PROJECT TITLE: Evaluation of spring wheat, durum, and barley varieties under minimum-till, continuous cropping conditions – 2012 (4W4145)

PRINCIPAL INVESTIGATOR:
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OBJECTIVE: To determine the best adapted varieties of spring wheat, durum, and barley for production under no-till continuous cropping conditions in eastern Montana.

Methods:
Soil type: Williams clay loam
Previous crops: 2011- spring wheat, 2010- safflower, 2009 - small grain plots
Residual soil N to 3 ft: 32 lb/bu
Residual soil P to 6 in: 41 ppm
Applied fertilizer: 40 lb N/ac as liquid 28-0-0
Herbicides: Brox M, 1.5 pt/ac applied May 31
Precipitation April – August, 2012: 7.78 in
Ave (63 yr) precipitation April – August: 9.53 in
Precipitation September 2011 – August 2012: 9.76 in
Ave (63 yr) precipitation September – August: 13.99 in
Conditions were dry at planting, and it was generally a hot, dry summer. Germination and emergence were erratic.

Experiment	Planting date	Harvest date	Plot size
recrop spring wheat	April 6	August 8	100 ft^2, entire plot harvested
recrop durum	April 6	August 8	100 ft^2, entire plot harvested
recrop barley	April 6	August 8	100 ft^2, entire plot harvested

RESULTS:
Spring wheat: Twenty lines and varieties of spring wheat were tested under dryland recrop conditions (Table 1). Six lines and varieties yielded significantly more than the check variety, Vida. Five-year summaries for yield, test weight, height, and protein content are shown in Tables 2 through 5.

Durum: Sixteen durum lines and varieties were tested under dryland recrop conditions (Table 6). Two varieties yielded significantly greater than the check variety, Mountrail and six lines and varieties yielded significantly less than Mountrail. Five-year summaries for yield, test weight, height, and protein content are shown in Tables 7 through 10.

Barley: Sixteen barley lines and varieties were tested under dryland recrop conditions. (Table 11). Nine lines and varieties yielded significantly lower than the check variety, Haxby. Five-year summaries for yield, test weight, and height are shown in Tables 12 through 14.

SUMMARY: The experiments reported under this project are all of the replicated small plot type. The three-year crop rotation is commercial small grain, small grain yield trials, safflower.

FUNDING SUMMARY: Expenditure information to be provided by OSP. No other grants support this project.

MWBC FY2012 GRANT SUBMISSION PLANS: It is planned to submit this project for funding consideration in the next fiscal year.

Table 1. Agronomic data obtained from a dryland recrop spring wheat yield trial conducted at the Eastern Agricultural Research Center, Sidney, MT.

entry	height, cm	height, in	grain protein, %	test wt, lb/bu	yield, bu/ac	
MT1053	48.7	19.2	12.12	56.5	14.2	a
Reeder	51.7	20.7	13.64	55.5	13.6	a
Hank	50.7	20.0	13.84	53.0	13.3	a
Jedd	48.7	19.2	12.11	58.5	12.3	a
Choteau	51.0	20.1	13.50	56.0	11.7	a
Volt	50.7	20.0	11.04	58.5	11.6	a
Ap604CL	51.3	21.0	14.47	54.0	11.5	
Kuntz	49.0	19.3	12.47	58.5	11.5	
Gunnison	52.7	20.8	12.99	57.0	10.6	
MT1008	50.0	19.7	13.43	55.5	10.5	
Duclair	52.3	20.6	14.24	54.0	10.4	
McNeal	57.0	22.4	14.57	52.5	9.9	
Outlook	54.3	21.4	12.69	54.0	9.5	
IMICHT79	49.3	19.4	13.23	56.5	9.0	
Corbin	47.3	18.6	14.96	55.0	9.0	
Mott	51.0	20.1	16.74	55.0	8.9	
Vida	48.3	19.0	13.73	54.5	8.4	
O'Neal	51.0	20.1	16.19	54.5	8.4	
SY Tyra	48.7	19.7	13.72	57.5	8.1	
Prosper	49.7	19.6	14.05	52.5	7.9	
mean	50.7	20.0	13.69	55.5	10.5	
Probability	0.183	0.062			0.001	
CV (S/mean)	6.5	5.9			17.9	
CV (SE/mean)	3.8	3.4			10.3	
LSD 0.05	5.5	1.9			3.1	

a indicates significantly greater yield than check variety, Vida, at probability of <0.05

