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ANNUAL REPORT

of the

WESTERN TRIANGLE AGRICULTURAL RESEARCH CENTER

Montana Agricultural Experiment Station

Conrad, Montana

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Submitted by

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and

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MSU-MAES Research Report

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Climatic summary for the 1995 calendar year at the Western Triangle Research Center, Conrad, MT.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total or average
Precipitation (inches)													
Current Year	0.00	0.06	0.25	0.96	2.87	5.82	3.98	0.80	0.93	0.61	0.59	0.19	17.06
Average	0.22	0.23	0.55	0.96	1.95	2.71	1.79	1.65	1.46	0.56	0.33	0.16	12.57
Mean Temperature (^{0}F)													
Current Year	25.5	27.3	30.1	40.9	50.6	57.5	64.2	62.5	56.1	44.0	29.6	19.5	42.3
Average	24.2	22.0	35.1	44.2	53.8	60.7	65.2	64.8	57.5	45.6	31.3	19.1	43.6

Last killing frost in Spring
1995----------May 22 (30^0)
Average----------May 15

First killing frost in Fall
1995----------Sep 20 (30^0)
Average----------Sep 21

Frost free period (days)
1995----------121
Average----------128

Maximum summer temperature--- 90^0 (Aug 23)

Minimum winter temperature---- - 13^0 (Jan 3, 1995)

Summary of climatic data by month for the 1994-95 crop year (September thru August) at the Western Triangle Agricultural Research Center, Conrad, MT.

	Sep 1994	Oct 1994	Nov 1994	Dec 1994	Jan 1995	Feb 1995	Mar 1995	Apr 1995	May 1995	June 1995	July 1995	Aug 1995	Total or Average
Precipitation (inches)													
Current year	0.05	1.01	0.11	0.02	0.00	0.06	0.25	0.96	2.87	5.82	3.98	0.80	15.93
Average	1.51	0.56	0.30	0.16	0.22	0.23	0.55	0.96	1.95	2.71	1.79	1.65	12.59
Mean Temperature (^{0}F)													
Current year	61.4	44.3	29.4	29.1	25.5	27.3	30.1	40.9	50.6	57.5	64.2	62.5	43.6
Average	57.6	45.8	31.5	19.1	24.2	22.0	35.1	44.2	53.8	60.7	65.2	64.8	43.7

Last killing frost in Spring
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Minimum winter temperature--------- -13^0 (Jan. 3, 1995)

Title: 1995 WESTERN TRIANGLE WINTER WHEAT VARIETY TESTS

Personnel: Greg Kushnak & Ron Thaut, Agricultural Research Center, Conrad, MT; and Dr. Phil Bruckner, MSU, Bozeman.

We failed to establish off-station winter wheat variety trials during the fall of 1994 due to dry conditions. Trials on station were planted in late October to avoid the possibility of having the seeds sprout in the fall and then die due to insufficient moisture. This tactic was successful in that the crop did not sprout and emerge until spring, when moisture was more favorable. Summer rainfall was approximately double the amount of normal, and the winter wheat averaged 90 b/a. The 1995 yield data represents spring-emerged winter wheat, and therefore is not influenced by winterhardiness levels of the varieties (Tables 1 & 2).

Five-year averages for the varieties are presented in Table 3. Varieties not included in the five-year summaries do not have enough test years to be certain of their adaptation to this area, and caution should be used when considering these for production. Detailed descriptions of most of the varieties tested are included in Extension Bulletin 1098 "Performance Summary of Winter Wheat Varieties in Montana", available at County Agent Offices. Other observations concerning the varieties are presented in the following pages.

Winter Wheat Variety Notes & Comments

Western Triangle Agricultural Research Center, Conrad, MT

Abilene (AgriPro NA 362-5) - Ranked low, Conrad 1988, low winter-hardiness(2). Adapted north of Ks/Okla borders and Texas panhandle. Short semidwarf. Susceptible to Hessian fly.

Agassiz (ND) - Recommended for District 6 only to replace Froid (Eastern Montana). High winterhardiness (4), slightly less than Roughrider. Tall very weak straw, lodges bad. Low yield, high protein. Shatter resistance fairly good, better than Norstar. Medium late maturity.

Alliance (Nebr, 1993) - Developed for dryland in Nebraska panhandle. Winter hardiness better than Vona, but still may be marginal for Montana. Early maturing, low test weight.

Arapaho (Nebr) - Medium height with long coleptile and moderate straw strength. Winterhardiness fairly good?? Heterozygons (mixed) resistance to Great Plains strain of Hessian fly, moderate tolerance to Cephalosporium stripe. Medium yield, low test weight, early heading. Medium winter survival (3).

Archer (NAPB) - Winterhardiness less than Centurk, but greater than Vona (probably should classify as a 2). Low protein. Sometimes can have test weight problems due to its massive tillering. Short straw. Good lodging and shatter resistance. Early maturity. Not widely adapted for Montana.

Blizzard (ID 0297) (Idaho/Oregon/USDA) - Snow mold resistance, for high elevation areas under snow. Probably similar to Weston for winterhardiness which is not very high (2-3). Better dwarf bunt resistance than Weston or Manning. Tough to thresh; lots of spikelets in grain sample. High protein.

Bighorn (Hybritech Intl) - Fairly good yield. Winterhardiness somewhat tender. Short straw. Medium early maturity. Protein is medium. Susceptible to stem rust but resistant to dwarf smut.

Centurk (Nebraska) - High yield, medium-low protein. Medium low winterhardiness (2), less than Redwin and Tiber. Very susceptible to yellow berry expression under low Nitrogen conditions. Early maturity, which sometimes allows escape from sawfly. Medium stiff straw.

Cheyenne - High protein. Tall straw, medium winterhardiness, medium to high yield, shatters bad -(see 'Cree' for an improvement). Medium maturity.

Chisolm (Oklahoma) - Winterhardiness equal or less than Cimmaron.

Cimmaron (Oklahoma) - Winterhardiness adequate for Kansas, Nebraska, and Colorado. Semidwarf, red head, awnless (awnletted). Hard to thresh due to very stiff straw.

Cree (MSU) - Shatter resistant version of Cheyenne. Identical to Cheyenne in other respects except has red head and brown chaff. Medium to high yield. Winterhardiness medium (3). Tall straw. High protein. Medium maturity and highly vulnerable to sawfly. Seed supply no longer maintained.

Dawn (S.Dak.) - Medium short height, good lodging resistance. Early maturity. Fair winterhardiness, greater than Hawk. Quality is fair.

Dynamic (Russia) - Entered in 1996 trial; no data yet.

Eklund (private var.- eastern Mta grower) - Beardless; medium short height and maturity. High winterhardiness (4 or 5). Medium shatter resistance.

Froid - Drop from recommended list. Low yield and tall weak straw. High winterhardiness (5).

Halt (Colorado, 1994) - Has Russian wheat aphid resistance. Short semidwarf, early maturing.

Hawk (AgriPro) - Winterhardiness moderate to poor, probably less than Centurk; sometimes yields high, but not consistently. Early maturity, short straw & good lodging resistance. Adapted to Southern Great Plains.

Hill-81 (Oregon) - Soft White. Compared to other soft-white wheats, winter-hardiness is good, but still may be risky for Triangle arèa. Good straw strength.

Ike (Kansas, 1993) - Tall semidwarf. Very early heading (2 days earlier than Rocky). Resistant to stem & leaf rust, and Hessian fly.

Judith (MT 8039) (MSU) - Yields fair to good, sometimes equal to Rocky and Tiber. Low vernalization requirement. Stripe and stem rust resistant. Protein is medium: equal to Tiber, greater than Centurk, and less than Redwin. Heading slightly later than Rocky, but earlier than Tiber. However, it had more sawfly damage than Rocky & Tiber at the Knees plot in 1991. Medium short straw; winter-hardiness = 3, higher than Rocky and Cheyenne, and equal to Redwin. Medium shatter resistance. Three problems:

1) Test weight is sometimes low, and may be a problem.
2) Broken stems at crown and white heads at Conrad in 1986.
3) Straw less stiff than Neeley, Tiber and Redwin; but stiffer than Rocky and Centurk. Has some red heads and tall and beardless heads.

Jules (Colorado, 1992) - Semidwarf with better straw strength & yield than Lamar, but medium to low test weight. Early maturity (like Rocky). High yield in 1994 and 1995. Winterhardiness medium low (2). Short coleoptile. Resistant to stem rust; some tolerance to wheat streak mv.

Karl 92 (Kansas, 1992) - Early maturing, low yield, poor winterhardiness.

Kestrel (Sask.,Can) - Winterhardy and high yielding in Canada (hardiness = 5, similar to Norstar). Higher yield, shorter straw, slightly better lodging resistance, and three days earlier than Norstar (similar maturity as Redwin). Test weight and protein less than Norstar (low). Probably will not tolerate drought stress very well. Short coleoptile. Very susceptible to physiological leaf spot. Susceptible to stem, stripe, & leaf rust. Dockage for low protein is most likely.

Lamar (Colorado, 1988) - Medium height with long coleoptile. Adapted to severe low moisture conditions of Colorado. Heterogeneous reaction to Great Plains biotype of Hessian fly. Very early heading, medium yield, high test weight, weak straw, very poor winterhardiness (1-2). Shattered in 1993.

Manning (Utah) - Adapted to deep snow areas, resistant to dwarf bunt and moderately tolerant to snow mold. Medium short; good straw strength; poor winterhardiness (1-2).

Meridian (Idaho, 1991) - Developed for irrigated conditions in Idaho. Yields rank from low to very high depending on year. Medium to low test weight and protein. Very late maturity (several days later than Neeley). Too late in maturity for satisfactory performance in the Triangle area; needs long, moist growing season. Good straw strength, poor winterhardiness (2). Moderate resistance to stripe rust, snow mold and dwarf bunt; susceptible to stem rust.

Minter - Medium height and maturity. High winterhardiness (4-5). Good shatter resistance. Low yield.

Mounty - (Wally Johnson's) Stiffer straw than Neeley, and yield claimed to be equal to or better than Neeley, according to Johnson?? Not tested by MSU.

MT 8713 (MSU) - Experimental, sister seln to 8719 with similar traits, but much shorter. Three inches taller than Norwin and 7" shorter than Redwin. Lodging resistance similar to Norwin. Early to medium maturity: 1-2 days later than Rocky & Judith. Very good winterhardiness (similar to Norwin). Moderate yield. Higher test wt and 2 bu/a higher yield than Norwin. Adequate quality and 1% higher protein than Norwin. Stem rust resistant. Potential replacement for Norwin, but will not be released unless there is interest in another Norwin type.

MT 8719 (MSU, 1996) - Experimental, may be considered for release in 1996. Yield 9 bu/a higher than Roughrider, and similar to Tiber, Neeley & Rocky. Higher test wt than Roughrider, Judith & Neeley, and similar to Tiber & Rocky. 5 inches shorter than Roughrider and 3 inches shorter than Rocky. Strong straw (much better lodging resistance than Roughrider, and somewhat better than Rocky & Neeley). Medium maturity & fair winterhardiness. Winter hardiness is slightly lower than Roughrider, and similar to that of Norwin & Winalta. A potential replacement for Roughrider in NE Montana. High protein (similar to Redwin) & excellent quality. Resistant to stem rust. Susceptible to WSMV, stripe rust, dwarf bunt, RWA & sawfly. Hetero resist to GP Hessian fly. Intended to replace Roughrider, Agassiz and Seward.

MT 88046 (MSU, 1996) - Experimental, may be considered for release in 1996. Low to medium yield, but has the highest protein and baking quality of any winter wheat tested in our lab. Protein 1% higher than Redwin. Possibly useful for specialty markets. Yield similar to Redwin and 7bu/a lower than Neeley. Red chaff. Very early maturity, 1 to 2 days earlier than Rocky. Test weight intermediate, similar to Rocky. Height similar to Neeley & Judith. Good lodging resistance, similar to Tiber & Redwin and superior to Neeley & Rocky. Winterhardiness intermediate, similar to Neeley & Rocky. Resistant to stem rust but susceptible to stripe rust, dwarf bunt, WSMV, RWA and sawfly.

MTS 92042 (MSU) - Experimental sawfly resistant line (sister line to Vanguard). May have some improvements over Vanguard for yield, stem solidness, winter hardiness, and quality. Yield averages 6 bu/a higher than Vanguard. Marginally better winterhardiness than Vanguard, but still borderline. Red chaff, upright head. Does not seem as prone to shatter as Vanguard. Some resistance to stem rust, and some tolerance to wheat streak mv. Still under evaluation.

Neeley (Idaho) - Very high yielder in good years, but does poor if stressed for moisture. Winterhardiness medium to high (3); greater than Cheyenne, but less than Winalta. Medium short straw slightly less stiff than Redwin and Tiber. Medium maturity. Good shatter resistance. Protein & quality are erratic, ranging from low to high; apparently more sensitive to Nitrogen deficiency. Highly vulnerable to sawfly due to medium-late maturity. Susceptible to stem rust.

Norstar (Canada) - Maximum Winterhardiness (5). Protein medium-low: lower than Roughrider. Very tall straw, poor lodging resistance. Low yield. Late maturity. Medium shatter resistance? (head shattering occurred at Conrad in 1980). Susceptible to stem rust & leaf spot.

Norwin (MSU) - Winterhardiness = 5 (high). Protein medium to low. Pseudumonas bacterial leaf blight bad. Licensed in Canada. Short semidwarf straw, but not a tripledwarf. Too short for dryland. Medium yield. Good shatter resistance. Medium maturity.

Nuwest (MT 7811) (MSU, WPB, 1994) - Hard white winter wheat for specialty markets. Contains 1 red kernal/1000. Good quality. Medium high yield and well adapted to Montana. Yield about 3% less than Neeley, 1% less than Rocky, & equal to Tiber. Test weight 1 lb/bu lower than Rocky & Tiber, but 1 lb/bu higher than Judith. Winterhardiness equals Tiber & Redwin (3). Two days later than Rocky, 3 days earlier than Neeley. 1 or 2 inches shorter than Rocky. Stiffer strawed

than Neeley & Rocky. Very short coleoptile, 30% shorter than Rocky & Neeley. Medium resistance to preharvest sprouting - hard whites tend to sprout as they lack the polyphenolic cpds that occur in the bran of red wheat. But sprouting is usually not a problem for hard whites in Montana (In 1993, everything sprouted - red or white). Resistant to stem rust but susceptible to stripe rust, dwarf bunt, and WSMV. Susceptible to sawfly, RWA, and Hessian fly. Protein medium to high, about 0.5% less than Redwin.

Promontory (Utah, 1990) - Excellent stripe rust & dwarf smut resistance; susceptible to stem rust. Yield and test weight higher than Manning. Medium short, strong straw, good lodging resistance. Medium-late maturity. Winter hardiness probably poor (2). Short coleoptile. Red head.

Quantum 542 (Hybritech- Seed Intl. Inc.) - An F_1 hybrid; needs new seed each year. Planting F_2 (second generation) seed may result in yield reduction and developement of ergot due to sterility in a small percentage of florets (ms ratio less than 3:1). F_1 vs F_2 tests in 1992 indicated a 12% yield reduction from planting 2nd generation seed. High yield; protein as good as Rocky (medium low); early maturity like Rocky. Recommended in 1991 for districts 2,3,4, & 5 (but not for dwarf smut areas). Medium short height, but taller than 547, giving an advantage in dry conditions. Lodging resistance equal to Rocky. Winterhardiness is fairly good (3), but less than Winalta. Susceptible to stem rust.

Quantum 547 (Hybritech) - F_1 hybrid. Tested as XNH1609 in 1993-94. Yielded higher than Neeley in 1994 & 1995. Shorter straw than 542, giving an advantage in high rainfall areas. Quality may be marginal.

Quantum 555 (Hybritech) - F_1 hybrid (see Q 542). According to Hybritech, adapted to Montana, 2 days later than Centurk. Semidwarf. Excellent straw strength. Good winterhardiness. Intended for irrigated only. Awnletted.

Quantum 566 (Hybritech) - F_1 hybrid. Tested as XNH1727 in 1994. Late maturing; mainly intended for eastern Montana & South Dakota. Yielded higher than Neeley in 1994 & 1995.

Ram (NAPB) - Winterhardiness less than Centurk. Tall semidwarf with good straw strength. Early maturity (similar to the Centurk-type wheats). Adapted to Southern Great Plains. Susceptible to Hessian fly. Low winterhardiness, medium-low test weight.

Rawhide (Nebraska) - Not tested in Montana. For Southern Plains.

Readymade (W188) (Lethbr. Canada) - Selection from Redwin by Agr Canada at Lethbridge. Slightly lower protein, and larger kernels than Redwin. Winter hardiness, yield and maturity similar to Redwin. Head color same as Redwin; but stems are yellow, whereas Redwin stems are mixture of red and yellow. Redwin has a mix of small spring wheat-like seeds with large seeds. Readymade is all large seed that grade properly under the Canadian system. Had similar leaf spot problems as Redwin at Conrad 1992, and is susceptible to leaf & stem rust.

Redwin (MSU) - Among the highest protein winter wheats. Yields similar to Winalta. Winterhardiness = 3, greater than Cheyenne but slightly less than Winalta. Medium short height. Very stiff straw, (along with Tiber, is among the stiffest available among Mta wheats). Medium-late maturity, medium yield. Red head. Very susceptible to leaf spot fungi and bacterial leaf blight. Good shatter resistance. Tiber and Readymade were selected from Redwin.

Rio Blanco (NAPB) - Not tested in Montana. For Southern Plains.

Rocky (NAPB) - A selection from Centurk for soil borne mosaic resistance. High yield, medium protein. Medium low winterhardiness (2), less than Redwin and Tiber. Very susceptible to yellow berry expression under low Nitrogen conditions. Rocky is lower quality than Centurk. Early maturity, which sometimes allows escape from sawfly. Medium stiff straw, medium height.

Roughrider (ND) - Tall, but more lodging resistant than Winalta. Good winter hardiness (5). Low yield. Medium-late maturity. For Eastern Montana; protein slightly greater than Winalta (high). Has a shatter problem in the Triangle area. Susceptible to leaf spot diseases. Heterogeneous for GP biotype Hessian fly.

Seward (ND 8002) (ND) - (Centurk/Froid/Norstar). Winterhardiness of Winalta (4), outyields Winalta by 20% at Sidney, but not at Conrad. Medium height and is shorter and stiffer than Winalta (about like Rocky). Protein is low: 3/4% less than Norstar. Good lodging resistance. Low protein & poor quality. Medium shatter resistance. Low yield. Susceptible to leaf rust & leaf spot.

Sierra (Agripro) - Short, stiff straw; good for irrigated lodging resistance. Higher yield & lower protein than Tomahawk.

Siouxland (S.Dak) - Sticky dough problems, and could damage our market image. Winterhardiness not adequate for Triangle area of Montana.

Tam 107 (Texas) - Early maturing, short straw. Moderate resistance to wheat curl mite infestation, and thus may be able to escape wheat streak mosaic virus. However, wheat streak symptoms were observed on Tam 107 at Conrad in 1993 (average level). Winterhardiness medium to low. Red head.

Thunderbird (Agripro) - Winterhardiness may be low, less than Centurk. Short straw with good lodging resistance, long coleoptile. Early maturity.

Tiber (MSU) - Winterhardiness comparable to Redwin (3), greater than Cheyenne, and slightly lower than Winalta. Equal, or sometimes 1 bushel less than Neeley. Among highest yielders. Medium short height with good lodging resistance. Stiff straw - stiffer than Judith, but not quite as stiff as Redwin. Straw stiffness may cause it to thresh a little harder than weaker-strawed varieties. Tiber sraw seems to persist longer after tillage, thus may enhance conservation compliance. Higher yielding and more tillers than Redwin, but 1/2% less protein. Protein is medium: higher than Rocky, and similar to Neeley. Medium maturity. Slightly earlier than Redwin, but still late enough to be sawfly vulnerable. Much greater tolerance to leaf spot diseases than Redwin. Good shatter resistance. Good milling and baking quality. Dark Red head, (darker than redwin); blackish red in years of favorable moisture. This trait makes Tiber popular for wheat weaving and other crafts. Susceptible to stem rust.

Tomahawk (Agripro) - No Montana data, but probably similar to Rocky in most agronomic traits. Short, stiff straw for good irrigated lodging resistance. Higher protein & lower yield than Sierra.

Vanguard (MTSF2238) (MSU, 1995) - Sawfly resistant. (Lew/Tiber//Redwin cross). Good stem solidness. Yield is 8-12% lower than Rocky and 5% less than Redwin; but under heavy sawfly infestation, yield was equal to Rocky and Tiber, and greater than Neeley and Judith. Test weight = Rocky. Head date 1 day later than Rocky, 3 days earlier than Neeley. Straw slightly stiffer and 1 inch shorter than Rocky, but moderately susceptible to lodging under high-yield conditions. Heterogeneous for height. Long coleoptile. Winterhardiness slightly less than Rocky (marginal). Good wheat streak mv tolerance. Susceptible to stem & stripe rust. Protein high (similar to Redwin), quality adequate. White chaff, nodding head. May have a tendency to shatter. Not a satisfactory variety for non-sawfly areas, and should not be grown where high levels of winterhardiness are needed.

Vista (Nebr, 1992) - Early heading semidwarf with resistance to Hessian fly, leaf rust, & stem rust. Medium to low yield in 1994. Short coleoptile. Winterhardiness uncertain, but good survival in 1994.

Vona (Colorado) - Winterkilled fairly often in Triangle area tests, but yields high if it survives without injury. Very early maturity if not winter-injured. Short stiff straw. Poor milling and baking quality.

Warrior (Nebr) - Tall straw and medium maturity. Medium shatter resistance. Yields lower than Cree. May be resistant to the Great Plains strain of Hessian fly. High protein. Seed supply no longer available.

Weston - (Idaho) Dwarf smut resistant, but less than Blizzard. Tall straw, lodges. Winter killed at Moccasin in 1989, winterhardiness poor (2). Moderate snowmold tolerance. Low to medium yield.

Winalta - High protein, tall weak straw, good winterhardiness (4). Medium yields. Good shatter resistance. Redwin and Tiber offer improvements.

Winoka - Similar to Winalta, but slightly earlier to mature.

Wings - (Private variety) Winterhardiness less than Centurk. Sister to Vona, but a little more winterhardiness. Early maturity.

Winridge (MSU) - Medium to high yield. Medium height with stiff straw. Medium late maturity, and therefore highly vulnerable to sawfly. Low test weight and protein. Winterhardiness 2 (medium low), similar to Centurk but less than Cheyenne. Good shatter resistance. For dwarf smut areas.

Yuma (Colorado, 1991) - Early maturing semidwarf, short coleoptile. Winter hardiness somewhat poor (2), otherwise good yield & TW potential. Some tolerance to wheat streak mv.

