

**Project Title:** Evaluation of spring barley cultivar performance under continuous-crop and crop-crop-fallow systems in central Montana

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**Objective:**  
Evaluate the performance of spring barley cultivars in central Montana.

**Results:**  
The 2012 growing season was warmer and dryer than the long term average. These conditions commenced in mid-late June 2011. Warm spring growing conditions were interrupted with of freezing temperatures. At CARC, it froze five consecutive nights May 24-29, with a low of 24 F. The barley leaves showed loss of vigor as result of frost. Driving hail at CARC, on June 5, removed 20-30% of the leaf tissue. The 2012 Geraldine trial was the first in the past decade.

The 2012 NTCC spring barley grain yields at Moccasin, Denton and Geraldine followed precipitation levels. Moccasin had low precipitation levels and low yields, Denton was intermediate, and Geraldine had good precipitation and good yields. Feed barley Haxby, a dryland yield standard, was the top grain producer at the three barley locations (Tables 1, 2, 3). Champion, Conrad and line MT010160 (MT970148/Harrington) were other high yield entries.

Barley 2012 test weights were heavier than average at Moccasin and Geraldine locations while near average at Denton (Tables 1, 2, 3). Haxby consistently has a high test weight. The grain protein levels were high with the Moccasin trial mean at 17.3%, followed by Denton at 15.6 % and Geraldine at 13.2%. There was little consistency in grain protein ranking across locations. Malt cultivars, Conrad, Harrington and Metcalfe, ranked high for grain protein and Haxby ranked low (Tables 7 & 8). CDC Cowboy feed barley and Hockett malt had higher plump seed counts. Lavina, had the highest thin seed score in the more optimum plump seed environment near Geraldine. Protein and sieve size are determined from a single sample per location.

Haxby is used as the standard for multi-year yield, test weight and protein performance comparison in tables 4-9. Haxby generally has the highest mean yield and test weight. For grain protein, Haxby is often near the bottom in multi-year comparisons. The yield of other entries is compared to Haxby mean yield for the same years.

**Summary:**  
2012 Provided good conditions for assessing the relative performance of barley lines under moisture and heat stress. Growing conditions were less than optimum throughout the crop year. These conditions contributed to good root development and excellent grain test weights.

**Funding Summary:**  
Expenditure information to be provided by OSP. No other grant support was provided.

**MWBC FY2011 Grant Submission Plans:**  
It is planned to submit this project for funding consideration in the next fiscal year.

Table 1 2012 No-Till continuous crop barley variety trial near Moccasin.  
Exp 367011 Central Agricultural Research Center. Moccasin, Montana

ID	Variety/Pedigree	Entry	Plant	Grain	Grain	Test	Grain	Plumpness		
			Height	Yield	Yield	Weight	Protein	Plump	Mid	Thin
			cm	lbs/a	bu/a	lbs/bu	%	%	%	%
YU501385	Champion (Brnss/Camas)	1	53.0	1315	27.4	52.7	16.6	2.0	16.6	81.4
COWBOY	CDC Cowboy	2	67.0	1193	23.2	52.7	17.8	<b>23.5</b>	<b>47.7</b>	28.9
MT910189	Hockett	3	52.3	1279	25.0	51.6	16.6	3.8	28.5	67.6
MT960101	Geraldine	4	48.3	1303	27.1	51.1	<b>18.8</b>	0.5	13.8	<b>85.7</b>
PI491534	Gallatin	5	58.3	1406	29.3	51.2	17.1	1.7	23.7	74.6
SK 76333	Harrington	6	52.7	1139	22.4	51.3	17.9	6.2	32.2	61.6
TR 232	Metcalfe	7	51.3	1233	24.5	51.7	18.6	8.4	36.3	55.4
<b>MT950186</b>	<b>Haxby</b>	<b>8</b>	59.3	<b>1703</b>	37.6	<b>53.4</b>	16.7	3.5	24.0	72.5
MT010158	Amsterdam	9	51.0	1264	24.9	51.8	18.7	12.8	38.3	49.0
MT070158	MT970148/Klages	10	51.3	1673	34.8	51.0	16.6	22.2	42.0	35.8
MT010160	MT920041/Harrington	11	58.7	<b>1697</b>	35.4	51.9	16.8	5.5	31.8	62.7
MT070159	MT970148/Klages	12	56.7	1364	28.4	50.6	17.5	9.5	33.0	57.5
MT080279	MT970148/MT970116	13	51.7	<b>1686</b>	35.1	50.6	17.3	10.5	28.5	61.0
6B952482	Tradition	14	58.3	1349	28.1	49.7	17.1	3.7	14.9	81.4
CONRAD	Conrad	15	46.7	1441	30.0	51.8	17.9	16.1	24.4	59.5
MT960228	Eslick	16	46.3	1415	29.5	51.4	17.4	6.7	26.7	66.6
Idaho2007	Lenetah	17	56.0	1655	34.5	50.9	15.9	20.3	43.4	36.3
MT981427	Lavina	18	50.3	1636	34.1	51.1	15.3	8.2	37.0	54.8
Mean			53.85	1431	29.52	51.46	17.3	9.2	30.1	60.7
P value			0.006	0.157	0.081	0.337				
CV 1			10.2	19.2	21.0	2.1				
LSD (0.05)			9.11	ns	ns	ns				

