.74%

LSD (P<=.05), Gross Return = \$ 44.29 / ac  
Prices = PNW Average Annual Market/Year

## Gross Return - Fallow Spring Wheat Leon Cederberg Farm – Turner, Montana 4-Yr Means (2010-2013)

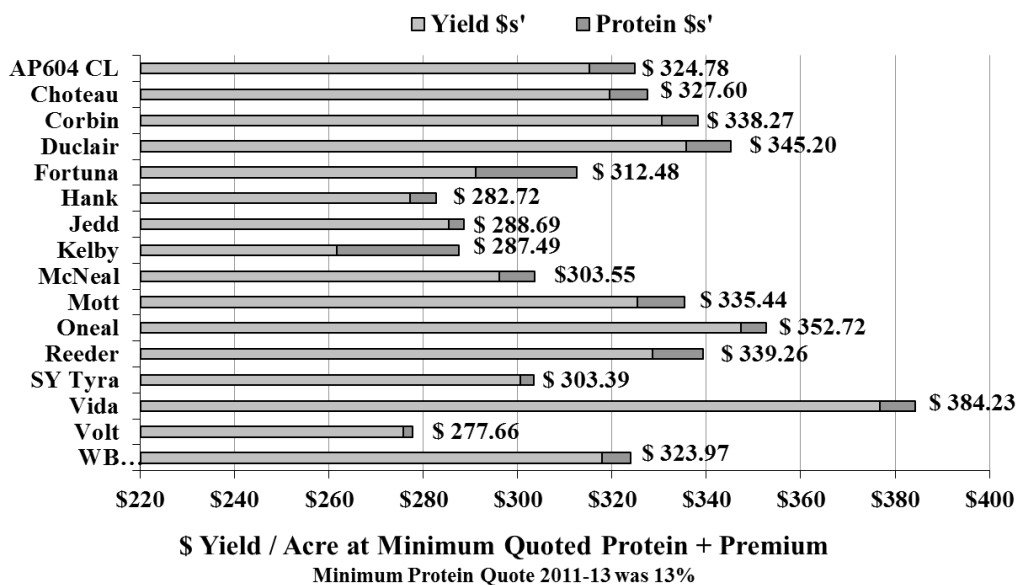


**Figure 4.**

MSU/AES/NARC-Havre  
Ref=13-99514 P=.0732 CV=11.27%

LSD (P<=.05), Gross Return = \$ 49.17 / ac  
Prices = PNW Average Annual Market/Year