Table 2. Relative yielding abilities of spring wheat varieties in bu/ac as compared to Vida when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2008	2009	2010	2011	2012	Ave	as % of Vida
MT 1053	--	--	--	--	14.2	14.2	169.0
Hank	--	--	--	--	13.3	13.3	158.3
MT 1008	--	--	--	--	10.5	10.5	125.0
Vida	6.3	29.8	53.8	43.1	8.4	28.3	100.0
Reeder	7.9	21.9	46.9	38.6	13.6	25.8	91.2
Duclair	--	--	49.4	34.6	10.4	31.5	89.6
O'Neal	8.7	27.6	43.9	36.9	8.4	25.1	88.8
Outlook	6.5	21.7	47.6	40.1	9.5	25.1	88.7
IMICHT79	--	--	--	36.1	9.0	22.6	87.6
McNeal	8.4	24.5	40.1	40.1	9.9	24.6	87.0
Gunnison	--	--	--	33.6	10.6	22.1	85.8
SY Tyra	--	--	--	36.0	8.1	22.1	85.6
AP604CL	--	21.6	45.1	36.6	11.5	28.7	85.0
Jedd	8.5	20.2	40.8	34.3	12.3	23.2	82.1
Volt	8.0	23.4	37.8	34.4	11.6	23.0	81.5
Choteau	7.7	20.0	43.2	32.6	11.7	23.0	81.5
Prosper	--	--	--	33.8	7.9	20.9	81.0
Mott	--	16.1	46.9	36.0	8.9	27.0	79.9
Corbin	6.7	12.6	43.7	34.5	9.0	21.3	75.3
Kuntz	7.2	17.2	41.6	22.5	11.5	20.0	70.7

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 3. Relative test weights of spring wheat varieties in lb/bu as compared to Vida when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2008	2009	2010	2011	2012	Ave	as % of Vida
Jedd	59.3	63.3	61.0	62.6	58.5	60.9	103.9
MT 1053	--	--	--	--	56.5	56.5	103.7
Volt	56.0	63.5	61.0	63.6	58.5	60.5	103.1
SY Tyra	--	--	--	61.4	57.5	59.5	102.8
Kuntz	56.2	62.0	60.5	63.3	58.5	60.1	102.4
Gunnison	--	--	--	61.2	57.0	59.1	102.2
MT 1008	--	--	--	--	55.5	55.5	101.8
IMICHT79	--	--	--	61.3	56.5	58.9	101.8
AP604CL	--	63.5	59.5	63.0	54.0	60.0	101.1
Reeder	57.0	61.3	61.5	60.9	55.5	59.2	101.0
O'Neal	56.3	62.5	60.5	62.0	54.5	59.2	100.8
Choteau	56.8	61.5	60.5	60.4	56.0	59.0	100.6
Corbin	56.5	61.0	59.5	62.5	55.0	58.9	100.4
Vida	56.0	61.7	60.0	61.2	54.5	58.7	100.0
Mott	--	60.7	60.0	61.7	55.0	59.4	100.0
Prosper	--	--	--	61.9	52.5	57.2	98.9
Duclair	--	--	59.5	58.6	54.0	57.4	98.0
Hank	--	--	--	--	53.3	53.3	97.8
Outlook	52.0	60.3	59.5	59.7	54.0	57.1	97.3
McNeal	51.7	60.0	60.0	60.1	52.5	56.9	96.9