Seed Date: 4-Apr-12 No-till CC in winter wheat sttbl. Soil: 2" temp 13C Moist Probe:15 "

Harvest Date: 1-Aug-12 Precip: Crop Year: 10.99

Fertilizer: Top Dress urea 60 N W/seed: 50 lbs 20+20+20+10

Weed control: Pre-plant glyphosate and MCPA+bromoxynil.

Comment: Surfuaace soil condition was good for seeding. Wheat stubble residue caused stand variability. Freezing temperatures, May 24-29, with a low of 24 F caused severe stress for some plants. Wind driven hail June 5th caused 20-35% leaf loss. Persisting drought conditions further limited yield potential.

Table 2 2012 No-Till continuous crop barley variety trial near Denton.  
Exp 3671 Central Agricultural Research Center. Moccasin, Montana

ID	Variety	Entry	Plant Height	Grain Yield	Grain Yield	Test Weight	Grain Protein	Plumpness		
								Plump	mid	Thin
		#	cm	bu/a	lbs/a	lbs/bu	%	%	%	%
YU501385	Champion (Brnss/Camas)	1	56.3	<b>2136</b>	44.5	49.4	14.3	1.7	20.9	77.4
COWBOY	CDC Cowboy	2	67.3	1823	38.0	48.6	15.9	<b>12.7</b>	<b>46.9</b>	40.4
MT910189	Hockett	3	57.3	1950	40.6	49.1	14.8	5.2	24.3	70.5
MT960101	Geraldine	4	55.7	1915	39.9	46.7	15.9	1.4	11.9	86.7
PI491534	Gallatin	5	58.0	1931	40.2	49.7	15.4	2.0	21.8	76.2
SK 76333	Harrington	6	54.7	1710	35.6	44.9	16.7	3.6	19.0	77.4
TR 232	Metcalfe	7	57.0	1889	39.3	46.5	<b>17.9</b>	3.3	23.1	73.7
<b>MT950186</b>	<b>Haxby</b>	<b>8</b>	53.7	<b>2169</b>	45.2	50.2	14.5	1.6	16.2	82.2
MT010158	Amsterdam	9	55.3	1620	33.7	<b>51.6</b>	16.8	12.2	39.7	48.1
MT070158	MT970148/Klages	10	55.7	2136	44.5	49.5	15.2	6.2	28.9	64.9
MT010160	MT920041/Harrington	11	61.0	2079	43.3	46.8	15.0	4.0	25.9	70.1
MT070159	MT970148/Klages	12	53.0	2029	42.3	47.5	15.3	6.6	30.5	62.9
MT080279	MT970148/MT970116	13	52.7	2050	42.7	50.2	15.0	6.7	27.0	66.2
6B952482	Tradition	14	60.7	1877	39.1	50.3	13.8	10.6	35.8	53.5
CONRAD	Conrad	15	54.0	2149	44.8	49.1	15.7	9.0	26.2	64.7
MT960228	Eslick	16	51.7	1866	38.9	47.1	16.5	1.0	6.5	92.4
Idaho2007	Lenetah	17	55.0	1878	39.1	46.0	15.5	1.7	16.1	82.1
MT981427	Lavina	18	54.3	1874	39.0	45.8	17.2	0.6	2.6	<b>96.8</b>
Mean			56.3	1949	40.6	48.25	15.6	5.0	23.5	71.5
P value			0.00	0.00	0.00	0.02				
CV 1			4.7	6.9	6.895	3.407				
LSD (0.05)			4.4	223.1	4.645	3.469				

