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The 11th

ANNUAL REPORT

of the

WESTERN TRIANGLE AGRICULTURAL RESEARCH CENTER

Montana Agricultural Experiment Station

Conrad, Montana

1988

Submitted by

Dr. Gregory D. Kushnak, Superintendent & Crop Scientist

and

Dr. Patrick Gallagher, Soil Scientist

MAES Research Report

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1988 Research Center Activities

Crop seminars featuring Western Triangle Research Center data were presented by the County Agents to Triangle Area Farmers at various locations in January. Off-station plot tours were conducted, in cooperation with Triangle Area County Agents and the Soil Conservation Service, in Glacier and Chouteau counties on June 22 and July 6, respectively. A Research Center field day was held July 12, with approximately 90 farmers and ranchers in attendance.

Special tours were held at the Research Center on March 15 for Conrad grade school students; June 21 for the Pondera Soil Conservation Service; and July 27 for the Glacier/Toole W.I.F.E. organization. On may 20, the Research Center hosted an ICPM field day, conducted by area County Agents.

Arne Benson, MSU graduate student, completed his M.S. thesis entitled "Influence of paired rows on growth, yield, and fertility requirements of no-till spring wheat." The study was conducted at the Western Triangle Research Center, using the no-till, paired-row planter constructed by Research Center Staff.

A 4-row no-till planter for testing grain varieties in stubble was constructed during the winter by Ron Thaut, Research Technician. The planter is much smaller and easier to use than the paired-row, fertilizer-banding drill constructed previously.

A plot-scale anhydrous and liquid fertilizer applicator for dual injection was fabricated. Most of the components were donated by other experiment stations.

An aphid suction trap was constructed at the Research Center to monitor the Russian Wheat Aphid. No Russian aphids were detected at the site until September.

Dr. Pat Gallagher was hired in February as the soils and cropping systems agronomist. Pat has extensive training in soil fertility, and has worked several years in Kansas with both University research and the fertilizer industry.

Other Research Center staff during 1988 included Dr. Greg Kushnak, Superintendent; Research Technicians Ron Thaut and Larry Christiaens; and Gladys Dunahoo, secretary (half-time). Temporary summer employees included Chris Norstrom, MSU graduate student; and Ross Moritz, Conrad H.S. student.

An Advisory Committee meeting was held March 1. Following is a list of Western Triangle Research Center Advisory Committee members:

Past Members

Richard Page, Bynum Teton Co.	1977-79
Dave Shane, Floweree, Cascade Co.	1977-82
Vade Hamma, Brady, Chouteau Co.	1977-82
Wilson Hodgskiss, Choteau, Teton Co.	1977-83
Don Buffington, Ledger, Liberty Co.	1977-83
Jerry Swenson, Cut Bank, Glacier Co.	1977-83
Karl Ratzburg, Ledger, Toole Co.	1977-84
Joe DeStaffany, Conrad, Pondera Co.	1977-84
Dale Vermulm, Cut Bank, Glacier Co.	1977-84
Jack Baringer, Conrad, Pondera Co.	1977-84
Bob LongCake, Shelby, Toole Co.	1982-84
Randy Weaver, Cut Bank, Glacier Co.	1982-84
Paul Kronebusch, Conrad, Pondera Co.	1977-85
Arnold Gettel, Power, Teton Co.	1980-85
Ted Neuman, Vaughn, Cascade Co.	1983-86

Current Members

Gary Iverson, Sunburst, Toole Co.
Dave Shane, Floweree, Cascade Co.
Bill McLean, Brady, Chouteau, Co.
Leif Larson, Choteau, Teton Co.
Miles Lewis, Cut Bank, Glacier Co.
Bruce Bradley, Cut Bank, Glacier Co.
Joe Larsen, Galata, Toole Co.
Bob Layne, Valier, Pondera Co.
Richard Thieltges, Chester, Liberty Co.
Bill Richter, Choteau, CES Representative (ex-officio)
Mark Grubb, Pondera Co.
Dave Gettel, Power, Teton Co.

Climatic summary for the 1988 calendar year at the Western Triangle Research Center, Conrad, MT.

	1988 Month												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Spt.	Oct.	Nov.	Dec.	Total or average
Precipitation (inches)	0.8	0.11	0.23	0.15	0.96	1.54	0.66	0.16	2.04	0.36	0.29	0.21	7.53
Mean Temperature (^{o}F)	23.3	21.0	34.9	45.4	57.3	66.5	68.4	66.7	55.7	46.6	33.0	26.0	45.4

Last killing frost in spring * ----------May 3 (29^{o})

First killing frost in fall * ----------September 12 (32^{o})

Frost free period ----------131 days

Maximum summer temperature ----------June 23 (96^{o})

Minimum winter temperature ----------January 5 (-13^{o})

In this summary, 32^{o}F is considered killing frost.

Soil moisture probe depth = 36" on fallow (or 6" available water); 6" on stubble (or 1" available water).

Summary of climatic data by months for the 1987-88 crop year (September thru August) at the Western Triangle Agricultural Research Center, Conrad, MT.

	Sept 1987	Oct 1987	Nov 1987	Dec 1987	Jan 1988	Feb 1988	Mar 1988	Apr 1988	May 1988	June 1988	July 1988	Aug 1988	Total or avg.
Precipitation (inches)	0.50	0.11	0.05	0.02	0.8	0.11	0.23	0.15	0.98	1.54	0.66	0.16	5.31
Mean Temperature (^{o}F)	61.6	47.6	38.2	29.0	23.3	21.0	34.8	45.4	57.3	66.5	68.4	66.7	46.7

Last killing frost in spring 1988*----------May 3 (29^{o})

First killing frost in fall 1988*----------September 12 (32^{o})

Frost free period 1988----------131 days

Maximum summer temperature----------June 23 (96^{o})

Minimum winter temperature----------January 5 (-13^{o})

* In this summary, 32^{o}F is considered a killing frost.

Soil moisture probe depth = 36" on fallow (or 6" available water); 6" on stubble (or 1" available water).

TITLE: Winter Wheat Variety Investigations

YEAR: 1988

LOCATION: Western Triangle Research Center, Conrad, Montana

PERSONNEL: Gregory D. Kushnak, Ron Thaut, and Larry Christiaens - Research Center, Conrad; Dr. Allan Taylor, MSU, Bozeman.

Winter wheat variety trials were grown at six locations in 1988: Conrad, Dutton, Chester, the "Knees Area", Sun River, and Eden (Tables 1-19). Three-year summaries are included.

Rainfall at Conrad, Dutton, and Sun River was somewhat below normal; while at the Chester and Knees locations, it was far below normal. Nearly all of the rainfall was received after the crop suffered considerable drought stress. Therefore, the yield results should be used to predict performance only for drought conditions. The Eden location had abundant moisture through the entire growing season.

The Knees location had a severe grasshopper infestation, damaging the varieties differentially. The yield data is presented as a point of interest, and should not be used to predict variety performance.

The late distribution of rainfall favored the late maturing varieties Norstar and Winridge at some locations. In past years, Norstar yielded lower than most other varieties at these locations.

Tiber, which yielded very high in the previous three years, ranked medium in 1988. The straw of Tiber was stiff, which may lend itself to slower residue breakdown - an advantage under the conservation compliance program. Tiber was later to head than Rocky, and thus may be more vulnerable to sawfly.

Judith, a new variety from MSU, ranked high at some locations. In the previous year, Judith had slightly higher protein than Centurk, and again in 1988. Judith headed as early as Rocky, which may be an advantage for this variety in sawfly areas.

The experimental lines marked with a star in the data tables are sawfly resistant. This is the first year of testing for these lines, and therefore little is known about their yield potential for average conditions.

These trials were conducted by the Western Triangle Research Center, Conrad and the Cooperative Extension Service, in Cooperation with Dr. Allan Taylor, Montana State University Plant and Soil Science Department.

The background and detailed descriptions of the varieties tested are included in Extension Bulletin 1098, "Performance Summary of Winter Wheat Varieties in Montana," available at all county agent offices.

Table 1. Winter wheat and winter triticale variety trials grown on no-till chem fallow at the Western Triangle Research Center, Conrad, 1988.

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	Head date	% Protein
QT 542	45.3	62.6	31	155	13.2
Winridge	41.6	60.8	23	158	11.7
Norstar	41.4	61.5	32	161	12.2
MT 88002*	41.4	57.9	23	158	10.3
Cree	41.3	61.9	25	156	13.2
Rocky	40.6	64.9	21	155	13.4
QTx1348	40.0	63.1	28	155	14.8
MT 88003*	40.0	58.3	25	159	10.8
Cheyenne	39.1	63.0	26	157	13.0
MT 86021	38.6	63.0	21	157	13.5
MT 7810	38.4	62.2	22	157	13.8
MT 87009	37.9	62.7	21	157	13.4
MT 84268	37.9	64.2	25	155	13.8
MT 86038	37.8	61.3	27	157	14.7
MT 86020	37.3	63.1	22	157	13.3
Neeley	37.1	62.5	24	158	14.1
Agassiz	36.8	62.9	26	157	14.2
MT 88004*	36.8	62.7	28	155	13.0
MT 79125	36.8	62.2	24	155	14.9
Winalta	36.4	64.3	27	156	15.3
Tiber	36.3	63.4	24	156	13.2
Seward	36.0	62.6	25	158	12.1
MT 85202	36.0	63.0	26	154	12.4
MT 85200	35.9	63.1	25	155	13.3
MT 86022	35.8	63.4	23	158	12.9
Centurk	35.4	64.3	26	155	12.4
MT 85203	35.0	64.1	21	157	11.1
MT 86036	35.0	60.9	28	158	14.2
MT 7811	35.0	62.9	24	157	13.8
MT 86032	34.0	63.2	24	155	13.1
Froid	33.4	62.7	27	157	12.7
Judith	33.3	62.4	24	155	12.6
MT 86003	32.9	63.6	21	156	13.5
Roughrider	32.9	63.1	26	155	15.8
Redwin	32.8	59.8	23	157	15.5
MT 86009	32.7	62.9	23	155	14.4

(continued)

Table 1. continued.

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	Heat date	% Protein
Norwin	31.5	64.6	21	157	15.5
Thunderbird	30.8	64.6	26	154	14.8
MT 86042	30.3	63.6	28	157	14.3
MT 88001*	30.3	64.2	21	159	14.9
MT 86029	30.2	63.1	25	157	13.9
MT 88007*	30.2	61.8	26	157	15.5
MT 86031	29.9	63.7	25	157	13.9
MT 88008*	29.7	61.5	26	158	13.9
NA 362-5 Abilene	29.0	64.4	23	154	17.7
MT 84458	28.8	64.2	20	155	15.7
MT 88005*	28.3	62.9	26	156	16.3
MT 88006*	27.8	61.0	25	156	16.4
MT 86007	27.3	62.7	22	157	15.5
Winter Triticale 1/ :					
Decade	47.4	53.4	33	154	12.4
I-18	39.7	53.6	34	153	12.7
#239	36.4	51.7	36	155	14.0

Location: Research Center, N. of Conrad
Date seeded: September 14, 1987
Seeding conditions: no-till chem-fallow; seed depth 1 inch; moisture probe 40".
Fertilizer: 100# 11-53-0 with seed + 40 N topdress.
Winter injury: none
Precipitation, planting to maturity: 5.07 inches, mostly received after crop showed signs of drought stress. Some late maturing varieties benefited from the late rains, while early maturing varieties did not.
Harvest date: July 19, 1988.
* Sawfly resistant lines.
1/ Triticale yield based on 50-pound test weight.

Table 2. Winter wheat and winter triticale variety trials grown on no-till chem fallow at the Western Triangle Research Center, Conrad, 1988. 2/

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	Head date	% Protein
Quantum-542	45.3	62.6	31	155	13.2
Winridge	41.6	60.8	23	158	11.7
Norstar	41.4	61.5	32	161	12.2
MT 88002*	41.4	57.9	23	158	10.3
Cree	41.3	61.9	25	156	13.2
Rocky	40.6	64.9	21	155	13.4
MT 88003*	40.0	58.3	25	159	10.8
Cheyenne	39.1	63.0	26	157	13.0
Neeley	37.1	62.5	24	158	14.1
Agassiz	36.8	62.9	26	157	14.2
MT 88004*	36.8	62.7	28	155	13.0
MT 79125	36.8	62.2	24	155	14.9
Winalta	36.4	64.3	27	156	15.3
Tiber	36.3	63.4	24	156	13.2
Seward	36.0	62.6	25	158	12.1
Centurk	35.4	64.3	26	155	12.4
Froid	33.4	62.7	27	157	12.7
Judith	33.3	62.4	24	155	12.6
Roughrider	32.9	63.1	26	155	15.8
Redwin	32.8	59.8	23	157	15.5
Norwin	31.5	64.6	21	157	15.5
Thunderbird	30.8	64.6	26	154	14.8
MT 88001*	30.3	64.2	21	159	14.9
MT 88007*	30.2	61.8	26	157	15.5
MT 88008*	29.7	61.5	26	158	13.9
MT 88005*	28.3	62.9	26	156	16.3
MT 88006*	27.8	61.0	25	156	16.4
Winter Triticale 1/ :					
Decade	47.4	53.4	33	154	12.4
I-18	39.7	53.6	34	153	12.7
#239	36.4	51.7	36	155	14.0

Location: Research Center, N. of Conrad
Date seeded: September 14, 1987
Seeding conditions: No-till chem-fallow; seed depth 1 inch; moisture probe 40".
Fertilizer: 100# 11-53-0 with seed + 40 N topdress.
Winter injury: none
Precipitation, planting to maturity: 5.07 inches, mostly received after crop showed signs of drought stress. Some late maturing varieties benefited from the late rains, while early maturing varieties did not.
Harvest date: July 19, 1988.
* Sawfly resistant lines.