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 4. Relative heights of spring wheat varieties in inches as compared to Vida when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2008	2009	2010	2011	2012	Ave	as % of Vida
Hank	--	--	--	--	20	20.0	105.3
MT 1008	--	--	--	--	20	20.0	105.3
McNeal	19	18	29	26	22	22.8	104.6
Prosper	--	--	--	24	20	22.0	102.3
Gunnison	--	--	--	23	21	22.0	102.3
AP604CL	--	17	29	25	21	23.0	102.2
Duclair	--	--	28	24	21	24.3	101.4
Mott	--	17	29	25	20	22.8	101.1
Vida	19	18	29	24	19	21.8	100.0
IMICHT79	--	--	--	24	19	21.5	100.0
MT 1053	--	--	--	--	19	19.0	100.0
Outlook	18	17	28	24	21	21.6	99.1
O'Neal	20	18	27	22	20	21.4	98.2
Reeder	18	16	28	24	21	21.4	98.2
Corbin	18	16	28	24	19	21.0	96.3
Volt	18	17	26	23	20	20.8	95.4
SY Tyra	--	--	--	21	20	20.5	95.3
Kuntz	18	16	27	23	19	20.6	94.5
Choteau	17	16	27	23	20	20.6	94.5
Jedd	16	16	23	22	19	19.2	88.1

NOTE: Average heights in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 5. Relative protein contents of spring wheat varieties in percent as compared to Vida when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2008	2009	2010	2011	2012	Ave	as % of Vida
Mott	--	18.2	12.6	16.0	16.7	15.9	105.3
Reeder	17.1	19.2	13.2	16.5	13.6	15.9	104.6
Corbin	17.1	19.1	11.8	14.9	15.0	15.6	102.4
Hank	--	--	--	--	13.8	13.8	100.7
Prosper	--	--	--	16.0	14.0	15.0	100.3
Vida	15.8	17.8	12.6	16.2	13.7	15.2	100.0
MT 1008	--	--	--	--	13.4	13.4	97.8
O'Neal	14.8	16.4	12.4	14.3	16.2	14.8	97.4
IMICHT79	--	--	--	15.6	13.2	14.4	96.3
McNeal	15.1	17.2	11.7	14.7	14.6	14.7	96.3
AP604CL	--	17.6	12.0	13.7	14.5	14.5	95.9
Choteau	15.4	17.7	11.5	14.8	13.5	14.6	95.8
SY Tyra	--	--	--	14.9	13.7	14.3	95.7
Outlook	14.8	18.4	11.8	14.5	12.7	14.4	94.9
Kuntz	15.5	17.6	12.0	14.2	12.5	14.4	94.3
Duclair	--	--	11.0	14.7	14.2	13.3	93.9
Volt	15.8	16.7	11.2	15.0	11.0	13.9	91.6
Gunnison	--	--	--	14.1	13.0	13.6	90.6
Jedd	14.5	17.2	10.3	14.2	12.1	13.7	89.8
MT 1053	--	--	--	--	12.1	12.1	88.3

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 6. Agronomic data obtained from a dryland recrop durum yield trial conducted at the Eastern Agricultural Research Center, Sidney, MT.

entry	height, cm	height, in	grain protein, %	test wt, lb/bu	yield, bu/ac	
Belfield	50.0	19.7	14.77	55.5	9.8	a
Normanno	47.7	18.8	11.93	56.0	9.5	a
Alkabo	52.0	20.5	15.02	56.5	8.7	
Silver	45.7	18.0	18.15	53.0	8.5	
Mountrail	52.0	20.5	17.27	53.5	7.0	
Alzada	53.7	21.1	15.06	53.0	6.7	
MT06584	52.3	20.6	18.05	52.0	6.6	
MT05158	47.7	18.8	16.50	56.5	6.2	
Westhope	48.0	18.9	18.70	55.0	5.0	
Strongfield	50.7	20.0	18.24	54.0	4.9	
MT05166	46.7	18.4	17.46	55.5	4.3	x
Grenora	48.7	19.2	16.06	53.5	4.2	x
Tioga	53.7	21.1	17.41	55.0	4.1	x
MT05183	45.7	18.0	17.77	53.5	3.9	x
Divide	49.3	19.4	15.50	55.0	3.8	x
Pierce	51.3	20.2	16.93	54.5	3.3	x
mean	49.7	19.6	16.57	54.5	6.0	
probability	0.011	0.011			<0.001	
CV (S/mean)	5.7	5.8			21.7	
CV (SE/mean)	3.3	3.3			12.5	
LSD 0.05	4.8	1.9			2.2	

