PROJECT TITLE: Small grain variety performance evaluation under recrop conditions in Northern Montana.

PERSONNEL:

Project Leader: Gregg R. Carlson - Havre - Agronomist

Cooperators: G. A. Taylor - Bozeman - Coordinator (WW)
S. P. Lanning - Bozeman - Technician (SW)
T. K. Blake - Bozeman - Coordinator (BLY)
Extension Agents in Counties Involved
Individual Cooperating Landowners

SUMMARY:

As implementation of flexible cropping systems became more of a routine component in the total crop management scheme on Northern Montana farms, producers were vitally interested in data relative to variety performance under recrop conditions. Although current federal program considerations have resulted in less recropping, it was our objective to continue development of a broad recrop variety data base from which producers can better make decisions in the selection of varieties under flexible management situations.

Duplications of the dryland off-station spring wheat and barley nurseries were seeded on barley or spring wheat stubble at the Research Center 1982-1987. An off-station location in northern Liberty County was added for spring wheat and barley in 1983; and a second off-station location in northern Hill County was established for spring wheat and barley in 1984. With some exceptions, nurseries were planted in standing stubble at right angles to the previous crop. The 1982-1986 plantings were, for the most part, 'no-till'; although pre-seeding fertilization was usually accomplished via placement with narrow injection knives on a tool bar operated parallel to previous crop rows. In cases where the implement used to inject the fertilizer dislodged the standing stubble to a point where the plot drill would not function without plugging, it was necessary to till the plot area prior to seeding the trial. Planting was accomplished with a 'Rem' self-propelled cone seeder fitted with 'Acra-Plant' or JD 3 inch hoe openers. In cases where the soil surface was mellow enough, double disk openers were utilized for spring grains. Plots were three rows, 20 feet in length on a 12 inch spacing. Three-row plots were trimmed to 16 feet and harvested with a 'Hege 125C' plot combine, partially funded by MWRMC in 1984. Prior to 1984, sixteen feet of the center row for each plot was harvested with a 'Suzue' single-row binder and threshed in a 'Vogel' plot thresher.

In 1987, paired trials with spring wheat and barley were established at the Research Center in a modified split-plot design with cropping systems as whole plots to evaluate recrop varietal performance under a 'till-plant' system

using the Center's conventional plot seeder as compared with a 'no-till' system using the 'Yielder USDA-III.' This no-till research drill was funded in part by MWRMC in 1986.

It was not our primary intent to evaluate any overall crop performance differences associated with the two systems, but rather to determine if relative performance among varieties differed with planting system utilized.

With the exception of nutrient placement and row configuration differences inherent with the equipment, management variables were held as constant as was possible. The 'till-plant' plot seedbeds were prepared via two angled tillage operations immediately prior to planting. A standard tool bar fitted with overlapping sweeps and a triple-bar, mounted tine harrow was used in preparing the 'till-plant' plots. Granular 46-0-0 was broadcast ahead of the tillage operations as principal nitrogen source with phosphorous and accompanying nitrogen applied with seed in the form of granular 18-46-0. Although nutrient rates were identical, materials were deep-banded between row pairs in a '5-15' row configuration with the 'Yielder'; and consisted of 11-53-0 granules and 28-0-0 liquid.

1987 off-station recrop variety performance trials were established 'till-plant' with the conventional plot seeder.

This partiicular series of recrop variety trials was scheduled to close in 1988 with completion of the fifth year of data at the Northern Hill County location as it was the last new location initiated in 1984. However, the 1988 trials at that location were lost to drought. Thus, they were replanted in 1989 to obtain a fifth year of data.

RESULTS:

Data for individual trials conducted in 1982 - 1987 were included in previous reports as were multi-year summaries per location. The final summary for all locations except Northern Hill County were included in the 1987 report. This report is thus limited to the Northern Hill County location.

Plant height, yield, test weight and protein data for the 1989 Northern Hill County off-station spring wheat trial are summarized in Table 1. Five-year yield and test weight summaries on selected entries from the Northern Hill County location are presented in Table 2.

Plant height, yield, test weight, plump/thin and protein data for the 1989 Northern Hill County off-station barley trial are summarized in Table 3. Five-year yield and test weight summaries on selected entries from the Northern Hill County location are presented in Table 4.

