PROJECT TITLE: Small grain variety testing under continuous cropping conditions.

PROJECT LEADERS:
Joyce L.A. Eckhoff, Jerald W. Bergman
Eastern Agricultural Research Center
Sidney, MT 59270

OBJECTIVE:

To determine the best adapted varieties of spring wheat, durum, barley and oats for production under continuous cropping conditions.

RESULTS:

Spring wheat

Planting date was 16 Apr and harvest date was 9 Sep. Twenty varieties of spring wheat were tested (Table 1). Montana line MT 8849, soon to be released as McNeal, yielded the most with a yield of 38.2 bu/acre. Average yield was 29.1 bu/acre. Relative yields, test weights, plant heights, and protein contents over five years are shown in Tables 2 through 5.

Durum

Planting date was 16 Apr and harvest date was 9 Sep. Twelve durum varieties were tested (Table 6). Canadian variety Plenty yielded most with a yield of 27.7 bu/acre. Average yield was 22.8 bu/acre. Relative yields, test weights, plant heights, and protein contents over five years are shown in Tables 7 through 10.

Barley

Planting date was 16 Apr and harvest date was 4 Aug. Eighteen barley varieties and lines were tested (Table 11). The highest yielding was Bearpaw with a yield of 60.5 bu/acre. Average yield was 40.5 bu/acre. Relative yields, test weights, plant heights, and protein contents over five years are shown in Tables 12 through 15.

Oats

Planting date was 16 Apr and harvest date was 9 Sep. Eighteen oat varieties were tested (Table 16). Cayuse yielded the most at 139.8 bu/acre. Average grain yield was 108.4 bu/acre. Relative yields, test weights, plant heights, and protein contents over five years are shown in Tables 17 through 20.

SUMMARY:

The trials in this project are all of the replicated small plot type. The three-year rotation is small grain, small grain plots, and safflower. Bromoxynil at a rate of 1.5 pt/acre was applied for broadleaf weed control in the small grain on 26 May. Trifluralin at a rate of 1.5 pt/acre is used in the safflower. This weed control and crop rotation have been effective in weed control. However, volunteer small grain has been a problem in plots in some years.

Soil tests in the fall of 1992 indicated 179 lb N/acre of residual soil N to a depth of 4 feet. No fertilizer N was applied. The small grain plots were planted on 16 April. Soil moisture was good and temperatures were above normal for six weeks before planting, providing good conditions for germination and emergence. Weather remained dry until June. High rainfall and abnormally low temperatures experienced during June, July, and August, resulting in delayed maturity and development of disease.

FUTURE PLANS

New varieties will continue to be tested under continuous cropping conditions to identify those which will perform best under continuous cropping conditions in eastern Montana.

Table 1 (Continued) Agronomic data obtained from a dryland recrop spring wheat nursery conducted at the Eastern Agricultural Research Center, Sidney, Montana, 1993.

Date Seeded: April 16, 1993 Date Harvested: September 9, 1993 Plot Size: 60 S.q Ft.[1/]

[1/] 3 row plots, rows 20 ft. long and 1 ft. apart. At harvest the entire plot was taken for yield, test weight and protein determinations.

[2/] Heading date is the number of days from planting date.

Newana is the check variety with an average yield of 30.3 Bu/Acre.

aa Indicates a significantly greater yield than check Newana at the 0.01 level of significance.
a Indicates a significantly greater yield than check Newana at the 0.05 level of significance.
x Indicates a significantly lower yield than check Newana at the 0.05 level of significance.
xx Indicates a significantly lower yield than check Newana at the 0.01 level of significance.

Previous crop: Barley

Soil type: Williams Loam

Residual soil N: 179 lbs/acre to 3 ft.

Residual soil P: 61 lbs/acre to 6 inches.

Insecticide: None

Fertilizer: None

Herbicide: 1.5 pts/a Bronate was applied on May 26, 1993.

Precipitation for average crop year = 13.78 inches. Precipitation for 1993 crop year = 16.75 in. Crop year considered to be from October 1, 1992 through September 30, 1993.

Precipitation for April 1 - August 31 period during 1993 = 13.47 inches. Average precipitation for same period = 9.49 inches.

Table 1 Agronomic data obtained from a dryland recrop spring wheat nursery conducted at the Eastern Agricultural Research Center, Sidney, Montana, 1993.