Table 1 **Dryland Winter Wheat** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	Spring survival class 1/	% protein
XNH 1643 (Hybr.)		112.4	61.5	36	177		10.0
QT 547 (Hybr.)		110.6	62.0	34	176		10.7
QT 566 (Hybr.)		110.1	61.4	37	177		10.2
JULES		109.6	60.6	35	177	2	8.7
ALLIANCE		105.6	61.1	34	174		10.5
ARAPAHOE		105.5	61.1	37	176	3	10.4
KESTREL		102.3	60.2	42	180	5	9.0
PROMINTORY		100.7	59.6	35	177	2	10.1
JUDITH		100.1	60.7	38	179	3	10.4
MANNING		100.0	56.2	35	176	2	9.9
VONA		99.7	60.0	33	174	2	10.5
YUMA		99.1	60.9	32	176	2	9.9
MT 9222		99.1	61.2	40	176		11.2
VISTA		98.6	61.0	31	176		11.5
MERIDIAN		97.4	59.0	34	182	2	9.9
BIGHORN		96.5	61.2	32	180		10.1
LAMAR		96.3	62.2	39	175	2	10.9
MT 91192		96.1	59.7	38	183		10.0
NEELEY		92.2	61.5	41	183	3	10.0
QUANTUM 542(Hybr.)		91.2	61.6	41	179	3	10.6
MT 9432		90.9	61.6	44	180		11.5
MTS92042	**	90.3	61.0	40	179		11.0
MT 8719		89.0	61.4	38	178		11.2
BZ6W90-422		88.6	57.2	38	179		10.9
KARL 92		88.4	60.5	28	176		12.4
WESTON		88.2	62.1	45	179	2	11.3
SDM00214		87.5	59.1	34	177		11.1
WINRIDGE		87.4	57.6	43	184	2	9.9
MTS92055	**	86.8	62.4	43	178		12.1
HALT	2/	86.6	59.7	30	175		11.6

(continued on next page)

(Conrad Winter Wheat, *continued*)

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	Spring survival class 1/	Protein %
NORWIN		85.8	60.0	30	182	5	10.5
MT 8949		85.4	61.7	39	182		10.4
ROCKY		85.4	60.8	41	177	2	10.3
BLIZZARD		85.0	60.3	46	183	2-3	10.5
CENTURK		83.9	60.5	39	177	2	10.4
NUWEST	*	83.6	59.8	41	180	3	9.7
MT 88046		82.5	62.4	39	176		12.4
WI88-275		81.0	59.7	31	175		10.9
IKE		80.1	61.5	33	175		12.8
AC READYMADE		79.1	60.6	43	182	3	11.6
TIBER		78.5	60.4	45	182	3	10.1
MTS92057	**	78.3	62.2	42	178	1-2	11.5
REDWIN		77.9	60.4	42	183	3	12.0
VANGAURD	**	76.5	59.1	37	180	1-2	11.8
W529		72.8	60.2	55	186		11.0
NORSTAR		69.1	59.5	55	186	5	11.1
AGASSIZ		67.9	61.8	47	180	4	11.4
MT 9105		66.7	60.0	46	182		9.8
ROUGHRIDER		65.6	61.4	49	180	5	11.5

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, Pondera County.
Fertilizer: 100# 11-51-0 with the seed, + 70# N broadcast.
Previous crop: Fallow.
Date seeded: Oct. 26, 1994.
Date harvested: Sept 6, 1995.
Rainfall: From April 1 to harvest was 14.44 inches.
1/ = Spring survival class: 5=best; 1=very low; based several location-years of observation.
2/ = Russian wheat aphid resistant.
Yield experimental mean: 89.61
Error degrees of freedom: 96.00
F test for var. = 8.13, c.v. 2 = 4.63, LSD (0.05) = 11.65
* = Hard white wheat, (MT 7811).
** = Sawfly resistant variety.

Table 2 **Dryland Winter Wheat** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

(Abbreviated list)

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	Spring survival class 1/	% protein
XNH 1643 (Hybr.)	112.4	61.5	36	177		10.0
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QT 566 (Hybr.)	110.1	61.4	37	177		10.2
JULES	109.6	60.6	35	177	2	8.7
ALLIANCE	105.6	61.1	34	174		10.5
ARAPAHOE	105.5	61.1	37	176	3	10.4
KESTREL	102.3	60.2	42	180	5	9.0
PROMINTORY	100.7	59.6	35	177	2	10.1
JUDITH	100.1	60.7	38	179	3	10.4
MANNING	100.0	56.2	35	176	2	9.9
VONA	99.7	60.0	33	174	2	10.5
YUMA	99.1	60.9	32	176	2	9.9
VISTA	98.6	61.0	31	176		11.5
MERIDIAN	97.4	59.0	34	182	2	9.9
BIGHORN	96.5	61.2	32	180		10.1
LAMAR	96.3	62.2	39	175	2	10.9
NEELEY	92.2	61.5	41	183	3	10.0
QUANTUM 542(Hybr.)	91.2	61.6	41	179	3	10.6
MTS92042 Rampart**	90.3	61.0	40	179		11.0
MT 8719 Erhardt	89.0	61.4	38	178		11.2
KARL 92	88.4	60.5	28	176		12.4
WESTON	88.2	62.1	45	179	2	11.3
WINRIDGE	87.4	57.6	43	184	2	9.9
HALT 2/	86.6	59.7	30	175		11.6
NORWIN	85.8	60.0	30	182	5	10.5
ROCKY	85.4	60.8	41	177	2	10.3
BLIZZARD	85.0	60.3	46	183	2-3	10.5

(*Continued on next page*)

(**Abbreviated list Winter Wheat,** ***continued***)

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	Spring survival class 1/	% protein
CENTURK	83.9	60.5	39	177	2	10.4
NUWEST *	83.6	59.8	41	180	3	9.7
MT 88046 McGuire	82.5	62.4	39	176		12.4
IKE	80.1	61.5	33	175		12.8
AC READYMADE	79.1	60.6	43	182	3	11.6
TIBER	78.5	60.4	45	182	3	10.1
REDWIN	77.9	60.4	42	183	3	12.0
VANGAURD **	76.5	59.1	37	180	1-2	11.8
NORSTAR	69.1	59.5	55	186	5	11.1
AGASSIZ	67.9	61.8	47	180	4	11.4
ROUGHRIDER	65.6	61.4	49	180	5	11.5

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, Pondera County.
Fertilizer: 100# 11-51-0 with the seed, + 70# N broadcast.
Previous crop: Fallow.
Date seeded: Oct. 26, 1994.
Date harvested: Sept 6, 1995.
Rainfall: From April 1 to harvest was 14.44 inches.
1/ = Spring survival class: 5=best; 1=very low; based several location-years of observation.
2/ = Russian wheat aphid resistant.
Yield experimental mean: 89.61
Error degrees of freedom: 96.00
F test for var. = 8.13, c.v. 2 = 4.63, LSD (0.05) = 11.65
* = Hard white wheat, (MT 7811).
** = Sawfly resistant variety.

Table 3 **Five-year summary** for **Winter Wheat** varieties grown near Conrad, MT. 1989 - 1990 - 1993 - 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average				
	Yield bu\ac	Test wt. lbs\bu.	Plant hgt. inches	Head date	% Protein 1/
MERIDIAN	81.2	59.9	33.7	177	10.3
YUMA	75.7	62.3	31.0	167	10.1
KESTREL	75.3	60.4	38.1	174	9.1
PROMONTORY	75.0	61.5	32.7	170	10.4
ARAPAHO	74.5	61.5	34.7	169	11.4
MANNING	74.5	59.5	32.4	171	10.6
QUANTUM 542	72.4	62.0	37.6	170	10.9
VONA	72.1	62.1	30.7	165	10.0
NEELEY	71.8	61.0	35.8	176	10.6
LAMAR	70.4	63.2	33.7	169	11.1
NUWEST *	69.7	60.7	36.2	173	11.0
JUDITH	69.4	60.3	35.2	172	10.0
BLIZZARD Rampart	69.1	61.0	38.6	177	11.3
MTS92042 Rampart**	68.4	62.3	34.9	173	11.2
WINRIDGE	67.6	59.3	38.8	176	9.8
ROCKY	67.5	62.6	36.2	171	10.4
TIBER	67.1	61.9	38.6	174	10.5
MT 8719 Erhardt	65.5	62.1	33.3	174	11.6
CENTURK	65.4	61.9	35.4	169	11.2
WESTON	65.1	60.7	38.9	173	11.0
REDWIN	62.3	61.3	36.8	174	11.2
MT 88046 McGuire	59.8	62.3	34.1	169	12.5
AGASSIZ	57.9	61.5	42.6	175	11.1
NORSTAR	57.0	61.4	45.0	179	11.3
ROUGHRIDER	54.0	61.8	39.4	173	11.6

Cooperator: Conrad Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
1/ = Proteins based on four years of data. (1989-90-93-1995)
* = Hard white wheat.
** = Sawfly resistant variety.

Title: 1995 Spring wheat & durum variety investigations.

Location: Western Triangle Research Center, Conrad, MT.

Personnel: Gregory D. Kushnak and Ron Thaut, Research Center, Conrad; and Dr. Luther Talbert, MSU Dept. of Plant Soil, and Environmental Sciences.

Spring wheat and durum varieties were grown on dryland at Conrad, Cut Bank, Oilmont, and Choteau. Data for the wheat trials are presented in Tables 4-12, and durum in Tables 13-16. 1995 data and five-year averages are included. (Emphasis should be placed more on the five-year averages when predicting which varieties are best suited for a given area. The 1995 tables reflect performance under the conditions of only one year, and they should not be relied on too heavily). Varieties were also tested under no-till continuous-crop conditions, and are discussed in the no-till variety section of this report.

Growing season rainfall was approximately double the amount of normal, producing exceptionally high yields at each of the locations. Therefore, the 1995 data should be treated as though the plots were irrigated, and used cautiously when selecting a variety for average dryland conditions.

Sawfly wasps were active at Conrad and Choteau, but did not cause the high level of damage that usually occurs at these sites. Therefore, some of the susceptible varieties such as Newana that have yielded medium in past years with heavy sawfly damage, were among the top yielders at these sites in 1995 (Tables 5-8). It is not known at this time if weather, parasites or some other factor reduced sawfly larval survival at Choteau and Conrad in 1995.

Although many of the varieties tested are classified as being sawfly resistant (indicated by an * in the data tables), the level of resistance has not been fully determined on some of the newer varieties. Resistance levels may range from 50 to 90 percent.

At Oilmont, the standard height (tall) varieties ranked lower for yield in 1995 than they normally have in past years at this site (Tables 9 & 10). Standard height varieties are more adapted to semi-arid conditions, and were apparently not able to compete in the wet year of 1995 at this site.

The Cut Bank location showed signs of nitrogen deficiency, and many of the varieties were not able to produce yields in line with the high moisture conditions of 1995 (Tables 11-12).

Comments on the varieties are presented in the following pages. Also refer to MSU Extension Bulletin 1093 for background and detailed descriptions for many of the varieties tested.

Spring Wheat Variety Notes & Comments

Western Triangle Agricultural Research Center, Conrad, MT

Far-Go herbicide tolerance:

Most Tolerant: Bergen, Bronze Chief, Butte-86, Fortuna, Glenman, Grandin, Gus, Klasic, Kodiak, Len, Marshall, McNeal(?), NK 751, Oslo, Owens, Penewawa, Pioneer 2731, Rambo, Stoa, Vanna, Westbred 926 & 936.

Least Tolerant: Alex, Amidon, Borah, Border, Centennial, Ellar, Era, Erik, Express, Fergus, Fremont, Hiline, Lew, Newana, and Pondera.

How to plant is just as important as what to plant. For best results plant with a hoe drill rather than a double-disc drill. A hoe drill moves the Far-Go treated soil out and away from the seed row so at normal planting depths the seed will go under the treated layer, where it's less susceptible to injury. If using a disc drill, choose tolerant varieties. Seeding depth should be 1.5 to 2 inches. Run tillage equipment 3" to 4" deep or less which will incorporate Far-Go 1.5" to 2" deep. Weather and soil type are also important. Cold, wet weather can delay the wheat's emergence and increase its chance of damage from the Far-Go in the soil. Wait until soil temps are warmer and increase seeding rate by 10% if planting less tolerant varieties. If the soil is light and has little organic matter, injury to the spring wheat is more likely.

Sawfly Resistant Hard Red Spr Wheat Varieties

(Resistance among varieties ranges from low to high; none have total resistance)

Amidon (ND 606) - Bearded standard height. Partial sawfly resistance (30% less solid than Fortuna); sawfly resistance not sufficient for severely infested areas. Lodges worse than Fortuna; weak broken stems. Same maturity as Lew, but slightly higher yield. Slightly later to mature than Pondera. Yield and test weight is medium to high. High protein like Fortuna. Does well in dry areas. Moderately susceptible to septoria. Has shown good tolerance to wheat streak mv (3 on scale of 1-3). Susceptible to Septoria.

Border, Westbred (WPB)- Bearded semidwarf. Early maturity (4 days earlier than Fortuna). Medium yield and protein. Solid stem in some years, moderate sawfly resistance (about like Rambo). Susceptible to leaf rust.

Cutless (ND) - Bearded tall semidwarf. Poor lodging resistance. Among lowest yielders. Protein high. Moderately susceptible to septoria. Medium test weight. Very good sawfly resistance (slightly more so than Fortuna).

Eatonia (Ag Canada Sask; Agripro) - Standard height, (Leader/Lancer cross). 3% higher yield than Leader (Leader has low yield). Maturity, test weight, & height similar to Leader. Larger kernels, greater stem solidness & sawfly resistance, and better resistance to common root rot than Leader. Straw strength slightly less than Leader.

Ernest (ND677) (ND, 1995) - Standard height. Tall, weak straw, and moderately late maturing (like Amidon). Sawfly resistance fairly good (slightly less than Lew, Fortuna & Cutless). Yield slightly less than Amidon, but greater than Lew, Fortuna and Cutless. Protein and test weight greater than Amidon. Resistant to prevalent races of leaf & stem rust.

Fortuna (ND) - Beardless standard height. High protein and test weight, early maturing; medium to low yield. Apparently tolerant to Fargo. Very susceptible to septoria. Somewhat susceptible to shattering. Very good sawfly resistance.

Glenman (MSU) - Beardless semidwarf, poor lodging resistance,(weak straw for a semidwarf). Medium-low (1%< Lew, 2%< Fortuna) protein, low test weight, hard to thresh. High yield. Higher yield than Lew most years, and about equal to Rambo.

Quality poor. Sawfly resistance has been very good in Triangle area tests (better than Amidon & Rambo), but the variety tends to produce some hollow stems under certain conditions, especially at Bozeman. Thus, it is rated "moderately" resistant (27% less solid than Fortuna). Fair tolerance to wheat streak mv (2.5 on scale of 1-3).

Lancer (Sask. Canada) - Beardless standard height. Among lowest yielders and seldom a protein advantage over Lew and Fortuna. Tangled lodging mess due to weak straw. Test weight medium-low. Fairly good sawfly resistance.

Leader (Canada) - Standard height. Among lowest yielders. Seldom a protein advantage over Lew and Fortuna. Fairly good sawfly resistance.

Lew (MSU) - Beardless standard height. Septoria tolerance moderate. 3 days later, and slightly lower protein than Fortuna, and susceptible to Fargo. Average yield similar to Fortuna. Avenge herbicide cannot be used. Medium to high test weight. Better shatter resistance than Fortuna. Medium-high protein, but less than fortuna. Good sawfly resistance (10 to 15% less than Fortuna, but 22% more resistant than Amidon).

Rambo, Westbred (WPB) - Bearded semidwarf. Partial sawfly resistance (36% less solid than Fortuna). Short stiff straw, but medium lodging resistance. Threshes easily, high yield, similar to Glenman. Medium-low protein similar to Glenman, but 1% lower than Lew and 2% lower than Fortuna. May have more tolerance to septoria than Fortuna, but is still susceptible. Test weight high.

Shoofly (private var.) - Bearded semidwarf with short stiff straw. Slightly shorter than Rambo, thus may be a little too short for dryland. Good stem solidness. Severe physiological leaf spotting in 1995.

Tioga (ND) - Beardless, standard height. Medium test weight, high protein, low yield. Good shatter resistance. Susceptible to lodging. Septoria tolerant. Good sawfly resistance.

Hollow-Stemmed, Sawfly **Susceptible** Hard Red Spr Wheat Varieties

Alex (ND) - Beardless standard height, medium lodging, high protein. Good shatter resistance and test weight.

Bergen (Agripro, 1991) - Bearded semidwarf for Minnesota. Medium test weight, low protein good lodging resistance, medium-late maturity. Tolerant to Septoria. Tends to shatter.

Bronze Chief (Seed Research Inc.) - Bearded semidwarf. Very low yield and tough threshability. Very high protein. Used in specialty milling market at Three Forks, MT.

Butte (ND) - Standard height. Early maturity (one day earlier than Fortuna). Low yield. Sawfly susceptible.

Butte 86 (ND) - Bearded standard height. Medium tall; stronger straw than Butte. Early maturity. Low yield, medium test weight, high protein. Septoria susceptible. See Butte-86.

Copper (Idaho) - Bearded semidwarf. Intended to replace McKay (higher quality) in Idaho, but acreage was less than expected. Protein and test weight is 1% less than Pondera. Late maturity. Straw weaker than Pondera and 906R.

Dalen (Agripro, 1991) - Bearded semidwarf. Medium early maturity. Shatter susceptible. Protein medium to low.

Express, Westbred (WPB) - Bearded semidwarf with good lodging resistance. Among highest yielders when tested at Conrad 1993. Protein about equal to Glenman. Reported to be tolerant to Avenge herbicide, but very susceptible to FarGo.

Resistant to Septoria.

Fergus, Westbred (WPB, TR983239) - Bearded semidwarf, red chaff. Good straw strength, same height as Newana Medium early maturity, 4 days earlier than Newana and 3 days earlier than McNeal. Similar to WB926, but is shatter resistant, and susceptible to dryland root rot. More suited for dryland (while 936 is better for irrigated). Protein slightly less than McNeal, but 1% higher than Newana. Slightly susceptible to Fargo. Moderate resistance to stripe & stem rust.

Field (Agripro) - Medium yield, short stiff straw, medium maturity, low test weight and protein.

Grandin (ND, 1989) - Bearded semidwarf. To replace Stoa in North Dakota. Good lodging resistance, medium high protein. Maturity similar to Pondera (medium-early). Yields less than Pondera and Hi-Line. Moderately susceptible to leaf spot.

Gus (ND, 1989) - Bearded semidwarf for high yield areas of Eastern Montana. Good lodging resistance. Very high protein and medium-late maturity (like Newana). Lower yield than Pondera and Hi-Line. Susceptible to leaf rust.

Hamer (Agripro) - Bearded medium height. Test wt, protein, and maturity are medium.

Hi-Line (MT8402) (MSU, 1993) - Bearded semidwarf. Higher protein and 3 days earlier than Newana and McNeal (maturity similar to Lew). Hi-Line yields greater than Newana on dryland, but similar to Newana on irrigated. Test weight slightly higher than Newana. Hi-Line yields similar to Pondera on dryland, but is 3 bu/a better than Pondera on irrigated. Protein and maturity of Hi-Line is similar to Pondera; but height is one inch shorter and test weight is slightly less than Pondera. Better lodging resistance than McNeal. Hi-Line contains a small percentage of tall plants, giving the variety a ragged appearance. This trait is probably due to an unstable chromosome carrying the semidwarf gene, and it may not be possible to purify the variety for uniform height. Fair tolerance to wheat streak mv (2.5 on scale of 1-3). Susceptible to leaf rust.

Kamut (T. polonicum 4x) - Polish wheat: about like durum; seeds larger than durum. Claimed to have non-allergenic gluten. 1% more protein than Pondera. For pasta & cereal products. 4 to 6" taller than Fortuna. Four days later to mature than Pondera. Too tall for irrigation.

Kodiak - Triple Dwarf (10" shorter than Newana; 18" shorter than Fortuna. Very low yield.

Krona (Agripro) - Semidwarf, good lodging resistance. Medium maturity, high yield, low protein. Moderate resistance to Septoria.

Kulm (ND, 1995) - Standard height, early maturing, fairly high protein. Intended to replace Butte-86 in N Dakota in areas where early maturity is desired.

Lars (Agripro) - Bearded semidwarf. Short straw, medium maturity. High yield under good growing conditions, but low protein.

Len (ND) - Bearded semidwarf. High protein. Straw not as stiff as Newana. Good quality, shatter resistance, and test weight. Tolerant to septoria. Yields similar to Pondera and Hi-Line, but Len has slightly lower protein.

Marshall (Minn) - Bearded semidwarf. High yield and test weight on irrigated; good lodging resistance, low protein. Irrigation only.

McKay (Idaho) - Bearded semidwarf. Very late maturing. High yield if water lasts, otherwise low yield. Lower quality than Copper.

MT9849

McNeal (MSU, 1994) - Bearded semidwarf but slightly taller and more uniform height than Hiline. Good lodging resistance, but lodged more than Hiline in the high rainfall year of 1995. Higher yield than Hiline. Red chaffed. Maturity slightly earlier than Newana, but slightly later than Hiline. Very good quality with high protein and loaf volume. Test weight about equal to Newana & Hiline, but 1#/bu less than Pondera. Not as tough to thresh as Pondera and Glenman, but may have a tendency toward toughness. Fair tolerance to wheat streak mv (2.5 on scale of 1-3).

Minnproe (Minn) - Bearded semidwarf. Short, stiff straw; medium maturity and protein; low test weight.

Newana (MSU) - Bearded semidwarf. Very Good yield on irrigation; medium on dryland. Protein medium. Very susceptible to sawfly. Medium-late maturity, 3 days later than Pondera and Hi-Line. Good lodging and shatter resistance. Tolerant to septoria. Yields similar to Hi-Line on irrigation, but has less protein than Hi-Line. Yields lower than Hi-Line on dryland.

Nomad, Westbred (WPB) - Beardless semidwarf, good lodging resistance. Medium-early maturity, medium test weight (but higher than Glenman), medium protein.

Norak - NAPB.

Nordic - Tall semidwarf; straw and protein are marginal for high yield, irrigation areas.

Norlander (Agripro) - Bearded semidwarf, early maturing. Intended for eastern Montana. High yield under good conditions. Medium protein.

Olaf (ND) - Bearded semidwarf. Medium test weight and lodging. Medium to low shatter resistance. Medium high protein, but most of it is concentrated in the bran, resulting in low flour protein. Medium-low yield. Septoria leaf blotch tolerant.

Pioneer 2369 (ND, 1993) - Bearded semidwarf, good lodging resistance. High yield and test weight on irrigated. Protein medium. (All pioneer materials turned over to NDSU).

Pioneer 2375 (ND, 1994) - Bearded, early maturing. Medium yield on dryland, high on irrigated. Medium to high protein, depending on level of N fertilizer. Protein response to fertilizer was higher than for other varieties in 1995.

Pioneer 2398 (ND, 1995) - Semidwarf with shorter and stronger straw than 2375. Medium late maturity (similar to Amidon). Lower protein than 2375.

Pondera (MSU) - Bearded semidwarf with good lodging resistance. A higher protein, earlier maturity (3 days) version of Newana. Sawfly susceptible. Good on irrigation or dryland. High yield and test weight. Tolerant to septoria.

Prospect (SD) - Bearded semidwarf. Low yield, medium maturity, medium lodging. High protein and test weight.

Probrand 751 (NK) - Bearded semidwarf. High yield on irrigated, short stiff straw, low test weight and protein. For irrigation only. Good shatter resistance.

Sonja (Agripro) - Bearded semidwarf with short straw and very good lodging resistance. High yield under irrigated conditions. Medium late maturity. Protein is medium.

Stoa (ND) - Bearded standard height. Poor yield in triangle area, but popular in North Dakota because of high protein. Lew and Pondera compete with it quite well in Triangle area. To be replaced in ND by Grandin. Later to mature than Pondera and Grandin.

Success (Cenex) - Semidwarf with medium lodging resistance. Medium high yield with irrigation. Late maturity. Low test weight and protein.

Telemark (Agripro) - Semidwarf with short stiff straw; good yield with irrigation. Medium early maturity. Good protein.

Thatcher - Tall beardless. Very low yield. Used as quality check.

Trenton (ND 673) (ND, 1995) - Hollow stem, sawfly susceptible.

Vance (Minn) - Bearded semidwarf. Medium test weight, low protein.

Vandal (Idaho) - For irrigated only.

Wampum (Minn) - Bearded semidwarf. Very high yield on irrigated. Low protein. Very susceptible to rust.

Westbred - See Border, Express, Fergus, Nomad, Rambo.

Westbred 926R (WPB) - Bearded semidwarf. Among highest yielders. Good straw strength; 2 inches shorter than Newana, and 4 inches shorter than McNeal. Earlier maturity than Newana, 4 days earlier than McNeal. Test weight similar to McNeal and slightly less than Newana. Protein higher than Newana and similar to McNeal. Tendency to shatter. Susceptible to Avenge herbicide; good tolerance to FarGo. Has some resistance to Washington race of Hessian fly. Fairly good tolerance to dryland root rot. See Fergus & 936.

Westbred 936 (WPB) - Bearded semidwarf for irrigated only. Has low test weight on dryland, and is more susceptible to dryland root rot than 926 and Fergus (although IMZ helps to control root rot). Shatter resistant. Possible replacement for 906 and 926. Superior to 906 and 926 as an irrigated variety. (Tested as ph986-61 in 1992). Does not have Hessian fly or dryland root rot resistance, thus 926 is preferred in those areas. 936 is stiffer strawed than 926; 3 inches shorter than Newana and 5 inches shorter than McNeal. Protein appears good, 1.5% higher than Newana and 0.4% higher than McNeal. Four days earlier than Newana, 3 days earlier than McNeal. Reportedly tolerant to Avenge herbicide; fairly good tolerance to FarGo. Moderate resistance to stem rust, resistant to stripe rust. Susceptible to leaf rust and Septoria.

Wheaton (Minn) - Bearded semidwarf. High yield with irrigation. Low protein and test weight. Short stiff straw, good lodging and good shatter resistance.