Seed Date: 25-Apr-12 No-till continuous crop into lentil stub Soil: 2" Temp 16 C Moist Probe:

Harvest Date: 7-Aug-12

Fertilizer: Top Dress urea 60 N W/seed: 50 lbs 20+20+20+10

Comment: Seeding conditions were good. Lentil stubble provides an excellent spring seed bed. Precipitation was above average in April but lower through the balance of the growing season. Conditions were conducive to root growth which enabled the crop to endure below average precipitation and above average temperatures.

Table 3 2012 No-Till continuous crop barley variety trial near Geraldine.  
Exp 367011 Central Agricultural Research Center. Moccasin, Montana

ID	Variety/Pedigree	Entry	Plant	Grain	Grain	Test	Grain	Plumpness		
			Height	Yield	Yield	Weight	Protein	Plump	Mid	Thin
			cm	lbs/a	bu/a	lbs/bu	%	%	%	%
YU501385	Champion (Brnss/Camas)	1	57	<b>2867</b>	59.7	54.1	11.4	45.8	38.0	16.2
COWBOY	CDC Cowboy	2	66	2301	48.0	53.8	13.3	72.0	20.3	7.7
MT910189	Hockett	3	82	2577	53.7	54.2	11.3	<b>79.1</b>	14.8	6.1
MT960101	Geraldine	4	67	2510	52.3	53.2	12.7	28.5	39.0	32.5
PI491534	Gallatin	5	65	2418	50.4	51.9	12.6	54.5	30.4	15.0
SK 76333	Harrington	6	69	2544	53.0	52.1	13.0	46.8	30.4	22.8
TR 232	Metcalfe	7	66	2454	51.1	52.7	13.8	54.5	30.2	15.3
<b>MT950186</b>	<b>Haxby</b>	<b>8</b>	67	<b>3100</b>	64.6	<b>56.1</b>	12.1	33.5	<b>42.8</b>	23.8
MT010158	Amsterdam	9	66	2152	44.8	54.1	15.0	61.2	23.9	14.9
MT070158	MT970148/Klages	10	69	2555	53.2	53.1	14.0	49.9	33.9	16.3
MT010160	MT920041/Harrington	11	58	2747	57.2	52.0	13.7	36.9	35.5	27.6
MT070159	MT970148/Klages	12	60	2649	55.2	51.6	13.1	49.8	33.6	16.6
MT080279	MT970148/MT970116	13	76	2660	55.4	50.6	12.8	40.6	36.3	23.1
6B952482	Tradition	14	67	2714	56.5	51.4	12.8	28.8	41.7	29.5
CONRAD	Conrad	15	58	2748	57.3	51.4	13.5	63.9	22.4	13.7
MT960228	Eslick	16	61	2394	49.9	52.7	12.9	26.2	39.2	34.6
Idaho2007	Lenetah	17	66	2743	57.1	50.7	13.0	40.9	35.8	23.4
MT981427	Lavina	18	70	2759	57.5	48.9	<b>16.0</b>	4.5	21.4	<b>74.1</b>
Mean			98.7	2605	54.3	52.5	13.2	45.4	31.6	22.9
P value				0	0.0	0.0				
CV 1				5.136	5.1	2.9				
LSD (0.05)				222	4.6	3.2				

Seed Date: 25-Apr-12 No-till continuous crop into heavy winter wheat stubble.  
Harvest Date: 13-Aug-12 Soil: 2" temp: 12C Moist Probe: 18"  
Fertilizer: Top Dress urea 45 N W/seed: 50 lbs 20+20+20+10  
Comment: Surface soil moisture conditions were good for seeding. Crop residue was heavy, so some seedlings did not establish leaving occasional small gaps in stand.