## Gross Return - Fallow Spring Wheat Leon Cederberg Farm – Turner, Montana 3-Yr Means (2011-2013)

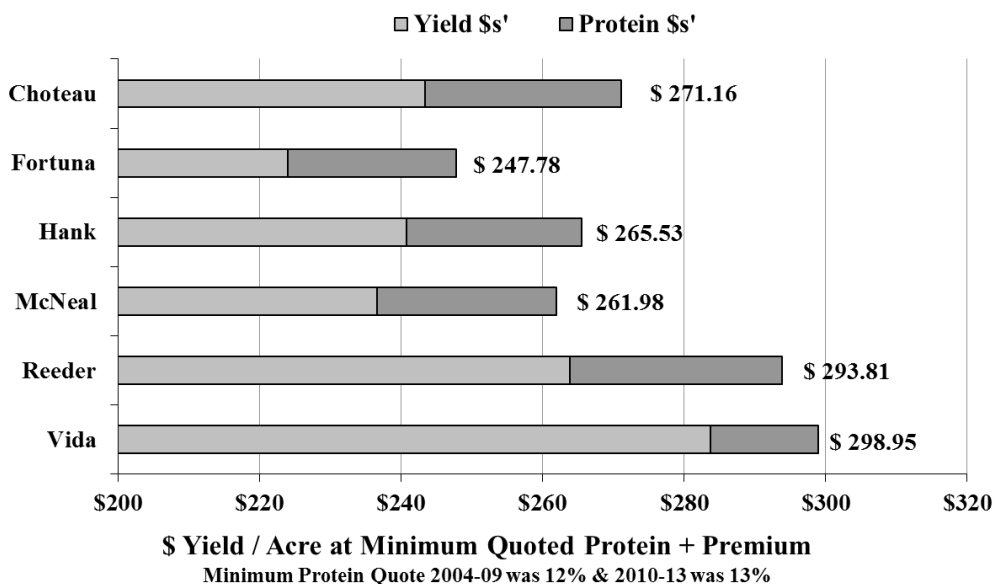


**Figure 5.**

MSU/AES/NARC-Havre  
Ref=13-99513 P=.0012 CV=8.22%

LSD (P<=.05), Gross Return = \$ 43.92 / ac  
Prices = PNW Average Annual Market/Year

## Gross Return - Fallow Spring Wheat Flansaas/Lumsden Farm – Loring, Montana 10-Yr Means (2004-2013)

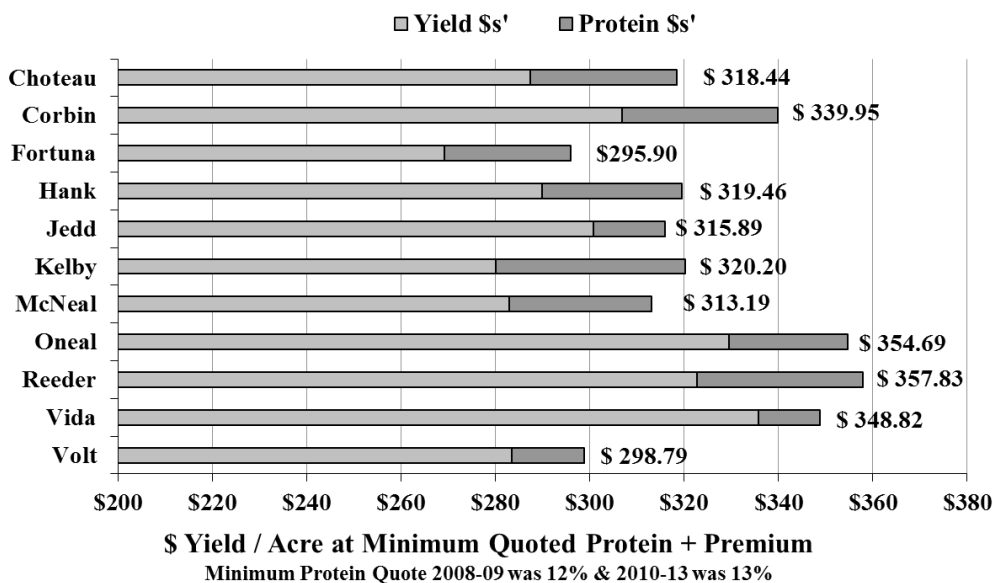


**Figure 6.**

MSU/AES/NARC-Havre  
Ref=13-995510 P=.0003 CV=9.33%

LSD (P<=.05), Gross Return = \$ 22.96 / ac  
Prices = PNW Average Annual Market/Year