Hard White Spring Wheat

For specialty market. Protein of hard white will probably need to be at least 14% to meet market standards. In order to be officially classified as Hard White by U.S. Grain Standards, the developer/owner of the variety must petition for classification. Hard whites sprout more readily than hard reds, especially those developed from Australian germ plasm. The pure white trait is difficult to maintain, as pollen from red wheats may pollinate a white variety, causing a mixture of red kernels.

Genesis (Canada) - Hard white. Not tested in Montana.

Golden 86 (Private Variety) - Owned by a commercial milling and baking firm north of Three Forks, Montana. A high quality hard white for specialty markets. Yielded more than Klasic, but less than Tanager (1 year), and 1.5 to 2% higher protein than Tananger and Klasic.

Klasic (NK) - Bearded semidwarf. Very short straw. Adapted to California. Not well adapted to Triangle area: low yield & protein. Officially classified as a hard white by U.S. Grain Standards.

Tanager "S" (CIMMYT) - Hard white. Very high yield (steep BYX).

Soft White Spr Wheat

Reed, AC (Alberta, Can.) - Soft white. Resistant to prevalent races of stripe rust. Higher yield, two days earlier maturity, and higher milling & baking quality than Fielder. Good lodging resistance and moderate shatter resistance. Adapted to irrigated regions of southern Alberta.

Fielder - Bearded semidwarf, soft white. Highly susceptible to stripe rust and can lose 40% yield.

Owens (Idaho/Oregon) - Bearded semidwarf, soft white. Earlier than Waverly and Treasure, but still may be too late for dryland in most years. Stripe rust resistant. Short straw, medium maturity and test weight.

Penawawa - (Wash/Oregon) - Bearded semidwarf, soft white. Replacement for Owens? Shorter and stiffer straw than Owens, later to mature than Owens, and lower test weight.

Sprite (WPB) - Soft white.

SWS-52 (Canada) - Soft white. Much better lodging resistance than Owens, but 5-6 days later than Owens and Fielder. Resistant to stripe rust (like Owens).

Treasure - Bearded semidwarf, soft white. Late maturing. Yields higher than Owens on irrigated; and also on dryland in years of favorable moisture.

Vanna (WPB, 1994) - Bearded semidwarf, soft white. Good straw strength; one inch taller than Penawawa, same height as Owens. Two days later maturing than Owens and Penawawa, but has reasonable tolerance to dryland conditions. Yield and test wt similar to Penawawa; higher yield than Owens. About 1% lower protein than Penawawa. Stripe rust resistant.

Waverly - Bearded semidwarf, soft white. Late maturing.

Durum

Durum quality scale: 1 - 4; 1 = low, 4 = high. Quality durum has strong gluten. Growers who plan to grow weak-gluten varieties need to have a marketing organization identified that will purchase those varieties.

Cando (ND) - Very short semidwarf. Very high lodging resistance. For irrigation or favorable moisture. Not suited for dry conditions. Good shatter resistance and high yield, but small kernel size. Medium maturity. Test weight medium. Septoria susceptible. Weak gluten, quality = 2.

Coulter (Canada)- Blackbearded, but blackness disappears upon ripening.

Crosby (ND) - Standard height. Fair lodging resistance on dryland, and good shatter resistance. Medium to early maturity. Test weight medium to high. Quality = 2.

Fjord - (Agripro) - Standard height, medium yield durum. Good lodging resistance. Susceptible to Septoria.

Golden Ball - Black bearded Canadian - old variety, seed may be hard to find - for wheat weaving.

Kyle (Canada) - Very tall weak straw, poor lodging resistance. Very late maturing. Strong gluten, good quality.

Laker, Westbred - (WPB) - Tall semidwarf. High yield, stiff straw, medium lodging resistance, midway between standard height and semidwarf, better height

choice for all around production, not as short as Lloyd and Cando. Diseased in irrigated in 1989, while other entries were not. Recommended for Dist 2-6. Protein medium. High test weight. Strong gluten, quality = 3.

Lloyd (ND) - Very short. For irrigation or favorable moisture. Not suited for dry conditions. Very high lodging resistance. High yield and good shatter resistance. Medium maturity. Test weight is medium. Susceptible to Septoria. Strong gluten, good quality.

Medora - (Manitoba, Canada) - Standard height, with fair lodging resistance. Dryland only, medium to early maturity. Good yield on dryland, better than Monroe. Test weight is medium to high. Strong gluten, quality = 4.

Monroe (ND) - Standard height, fair lodging resistance for dryland. Early maturity, dryland only. Test weight is medium. Strong gluten, quality = 4.

Munich (ND, 1995) - Medium height, strong straw, and higher yield than Renville, Sceptre and Medora. Stong gluten, quality = 4.

Pelissier - Black bearded Canadian. Wheat weaving.

Pendur (WPB) -Does not do well in Triangle area.

Plenty (Canada) - High yield, but very tall weak straw. Lodges easily. Late maturing. Strong gluten, quality = 4.

Regold, Westbred (WPB) - (Originally named Regal). Standard height durum for dryland areas of Montana and North Dakota. Tall straw, susceptible to lodging. Medium yield and test weight, medium-low protein. Resistant to Septoria and most races of leaf & stem rust. Excellent semolina color and strong gluten.

Renville (ND) - (Rollette/Vic) -Standard height. One day later and greater yield than Vic. Tall, lodges bad; thus, even though it yields good on irrigation, its weak straw renders is unsuitable for irrigation. Has a niche in the low yield/low rainfall areas. Test weight and maturity are medium. Strong gluten, quality = 4.

Rolette (ND) - Standard height, but good lodging resistance. Good shatter resistance and test weight. Early maturing and low yield. Good quality. Susceptible to leaf spot diseases.

Rugby (ND) - Standard height. Good shatter resistance. Medium test weight. Moderately susceptable to septoria. Weak gluten, poor quality. Susceptible to Septoria.

Sceptre (Sask. Can.) - Standard to medium height, but fairly stiff straw. Taller than Laker, but shorter than Medora and other standard height varieties. High yield. Medium maturity. Susceptible to leaf rust. Strong gluten, quality = 4.

Stockholm (Agripro) - Semidwarf (short like Lloyd and Cando), medium early. High yield (Similar to Lloyd, and higher than Fjord). Very stiff straw. Protein medium to low. Quality = 3.

Vic (ND) - Tall weak straw. Low to medium yield. Good shatter resistance and high test weight. Susceptible to leaf rust and leaf spotting diseases; highly susceptible to WSMV. Strong gluten, quality = 4.

Voss (Agripro) - Intended to replace Stockholm. Latest maturing of all entries in 1995. Strong gluten.

Ward (ND) - Standard height with fair lodging resistance for dryland, and good shatter resistance. Test weight medium. Tolerant to septoria. Weak gluten, quality = 2.

Spring Triticale

Assume all triticales have a potential ergot problem!

Carman (Canada) - early maturing (similar to Newana wheat in maturity) by triticale standards; generally the best for dryland; and generally higher protein. Shorter straw than Welsh triticale, but still tall.

Juan (Calif) - Too late to mature, resulting in low yield & T.W. some yrs.

Karl (N. Dakota) - Early maturing (similar to Newana wheat in maturity) by triticale standards; generally the best for dryland; and generally higher yield & protein. A semidwarf; thus, easier to manage than taller & later varieties. Similar height as Newana wheat.

Kramer (N. Dakota) - Very early maturity by triticale standards. Good yield. A semidwarf, but slightly taller than Newana wheat and Karl triticale. Kramer is medium height, while Karl and Newana are short.

Marval (S. Dak) - Medium maturity. Low yield on dryland in some years.

T-54, T-59, T-61 (Saskatchewan) - Very late maturity. Look like wheat, and have test weights nearly equal to wheat.

Wapiti (Canada) - To replace Carman and Welsh. High yield but tall weak straw and late maturity.

Welsh (Canada) - Late maturing, may be discontinued.

Whitman (Wash) - Too late to mature, resulting in low yield & test weight in some years.

Test weight of triticale = approximately 50 lbs/bu. Proteins were less than Newana wheat, but slightly higher than barley. Triticale seed rate 20% higher than wheat. Relative maturities and heights for triticale:

Newana wheat	very early	short
Kramer	very early	med short
Carman	early	med. tall
Karl	early	short
Marval	medium	very tall
Welsh	medium late	tall
Beagle	late	tall
Wapiti	late	med. tall
Sunland	very late	med. tall
T-54	very late	tall
T-61	very late	tall
Juan	extreme late	tall
Whitman	extreme late	tall

Winter Triticale

Decade (Canada) - Shorter than most other winter triticales, but still as tall as some of the taller winter wheats; earlier and higher yield and shorter strawed than Winteri. Thus Decade may be the better choice. May have a head snap problem.

Flora - Short strawed (like Rocky w.wht.) and good yield, but had very low test weight. Survived winter of 1989 OK, but winterhardiness is questionable. Straw breakage observed in 1988.

Grace - Poor winterhardiness (May be a spring type). Stem-breakage and crinkle-joint.

Winteri (Canada) - Very tall and late maturing.

VTO numbers from 1988: winter types according to WSU.

Table 4 **Advanced Yield Dryland Spring Wheat** variety trial grown north of **Conrad**, 1995. Montana Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety		Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	Head date	% protein
PENAWAWA	(s. white)	99.5	58.8	35	190	7.8
VANNA	(s. white)	89.8	59.0	35	191	7.8
BZ992632		84.7	61.2	38	188	10.1
MT 9467		84.5	58.1	33	190	10.3
HY 413		83.5	60.5	37	190	9.0
MT 9328		83.2	58.8	39	190	9.4
MT 9410		81.9	60.6	43	189	10.3
MT 9432		81.6	58.7	47	190	10.7
MT 9407		81.1	60.3	44	189	11.0
MT 9311		79.9	60.8	41	193	9.4
NEWANA		79.6	55.1	34	191	10.4
MT 9354		78.6	62.2	40	189	11.2
GLENMAN	*	78.6	54.4	37	190	10.1
MT 9426		78.3	58.3	37	185	11.5
BZ992634		77.7	60.5	35	189	10.3
ERNEST (ND 677)	*	77.1	61.9	44	189	11.1
MCNEAL		76.8	60.2	36	190	10.9
MT 9408		76.1	61.0	41	189	10.8
MT 9403		76.0	59.5	44	189	10.4
MT 9453		75.9	59.5	42	190	11.3
BZ992588		75.5	56.1	36	189	11.2
WESTBRED 926		75.0	60.0	36	185	10.7
MT 9422		74.6	56.2	40	190	11.7
FERGUS		74.6	59.1	33	187	10.6
MT 9307		74.5	61.7	46	191	11.1
WESTBRED 936		74.3	59.1	32	189	10.4
LEW	*	74.3	61.3	46	192	10.3
HI-LINE		74.2	62.7	33	189	10.5
MT 9427		73.9	59.9	38	188	11.7
FORTUNA	*	73.6	62.1	44	189	11.0

(continued on next page)

(Advanced Yield Spring Wheat , *continued*)

Variety		Yield bu/ac	Test weight lbs/bu	Plant height inches	Head date	Protein %
MT 9433		73.4	58.6	43	191	10.9
MT 9332		73.3	61.2	40	190	10.2
BORDER	*	73.2	59.7	35	189	11.1
MT 9434		73.1	61.2	38	186	11.0
MT 9419		72.4	60.3	40	185	10.6
MT 9406		72.1	61.5	42	187	11.5
MT 9420		70.8	60.2	43	190	10.6
MT 9469		70.5	58.6	36	190	10.8
MT 9425		70.2	59.5	39	186	11.2
MT 9450		70.1	59.0	40	188	11.0
MT 9413		69.3	61.6	35	188	10.8
LEN		69.2	58.7	34	190	11.8
SHOOFLY	*	69.1	61.1	29	192	9.7
NORLANDER (N90-700)		68.8	61.0	30	185	9.4
MT 9360		68.7	61.2	38	189	11.7
WESTBRED EXPRESS		68.5	60.4	30	190	10.2
MT 9430		67.2	61.2	40	190	10.9
AMIDON	*	65.7	59.3	43	191	9.9
ND 673		65.7	59.0	46	189	10.6
MTRWA116		64.7	61.4	35	189	10.6
BW 688	*	63.6	61.0	41	189	10.5
THATCHER		62.8	59.3	47	191	9.7
AC EATONIA	*	61.2	61.8	42	189	10.6
MT 9405		57.8	61.9	36	183	11.7

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-52-0 with the seed, + 45# N actual topdressed before seeding.
Previous crop: Fallow.
Date seeded: May 3, 1995.
Date harvested: September 6, 1995.
Rainfall: From seeding to harvest was 13.47 inches.
* = Sawfly resistant varieties. (Amidon and Border have partial resistance.)
Yield experimental mean: 74.27
Error degrees of freedom: 106
F test for var: 6.13, C.V. 2: 3.94, LSD (0.05): 8.21

Table 5 **Advanced Yield Dryland Spring Wheat** variety trial grown north of **Conrad,** 1995. Montana Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

(***Abbreviated list***)

Variety		Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	Head date	% protein
PENAWAWA	(s. white)	99.5	58.8	35	190	7.8
VANNA	(s. white)	89.8	59.0	35	191	7.8
NEWANA		79.6	55.1	34	191	10.4
GLENMAN	*	78.6	54.4	37	190	10.1
ERNEST (ND 677)	*	77.1	61.9	44	189	11.1
MCNEAL		76.8	60.2	36	190	10.9
WESTBRED 926		75.0	60.0	36	185	10.7
FERGUS		74.6	59.1	33	187	10.6
WESTBRED 936		74.3	59.1	32	189	10.4
LEW	*	74.3	61.3	46	192	10.3
HI-LINE		74.2	62.7	33	189	10.5
FORTUNA	*	73.6	62.1	44	189	11.0
BORDER	*	73.2	59.7	35	189	11.1
LEN		69.2	58.7	34	190	11.8
SHOOFLY	*	69.1	61.1	29	192	9.7
NORLANDER (N90-700)		68.8	61.0	30	185	9.4
WESTBRED EXPRESS		68.5	60.4	30	190	10.2
AMIDON	*	65.7	59.3	43	191	9.9
THATCHER		62.8	59.3	47	191	9.7
AC EATONIA	*	61.2	61.8	42	189	10.6

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-52-0 with the seed, + 45# N actual topdressed before seeding.
Previous crop: Fallow.
Date seeded: May 3, 1995.
Date harvested: September 6, 1995.
Rainfall: From seeding to harvest was 13.47 inches.
* = Sawfly resistant varieties. (Amidon and Border have partial resistance.)
Yield experimental mean: 74.27
Error degrees of freedom: 106.00
F test for var: 6.13, C.V. 2: 3.94, LSD (0.05): 8.21

Table 6 **Five-year summary** for dryland **Spring Wheat** varieties grown near **Conrad, MT.** 1990 - 1991 - 1993 - 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety		5 - year comparable average				
		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	% Protein
PENAWAWA	(s. white)	76.5	59.9	32.6	185	10.3
VANNA	(s. white)	73.7	59.3	33.8	187	10.4
GLENMAN	*	68.4	59.6	35.4	185	12.2
NEWANA		66.6	58.7	33.2	186	12.3
WESTBRED 926		66.2	60.9	33.1	182	13.0
HI-LINE		65.5	61.6	31.8	182	12.8
WESTBRED 936		64.7	59.3	30.1	184	13.7
FERGUS		64.0	60.0	34.1	184	12.9
WESTBRED EXPRESS		63.2	60.4	29.1	187	12.5
AMIDON	*	62.3	60.6	40.4	181	12.1
BORDER	*	61.8	61.1	34.8	182	13.1
LEW	*	61.7	62.1	41.6	186	12.8
FORTUNA	*	61.5	61.9	41.8	184	12.9
LEN		59.0	59.9	33.4	183	13.6
THATCHER		52.9	59.8	44.0	185	12.8

Cooperator: Western Triangle Agricultural Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
* = Sawfly resistant varieties. (Amidon and Border have partial resistance.)

Table 7 **Dryland Spring Wheat** variety trial grown near **Choteau**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% protein
VANNA (s. white)		84.6	60.8	38	9.9
PONDERA		79.2	59.8	38	13.2
McNEAL		78.8	56.9	38	13.9
NEWANA		78.8	57.1	35	13.3
GLENMAN	*	78.1	57.8	35	12.5
BORDER	*	77.3	61.2	36	13.2
NORLANDER (N90-700)		76.6	59.4	35	12.9
FERGUS		75.9	61.0	37	13.0
LEW	*	75.2	62.4	44	13.4
HI-LINE		74.9	61.7	34	12.9
MT 9354		74.6	61.5	40	12.8
RAMBO	*	73.9	57.8	34	12.2
SHOOFLY	*	73.7	57.7	33	12.2
MT 9360		73.3	60.2	37	13.8
FORTUNA	*	72.1	61.9	44	13.8
WESTBRED 936		71.8	58.8	33	13.6
WESTBRED 926		70.0	59.1	34	13.6
PIONEER 2375		69.6	60.8	40	13.1
MTHW9406		69.5	59.2	35	12.8
AMIDON	*	69.0	60.7	45	13.4
LEN		68.8	59.6	38	14.0
GRANDIN		67.7	60.0	39	14.3
BW 688	*	67.4	59.2	46	14.1
ERNEST (ND 677)	*	66.9	62.2	45	14.8
WESTBRED EXPRESS		63.7	59.9	30	13.4
STOA		62.9	60.0	45	14.0
AC EATONIA	*	60.3	59.3	45	14.2

Cooperator: Roy Inbody.
Location: Twelve miles northeast of Choteau. (Teton County)
Fertilizer: 100# 11-52-0 with the seed, + 60# actual 32-0-0 liquid applied in the fall on fallow.
Date seeded: April 18, 1995, Date harvested: Aug. 30, 1995.
Rainfall: From seeding to harvest was 12 + inches.
* = Sawfly resistant varieties. (Amidon, Rambo and Border have partial resistance.)
Yield experimental mean: 72.39 Error degrees of freedom: 52.00
F test for var: 3.20, C.V. 2: 4.36, LSD (0.05): 8.95

Table 8 **Five-year summary** for Dryland **Spring Wheat** varieties grown near **Choteau, MT.** 1991 - 1992 - 1993 - 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety		5 - year comparable average Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Protein
GLENMAN	*	49.4	56.6	32.0	14.1
HI-LINE		46.0	59.1	29.6	14.7
PONDERA		45.1	58.9	31.4	15.1
FORTUNA	*	44.7	59.7	37.2	15.2
RAMBO	*	44.3	57.2	30.0	14.0
NEWANA		43.9	56.8	30.0	14.3
LEW	*	43.5	59.3	36.8	15.0
AMIDON	*	41.4	57.4	36.8	15.1
WESTBRED 926		41.4	57.2	29.2	14.8
GRANDIN		39.8	58.2	32.6	15.4
LEN		39.6	57.2	31.0	15.0
STOA		37.8	57.0	36.0	15.3

Cooperator: Roy Inbody in 1994 - 1995, and Rick Corey in 1991-1992 - 1993.
Location: Northeast of Choteau, MT. (Teton County)
* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.)

Table 9 **Dryland Spring Wheat** variety trial grown near **Oilmont**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% protein
VANNA (s. white)		60.6	61.6	31	6.4
WESTBRED 936		60.5	62.1	26	10.0
McNEAL		59.5	62.4	35	10.5
WESTBRED 926		56.0	62.5	34	9.6
GRANDIN		55.9	63.9	35	10.9
MTHW9406		55.6	62.4	36	8.7
HI-LINE		54.9	62.4	32	10.4
ERNEST (ND 677)	*	53.3	65.0	38	9.6
NORLANDER (N90-700)		53.1	64.1	32	9.2
BW 688	*	52.8	62.7	38	8.8
GLENMAN	*	52.7	62.7	33	9.0
RAMBO	*	52.7	63.9	32	8.7
WESTBRED EXPRESS		52.4	63.4	26	9.6
PIONEER 2375		52.2	64.0	33	9.1
SHOOFLY	*	51.6	62.2	28	7.4
PONDERA		51.4	62.7	34	9.7
NEWANA		51.2	62.8	33	7.8
FERGUS		50.8	63.4	31	8.8
LEN		49.8	62.3	35	9.5
STOA		49.7	62.8	36	9.9
LEW	*	49.7	63.9	37	9.5
AC EATONIA	*	48.5	63.6	39	9.2
AMIDON	*	47.1	63.1	39	9.6
MT 9354		47.0	64.0	34	9.4
BORDER	*	46.3	63.8	31	9.8
MT 9360		45.4	63.4	36	9.9
FORTUNA	*	44.5	63.7	41	9.4

Cooperator: Terry Alme.
Location: Eight miles east of Oilmont. (Toole County)
Fertilizer: 100# 11-52-0 with the seed.
Previous crop: Fallow.
Date seeded: April 17, 1995. Date harvested: August 22, 1995.
Rainfall: From seeding to harvest was 10 + inches.
* = Sawfly resistant varieties. (Amidon, Rambo and Border have partial resistance.)
Yield experimental mean: 52.05, Error degrees of freedom: 52
F test for var: 1.71, C.V. 2: 6.27, LSD (0.05): 9.25

Table 10 **Five-year summary** for dryland **Spring Wheat** varieties grown near **Oilmont, MT.** 1991 - 1992 - 1993 - 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety		5 - year comparable average			
		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Protein
GLENMAN	*	47.3	59.3	30.6	12.9
HI-LINE		44.3	59.2	29.2	14.8
GRANDIN		43.9	59.2	31.8	15.1
WESTBRED 926		42.6	58.4	27.3	14.1
AMIDON	*	42.6	59.9	34.6	13.9
LEN		42.2	59.6	31.0	14.2
LEW	*	42.1	60.1	35.4	14.0
NEWANA		42.1	58.5	29.2	12.8
PONDERA		40.9	60.1	30.0	14.2
FORTUNA	*	40.1	60.3	35.2	13.5
RAMBO	*	40.1	59.8	29.0	13.5
STOA		39.6	58.7	34.6	14.5

Cooperator: Terry Alme.
Location: Eight miles east of Oilmont, MT. (Toole County)
* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.)

Table 11 **Dryland Spring Wheat** variety trial grown near **Cut Bank**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Protein
VANNA	(s. white)	68.3	62.1	31	6.7
NORLANDER	(N90-700)	61.6	61.2	31	9.3
BORDER	*	59.7	62.9	32	10.5
LEW	*	58.7	63.4	37	9.7
FERGUS		58.1	63.3	33	10.1
AMIDON	*	56.4	61.5	38	9.2
GLENMAN	*	55.9	61.8	32	9.4
PONDERA		55.6	62.3	32	10.4
SHOOFLY	*	53.0	61.2	28	9.5
BW 688	*	53.0	61.1	42	10.1
FORTUNA	*	52.6	62.7	36	10.3
MCNEAL		52.0	62.3	32	10.9
AC EATONIA	*	51.8	62.4	38	11.1
WESTBRED 936		51.6	61.2	29	9.3
GRANDIN		51.5	62.3	32	10.0
MT 9360		50.2	61.9	35	10.9
MT 9354		49.4	62.8	34	10.9
STOA		48.8	61.0	35	9.8
HI-LINE		48.8	62.4	28	10.2
RAMBO	*	48.6	61.9	28	9.4
PIONEER 2375		48.3	62.1	35	10.4
NEWANA		47.2	62.2	32	10.2
LEN		46.4	61.5	32	10.6
WESTBRED EXPRESS		46.4	62.2	26	10.7
MTHW9406		46.2	61.5	34	9.9
WESTBRED 926		44.7	61.7	30	10.0
ERNEST (ND 677)	*	44.7	60.9	36	9.7

Cooperator: Don Bradley.
Location: Fifteen miles north of Cut Bank. (Glacier County)
Fertilizer: 100# 11-52-0 with the seed.
Previous crop: Fallow.
Date seeded: April 24, 1995. Date harvested: Oct.16, 1995.
Rainfall: From seeding to harvest was 10 + inches.
* = Sawfly resistant varieties. (Amidon , Rambo and Border have partial resistance.)
Yield experimental mean: 52.20, Error degrees of freedom: 52
F test for var: 2.03, C.V. 2: 7.58, LSD (0.05): 11.23

Table 12 **Five-year summary** for dryland **Spring Wheat** varieties grown near **Cut Bank, MT.** 1991 - 1992 - 1993 - 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety		5 - year comparable average Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Protein
AMIDON	*	45.3	58.4	37.8	10.4
GLENMAN	*	44.0	58.6	31.0	9.3
PONDERA		43.0	60.5	31.2	10.9
LEW	*	42.5	59.6	36.6	9.8
RAMBO	*	42.5	59.1	29.6	9.9
HI-LINE		42.1	60.7	29.0	10.3
FORTUNA	*	42.0	60.3	36.2	10.2
GRANDIN		41.6	60.1	33.2	11.4
STOA		41.4	60.4	35.0	10.0
LEN		41.3	58.8	31.2	11.2
WESTBRED 926		41.0	58.8	30.6	10.0
NEWANA		39.9	59.2	29.8	9.7

Cooperator: Don Bradley.
Location: Fifteen miles north of Cut Bank, MT. (Glacier Co.)
* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.)