Table 4 Moccasin multi-year spring barley variety grain yields in no-till CC.  
Exp 3670 Central Agricultural Research Center. Moccasin, Montana

Selected entries	2007	2008	2009	2010	2011	2012	Haxby	
							average	Same Yrs
					bu/a			
Champion		45	49	51		27.4	43.2	46.8
Conrad	39	41	51	56	36	30.0	42.1	45.2
Gallatin			<b>46</b>	60	31	29.3	41.4	45.3
Geraldine	45	44	47	56	29	27.1	41.1	45.2
Harrington	38	41	46	40	28	22.4	35.9	45.2
<b>Haxby</b>	<b>48</b>	<b>42</b>	<b>48</b>	<b>59</b>	<b>36</b>	<b>37.6</b>	<b>45.2</b>	<b>45.2</b>
Hockett	34	45	41	56	32	25.0	38.9	45.2
Metcalfe	34	30	42	46	29	24.5	34.1	45.2
MT010158 Amstr		51	53	48	34	37.6	44.6	44.7
Tradition					31	28.1	29.6	37.0
Means	40.8	41.0	47.9	55.27	32	29.52		

Varieties with multi-year mean > than Haxby for the same years are in **bold**.

Table 5 Denton multi-year spring barley variety grain yields in no-till CC.  
Exp 36701 Central Agricultural Research Center. Moccasin, Montana

Selected entries	2007	2008	2009	2010	2011	2012	Haxby	
							average	Same Yrs
					bu/a			
Champion		38	58	50		44.5	<b>47.7</b>	44.9
Conrad	29	35	41	56	21	44.8	37.7	38.1
Gallatin			42	52	21	40.2	38.7	41.1
Geraldine	31	37	45	51	23	39.9	37.6	38.1
Harrington	27	33	38	47	20	35.6	33.3	38.1
<b>Haxby</b>	<b>28</b>	<b>36</b>	<b>40</b>	<b>58</b>	<b>21</b>	<b>45.2</b>	<b>38.1</b>	<b>38.1</b>
Hockett	28	38	46	47	23	40.6	36.9	38.1
Metcalfe	29	36	42	49	19	39.3	35.6	38.1
MT010158		34	41	58	20	33.7	37.5	40.1
Tradition					21	39.1	30.2	39.8
Mean	30.0	35.9	43.4	53.2	21.32	40.6		

Varieties with multi-year mean > than Haxby for the same years are in **bold**.

Table 6 Moccasin multi-year barley variety grain test weight on no-till CC.  
Exp 3670 Central Agricultural Research Center. Moccasin, Montana

Selected entries	2007	2008	2009	2010	2011	2012	Average	Haxby Same Yrs
Champion		51.7	54.2	51.3		52.7	52.5	53.4
Conrad	52	49.2	52.9	50.5	50.7	51.8	51.2	53.7
Gallatin			53.3	51.1	52.8	51.2	52.1	53.8
Geraldine	52.3	49.0	53.3	51.5	52.0	51.1	51.5	53.7
Harrington	51.3	47.7	53.1	50.5	50.6	51.3	50.7	53.7
<b>Haxby</b>	<b>54.6</b>	<b>52.2</b>	<b>54.6</b>	<b>53.2</b>	<b>54.1</b>	<b>53.4</b>	<b>53.7</b>	<b>53.7</b>
Hockett	52.7	49.4	54.3	52.4	52.6	51.6	52.2	53.7
Metcalfe	51.5	49.7	54.1	50.7	51.8	51.7	51.6	53.7
MT010158		50.5	53.4	51.0	50.7	51.8	51.5	53.5
Tradition					50.9	49.7	50.3	53.8
Means	51.93	49.0	53.6	51.45	51.53	51.46		

Varieties with multi-year mean > than Haxby for the same years are in **bold**.