Table 3. Three-year summary for winter wheat varieties grown at the Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 1986 - 1987 - 1988

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Neeley	66	30	62	
Centurk	63	32	63	
Rocky	62	30	63	
Cree	62	33	62	
Tiber	61	33	62	
Judith	60	30	61	
Cheyenne	60	34	62	
Winridge	60	31	59	
MT 7811	58	30	62	
MT 79125	58	30	61	
Redwin	57	32	62	
Agassiz	57	35	63	
Winalta	56	34	63	
Thunderbird	56	29	65	
Norstar	55	38	61	
Norwin	54	24	63	
Seward	54	31	61	
Roughrider	49	33	62	

Table 4. Winter wheat variety trial grown near Chester, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad.

Variety	Yield bu/a	Test wt. lb/bu	Plant hgt. inches	Spring survival class 1/	% Protein
Judith (MT 8039)	16.4	58.6	16	3	16.0
Cheyenne	15.0	60.1	14	3	15.8
Warrior	13.2	59.6	14	3	15.4
Cree	12.6	56.0	13	3	15.7
Wings	12.5	60.3	13		14.3
Redwin	11.6	53.1	14	3.5	16.4
MT 79125	11.4	57.4	14		15.7
Rocky	11.2	51.2	12	2	15.0
Tiber	11.1	50.7	14	3.5	15.5
Norstar	11.0	53.6	14	5	15.6
Archer	11.0	58.6	13	2	14.8
Neeley	10.9	49.9	15	3	15.1
Winalta	10.0	60.1	14	4	16.0
MT 88002*	9.6	54.8	14		14.3
Vona	9.4	59.9	12	1.5	13.8
MT 88001*	9.0	58.3	11		17.1
MT 88003*	8.6	49.5	14		13.4
Winridge	8.4	45.6	12	2	14.6
Centurk	8.4	48.4	13	2	14.4
MT 88007 *	7.9	52.7	15		16.6
MT 88008*	7.6	55.4	15		16.0
Thunderbird	7.6	60.1	11	2	15.8
MT 88005*	6.8	55.7	12		16.8
Norwin	6.6	57.4	13	5	15.4
MT 88004*	6.1	55.4	15		15.1
MT 88006*	5.7	52.0	12		17.8

Cooperator & location: Mike Violet, 10 miles south of Chester.
Date seeded: September 9, 1987
Date harvested: July 7, 1988
Previous crop: Fallow
Fertilizer: 11-51-0 actual with seed + 50 N Top.
Moisture probe depth at seeding: 36 inches
Rainfall, April to maturity: 2.8 inches.
1/ Spring survival class: 5=best, 1= very low; based on several location-years of observation.
* Sawfly resistant lines.

Table 5. Three-year summary for dryland winter wheat varieties grown near Chester, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Cheyenne	37	23	61	14.7
Neeley	36	22	56	14.7
Centurk	35	23	56	13.9
Tiber	35	21	57	14.8
Cree	34	21	59	14.9
Rocky	34	20	57	13.7
Redwin	34	21	58	15.6
Warrior	34	22	59	14.7
Judith	34	22	58	15.4
Norstar	33	23	58	15.1
Winalta	32	21	61	15.0
Archer	32	19	59	13.9
Norwin	31	16	60	14.5
Winridge	31	21	53	14.8
Wing	31	21	61	13.6
Thunderbird	31	20	61	15.2
Vona	26	18	63	13.2

Table 6. Winter wheat variety trial grown at the Knees east of Brady, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad.

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	Spring survival class 1/	% Protein
(Varieties immediately below suffered no grasshopper damage)					
MT 88004*	19.9	57.0	24		15.3
MT 88008*	19.6	60.5	21		14.8
MT 88005*	17.7	57.0	22		16.2
MT 88007*	15.9	53.7	21		16.8
MT 88006*	15.4	57.1	18		16.7
(Varieties immediately below suffered slight head loss to hoppers)					
Judith (MT 8039)	23.6	58.5	18	3	14.9
Vona	20.3	59.0	17	1.5	14.5
Wings	20.2	60.5	18		14.5
Winridge	18.8	55.8	20	2	14.8
Cree	18.6	59.5	19	3	15.9
Thunderbird	16.9	60.8	17	2	16.0
Neeley	12.8	51.4	16	3	15.8
MT 88001*	11.8	52.7	14		17.2
Norwin	11.6	53.1	17	5	14.3
Norstar	11.0	50.5	21	5	14.8
(Varieties immediately below suffered moderate head loss to hoppers)					
Cheyenne	19.0	59.8	22	3	15.5
Warrior	17.9	58.6	20	3	15.5
Archer	15.6	58.4	16	2	15.1
Redwin	14.6	59.6	21	3.5	16.3
Tiber	14.5	59.0	20	3.5	15.5
Winalta	11.8	54.5	20	4	15.2
Centurk	10.7	49.2	18	2	14.5
Rocky	10.3	47.2	16	2	15.1
MT 88002*	9.9	45.2	15		14.0
MT88003*	8.2	47.3	16		12.9
MT 79125	7.8	45.9	17		15.2

Cooperator & location: Dan Picard, 30 miles east of Brady.
Date seeded: September 6, 1987
Date harvested: July 6, 1988
Previous crop: fallow
Fertilizer: 11-51-0 actual with the seed and 50# AA-N.
Moisture probe depth at seeding: 40 inches
Rainfall, April to maturity: 1.64 inches
1/ Spring survival class: 5=best, 1=very low; based in several location-years of observation.
* Sawfly resistant lines.

Table 7. Three year summary for dryland winter wheat varieties grown near the Knees, 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Wing	43	24	64	13.7
Vona	43	23	62	13.3
Judith	41	27	59	13.5
Tiber	40	28	61	13.7
Warrior	39	28	61	14.2
Thunderbird	39	25	62	14.4
Winridge	39	27	59	13.5
Centurk	38	26	57	12.8
Rocky	38	26	57	13.8
Cree	38	27	62	14.2
Neeley	38	26	58	14.1
Cheyenne	37	28	62	13.9
Redwin	37	27	61	14.4
Norwin	35	21	59	12.7
Archer	34	22	61	13.9
Winalta	34	29	60	13.7
Norstar	33	30	57	14.0

Table 8. Winter wheat variety trial grown near Dutton, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad.

Variety	Yield bu/a	Test wt. lbs/bu	Plant hgt. inches	Spring survival class 1/	% Protein
Cree	45.9	60.8	27	3	14.7
Judith (MT 8039)	45.3	59.5	24	3	15.2
MT 88003*	43.6	60.1	22		12.6
Cheyenne	43.4	60.2	27	3	15.2
Neeley	41.5	62.2	23	3	15.3
Warrior	41.2	60.7	27	3	15.5
Norstar	41.2	61.9	29	5	13.9
Rocky	41.0	61.7	24	2	14.6
MT 88008*	41.0	61.0	28		15.5
Wings	40.9	62.0	23		15.0
Redwin	40.0	61.0	24	3.5	26.3
MT 88004*	39.4	59.7	29		14.8
Tiber	38.5	60.7	24	3.5	15 7
Centurk	37.6	61.4	24	2	14.9
Vona	36.4	61.2	22	1.5	14.2
MT 79125	36.0	59.9	22		15.8
MT 88007*	35.8	58.5	26		16.1
Archer	35.4	60.3	23	2	14.7
Winalta	35.2	61.6	27	4	16.0
MT 88002*	34.6	58.0	21		13.4
Winridge	34.4	60.1	25	2	14.2
Thunderbird	33.3	60.6	24	2	16.9
MT 88001*	33.2	61.1	20		16.0
MT 88005*	32.6	59.4	26		17.0
Norwin	31.3	62.2	21	5	15.2
MT 88006*	29.8	60.1	26		17.3

Cooperator: Darryl Goodmundson, 1 mile east of Dutton.
Fertilizer: 11-51-0 actual with seed + 80 AA actual
Previous crop: Fallow
Date seeded: September 9, 1987
Date harvested: July 18, 1988
Moisture probe depth at seeding: 40 inches
Rainfall, April to maturity: 4.2 inches
1/ Spring survival class: 5=best, 1=very low; based on several location-years of observation.
* Sawfly resistant lines.

Table 9. Three-year summary for dryland winter wheat varieties grown near Dutton, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Judith	51	27	60	13.2
Neeley	48	28	61	12.9
Cheyenne	47	31	60	12.3
Tiber	47	29	61	13.5
Redwin	46	29	61	14.1
Cree	45	31	61	12.7
Rocky	45	26	62	13.3
Centurk	44	27	61	11.9
Winridge	44	28	60	11.8
Norstar	44	35	61	11.9
Wing	43	26	61	13.7
Archer	42	24	60	13.1
Winalta	42	32	62	13.9
Thunderbird	41	26	61	14.9
Warrior	41	30	61	14.3
Vona	41	25	61	12.3
Norwin	40	23	62	12.7

Table 10. Winter wheat variety trial grown near Sun River, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, and Mont. Co-op Ext. Service.

Variety	Yield bu/a	Test wt. lb/bu	Plant hgt. inches	% Protein
Quantum-542	23.4	58.6	18	18.0
Quantum-555	22.0	58.4	14	16.9
Vona	20.2	59.4	15	16.5
Cree	19.3	61.3	18	17.7
Warrior	18.2	59.2	21	18.0
Rocky	18.1	60.5	18	17.9
Wings	17.9	59.8	16	16.8
Archer	17.9	59.1	17	17.8
Centurk	17.9	59.7	17	17.8
Judith (MT 8039)	14.6	58.3	18	18.6
Tiber	14.5	60.3	18	17.3
MT 88002*	14.2	55.4	16	16.6
Neeley	13.8	57.0	16	18.9
MT 88004*	13.7	59.1	21	17.4
Cheyenne	13.6	61.1	20	17.5
Redwin	13.5	60.5	15	18.2
MT 88007*	13.3	55.3	20	19.9
Winridge	12.5	59.2	17	17.1
MT 88008*	12.3	60.7	21	17.4
MT 88003*	11.6	56.5	18	16.6
Winalta	11.5	60.3	21	17.9
MT 88006*	11.4	57.9	19	19.1
Norwin	11.4	60.6	14	17.4
MT 88005*	11.2	58.8	21	18.7
Norstar	10.6	58.9	19	18.1
MT 88001*	8.3	57.8	14	19.3
MT 79125	8.2	59.2	18	17.8

Cooperator & location: Chuck Merja, 2 miles southeast of Sun River.
Date seeded: September 18, 1987
Date harvested: July 18, 1988
Previous crop: Fallow
Fertilizer: 6-26-0 actual with seed + 50# AA-N.

* Sawfly resistant lines.

Table 11. Three year summary for dryland winter wheat grown near Sun River, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Vona	33	19	59	14.7
Archer	31	22	58	15.1
Cree	30	25	61	15.0
Wing	29	22	61	14.8
Centurk	28	23	60	15.8
Tiber	28	23	61	15.6
Cheyenne	28	25	61	15.7
Rocky	27	22	60	15.6
Warrior	27	25	60	16.5
Neeley	27	22	59	15.3
Judith	25	23	58	16.6
Redwin	25	22	61	15.7
Winridge	24	23	59	15.7
Norstar	24	26	60	15.2
Norwin	24	18	61	14.7
Winalta	24	26	61	15.8

Table 12. Winter wheat variety trial grown near Eden, Cascade County, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, and Mont. Co-op Ext. Service.

Variety	Yield bu/a	Test wt. lb/bu	Plant hgt. inches	% Protein
Winridge	64.7	60.7	35	9.5
Quantum-524	62.2	61.5	35	10.3
Manning	62.1	62.2	33	9.8
Quantum-542	61.9	62.5	32	9.9
Quantum-555	61.0	61.4	29	9.2
Bounty-202	60.9	61.2	29	10.4
Neeley	60.4	62.1	33	9.5
Archer	57.4	59.8	32	9.7
Ram	57.0	59.6	28	9.9
Wings	55.9	62.3	31	10.5
Souixland	55.4	61.1	37	11.3
Tiber	55.2	62.8	34	10.6
CS-375	55.1	58.9	33	11.5
Cree	54.9	63.0	36	10.2
Hawk	53.9	61.7	31	10.0
Centurk	52.9	62.5	32	10.0
Cheyenne	52.8	63.0	35	11.2
CS-377	52.0	59.5	31	9.7
Bighorn	51.6	62.2	26	9.9
Quantum-515	51.4	61.8	34	11.0
Redwin	50.9	63.0	34	10.8
Warrior	50.9	62.2	34	11.0
CS-376	49.2	58.1	29	10.9
Thunderbird	47.9	62.9	30	11.0
Norstar	46.8	62.2	42	10.5
Norwin	46.7	62.9	26	12.2
Agassiz	44.5	62.2	38	10.8
Winalta	44.3	63.1	35	11.9
Roughrider	44.1	62.1	38	11.1
Winter Barley:				
Sprinter	47.4	42.9	22	
Luther	42.3	41.9	19	

Cooperator & location: Tom Lorang, Eden.
Date seeded: September 18, 1987
Date harvested: July 20, 1988
Previous crop: Fallow
Fertilizer: None

Table 13. Three-year summary for dryland winter wheat varieties grown near Eden, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Manning	54	30	63	8.9
Winridge	50	33	58	8.9
Tiber	50	33	62	9.7
Neeley	49	29	63	8.8
Bighorn	48	26	63	10.8
Cree	48	33	63	10.0
Siouxland	47	33	61	10.9
Hawk	47	29	62	9.2
Wing	47	29	63	10.0
Archer	47	29	61	9.6
Ram	45	28	61	9.3
Cheyenne	44	33	63	10.1
Norwin	44	24	63	10.6
Warrior	43	32	63	10.4
Norstar	43	37	62	10.3
Agassiz	42	35	63	9.8
Thunderbird	42	29	63	10.1
Winalta	41	33	63	10.7
Redwin	41	32	63	10.3
Centurk	41	31	63	9.2
Roughrider	40	36	62	10.5

TITLE: Spring Wheat, Durum, and Triticale variety investigations.