Table 13 **Dryland Durum** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	% Protein
VOSS 1/	84.9	61.5	30	190	9.5
LAKER	84.9	60.1	33	191	9.6
SCEPTRE	84.5	62.2	42	190	9.5
LLOYD	82.2	59.5	30	191	9.1
RENVILLE	79.9	60.8	44	191	9.9
KYLE	77.5	61.7	49	193	9.3
~~CROSBY~~ Cando	76.0	59.1	30	191	8.9
MONROE	72.8	62.4	44	190	9.7
MEDORA	71.8	62.0	45	189	9.4
PLENTY	69.3	62.6	43	190	9.4
VIC	66.5	61.3	46	190	9.2
WARD	64.1	62.5	45	190	9.3

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-51-0 with the seed, + 45# N actual topdressed before planting.
Previous crop: Fallow
Date seeded: May 3, 1995.
Date harvested: September 6, 1995.
Rainfall: From seeding to harvest was 13.47 inches.
Yield experimental mean: 76.19
Error degrees of freedom: 22.00
F test for var.: 3.47
C.V. 2: 5.15
LSD (0.05): 11.52
1/ = Voss was later to ripen than the other varieties.

Table 14 **Five-year** summary for **Dryland Durum** varieties grown north of Conrad, MT. 1990 - 1991 - 1993- 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average				
	Yield Bu\ac	Test weight lbs\bu	Plant hgt. inches	head date	% Protein
LLOYD	68.0	58.6	28.6	174	11.4
LAKER	64.7	60.2	32.6	174	12.1
RENVILLE	64.6	60.9	41.0	173	12.5
SCEPTRE	63.4	60.9	37.6	185	12.6
PLENTY	59.5	61.3	41.4	194	12.3
CROSBY	59.4	60.8	~~37.0~~ 40	183	13.0
VIC	54.1	61.2	41.0	184	12.7
MEDORA	57.8	61.7	39.8	184	13.1
MONROE	57.6	61.3	39.0	182	12.9
WARD	53.6	61.1	40.8	184	12.8

Cooperator: Western Triangle Ag. Research Center.
Location : Ten miles north of Conrad, MT. (Pondera County)

Table 15 **Irrigated Durum** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	% Protein
~~CROSBY~~ Cando	108.5	61.2	31	187	12.0
VOSS	104.6	62.7	31	187	11.2
LLOYD	98.1	62.2	31	187	11.6
LAKER	94.4	62.4	33	187	11.6
SCEPTRE	90.7	61.9	45	187	12.9
VIC	87.1	61.3	46	187	13.0
RENVILLE	86.0	61.5	47	187	13.1
PLENTY	85.6	63.1	47	184	13.1
MEDORA	81.5	62.7	47	185	13.1
WARD	75.5	62.5	44	185	13.1
MONROE	74.9	62.4	45	183	12.3
KYLE	71.3	61.7	50	187	12.8

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-51-0 with the seed, + 200# N actual topdressed. (45# preplant and 155# post emergence)
Previous crop: Fallow
Date seeded: April 28, 1995.
Date harvested: September 21, 1994.
Rainfall: From seeding to harvest was 14.5 inches.
Irrigation dates: No irrigation was applied due to sufficient rainfall throughout the summer.
Yield experimental mean: 88.18
Error degrees of freedom: 22.00
F test for var.: 4.07
C.V. 2: 6.58
LSD (0.05): 17.01

Table 16 **Five-year** summary for **Irrigated Durum** varieties grown north of Conrad, MT. 1990 - 1991 - 1993 - 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average				
	Yield Bu\ac	Test weight lbs\bu	Plant hgt. inches	head date	% Protein
LLOYD	75.6	61.2	30.2	177	10.4
LAKER	73.2	62.2	32.6	177	10.8
RENVILLE	69.7	61.7	42.4	184	10.8
SCEPTRE	69.2	61.8	37.2	184	11.1
PLENTY	68.5	62.6	41.6	190	11.1
CROSBY	67.4	62.4	~~37.2~~ 40.0	183	11.9
VIC	64.6	62.5	41.2	183	11.8
MEDORA	63.3	62.9	41.6	183	11.8
WARD	62.1	62.4	39.2	183	12.0
MONROE	61.3	62.2	40.2	181	11.5

Cooperator: Western Triangle Ag. Research Center.
Location : Ten miles north of Conrad, MT. (Pondera County)

Title: 1995 Barley Variety Investigations.

Location: Western Triangle Research Center, Conrad, MT.

Personnel: Gregory D. Kushnak & Ron Thaut, Research Center, Conrad; and Dr. Tom Blake, MSU Dept. of Plant, Soil & Environmental Sciences.

Barley variety trials were grown on dryland at Conrad, Cut Bank, Oilmont and Choteau. The irrigated trial at Conrad did not receive supplemental irrigation in 1995 due to abundant rainfall. Varieties were also tested under no-till continuous-crop conditions, and are discussed in the no-till variety section of this report.

Growing season rainfall was approximately double the amount of normal, producing exceptionally high yields at each of the locations. Therefore, the 1995 data should be treated as though the plots were irrigated, and used cautiously when selecting a variety for average dryland conditions.

The 1995 data, along with five-year averages, are presented in Tables 17-28. Emphasis should be placed on the five-year averages when selecting varieties best suited for a given area. The 1995 tables reflect performance under the conditions of only one year, & therefore should be used cautiously.

Comments on the varieties are presented in the following pages. Also refer to MSU Extension Bulletin 1094 for background and detailed descriptions for many of the varieties tested.

Barley Variety Notes & Comments

Western Triangle Agricultural Research Center, Conrad, MT

Andre (Wash): 2-row. Was not successful.

BA 1202 (Busch Ag): 2-Row. Very good yield. Stiffer strawed & higher yield than Klages. Requires good rainfall or irrigation. Maturity 2 days later than Harrington.

BA 1215 (Busch Ag): 2-row malt. Very high irrigated yields, and very good lodging resistance. Maturity 4 days later than Harrington. Tested as BA8529 prior to 1990. *Discontinued due to malt quality problems.*

BA 5133 (Busch Ag): experimental 2-row type. Earlier maturity than 1202, 2 days earlier than Harrington.

BA 5648 (Busch Ag): experimental 2-row type. Later maturity than 1202, 7 days later than Harrington. Taller than Harrington.

BA 2601 (Busch Ag): 6-row malt for parts of the triangle area. Very high irrigated yield. Erect head. Maturity later than Harrington.

BA 1614 (Busch Ag): 6-row experimental. Taller than 2601, shorter than Morex. Stronger strawed & higher yield than Morex. Nodding head.

Baronnesse (Ackermann-Germany): Seed produced in USA by Western Plant Breeders. 2-row feed. Short straw and good lodging resistance; 2.5" & 3" shorter than Harrington & Gallatin, respectively. Among highest yielders when tested in favorable moisture conditions (not tested in dry years yet). One to four days later maturity than Piroline and Gallatin; equal or slightly later maturity than Harrington; thus, may possibly rank lower for yield in dry years without irrigation. Test weight is 1 lb less than Gallatin, but % plump is higher. Recommended list for irrigated and dryland.

Bearpaw (MT 81616) (MSU): 2-row feed. Medium yield, but better than Clark and Harrington in most cases (Harrington will usually outyield Bearpaw in extremely high fertility conditions). One day later than Clark and Hector, but slightly earlier than Harrington. May sprout and skin easily. Malt tolerance is 7% skinning, thus may be difficult to manage. Has exceeded the limits in morphology of malt quality. Can "go out of condition" (germ dropped 60% in 2 years), probably due to high DP (Harrington also does this). Probably worse than Harrington for sprouting at low moisture content (ie. Bin sweat). In spite of very high malt extract, Bearpaw was dropped for consideration as a malt variety. Test weight is sometimes low on dryland, possibly due to its medium-late maturity. Dropped from recommended list.

Bellona: Dropped from recommended list, due to nonavailability of seed. High yield on irrigation, and excellent lodging resistance.

Bowman (ND): 2-row. Strictly for drought conditions. Early maturing, large seeded, feed type. Highest yielder on dryland in drought years; but in wet years, only medium to low yield. Weak straw. Stark is a possible alternative.

Bridge (Lethbridge, Alberta): 2-row feed; higher yield than Adee and Harrington. Similar to Harrington for height and lodging resistance. Good test weight and plump seed. Reportedly does well under drought conditions in Alberta. (Hector/Piroline/Zephyr parentage).

Chinook (MT140523) (MSU): 2-row malt with quality similar to Harrington. Higher yield and test weight, and one day earlier maturing than Harrington. Slightly earlier than Hector. One to two inches shorter and 30% less lodging than Hector. Recommended for dryland and irrigated.

Clark (MSU): 2-row feed. Better yield and earlier maturity than Klages. Does not have the malt quality of Harrington. Dryland primarily.

Colter (Id/Ore/Wash): 6-row feed. Very low yield and test weight in Triangle area tests in 1993. Tested as ID 71966 in Western Regional (79Ab10719-66). Stiffer straw than Steptoe.

Columbia: 6-row. Comparable to Steptoe yield (very high). Short, stiff straw, and is among the best for lodging resistance.

Crystal (78AB6871) (ID): 2-row malt (AMBA for Idaho & Montana). (Klages cross). 5% greater yield than Klages but 2% less than Clark; same height and head date as Klages, but better lodging resistance. Good tolerance to Pseudomonas Kernel Blight. Did not "store" well in Idaho (lost germination in six months), and thus was dropped from production by Coors.

Eight-Twelve (Id/Oregon): 6-row winter barley. Feed. Not adapted to winter conditions of the Triangle area.

Excel (Minn): 6-row malt. Supposed to combine the superior agronomics of Robust and the malt quality of Morex. Stiff straw. Higher yield and later maturity than Morex. On Minnesota AMBA list; will be on ND AMBA soon. Probably will not be used in Montana.

Foster (ND): 6-row from North Dakota. Under evaluation for possible malt type.

Galena (Coors): 2-row malt. Among latest to mature at Conrad 1993. High irrigated yield. Probably will replace Moravian III & Triumph in Coors program.

Gallatin (MSU): 2-row feed. Stiff straw and good lodging resistance (more than Hector, Klages, Lewis, and Clark); yields high in both dry and wet conditions; thus a broadly adapted feed barley. Good drought tolerance. Slightly earlier than Hector, and earlier than Bearpaw.

Harrington (Sask. Canada): 2-row malt. Sensitive to hot dry areas; yields good in moist areas. Matures later than Clark and Bearpaw, but earlier than Klages. Lodging resistance better than Klages. Can sprout or germinate (internal falling number) at a lower moisture content than any other barley except perhaps Bearpaw. Sweating in the bin has been suspected of being sufficient enough to ruin the germination. Susceptible to skinning unless carefully threshed. Montana AMBA. See notes on Bearpaw.

Haybet (MSU): 2-row, hooded hay barley. Later to mature than Horsford, and higher forage yield. Similar to Horsford for grain yield, which is low. (See also Westford). Caution: any cereal grain grown for hay should be tested for nitrate level prior to cutting.

Hector (Lethbridge, Alberta): 2-row feed. High yield on dryland (similar to Gallatin); slightly later to mature and weaker strawed than Gallatin. Yields less than Gallatin on irrigated.

Idagold (Coors): 2-row feed. Lower irrigated yield than Galena at Conrad 1993. Late maturing. May be marketed by WPB??

Karla (Idaho): 6-row. Medium high yield. Low test weight on dryland. Tall, but fairly good lodging resistance. Rejected for malt.

Kimberly (Idaho): 2-row. Slightly lower yield than Harrington in dry conditions, but slightly higher in moist conditions. Later to mature than Harrington. Poor lodging resistance.

Klages (ID): 2-row malt. Late maturity; for irrigation or high rainfall only. Replaced on contracted acres by Harrington, BA 1215, etc.

Lamont (ID): 2-row feed. Rejected by AMBA. (74Ab10167).

Lewis (MSU): 2-row feed. Higher yield than Clark and Klages. Similar to Gallatin but not as stiff strawed. Rejected by AMBA due to flavor. Gallatin and Lewis are good for both dry and wet conditions.

Logan (ND): 2-row feed.

Manley (TR 409) (Canada): 2-row. Slightly stiffer strawed and three days later than Harrington, (approx. Klages maturity); longer shelf life than Harrington - does not lose its germination as bad. May replace Harrington in Canada; but only in high rainfall, stripe rust areas.

Medallion, Westbred (WPB): 6-row feed. Very high yield at Conrad 1993 under high rainfall conditions. Semidwarf with very stiff straw, but can be lodged in very high yield conditions (see WB 501, which reportedly "cannot" be lodged). Not intended for dryland as test weight may drop unless high rainfall.

Meltan (Wash): 2-row. Short stiff straw; very good lodging resistance. Late maturing irrigated type.

Menuet (Netherlands): Marketed by Cenex. 2-row feed. Short stiff straw.

Merlin, Westbred (WPB): Waxy, semidwarf. Better yield and lodging resistance than Waxbar, but quality not accepted by Japan markets yet.

Morex (Minn): 6-row malt type. Shatters readily - swathing advised.

Nancy (Wash): 2-row. Short stiff straw; very good lodging resistance. Late maturing irrigated type.

Piroline: 2-row. Medium yield, except during drought years it yielded high relative to most varieties.

Prowashonupana (line 3) (MSU): 2-row hulless. Does not have soluble B-glucan unless they can find a way to steam process it out. Potential specialty market.

Robust: 6-row malt per ND AMBA list; but not Montana's, in order to keep Montana clear for Morex. The 1992 Robust crop in Minnesota did not malt due to dormancy for unknown reasons. Growers therefore switched to 'Stander' in 1993.

Russell (Idaho): 6-row (tested in 83-85 as ID 789009). Greater yield and plump, but less protein than Morex and Robust. Shatters; swathing advised. Was planned for possible replacement for Karla on dryland as a malt, but did not pass AMBA tests. However, Russell may be contracted for malt in some areas.

Shonkin (MSU): 2-row hulless waxy. Name for Wanubet LR 247. Stands up better than Wanubet, but has weak straw and low yield. (A separate variety from Wanubet) A "clean seed" source of Wanubet to allow a more pure line. Heads slightly later than Hector. Special use, with no recommendation. Up to 10% or more of the grain may not thresh free from the hulls.

Sissy, Westbred (WPB): 2-row feed, intended for irrigated/high rainfall.

Stander (Minn, M-64): May replace Excel and Robust as a 6-row malt variety in the mid-west. Stiffer straw than other 6-row malt types. Better yield stability than Excel.

Stark (N. Dakota, ND 9866): 2-row feed. Medium to high yield. Related to Bowman; but yields higher than Bowman except in extremely dry conditions. Probably not as drought tolerant as Bowman. Weak straw. Birds selectively damaged this variety 2 years in a row.

Steptoe (Wash): 6-row. Among the highest yielders on irrigation or dryland. Feed type. Low test weight dryland.

Targhee (Id/Wash/Ore): 2-row feed. Lower test weight and yield than Hector, and two inches shorter. Straw too weak for irrigated. (78-Ab10099).

Triumph: 2-row. Malt type in Europe, but may not fit USA malt requirements (germinates too slow). Very high yields on irrigation, but very late to mature, and thus not recommended except for "lower Yellowstone valley type" of growing season; feed barley only.

Wanubet (MSU): 2-row hulless waxy. 'The' B-glucan line that will most likely be industrialized. Up to 10% or more of the seed may not thresh free from the hulls. Weak straw and low yield (70% of Hector or Gallatin).

Waxbar, Westbred (WPB): Waxy barley grown under contract in 1994 for export to Japan. Standard height and fairly late to mature. See Merlin.

Westford, Westbred (WPB): 6-row hooded hay barley. Seed yield low (similar to Horsford). Hay yields considerably higher than Horsford. Maturity considerably later than Horsford and Whitford, allowing for greater forage production. Hooded barleys are sometimes vulnerable to ergot, but the amount is slight. Caution should be taken to avoid high nitrate levels when using any small grain as a forage. Testing of the forage for nitrate should be done before the crop is harvested.

Westbred 501 (WPB): 6-row feed. Marketed mainly in Idaho. Very stiff straw (supposedly doesn't lodge).

Table 17 **Dryland Intrastate Barley** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test weight lbs\bu	Plant hgt. inches	% Plump	% Thin	Head date	% Protein
MT890008	120.4	52.9	33	95	1	190	8.7
Baronesse	109.5	54.5	32	97	1	188	8.9
MT930169	107.6	53.3	39	93	1	187	9.4
MT930013	107.1	54.1	37	94	2	182	9.8
H3860224	106.5	54.8	35	98	1	189	9.1
Steptoe (6-row)	105.7	49.3	35	93	2	182	8.7
MT920053	104.3	54.5	33	94	2	189	9.0
BA 1215	103.9	54.8	34	97	1	189	8.8
MT930132	103.2	53.9	35	98	1	183	10.0
MT920073	103.1	55.5	33	99	0	184	10.2
MT930203	102.8	53.0	37	97	1	185	10.3
MT886610	102.5	54.5	38	95	1	185	9.1
MT920161	102.4	55.2	35	97	1	186	9.6
H1851195	100.3	53.4	37	96	1	186	9.9
MT920201	99.0	54.5	37	95	1	188	8.6
Lewis	98.5	53.8	35	92	3	189	9.3
MT930048	98.5	53.1	35	95	1	185	9.5
MT930204	98.2	53.8	36	96	1	182	9.7
H5870120	97.7	47.8	35	94	1	180	9.0
H5851161	96.9	53.6	36	94	2	188	8.9
MT910150	96.4	55.1	35	95	1	185	9.8
Excel (6-row)	95.1	51.6	38	93	1	185	8.6
Hector	95.1	53.1	38	94	2	189	9.6
MT910033	95.0	54.9	34	98	1	183	9.6
Stark	95.0	55.2	37	98	1	183	9.5
MT910160	93.9	55.1	36	99	0	188	9.4
MT890070	93.1	54.3	36	97	1	184	9.7
MT930050	92.3	54.0	36	97	1	182	10.5
Gallatin	91.8	54.8	38	94	2	186	9.4
MT930133	91.0	55.2	37	95	2	183	10.2
MT930155	90.6	54.8	36	97	1	185	9.9
MT930097	90.0	54.2	34	91	2	180	10.1
MT920041	89.9	54.5	34	97	0	185	9.3

(**continued on next page**)

(**Dryland Intrastate Barley trial,** ***continued***)

Chinook	89.6	52.3	36	83	7	190	10.3
BA 1202	89.1	52.4	36	98	1	189	9.1
MT890018	89.1	54.7	32	94	1	188	9.3
MT930051	88.9	53.6	37	99	0	183	10.1
Bowman	89.0	53.3	36	96	1	182	10.3
BA 1614 (6-row)	88.7	51.1	36	95	1	189	9.5
MT930059	88.2	53.6	36	97	1	184	10.4
MT930135	86.9	54.8	33	97	0	188	9.6
Harrington	86.8	51.9	37	87	4	189	9.2
MT930076	86.0	53.8	35	90	3	182	10.4
MT930047	85.4	53.8	38	97	1	182	10.1
MT910189	84.3	52.8	34	91	3	184	8.8
MT930056	83.9	53.8	35	97	1	183	10.2
Foster (6-row)	83.2	51.9	38	95	1	185	8.5
MT930096	83.2	53.3	33	96	2	180	9.7
MT930136	82.3	55.7	38	98	0	181	10.6
MT930068	81.2	53.7	35	98	1	182	10.8
Logan	80.6	53.6	34	94	2	182	9.8
MT930065	80.4	53.6	33	98	0	182	10.9
MT930052	79.1	53.7	35	99	0	182	10.0
MT930049	78.4	54.2	33	96	1	184	10.6
MT930029	75.4	52.2	36	87	3	187	9.5
MT920024	75.2	51.9	26	53	17	191	9.4
BZ489-74	75.1	53.5	33	92	2	192	10.8
MT140523	73.8	51.7	36	69	11	188	10.0
MT920070	73.6	52.3	34	76	8	189	9.8
MT930069	73.3	53.0	32	97	1	180	10.4
MT930070	73.3	53.5	33	98	0	182	10.5
2B894311	71.7	52.5	34	84	5	190	9.5
MT930071	66.4	53.1	33	98	0	182	10.5
Morex (6-row)	62.2	51.4	40	82	5	183	8.9

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-51-0 with the seed, + 45# N topdressed.
Previous crop: Fallow.
Date seeded: May 3, 1995. Date harvested: Aug. 28, 1995.
Rainfall: From seeding to harvest was 13.47 inches.
Yield experimental mean: 90.33
Error degrees of freedom: 126.00
F test for var. = 5.13, C.V. 2 = 5.68, LSD (0.05) = 14.37

Table 18 **Dryland Intrastate Barley** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

(***Abbreviated list***)

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	Head date	% Protein
Baronesse	109.5	54.5	32	97	1	188	8.9
Steptoe (6-row)	105.7	49.3	35	93	2	182	8.7
BA 1215	103.9	54.8	34	97	1	189	8.8
MT 886610	102.5	54.5	38	95	1	185	9.1
Lewis	98.5	53.8	35	92	3	189	9.3
Excel (6-row)	95.1	51.6	38	93	1	185	8.6
Hector	95.1	53.1	38	94	2	189	9.6
Stark	95.0	55.2	37	98	1	183	9.5
Gallatin	91.8	54.8	38	94	2	186	9.4
Chinook	89.6	52.3	36	83	7	190	10.3
BA 1202	89.1	52.4	36	98	1	189	9.1
Bowman	89.0	53.3	36	96	1	182	10.3
BA 1614 (6-row)	88.7	51.1	36	95	1	189	9.5
Harrington	86.8	51.9	37	87	4	189	9.2
Foster (6-row)	83.2	51.9	38	95	1	185	8.5
Logan	80.6	53.6	34	94	2	182	9.8
MT 140523 1/	73.8	51.7	36	69	11	188	10.0
Morex (6-row)	62.2	51.4	40	82	5	183	8.9

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-51-0 with the seed, + 45# N topdressed.
Previous crop: Fallow.
Date seeded: May 3, 1995. Date harvested: Aug. 28, 1995.
Rainfall: From seeding to harvest was 13.47 inches.
1/ = MT 140523 is the parent population for Chinook.
Yield experimental mean: 90.33
Error degrees of freedom: 126.00
F test for var.: 5.13
C.V. 2: 5.68
LSD (0.05): 14.37

Table 19 **Five-year** summary for **Dryland Barley** varieties grown north of **Conrad, MT.** 1990 - 1991 - 1993 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety		5 - year comparable average						
		Yield bu\ac	Test weight lbs\bu	Plant hgt. inches	% Plump	% thin	Head date	% Protein
BARONESSE		105.6	53.1	32.2	87	4	184	10.1
MT 8886610		99.8	53.4	36.2	92	2	182	10.4
BA 1215		97.4	53.3	34.4	89	2	184	9.9
GALLATIN		97.2	53.8	36.0	92	2	182	10.2
STEPTOE	*	96.7	48.5	36.0	89	3	178	10.1
STARK		95.3	54.0	37.0	96	1	180	10.5
LEWIS		94.2	53.8	36.4	93	2	184	10.6
MT 140523		93.1	52.9	36.6	86	5	184	10.9
HARRINGTON		91.5	51.6	37.0	86	4	184	10.4
HECTOR		90.8	53.3	37.4	93	2	183	10.4
CHINOOK		89.9	52.5	35.7	89	3	185	10.9
BA 1202		89.9	51.3	36.0	90	4	184	11.0
BOWMAN		89.2	53.1	34.8	96	1	179	11.0

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
* = 6 row variety.