Date Seeded: April 16, 1993 Date Harvested: September 9, 1993 Plot Size: 60 Sq. Ft.[1/]

Variety	Average Days to Heading[2/]	Average Height Inches	Average Protein Content %	Average Test Wt. Lbs/Bu	Average Yield Bu/Acre
MT 8849	67	28	16.7	56.5	38.2 aa
Penawawa	65	23	14.7	54.2	37.7 aa
Owens	65	26	13.7	54.8	36.3 aa
Amidon	66	28	16.6	53.7	33.6 a
Pondera	64	27	16.8	56.2	33.6 a
Hi-Line	64	25	16.7	56.5	30.8
Newana	68	25	15.7	54.7	30.3
Lew	68	29	17.2	55.3	30.0
Grandin	64	28	16.9	56.0	29.1
Gus	65	26	18.1	53.5	28.2
Rambo	67	25	16.1	54.5	28.0
Stoa	65	29	17.3	53.2	27.9
Glenman	67	28	16.3	50.7	27.6
Len	66	27	17.1	54.0	27.3
Lancer	65	29	17.8	55.3	26.9 x
Klasic	59	24	16.5	54.3	25.1 xx
Westbred 926	59	25	16.6	54.0	24.2 xx
Cutless	65	27	17.8	53.5	24.0 xx
Olaf	66	27	16.9	54.3	22.7 xx
Fortuna	65	30	16.5	52.8	20.2 xx
Mean	65	27	16.6	54.4	29.1
F-Value	23.46	5.90	16.20	11.24	21.55
SE of the mean	0.44	0.78	0.25	0.42	1.06
LSD (0.05)	1.27	2.22	0.72	1.19	3.02
LSD (0.01)					4.02
CV (SE/Mean)	0.26	2.90	1.52	0.77	3.63
CV (s/Mean)	0.45	5.03	2.64	1.33	6.29

(Continued)

Table 2. Relative yielding abilities of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Newana
MT 8849	2	--	--	--	93.6	38.2	65.9	120.4
Glenman	5	6.8	24.4	18.5	85.6	27.6	32.6	108.2
Grandin	5	11.2	21.3	18.4	80.7	29.1	32.1	106.8
Amidon	5	8.0	24.6	16.6	77.6	33.6	32.1	106.6
Lew	5	5.6	22.9	17.7	84.3	30.0	32.1	106.6
Westbred Rambo	5	4.1	21.6	18.4	86.6	28.0	31.7	105.4
Stoa	5	6.7	22.1	18.1	81.1	27.9	31.2	103.6
Len	5	8.8	23.4	19.2	75.8	27.3	30.9	102.4
Gus	5	9.2	18.7	16.8	80.7	28.2	30.7	102.1
Hi-Line	5	7.6	21.2	17.3	75.2	30.8	30.4	101.1
Newana	5	6.2	17.7	17.1	79.2	30.3	30.1	100.0
Pondera	5	7.3	25.8	16.3	64.8	33.6	29.6	98.2
Lancer	5	6.6	21.7	17.5	71.0	26.9	28.7	95.5
Olaf	5	6.4	22.9	15.6	74.5	22.7	28.4	94.4
Westbred 926	4	--	22.5	14.5	71.5	24.2	33.2	92.0
Cutless	5	5.8	21.9	15.1	68.0	24.0	27.0	89.6
Klasic	2	--	--	--	66.8	25.1	46.0	83.9
Fortuna	5	7.3	23.7	18.0	49.8	20.2	23.8	79.1

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, Newana.

Table 3. Relative test weights of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Newana
Pondera	5	58.4	59.9	59.3	63.3	56.2	59.4	101.0
MT 8849	2	--	--	--	61.5	56.5	59.0	100.3
Hi-Line	5	57.4	58.3	58.9	63.5	56.5	58.9	100.1
Newana	5	59.1	58.6	58.9	63.0	54.7	58.9	100.0
Lancer	5	58.9	59.0	57.7	62.7	55.3	58.7	99.8
Klasic	2	--	--	--	63.2	54.3	58.8	99.8
Westbred Rambo	5	57.4	59.9	59.4	62.3	54.5	58.7	99.7
Lew	5	57.2	59.9	57.8	63.2	55.3	58.7	99.7
Westbred 926	4	--	58.8	59.0	62.8	54.0	58.6	99.7
Grandin	5	55.8	57.7	59.7	63.3	56.0	58.5	99.4
Olaf	5	58.1	58.6	59.1	62.0	54.7	58.5	99.4
Cutless	5	57.1	59.6	59.1	62.8	53.5	58.4	99.3
Stoa	5	57.8	58.9	58.0	62.3	53.2	58.0	98.6
Fortuna	5	58.3	59.3	58.3	60.5	52.8	57.8	98.3
Amidon	5	58.5	59.0	57.1	60.5	53.7	57.8	98.1
Gus	5	55.6	58.6	58.8	62.2	53.5	57.7	98.1
Len	5	54.4	58.0	58.4	62.8	54.0	57.5	97.7
Glenman	5	55.3	59.0	57.4	61.7	50.7	56.8	96.5

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, Newana.