YEAR: 1988

LOCATION: Western Triangle Research Center, Conrad, MT.

PERSONNEL: Gregory D. Kushnak, Ron Thaut, and Larry Christiaens, Research Center, Conrad; and the MSU Dept. of Plant & Soil Science.

Dryland spring wheat, durum, and triticale variety trials were grown near Conrad, Cut Bank, Oilmont, Choteau, and Sun River; and irrigated trials at Conrad and Fairfield. Soil moisture on fallow was good during planting at most locations, contributing to fair yields in spite of the below-normal rainfall of 1988. Soil moisture on recrop was insufficient to support plant growth beyond the seedling stage; and therefore all recrop trials were lost. Irrigation at Conrad was delayed due to a damaged canal.

Data for the spring wheat tests at the various locations are presented in Tables 14-28. Three-year summaries are included. Substantial sawfly damage occured at Choteau and Conrad. Sawfly resistant varieties in the tests included three semidwarfs Glenman, Rambo and Cutlass; and four standard height varieties Lew, Fortuna, Lancer, and Amidon. Rambo and Amidon showed only partial resistance to sawfly in 1988. Amidon is a new release from North Dakota.

Among the sawfly resistant and semi-resistant varieties, Glenman and Rambo had the highest 3-year average yield at all locations except Choteau, where Lew ranked highest. Lancer yielded low at several locations, and exhibited very weak straw. Lancer, Fortuna and Cutlass generally ranked highest for protein, followed by Lew , Rambo, and Glenman.

Durum varieties were grown at the Conrad dryland and irrigated sites (Tables 29-31). The semidwarf types Stockholm, Lloyd, and Cando yielded the highest on both irrigated and dryland; followed by the medium-height Laker and Sceptre. Medora, a tall type, ranked high only on dryland.

Spring triticale trials were grown on dryland at Conrad, Cut Bank, Oilmont, and Choteau. Eight triticale varieties were tested: Karl and Kramer, two semidwarfs from North Dakota; Marval from South Dakota; Carman, Welsh, and Wapiti from Canada; Juan from California; and Whitman from Washington. Spring wheat was included in the trials for comparison.

Data from the four triticale tests are presented in Tables 32-35. Wapiti ranked high for yield at all locations, but its tall straw appeared weak. Juan and Whitman were too late to mature, resulting in very low yield and test weight at most locations. On a pounds/acre basis, the top yielding triticale variety at the respective locations yielded 90% of spring wheat at Cut Bank, 123% at Oilmont, and 144% at Conrad and Choteau.

The test weight of triticale averaged approximately 50 pounds/ bushel, and the yields were calculated on that basis. All varieties suffered moderate sawfly damage.

Ergot was not detected in the triticale plots. However, ergot has been observed in some fields of triticale in the Triangle area.

These trials were conducted by the MSU Western Triangle Research Center, Conrad and the Cooperative Extension Service, in cooperation with the MSU Plant and Soil Science Department.

The background and detailed descriptions of the varieties tested are included in MSU Extension Bulletin 1093, "Performance Summary of Spring Wheat Varieites in Montana," available at all County Agent offices.

Table 14. Advanced yield dryland spring wheat variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Head date	Plant height inches	Yield bu/a	Test wt.	% Protein	Sawfly damage 1/	Stem Solidness 2/
MT 8603	168	24	46.5	62.2	15.8	5	4.7
MT 8447	172	29	46.1	60.3	17.1	3	3.5
Stockholm durum	171	21	44.3	63.5	13.0	4	3.0
Butte 86	170	26	43.3	61.7	15.7	5	2.2
Copper	171	24	42.1	59.7	14.7	5	4.3
MT 7926*	170	25	42.0	54.1	15.7	4	4.0
MT 8602	168	26	41.8	62.5	15.5	5	3.6
MT 8626	168	25	41.7	62.6	14.3	5	4.0
Glenman*	172	25	40.6	58.2	15.1	3	3.8
Amidon*	171	26	40.4	61.2	16.3	3	3.3
MT 8612	171	25	40.4	62.5	16.3	5	2.1
Owens (s. white)	169	24	39.1	61.2	12.1	5	2.1
MT 8407	169	26	38.3	60.9	16.9	3	4.2
Ward durum	168	25	38.3	62.3	15.5	4	3.3
MT 8632	171	24	38.1	59.5	15.3	5	2.3
MT 8652	171	27	38.0	62.2	15.5	5	3.6
MT 8615	171	25	37.5	61.5	16.0	5	3.2
MT 8537	171	25	37.4	62.2	16.4	5	2.6
MT 8515	172	27	37.3	60.3	17.4	5	2.1
MT 8402	169	26	37.1	62.2	15.0	5	2.1
Rambo*	171	23	37.1	62.5	15.4	4	3.3

(continued)

Table 14. Advanced yield dryland spring wheat continued.

Variety	Head date	Plant height inches	Yield bu/a	Test wt.	% Protein	Sawfly damage 1/	Stem Solidness 2/
MT 8625	168	24	37.1	60.5	15.5	5	2.7
MT 8653	168	27	37.0	61.0	16.4	5	3.0
MT 8661	171	25	36.9	61.3	14.9	5	2.3
Treasure (s. white)	172	23	36.8	60.6	11.9	5	2.3
Newana	173	25	36.5	57.5	15.9	5	2.0
MT 8608	171	24	36.5	63.0	15.1	5	1.6
MT 8627	170	25	36.4	58.6	15.5	5	2.0
Lew*	171	26	35.6	61.5	15.4	2	4.3
MT 8645	168	26	35.3	61.1	16.3	5	2.3
Cutlass*	173	26	35.0	62.1	16.4	2	3.8
MT 8658	167	26	35.0	61.4	16.5	5	3.8
MT 8609	168	25	34.9	60.5	15.4	5	2.2
Fortuna*	169	25	34.8	61.8	17.1	1	4.8
MT 8641	168	24	34.3	60.8	15.2	5	2.5
MT 8651	171	26	34.0	61.5	15.8	5	3.1
Crosby durum	170	27	34.0	62.7	15.4	5	3.0
Lancer*	169	27	33.6	61.1	16.5	1	4.4
MT 8631	168	24	33.3	63.2	16.6	5	3.3
MT 8657	168	22	33.3	61.5	16.3	5	1.9
Pondera	170	23	32.7	62.5	15.4	5	2.4
MT 8429	171	25	32.4	59.7	17.2	5	2.6

(continued)

Table 14. Advanced yield dryland spring wheat cont.

Variety	Head date	Plant height inches	Yield bu/a	Test wt.	% Protein	Sawfly damage 1/	Stem Solidness 2/
MT 8182 (H. white)	171	23	32.1	60.3	14.9	5	2.4
MT 8424	171	25	31.5	61.7	15.7	5	1.7
MT 8648	172	24	30.9	60.1	17.2	5	2.1
MT 8621	169	23	30.9	60.5	16.7	5	2.7
Thatcher	170	27	30.8	57.8	15.5	5	2.5
MT 8619	169	26	28.5	58.4	16.8	5	2.0
MT 8624	171	25	25.2	56.9	17.6	5	2.6

Location : Research Center, Conrad.
Seeding date : April 11, 1988
Harvest date : August 2, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
* Sawfly resistant varieties
Soil moisture probe at seeding : 36"
Rainfall from seeding to ripening : 2.68"
1/ Sawfly damage : 1 = slight; 5 = severe.
2/ Stem solidness : 1 = hollow; 5 = solid.

Table 15. Dryland spring wheat variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 3/

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein	Head date	Sawfly damage 1/	Stem Solidness 2/
Stockholm durum	21	44.3	63.5	13.0	171	4	3.0
Butte 86	26	43.3	61.7	15.7	170	5	2.2
Copper	24	42.1	59.7	14.7	171	5	4.3
MT 7926*	25	42.0	54.1	15.7	170	4	4.0
Glenman*	25	40.6	58.2	15.1	172	3	3.8
Amidon*	26	40.4	61.2	16.3	171	3	3.3
Owens (s. white)	24	39.1	61.2	12.1	169	5	2.1
Ward durum	25	38.3	62.3	15.5	168	4	3.3
Rambo*	23	37.1	62.5	15.4	171	4	3.3
Treasure (s. white)	23	36.8	60.6	11.9	172	5	2.3
Newana	25	36.5	57.5	15.9	173	5	2.0
Lew*	26	35.6	61.5	15.4	171	2	4.3
Cutlass*	26	35.0	62.1	16.4	173	2	3.8
Fortuna*	25	34.8	61.8	17.1	169	1	4.8
Crosby durum	27	34.0	62.7	15.4	170	5	3.0
Lancer*	27	33.6	61.1	16.5	169	1	4.4
Pondera	23	32.7	62.5	15.4	170	5	2.4
MT 8182 (h. white)	23	32.1	60.3	14.9	171	5	2.4
Thatcher	27	30.8	57.8	15.5	170	5	2.5

Location : Research Center, Conrad.
Seeding date : April 11, 1988
Harvest date : August 2, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
* Sawfly resistant varieties
Soil moisture probe at seeding : 36 inches
Rainfall from seeding to ripening : 2.68 inches
1/ Sawfly damage : 1 = slight; 5 = severe.
2/ Stem solidness : 1 = hollow; 5 = solid.
3/ Abbreviated list from advanced yield trial.

Table 16. Three-year summary for dryland spring wheat varieties grown at Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 1986 - 1987 - 1988.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Stockholm	61	23	65	12.1
MT 7926	61	30	60	13.5
Copper	58	25	61	13.9
Glenman	57	26	60	13.7
Owens	56	25	61	11.2
MT 8402	55	26	65	14.7
Rambo	54	27	63	14.3
Lew	54	30	62	13.8
Fortuna	53	29	62	14.9
Treasure	52	24	59	12.1
Newana	52	26	59	13.9
Amidon	52	29	61	14.5
Pondera	52	25	63	14.7
Ward	51	31	62	13.7
Crosby	50	29	63	14.2
Cutlass	48	27	62	15.7
Butte 86	47	27	62	15.0
Thatcher	46	31	60	13.6
Lancer	44	31	62	14.5

Table 17. Advanced yield irrigated spring wheat trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Head date	Plant height inches	Yield bu/a	Test wt.	% Protein	Stem Solidness 1/
Stockholm durum	168	26	65.6	63.0	13.5	3.6
Amidon*	171	34	64.9	62.2	14.2	2.8
Owens (s. white)	168	24	61.4	61.7	11.8	1.8
Glenman*	170	30	60.6	61.7	15.0	3.1
Rambo*	170	28	59.4	62.5	15.4	2.8
Copper	169	27	58.8	62.2	14.4	3.0
Pondera	169	29	58.4	62.6	15.1	4.4
MT 8615	168	28	58.4	62.9	15.0	2.8
MT 8603	167	28	57.5	62.7	14.6	3.6
MT 8648	170	29	56.8	62.6	15.7	1.8
Newana	171	28	56.6	61.7	15.1	1.7
MT 8537	169	30	56.2	63.3	15.3	2.1
MT 8631	169	26	56.1	62.7	16.5	2.6
Treasure (s. white)	171	27	55.6	60.3	11.2	2.0
MT 8402	168	27	55.5	63.1	15.6	2.2
MT 8182 (H. white)	168	27	55.4	59.8	13.8	2.0
MT 7926*	170	32	55.3	62.9	14.1	4.3
MT 8652	169	27	55.0	62.7	15.2	3.0
MT 8658	168	27	54.9	61.8	14.7	3.5
Cutlass*	169	30	54.9	62.1	16.6	5.0
MT 8447	169	33	54.7	62.8	15.5	4.6
MT 8612	167	27	54.7	63.4	15.6	3.2
MT 8625	171	28	54.2	61.0	15.5	2.0
MT 8651	169	30	54.2	62.4	14.7	2.8
MT 8619	169	28	53.5	61.4	16.4	1.4
Crosby durum	167	35	53.2	62.3	15.1	2.5
MT 8645	169	29	53.2	62.2	15.9	1.9

(continued)

Table 17. Advanced yield irrigated spring wheat continued.