## Gross Return - Fallow Spring Wheat Flansaas/Lumsden Farm – Loring, Montana 6-Yr Means (2008-2013)

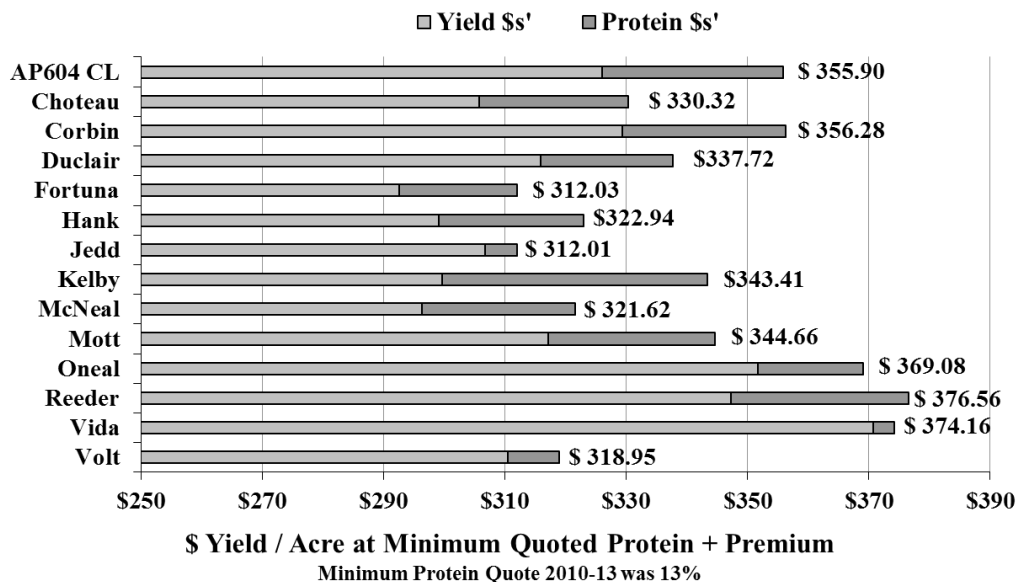


**Figure 7.**

MSU/AES/NARC-Havre  
Ref=13-99556 P=.0023 CV=8.87%

LSD (P<=.05), Gross Return = \$ 33.49 / ac  
Prices = PNW Average Annual Market/Year

## Gross Return - Fallow Spring Wheat Flansaas/Lumsden Farm – Loring, Montana 4-Yr Means (2010-2013)

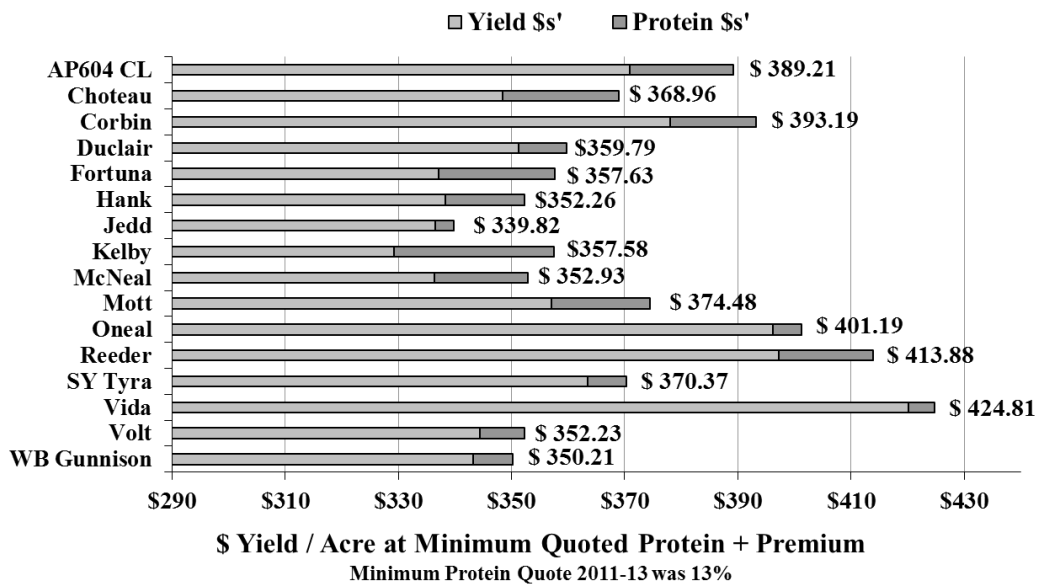


**Figure 8.**

MSU/AES/NARC-Havre  
Ref=13-99554 P=.0369 CV=9.12%

LSD (P<=.05), Gross Return = \$ 41.21 / ac  
Prices = PNW Average Annual Market/Year

## Gross Return - Fallow Spring Wheat Flansaas/Lumsden Farm – Loring, Montana 3-Yr Means (2011-2013)



**Figure 9.**

MSU/AES/NARC-Havre  
Ref=13-99553 P=.0348 CV=7.90%

LSD (P<=.05), Gross Return = \$ 49.05 / ac  
Prices = PNW Average Annual Market/Year