Table 20 **Irrigated Intrastate Barley** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	Head date	% Protein
Baronesse	109.4	52.2	33	96	2	184	8.5
MT890008	98.6	52.1	31	94	2	185	7.4
BA 1215	96.9	53.1	38	96	2	184	8.9
MT920201	96.7	54.4	36	94	2	182	9.1
Stark	96.0	54.5	38	97	1	180	9.2
MT930135	95.6	54.2	36	92	3	183	9.9
H3860224	95.5	54.4	31	94	1	186	8.5
H1851195	95.2	53.1	36	97	2	183	9.7
Sissy	94.8	52.9	31	97	1	186	8.5
MT930013	94.6	54.0	36	96	1	182	8.8
MT930169	94.3	53.8	39	92	3	184	9.0
DA592-47	93.8	46.4	26	93	2	186	8.2
Steptoe (6-row)	92.6	46.9	36	90	4	180	9.2
MT886610	92.0	54.3	35	93	2	183	8.5
MT930203	91.4	52.1	33	96	2	182	10.4
Lewis	88.3	54.7	39	95	2	184	8.9
Gallatin	87.9	54.0	35	94	2	182	8.6
MT930132	87.6	53.1	36	99	1	180	9.3
MT910150	87.5	55.4	35	97	2	182	9.4
BA 1614 (6-row)	87.5	50.0	39	95	2	183	8.9
H5851161	87.3	53.1	35	92	3	183	9.4
MT930047	86.7	53.6	38	99	1	180	9.4
MT920073	86.7	54.7	31	97	1	182	9.0
Hector	85.4	53.3	34	94	2	184	9.2
Klages *	84.8	51.9	39	83	6	185	8.2
MT910160	84.4	55.2	31	99	1	185	8.9
MT930155	82.7	54.1	35	98	1	181	9.6
Excel (6-row)	82.1	50.7	35	92	1	182	7.9
MT920161	81.2	55.0	35	98	1	183	9.5
BA 1202	80.6	52.7	32	95	1	184	8.6
MT930059	80.5	54.5	36	97	1	180	9.4
MT930204	80.4	53.6	34	97	1	180	9.0
Foster (6-row)	79.4	51.0	35	95	1	182	9.1

(**continued on next page**)

(**Irrigated Intrastate Barley,** *continued*)

H5870120		79.3	47.9	38	89	4	178	8.3
MT930051		79.2	53.3	35	98	1	180	10.0
MT920041		78.9	54.2	31	96	1	180	8.9
MT910033		78.0	54.3	30	98	1	180	9.0
MT930069	*	76.1	52.4	33	96	2	179	10.7
MT930050		75.0	53.6	32	98	1	179	10.3
MT890070	*	74.7	53.3	34	96	3	179	9.4
MT930052		73.8	53.6	36	97	2	180	9.7
MT930056		73.3	52.8	34	98	2	180	10.7
Harrington	*	72.8	51.2	35	91	3	184	9.1
MT930049		71.3	53.1	31	95	2	178	10.4
MT910189		70.2	52.1	30	92	3	180	8.2
MT890018		69.3	53.7	33	89	4	183	10.0
MT930070		68.9	53.6	31	98	1	178	9.9
MT930133		68.8	54.8	31	95	2	180	9.6
MT930071	*	68.0	53.3	30	98	2	178	10.4
MT930068	*	67.6	53.1	32	98	1	178	9.9
Chinook	*	67.3	51.9	33	89	3	183	9.7
Logan		66.2	52.7	32	95	3	182	8.5
MT140523	*	66.1	50.1	36	70	11	183	9.9
Morex (6-row)	*	65.7	50.4	42	86	4	182	9.0
MT930065		64.5	53.0	30	97	3	178	10.7
MT930076	*	63.0	52.4	30	91	4	180	9.9
MT930136		62.8	54.3	31	94	5	180	10.2
MT930096	*	62.0	53.1	31	91	4	178	9.7
BZ489-74		60.8	48.0	31	90	4	186	9.5
MT930029		59.1	50.4	36	85	4	183	8.9
2B894311	*	59.1	51.8	36	86	5	183	9.3
MT930097	*	58.5	53.2	30	90	4	178	9.5
IdaGold	*	52.8	47.0	26	69	10	187	8.3
MT920070	*	45.8	50.4	31	69	13	182	9.2

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-51-0 with the seed, + 45# N topdressed.
Previous crop: Fallow.
Date seeded: April 28, 1995. Date harvested: Aug. 21, 1995.
Rainfall: From seeding to harvest was 13.47 inches.
Irrigation dates: No irrigation was applied due to sufficient rainfall throughout the summer.
* = Lodging occured on these varieties.
Yield exp. mean = 79.02, Error degrees of freedom = 126
F test for var. = 5.83, C.V. 2 = 6.94, LSD (0.05) = 15.34

Table 21 **Irrigated Intrastate Barley** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.
(***Abbreviated list***)

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	Head date	% Protein
Baronesse	109.4	52.2	33	96	2	184	8.5
BA 1215	96.9	53.1	38	96	2	184	8.9
Stark	96.0	54.5	38	97	1	180	9.2
Sissy	94.8	52.9	31	97	1	186	8.5
Steptoe (6-row)	92.6	46.9	36	90	4	180	9.2
MT 886610	92.0	54.3	35	93	2	183	8.5
Lewis	88.3	54.7	39	95	2	184	8.9
Gallatin	87.9	54.0	35	94	2	182	8.6
BA 1614 (6-row)	87.5	50.0	39	95	2	183	8.9
Hector	85.4	53.3	34	94	2	184	9.2
Klages *	84.8	51.9	39	83	6	185	8.2
Excel (6-row)	82.1	50.7	35	92	1	182	7.9
BA 1202	80.6	52.7	32	95	1	184	8.6
Foster (6-row)	79.4	51.0	35	95	1	182	9.1
Harrington *	72.8	51.2	35	91	3	184	9.1
Chinook *	67.3	51.9	33	89	3	183	9.7
Logan	66.2	52.7	32	95	3	182	8.5
MT 140523 1/	66.1	50.1	36	70	11	183	9.9
Morex (6-row)*	65.7	50.4	42	86	4	182	9.0
IdaGold *	52.8	47.0	26	69	10	187	8.3

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-51-0 with the seed, + 45# N topdressed.
Previous crop: Fallow.
Date seeded: April 28, 1995. Date harvested: Aug. 21, 1995.
Rainfall: From seeding to harvest was 13.47 inches.
Irrigation dates: No irrigation was applied due to sufficient rainfall throughout the summer.
* = Lodging occured on these varieties.
1/= MT 140523 is the parent population for Chinook.
Yield exp. mean = 79.02, Error degrees of freedom = 126.00
F test for var. = 5.83, C.V. 2 = 6.94, LSD (0.05) = 15.34

Table 22 **Five-year** summary for **Irrigated Barley** varieties grown north of **Conrad,** MT. 1990 - 1991 - 1993 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Ag. Research Center, Conrad, MT.

Variety		5 - year comparable average						
		Yield bu\ac	Test weight lbs\bu	Plant hgt. inches	% Plump	% thin	Head date	% Protein
BARONESSE		107.0	53.6	31.0	95	1	183	8.6
BA 1215		96.4	53.6	35.4	96	2	183	9.1
STEPTOE	*	95.2	47.8	32.8	91	3	177	9.5
GALLATIN		95.1	54.3	35.0	94	2	180	9.3
STARK		92.9	54.2	36.0	96	2	179	9.9
MT 886610		92.5	53.7	35.4	95	2	181	9.0
LEWIS		90.5	54.8	35.6	95	2	182	9.9
EXCEL	*	90.5	49.9	34.4	93	2	176	9.1
KLAGES		88.9	51.8	35.6	83	6	182	8.9
BA 1202		88.3	52.7	33.8	96	1	185	9.7
HECTOR		87.6	53.3	35.8	92	2	181	9.8
MT 140523		81.7	51.7	35.0	88	4	181	9.6
HARRINGTON		79.7	52.0	34.8	89	3	183	8.7
IDAGOLD		78.1	50.4	26.5	82	6	184	8.7
CHINOOK		77.7	52.4	32.8	90	3	184	9.9

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
* = 6 row variety.

Table 23 **Dryland Barley** variety trial grown northeast of **Choteau**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% Thin	% Protein
Stark	103.3	54.6	38	97	1	11.3
Baronesse	102.1	53.8	34	93	2	10.6
Lewis	98.8	55.4	41	94	2	11.4
MT890008	97.8	53.1	35	93	2	9.8
Steptoe (6-row)	97.4	48.0	37	92	3	10.1
Gallatin	95.2	53.9	39	90	3	11.4
Targhee	95.0	54.3	38	94	2	10.8
H1851195	93.1	52.8	38	94	2	11.6
MT886610	93.0	54.8	38	96	1	10.6
Hector	92.6	54.8	41	93	2	11.3
MT889106	91.8	53.6	36	96	2	11.8
H3860224	87.6	54.8	36	97	1	10.4
MT890070	87.5	53.5	38	95	2	11.2
Bowman	85.9	53.9	37	97	1	11.4
Harrington	85.5	52.8	37	91	2	10.5
Colter (6-row)	85.2	47.8	36	80	6	9.5
Chinook	83.0	54.0	37	95	2	10.7
Piroline	79.6	52.6	39	77	8	12.1

Cooperator: Roy Inbody.
Location: Twelve miles northeast of Choteau. (Teton Co.)
Fertilizer: 100# 11-51-0 with the seed, + 60# N actual 32-0-0 liquid applied in the fall.
Previous crop: Fallow.
Date seeded: April 18, 1995.
Date harvested: August 22, 1995.
Rainfall: From seeding to harvest was 12 + inches.
Yield experimental mean: 91.90
Error degrees of freedom: 34.00
F test for var. = 1.57
C.V. 2 = 5.81
LSD (0.05) = 15.35

Table 24 **Five-year** summary for **Dryland Barley** varieties grown near **Choteau, MT.** 1990 - 1991 - 1993 - 1994 - 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average					
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% thin	% Protein
BARONESSE	87.4	51.3	30.4	77	7	11.8
STEPTOE	84.0	45.6	32.0	81	6	10.7
STARK	83.2	52.4	33.6	91	3	11.8
LEWIS	79.4	52.1	32.8	80	6	11.6
CHINOOK	79.0	50.9	31.8	69	10	11.9
HECTOR	78.9	51.3	34.4	79	6	12.1
GALLATIN	78.1	51.4	32.8	76	8	11.8
BOWMAN	74.8	51.4	32.8	92	2	12.1
PIROLINE	74.7	51.6	32.8	64	12	12.1
COLTER	73.0	44.9	30.2	63	16	10.1
HARRINGTON	71.8	49.1	32.6	80	7	11.7

Cooperator: Roy Inbody in 1994 -1995, and Rick Corey in - 1990 - 1991 - 1993.
Location: Northeast of Choteau. (Teton County)

Table 25 **Dryland Barley** variety trial grown east of **Oilmont**, 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% Thin	% Protein
MT890008	93.3	52.0	27	96	2	7.8
H3860224	86.9	52.8	27	97	1	8.3
Targhee	86.8	51.9	30	97	1	7.7
MT886610	86.6	53.2	28	96	2	8.8
Baronesse	86.0	51.1	25	98	1	8.4
Chinook	84.9	53.0	28	97	1	8.4
Hector	83.0	52.3	32	94	1	8.5
Harrington	82.1	51.5	29	96	1	8.0
Steptoe (6-row)	81.1	46.2	28	93	2	8.7
Lewis	78.8	53.6	31	97	1	7.3
H1851195	78.5	51.2	29	96	1	8.2
MT890070	76.3	51.1	26	97	1	8.9
Bowman	76.1	50.7	29	95	2	8.3
Stark	75.9	52.5	31	99	1	8.5
Piroline	75.2	53.9	31	97	1	8.0
Colter (6-row)	74.0	47.2	27	96	4	8.5
MT889106	73.6	51.0	27	96	2	9.1
Gallatin	73.4	52.9	30	97	1	9.1

Cooperator: Terry Alme.
Location: Eight miles east of Oilmont, MT. (Toole County)
Fertilizer: 100# 11-51-0 with the seed.
Previous crop: Fallow.
Date seeded: April 17, 1995.
Date harvested: August 15, 1995.
Rainfall: From seeding to harvest was 10 + inches.
Yield experimental mean: 80.69
Error degrees of freedom: 34.00
F test for var. = 2.98
C.V. 2 = 4.17
LSD (0.05) = 9.67

Table 26 **Five-year** summary for **Dryland Barley** varieties grown near **Oilmont, MT.** 1991 - 1992 - 1993 - 1994 - 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average					
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	% Plump	% thin	% Protein
CHINOOK	77.0	49.2	29.2	73	17	12.0
BARONESSE	75.7	48.9	26.6	66	18	11.9
BOWMAN	75.0	49.0	29.4	88	5	11.3
LEWIS	73.5	49.9	30.4	75	16	11.3
HECTOR	72.5	49.7	32.2	69	17	12.1
PIROLINE	71.9	50.2	31.6	70	20	11.6
STARK	70.8	48.9	31.2	76	14	11.7
STEPTOE	69.3	42.7	27.4	73	15	10.6
GALLATIN	68.5	49.6	30.4	69	18	11.2
HARRINGTON	66.2	48.9	29.8	77	12	12.1
COLTER	61.7	42.5	26.6	65	27	11.0

Cooperator: Terry Alme.
Location: Eight miles east of Oilmont, MT. (Toole County)

Table 27 **Dryland Barley** variety trial grown north of **Cut Bank,** 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test wt. lbs/bu.	Plant Hgt. inches	% Plump	% Thin	% Protein
H1851195	84.5	51.4	35	93	3	10.7
Targhee	83.3	52.0	33	94	3	9.5
Steptoe (6-row)	79.1	45.5	28	81	8	9.2
Chinook	76.2	52.0	35	93	3	9.8
Piroline	73.6	53.3	34	94	2	10.0
Baronesse	73.3	52.9	26	96	1	9.2
Hector	72.9	52.4	33	93	3	9.7
Colter (6-row)	71.5	46.5	34	65	15	8.8
MT890008	71.1	50.9	28	92	4	9.0
H3860224	69.0	53.3	26	96	1	9.6
Gallatin	68.9	52.7	28	89	4	9.6
MT890070	68.7	51.8	30	91	3	9.6
MT886610	68.2	52.6	32	94	3	9.4
MT889106	65.8	52.6	30	96	2	10.2
Stark	64.2	53.3	28	94	2	9.7
Lewis	62.5	53.3	32	95	2	10.0
Harrington	58.9	50.8	29	86	4	9.4
Bowman	58.6	53.4	28	96	1	10.4

Cooperator: Don Bradley.
Location: Fifteen miles north of Cut Bank, MT. (Glacier Co.)
Fertilizer: 100# 11-51-0 with the seed.
Previous crop: Fallow.
Date seeded: April 24, 1995.
Date harvested: August 31, 1995.
Rainfall: From seeding to harvest was 10 + inches.
Yield experimental mean: 70.57
Error degrees of freedom: 34.00
F test for var. = 1.69
C.V. 2 = 7.96
LSD (0.05) = 16.15

Table 28 **Five-year** summary for **Dryland Barley** varieties grown near **Cut Bank, MT.** 1991 - 1992 - 1993 - 1994 - 1995. Mont. Agr. Expt. Sta., Western Triangle Ag. Research Center, Conrad, MT.

Variety	5 - year comparable average					
	Yield bu/ac	Test wt. lbs/bu.	Plant hgt.* inches	% Plump	% thin	% Protein
BARONESSE	66.8	49.8	25.8	91	3	8.6
STEPTOE	61.3	44.2	26.5	85	5	9.1
HECTOR	57.4	50.5	29.2	90	3	9.1
CHINOOK	56.6	51.3	29.0	92	2	8.9
HARRINGTON	56.5	50.4	28.3	91	2	8.8
PIROLINE	56.3	51.9	29.7	92	2	9.3
LEWIS	54.0	51.4	28.0	90	3	9.1
GALLATIN	52.2	51.3	28.3	90	3	9.0
COLTER	50.7	44.5	28.7	69	11	8.6
STARK	49.6	51.9	29.0	95	1	9.6
BOWMAN	49.5	51.5	27.3	96	1	10.1

Cooperator: Don Bradley.
Location: Fifteen miles north of Cut Bank. (Glacier County)
* = Plant height averages based on four years only. (1991-1992-1994-1995)

Project Title: 1995 Small grain variety performance under no-till cropping conditions.

Location: Western Triangle Agricultural Research Center, Conrad.

Personnel:

Project Leader: Gregory D. Kushnak
Cooperators: Luther Talbert & Sue Lanning (Spring Wheat)
Tom Blake & Pat Hensleigh (Barley).

Objectives: Identify small grain varieties most adapted to no-till conditions.

Methods: Spring wheat and barley varieties were no-till planted into barley stubble at right angles to the previous crop. Crop history for the site was barley in 1994, fallow in 1993, and barley in 1992. Planting was accomplished with a double-disc no-till plot planter constucted by our Research Center Staff. The double disc openers were supplied by Acra-Plant, Inc., Garden City, KS. Row space was 12 inches. Ammonium phosphate was applied with the seed to provide 51 lbs P_2O_5/a and 11 lbs N/a. Urea (46-0-0) was topdressed to provide 90 lbs N/a. Herbicides included Roundup for preseeding vegetation control; Hoelon for wild oat control; and Bronate for broadleaf control. Planting date was April 18, 1995.

Results: The 1995 data, along with five-year averages, for no-till continuous-crop spring wheat and barley are presented in Tables 29-32.

The continuous-crop spring wheat nursery averaged 19% lower yield than the same varieties grown on the fallow system, while continuous-crop barley yielded only 4% less than the fallow system. Rainfall was far above normal, with favorable distribution throughout the growing season. Therefore, moisture was not considered a limiting factor for continuous-crop in 1995. Nitrogen rates were adjusted so that, when combined with soil-residual N, continuous-crop nurseries had a similar level of available N as the fallow-system nurseries. Therefore, it is not known why recrop spring wheat yield was 19% lower than fallow-system yield.

Vanna, Newana, Ernest and McNeal ranked high for yield on fallow, but low on recrop; indicating these varieties may be more sensitive to continuous-crop conditions. Varieties ranking high for yield under both cropping systems were Glenman, Hiline, & Fergus. Border ranked high in the recrop trial, but medium low in the fallow system.

The barley varieties followed about the same yield rank on recrop as they did on fallow.

Table 29 **Dryland Recrop No-till Spring Wheat** variety trial grown north of **Conrad,** 1995. Mont. Agr. Expt. Stat., Western Tri. Ag. Res. Cnt., Conrad, MT

Variety		Yield bu/ac	Test wt. lbs/bu.	Plant hgt. inches	Head date	% protein
GLENMAN	*	76.4	61.9	37	182	11.6
RAMBO	*	71.0	60.5	36	183	11.9
WESTBRED 936		71.0	60.5	33	180	13.0
HI-LINE		70.8	63.5	37	180	11.3
PONDERA		70.6	62.4	38	180	12.3
BORDER	*	70.6	63.5	38	178	12.6
N90-700 Norlander		68.3	61.4	35	178	12.9
FERGUS		65.3	62.2	36	180	11.7
NEWANA		63.7	60.8	35	183	11.2
WESTBRED EXPRESS		62.8	62.2	32	179	13.3
WESTBRED 926		62.5	60.4	36	179	12.5
McNEAL		62.0	61.7	39	182	12.5
VANNA (s. white)		61.4	61.7	36	182	9.7
MT 9354		60.8	62.8	42	182	12.4
GRANDIN		60.7	62.1	40	182	13.1
AMIDON	*	57.9	62.4	48	182	13.1
ND 677 Ernest	*	56.6	63.6	46	180	12.7
MTHW9406		53.1	61.9	39	177	10.9
PIONEER 2375		52.4	63.7	42	180	11.9
LEN		51.6	62.1	36	182	12.4
FORTUNA	*	51.3	63.2	45	182	13.0
LEW	*	51.3	63.1	45	183	11.7
STOA		51.3	61.9	47	182	12.6
MT 9360		51.1	62.7	40	180	13.1
SHOOFLY	*	48.7	59.5	33	183	12.6
AC EATONIA	*	48.2	62.7	48	182	13.9
BW 688	*	41.2	62.4	48	182	13.6

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-52-0 with the seed, + 90# N topdressed.
Previous crop: Barley.
Date seeded: April 18, 1995. Date harvested: Aug. 31, 1995.
Rainfall: From seeding to harvest was 13.89 inches.
* = Sawfly resistant varieties. (Amidon, Rambo and Border have partial resistance.)
Yield experimental mean: 59.72, Error degrees of freedom: 52
F test for var: 4.63, C.V. 2: 6.99, LSD (0.05): 11.85

Table 30 **Five-year summary** for **No-till Recrop Spring Wheat** varieties grown near **Conrad, MT.** 1990 - 1991 - 1993 - 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Agr. Research Center, Conrad, MT.

Variety		5 - year comparable average				
		Yield bu/ac	Test wt lbs/bu	Plant hgt. @ inches	Head date	% Protein
GLENMAN	*	45.9	58.6	31.3	186	10.3
WESTBRED 926		45.0	58.4	30.3	181	10.4
RAMBO	*	45.0	57.2	30.0	187	10.7
PONDERA		43.5	60.5	31.8	183	11.3
HI-LINE		43.1	60.9	30.3	184	10.8
NEWANA		42.5	59.2	29.5	186	10.2
AMIDON	*	41.3	59.6	37.0	185	10.9
STOA		39.8	59.6	37.8	185	11.0
FORTUNA	*	39.4	60.6	36.5	184	11.4
GRANDIN		40.5	59.6	32.8	185	11.2
LEW	*	39.5	60.5	36.5	187	10.6
LEN		38.9	58.5	30.3	184	11.1

Cooperator: Western Triangle Agricultural Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
* = Sawfly resistant varieties. (Amidon and Rambo have partial resistance.)
@ = Plant height averages based on four years only. (1990 - 1991 - 1994 - 1995)

Table 31 **Dryland Recrop No-till Barley** variety trial grown north of **Conrad**, 1995. Mont. Agr. Expt. Station, Westerm Triangle Ag. Research Center, Conrad, MT.

Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt. inches	% Plump	% Thin	Head date	% Protein
Baronesse	104.3	54.0	33	91	3	180	9.5
H3860224	102.3	54.5	38	93	2	180	10.1
MT890008	101.1	50.3	37	89	4	182	9.4
Steptoe (6-row)	97.0	44.6	37	81	7	175	9.9
Stark	96.8	53.6	36	94	2	178	10.6
H1851195	96.0	51.0	39	91	4	179	11.1
Colter (6-row)	93.5	46.0	35	72	10	176	9.1
Gallatin	90.7	53.5	39	88	4	179	10.8
Piroline	88.8	53.9	39	89	3	180	9.9
Bowman	88.3	53.0	34	92	2	176	11.0
MT886610	87.1	51.4	41	83	7	177	10.2
Harrington	86.7	50.4	37	85	5	180	10.0
Lewis	83.3	53.0	37	87	4	180	10.6
Hector	83.0	51.6	38	84	6	180	10.9
Targhee	81.5	48.4	37	70	16	180	10.4
MT889106	81.1	52.2	35	95	2	176	11.2
Chinook	75.8	50.8	35	79	7	180	10.6
MT890070	75.0	50.9	38	90	4	176	10.8

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
Fertilizer: 100# 11-51-0 with the seed, + 90# N actual topdressed after planting.
Previous crop: Barley.
Method of seeding: Double-disc drill.
Date seeded: April 18, 1995.
Date harvested: August 21, 1995.
Rainfall: From seeding to harvest was 13.84 inches.
Yield experimental mean: 89.56
Error degrees of freedom: 34.00
F test for var. = 4.75
C.V. 2 = 4.51
LSD (0.05) = 11.60

Table 32 **Five-year** summary for **Recrop Dryland No-Till Barley** varieties grown north of **Conrad, MT.** 1990 - 1991 - 1993 - 1994 - 1995. Mont. Agr. Expt. Station, Western Triangle Agr. Res. Center, Conrad, MT.