Variety	Head date	Plant height inches	Yield bu/a	Test wt.	% Protein	Stem Solidness 1/
MT 8641	168	27	52.4	61.7	15.9	3.0
MT 8602	168	27	52.4	62.3	15.0	2.8
MT 8608	169	27	52.3	62.7	15.1	2.0
MT 8424	168	27	52.2	62.8	14.4	2.2
Lew*	169	33	52.0	63.2	15.7	4.2
MT 8632	169	28	51.7	62.1	15.2	1.7
Butte 86	167	34	51.4	62.1	15.6	1.5
MT 8627	168	28	50.9	61.8	15.8	2.3
Ward durum	168	32	50.5	61.6	15.2	2.0
MT 8407	168	36	50.3	61.4	16.1	3.7
MT 8429	170	32	50.0	61.7	16.6	1.7
MT 8515	169	30	49.6	61.6	16.1	1.9
MT 8626	168	26	49.0	61.9	14.9	3.4
MT 8653	168	31	48.5	63.3	16.7	2.4
Fortuna*	168	32	46.9	62.6	16.5	4.8
Thatcher	170	33	46.9	60.9	15.3	2.4
Lancer*	169	33	46.7	62.0	17.3	2.4
MT 8609	168	27	46.6	60.9	15.8	2.5
MT 8661	170	26	46.5	62.2	15.4	2.4
MT 8657	168	25	45.3	60.8	16.4	2.1
MT 8624	171	30	44.7	60.3	16.4	1.6
MT 8621	169	26	44.1	62.3	16.6	1.7

Location : Research Center, Conrad.
Seeding date : April 13, 1988
Harvest date : August 9, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
* Sawfly resistant varieties
Irrigation method : Sprinkler ; June 15, June 28, July 15 ; 2-inches per date, plus 2.68 inches rainfall.
1/ Stem solidness : 1 = hollow; 5 = completely solid.

Table 18. Irrigated spring wheat trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 1/

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein	Head date
Stockholm durum	26	65.6	63.0	13.5	168
Amidon*	34	64.9	62.2	14.2	171
Owens (s. white)	24	61.4	61.7	11.8	168
Glenman*	30	60.6	61.7	15.0	170
Rambo*	28	59.4	62.5	15.4	170
Copper	27	58.8	62.2	14.4	169
Pondera	29	58.4	62.6	15.1	169
Newana	28	56.6	61.7	15.1	171
Treasure (s. white)	27	55.6	60.3	11.2	171
MT 8182 (h. white)	27	55.4	59.8	13.8	168
MT 7926*	32	55.3	62.9	14.1	170
Cutlass*	30	54.9	62.1	16.6	169
Crosby durum	35	53.2	62.3	15.1	167
Lew*	33	52.0	63.2	15.7	169
Butte 86	34	51.4	62.1	15.6	167
Ward durum	32	50.5	61.6	15.2	168
Fortuna*	32	46.9	62.6	16.5	168
Thatcher	33	46.9	60.9	15.3	170
Lancer*	33	46.7	62.0	17.3	169

Location : Research Center, Conrad.
Seeding date : April 13, 1988
Harvest date : August 9, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed.
* Sawfly resistant varieties
Irrigation method : Sprinkler; June 15, June 28, July 15;
2 inches per date, plus 2.68 inches rainfall.
1/ Abbreviated list from advanced yield trial.

Table 19. Three-year summary for irrigated spring wheat varieties grown at the Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 1986 - 1987 - 1988.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Stockholm	83	27	63	12.9
Treasure	80	29	58	11.4
Glenman	79	32	62	14.3
Copper	79	29	62	13.9
Amidon	79	36	62	14.2
Owens	75	26	62	11.3
Newana	75	28	62	14.2
Rambo	73	30	63	14.2
Lew	73	36	63	15.2
MT 8402	69	28	63	13.1
MT 7926	69	35	63	14.3
Fortuna	68	35	63	14.7
Pondera	68	30	63	14.7
Crosby	67	34	63	14.6
Ward	65	35	62	14.2
Cutlass	63	31	62	15.6
Thatcher	62	37	61	14.3
Butte 86	59	33	62	14.8
Lancer	58	35	62	16.6

Table 20. Spring wheat variety trial north of Cut Bank, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt. lbs/bu	% Protein
Glenman*	26	34.7	56.0	14.6
Olaf	24	33.8	57.7	15.6
Len	25	33.7	57.4	14.9
Newana	25	33.1	58.1	16.1
Rambo*	25	33.0	59.8	14.8
Alex	31	32.7	58.7	15.2
Lancer*	31	32.6	58.9	16.1
Cutlass*	26	32.3	58.7	15.6
Owens (s. white)	25	32.0	57.2	13.0
Westbred 906R	25	31.8	58.0	16.4
Treasure (s. white)	24	31.5	55.2	14.1
MT 7926*	28	30.9	59.1	14.3
MT 8402	27	30.7	57.2	16.2
Lew*	30	30.5	57.9	15.4
Marshall	24	30.4	57.2	15.1
Copper	26	29.8	57.9	15.1
Stoa	26	29.6	56.2	16.0
Butte 86	30	29.4	57.8	15.0
Fortuna*	30	29.0	59.4	15.8
Pondera	25	28.7	58.1	15.7

Cooperator & location : Don Bradley, 14 miles north of Cut Bank, Glacier County.
Planting date : April 27, 1988
Harvest date : August 15, 1988
Previous crop : Fallow
Fertilizer : 100# 11-51-0 with the seed
Soil moisture probe depth at seeding : 30 inches
Rainfall, planting to maturity : 3.9 inches
* Sawfly resistant varieties

Table 21. Three-year summary for dryland spring wheat grown near Cut Bank, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Treasure	52	25	56	12.0
Olaf	47	26	60	14.4
Glenman	47	29	58	12.9
Copper	46	27	58	14.0
MT 7926	46	33	61	13.7
Alex	46	33	61	14.0
Owens	46	28	59	11.5
Westbred 906R	44	27	60	15.1
Marshall	44	26	59	13.4
Newana	44	27	60	13.7
Rambo	44	27	61	13.6
Len	44	28	59	13.2
MT 8402	43	29	59	14.9
Pondera	43	28	60	13.7
Lew	43	33	60	13.7
Fortuna	42	33	60	14.3
Butte 86	40	31	60	14.5
Cutlass	40	28	59	14.9
Stoa	40	30	59	14.4
Lancer	39	34	60	15.1

Table 22. Dryland spring wheat variety trial east of Oilmont, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein
Stoa	17	14.7	60.2	17.7
Marshall	16	14.2	60.1	16.8
Len	17	13.8	58.4	16.6
Copper	16	13.8	57.5	16.5
Glenman*	17	13.6	57.4	15.8
Rambo*	14	13.2	60.9	17.2
Butte 86	17	13.0	59.6	17.2
Olaf	15	12.8	59.2	17.9
Alex	21	12.8	61.0	18.0
Pondera	16	12.8	60.6	18.7
MT 7926*	17	12.0	56.1	17.1
Treasure (white)	15	12.0	58.5	15.0
Newana	13	11.5	60.1	18.5
Lancer*	17	11.5	57.8	17.1
Owens (white)	16	11.3	56.7	15.8
Fortuna*	16	11.1	59.2	17.6
Cutlass*	16	10.9	59.8	18.1
MT 8402	15	10.9	58.9	18.4
Westbred 906R	16	10.3	56.8	18.3
Lew*	16	10.0	59.4	18.0

Cooperator & location : Terry Alme, 8 miles east of Oilmont, Toole County.
Planting date : April 12, 1988
Harvest date : July 26, 1988
Previous crop : fallow
Soil moisture probe at planting : 40 inches
Rainfall, planting to maturity : 2.65 inches
* Sawfly resistant

Table 23. Spring wheat variety trial east of Choteau, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center,Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Protein
MT 7926*	25	24.0	57.6	12.9
Owens (s. white)	23	23.6	58.2	11.1
Copper	21	22.1	57.4	13.7
MT 8402	21	21.9	61.0	15.0
Lew*	27	21.4	58.9	14.3
Fortuna*	26	21.3	59.6	14.5
Westbred 906R	24	21.2	59.9	15.2
Stoa	24	21.1	58.7	14.2
Butte 86	26	20.9	60.4	14.1
Glenman*	23	20.1	55.8	13.1
Lancer*	28	20.0	59.8	14.5
Rambo*	21	19.8	55.0	13.2
Len	22	19.5	59.1	14.2
Cutlass*	21	18.8	60.3	15.4
Alex	24	18.4	58.4	14.6
Pondera	23	18.0	60.2	14.4
Treasure (s. white)	21	17.8	55.9	11.5
Olaf	23	17.7	57.9	14.4
Newana	21	15.9	55.5	13.9
Marshall	22	14.6	57.9	14.0

Cooperator & location : Herb Corey, northeast of Choteau, Teton County.
Planting date : April 6, 1988
Harvest date : July 25, 1988
Previous crop : Fallow
Fertilizer : 100# 11-51-0 with seed
Soil moisture probe depth at seeding : 40 inches
Rainfall, planting to maturity : 4.25 inches
* Sawfly resistant varieties

Table 24. Three-year summary for dryland spring wheat grown near Choteau, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Owens	38	26	59	11.1
MT 7926	35	29	60	12.8
Lew	35	32	60	13.8
Rambo	33	24	60	13.2
MT 8402	33	24	62	14.7
Pondera	33	26	62	14.1
Treasure	32	22	58	11.2
Fortuna	32	31	61	14.5
Westbred 906R	32	27	61	14.9
Copper	31	23	59	13.6
Glenman	30	25	59	12.8
Stoa	30	29	55	14.2
Len	30	25	61	13.2
Alex	29	28	61	14.1
Newana	28	25	59	14.0
Marshall	28	23	61	13.5
Lancer	27	31	61	14.7
Butte 86	27	29	61	14.0
Olaf	27	26	59	14.1
Cutlass	26	27	61	15.1

Table 25. Irrigated spring wheat variety trial north of Fairfield, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt. lbs/bu	% Protein
Owens (s. white)	25	72.0	59.9	12.4
Rambo*	25	70.8	60.1	15.5
Pondera	23	61.9	59.6	15.1
Stoa	27	61.5	59.9	16.0
Treasure (s. white)	23	60.2	60.1	12.8
MT 7926*	27	60.1	57.7	13.9
Glenman*	24	60.0	53.3	15.4
Len	24	58.0	60.7	15.4
MT 8402	25	57.3	59.8	15.6
Marshall	23	57.2	57.6	15.9
Lew*	28	57.0	61.1	16.2
Newana	22	56.3	60.7	14.8
Fortuna*	27	55.7	59.1	15.9
Butte 86	26	54.8	62.1	16.4
Lancer*	29	54.3	60.8	17.3
Westbred 906R	24	54.6	59.1	14.4
Cutlass*	23	53.9	61.0	17.2
Alex	24	53.8	57.9	16.5
Copper	22	53.0	57.2	15.2
Olaf	27	52.2	61.3	15.4

Cooperator & location : Al Meyer, north of Fairfield, Teton County.
Planting date : April 18, 1988
Harvest date : August 10, 1988
Previous crop : Barley
Fertilizer : 110-60-40-10 worked in
Irrigation method : Flood
* Sawfly resistant varieties

Table 26. Three-year summary, irrigated spring wheat varieties grown near Fairfield, MT. 1985 - 1986 - 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Treasure	98	30	53	10.6
Owens	94	31	59	13.4
Nordic	93	33	60	12.3
Marshall	92	30	60	12.2
Wheaton	91	31	61	11.2
Norak	91	30	63	12.8
Rambo	90	31	61	12.5
Alex	89	35	62	13.3
Newana	86	30	61	12.0
Len	85	30	60	11.8
Copper	83	28	60	13.1
Glenman	82	30	60	12.3
Stoa	82	36	61	12.3
Success	82	34	60	11.0
NK 751	79	29	61	12.1
Lew	78	35	63	12.4
Cutlass	78	34	61	13.7
Pondera	78	29	61	12.9
Telemark	76	29	61	13.4
Pioneer	74	30	62	12.6
Lancer	72	39	62	13.6
Fortuna	72	35	61	13.5
Butte 86	70	32	61	14.2

Table 27. Dryland spring wheat and triticale variety trial south of Sun River, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad; and Mont. Co-op Extension Service.

Variety	Plant height inches	Yield bu/a	Test wt. lbs/bu	% Protein
NK 751	17	13.3	53.0	20.2
Westbred Challenger	20	13.3	56.1	20.0
Westbred 906R	20	12.1	56.0	20.8
WPB 926	18	11.7	56.1	20.6
Pondera	20	11.5	56.7	20.6
Wheaton	19	11.4	51.6	20.4
Rambo*	18	10.7	56.8	19.2
Bronze Chief	17	10.5	55.3	20.5
Owens (soft white)	18	10.3	55.0	17.4
Len	19	10.1	54.8	20.3
Amidon*	20	10.0	55.8	20.0
Newana	18	9.9	53.4	19.4
Lew*	21	9.4	55.7	20.0
McKay	21	9.4	50.0	19.8
Glenman*	20	9.1	52.3	19.5
Cutlass*	19	8.8	56.5	20.5
Stoa	20	8.6	53.8	20.4
Fortuna*	21	8.5	57.0	19.3
Alex	21	7.7	55	20.6
Leader*	20	7.2	55.4	19.7
Marshall	17	6.5	53.0	19.6
Thatcher	22	6.0	52.7	20.4
Triticale:		**		
Karl	20	14.4	45.8	16.7
Kramer	23	14.0	48.3	17.1
Welsh	25	14.0	44.0	16.2
Carman	25	11.1	45.0	18.0

Cooperator & location : Chuck Merja, southeast of Sun River.
Planting date : April 7, 1988
Harvest date : July 18, 1988
Previous crop : Fallow
* Sawfly resistant varieties
** Triticale yields based on 50 lb/bu test weight
Soil moisture probe at planting : 12 inches

Table 28. Three-year summary for dryland spring wheat grown near Sun River, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average			
	Yield bu/a	Height inches	Test wt.	% Protein
Len	27	22	59	16.7
Stoa	26	26	58	16.7
Pondera	26	24	59	17.2
Newana	25	23	58	16.1
Owens	25	22	58	15.3
NK 751	25	19	55	16.6
Marshall	25	22	57	15.9
Westbred Challenger	24	22	58	18.1
Glenman	24	23	55	15.7
Alex	23	24	58	17.3
Lew	23	25	59	16.6
Fortuna	23	27	59	18.0
Bronze Chief	20	19	57	18.6
Amidon	19	22	58	18.1
Rambo	18	20	58	17.7
McKay	17	24	52	17.9
Cutlass	17	21	59	18.6
Leader	13	22	57	17.8
Thatcher	11	25	55	18.5

Table 29. Dryland URDN Regional durum variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center,Conrad, MT.