a indicates significantly greater yield than check variety, Mountrail, at p = 0.05
x indicates significantly lower yield than check variety, Mountrail, at p = 0.05

Table 7. Relative yields of durum varieties in bu/ac as compared to Mountrail when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2008	2009	2010	2011	2012	Ave	as % of Mountrail
Divide	7.3	37.9	48.6	39.8	3.8	27.5	104.2
Silver	6.9	38.8	44.4	34.3	8.5	26.6	100.8
Mountrail	6.5	38.2	43.7	36.5	7.0	26.4	100.0
Alkabo	8.5	31.5	44.3	38.0	8.7	26.2	99.3
Westhope	--	--	--	37.8	5.0	21.4	98.4
Tioga	--	--	46.0	35.5	4.1	28.5	98.2
Belfield	--	--	--	32.8	9.8	21.3	97.9
Strongfield	6.6	36.5	42.7	36.9	4.9	25.5	96.7
MT06584	--	--	--	--	6.6	6.6	94.3
Normanno	--	31.1	42.8	--	9.5	27.8	93.8
Grenora	5.8	24.9	46.2	37.0	4.2	23.6	89.5
Alzada	7.9	29.6	41.7	31.6	6.7	23.5	89.1
MT05158	--	--	--	--	6.2	6.2	88.6
MT05183	--	--	--	33.8	3.9	18.9	86.7
MT05166	--	--	--	32.8	4.3	18.6	85.3
Pierce	6.5	20.6	44.0	36.2	3.3	22.1	83.9

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety.

Table 8. Relative test weights of durum varieties in lb/bu as compared to Mountrail when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2008	2009	2010	2011	2012	Ave	as % of Mountrail
MT05158	--	--	--	--	56.5	56.5	105.6
Alkabo	58.7	61.0	60.5	62.5	56.5	59.8	102.4
MT05166	--	--	--	62.0	55.5	58.8	101.3
Pierce	57.5	60.3	61.0	62.0	54.5	59.1	101.1
Westhope	--	--	--	62.0	55.0	58.5	100.9
Belfield	--	--	--	61.5	55.5	58.5	100.9
Divide	56.5	61.5	59.5	62.0	55.0	58.9	100.8
Tioga	--	--	60.0	62.5	55.0	59.2	100.6
Normanno	--	60.2	59.5	--	56.0	58.6	100.5
MT05183	--	--	--	63.0	53.5	58.3	100.4
Mountrail	54.8	60.8	60.5	62.5	53.5	58.4	100.0
Grenora	56.0	60.5	60.0	62.0	53.5	58.4	100.0
Strongfield	56.2	60.7	59.0	62.0	54.0	58.4	99.9
Alzada	56.7	60.3	60.5	61.0	53.0	58.3	99.8
Silver	55.7	61.2	59.5	62.0	53.0	58.3	99.8
MT06584	--	--	--	--	52.0	52.0	97.2

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare test weights only to the check variety.