	5 - year comparable average						
Variety	Yield bu/ac	Test weight lbs/bu	Plant hgt.* inches	% Plump	% Thin	Head date	% Protein
BARONESSE	74.9	51.8	28.0	80	5	185	8.5
GALLATIN	67.0	51.5	31.1	84	5	183	9.0
STEPTOE	65.7	45.3	30.3	81	7	179	9.0
PIROLINE	64.7	53.2	32.4	82	5	183	8.7
HECTOR	63.4	50.4	31.3	75	8	185	9.1
LEWIS	62.1	51.8	30.0	81	6	186	9.2
HARRINGTON	62.0	49.9	29.9	82	5	186	8.8
CHINOOK	61.9	50.6	30.7	77	7	184	9.1
STARK	61.8	52.7	30.8	90	3	182	9.3
BOWMAN	60.7	51.7	30.5	93	2	180	9.9
COLTER	60.5	45.9	28.9	73	12	181	8.6

Cooperator: Western Triangle Ag. Research Center.
Location: Ten miles north of Conrad, MT. (Pondera County)
* = Plant hgt. averages based on four years only. (90-91-94-95)

I. PROJECT TITLE: Impact of plant disease on the ability of producers to comply with the residue compliance program

II. PROJECT LEADER: D. E. Mathre

III. PROJECT PERSONNEL: Bill Grey, Robert Johnston, Greg Kushnak, Jack Martin

IV. OBJECTIVES:

1. Determine the effect of residue conservation on the development and impact of plant disease on barley production.

V. METHODS

The barley experiment was conducted on the Western Triangle Ag Research Center in cooperation with Greg Kushnak. A test was set up in an area that had been in Harrington barley in 1994 and the straw left on the soil surface. Straw residue samples were taken on April 19, 1995. Three separate treatment areas were set up as follows:

#1 - all residue burned with essentially none remaining on the soil surface
#2 - residue tilled one time
#3 - no tillage

Nitrogen as urea was top dressed at 60 lb N/acre and 100 lb/acre of 11-51-0 was applied with the seed. Two barley varieties were selected for planting - Harrington as a leaf-spot susceptible variety and Baronesse as a leaf-spot "tolerant" variety. Twelve row plots 20 ft long were seeded on April 19, 1995. Tilt foliar fungicide was applied at the label recommended rate on June 7 (4-5 leaf stage) and on July 10 (heads emerging) to half of the test involving four replications.

VI. RESULTS AND DISCUSSION

Isolations from barley leaf spots indicated that almost all of the spots were the spot-form of net blotch (*Pyrenophora teres*). The lower leaves of barley did develop some net blotch early in the season and disease continued to move up the plants to infect the flag leaf.

Foliar disease on the barley crop was quite severe in 1995 as compared to 1994. In addition, there were timely rains during 1995 such that the crop was rarely under moisture stress. As a result, the yields were very high for dryland conditions. We did see a significant crop response to the use of Tilt foliar fungicide as indicated by higher overall yield, higher % plump kernels, and lower % thin kernels. We also saw a varietal response in that Baronesse had a lower disease score than Harrington thus indicating that Baronesse does, indeed, have some tolerance to net blotch.

The effect of residue on disease development and yield was what might be expected, ie the burned area produced higher yields than areas where the residue was not tilled or tilled only once. This indicates that in a year where inoculum level in the area is high, destruction of residue can lower, but not eliminate, the disease pressure; growers should make special effort to select and use the most disease tolerant varieties, and there are such available. The data also suggest that it will be worthwhile for barley breeders, public and private, to increase their efforts in developing even more disease resistant varieties for the future. Our data would also suggest that use of fungicides to control foliar diseases in barley is effective, and can provide economical returns when disease pressure is high. It is interesting to note that the lowest yield in this test (Harrington, not sprayed, in no till = 82 bu/ac) was only 59% of the highest yield (Baronesse, sprayed, burned = 140 bu/ac). This suggests that growers can have a great deal of impact on their yields through variety selection, pest control measures, and residue management.

Agronomic and quality data are presented in Tables 33 - 38, and disease readings in Table 39.

Barley Residue Test

Table 33

Yield - bu/acre

	'Tilt' fungicide		
	Spray	No Spray	% Increase
No Till			
Harrington	106	82	29
Baronesse	135	113	19
Cultivated			
Harrington	105	87	21
Baronesse	133	117	13
Burn			
Harrington	111	88	27
Baronesse	140	121	15

Table 34

Test Weight - Pounds of seed per bushel

	'Tilt' fungicide		
	Spray	No spray	Mean
Harrington	51.2 w	47.7 y	49.5 a
Baronesse	53.8 x	52.5 z	53.2 b
Mean	52.5 a	50.1 b	

IA. = 0.01

	Harrington	Baronesse	Mean
Burned	50.9 w	53.2 z	52.1 a
Cultivated	50.0 x	53.0 z	51.0 b
NoTill	48.5 y	53.2 z	50.8 b
Mean	49.5 a	53.2 b	

IA. = 0.01

	'Tilt' fungicide		
	Spray	No spray	Mean
Burned	53.3	51.0	52.1 a
Cultivated	52.1	49.9	51.0 b
NoTill	52.2	49.4	50.8 b
Mean	52.5 a	50.1 b	

IA. = ns

Table 35

Plump seed (per cent)

	'Tilt' fungicide		
	Spray	No spray	Mean
Harrington	90.4 x	74.2 y	82.3 a
Baronesse	95.6 w	89.7 x	92.6 b
Mean	93.0 a	81.9 b	

IA. = 0.01

	Harrington	Baronesse	Mean
Burned	85.4 x	93.4 y	89.4 a
Cultivated	82.0 w	91.3 y	86.6 b
NoTill	79.5 w	93.3 y	86.4 b
Mean	82.3 a	92.6 b	

IA. = 0.01

	'Tilt' fungicide		
	Spray	No spray	Mean
Burned	94.3	84.5	89.4 a
Cultivated	92.4	80.9	86.6 b
NoTill	92.4	80.4	86.4 b
Mean	93.0 a	81.9 b	

IA. = ns

Table 36
Percent Thin Seed

	'Tilt' fungicide		
	Spray	No spray	Mean
Harrington	2.8 x	9.8 y	6.3 a
Baronesse	1.1 w	3.2 x	2.1 b
Mean	2.0 a	6.5 b	

IA. = 0.01

	Harrington	Baronesse	Mean
Burned	4.5 w	1.9 z	3.2 a
Cultivated	6.5 x	2.6 z	4.6 b
NoTill	8.0 y	1.9 z	4.9 b
Mean	6.3 a	2.1 b	

IA. = 0.01

	'Tilt' fungicide		
	Spray	No spray	Mean
Burned	1.4	5.0	3.2 a
Cultivated	2.1	7.0	4.6 b
NoTill	2.4	7.5	4.9 b
Mean	2.0 a	6.5 b	

IA. = ns

Table 37

Thousand Kernel Weight (TKW) Weight of 1000 seeds

	'Tilt' fungicide		
	Spray	No spray	Mean
Harrington	41.3	36.5	38.9 a
Baronesse	45.8	42.0	43.9 b
Mean	43.5 a	39.2 b	

IA. = ns

	Harrington	Baronesse	Mean
Burned	40.3 x	44.0 y	42.1 a
Cultivated	38.7 w	43.2 y	40.9 a
NoTill	37.7 w	44.5 y	41.1 a
Mean	38.9 a	43.9 b	

IA. = 0.01

	'Tilt' fungicide		
	Spray	No spray	Mean
Burned	44.1	40.2	42.1 a
Cultivated	43.3	38.5	40.9 a
NoTill	43.2	39.0	41.1 a
Mean	43.5 a	39.2 b	

IA. = ns

Table 38

Percent Protein

	'Tilt' fungicide		
	Spray	No spray	Mean
Harrington	9.3	9.6	9.5 a
Baronesse	8.8	8.9	8.9 b
Mean	9.1 a	9.3 b	

IA. = ns

	Harrington	Baronesse	Mean
Burned	9.2	8.7	9.0 a
Cultivated	9.5	8.9	9.2 b
NoTill	9.6	9.0	9.3 b
Mean	9.5 a	8.9 b	

IA. = ns

	'Tilt' fungicide		
	Spray	No spray	Mean
Burned	8.9	9.0	9.0 a
Cultivated	9.0	9.4	9.2 b
NoTill	9.2	9.5	9.3 b
Mean	9.1 a	9.3 b	

IA. = ns

Table 39

Disease Readings - July 10, 1995 (net blotch and scald).

	'Tilt' fungicide		
	Spray	No spray	Mean
Harrington	1.5 x	2.4 y	1.9 a
Baronesse	1.1 w	1.6 x	1.4 b
Mean	1.3 a	2.0 b	

IA. = 0.01

	Harrington	Baronesse	Mean
Burned	1.9	1.4	1.6 a
Cultivated	1.9	1.4	1.7 a
NoTill	2.0	1.3	1.7 a
Mean	1.9 a	1.4 b	

IA. = ns

	'Tilt' fungicide		
	Spray	No spray	Mean
Burned	1.2	2.1	1.6 a
Cultivated	1.3	2.0	1.7 a
NoTill	1.4	1.9	1.7 a
Mean	1.3 a	2.0 b	

IA. = ns

Table 40. 'Dividend' seed treatment trial on no-till continuous-crop winter wheat, 1995. Western Triangle Agric. Research Center, Conrad, MT.

Treatment	Rate product/cwt	Yield bu/a	Test Wt. lbs/bu
Untreated	--	32.7	58.1
Vitavax 200	3 oz	36.2	58.1
Dividend 3FS	0.5 oz	41.4	57.7
Dividend 28WP	0.66 oz	42.3	57.5
Dividend 3FS + CGA	0.5 oz + 7.5 ml	38.6	59.5
Dividend 3FS + CGA	0.5 oz + 15.0 ml	39.9	59.8

Variety: Neeley
Cropping system: no-till planted into barley stubble.
Planting date: Nov 1, 1994; dry soil; spring emergence.
Fertilizer: 100 # 11-51-0.

Table 41 **Legume variety trial** north of Conrad grown on recrop no-till barley stubble, 1995. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, Montana.

Variety		Seed yield pounds per acre	Plant length inches
MEROSE AUST. WINTER PEA		3268	63
FRENCH GREEN LENTIL		2913	24
INIANHEAD LENTIL		2788	26
TRAPPER PEA	*	2775	56
CHICKLING VETCH		2578	58
CRIMSON LENTIL		2468	22
MIRANDA PEA	**	2060	53
PROCON PEA	**	1424	42
MID. SWEET PEA		1169	50
LATE SWEET PEA		984	45
EARLY SWEET PEA		880	50

Location: Western Triangle Reseach Center, 10 miles north of Conrad, Montana. (Pondera County)
Fertilizer: 100# 11-51-0 with the seed.
Planting date: April 28, 1995.
Harvest date: September 27, 1995.
Rainfall: From seeding to harvest was 14.6 inches.
Seeded into standing stubble with a double disc drill.
* = Moderate shattering occured.
** = Severe shattering occured.
Plots were combined, straight cut.

TITLE: Effect of nitrogen, phosphorus, potassium, and chloride on grain yield and quality of spring wheat.

YEAR: 1995

LOCATIONS:
1. Patricia Hellinger Farm, east of Ethridge;
2. Ron Long Farm, north of Shonkin;
3. Bruce Bradley Farm, northwest of Cut Bank;
4. Don Bradley Farm, northeast of Cut Bank;
5. Bob Inabnit Farm, east of Ledger;
6. Allan Skari Farm, north of Lothair;
7. Moog Farms, north of Joplin;
8. Ray Ramberg Farm, north of Inverness
9. Lyle McKeever Farm, northeast of Loma.
10. Kathy and Randy Bessette Farm, north of Havre.

PERSONNEL: Grant Jackson, Larry Christiaens, Robert Kirby-Glacier County Agent, Chris Onstad-Toole County Agent, John Maatta-Liberty County Agent, Judy Wargo-Chouteau County Agent, and Robert Brastrup-Hill County Agent.

OBJECTIVES: Determine the response of spring wheat to N, P, K, and Cl fertilizers, and calibrate nitrate-N and P soil tests to spring wheat response.

PROCEDURES: Fourteen fertilizer treatments, described in each data table, were applied broadcast between every other row while planting (P fertilizer was placed with the seed). Plots were seeded with a double disc plot planter (12" row spacing). A 3" shovel was clamped on the tool bar in front of the opener to remove Fargo from the planting area. Plot size was 6 x 20 feet with four replications. Location characteristics such as variety, fertilizer applied with the seed, soil test results, etc. are shown with each table also. Plots were harvested with a small plot combine.

RESULTS: Data are summarized in Tables 1S through 10S. Comments about individual locations are shown at the bottom of each table. All locations had significant yield and protein increases due to N. Maximum location yields ranged from 37 to 86 bu/acre, only two sites had maximum yields less than 60 bu/acre. Just two locations had 14 % protein. Phosphorus significantly increased yield at six sites. These locations had P soil tests ranging from 6 to 18 ppm. Note the necessity of P for N response. Two locations had significant K yield responses, and Cl significantly increased grain yield at one location.

TABLE 1S. EFFECT OF N, P, K, AND Cl ON SPRING WHEAT. Experiment located north of Cut Bank. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT NO.	$N-P_2O_5-K-Cl$ lb/acre	GRAIN YIELD bu/ac	GRAIN PROTEIN %	TEST WT. lb/bu
12	150-50-30-27	70.83	11.60	60.72
8	150-25-30-27	68.63	11.63	61.14
11	100-50-30-27	65.83	9.60	60.63
7	100-25-30-27	63.40	9.73	61.63
13	100-25-0-27	61.95	9.75	61.03
4	150-0-30-27	60.85	13.02	58.49
14	100-25-30-0	60.38	10.65	60.66
3	100-0-30-27	57.88	11.35	58.92
6	50-25-30-27	49.65	8.13	61.32
10	50-50-30-27	49.05	8.25	61.46
2	50-0-30-27	40.92	8.75	60.05
1	0-0-30-27	22.82	10.13	59.39
5	0-25-30-27	22.38	9.70	59.99
9	0-50-30-27	19.52	10.20	59.30
	STATISTICAL TABLE			
EXPERIMENTAL MEANS		51.01	10.18	60.34
ERROR MEAN SQUARE		28.47	.38	.70
STANDARD ERROR		5.34	.62	.84
STANDARD ERROR OF THE MEAN		2.67	.31	.42
C.V. 1: (S/MEAN)*100		10.46	6.07	1.39
LSD (0.05)		7.63	.88	1.20
	NITROGEN SUMMARY			
0		21.57	10.01	59.56
50		46.54	8.37	60.93
100		62.37	10.22	60.39
150		66.77	12.08	60.12
LSD (0.05)		4.41	.51	.69
	PHOSPHORUS SUMMARY			
0		45.62	10.81	59.21
25		51.01	9.79	61.01
50		51.31	9.91	60.53
LSD (0.05)		3.82	.44	.60

Grain yields based on 60 lb/bu.
Variety: Amidon
Previous crop: Fallow
Growing Season ppt. = 6.35"
Depth of Moist Soil = > 3'
Seeding Date: 4-18-95
Harvest Date: 9-14-95
Soil Tests: pH = 7.9, O.M. = 1.8 %, P = 13.7 ppm, K = 292 ppm, Zn = 0.7 ppm, Cu = 2.0 ppm

Depth ft.	Cl	NH_4-N	NO_3-N	SO_4-S
		--------lbs/acre--------		
0-1	4	16.1	14.9	63.4
1-2	4	17.8	3.5	47.0
2-3	4	19.9	0.8	50.3
3-4	4	18.2	0.5	60.2

Comments: Optimum fertilizer rate was 150-25-30 this year, however, the 14% protein goal was not reached.

TABLE 2S. EFFECT OF N, P, K, AND Cl ON SPRING WHEAT. Experiment located east of Ethridge. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT NO.	$N-P_2O_5-K-Cl$ lb/acre	GRAIN YIELD bu/ac	GRAIN PROTEIN %	TEST WT lb/bu
11	60-40-20-18	62.45	12.03	61.73
7	60-20-20-18	60.85	11.33	62.20
10	30-40-20-18	60.18	10.23	62.48
14	60-20-20-0	57.93	11.73	61.50
4	90-0-20-18	56.83	12.62	61.25
8	90-20-20-18	56.40	13.05	61.50
6	30-20-20-18	53.08	10.63	61.78
9	0-40-20-18	52.70	9.45	61.90
12	90-40-20-18	52.60	12.57	61.70
5	0-20-20-18	50.25	10.27	62.38
3	60-0-20-18	50.02	11.65	60.78
13	60-20-0-18	47.68	11.63	62.03
2	30-0-20-18	45.55	11.75	61.52
1	0-0-20-18	36.38	10.35	61.38
	STATISTICAL TABLE			
EXPERIMENTAL MEANS		53.06	11.38	61.72
ERROR MEAN SQUARE		83.39	.83	.50
STANDARD ERROR		9.13	.91	.70
STANDARD ERROR OF THE MEAN		4.57	.45	.35
C.V. 1: (S/MEAN)*100		17.21	7.99	1.14
LSD (0.05)		13.06	1.30	NS
	NITROGEN SUMMARY			
0		46.44	10.03	61.88
30		52.93	10.87	61.93
60		57.77	11.67	61.57
90		55.27	12.75	61.48
LSD (0.05)		7.54	.75	NS
	PHOSPHORUS SUMMARY			
0		47.19	11.59	61.23
20		55.14	11.32	61.96
40		56.98	11.07	61.95
LSD (0.05)		6.53	NS	.51

Grain yields based on 60 lb/bu.
Variety: Amidon
Previous crop: Fallow
Growing Season ppt. = 8.2 "
Depth of Moist Soil = > 3'
Seeding Date: 4-18-95
Harvest Date: 9-7-95
Soil Tests: pH = 8.2, O.M. = 2.5 %, P = 10.4 ppm, K = 412 ppm, Zn = 0.6 ppm, Cu = 1.6 ppm

Depth ft.	Cl	NH_4-N	NO_3-N	SO_4-S
		-------lbs/acre-------		
0-1	4	17.3	42.2	180.5
1-2	4	14.1	12.0	134.6
2-3	4	13.6	4.9	4463.0
3-4	4	14.0	8.9	8916.0

Comments: Optimium fertilizer rate was 60-20-20 this year, however, the 14% protein goal was not reached.

TABLE 3S. EFFECT OF N, P, K, AND Cl ON SPRING WHEAT. Experiment located north of Lothair. Western Triangle Ag. Research Center, Conrad. 1995.

NO.	TREATMENT $N-P_2O_5-K-Cl$	GRAIN YIELD	GRAIN PROTEIN	TEST WT.
	lb/acre	bu/ac	%	lb/bu
8	90-20-20-18	62.78	10.50	60.63
12	90-40-20-18	62.08	10.33	61.02
3	60-0-20-18	60.48	10.92	60.10
4	90-0-20-18	58.90	9.45	61.05
7	60-20-20-18	57.98	9.38	61.02
13	60-20-0-18	57.95	9.73	61.58
11	60-40-20-18	56.65	10.03	61.19
14	60-20-20-0	55.73	10.35	60.98
6	30-20-20-18	51.55	11.08	61.44
10	30-40-20-18	49.73	9.45	60.77
2	30-0-20-18	47.80	9.85	59.75
9	0-40-20-18	47.03	11.55	61.79
1	0-0-20-18	46.93	10.65	60.40
5	0-20-20-18	40.20	10.70	61.62
	STATISTICAL TABLE			
EXPERIMENTAL MEANS		53.98	10.28	60.95
ERROR MEAN SQUARE		43.40	2.07	1.09
STANDARD ERROR		6.59	1.44	1.04
STANDARD ERROR OF THE MEAN		3.29	.72	.52
C.V. 1: (S/MEAN)*100		12.20	13.98	1.71
LSD (0.05)		9.42	NS	NS
	NITROGEN SUMMARY			
0		44.72	10.97	61.27
30		49.69	10.12	60.64
60		58.37	10.11	60.76
90		61.25	10.09	60.92
LSD (0.05)		5.44	NS	NS
	PHOSPHORUS SUMMARY			
0		53.52	10.22	60.32
20		53.12	10.41	61.17
40		53.87	10.34	61.19
LSD (0.05)		NS	NS	.75

Grain yields based on 60 lb/bu.
Variety: Amidon — Previous crop: Chemical Fallow
Growing Season ppt. = 10.35" — Depth of Moist Soil = > 3'
Seeding Date: 4-17-95 — Harvest Date: 8-31-95
Soil Tests: pH = 8.2, O.M. = 1.8 %, P = 11.0 ppm, K = 592 ppm, Zn = 0.3 ppm, Cu = 2.0 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
ft	------lbs/acre-------			
0-1	21	9.8	22.9	134.5
1-2	15	11.2	3.6	1085.0
2-3	148	19.0	1.8	9430.0
3-4	263	20.5	20.0	9598.0

Comments: No P response, fertilizer rate for optimum yield was 60-0-20. Protein data was highly variable and should be interpreted with caution.

TABLE 4S. EFFECT OF N, P, K, AND Cl ON SPRING WHEAT. Experiment located north of Joplin. Western Triangle Ag. Research Center, Conrad. 1995.

NO.	TREATMENT $N-P_2O_5-K-Cl$	GRAIN YIELD	GRAIN PROTEIN	TEST WT.
	lb/acre	bu/ac	%	lb/bu
12	150-50-30-27	67.12	11.83	62.13
8	150-25-30-27	65.80	12.70	61.92
14	100-25-30-0	64.88	11.43	61.83
7	100-25-30-27	64.48	10.85	61.95
13	100-25-0-27	63.22	11.38	61.90
11	100-50-30-27	62.58	11.13	61.74
10	50-50-30-27	60.88	9.80	61.86
4	150-0-30-27	56.38	13.27	61.95
3	100-0-30-27	55.88	12.62	61.92
2	50-0-30-27	54.33	10.07	62.18
6	50-25-30-27	53.35	9.58	61.83
9	0-50-30-27	40.03	9.08	61.88
5	0-25-30-27	38.83	8.63	61.93
1	0-0-30-27	38.23	8.80	61.97
	STATISTICAL TABLE			
EXPERIMENTAL MEANS		56.14	10.80	61.93
ERROR MEAN SQUARE		18.01	.54	.09
STANDARD ERROR		4.24	.74	.29
STANDARD ERROR OF THE MEAN		2.12	.37	.15
C.V. 1: (S/MEAN)*100		7.56	6.81	.47
LSD (0.05)		6.07	1.05	NS
	NITROGEN SUMMARY			
0		39.02	8.83	61.97
50		56.18	9.81	61.97
100		60.98	11.53	61.88
150		63.10	12.60	61.99
LSD (0.05)		3.50	.61	NS
	PHOSPHORUS SUMMARY			
0		51.20	11.19	62.01
25		55.61	10.44	61.91
50		57.65	10.46	61.89
LSD (0.05)		3.04	.53	NS

Grain yields based on 60 lb/bu.

Variety: Amidon — Previous crop: Chemical Fallow

Growing Season ppt. = 14.2" — Depth of Moist Soil = > 3'

Seeding Date: 4-24-95 — Harvest Date: 9-12-95

Soil Tests: pH = 8.4, O.M. = 1.4 %, P = 10.4 ppm, K = 354 ppm, Zn = 0.2 ppm, Cu = 1.6 ppm

Depth ft	Cl	NH_4-N	NO_3-N	SO_4-S
	-----lbs/acre-------			
0-1	4	9.2	33.3	26.8
1-2	4	9.4	6.5	34.9
2-3	4	13.0	3.4	80.3
3-4	4	21.6	7.0	219.0

Comments: Optimum fertilizer rate was 150-25-30, however, the protein goal of 14% was not reached.