Table 4. Relative heights of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Newana
Lancer	5	15	25	29	35	29	26.6	115.7
Grandin	5	19	26	24	31	28	25.6	111.3
Lew	5	16	24	25	33	29	25.4	110.4
Fortuna	5	16	24	23	34	30	25.4	110.4
Amidon	5	16	24	25	33	28	25.2	109.6
Stoa	5	15	23	26	31	29	24.8	107.8
MT 8849	2	--	--	--	30	28	29.0	107.4
Glenman	5	15	23	24	31	28	24.2	105.2
Len	5	15	24	24	30	27	24.0	104.3
Pondera	5	16	24	23	29	27	23.8	103.5
Olaf	5	13	22	25	30	27	23.4	101.7
Cutless	5	14	24	21	30	27	23.2	100.9
Newana	5	15	24	22	29	25	23.0	100.0
Hi-Line	5	15	21	24	28	25	22.6	98.3
Gus	5	15	20	22	29	26	22.4	97.4
Westbred 926	4	--	21	24	27	25	24.2	97.0
Westbred Rambo	5	12	22	22	30	25	22.2	96.5
Klasic	2	--	--	--	21	24	22.5	83.3

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, Newana.

Table 5. Relative protein contents of spring wheat varieties as compared to Newana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Newana
Gus	5	20.5	17.8	17.8	16.5	18.1	18.1	110.1
Cutless	5	20.0	17.2	17.9	16.5	17.8	17.9	108.5
Lancer	5	19.0	17.3	18.2	16.8	17.8	17.8	108.1
MT 8849	2	--	--	--	15.2	16.7	16.0	107.4
Hi-Line	5	20.1	17.6	18.1	15.9	16.7	17.7	107.3
Stoa	5	19.4	17.4	17.5	16.0	17.3	17.5	106.3
Pondera	5	20.4	17.4	18.2	14.7	16.8	17.5	106.2
Grandin	5	19.7	17.7	17.0	16.2	16.9	17.5	106.2
Len	5	20.5	16.9	17.4	15.6	17.1	17.5	106.2
Westbred 926	4	--	18.0	17.7	15.2	16.6	16.9	105.8
Lew	5	20.0	17.0	17.5	15.4	17.2	17.4	105.7
Olaf	5	19.0	17.2	17.7	15.9	16.9	17.3	105.2
Fortuna	5	18.9	16.1	17.4	17.3	16.5	17.2	104.6
Klasic	2	--	--	--	14.5	16.5	15.5	104.4
Amidon	5	19.0	16.4	17.3	15.4	16.6	16.9	102.8
Glenman	5	19.7	16.5	17.3	13.7	16.3	16.7	101.3
Westbred Rambo	5	18.5	16.7	17.5	14.5	16.1	16.7	101.1
Newana	5	18.6	16.4	17.7	14.0	15.7	16.5	100.0

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

Table 6 Agronomic data obtained from a dryland recrop durum nursery conducted at the Eastern Agricultural Research Center, Sidney, Montana, 1993.

Date Seeded: April 16, 1993 Date Harvested: September 9, 1993 Plot Size: 60 Sq. Ft.[1/]

Variety	Average Days to Heading[2/]	Average Height Inches	Average Protein Content %	Average Test Wt. Lbs/Bu	Average Yield Bu/Acre
Plenty	66	29	15.4	54.5	27.7 aa
Sceptre	66	27	16.0	54.7	27.4 aa
Cando	68	24	15.2	55.7	25.5
Monroe	64	29	15.3	55.3	24.4
Crosby	65	28	16.6	54.2	23.3
Ward	65	29	16.0	54.3	23.0
Renville	65	29	16.0	55.4	22.1
Vic	67	29	15.5	53.8	21.9
Lloyd	69	25	14.6	53.7	20.7
Medora	65	30	16.1	54.1	20.3
Laker	69	27	15.5	52.9	19.0 x
Stockholm	67	25	15.5	54.5	18.0 xx
Mean	66	27	15.7	54.4	22.8
F-Value	8.14	19.36	2.77	3.71	9.56
SE of the mean	0.55	0.45	0.31	0.41	1.00
LSD (0.05)	1.61	1.31	0.92	1.21	2.92
LSD (0.01)					3.98
CV (SE/Mean)	0.32	1.62	2.00	0.76	4.37
CV (s/Mean)	0.55	2.81	3.47	1.31	7.57

(Continued)

Table 6 (Continued) Agronomic data obtained from a dryland recrop durum nursery conducted at the Eastern Agricultural Research Center, Sidney, Montana, 1993.