Variety	Head date	Plant height inches	Yield bu/a	Test wt.	Sawfly damage 1/	% Protein
D84134	172	23	54.7	62.5	3	14.2
D8479	172	26	48.2	58.2	5	14.0
D8261	171	22	47.2	62.6	5	13.6
Renville	172	25	46.9	60.3	5	14.7
D8380	172	20	46.6	60.7	4	12.7
FA883323	171	27	45.0	61.7	4	14.4
D8370	172	21	43.9	62.4	3	14.4
Lloyd	172	21	43.2	59.9	4	14.4
D8374	171	21	43.1	62.8	5	13.5
D8459	169	24	42.3	60.9	4	14.4
Ward	171	26	40.9	62.4	4	15.1
Mindum	172	31	40.8	62.0	4	14.7
Stockholm	171	20	40.5	63.2	5	13.8
Medora	171	26	40.0	62.8	4	15.8
D8302	169	22	39.9	62.9	5	14.3
D8458	171	22	39.8	60.8	5	14.6
Monroe	168	26	39.1	62.9	5	14.6
D83103	172	22	38.5	62.2	5	13.6
Fjord	171	27	38.5	63.9	5	15.2
D8475	171	26	38.5	63.4	5	15.3
Stoa wheat	171	26	37.6	60.8	4	14.7
D8291	173	20	37.3	61.9	5	13.6
Rugby	168	23	37.3	63.3	5	15.1
Vic	171	26	37.1	61.7	4	14.5
D8460	171	24	35.9	62.0	4	15.1
Sceptre	171	21	34.4	63.1	5	15.5
D8434	168	24	33.6	63.5	4	15.0
D84130	172	21	30.5	63.4	5	14.8

Location : Research Center, Conrad.
Seeding date : April 11, 1988
Harvest date : August 2, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
Soil moisture probe depth at seeding : 40 inches
Rainfall from seeding to harvest : 2.68 inches
1/ Sawfly damage; 1 = slight; 5 = severe.

Table 30. Dryland durum variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Head date	Plant height inches	Yield bu/a	Test wt.	% Protein	Sawfly damage 1/
Stockholm	172	23	47.8	62.9	14.8	4
Medora	171	29	46.6	62.2	15.5	4
Cando	172	21	45.4	63.4	15.1	1
Lloyd	174	22	44.2	61.6	14.4	3
Laker	172	26	43.9	62.9	14.9	2
Sceptre	172	25	42.2	62.6	14.1	5
Ward	171	26	37.9	62.1	15.9	4
Crosby	171	28	37.4	62.0	16.7	5
Vic	172	28	36.1	61.8	16.0	5
Rolette	168	28	32.0	62.5	16.9	4

Location : Research Center, Conrad.
Seeding date : April 11, 1988
Harvest date : August 2, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed, and 40# N actual top dressed
Soil moisture probe depth at seeding : 40 inches
Rainfall from seeding to harvest : 2.68 inches
1/ Sawfly damage : 1 = slight; 5 = severe.

Table 31. Irrigated durum variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Head date	Plant height inches	Yield bu/a	Test wt.	% Protein
Stockholm	171	25	68.6	62.9	14.4
Lloyd	171	25	62.0	61.6	13.3
Cando	170	23	59.9	63.4	14.3
Laker	169	25	56.0	62.9	15.0
Sceptre	171	27	55.3	62.6	15.2
Ward	168	28	53.6	62.1	15.6
Vic	169	30	53.3	61.8	15.4
Medora	169	29	51.7	62.2	15.7
Crosby	168	32	49.3	62.0	16.3
Rolette	167	29	38.5	62.5	16.5

Location : Research Center, Conrad.
Seeding date : April 13, 1988
Harvest date : August 9, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed.
Irrigation method : Sprinkler; June 15, June 28, July 15;
2 inches per date; plus 2.68 inches rainfall.

Table 32. Dryland spring triticale variety trial north of Conrad, 1988.
Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Head date	Plant height	Yield bu/a 1/	Test wt.	% Protein	Sawfly damage 2/	Relative maturity
Juan	168	31	52.2	52.7	12.9	4	very late
Wapiti	168	31	49.6	55.3	12.7	3	late
T-59	168	26	49.3	53.4	13.1	4	medium
T-54	168	30	45.0	57.0	12.2	4	medium
T-61	168	28	44.3	56.5	12.8	4	medium
Marval	168	32	43.8	51.1	13.3	3	medium
Welsh	168	30	43.5	51.7	13.5	3	late
FF81T211	166	24	39.7	54.1	14.3	4	late
VT082478	172	28	38.1	49.1	14.1	4	late
VT082464	171	27	37.6	49.2	13.2	4	late
VT086497	178	25	36.9	40.1	13.5	4	late
Kramer	166	27	34.7	51.0	14.0	4	very early
FF83T103	167	25	33.6	53.8	12.8	4	late
Whitman	177	29	33.3	42.7	14.6	4	extreme late
Carman	167	27	32.9	50.3	14.7	4	early
Karl	166	25	31.7	53.4	13.5	4	early
VT086085	181	26	30.6	39.4	14.6	4	late
Newana wheat	172	24	29.0	61.9	15.6	5	early

Location : Research Center, Conrad
Planting date : April 11, 1988
Harvest date : August 9, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
Soil moisture probe depth at seeding : 40 inches
Rainfall, planting to maturity : 2.68 inches
1/ Triticale yield calculated on 50-lb test wt; spring wheat yeild calculated on 60-lb
2/ Sawfly damage : 1- slight; 5 = severe.

Table 33. Dryland spring triticale variety trial north of Cut Bank, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a 1/	Test wt. lbs/bu	% Protein	Relative maturity
Kramer	28	35.5	47.1	13.9	very early
Marval	35	34.0	45.9	13.7	medium
Wapiti	31	33.7	49.3	13.2	late
Carman	28	32.8	48.4	14.4	early
Welsh	31	31.0	48.1	14.5	late
Karl	23	29.7	48.3	14.1	early
Juan	31	23.7	46.9	13.7	very late
Whitman	29	18.3	33.9	16.1	extreme late
Newana wheat	25	33.1	58.1	16.1	early

Cooperator & location : Don Bradley, 14 miles north of Cut Bank, Glacier County.
Planting date : April 27, 1988
Harvest date : August 15, 1988
Previous crop : Fallow
Fertilizer : 100# 11-51-0 with the seed
Soil moisture probe depth at seeding : 30 inches
Rainfall, planting to maturity : 3.9 inches
1/ Triticale yield calculated on 50-lb test wt; wheat yield calculated on 60-lb.

Table 34. Dryland spring triticale variety trial east of Oilmont, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a 1/	Test wt. lbs/bu	% Protein	Relative maturity
Wapiti	21	17.2	54.0	14.6	late
Marval	21	14.9	49.1	15.7	medium
Welsh	17	14.8	53.8	15.8	late
Kramer	21	12.8	51.2	16.1	very early
Karl	16	12.2	52.2	16.3	early
Carman	19	10.4	49.8	16.5	early
Juan	16	7.3	44.4	16.1	very late
Whitman	19	7.0	37.9	16.7	extreme late
Newana wheat	13	11.5	60.1	18.5	early

Cooperator & location : Terry Alme, 8 miles east of Oilmont, Toole County.
Planting date : April 12, 1988
Harvest date : July 26, 1988
Previous crop : Fallow
Soil moisture probe depth at planting : 40 inches.
Rainfall, planting to maturity : 2.65 inches
1/ Triticale yield based on 50-lb/bu test weight.

Table 35. Dryland spring triticale variety trial east of Choteau, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a 1/	Test wt. lbs/bu	% Protein	Relative maturity
Wapiti	32	37.1	52.9	11.2	late
Marval	33	33.8	47.9	12.0	medium
Welsh	33	33.5	51.4	12.6	late
Kramer	29	28.9	51.1	13.2	very early
Karl	25	28.5	52.4	12.6	early
Carman	33	26.6	50.2	13.3	early
Juan	30	21.8	41.6	12.0	very late
Whitman	27	9.8	33.6	13.0	extreme late
Lew wheat	27	21.4	58.9	14.3	very early
Newana wheat	21	15.9	55.5	13.9	early

Cooperator & location : Herb Corey, northeast of Choteau, Teton County.
Planting date : April 6, 1988
Harvest date : July 25, 1988
Previous crop : Fallow
Fertilizer : 100# 11-51-0
Soil moisture probe depth at planting : 40 inches
Rainfall, planting to maturity : 4.25 inches.
1/ Triticale yield calculated on 50-lb test wt; spring wheat yield calculated on 60-lb.

TITLE: Barley Variety Investigations

YEAR: 1988

LOCATION: Western Triangle Research Center, Conrad

PERSONNEL: Gregory D. Kushnak, Ron Thaut, & Larry Christiaens, Research Center, Conrad, MT; Dr. Tom Blake MSU, Bozeman

Dryland barley variety trials were grown near Conrad, Cut Bank, Oilmont, Choteau, and Sun River; and irrigated trials at Conrad and Fairfield. Soil moisture on fallow was good during planting at most locations, contributing to fair yields in spite of the below-normal rainfall of 1988. Soil moisture on recrop was insufficient to support plant growth beyond the seedling stage; and therefore all recrop trials were lost. The trial at Sun River was lost to grasshoppers. Delayed irrigation at Conrad, due to a damaged canal, reduced yields somewhat.

Data for the various locations are presented in Tables 36-49, including 3-year summaries. The feed types Hector and Gallatin were among the top yielders across the dryland locations. Gallatin also ranked high on irrigated, indicating its wide adaptation to both wet and dry conditions. Bowman yielded similar to Gallatin only at the drier locations.

The malt types Harrington, Clark, and BA 1202 were similar for yield on irrigated, and produced considerably higher yields than Klages. On dryland, Clark, Harrington, and Kimberly ranked low at all locations except Conrad, where moisture was more favorable. BA 1202 was not tested in the dryland trials.

These trials were conducted by the MSU Western Triangle Research Center, Conrad and the Cooperative Extension Service, in cooperation with Dr. Tom Blake, Montana State University Plant and Soil Science Department.

The background and detailed descriptions of the varieties tested are included in MSU Extension Bulletin 1094, "Performance Summary of Barley Varieties in Montana," available at all County Agent offices.

Table 36. Dryland intrastate barley variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt	% Plump	% Thin	% Protein	Head date
MT 851032	21	64.9	52.1	93	2	13.1	179
MT 861596	20	63.1	52.7	88	6	14.2	178
Clark	21	63.1	50.0	86	8	13.6	179
MT 861626	20	62.7	52.4	94	3	13.6	178
MT 860189	19	62.6	51.1	88	6	14.4	181
MT 861426	21	62.5	52.2	90	6	14.2	181
MT 860326	20	62.1	53.9	90	5	14.3	178
MT 860839	20	61.3	53.6	96	2	13.8	179
MT 851051	21	60.8	49.8	90	4	14.4	179
Hector	22	60.7	48.0	84	10	14.8	179
MT 860463	19	60.5	51.0	88	6	14.7	178
Gallatin	22	60.3	52.5	92	4	14.2	178
MT 851031	22	60.2	50.6	92	4	13.9	181
MT 851013	22	59.7	52.6	93	3	14.2	178
MT 860224	23	59.5	52.9	92	3	14.7	181
Lewis	21	59.2	54.1	95	2	14.0	178
MT 860756	21	58.8	49.3	91	5	14.9	183
MT 81502	20	58.7	52.7	92	4	14.1	179
Piroline	22	58.2	52.9	88	4	14.9	169
MT 851177	18	58.0	52.6	94	3	13.7	179
MT 860186	20	57.6	49.8	90	5	14.8	181
MT 861044	21	57.4	51.9	96	2	14.6	178
MT 851224	21	57.3	51.0	91	5	15.0	180
MT 83533	20	57.1	50.9	92	4	14.2	179
MT 851088	20	57.1	52.7	93	2	14.1	179
MT 851195	21	56.6	52.4	91	5	14.3	178
Kimberly	21	56.4	51.7	90	4	14.4	181
MT 860461	21	56.4	51.5	93	3	13.7	181
MT 83422	22	56.3	50.7	85	7	13.3	183
MT 851216	20	55.9	51.0	93	3	15.3	179
MT 860767	19	55.9	50.7	92	4	15.4	179
Bowman	22	55.7	50.0	87	6	13.9	169
MT 851161	22	55.4	52.0	88	7	14.4	188
MT 861554	21	55.3	51.1	92	3	14.5	178
MT 861572	21	55.3	49.7	80	12	14.6	181
MT 860449	20	55.3	50.9	92	4	14.3	179

(continued)

Table 36. Dryland intrastate barley continued.