Table 9. Relative heights of durum varieties in inches as compared to Mountrail when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2008	2009	2010	2011	2012	Ave	as % of Mountrail
Tioga	--	--	32	27	21	26.7	115.9
Pierce	18	20	31	26	20	23.0	109.5
Divide	20	21	29	25	19	22.8	108.6
Strongfield	19	19	28	25	20	22.2	105.7
MT06584	--	--	--	--	21	21.0	105.0
Alkabo	19	19	28	24	20	22.0	104.8
Alzada	20	18	25	22	21	21.2	101.0
Mountrail	17	19	26	23	20	21.0	100.0
Westhope	--	--	--	24	19	21.5	100.0
Grenora	18	18	27	23	19	21.0	100.0
Belfield	--	--	--	22	20	21.0	97.7
MT05158	--	--	--	--	19	19.0	95.0
Silver	16	18	23	23	18	19.6	93.3
MT05183	--	--	--	22	18	20.0	93.0
MT05166	--	--	--	21	18	19.5	90.7
Normanno	--	16	23	--	19	19.3	89.2

NOTE: Average heights in this summary should not be compared to each other since they are not grown in the same years. Compare heights only to the check variety.

Table 10. Relative protein contents of durum varieties in percent as compared to Mountrail when grown under dryland continuous cropping at the EARC, Sidney, Montana.

Cultivar	2008	2009	2010	2011	2012	Ave	as % of Mountrail
Westhope	--	--	--	13.8	18.7	16.3	105.9
Strongfield	15.5	15.7	12.7	14.3	18.2	15.3	105.8
MT06584	--	--	--	--	18.0	18.0	104.0
Pierce	14.8	16.6	12.3	13.5	16.9	14.8	102.6
MT05183	--	--	--	13.7	17.8	15.8	102.6
Tioga	--	--	12.2	13.0	17.4	14.2	102.4
Silver	15.1	13.6	12.0	14.0	18.2	14.6	101.0
Mountrail	15.7	14.9	10.9	13.4	17.3	14.4	100.0
MT05166	--	--	--	13.0	17.5	15.3	99.3
Grenora	14.9	15.4	11.4	13.4	16.1	14.2	98.6
Alzada	14.8	15.3	11.3	13.9	15.1	14.1	97.5
Alkabo	13.8	14.8	12.4	13.7	15.0	13.9	96.5
Divide	14.5	14.5	11.6	13.1	15.5	13.8	95.8
MT05158	--	--	--	--	16.5	16.5	95.4
Belfield	--	--	--	13.6	14.8	14.2	92.5
Normanno	--	14.7	11.0	--	11.9	12.5	87.2

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 11. Agronomic data obtained from a dryland recrop barley yield trial conducted at the Eastern Agricultural Research Center, Sidney, MT.

entry	height, cm	height, in	test wt, lb/bu	percent plump	percent regular	yield, bu/ac	
Haxby	44.3	17.5	48.0	6	83	21.5	
Champion	44.7	17.6	41.5	7	66	21.2	
MT070159	41.3	16.3	38.5	4	51	21.0	
Tradition	47.7	18.8	46.0	33	59	19.9	
MT070158	42.7	16.8	42.0	8	69	19.4	
Gallatin	49.0	19.3	42.0	8	64	19.0	
Harrington	48.0	18.9	42.5	5	69	18.8	
MT080279	43.7	17.2	41.5	5	67	17.9	x
MT010160	49.7	19.6	44.0	8	60	17.7	x
Hockett	44.0	17.3	44.0	18	79	16.9	x
Eslick	40.3	15.9	42.5	1	44	16.7	x
Metcalf	46.7	18.4	43.0	7	72	15.5	x
Amsterdam	47.3	18.6	44.5	22	69	14.9	x
Conrad	45.7	18.0	45.5	44	48	14.9	x
Geraldine	43.0	16.9	43.5	7	51	14.5	x
Cowboy	62.0	24.4	44.0	24	69	14.0	x
mean	46.3	18.2	43.3	12.9	63.8	17.73	
probability	<0.001	<0.001				<0.001	
CV (S/mean)	6.6	6.6				10.9	
CV (SE/mean)	3.8	3.8				6.3	
LSD 0.05	5.1	5.1				3.2	

x indicates significantly lower yield than check variety, Haxby, at probability = 0.05

Table 12. Relative yields of barley varieties in bu/ac compared to Haxby when grown under dryland recrop conditions at the EARC, Sidney, Montana.