Date Seeded: April 16, 1993 Date Harvested: September 9, 1993 Plot Size: 60 S.q Ft.[1/]

[1/] 3 row plots, rows 20 ft. long and 1 ft. apart. At harvest the entire plot was taken for yield, test weight and protein determinations.

[2/] Heading date is the number of days from planting date.

Ward is the check variety with an average yield of 23.0 Bu/Acre.

aa Indicates a significantly greater yield than check Ward at the 0.01 level of significance.
x Indicates a significantly lower yield than check Ward at the 0.05 level of significance.
xx Indicates a significantly lower yield than check Ward at the 0.01 level of significance.

Previous crop: Barley

Soil type: Williams Loam

Residual soil N: 179 lbs/acre to 3 ft.

Residual soil P: 61 lbs/acre to 6 inches.

Insecticide: None

Fertilizer: None

Herbicide: 1.5 pts/a Bronate was applied on May 26, 1993.

Precipitation for average crop year = 13.78 inches. Precipitation for 1993 crop year = 16.75 in. Crop year considered to be from October 1, 1992 through September 30, 1993.

Precipitation for April 1 - August 31 period during 1993 = 13.47 inches. Average precipitation for same period = 9.49 inches.

Table 7. Relative yielding abilities of durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Ward
Plenty	1	--	--	--	--	27.7	27.7	120.4
Sceptre	5	5.4	12.0	13.3	86.8	27.4	29.0	110.8
Renville	5	3.7	12.1	12.7	92.0	22.1	28.5	109.0
Lloyd	5	5.0	8.0	11.5	97.2	20.7	28.5	108.9
Stockholm	4	4.4	14.3	--	89.4	18.0	31.5	106.7
Westbred Laker	5	3.5	9.4	8.9	93.4	19.0	26.8	102.6
Crosby	5	6.2	8.3	13.3	80.9	23.3	26.4	100.9
Ward	5	4.4	14.2	12.6	76.6	23.0	26.2	100.0
Monroe	5	6.5	11.7	12.7	73.0	24.4	25.7	98.1
Vic	5	5.2	10.8	10.3	79.7	21.9	25.6	97.8
Medora	5	4.0	8.8	13.8	80.1	20.2	25.4	97.0
Cando	5	0.9	4.7	8.9	83.3	25.5	24.7	94.3

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, Ward.

Table 8. Relative test weights of durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Ward
Stockholm	4	57.9	60.3	--	64.0	54.5	59.2	101.7
Cando	4	***	58.5	58.6	64.5	55.7	59.3	101.5
Vic	5	58.4	59.9	58.9	62.8	53.8	58.8	101.1
Westbred Laker	5	56.7	61.7	59.8	62.8	52.9	58.8	101.1
Sceptre	5	57.3	59.2	57.9	63.2	54.7	58.5	100.6
Medora	5	57.7	59.2	57.8	63.3	54.1	58.4	100.5
Plenty	1	--	--	--	--	54.5	54.5	100.4
Renville	5	54.7	59.6	59.3	62.5	55.4	58.3	100.3
Ward	5	57.0	58.5	57.9	63.0	54.3	58.1	100.0
Crosby	5	56.6	58.7	57.8	63.2	54.2	58.1	99.9
Monroe	5	57.1	57.1	57.8	62.8	55.3	58.0	99.8
Lloyd	5	56.5	59.0	55.9	62.3	53.7	57.5	98.9

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare test weights only to the check variety, Ward. ***indicates not enough sample for test weight determination.

Table 9. Relative heights of durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Ward
Ward	5	17	23	24	32	29	25.0	100.0
Plenty	1	--	--	--	--	29	29.0	100.0
Medora	5	18	21	22	33	30	24.8	99.2
Crosby	5	17	23	22	33	28	24.6	98.4
Vic	5	16	22	23	33	29	24.6	98.4
Renville	5	15	22	24	32	29	24.4	97.6
Monroe	5	16	22	23	31	29	24.2	96.8
Westbred Laker	5	16	21	22	29	27	23.0	92.0
Sceptre	5	15	21	21	29	27	22.6	90.4
Stockholm	4	14	21	--	27	25	21.8	86.1
Lloyd	5	14	20	21	26	25	21.2	84.8
Cando	5	11	19	21	25	24	20.0	80.0

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, Ward.