TABLE 5S. EFFECT OF N, P, K, AND Cl ON SPRING WHEAT. Experiment located northeast of Inverness. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT NO.	$N-P_2O_5-K-Cl$ lb/acre	GRAIN YIELD bu/ac	GRAIN PROTEIN %	TEST WT. lb/bu
8	150-25-30-27	54.98	14.40	61.88
12	150-50-30-27	54.70	14.33	61.30
13	100-25-0-27	54.23	13.40	62.13
11	100-50-30-27	54.00	13.10	61.85
14	100-25-30-0	53.30	13.88	61.38
7	100-25-30-27	53.28	13.63	62.52
10	50-50-30-27	48.50	11.13	62.38
6	50-25-30-27	46.75	11.48	62.70
3	100-0-30-27	42.28	13.82	62.00
2	50-0-30-27	41.60	12.75	62.13
4	150-0-30-27	41.60	14.73	61.23
5	0-25-30-27	31.23	9.60	62.43
1	0-0-30-27	30.25	10.18	61.70
9	0-50-30-27	28.78	9.95	61.80
	STATISTICAL TABLE			
EXPERIMENTAL MEANS		45.39	12.60	61.96
ERROR MEAN SQUARE		11.84	.40	.20
STANDARD ERROR		3.44	.63	.44
STANDARD ERROR OF THE MEAN		1.72	.32	.22
C.V. 1: (S/MEAN)*100		7.58	5.01	.72
LSD (0.05)		4.92	.90	.64
	NITROGEN SUMMARY			
0		30.08	9.91	61.98
50		45.62	11.78	62.40
100		49.85	13.52	62.13
150		50.42	14.48	61.47
LSD (0.05)		2.84	.52	.37
	PHOSPHORUS SUMMARY			
0		38.93	12.87	61.76
25		46.56	12.27	62.38
50		46.49	12.13	61.83
LSD (0.05)		2.46	.45	.32

Grain yields based on 60 lb/bu.
Variety: Amidon — Previous crop: Chemical Fallow
Growing Season ppt. = " — Depth of Moist Soil = > 3'
Seeding Date: 4-24-95 — Harvest Date: 8-31-95
Soil Tests: pH = 8.3, O.M. = 1.0 %, P = 5.3 ppm, K = 300 ppm, Zn = 0.1 ppm, Cu = 1.1 ppm

Depth ft	Cl	NH_4-N	NO_3-N	SO_4-S
	----lbs/acre----------			
0-1	4	10.1	41.8	65.0
1-2	4	10.8	10.7	71.1
2-3	4	12.1	3.9	91.9
3-4	4	18.4	5.4	3811.0

Comments: Optimum fertilizer rate for yield and 14% protein was 150-25-30.

TABLE 6S. EFFECT OF N, P, K, AND Cl ON NO-TILL SPRING WHEAT. Experiment located east of Ledger. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT NO.	$N-P_2O_5-K-Cl$ lb/ac	GRAIN YIELD bu/ac	GRAIN PROTEIN %	TEST WT. lb/bu
8	90-20-20-18	35.75	11.27	60.60
7	60-20-20-18	34.12	9.95	61.45
14	60-20-20-0	32.28	9.60	60.85
11	60-40-20-18	32.00	9.40	60.97
12	90-40-20-18	31.77	11.47	60.13
3	60-0-20-18	30.65	10.35	60.82
13	60-20-0-18	29.90	9.73	61.02
4	90-0-20-18	28.72	10.92	60.72
10	30-40-20-18	26.25	8.00	60.95
6	30-20-20-18	26.05	8.23	61.10
2	30-0-20-18	23.13	8.83	60.53
1	0-0-20-18	19.70	11.80	60.70
5	0-20-20-18	13.70	8.60	60.95
9	0-40-20-18	12.87	9.07	60.67
	STATISTICAL TABLE			
EXPERIMENTAL MEANS		28.20	9.81	60.84
ERROR MEAN SQUARE		20.80	.45	.59
STANDARD ERROR		4.56	.67	.77
STANDARD ERROR OF THE MEAN		2.28	.34	.39
C.V. 1: (S/MEAN)*100		16.18	6.86	1.27
LSD (0.05)		11.39	1.68	NS
	NITROGEN SUMMARY			
0		15.42	9.82	60.77
30		25.14	8.35	60.86
60		32.26	9.90	61.08
90		32.08	11.22	60.49
LSD (0.05)		5.30	.78	NS
	PHOSPHORUS SUMMARY			
0		25.55	10.48	60.70
20		27.41	9.51	61.03
40		25.72	9.48	60.68
LSD (0.05)		NS	.62	NS

Grain yields based on 60 lb/bu.
Variety: Amidon — Previous crop: Barley
Growing Season ppt. = 7.75" — Depth of Moist Soil = 6"
Seeding Date: 4-17-95 — Harvest Date: 8-22-95
Soil Tests: pH = 8.3, O.M. = 1.2 %, P = 25.3 ppm, K = 212 ppm, Zn = 0.2 ppm, Cu = 1.4 ppm

Depth ft	Cl	NH_4-N	NO_3-N	SO_4-S
		lbs/acre		
0-1	4	13.6	7.2	184.8
1-2	4	16.2	3.1	1816.0
2-3	4	28.3	0.7	5865.0
3-4	4	28.5	4.3	7882.0
4-5	24	28.5	9.1	7602.0

Comments: Optimum fertilizer rate was 60-20-20, however, the 14% protein goal was not reached.

TABLE 7S. EFFECT OF N, P, K, AND Cl ON NO-TILL SPRING WHEAT. Experiment located west of Shonkin. Western Triangle Ag. Research Center, Conrad. 1995

TREATMENT NO.	$N-P_2O_5-K-Cl$ lb/acre	GRAIN YIELD bu/ac	GRAIN PROTEIN %	TEST WT. lb/bu
14	100-25-30-0	66.32	12.85	61.87
12	150-50-30-27	63.07	13.40	61.37
3	100-0-30-27	62.57	13.23	60.20
8	150-25-30-27	61.50	13.20	60.50
4	150-0-30-27	59.60	14.05	60.00
13	100-25-0-27	59.50	12.70	61.87
6	50-25-30-27	58.83	10.90	61.47
11	100-50-30-27	58.73	12.60	61.60
7	100-25-30-27	57.55	12.23	61.55
10	50-50-30-27	52.67	11.30	61.57
2	50-0-30-27	51.83	11.60	60.07
9	0-50-30-27	43.22	12.33	60.67
1	0-0-30-27	41.62	10.73	59.32
5	0-25-30-27	37.77	10.65	61.15
	STATISTICAL SUMMARY			
EXPERIMENTAL MEANS		54.78	12.23	60.93
ERROR MEAN SQUARE		75.66	.75	.59
STANDARD ERROR		7.94	.79	.70
STANDARD ERROR OF THE MEAN		6.15	.61	.54
C.V. 1: (S/MEAN)*100		15.88	7.09	1.26
LSD (0.05)		16.12	1.61	1.42
	NITROGEN SUMMARY			
0		40.88	11.23	60.38
50		54.45	11.27	61.04
100		59.62	12.68	61.12
150		61.39	13.55	60.62
LSD (0.05)		8.79	.85	.77
	PHOSPHORUS SUMMARY			
0		53.91	12.40	59.90
25		53.91	11.74	61.17
50		54.42	12.41	61.30
LSD (0.05)		NS	NS	.64

Grain yields based on 60 lb/bu.
Variety: Amidon
Growing Season ppt. = 10.58 "
Seeding Date: 5-3-95
Soil Tests: pH = 5.4, O.M. = 2.6 %, P = 29.1 ppm, K = 456 ppm, Zn = 1.0 ppm, Cu = 2.1 ppm

Previous crop: spring wheat
Depth of Moist Soil = 20"
Harvest Date: 9-1-95

Depth feet	Cl	NH_4-N	NO_3-N	SO_4-S
	-------lbs/acre--------			
0-1	10	19.9	39.3	40.4
1-2	4	12.2	7.5	145.6
2-3	4	11.2	3.8	401.0

Comments: Data is highly variable and should be interpreted with caution. Optimum fertilizer rate is 100-25-30, however, the 14% protein goal was not reached.

TABLE 8S. EFFECT OF N, P, K, AND Cl ON SPRING WHEAT.
Experiment located northeast of Cut Bank. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT NO.	$N-P_2O_5-K-Cl$ lb/acre	GRAIN YIELD bu/ac	GRAIN PROTEIN %	TEST WT. lb/bu
8	150-25-30-27	85.50	11.05	58.85
13	100-25-0-27	79.80	10.33	57.66
12	150-50-30-27	78.20	11.78	57.87
14	100-25-30-0	73.73	9.98	57.42
3	100-0-30-27	73.33	10.33	57.58
7	100-25-30-27	69.80	10.07	58.62
6	50-25-30-27	68.53	8.88	57.66
11	100-50-30-27	66.40	9.93	58.08
10	50-50-30-27	65.53	9.23	58.85
2	50-0-30-27	59.73	8.28	57.82
4	150-0-30-27	56.80	11.95	56.47
5	0-25-30-27	42.75	7.40	57.90
1	0-0-30-27	39.90	7.80	57.60
9	0-50-30-27	38.53	8.50	58.67
STATISTICAL TABLE				
EXPERIMENTAL MEANS		64.18	9.68	57.93
ERROR MEAN SQUARE		92.34	.48	.89
STANDARD ERROR		9.61	.69	.94
STANDARD ERROR OF THE MEAN		4.80	.34	.47
C.V. 1: (S/MEAN)*100		14.97	7.13	1.63
LSD (0.05)		13.74	.99	1.35
NITROGEN SUMMARY				
0		40.39	7.90	58.04
50		64.59	8.79	58.09
100		69.84	10.11	58.08
150		73.50	11.59	57.72
LSD (0.05)		7.94	.57	NS
PHOSPHORUS SUMMARY				
0		57.44	9.59	57.36
25		66.64	9.35	58.24
50		62.16	9.86	58.35
LSD (0.05)		6.87	.50	.67

Grain yields based on 60 lb/bu.
Variety: Amidon
Growing Season ppt. = 12+ "
Seeding Date: 4-18-95
Previous crop: Fallow
Depth of Moist Soil = > 3'
Harvest Date:10-11-95
Soil Tests: pH = 8.0, O.M. = 2.4 %, P = 17.8 ppm, K = 348 ppm, Zn = 1.3 ppm, Cu = 1.3 ppm

Depth feet	Cl	NH_4-N	NO_3-N	SO_4-S
	------lbs/acre---------			
0-1	4	15.2	40.5	25.5
1-2	4	9.7	17.5	31.4
2-3	4	8.1	3.3	37.6

Comments: The fertilizer rate for optimum yield was 150-25-30. More N was needed for 14% protein.

TABLE 9S. EFFECT OF N, P, K, AND Cl ON NO-TILL SPRING WHEAT. Experiment located north of Loma. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT NO.	$N-P_2O_5-K-Cl$	GRAIN YIELD	GRAIN PROTEIN	TEST WT.
	lb/acre	bu/ac	%	lb/bu
8	90-20-20-18	60.35	13.35	60.48
11	60-40-20-18	59.53	13.27	60.88
7	60-20-20-18	58.18	13.15	61.35
14	60-20-20-0	58.08	13.02	61.18
4	90-0-20-18	57.70	12.87	60.35
2	30-0-20-18	56.85	13.27	61.78
13	60-20-0-18	56.78	12.77	61.38
3	60-0-20-18	55.48	13.10	61.48
12	90-40-20-18	54.98	13.25	60.03
6	30-20-20-18	54.90	13.02	61.65
10	30-40-20-18	54.53	13.13	61.33
5	0-20-20-18	54.35	13.68	60.63
1	0-0-20-18	51.75	13.52	61.20
9	0-40-20-18	51.45	13.50	60.93
	STATISTICAL TABLE			
EXPERIMENTAL MEANS		56.06	13.21	61.04
ERROR MEAN SQUARE		14.46	.11	.28
STANDARD ERROR		3.80	.33	.53
STANDARD ERROR OF THE MEAN		1.90	.17	.27
C.V. 1: (S/MEAN)*100		6.78	2.50	.87
LSD (0.05)		5.44	.47	.76
	NITROGEN SUMMARY			
0		52.52	13.57	60.92
30		55.43	13.14	61.58
60		57.73	13.18	61.23
90		57.67	13.16	60.28
LSD (0.05)		3.14	.27	.44
	PHOSPHORUS SUMMARY			
0		55.44	13.19	61.20
20		56.94	13.30	61.02
40		55.12	13.29	60.79
LSD (0.05)		NS	NS	.38

Grain yields based on 60 lb/bu.
Variety: Amidon
Previous crop: Spring Wheat
Growing Season ppt. = 12.6"
Depth of Moist Soil = 23"
Seeding Date: 4-25-95
Harvest Date: 8-22-95
Soil Tests: pH = 6.2, O.M. = 1.7 %, P = 28.1 ppm, K = 490 ppm, Zn = 0.7 ppm, Cu = 2.1 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
feet	---------lbs/acre---------			
0-1	17	12.9	38.2	21.8
1-2	4	8.4	13.9	50.5
2-3	7	8.1	24.9	80.0
3-4	56	11.7	48.2	217.0

Comments: Really strange protein data. Spring wheat seems to have problems accumulating protein during a cool, moist growing season.

TABLE 10S. EFFECT OF N, P, K, and Cl ON SPRING WHEAT.
Experiment located north of Havre. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT NO.	$N-P_2O_5-K-Cl$	GRAIN YIELD	GRAIN PROTEIN	TEST WT.
	lb/acre	bu/ac	%	lb/bu
8	90-20-20-18	60.98	12.03	58.47
12	90-40-20-18	60.85	11.88	58.62
11	60-40-20-18	59.65	10.67	58.88
7	60-20-20-18	59.10	10.80	58.85
14	60-20-20-0	58.43	10.63	58.56
13	60-20-0-18	57.73	10.77	58.69
4	90-0-20-18	54.95	12.25	57.84
6	30-20-20-18	53.95	9.33	59.09
3	60-0-20-18	53.80	11.20	59.04
10	30-40-20-18	51.75	9.55	59.20
2	30-0-20-18	51.43	9.65	59.34
5	0-20-20-18	44.95	7.93	58.92
9	0-40-20-18	44.60	8.30	58.95
1	0-0-20-18	42.50	8.30	59.15
	STATISTICAL TABLE			
EXPERIMENTAL MEANS		53.90	10.23	58.83
ERROR MEAN SQUARE		8.70	.12	.23
STANDARD ERROR		2.95	.35	.48
STANDARD ERROR OF THE MEAN		1.48	.17	.24
C.V. 1: (S/MEAN)*100		5.47	3.40	.82
LSD (0.05)		4.22	.50	.69
	NITROGEN SUMMARY			
0		44.02	8.18	59.01
30		52.38	9.51	59.21
60		57.52	10.89	58.91
90		58.92	12.05	58.31
LSD (0.05)		2.44	.29	.40
	PHOSPHORUS SUMMARY			
0		50.67	10.35	58.84
20		54.74	10.02	58.83
40		54.21	10.10	58.91
LSD (0.05)		2.11	.25	NS

Grain yields based on 60 lb/bu.
Variety: Amidon
Previous crop: Fallow
Growing Season ppt. = 9.90"
Depth of Moist Soil = > 3'
Seeding Date: 4-24-95
Harvest Date: 9-12-95
Soil Tests: pH = 7.06, O.M. = 1.2 %, P = 13.5 ppm, K = 374 ppm, Zn = 0.7 ppm, Cu = 1.3 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
ft	-------lbs/acre-------			
0-1	4	20.8	36.5	18.9
1-2	4	12.0	10.6	60.4
2-3	4	11.0	4.0	103.1
3-4	4	10.7	1.5	139.1
4-5	4	12.5	1.5	333.2

Comments: Nine inches of the rain occured between June 6 and Aug 17. Optimum fertilizer for yield was 60-20-20, however, the 14% protein goal was not reached.

TITLE: Fertilizer Response of Selected Spring Wheat and Durum Varieties

YEAR: 1995

LOCATIONS:
1. Ray Ramberg Farm, north of Inverness
2. Beck Farm, east of Fairfield
3. Western Triangle Ag. Research Center, north of Conrad

PERSONNEL: Grant Jackson and Larry Christiaens

OBJECTIVES: Evaluate spring wheat variety response to N and Cu fertilizers.

PROCEDURES: Fertilizer treatments, described in each data table, were applied broadcast between rows while planting (Cu and P fertilizers were placed with the seed). Plots near Fairfield and Inverness were seeded with a double disc plot planter, a 3" shovel was clamped on the tool bar in front of the opener, and plot size was 6 x 20 feet with four replications. The experiment at Conrad was planted with a four row plot planter with 3" shovel openers, and plot size was 4 X 12 feet. Planting rate was 20 seeds per foot of row at Inverness and 30 seeds per foot of row at Fairfield and Conrad. Blanket fertilizer applications were: 0-50-30 at Inverness, 0-30-0 with the seed and 29-41-40-24 broadcast by the producer at Fairfield, and 300-50-0 at Conrad. Location characteristics such as varieties, fertilizer applied with the seed, soil test results, etc. are shown with each table also. Plots were harvested with a small plot combine.

RESULTS: Data from the Inverness dryland location are shown in Table 11S. These data are interesting and unusual because of the interaction between variety response and N. HiLine, Lew, and Fortuna did not have the protein response of the other varieties, and McNeal had a steeper yield response to N. However these data only represent one year. Amidon grain moisture at harvest was higher at the 100 and 150 N rates.

The variety response at the irrigated Fairfield location (Table 12S) was unusual also. These data were quite variable, probably due to the alfalfa-grass mixture of the previous crop. However the response curves of Newana and McNeal were essentially flat. HiLine and Laker were the only cultivars to have the expected N response curve.

The results from the Cu fertilization experiment are shown in Table 13S. Many of the varieties had visual differences due to Cu during the growing season, but Amidon was the only one to show any yield difference. The Cu soil tests are high according to the literature, therefore, no yield differences were expected. The surprise of this trial was the high yield and protein content of 2375 which is a North Dakota release of a Pioneer developed variety.

TABLE 11S. EFFECT OF NITROGEN ON SPRING WHEAT AND DURUM VARIETIES. Experiment located N of Inverness. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT		GRAIN	TEST	GRAIN
VARIETY	N RATE	YIELD	WT.	PROTEIN
	lbs/ad	bu/ac	lb/bu	%
Fortuna	0	30.4	60.6	9.1
Fortuna	50	35.1	61.0	10.9
Fortuna	100	40.4	61.6	12.4
Fortuna	150	45.7	62.0	12.8
Grandin	0	33.0	62.4	9.3
Grandin	50	47.1	63.2	11.0
Grandin	100	52.6	62.9	13.4
Grandin	150	57.1	63.0	15.0
Lew	0	34.1	62.0	8.3
Lew	50	48.6	63.1	10.0
Lew	100	52.0	63.4	12.7
Lew	150	57.7	63.5	13.6
McNeal	0	35.9	61.6	9.3
McNeal	50	53.6	62.6	11.0
McNeal	100	64.1	62.5	12.7
McNeal	150	68.5	62.5	14.4
HiLine	0	26.3	62.2	9.5
HiLine	50	46.2	62.2	10.9
HiLine	100	52.5	62.4	12.3
HiLine	150	59.7	62.3	13.5
Amidon	0	32.9	62.2	9.5
Amidon	50	49.6	62.7	10.7
Amidon	100	55.8	61.8	13.0
Amidon	150	60.9	62.2	14.4
	VARIETY SUMMARY			
Fortuna		37.9	61.3	11.3
Grandin		47.4	62.9	12.2
Lew		48.1	63.0	11.1
McNeal		55.5	62.3	11.8
HiLine		46.2	62.3	11.8
Amidon		49.8	62.2	11.9
LSD (0.05)		2.8	0.4	0.3
	NITROGEN SUMMARY			
	0	32.1	61.8	9.1
	50	46.7	62.5	10.8
	100	52.9	62.5	12.9
	150	58.3	62.6	13.9
LSD (0.05)		6.2	0.5	0.6
Var X N Rate p-value		0.00	0.02	0.00

Grain yields based on 60 lb/bu. Previous crop: Chemical Fallow
Soil tests and other site information same as Table 5S.

Comments: Very interesting experiment. Protein levels of Fortuna, Lew, and HiLine were lower than expected.

TABLE 12S. EFFECT OF NITROGEN ON IRRIGATED SPRING WHEAT VARIETIES. Experiment located near Fairfield. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT VARIETY	N RATE	GRAIN YIELD	TEST WT.	GRAIN PROTEIN
	lbs/ac	bu/ac	lb/bu	%
McNeal	0	82.0	61.5	11.3
McNeal	100	87.7	61.0	12.3
McNeal	200	83.1	60.9	13.0
McNeal	300	82.5	59.5	13.8
Laker	0	85.4	62.3	9.3
Laker	100	97.6	61.6	10.3
Laker	200	104.0	60.6	11.8
Laker	300	96.2	60.1	12.2
Glenman	0	77.0	59.7	10.2
Glenman	100	87.1	59.5	10.9
Glenman	200	87.4	58.1	12.0
Glenman	300	87.3	57.9	12.4
Express	0	76.3	60.2	11.5
Express	100	78.0	59.6	12.5
Express	200	82.6	59.4	13.4
Express	300	90.8	59.5	13.4
HiLine	0	85.9	61.8	10.9
HiLine	100	94.6	61.6	11.9
HiLine	200	99.4	61.2	12.9
HiLine	300	91.2	60.8	13.2
Newana	0	89.6	60.3	10.3
Newana	100	92.7	60.2	11.2
Newana	200	86.5	58.0	12.6
Newana	300	87.8	58.0	12.7
	VARIETY SUMMARY			
McNeal		83.8	60.7	12.6
Laker		95.8	61.1	10.9
Glenman		84.7	58.8	11.4
Express		81.9	59.7	12.7
HiLine		92.8	61.3	12.2
Newana		89.2	59.1	11.7
LSD (0.05)		7.7	0.5	0.4
	NITROGEN SUMMARY			
	0	82.7	60.9	10.6
	100	89.6	60.6	11.5
	200	90.5	59.7	12.6
	300	89.3	59.3	12.9
LSD (0.05)		6.3	0.4	0.3

Grain yields based on 60 lb/bu. Previous crop: Mixed hay
Growing Season ppt. = 7.85" No. of flood irrigations: 2
Seeding Date: 4-19-95 Harvest Date: 9-11-95
Soil Tests: pH = 8.0, O.M. = 3.4 %, P = 14.9 ppm, K = 280 ppm, Zn = 0.9 ppm, Cu = 1.3 ppm

Depth feet	Cl	NH_4-N	NO_3-N	SO_4-S
		------lbs/acre---------		
0-1	14	30.8	17.3	83.2
1-2	4	8.1	2.6	67.1
2-3	4	4.5	1.2	69.9
3-4	4	4.6	0.6	58.8

TABLE 13S. EFFECT OF COPPER ON IRRIGATED SPRING WHEAT AND DURUM VARIETIES. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT		GRAIN	TEST	GRAIN
VARIETY	Cu RATE	YIELD	WT.	PROTEIN
	lb/acre	bu/acre	lb/bu	%
Roblin	0	75.8	61.5	15.4
Roblin	2.5	77.2	61.3	14.5
Laker (D)	0	102.3	62.5	10.4
Laker (D)	2.5	103.4	61.3	11.6
HiLine	0	105.8	62.1	13.0
HiLine	2.5	95.6	62.3	11.5
2375	0	107.4	62.5	13.6
2375	2.5	110.0	62.6	13.9
NK 751	0	111.5	61.7	11.1
NK 751	2.5	101.8	61.3	11.1
Express	0	95.2	61.3	13.5
Express	2.5	94.4	61.0	13.2
Amidon	0	93.3	62.4	12.4
Amidon	2.5	101.5	61.7	13.6
Penawana	0	109.0	62.2	10.6
Penawana	2.5	111.8	62.2	12.1
Park 92	0	96.6	61.5	14.5
Park 92	2.5	83.5	62.3	14.8
Kyle (D)	0	99.1	60.3	13.5
Kyle (D)	2.5	96.4	61.2	12.6
VARIETY SUMMARY				
Roblin		76.5	61.4	15.0
Laker Durum		102.9	61.9	11.0
HiLine		100.7	62.2	12.2
2375		108.7	62.6	13.9
NK 751		106.6	61.5	11.1
Express		94.8	61.1	13.3
Amidon		97.4	62.0	13.0
Penawana		110.4	62.2	11.3
Park 92		90.1	61.9	14.7
Kyle Durum		97.7	60.8	13.0
LSD (0.05)		9.3	1.0	1.1
COPPER SUMMARY				
	0	99.6	61.8	12.8
	2.5	97.6	61.7	12.9
LSD (0.05)		NS	NS	NS

Grain yields based on 60 lb/bu. Previous crop: Fallow
Growing Season ppt. = 14.1" Depth of Moist Soil = > 3'
Seeding Date: 4-27-95 Harvest Date:9-13-95
Fertilizer: 300-50-0, Cu as $CuSO_4$, Cu and P applied with seed.
Soil Tests: pH = 8.0, O.M. = 2.3 %, P = 33.0 ppm, K = 480 ppm,

Depth	Cl	NH_4-N	NO_3-N	SO_4-S	Cu	Zn
feet		------lbs/acre---------			ppm	ppm
0-1	<4	24.5	38	126.0	1.7	0.5
1-2	<4	15.5	23	67.5	1.6	0.4
2-3	<4	17.3	11	143.8	1.5	0.4
3-4	<4	24.9	4	3891.2	1.4	0.4
4-5	6	20.7	7	7212.1	1.2	0.4

TITLE: Plant Diagnosis for Protein Management in Spring Wheat

YEAR: 1995

LOCATION: Western Triangle Ag. Research Center, Conrad.