Variety	Plant height	Yield bu/a	Test wt	% Plump	% Thin	% Protein	Head date
Harrington	20	55.1	48.6	87	8	14.3	178
MT 851011	22	54.6	48.8	87	7	13.8	179
MT 851221	24	54.5	50.1	85	9	14.6	178
MT 851012	22	54.5	53.8	95	2	13.6	181
MT 851005	22	54.1	52.3	93	2	13.3	178
MT 83435	23	54.0	51.6	90	4	13.5	179
MT 81616	20	53.9	51.6	90	5	13.3	178
MT 83424	19	53.5	51.7	90	6	14.3	179
MT 861330	21	53.3	51.6	92	3	14.8	182
Klages	20	53.1	52.7	91	3	14.2	180
MT 860737	20	52.9	52.4	91	3	13.5	179
MT 83491	20	52.5	50.5	87	7	14.2	182
MT 860373	22	52.5	54.4	96	2	14.9	179
MT 860121	22	52.4	51.9	88	5	14.0	178
MT 860219	21	51.8	51.9	90	4	14.0	182
MT 83518	21	51.7	48.8	86	7	14.1	179
MT 140523	22	51.6	51.4	83	11	14.2	178
Nubet	22	51.4	53.4	48	14	15.1	179
MT 851039	22	51.1	50.0	87	7	14.0	178
Morex	20	50.4	50.9	90	3	13.2	172
Steptoe	20	49.6	48.0	94	2	13.0	169
MT 81161	21	47.8	48.0	83	9	13.8	178
MT 81143	22	47.4	50.7	88	7	15.5	178
MT 861183	22	47.1	51.9	91	4	13.4	178
MT 860188	21	46.4	49.0	82	9	15.1	179
Robust	22	46.4	50.5	92	3	13.5	170
Wanubet	21	44.0	55.0	47	13	16.8	182
Russell	20	43.4	49.5	84	8	13.7	169

Location : Research Center, Conrad.
Seeding date : April 11, 1988
Harvest date : August 9, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N. actual top dressed.
Soil moisture probe at seeding : 36 inches
Rainfall from seeding to ripening : 2.68 inches

Table 37. Dryland barley variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 1/

Variety	Plant height inches	Yield bu/a	Test wt	% Plump	% Thin	% Protein	Head date
Clark	21	63.1	50.0	86	8	13.6	179
Hector	22	60.7	48.0	84	10	14.8	179
Gallatin	22	60.3	52.5	92	4	14.2	178
Lewis	21	59.2	54.1	95	2	14.0	178
Piroline	22	58.2	52.9	88	4	14.9	169
Kimberly	21	56.4	51.7	90	4	14.4	181
Bowman	22	55.7	50.0	87	6	13.9	169
Harrington	20	55.1	48.6	87	8	14.3	178
MT 81616	20	53.9	51.6	90	5	13.3	178
Klages	20	53.1	52.7	91	3	14.2	180
Nubet	22	51.4	53.4	48	14	15.1	179
Morex	20	50.4	50.9	90	3	13.2	172
Steptoe	20	49.6	48.0	94	2	13.0	169
MT 81161	21	47.8	48.0	83	9	13.8	178
Robust	22	46.4	50.5	92	3	13.5	170
Wanubet	21	44.0	55.0	47	13	16.8	182
Russell	20	43.4	49.5	84	8	13.7	169

Location : Research Center, Conrad.
Seeding date : April 11, 1988
Harvest date : August 9, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed.
Soil moisture probe at seeding : 36 inches
Rainfall from seeding to ripening : 2.68 inches
1/ Abbreviated list from Intrastate trial.

Table 38. Three-year summary for dryland barley varieties grown at the Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 1986 - 1987 - 1988.

Variety	3-year comparable average					
	Yield bu/a	Height inches	Test wt.	% Plump	% Thin	% Protein
Lewis	91	27	54	95	2	12.8
Clark	89	25	52	91	4	12.8
Hector	88	28	52	90	5	13.0
MT 81616	87	25	51	89	5	12.4
Gallatin	87	26	53	92	3	13.2
Kimberly	86	27	51	90	3	13.5
MT 81161	81	26	50	86	6	12.9
Klages	81	27	52	75	9	13.3
Piroline	81	26	53	92	2	13.0
Harrington	79	27	50	88	5	12.5
Steptoe	77	25	47	94	2	11.5
Robust	77	30	52	95	2	12.8
Bowman	75	27	52	94	3	13.3
Nubet	74	27	53	49	11	14.0
Morex	71	28	51	92	2	12.5
Wanubet	68	27	56	46	9	15.1
Russell	62	25	50	85	6	12.7

Table 39. Irrigated intrastate barley variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt	% Plump	% Thin	% Protein	Head date
AC 117-11	20	101.8	51.9	96	1	11.0	181
MT 83533	28	101.7	53.3	98	1	11.7	172
MT 860219	23	101.5	54.3	98	1	11.7	178
Steptoe	21	99.8	49.2	96	1	10.6	168
MT 83435	26	99.6	53.2	97	1	13.2	172
MT 81616	25	99.4	51.8	93	3	12.3	177
MT 860756	24	98.9	53.7	97	1	13.6	176
MT 83422	25	98.7	52.9	97	1	11.7	178
Gallatin	28	98.0	52.4	95	3	13.3	172
MT 860737	26	97.2	53.6	98	1	13.1	172
MT 860463	24	97.2	52.2	94	2	11.4	172
MT 860224	26	97.1	54.0	97	1	13.1	179
MT 81143	26	96.7	54.2	98	1	12.2	172
MT 851224	23	96.4	51.9	97	1	12.5	179
MT 83424	23	96.2	53.6	97	1	11.6	177
MT 83518	25	96.0	53.5	94	2	13.3	172
MT 851177	34	95.9	53.7	95	1	11.6	177
MT 860189	24	95.3	51.4	97	1	11.9	178
MT 851216	27	95.0	51.5	99	1	12.2	169
MT 851011	25	94.4	52.1	95	1	12.4	179
MT 860326	26	93.9	53.8	95	2	13.5	172
MT 851051	25	93.6	52.7	94	2	11.8	172
MT 851013	29	93.4	52.9	92	3	13.3	178
MT 851161	25	93.5	52.7	93	2	12.2	176
MT 81161	24	93.2	52.2	97	1	13.8	169
MT851088	23	93.1	53.1	97	1	12.4	173
MT 860839	25	92.2	52.9	94	3	13.0	172
Lewis	26	91.9	54.3	97	2	12.2	173
MT 861626	28	91.6	52.4	95	2	10.7	172
Moravian III	25	90.7	53.5	90	4	12.1	178
MT 860186	23	90.3	53.1	95	2	12.0	178
MT 81502	25	90.3	52.9	93	3	12.6	173
MT 140523	26	90.2	52.8	96	2	13.9	169
Harrington	30	90.2	51.7	96	1	12.0	172
MT 861183	26	90.1	53.4	97	1	13.7	173
MT 851005	28	89.9	51.1	97	1	13.5	172

(continued)

Table 39. Irrigated intrastate barley continued.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein	Head date
Clark	28	89.7	51.9	97	1	12.5	178
MT 861426	24	89.5	52.1	87	6	13.1	177
MT 851012	26	88.9	53.1	92	4	11.9	173
BA 1202*	21	88.2	52.0	94	1	13.4	178
MT 83491	24	88.2	51.5	87	7	13.8	176
Hector	31	87.5	52.7	96	2	13.7	169
MT 851221	25	87.0	52.5	97	1	12.5	169
Bowman	27	86.8	52.0	98	1	13.2	169
MT 861596	26	86.5	52.0	89	6	13.3	173
MT 861572	24	86.2	53.6	96	1	12.8	178
MT 860373	26	85.5	53.6	96	2	12.6	178
BA 8529	28	85.1	51.2	90	4	13.4	178
Russell	24	84.8	52.3	94	2	12.3	168
MT 860449	25	84.2	51.2	93	3	12.3	177
MT 861554	24	83.8	50.1	95	2	13.2	173
MT 861330	27	83.2	52.8	97	1	13.7	172
MT 851039	24	83.2	52.7	95	2	12.4	173
Piroline	26	81.7	53.6	91	5	14.3	169
Klages	25	80.8	52.6	93	3	12.9	178
Triumph	22	80.3	51.9	95	3	13.0	188
MT 860121	26	78.9	52.2	91	4	12.4	172
Robust	26	78.9	50.2	94	1	13.5	168
Nubet	26	77.9	56.7	44	11	14.4	172
MT 851195	23	77.2	50.7	80	11	14.2	169
MT 851032	24	76.5	47.9	81	9	13.5	173
MT 851031	29	76.3	49.1	84	8	13.6	169
Morex	29	69.8	50.8	93	2	12.3	171
Wanubet	26	64.9	51.4	47	15	15.5	173

Location : Research Center, Conrad.
Seeding date : April 13, 1988
Harvest date : August 8, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
Soil moisture probe at seeding : 36 inches
Rainfall from seeding to harvest : 2.68 inches
Irrigation method : Sprinkler; June 15, June 28, July 15; 2-inches per date.
* BA 4039

Table 40. Irrigated barley variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 1/

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein	Head date
Steptoe	21	99.8	49.2	96	1	10.6	168
MT 81616	25	99.4	51.8	93	3	12.3	177
Gallatin	28	98.0	52.4	95	3	13.3	172
MT 81161	24	93.2	52.2	97	1	13.8	169
Lewis	26	91.9	54.3	97	2	12.2	173
Moravian III	25	90.7	53.5	90	4	12.1	178
Harrington	30	90.2	51.7	96	1	12.0	172
Clark	28	89.7	51.9	97	1	12.5	178
BA 1202*	21	88.2	52.0	94	1	13.4	178
Hector	31	87.5	52.7	96	2	13.7	169
Bowman	27	86.8	52.0	98	1	13.2	169
BA 8529	28	85.1	51.2	90	4	13.4	178
Russell	24	84.8	52.3	94	2	12.3	168
Piroline	26	81.7	53.6	91	5	14.3	169
Klages	25	80.8	52.6	93	3	12.9	178
Triumph	22	80.3	51.9	95	3	13.0	188
Robust	26	78.9	50.2	94	1	13.5	168
Nubet	26	77.9	56.7	44	11	14.4	172
Morex	29	69.8	50.8	93	2	12.3	171
Wanubet	26	64.9	51.4	47	15	15.5	173

Location : Research Center, Conrad.
Seeding date : April 13, 1988
Harvest date : August 8, 1988
Previous crop : No-till chemical fallow (barley stubble)
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
Soil moisture probe at seeding : 36 inches
Rainfall from seeding to harvest : 2.68 inches
Irrigation method : Sprinkler; June 15, June 28, July 15; 2 inches per date.
* BA 4039
1/ Abbreviated list from Intrastate trial.

Table 41. Three-year summary for irrigated barley varieties grown at Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT. 1986 - 1987 - 1988.

Variety	3-year comparable average					
	Yield bu/a	Height inches	Test wt.	% Plump	% Thin	% Protein
Steptoe	116	24	49	96	1	10.4
Harrington	108	31	52	94	1	11.3
Gallatin	107	30	53	95	5	11.7
MT 81616	107	30	52	93	3	11.5
Triumph	106	25	53	92	4	11.9
Lewis	105	29	54	96	2	12.1
Hector	103	34	52	94	3	12.4
MT 81161	103	27	52	95	2	12.7
Clark	103	29	52	93	4	12.5
Bowman	99	29	52	98	4	12.5
Moravian 3	99	28	54	92	3	11.9
Klages	98	28	52	88	5	12.1
Russell	97	27	52	94	2	13.7
Piroline	96	30	53	92	3	13.3
Nubet	89	29	57	44	10	11.7
Wanubet	79	29	54	66	9	13.8
Morex	74	31	51	93	2	12.0
Robust	70	31	51	93	2	12.5

Table 42. Western Regional dryland barley trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	Head date
Clark	20	61.3	51.4	92	4	179
MT 83422	18	60.9	50.7	93	3	179
Hector	22	60.3	51.7	87	7	179
MT 140523	21	59.9	51.0	88	7	179
ID 810274	21	59.4	51.3	89	5	179
ID 810099	21	57.8	50.0	92	4	179
ND 9870	23	57.8	51.6	96	2	179
WA 755283	20	57.2	51.5	87	6	169
ID 71966	20	56.9	48.3	91	4	169
MT 83518	21	56.8	51.0	97	1	179
MT 83435	21	56.3	50.5	89	6	181
WA 877178	21	56.0	51.4	88	6	178
Munsing	18	55.7	52.4	92	4	179
MT 83533	20	55.7	51.3	92	4	178
MT 83491	19	55.6	51.7	93	3	181
WA 701883	22	55.5	52.6	92	4	178
ND 10122	25	54.1	50.7	84	8	176
WA 102178	21	53.2	47.4	91	2	172
Steptoe	20	52.6	47.2	94	2	171
MT 83424	21	52.2	49.3	80	12	178
Lewis	21	50.2	51.2	75	14	178
ND 8671	21	49.7	47.8	87	8	170
Bowman	22	49.0	50.0	87	7	169
BA 280350	19	48.6	50.5	78	11	179
WA 777383	20	48.2	50.2	84	8	177
MT 81161	23	45.5	48.9	83	9	178

Location : Research Center, Conrad.
Seeding date : April 11, 1988
Harvest date : August 9, 1988
Previous crop : NO-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed and 40# N actual top dressed
Soil moisture probe depth at seeding : 36 inches
Rainfall from seeding to harvest : 2.68 inches

Table 43. Dryland barley variety trial north of Cut Bank, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
Hector	25	53.2	51.6	84	4	11.8
Steptoe	24	51.1	45.2	69	9	10.9
Piroline	22	50.5	52.2	76	4	13.0
Lewis	24	49.9	52.0	85	4	12.4
Gallatin	23	49.0	51.9	80	4	12.3
Bowman	24	48.8	52.4	96	1	12.0
MT 81616	22	48.6	51.1	83	3	12.7
MT 81161	22	47.1	50.2	75	7	12.1
Clark	22	44.2	50.4	73	8	12.6
MT 140523	23	43.3	51.4	80	4	13.9
Harrington	22	40.4	51.9	86	3	13.0
Kimberly	23	35.1	51.9	68	7	14.9

Cooperator & location : Don Bradley, north of Cut Bank, Glacier Co.
Planting date : April 27, 1988
Harvest date : August 15, 1988
Previous crop : Fallow
Fertilizer : 100 # 11-51-0 with the seed
Soil moisture probe depth at seeding : 30 inches
Rainfall, planting to ripening : 3.9 inches.