Table 10. Relative protein contents of durum varieties as compared to Ward when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Ward
Renville	5	22.1	20.4	21.2	16.2	16.0	19.2	104.7
Crosby	5	21.6	20.4	19.9	16.3	16.6	19.0	103.5
Medora	5	20.9	20.7	20.1	16.4	16.1	18.8	102.8
Sceptre	5	21.6	20.3	20.1	15.3	16.0	18.7	101.9
Monroe	5	21.3	20.5	19.2	16.3	16.6	18.5	101.1
Ward	5	20.8	19.5	19.8	15.5	16.0	18.3	100.0
Vic	5	20.1	19.1	19.7	15.5	15.5	18.0	98.1
Cando	5	19.6	18.9	20.6	14.8	15.2	17.8	97.3
Westbred Laker	5	20.0	18.4	19.6	15.0	15.5	17.7	96.6
Plenty	1	--	--	--	--	15.4	15.4	96.2
Lloyd	5	20.4	19.0	20.4	13.2	14.6	17.5	95.6
Stockholm	4	20.2	17.9	--	15.0	15.5	17.2	95.5

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

Table 11 Agronomic data obtained from a dryland recrop spring barley nursery conducted at the Eastern Agricultural Research Center, Sidney, Montana, 1993.

Date Seeded: April 16, 1993 Date Harvested: August 4, 1993 Plot Size: 60 Sq. Ft.[1/]

Variety	Average Days to Heading[2/]	Average Height Inches	Average Protein Content %	Average Test Wt. Lbs/Bu	Average Yield Bu/Acre
Bearpaw	67	24	13.6	44.5	60.5 aa
Baronesse	67	23	13.1	47.0	52.6 aa
MT890008	68	22	13.0	44.0	50.0 a
MT860756	66	24	13.7	47.0	45.4
MT851032	66	24	13.4	46.5	43.5
Harrington	66	24	13.5	45.7	42.9
Piroline	63	28	14.8	47.5	42.4
Clark	66	25	13.3	46.8	41.9
Lewis	66	24	13.6	47.7	41.1
Hector	65	26	13.6	46.3	40.1
Gallatin	64	26	13.8	46.7	39.9
MT140523	66	24	14.0	46.3	39.8
MT851195	64	24	14.0	45.3	37.7
MT 81161	66	25	14.3	44.7	37.0
Steptoe	59	25	12.9	42.8	36.0
Colter	62	25	12.3	40.7	31.9 x
Stark	63	25	13.4	47.0	23.7 xx
Bowman	61	24	13.8	45.7	21.7 xx
Mean	65	25	13.6	45.7	40.5
F-Value	59.25	3.70	9.39	17.04	11.83
SE of the mean	0.30	0.69	0.18	0.44	2.67
LSD (0.05)	0.85	1.98	0.52	1.25	7.67
LSD (0.01)					10.37
CV (SE/Mean)	0.17	2.80	1.33	0.95	6.60
CV (s/Mean)	0.30	4.86	2.30	1.65	11.42

(Continued)

Table 11 (Continued) Agronomic data obtained from a dryland recrop spring wheat nursery conducted at the Eastern Agricultural Research Center, Sidney, Montana, 1993.

Date Seeded: April 16, 1993 Date Harvested: August 4, 1993 Plot Size: 60 S.q Ft. 1/

1/ 3 row plots, rows 20 ft. long and 1 ft. apart. At harvest the entire plot was taken for yield, test weight and protein determinations.

2/ Heading date is the number of days from planting date.

Gallatin is the check variety with an average yield of 39.9 Bu/Acre.

aa Indicates a significantly greater yield than check Gallatin at the 0.01 level of significance.
a Indicates a significantly greater yield than check Gallatin at the 0.05 level of significance.
x Indicates a significantly lower yield than check Gallatin at the 0.05 level of significance.
xx Indicates a significantly lower yield than check Gallatin at the 0.01 level of significance.

Previous crop: Barley

Soil type: Williams Loam

Residual soil N: 179 lbs/acre to 3 ft.

Residual soil P: 61 lbs/acre to six inches.

Insecticide: None

Fertilizer: None

Herbicide: 1.5 pts/a Bronate was applied on May 26, 1993.