PERSONNEL: Mal Westcott (Principal Investigator), Grant Jackson, and Larry Christiaens.

OBJECTIVES: To develop a system of protein management in spring wheat based on plant diagnosis of flag leaf N and chlorophyll (SPAD) levels.

1. Determine the relationship between protein response to N topdressed at heading and flag leaf N or chlorophyll (SPAD) levels in selected spring wheat varieties.

2. Determine the efficiency of uptake and utilization of N topdressed at heading.

MATERIALS AND METHODS: Three varieties of spring wheat (Len, HiLine, and Newana) were planted in a factorial combination with four N fertilizer rates (0, 150, 225, and 300 lbs N/acre as urea applied while planting) in a randomized complete block design with four replications. One hundred lbs of 11-52-0/acre was applied with the seed. After flowering, 30 flag leaves in each plot was assayed for chlorophyll content with the SPAD meter and then pulled, dried, ground, and analyzed for total N (TKN). Each plot was split into two subplots, one received a topdressing of 40 lbs N/ac as granular urea followed by irrigation. At grain maturity, subplots was subsampled for total plant N determination, and when ripe, grain was mechanically harvested for grain yield and protein determination. The Newana plots was soil sampled for post-harvest N.

RESULTS: Results are shown in Table 14 S. Results were similar to last year except the yields were about 20 bu/acre higher and protein levels were lower. Len easily achieved 14 % protein with added N, it didn't seem to matter when it was applied. Neither Newana or HiLine had 14 % protein with any fertilizer scheme. Note the highest available N was 409 lbs N/acre (340 fertilizer N + 11 from MAP + 58 nitrate-N in 3 feet of soil). The 40 lbs of N applied after flowering elevated protein contents in every case and, this year, only increased yields at the 0 initial N rate. initial N rate.

TABLE 14S. EFFECT OF N APPLIED AT PLANTING AND FLOWERING ON THREE IRRIGATED SPRING WHEAT VARIETIES. Western Triangle Ag Research Center, Conrad. 1995.

VARIETY	N RATE	FLOWERING N RATE	GRAIN YIELD	PROTEIN	TEST WT	TISSUE N	N UPTAKE	SPAD READING
	lbs	N/acre	bu/ac	%	lb/bu	%	lb/ac	#
Highline	0	0	55.9	10.2	63.9			43
Highline	0	40	64.4	13.9	63.7			--
Highline	150	0	96.8	13.2	63.4			48
Highline	150	40	100.4	13.5	63.4			--
Highline	225	0	102.5	13.3	63.3			49
Highline	225	40	95.0	13.6	63.1			--
Highline	300	0	103.8	13.3	62.8			51
Highline	300	40	105.1	13.6	62.8			--
Newana	0	0	79.2	11.1	63.1			45
Newana	0	40	80.8	13.7	63.3			--
Newana	150	0	103.0	12.8	62.0			49
Newana	150	40	101.4	13.5	62.2			--
Newana	225	0	107.8	13.4	60.6			52
Newana	225	40	106.5	13.7	61.0			--
Newana	300	0	104.3	13.4	60.9			51
Newana	300	40	106.4	13.8	60.9			--
Len	0	0	59.1	11.9	61.6			45
Len	0	40	63.8	14.3	62.4			--
Len	150	0	85.4	13.9	61.5			49
Len	150	40	89.8	14.4	61.5			--
Len	225	0	86.0	14.1	61.1			50
Len	225	40	85.0	14.4	61.0			--
Len	300	0	86.1	14.3	60.9			50
Len	300	40	86.8	14.5	61.0			--
				Summary				
Highline			90.5	13.1	63.3			48
Newana			98.7	13.2	61.7			49
Len			80.2	14.0	61.4			49
LSD (0.05)			7.9	0.3	0.6			NS
	0		67.2	12.5	63.0			45
	150		96.1	13.5	62.3			49
	225		97.1	13.8	61.7			50
	300		98.8	13.8	61.5			51
LSD (0.05)			6.3	0.5	0.5			1
		0	89.1	12.9	62.1			49
		40	90.4	13.9	62.2			--
LSD (0.05)			NS	0.3	NS			--
			Interaction p-values					
Variety x N Rate			0.15	0.97	0.11			0.62
Var x Flowering N Rate			0.70	0.77	0.29			----
Var x N Rate Flow N Rate			0.46	0.65	0.45			----
N Rate x Flow N Rate			0.04	0.00	0.64			----

Grain Yield based on 60 lb/bu as standard test weight.
Planting Date: April 27. Harvest Date: Sept. 13.
Flowering fertilization Date: July 18.
Growing season rainfall = 14.1". 100 lbs 11-52-0 applied with the seed, and main N treatments applied while planting.
Planting rate: 22 seeds/ft. SPAD reading date: July 18.

Soil test results: pH= 8.0, O.M.= 2.3%, P = 33 ppm, K= 480 ppm, Cu = 1.5 ppm, Zn = 0.6 ppm

Depth	NH_4-N	NO_3-N	Cl	SO_4-S
ft	--------lbs /acre-------			
0-1	38	25	4	126
0-2	61	41	8	194
0-3	72	58	12	338
0-4	76	83	16	4229
0-5	83	104	22	11441

TITLE: Nitrogen and sulfur management and nutrient cycling in the north central Montana canola production area.

YEAR: 1995

LOCATIONS:
1. Herb Karst Farm, east of Sunburst
2. Dan Andrews Farm, east of Fairfield
3. Western Triangle Ag. Research Center, north of Conrad

PERSONNEL: Grant D. Jackson and Larry Christiaens

OBJECTIVES: To determine the relationship of canola seed yield and quality to N and S fertilization and soil tests; to determine the effect of N and S fertilization on potential nutrient (N,P,K, and S) cycling or rotational benefits; and to determine canola N, S, and water use efficiency relative to N and S additions.

PROCEDURES: The Fairfield and Conrad sites were irrigated while the Sunburst location was rainfed. All plots were located on fields previously in barley. Sunburst and Conrad locations were planted no-till, and the site at Fairfield was conventionally tilled. Four N rates (0, 75, 150 & 225 lbs N/a) and three S rates (0, 20 & 40 lbs S/a) organized into a RCB, 4 x 3 factorial design, with four blocks were applied to plot areas. Plot size was six rows wide and 20' long. Blanket levels of 30 lbs P_2O_5/acre metered with the seed and 30 lbs K/acre broadcast while planting were applied to each research area. Planting rate was 6 lbs/acre. Fertilizer materials were urea, treble super phosphate, potassium chloride, potassium sulfate, and ammonium sulfate. Plots were swathed with a Swift small plot swather and threshed with a Hege combine. Seed samples were dried, weighed, and analyzed for oil content. Data were analyzed by ANOVA and multiple regression. Plant and soil samples were taken for nutrient analysis.

RESULTS: Seed yield and oil content results are tabulated in Tables 15S through 17S. Chemical analysis of whole plant material and post-harvest soil samples have not been completed. Seed yields averaged 1905, 1466, and 1806 lbs/acre at Sunburst, Fairfield, and Conrad, respectively. Yields were probably reduced by the May 19 planting date at Fairfield. Nitrogen significantly increased seed and oil yields and decreased oil content at all locations. All had seed and oil yield quadratic responses to fertilizer plus soil nitrate-N. Conrad and Sunburst had significant seed and oil yield responses to S. The Sunburst site had significant N and S interactions with seed and oil yield and oil content.

SUMMARY: Seed yield N responses from Conrad and Sunburst fit the yield versus soil plus fertilizer-N response curve from previous years. Sulfur responses appear unrelated to the S soil test. Growers should continue using about 20 lbs S in their fertilizer programs.

TABLE 15S. EFFECT OF NITROGEN AND SULFUR ON NO-TILL CANOLA. Experiment located east of Sunburst. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT N-S	SEED YIELD	OIL YIELD	OIL CONTENT
lbs\acre	lb\ac	lb\ac	%
225-20	3373	1595	47.28
225-40	3043	1419	46.65
150-20	2683	1300	48.45
150-40	2657	1283	48.35
150-0	2202	1003	45.42
225-0	2187	977	44.68
75-20	1887	948	50.22
75-40	1885	939	49.78
75-0	1791	881	49.28
0-40	416	204	49.15
0-0	383	191	49.73
0-20	350	175	50.32
STATISTICAL TABLE			
EXPERIMENTAL MEANS	1905	910	48.28
P-VALUE	.0000	.0000	.0000
STANDARD ERROR	264.4	132.4	.9175
STANDARD ERROR OF THE MEAN	132.2	66.18	.4587
C.V. 1: (S/MEAN)*100	13.88	14.54	1.901
LSD (0.05)	380	191	1.32
NITROGEN SUMMARY			
0	383	191	49.73
75	1854	924	49.76
150	2514	1195	47.41
225	2867	1330	46.20
LSD (0.05)	220	110	.76
SULFUR SUMMARY			
0	1641	764	47.28
20	2073	1005	49.07
40	2000	962	48.48
LSD (0.05)	190	95	.66
Interaction P-value	.002	.001	.01

Previous crop: Barley — Growing Season ppt. = 9.4"
Depth of Moist Soil = > 3' — Seeding Date: April 27
Swathing Date: August 15 — Threshing Date: August 29
Variety: Westar
30 lbs P_2O_5/acre as 0-45-0 was applied with the seed.
30 lbs K/acre as 0-0-60 was applied broadcast while planting.

SOIL TEST RESULTS

pH = 6.9, O.M. = 2.2 %, P = 21.3 ppm, K = 352 ppm, Zn = 0.7 ppm
Cu = 2.2 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
feet	----------lbs/acre----------			
0-1	4	12.7	4.9	44.9
1-2	4	12.1	2.0	56.7
2-3	6	13.2	1.6	77.9
3-4	4	17.3	2.1	72.9
4-5	4	19.4	2.1	76.4

TABLE 16S. EFFECT OF NITROGEN AND SULFUR ON IRRIGATED CANOLA. Experiment located east of Fairfield. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT N-S	SEED YIELD	OIL YIELD	OIL CONTENT
lbs\acre	lb\ac	lb\ac	%
150-20	1849	824	44.63
225-40	1754	748	42.70
225-0	1732	729	42.38
75-40	1676	772	46.05
75-0	1584	752	47.57
75-20	1577	733	46.67
150-40	1570	692	44.17
150-0	1546	673	43.63
225-20	1539	651	42.30
0-40	949	460	48.85
0-20	918	448	49.10
0-0	845	413	48.58
STATISTICAL TABLE			
EXPERIMENTAL MEANS	1462	658	45.55
P-VALUE	.0000	.0000	.0000
STANDARD ERROR	232.7	106.9	.8069
STANDARD ERROR OF THE MEAN	116.4	53.43	.4034
C.V. 1: (S/MEAN)*100	15.92	16.23	1.771
LSD (0.05)	335	154	1.16
NITROGEN SUMMARY			
0	904	441	48.84
75	1612	753	46.77
150	1655	730	44.14
225	1675	710	42.46
LDS (0.05)	193	89	.67
SULFUR SUMMARY			
0	1427	642	45.54
20	1471	664	45.67
40	1487	669	45.44
LSD (0.05)	NS	NS	NS
INTERACTION P-VALUE	.29	.38	.12

Variety: Westar
Growing Season ppt. = 7.85"
Swathing Date: August 24
Previous crop: Barley
Seeding Date: May 19
Harvest Date: Sept. 11
30 lbs P_2O_5/acre as 0-45-0 applied with the seed.
30 lbs K/acre as 0-0-60 applied broadcast while seeding.
Flood irrigated two times.

SOIL TEST RESULTS

pH = 8.2, O.M. = 2.5 %, P = 10.4 ppm, K = 412 ppm, Zn = 0.6 ppm
Cu = 1.6 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
feet	----------lbs/acre----------			
0-1	4	17.3	42.2	180.5
1-2	4	14.1	12.0	134.6
2-3	4	13.6	4.9	4463.0
3-4	4	14.0	8.9	8916.0

TABLE 17S. EFFECT OF NITROGEN AND SULFUR ON NO-TILL CANOLA.
Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT N-S	SEED YIELD	OIL YIELD	OIL CONTENT
lb/acre	lb/ac	lb/ac	%
225-40	2550	1175	46.08
150-40	2419	1154	47.68
225-20	2387	1088	45.53
150-20	2372	1141	48.10
150-0	2175	1032	47.43
225-0	2131	974	45.70
75-40	1899	944	49.75
75-20	1822	916	50.20
75-0	1680	833	49.65
0-40	782	397	50.80
0-20	747	365	48.68
0-0	709	358	50.58
STATISTICAL TABLE			
EXPERIMENTAL MEANS	1806	865	48.35
P-VALUE	.0000	.0000	.0000
STANDARD ERROR	164.1	84.6	1.258
STANDARD ERROR OF THE MEAN	82.05	42.3	.6290
C.V. 1: (S/MEAN)*100	9.085	9.78	2.602
LSD (0.05)	236	122	1.81
NITROGEN SUMMARY			
0	747	374	50.02
75	1800	812	49.87
150	2322	1109	47.73
225	2356	1079	45.77
LSD (0.05)	136	130	1.05
SULFUR SUMMARY			
0	1674	800	48.34
20	1832	813	48.13
40	1913	918	48.58
LSD (0.05)	118	113	NS
INTERACTION P-VALUE	.58	.41	.32

Variety: Westar — Previous crop: Barley
Growing Season ppt. = 13.66" — Seeding Date: April 27
Swathing Date: Aug. 14 — Threshing Date: Aug. 22
30 lbs P_2O_5/acre as 0-45-0 applied with the seed.
30 lbs K/acre as 0-0-60 applied broadcast while seeding.

SOIL TEST RESULTS

pH = 7.8, O.M. = 2.2 %, P = 23.4 ppm, K = 324 ppm, Zn = 0.7 ppm
Cu = 1.5 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
feet	----------lbs/acre----------			
0-1	9	10.2	22.8	93.5
1-2	4	6.6	1.3	2431.0
2-3	4	8.7	1.0	3668.0
3-4	4	13.0	3.6	9628.0
4-5	4	16.8	5.4	11012.0

TITLE: Canola Variety Investigations

YEAR: 1995

LOCATIONS:
1. Herb Karst Farm, east of Sunburst
2. Dan Andrews Farm, east of Fairfield
3. Western Triangle Ag. Research Center, north of Conrad

PERSONNEL: Grant D. Jackson and Larry Christiaens

OBJECTIVES: Evaluate canola varieties or hybrids under Western Triangle conditions.

PROCEDURES: The Fairfield and Conrad sites were irrigated while the Sunburst location was rainfed. All plots were located on fields previously in barley. Sunburst and Conrad locations were planted no-till, and the site at Fairfield was conventionally tilled. Three varieties and one hybrid from SeedTec International were tested with Westar as the check variety. Variety names and other site information are included with each summary Table. Plot size was six rows wide and 20' long. Fertilizers were 150-30-30-20, P was metered with the seed, all others were broadcast while planting. Planting rate was 6 lbs/acre. Plots were swathed with a Swift small plot swather and threshed with a Hege combine. Seed samples were dried, weighed, and analyzed for oil content. Data were analyzed by ANOVA.

RESULTS: Seed yield and oil content results are tabulated in Tables 18S through 20S. Seed yields averaged 2112, 2539, and 1985 lbs/acre for Conrad, Sunburst, and Fairfield, respectively. Oil contents averaged 47.2 % at Conrad, 48.9 % at Sunburst, 42.9 % at Fairfield. Seed yields and oil levels were probably reduced by the May 19 planting date at Fairfield.

TABLE 18S. NO-TILL CANOLA VARIETY TRIAL. Western Triangle Ag. Research Center, Conrad. 1995.

VARIETY	SEED YIELD lb/ac	OIL YIELD lb/ac	OIL CONTENT %
HYBRID	2432	1151	47.32
WESTAR	2334	1122	48.10
HELOSE	2190	1033	47.15
LEGEND	1915	900	47.03
SPRINGFIELD	1690	786	46.48
STATISTICAL TABLE			
EXPERIMENTAL MEANS	2112	999	47.22
P-VALUE FOR VAR.	.0000	.0000	.0024
STANDARD ERROR	153.6	71.34	.4285
STANDARD ERROR OF THE MEAN	76.82	35.67	.2142
C.V. 1: (S/MEAN)*100	7.275	7.144	.9075
LSD (0.05)	237	110	.66

Previous crop: Barley
Growing Season ppt. = 13.66" Seeding Date: April 27
Swathing Date: Aug. 14 Threshing Date: Aug. 22
150-30-30-20 applied while seeding, P with the seed, all other fertilizers broadcast.

SOIL TEST RESULTS

pH = 7.8, O.M. = 2.2 %, P = 23.4 ppm, K = 324 ppm, Zn = 0.7 ppm
Cu = 1.5 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
feet	----------lbs/acre----------			
0-1	9	10.2	22.8	93.5
1-2	4	6.6	1.3	2431.0
2-3	4	8.7	1.0	3668.0
3-4	4	13.0	3.6	9628.0
4-5	4	16.8	5.4	11012.0

TABLE 19S. NO-TILL CANOLA VARIETY TRIAL. Experiment located east of Sunburst. Western Triangle Ag. Research Center, Conrad. 1995.

VARIETY	SEED YIELD	OIL YIELD	OIL CONTENT
	lb/ac	lb/ac	%
HYBRID	2774	1343	48.40
WESTAR	2682	1300	48.45
HELOSE	2547	1255	49.28
LEGEND	2512	1234	49.13
SPRINGFIELD	2182	1075	49.28
STATISTICAL TABLE			
EXPERIMENTAL MEANS	2539	1241	48.90
P-VALUE FOR VAR.	.0041	.0141	.2239
STANDARD ERROR	176.9	95.10	.6923
STANDARD ERROR OF THE MEAN	88.43	47.55	.3461
C.V. 1: (S/MEAN)*100	6.96	7.66	1.42
LSD (0.05)	273	147	NS

Previous crop: Barley Growing Season ppt. = 9.4"
Depth of Moist Soil = > 3' Seeding Date: April 27
Swathing Date: August 15 Threshing Date: August 29
150-30-30-20 applied while seeding, P applied with the seed all other fertilizers broadcast.

SOIL TEST RESULTS

pH = 6.9, O.M. = 2.2 %, P = 21.3 ppm, K = 352 ppm, Zn = 0.7 ppm
Cu = 2.2 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
feet	----------lbs/acre----------			
0-1	4	12.7	4.9	44.9
1-2	4	12.1	2.0	56.7
2-3	6	13.2	1.6	77.9
3-4	4	17.3	2.1	72.9
4-5	4	19.4	2.1	76.4

TABLE 20S. IRRIGATED CANOLA VARIETY TRIAL. Experiment located east of Fairfield. Western Triangle Ag. Research Center, Conrad. 1995.

VARIETY	SEED YIELD	OIL YIELD	OIL CONTENT
	lb/ac	lb/ac	%
HYBRID	2277	952	41.90
HELOSE	2092	878	42.03
SPRINGFIELD	1984	878	44.28
WESTAR	1849	823	44.63
LEGEND	1725	715	41.50
STATISTICAL TABLE			
EXPERIMENTAL MEANS	1985	850	42.86
P-VALUE FOR VAR.	.3667	.4210	.0000
STANDARD ERROR	390.5	168.9	.6187
STANDARD ERROR OF THE MEAN	195.2	84.45	.3093
C.V. 1: (S/MEAN)*100	19.67	19.88	1.443
LSD (0.05)	NS	NS	.85

Previous crop: Barley Growing Season ppt. = 7.85"
Seeding Date: May 19 Swathing Date: August 24
Harvest Date: Sept. 11
150-30-30-20 applied while planting, P with the seed, all other fertilizers broadcast.
Flood irrigated two times.

SOIL TEST RESULTS

pH = 8.2, O.M. = 2.5 %, P = 10.4 ppm, K = 412 ppm, Zn = 0.6 ppm
Cu = 1.6 ppm

Depth	Cl	NH_4-N	NO_3-N	SO_4-S
feet	----------lbs/acre----------			
0-1	4	17.3	42.2	180.5
1-2	4	14.1	12.0	134.6
2-3	4	13.6	4.9	4463.0
3-4	4	14.0	8.9	8916.0

TITLE: Legumes as Cover Crops during Fallow

YEAR: 1995

LOCATION: Western Triangle Ag. Research Center, north of Conrad.

PERSONNEL: James R. Sims (PI), Grant D. Jackson, and Larry Christiaens

OBJECTIVES: Determine adaptation, water-use, biomass, and soil nitrogen contribution of late-summer seeded legumes in the dryland spring wheat or barley/summer fallow rotation.

PROCEDURES: Austrian winter peas, snail medic, and Indianhead lentils were planted, no-till at approximately two week intervals starting June 21 and ending August 4 into barley stubble. A fallow plot was left for a control. Plot size was 6 x 20 feet. Seeding rate was 75 lbs/acre for peas and 30 lbs/acre for lentils and snail medic. Plot area was sprayed once with Roundup for preplant weed control. The legumes emerged about 8 days after each planting date and were allowed to grow until a killing frost. Soil samples for water and nitrate-N were taken just prior to planting. Plant samples for biomass and N content were taken after the killing frost and soils again sampled for nitrate-N and water. Water use was determined by subtracting soil water content after the killing frost from soil water content at planting and adding the precipitation collected from the planting date and until the killing frost. Spring wheat will be no-tilled into the plot area next spring.

RESULTS: Biomass yield, oven dry weight basis, and plant water use data are presented in Table 21S. The 1995 growing season was an excellent environment for growing legumes (or any cool season crop) during the late summer. Legumes were planted when the soil was dry enough between rains. Biomass yields for winter peas was over 5 tons/acre for the earliest seeding date, June 21, and they had the highest yields for each planting date. However, water use was the same for each legume at the same planting date and reflected the two times average growing season precipitation (14 inches plus).

TABLE 21S. EFFECT OF LEGUME AND PLANTING DATE NO-TILL GREEN MANURES. Western Triangle Ag. Research Center, Conrad. 1995.

TREATMENT		PLANT	N	N	WATER
LEGUME SPECIE	PLANTING DATE	YIELD	CONTENT	UPTAKE	USE
		lb/ac	%	lb/ac	in.
AUSTRIAN WINTER PEA	JUNE 21	10560			9.4
SNAIL MEDIC	JUNE 21	5714			9.5
INDIANHEAD LENTIL	JUNE 21	5282			9.8
AUSTRIAN WINTER PEA	JULY 9	5738			6.2
SNAIL MEDIC	JULY 9	4514			6.0
INDIANHEAD LENTIL	JULY 9	3985			6.2
AUSTRIAN WINTER PEA	JULY 20	3121			5.0
SNAIL MEDIC	JULY 20	2833			4.4
INDIAN LENTIL	JULY 20	2257			4.6
AUSTRIAN WINTER PEA	AUG 4	1873			2.8
SNAIL MEDIC	AUG 4	1729			2.3
INDIANHEAD LENTIL	AUG 4	1729			2.7
LEGUME SUMMARY					
AUSTRIAN WINTER PEA		5324			5.8
SNAIL MEDIC		3697			5.5
INDIANHEAD LENTIL		3313			5.8
PLANTING DATE SUMMARY					
JUNE 21		7186			9.6
JULY 9		4745			6.1
JULY 20		2737			4.6
AUGUST 4		1777			2.6
STATISTICAL TABLE					
EXPERIMENTAL MEANS		4111			5.7
P-VALUE LEGUME		.0001			.40
LSD (0.05) LEGUME		839			NS
P-VALUE PLANTING DATE		.0000			.00
LSD (0.05) PLANTING DATE		969			0.5
P-VALUE INTERACTION		.0010			.92
STANDARD ERROR OF THE MEAN		3.29			.15
C.V. 1: (S/MEAN)*100		28.37			10.8

Hard Freeze Date: Sept. 21 Harvest Date: Sept. 21

Precipitation (from planting date until killing frost):
June 21 = 6.94"; July 9 = 4.53"; July 20 = 3.43"; Aug 4 = 2.02"

SOIL TEST RESULTS

pH = 7.8, O.M. = 2.2 %, P = 23 ppm, K = 324 ppm, Zn = 0.7 ppm, Cu = 1.5 ppm,

Nitrate-N

Date	6-21	7-09	7-20	8-04
Depth	------lbs N/acre------			
0-1	10.8	11.1	14.3	23.4
1-2	14.4	8.4	9.0	19.6
2-3	15.2	--	--	--
3-4	10.8	--	--	--