Table 44. Three year summary for dryland barley varieties grown near Cut Bank, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average					
	Yield bu/a	Height inches	Test wt.	% Plump	% Thin	% Protein
Steptoe	71	27	44	81	6	10.5
Lewis	68	27	51	81	7	11.6
Hector	67	28	53	86	4	11.4
MT 81161	67	26	50	81	6	11.7
MT 81616	65	27	50	83	5	12.8
Harrington	64	26	51	87	3	11.6
Gallatin	64	27	51	83	4	12.1
Piroline	64	27	52	76	3	12.7
Clark	62	26	50	80	6	12.0
Bowman	62	28	51	95	2	12.0
Kimberly	60	27	51	72	8	13.4

Table 45. Dryland barley variety trial east of Oilmont, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt. lb/bu	% Plump	% Thin	% Protein
Hector	17	21.1	49.2	26	29	17.3
Steptoe	14	20.1	39.7	19	51	13.8
Gallatin	14	18.9	50.5	34	25	18.3
MT 81161	16	18.7	50.5	46	20	17.0
Piroline	14	17.5	47.6	8	54	18.8
Bowman	17	17.0	49.2	49	16	16.7
MT 140523	17	16.4	49.3	30	31	18.9
MT 81616	15	13.5	48.1	60	14	18.0
Lewis	14	13.5	49.3	44	23	18.9
Clark	14	12.8	46.7	35	26	18.8
Harrington	16	10.1	47.5	45	20	19.1
Kimberly	15	2.3	34.2	27	47	19.2

Cooperator & location : Terry Alme, 8 miles east of Oilmont, Toole Co.
Planting date : April 12, 1988
Harvest date : July 26, 1988
Previous crop : fallow
Soil moisture probe at planting : 40 inches
Rainfall, planting to maturity : 2.65 inches.

Table 46. Dryland barley variety trial east of Choteau, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
Hector	23	45.6	53.4	70	7	12.4
Gallatin	23	44.7	53.1	70	7	12.3
Steptoe	22	43.3	47.4	60	13	11.1
Bowman	23	41.5	54.6	92	2	13.0
Lewis	23	39.1	53.3	69	9	11.8
Piroline	22	38.5	51.4	37	21	13.8
Harrington	22	37.6	52.9	79	6	12.1
MT 140523	22	36.4	53.4	74	7	11.5
MT 81161	23	36.2	51.9	75	7	12.4
MT 81616	21	35.9	52.2	77	6	12.5
Clark	20	34.6	50.9	51	19	12.9
Kimberly	21	32.4	53.7	71	9	12.9

Cooperator & location : Herb Corey, northeast of Choteau, Teton Co.
Planting date : April 6, 1988
Harvest date : July 25, 1988
Previous crop : Fallow
Fertilizer : 100# 11-51-0 with the seed
Soil moisture probe depth at seeding : 40 inches
Rainfall, planting to ripening : 4.25 inches

Table 47. Three year summary for dryland barley varieties grown near Choteau, MT. 1986 - 1987 - 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad MT.

Variety	3-year comparable average					
	Yield bu/a	Height inches	Test wt.	% Plump	% Thin	% Protein
Steptoe	60	24	46	83	6	10.3
MT 81616	59	25	52	89	3	11.8
Hector	58	26	53	87	3	12.0
Lewis	57	25	54	88	4	11.9
Gallatin	57	25	53	87	3	12.1
MT 81161	56	26	52	90	3	11.7
Kimberly	56	25	53	86	4	12.2
Harrington	56	24	53	90	3	11.5
Clark	54	23	52	80	7	12.2
Bowman	51	26	53	96	1	12.2
Piroline	51	25	52	75	8	12.8

Table 48. Irrigated barley variety trial north of Fairfield, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield bu/a	Test wt.	% Plump	% Thin	% Protein
MT 81616	20	104.5	56.0	98	2	13.0
Menuet	21	101.9	55.7	96	2	14.6
Harrington	20	100.7	54.4	97	3	13.8
Hector	24	100.6	53.1	96	2	14.0
Crystal	25	97.2	55.5	98	1	15.0
Gallatin	21	96.7	55.5	95	1	11.2
MT 81161	23	96.5	55.8	95	2	14.7
Clark	22	89.5	55.0	98	1	13.9
Ingrid	24	89.4	55.0	95	1	14.5
Lewis	20	89.4	55.8	96	1	12.3
Moravian III	24	88.1	55.8	96	1	14.3
Busch 1202	19	88.0	55.0	97	4	15.5
Robust	26	84.8	55.3	95	1	13.3
Bellona	19	83.4	54.2	96	1	15.1
Morex	25	80.8	54.3	93	3	14.6
Kimberly	20	80.2	54.8	95	1	12.8
Triumph	20	75.9	56.0	95	3	14.9
Klages	19	75.3	54.0	94	1	14.8
Steptoe	19	72.4	52.4	95	2	13.1
Russell	26	68.2	54.3	89	1	13.8

Cooperator & location : Al Meyer, north of Fairfield, Teton Co.
Seeding date : April 18, 1988
Harvest date : August 10, 1988
Previous crop : Barley
Fertilizer : 100-60-40-10 worked in
Irrigation method : Flood

Table 49. Three-year summary for irrigated barley varieties grown near Fairfield, MT. 1985 - 1986 - 1987. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	3-year comparable average					
	Yield bu/a	Height inches	Test wt.	% Plump	% Thin	% Protein
Menuet	126	30	54	95	2	11.6
Steptoe	125	29	49	94	3	10.6
Triumph	124	28	52	86	5	11.5
Columbia	122	29	48	94	3	11.1
Gallatin	122	31	53	87	6	11.4
Bellona	118	30	54	94	2	12.1
Harrington	118	31	53	90	4	12.1
Lewis	117	30	53	87	6	12.6
Hector	117	33	53	90	4	11.8
Premier	113	30	53	85	5	12.3
Clark	113	33	52	87	5	12.0
Klages	111		52	81	7	11.9
Ingrid	111	33	53	97	3	11.9
Hazen	111	35	50	93	2	11.8
Piroline	109	30	53	83	7	12.6
Ellice	109	33	53	97	1	10.6
Morex	105	34	51	92	2	12.4

Table 50. Seeding rate trial on dryland barley and spring wheat east of Oilmont, 1988. Mont. Agr. Expt. Sta., Western Triangle Agr. Research Center, Conrad. MT.

Rate seeds/sq. ft.	Yield bu/a	Test wt.	Plant height	% Plump	% Thin	% Protein
Barley:						
15	15.6	48.7	12	38	24	17.9
20	12.9	48.2	12	31	30	18.5
25	11.3	48.5	13	27	32	19.4
30	10.7	48.1	12	28	31	19.3
Wheat:						
15	10.2	58.9	14	-	-	17.8
20	9.8	60.5	14	-	-	18.0
25	10.3	59.2	15	-	-	17.1
30	10.0	59.1	15	-	-	18.6

Cooperator & location : Terry Alme, 8 miles east of Oilmont, Toole Co.
Planting date : April 12, 1988
Harvest date : July 26, 1988
Previous crop : Fallow
Soil moisture probe at planting : 40 inches
Rainfall, planting to maturity : 2.65 inches (drought conditions).
Varieties : 'Lew' wheat; 'Clark' barley

Table 51. 'Tilt' fungicide on irrigated barley, 1988. Western Triangle Research Center and Cooperative Extension Service, Conrad, MT.

Treatment & location	Yield bu/a	Test wt.	% Plump	% Thin
Smedsrud				
Check	88.5	52.9	93	3
Tilt	94.2	53.0	92	2
Tilt & oil	91.7	52.8	95	2
Yeager				
Check	108.5	51.7	97	1
Tilt	97.2	51.6	94	1
Tilt & oil	106.2	53.0	90	2

Location : Conrad, MT.
Applied : June 16, 1988; Temp. 94° F
Stage : Flag leaf.

Table 52. "ALGA-MIN+" seed treatment on irrigated barley and spring wheat. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Treatment	Yield bu/a	Plant height inches	Test wt.	% Plump	% Thin	% Protein
Barley						
Vitavax	85.3	24	53.2	91	3	
Vitavax+Alga-min	83.3	24	53.8	91	3	
Wheat						
Vitavax + Lindane	44.8	34	61.8			
Vitavax + Lindane + Alga-min	45.3	34	61.2			

Location : Research Center
Planting date : April 13, 1988
Harvest date : August 9, 1988
Previous crop : No-till chemical fallow
Fertilizer : 100# 11-51-0 with the seed + 40# N top dressed
Irrigation : Sprinkler; June 15, June 28, and July 15; 2"/date + 2.68 inches rainfall.

PROJECT TITLE: Oilseed and pulse crop evaluation under no-till conditions.

PERSONNEL: Gregory D. Kushnak, Ron Thaut, Pat Gallagher, and Larry Christiaens, Western Triangle Research Center, Conrad, MT.; Jerry Bergman, EARC, Sidney; and Jim Sims, MSU Plant & Soil Science, Bozeman.

INTRODUCTION/OBJECTIVES:

Oilseed and pulse crops in rotation can benefit grain production (soil amelioration, pest cycle disruption, etc.) The production potential of various oilseed and pulse crops has been determined for fallow systems, under average management levels, in the Western Triangle area. This project seeks to determine production potential of these crops under no-till conditions, where they will most likely be grown in rotation with grain; and also to test new crops as they become available.

In 1988, the oilseed trial consisted of 24 safflower varieties and experimental lines, mostly from the MSU safflower breeding program at Sidney; and 5 varieties of Canola; and one of rapeseed. The pulse crop study consisted of 22 types of annual legumes, most of which have never been tested in Montana. The primary objective was to determine if they were adapted to the dryland growing conditions of Montana. Evaluation for nitrogen-fixation is a secondary objective, and is in progress.

Both studies were no-till planted into standing barley stubble from the previous years chemical fallow. A hoe-type (furrow) planter was used. Planting depth was shallow (½ inch) for small seeded types, and deep 1½ inch for large seeded types. Medium sized seed, including safflower, was placed 1-inch deep.

Results:

Data for the safflower, canola/rapeseed and legumes are presented in Tables 53-55, respectively. Soil moisture was abundant at planting time, contributing to high yields in spite of the below-normal rainfall of 1988. The no-till conditions allowed soil moisture to remain very near the surface, allowing good germination of small-seeded, shallow-planted crops. Pre-seeding tillage would have certainly caused stand failures for crops with small- and medium- sized seed, as it never rained during or after the planting season until mid-summer. Stands were excellent for all crops grown in the trials.

It was not possible to obtain seed yield for many of the legumes, as they shattered readily. The gamma, snail, and disc medics had leathery pods that were difficult to thresh; and most pods fell off the plants before ripening. The SS7 feed pea was the highest producer of total plant material.

Indianhead lentil ranked high, as did some of the other peas and clover. Differential water use among the various crops was not determined, but this would be an important consideration in choosing a legume for annual rotation with cereal grain on dryland.

Table 53. No-till safflower variety trial north of Conrad, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Plant height inches	Yield lbs/a	Test wt.	Bloom date	% Oil *
S-541	24	2686	41.7	206	50.6
82B1954	23	2634	40.3	206	49.0
85B4793	22	2430	42.6	203	46.1
82B3555	24	2321	41.3	208	50.6
85B4453	22	2248	40.3	203	51.0
S-208	23	2231	42.5	206	47.5
85B851	23	2170	38.1	206	50.0
85B4716	24	2168	42.2	203	45.1
85B2818	24	2131	42.1	205	48.9
85B4829	25	2063	41.1	206	50.9
Finch	22	2024	44.3	205	45.5
Girard	24	2014	42.3	207	46.9
82B1277	23	2001	39.8	209	52.1
86B4509	21	1967	42.6	204	49.8
85B1873	25	1938	42.0	208	46.2
85B1837	22	1931	42.3	206	46.4
85B4431	23	1928	41.3	206	47.5
85B4193	24	1828	39.1	208	45.8
Saffire	19	1825	43.4	201	37.7
85B1856	24	1795	43.1	207	45.7
MT 3697	23	1714	42.8	206	50.2
85B1832	21	1699	40.5	203	51.2
Oker	22	1611	39.8	203	48.3
85B3918	23	1589	35.2	208	54.9

Location : Research Center; 10 miles north of Conrad.
Planting date : April 26, 1988
Harvest date : September 26, 1988
Previous crop : chemical fallow (barley stubble).
Fertilizer : 50 lbs/a 11-51-0 with seed.
Soil moisture at planting : 36 inches moist soil, clay loam.
Rainfall, planting to ripe : 3.7 inches
* Multiply by 0.92 to obtain 8% moisture-basis oil.