Precipitation for average crop year = 13.78 inches. Precipitation for 1993 crop year = 16.75 in. Crop year considered to be from October 1, 1992 through September 30, 1993.

Precipitation for April 1 - August 31 period during 1993 = 13.47 inches. Average precipitation for same period = 9.49 inches.

Table 12. Relative yielding abilities of barley varieties as compared to Gallatin when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Gallatin
Baronesse	3	--	--	27.6	87.3	52.6	55.8	110.5
Lewis	5	18.3	26.1	30.5	93.3	41.1	41.9	108.1
Hector	5	20.2	21.6	28.6	89.1	40.0	39.9	103.0
Bearpaw	5	8.7	18.0	22.9	83.7	60.5	38.8	100.1
Gallatin	5	17.8	24.3	25.7	86.0	39.9	38.7	100.0
Clark	5	17.9	27.7	23.1	82.9	41.9	38.7	99.9
Steptoe	5	24.2	22.5	27.3	82.5	36.0	38.5	99.4
Piroline	5	17.2	22.9	25.2	82.3	42.4	38.0	98.1
Stark	4	--	22.2	20.2	95.3	23.7	40.4	91.8
Bowman	5	20.8	21.4	26.6	81.2	21.7	34.3	88.6
Harrington	5	7.5	15.1	20.3	84.5	42.9	34.1	87.9
Colter	1	--	--	--	--	31.9	31.9	79.9

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, Gallatin.

Table 13. Relative test weights of barley varieties as compared to Gallatin when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Gallatin
Lewis	5	47.5	49.1	50.4	53.5	47.7	49.6	101.4
Stark	4	--	50.2	50.9	53.2	47.0	50.3	101.3
Bowman	5	48.0	49.0	50.2	52.8	45.7	49.1	100.4
Gallatin	5	46.0	48.6	50.1	53.3	46.7	48.9	100.0
Hector	5	45.5	48.0	51.3	53.0	46.3	48.8	99.8
Clark	5	44.0	47.2	50.2	53.3	46.8	48.3	98.7
Baronesse	3	--	--	47.5	53.5	47.0	49.3	98.6
Piroline	5	43.0	48.2	48.1	53.7	47.5	48.1	98.3
Harrington	5	45.2	46.9	46.0	52.5	45.7	47.3	96.6
Bearpaw	5	45.5	47.7	46.1	51.8	44.5	47.1	96.3
Steptoe	5	39.0	41.9	47.1	48.2	42.8	43.8	89.5
Colter	1	--	--	--	--	40.7	40.7	87.2

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, Gallatin.

Table 14. Relative heights of barley varieties as compared to Gallatin when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Gallatin
Hector	5	20	18	24	28	26	23.2	105.5
Stark	4	--	20	23	27	25	23.8	102.2
Piroline	5	17	17	22	28	28	22.4	101.8
Gallatin	5	17	18	21	28	26	22.0	100.0
Bowman	5	19	19	20	28	24	22.0	100.0
Lewis	5	17	18	22	26	24	21.4	97.3
Steptoe	5	19	18	19	26	25	21.4	97.3
Clark	5	17	17	19	28	25	21.2	96.4
Colter	1	--	--	--	--	25	25.0	96.2
Harrington	5	15	16	22	26	24	20.6	93.6
Bearpaw	5	15	16	21	26	24	20.4	92.7
Baronesse	2	--	--	19	24	23	22.0	88.0

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, Gallatin.

Table 15. Relative protein contents of barley varieties as compared to Gallatin when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Gallatin
Piroline	5	20.6	17.0	15.8	13.3	14.8	16.3	105.8
Harrington	5	20.5	17.5	15.2	12.4	13.5	15.8	102.7
Bearpaw	5	21.4	16.7	15.1	12.2	13.6	15.8	102.6
Lewis	5	20.4	17.1	14.6	12.3	13.6	15.6	101.3
Hector	5	20.1	17.1	14.8	12.4	13.6	15.6	101.3
Clark	5	20.5	16.0	15.1	12.2	13.3	15.4	100.1
Gallatin	5	20.5	15.1	15.1	12.5	13.8	15.4	100.0
Stark	4	--	16.1	14.4	12.6	13.4	14.1	100.0
Baronesse	3	--	--	15.5	12.7	13.1	13.8	99.8
Bowman	5	17.6	17.3	14.2	13.0	13.8	15.2	98.6
Steptoe	5	14.2	15.9	13.3	12.4	12.9	13.7	89.2
Colter	1	--	--	--	--	12.3	12.3	89.1

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

Table 16 Agronomic data obtained from a dryland recrop spring oat nursery conducted at the Eastern Agricultural Research Center, Sidney, Montana, 1993.