Table 7 Denton multi-year spring barley variety test weights in no-till CC.  
Exp 36701 Central Agricultural Research Center. Moccasin, Montana

Selected entries	2007	2008	2009	2010	2011	2012	Average	Haxby Same Yrs
				lbs/bu				
Champion		52.4	56.5	54.9		49.4	53.3	53.2
Conrad	46.1	49.9	55.0	53.0	53.0	49.1	51.0	52.4
Gallatin			55.1	53.5	52.5	49.7	52.7	52.7
Geraldine	46.7	51.1	54.3	53.0	53.0	46.7	50.8	52.4
Harrington	46.8	52.3	55.4	53.1	53.5	44.9	51.0	52.4
<b>Haxby</b>	<b>50.2</b>	<b>53.4</b>	<b>55.0</b>	<b>54.2</b>	<b>51.5</b>	<b>50.2</b>	<b>52.4</b>	<b>52.4</b>
Hockett	49.6	51.5	55.8	53.9	54.0	49.1	52.3	52.4
Metcalfe	47.0	51.2	55.6	52.8	53.0	46.5	51.0	52.4
MT010158		51.8	54.3	54.5	54.0	51.6	53.2	52.9
Tradition					51.0	50.3	50.7	50.8
Mean	46.98	50.87	55.0	53.6	52.41	48.25		

Varieties with multi-year mean > than Haxby for the same years are in **bold**.

Table 8 Moccasin multi-year barley variety grain protein on no-till CC.  
Exp 3670 Central Agricultural Research Center. Moccasin, Montana

Selected entries	2007	2008	2009	2010	2011	2012	average	Haxby Same Yrs
		%						
Champion		13.0	14.2	11.1		16.6	13.7	13.8
Conrad	16.0	14.0	16.1	12.8	15.5	17.9	<b>15.4</b>	13.8
Gallatin			<b>15.1</b>	10.9	15.6	17.1	<b>14.7</b>	14.2
Geraldine	16.4	13.7	15.0	12.1	17.0	18.8	<b>15.5</b>	13.8
Harrington	15.5	14.0	15.0	12.1	16.2	17.9	<b>15.1</b>	13.8
<b>Haxby</b>	<b>13.8</b>	<b>12.6</b>	<b>14.8</b>	<b>10.9</b>	<b>14.2</b>	<b>16.7</b>	<b>13.8</b>	<b>13.8</b>
Hockett	15.8	13.2	14.4	12.0	15.1	16.6	<b>14.5</b>	13.8
Metcalfe	17.3	15.2	15.5	11.6	16.1	18.6	<b>15.7</b>	13.8
MT010158		13.3	15.4	11.8	16.0	18.7	<b>15.0</b>	13.8
Tradition					14.6	17.1	<b>15.9</b>	15.5
Means	15.51	13.10	14.60	11.37	15.3	17.3		

Varieties with multi-year mean > than Haxby for the same years are in **bold**.

Table 9 Denton multi-year barley variety protein content on no-till CC.  
Exp 36701 Central Agricultural Research Center. Moccasin, Montana

Selected entries	2007	2008	2009	2010	2011	2012	average	Haxby Same Yrs
		%						
Champion		13.3	13.4	12.4		14.3	13.4	13.4
Conrad	16.5	13.7	15.0	12.5	14.4	15.7	<b>14.6</b>	13.7
Gallatin			14.4	12.7	14.8	15.4	<b>14.3</b>	13.7
Geraldine	15.3	14.2	14.1	13.3	14.8	15.9	<b>14.6</b>	13.7
Harrington	15.7	13.6	14.4	13.9	17.0	16.7	<b>15.2</b>	13.7
<b>Haxby</b>	<b>13.7</b>	<b>13.4</b>	<b>13.7</b>	<b>12.1</b>	<b>14.6</b>	<b>14.5</b>	<b>13.7</b>	<b>13.7</b>
Hockett	13.5	13.2	13.5	12.2	14.1	14.8	13.6	13.7
Metcalfe	15.0	14.0	14.9	13.4	15.1	17.9	<b>15.1</b>	13.7
MT010158		14.5	14.8	13.4	13.6	16.8	<b>14.6</b>	13.7
Tradition					13.3	13.8	13.6	14.6
Mean	14.36	13.59	13.80	12.56	14.2	15.6		

Varieties with multi-year mean > than **Haxby** for the same years are in **bold**.