Table 54. No-till canola and rapeseed variety trial, Conrad 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Type	Yield lbs/a	Test wt	Plant height	Bloom date	Maturity	Use	Seed color
Tobin	campestris	1053	49.6	20	168	early	edible	yellow/brown
Westar	napus	956	47.6	25	172	medium	edible	dark brown
Global	napus	718	45.0	34	178	late	edible	dark brown
Pivot	napus	718	46.7	30	175	late	edible	dark brown
Topas	napus	562	47.6	31	176	late	edible	brown
R-500	campestris	938	48.9	19	169	early	industrial	yellow

Location : Research Center, Conrad, MT
Planting date : April 26, 1988
Harvest date : August 9, 1988
Soil moisture at planting : 36 inches moist soil (clay-loam).
Rainfall, planting to harvest : 2.7 inches
Fertilizer : 50 lbs/a 11-51-0 with seed.
"No-till, chemical fallow (barley stubble)"

Table 55. Annual legume adaptation trial, Conrad 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Variety	Total plant yield lbs/a *	Seed yield lbs/a	Canopy height inches	Plant length inches	Harvest date	Bloom date	Seed size	TEST WT. LBS/BU.
Austrian Winter Pea	2446	1101	32	32	Aug 8	181	L	65
NC8-3 Chickling Vetch	2341	763	16	17	Aug 17	171	L	62
Tinga Tangier Flatpea**	1848	197	18	30	Aug 17	181	L	62
SEMU-SI Feed Pea	2618	1298	14	26	Aug 8	179	L	64
Primorski Lupine	892	530	15	15	Aug 23	172	L	58
Ultra Lupine	964	566	16	16	Aug 23	178	L	59
Jasper Food Pea	2300	1238	7	20	Aug 8	189	L	58
SS7 Feed Pea	2756	1240	19	24	Aug 8	187	L	62
Indianhead Lentil	2508	790	14	14	Aug 8	193	M	66
Robinson Snail Medic	619		13	13	Aug 8	192	M	
Paraponto Gamma Medic	1333		7	18	Aug 8	188	M	
Mt. Barker Sub Clover	2189		4	7	Oct 12	227	M	
Bigbee Berseem Clover	1536		7	26	Sept 1	205	S	
Multicut Berseem Clover	1266		19	19	Sept 1	203	S	
Common Yellow Sweet Clover	1461		25	25	Oct 12	227	S	
Harbinger Strand Medic	940		6	14	Aug 24	178	S	
Maral Shaftal Clover	1513		17	20	Oct 12	194	S	
Youchi Arrowleaf Clover	2389		14	22	Oct 12	227	S	
George Black Medic	655		8	17	Sept 1	178	S	
Jemalong Barrel Medic	496		7	18	Aug 24	180	S	
Tornafield Disc Medic	669		10	22	Aug 24	179	S	
Sapo Gamma Medic	1055		12	20	Aug 24	194	S	

Location : Research Center, Conrad, MT
Planting date : May 4, 1988
Planted no-till, chemical fallow (barley stubble).
Soil moisture at planting : 36 inches moist soil (clay-loam).
Rainfall, planting through August : 2.7 inches
Fertilizer : 50 lbs/a 11-51-0 with seed
** Shatters readily
* Dry matter, including seed

TITLE: Phosphorus Fertilization of Wheat

YEAR: 1988

LOCATION: Western Triangle Research Center, Conrad, MT.

PERSONNEL: Pat Gallagher, Greg Kushnak, Ron Thaut, & Larry Christiaens - Research Center, Conrad.

Phosphorus rate studies were established at three off station and one on station site adjacent to the standard variety trials. Yields were depressed on account of the low precipitation received at the sites this year coupled with reduced soil moisture at planting.

In spite of the low ppt., and resulting low yield, the spring wheat study near Oilmont (Table 56) showed a significant response to seed banded phosphorus with the maximum yield reached at 60 lbs P_2O_5/a. There was no significant difference at the 95% level between rates of 40 to 100 lbs of P_2O_5. Olsen soil test P of 7.3 ppm calls for 35 lbs P_2O_5/a banded. This correlates well with the results from this particular location.

The other three locations were non-significant for grain yield. This would be expected at the Choteau site (Table 57) because of the very high rating by Olsen P test at 30.5 ppm P. Soil P data was not collected on the winter wheat sites (Tables 58 and 59).

Grain protein was not affected by P rates on the station or Dutton sites (Tables 58 and 59). Spring wheat grain protein was affected by P rates at both the Oilmont and Choteau sites. At the Oilmont site (Table 56) protein reflected P rates as yield increased, the protein level increased, while at the Choteau site (Table 57) levels were mixed with the lowest, 13.3% with the 80lb P_2O_5/a rate. Protein data at this site reflects the varable nature of grain growth under stress.

Table 56. Phosphorus rate spring wheat study near Oilmont, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Rate $N-P_2O_5-K_2O$ lb/a	Yield bu/a	Test wt lb/bu	Grain Protein %
80-0-0	12.6	61	16.8
80-20-0	11.9	57	17.5
80-40-0	14.4	61	17.3
80-60-0	15.1	60	17.3
80-80-0	14.0	59	18.1
80-100-0	13.7	59	18.2
$LSD_{.05}$	1.7	-	1.2

Cooperator & location : Terry Alme 8 miles east of Oilmont
Seeding date : 12 April 1988, fallow
Harvest date : 26 July 1988
Variety : Lew
Depth of soil moisture probe at seeding : 40 inches

Soil test data :

	NO_3-N	P	K	SO_4-S	Zn	Ph
		ppm				
0-6"	16.7	7.3	402	2.3	1.4	7.2
6-24"	12.2					

PPT. 2.65"

Table 57. Phosphorus rate spring wheat study near Choteau, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Rate $N-P_2O_5-K_2O$ lb/a	Yield bu/a	Test wt lb/bu	Grain Protein %
80-0-0	19.7	61	13.6
80-20-0	20.2	60	13.8
80-40-0	20.5	61	13.9
80-60-0	19.1	60	13.7
80-80-0	20.8	60	13.3
80-100-0	20.5	61	13.8
$LSD_{.05}$	NS	-	0.5

Cooperator & location : Herb Corey northeast of Choteau
Seeding date : 16 April 1988
Harvest date : 25 July 1988
Variety : Lew
Depth of soil moisture at planting : 40 inches

Soil test data :

	NO_3-N	P	K	Ph
		ppm		
0-6"	13.4	30.5	534	8.2

PPT. 4.25"

Table 58. Phosphorus rate winter wheat study near Dutton, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Rate $N-P_2O_5-K_2O$ lb/a	Yield bu/a	Test wt. lb/bu	Grain Protein %
10-0-0	37.4	63	15.0
10-10-0	39.7	63	15.5
10-20-0	38.6	63	15.5
10-30-0	33.8	62	14.8
10-40-0	35.6	63	14.7
10-50-0	40.5	63	14.7
$LSD_{.05}$	NS	-	NS

Cooperator & location : Darryl Goodmundson, 1 mile east of Dutton.
Seeding date : 9 September 1987
Harvest date : 18 July 1988
Variety : Rocky
Depth of soil moisture probe at planting :
PPT. 4.2"

Table 59. Phosphorus rate winter wheat study, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Rate $N-P_2O_5-K_2O$ lb/a	Yield bu/a	Test wt lbs/bu	Grain Protein %
10-0-0	26.1	63	15.2
10-10-0	30.5	64	15.3
10-20-0	32.1	64	15.5
10-30-0	29.4	64	15.5
10-40-0	29.2	63	15.6
10-50-0	28.4	63	15.6
$LSD_{.05}$	NS	-	NS

Location : Rearch Center, north of Conrad
Seeding date : 14 September 1987
Harvest date : 19 July 1988
Variety : Rocky
Depth of soil moisture at planting : 36 inches
PPT. 2.68"

TITLE: Phosphorus rate study on irrigated barley.

YEAR: 1988

LOCATION: Western Triangle Research Center, Conrad.

PERSONNEL: Pat Gallagher, Greg Kushnak, Ron Thaut, & Larry Christiaens - Research Center.

Plots were established on land northeast of Choteau, near Agawam, to assess the response of irrigated barley to high rates of Phosphorus.

The field has a history of yields reaching about 60 bu/a. Several problems were thought to exist, including low soil phosphorus, soil salt problems, salty irrigation water, and poor soil physical structure. At approximately 40" there is a black platy silt like layer that may restrict water and/or salt drainage and act as a root restriction layer.

Yield date (Table 61) reflect soil test P levels. Little response would be expected at Olsen soil levels measured. Irrigation water was sampled well into the season, EC and SAR are within guidelines established by MSU Montguide MT8383, 'Irrigation Water Quality in Montana'.

Grain protein data where mixed with the 60lb P_2O_5/a rate producing the highest level, while the 150lb and 30lb P_2O_5/a rates produced the lowest level of 14.2% average while differences were evident no clear trend is noted.

Additional work is planned for 1989 that will involve fertilizer placement and a closer look at the physical structure problem.

Table 61. Phosphorus rate study on irrigated barley near Agawam, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

P_2O_5 rate lb/a	Yield bu/a	Test wt. lb/a	Grain protein %
0	59.9	47.4	14.6
30	63.3	49.2	14.2
60	60.9	47.4	14.9
90	60.0	49.2	14.5
120	68.0	48.3	14.5
150	68.4	48.8	14.2
LSD .05	NS		0.6

Cooperator & location : Darryl Stott, northeast of Choteau
Seeding date : 19 April 88
Harvest date : 10 August 88
Variety : Lewis
Fertilizer : 80# N as A. nitrate

Soil test data :

	NO_3-N	P	K	pH	EC MMHO/CM
		ppm			
0-6"	19.1	16.4	396	8.4	0.80

Irrigation water analysis:

Ca	MG	Na	SO_4-S	Cl	SAR MMOLE/L	EC MMHO/CM	pH
ppm							
57.6	48	18	53	3	0.4	0.71	8.5

TITLE: Fertility trials on spring wheat and barley.

YEAR: 1988

LOCATION: Western Triangle Research Center, Conrad.

PERSONNEL: Pat Gallagher, Greg Kushnak, Ron Thaut. & Larry Christiaens - Research Center, Conrad and Grant Jackson - Research Center, Moccasin.

Four fertility trials (Table 62) were established on spring wheat and barley. These investigations included; phosphorus rates and placement method, nitrogen rates and placement method, sulfur rates, and zinc rates. Plots were seeded with a no-till plot drill on land that had been in barley the previous season.

Recrop was chosen in order to lower available N and P in hope of a good response to treatments. Phosphorus was applied at each of 5 rates either with the seed or in a deep band 2" below the seed and central between a 6" paired row configuration. Nitrogen was constant at 80 lbs N/A.

Nitrogen was applied at 4 rates in either a deep band similar to the P study above, surface broadcast or surface banded in narrow row between the pairs.

Sulfur rates of 10 through 40 lbs S/A was applied with the seed and Zinc rates of 0.5 through 1.25 lbs Zu/A were established.

Adquate moisture was measured at planting and the seed emerged with no problems. No precipitation was received after planting. Plant growth essentially stopped and by 6 June drought had taken its toll. Plants were 2-3 inch tall and attempting to head out. The studies were abandoned at this time.

The phosphorus and nitrogen studies were re-established on winter wheat this fall, and will be reported in the 1989 report.

Table 62. Fertilizer placement study on spring wheat and barley, east of Ledger, 1988. Mont. Agr. Expt. Sta., Western Triangle Research Center, Conrad, MT.

Phosphorus	P rate #P_2O_5/A	Method
	0	-
	10	w/seed
	20	"
	30	"
	40	"
	50	"
	10	deep band
	20	"
	30	"
	40	"
	50	"

Fertilizer : N constant at 80 lb N/a A. nitrate.

Nitrogen	N rate lb N/A	Method
	6	deep band
	30	"
	60	"
	90	"
	6	surface broadcast
	30	"
	60	"
	90	"
	6	surface band
	30	"
	60	"
	90	"

Fertilizer: P constant at 30 lbs P_2O_5/a as MAP (11-52-0)

Sulfur	S rate # S/a
	0
	10
	20
	30
	40

Fertilizer : N constant at 80# N/a as A nitrate
P constant at 60# P_2O_5/a as TSP

(continued)

Table 62. Fertilizer placement study continued.

Zinc	Zn rates # Zn/a
	0
	0.5
	0.75
	1.00
	1.25

Fertilizer : N constant at 80 lbs N/a as A nitrate as MAP.
P constant at 30 lb P_2O_5/a as TSP
and 30 lb P_2O_5/a as MAP.

Cooperator & location : Bob Inabnit, 25 miles east of Ledger.
Seeding date : April 5, 1988
Harvest date : Not harvested account of drought.
Varieties : Lew and Clark
Soil test data :

		NO_3-N	P	K	SO_4-S	Zn	pH
			ppm				
spring wheat	0-6"	12.5	12.6	316	2.3	1.0	7.3
	6-12"	10.6					
barley	0-6"	4.9	11.6	286	3.1	0.6	8.0
	6-12"	6.4					