Date Seeded: April 16, 1993 Date Harvested: September 9, 1993 Plot Size: 60 Sq. Ft. [1/]

Variety	Average Days to Heading [2/]	Average Height Inches	Average Protein Content %	Average Test Wt. Lbs/Bu	Average Yield Bu/Acre
Cayuse	67	33	12.4	34.0	139.8 aa
Appaloosa	68	32	12.3	31.8	128.6 aa
Monida	69	35	12.2	35.0	126.0 aa
Rio Grande	65	30	12.8	35.3	124.8 aa
Border	68	33	12.9	32.7	121.8 aa
Ajay	67	26	13.6	33.3	119.9 aa
Valley	67	31	13.9	35.3	110.0
Ogle	65	31	13.0	33.5	109.2
Troy	66	36	13.3	36.0	109.1
Riel	67	34	14.2	35.3	104.3
Newdak	64	34	13.7	34.3	99.0
Robert	69	34	12.9	35.3	98.6
Settler	63	30	14.5	37.7	98.2
Otana	67	37	13.2	36.2	96.3
Park	67	36	13.6	31.7	95.0
Derby	68	38	12.7	35.2	93.8
Calibre	69	37	13.3	33.2	88.6
Hytest	65	33	14.2	39.7	88.2
Mean	67	33	13.3	34.8	108.4
F-Value	19.95	19.45	10.59	22.37	6.64
SE of the mean	0.38	0.68	0.21	0.42	5.90
LSD (0.05)	1.10	1.96	0.60	1.21	16.96
LSD (0.01)					22.96
CV (SE/Mean)	0.22	2.05	1.57	1.21	5.44
CV (s/Mean)	0.39	3.54	2.72	2.09	9.43

(Continued)

Table 16 (Continued) Agronomic data obtained from a dryland recrop spring oat nursery conducted at the Eastern Agricultural Research Center, Sidney, Montana, 1993.

Date Seeded: April 16, 1993 Date Harvested: September 9, 1993 Plot Size: 60 S.q Ft. 1/

1/ 3 row plots, rows 20 ft. long and 1 ft. apart. At harvest the entire plot was taken for yield, test weight and protein determinations.

2/ Heading date is the number of days from planting date.

Otana is the check variety with an average yield of 96.3 Bu/Acre.

aa Indicates a significantly greater yield than check Otana the 0.01 level of significance.

Previous crop: Barley Soil type: Williams Loam

Residual soil N: 179 lbs/acre to 3 ft. Residual soil P: 61 lbs/acre to 6 inches.

Insecticide: None Fertilizer: None

Herbicide: 1.5 pts/a Bronate was applied on May 26, 1993.

Precipitation for average crop year = 13.78 inches. Precipitation for 1993 crop year = 16.75 in. Crop year considered to be from October 1, 1992 through September 30, 1993.

Precipitation for April 1 - August 31 period during 1993 = 13.47 inches. Average precipitation for same period = 9.49 inches.

Table 17. Relative yielding abilities of oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Otana
Troy	1	--	--	--	--	109.0	109.0	113.2
Appaloosa	5	26.2	23.6	31.3	155.6	128.6	73.1	110.1
Cayuse	5	25.8	18.3	38.5	142.6	139.8	73.0	110.0
Monida	5	21.5	23.2	32.1	159.8	126.0	72.5	109.3
Rio Grande	2	--	--	--	140.8	124.8	132.8	107.2
Border	5	23.6	25.9	32.7	151.0	121.8	71.0	107.0
Derby	2	--	--	--	159.0	93.8	126.4	102.1
Settler	1	--	--	--	--	98.2	98.2	102.0
Ajay	2	--	--	--	131.6	119.9	125.8	101.5
Newdak	2	--	--	--	151.0	99.0	125.0	100.9
Otana	5	24.8	27.9	31.3	151.4	96.3	66.3	100.0
Ogle	5	27.2	26.9	27.3	140.9	109.2	66.3	99.9
Riel	5	21.7	21.6	30.4	139.7	104.3	63.5	95.8
Calibre	5	11.0	17.0	30.0	165.7	88.6	62.5	94.2
Valley	4	22.4	--	29.9	122.5	110.0	71.4	93.7
Robert	5	19.9	15.1	29.1	146.3	98.6	61.8	93.2
Hytest	1	--	--	--	--	88.2	88.2	91.6
Park	5	16.3	17.8	26.6	132.9	95.0	57.7	87.0

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, Otana.