Cultivar	2007	2008	2010	2011	2012	Ave	as % of Haxby
Haxby	40.8	8.1	51.0	40.3	21.5	32.3	100.0
Champion	--	--	--	--	21.2	21.2	98.6
MT070159	--	--	--	--	21.0	21.0	97.7
Conrad	41.4	8.9	55.4	36.5	14.9	31.4	97.2
Hockett	33.5	10.7	60.9	33.5	16.9	31.1	96.2
Gallatin	--	--	54.6	34.0	19.0	35.9	95.4
Metcalfe	39.9	6.4	53.1	36.5	15.5	30.3	93.6
Harrington	36.5	7.4	54.0	30.3	18.8	29.4	90.9
MT070158	--	--	--	--	19.4	19.4	90.2
MT010160	--	--	60.7	21.5	17.7	33.3	88.6
Geraldine	33.7	7.6	54.9	31.5	14.5	28.4	87.9
Tradition	41.1	8.3	--	25.2	19.9	23.6	85.4
MT080279	--	--	--	--	17.9	17.9	83.3
Amsterdam	--	7.8	47.8	26.5	14.9	24.3	80.2
Eslick	--	--	--	--	16.7	16.7	77.7
Cowboy	--	--	--	--	14.0	14.0	65.1

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety. No trial in 2009.

Table 13. Relative test weights of barley varieties in lb/bu compared to Haxby when grown under dryland recrop conditions at the EARC, Sidney, Montana.

Cultivar	2007	2008	2010	2011	2012	Ave	as % of Haxby
Haxby	51.8	50.5	54.0	47.0	48.0	50.3	100.0
Conrad	49.7	47.5	50.5	46.0	45.5	47.8	95.2
Tradition	50.0	44.5	--	47.0	46.0	46.9	95.0
Geraldine	50.5	47.0	50.0	47.0	43.5	47.6	94.7
Hockett	51.3	46.0	50.5	46.0	44.0	47.6	94.6
Amsterdam	--	47.0	52.0	44.0	44.5	46.9	94.0
Gallatin	--	--	51.0	47.0	42.0	46.7	94.0
MT010160	--	--	50.0	46.0	44.0	46.7	94.0
Metcalfe	50.8	45.0	49.5	46.0	43.0	46.9	93.2
Harrington	50.0	43.5	49.5	47.0	42.5	46.5	92.5
Cowboy	--	--	--	--	44.0	44.0	91.7
Eslick	--	--	--	--	42.5	42.5	88.5
MT070158	--	--	--	--	42.0	42.0	87.5
Champion	--	--	--	--	41.5	41.5	86.5
MT080279	--	--	--	--	41.5	41.5	86.5
MT070159	--	--	--	--	38.5	38.5	80.2

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare test weights only to the check variety. No trial in 2009.

Table 14. Relative heights of barley varieties in inches compared to Haxby when grown under dryland recrop conditions at the EARC, Sidney, Montana.

Cultivar	2007	2008	2010	2011	2012	Ave	as % of Haxby
Cowboy	--	--	--	--	24	24.0	133.3
Tradition	25	20	--	22	19	21.5	108.9
Gallatin	--	--	26	22	19	22.3	108.1
MT010160	--	--	24	22	20	22.0	106.5
Metcalfe	22	18	24	24	18	21.2	105.0
Amsterdam	--	16	22	23	19	20.0	101.3
Haxby	22	17	22	22	18	20.2	100.0
Champion	--	--	--	--	18	18.0	100.0
Hockett	20	17	25	21	17	20.0	99.0
Harrington	22	16	21	21	19	19.8	98.0
Conrad	20	16	22	22	18	19.6	97.0
MT070158	--	--	--	--	17	17.0	94.4
MT080279	--	--	--	--	17	17.0	94.4
Geraldine	18	15	21	19	17	18.0	89.1
Eslick	--	--	--	--	16	16.0	88.9
MT070159	--	--	--	--	16	16.0	88.9

NOTE: Average heights in this summary should not be compared to each other since they are not grown in the same years. Compare heights only to the check variety. No trial in 2009.