Table 18. Relative test weights of oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Otana
Hytest	1	--	--	--	--	39.7	39.7	109.7
Settler	1	--	--	--	--	37.7	37.7	104.1
Riel	5	33.5	35.0	35.7	38.0	35.3	35.5	103.3
Otana	5	28.0	34.0	36.4	37.2	36.2	34.4	100.0
Valley	4	30.0	--	34.4	38.0	35.3	34.4	99.9
Troy	1	--	--	--	--	36.0	36.0	99.4
Derby	2	--	--	--	34.5	35.2	34.8	95.0
Newdak	2	--	--	--	35.3	34.3	34.8	94.8
Rio Grande	2	--	--	--	34.2	35.3	34.8	94.7
Ogle	5	29.0	31.5	34.0	33.3	33.5	32.3	93.9
Robert	5	26.5	29.0	34.4	35.3	35.3	32.1	93.4
Monida	5	25.5	29.0	30.1	34.5	35.0	30.8	89.7
Ajay	2	--	--	--	32.3	33.3	32.8	89.4
Cayuse	5	24.5	28.5	29.8	34.5	34.0	30.3	88.1
Calibre	5	21.0	29.5	31.7	35.2	33.2	30.1	87.7
Border	5	24.0	29.0	30.9	32.2	32.7	29.8	86.6
Park	5	24.5	28.0	30.4	33.8	31.7	29.7	86.4
Appaloosa	5	24.5	27.5	30.2	33.2	31.8	29.4	85.7

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, Otana.

Table 19. Relative heights of oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Otana
Otana	5	20	21	25	38	37	28.2	100.0
Calibre	5	19	20	26	38	37	28.0	99.3
Derby	2	--	--	--	36	38	37.0	98.7
Troy	1	--	--	--	--	36	36.0	97.3
Park	5	18	19	26	37	36	27.2	96.5
Riel	5	20	19	26	36	34	27.0	95.7
Robert	5	18	19	27	35	34	26.6	94.3
Monida	5	17	19	24	36	35	26.2	92.9
Hytest	1	--	--	--	--	33	33.0	89.2
Cayuse	5	16	17	26	33	33	25.0	88.7
Newdak	2	--	--	--	32	34	33.0	88.0
Appaloosa	5	17	18	23	32	32	24.4	86.5
Ogle	5	18	19	23	30	31	24.2	85.8
Border	5	16	17	22	33	33	24.2	85.8
Valley	4	17	--	24	31	31	25.8	85.8
Settler	1	--	--	--	--	30	30.0	81.1
Rio Grande	2	--	--	--	28	30	29.0	77.3
Ajay	2	--	--	--	24	26	25.0	66.7

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, Otana.

Table 20. Relative protein contents of oat varieties as compared to Otana when grown under continuous cropping conditions at the Eastern Agricultural Research Center, Sidney, Montana, during the 1989-1993 period.

Cultivar	# of Years	1989	1990	1991	1992	1993	Ave	as % of Otana
Settler	1	--	--	--	--	14.5	14.5	109.8
Hytest	1	--	--	--	--	14.2	14.2	107.6
Ajay	2	--	--	--	12.9	13.6	13.2	104.3
Park	5	16.2	14.4	15.3	13.0	13.6	14.5	104.0
Riel	5	16.1	14.4	14.6	12.4	14.2	14.3	102.9
Newdak	2	--	--	--	12.4	13.7	13.0	102.8
Valley	4	15.8	--	14.6	12.7	13.9	14.2	102.7
Rio Grande	2	--	--	--	13.0	12.8	12.9	101.6
Troy	1	--	--	--	--	13.3	13.3	100.8
Robert	5	15.4	13.8	14.7	13.0	12.9	14.0	100.1
Otana	5	15.5	14.2	14.6	12.2	13.2	13.9	100.0
Border	5	15.6	14.0	14.5	12.7	12.9	13.9	100.0
Ogle	5	15.6	13.9	14.1	12.2	13.0	13.8	98.7
Appaloosa	5	15.9	14.0	14.4	12.1	12.3	13.7	98.6
Derby	2	--	--	--	12.3	12.7	12.5	98.4
Calibre	5	13.8	14.1	14.3	12.6	13.3	13.6	97.7
Cayuse	5	15.4	13.8	14.1	11.8	12.4	13.5	96.8
Monida	5	14.6	13.5	14.3	11.9	12.2	13.3	95.4

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