FUTURE PLANS:

Although 'no-till' and 'fallow-seeded' variety testing will continue, 'Recrop' variety testing at this Research Center will be terminated at least for the present time with 16 location-years of data each for spring wheat and barley.

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TABLE 1. DRYLAND TILL-PLANT RECROP SPRING WHEAT VARIETY NURSERY GROWN OFF-STATION AT THE MARK & NANCY PETERSON FARM, HAVRE. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1989.

VARIETY OR SELECTION	PLNT HT INCHES	YIELD BU/AC	TEST WT LBS/BU	PROTEIN %
ND 606 AMIDON	23.66	25.32	57.63	17.50
CI 17904 OWENS (soft white)	21.34	25.26	56.17	18.30
WA 6920 PENAWAWA (soft white)	20.07	24.78	57.33	18.10
PI483235 GLENMAN	21.77	24.16	55.80	15.30
CI 17910 ALEX	23.40	23.54	58.10	18.60
CI 17430 NEWANA	19.41	23.25	58.07	17.30
MT 8182 YDING "S"/PCI "S"-28 (hrd white)	21.98	23.16	55.33	18.60
MT 8402 MT7336/SHORTANA	21.57	22.85	55.97	19.10
NDCUT CUTLESS	22.23	22.81	57.90	18.10
CI 17828 PONDERA	22.81	22.21	57.43	18.10
CI 13596 FORTUNA	23.50	22.05	57.57	17.40
CI 17429 LEW	22.87	21.88	57.30	18.20
CI 17790 LEN	23.10	21.80	55.67	18.50
CI 17920 MARSHALL	18.06	21.56	54.40	18.00
CI 15930 OLAF	20.68	21.15	56.43	18.60
C982-324 RAMBO	19.97	20.32	59.33	18.30
CANLANC LANCER	22.40	20.30	56.70	18.10
NK 751 NK 751	20.76	20.29	52.97	17.70
WPB 906R WESTBRED 906R	22.74	20.12	56.13	19.40
ND 582 STOA	22.78	18.18	57.07	19.00

STATISTICAL SUMMARY	PLNT HT INCHES	YIELD BU/AC	TEST WT LBS/BU	PROTEIN %
EXPERIMENTAL MEANS	21.76	22.25	56.67	18.10
C.V. 2: (S OF MEAN/MEAN)*100	2.76	10.16	.70	-
LSD (0.05)	1.72	6.47	1.13	-

CLIMATIC and NURSERY MANAGEMENT DATA

Seeding Date: 05/01/89	Soil Temp @ Sdg: 68F @ 2in., 62F @ 4in.
Harvest Date: 08/10/89	Root Penetration Depth: N/A in.
Seeding Depth: 2.00 in.	Depth to Moisture at Sdg: 0.00 in.
Soil Series: Telstad	Probed Moist.Depth @ Sdg: 24.0 in.
Previous Crop: Winter Wheat	Herbicide: MCP Ester @ 1 pt/ac + surf.

Initial Stored Soil Water at Seeding: 6.18 in. (sampling depth = 48 in.)
Measured Soil Water at Harvest: 2.58 in. (sampling depth = 48 in.)
Growing Season Precipitation (Sdg.to 14 days prior to harvest maturity `HM'):
Total - all measurable events: 5.49 in.
Total - all events >.1 inches: 4.91 in.
Adj'd Residual Soil Water @ (HM-14d): 2.58 in. (sampling depth = 48 in.)
Initial Soil Analysis (NO3,P,K at 0-6 in.; NO3 at 6-24, 24-36 & 36-48 in.):
NO3(lbs/ac)= 48 , P(ppm olsen)= 15 , K(ppm)= 327 , pH= 7.6, O.M.(%) = 1.0
Fertilizer: 90#N via 46-0-0 broadcast & disked in prior to planting

TABLE 2. SIX-YEAR YIELD AND TEST WEIGHT SUMMARY ON SELECTED ENTRIES FROM A RECROP SPRING WHEAT VARIETY NURSERY GROWN OFF-STATION AT THE MARK & NANCY PETERSON FARM, NORTH HAVRE. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1984-1989.

2/ VARIETY OR SELECTION	NO. OF YEARS TESTED	1/ YIELD (BUSHELS PER ACRE) 1985	1986	1987	1988 3/	1989	AVERAGE FOR YEARS TESTED	6-YR. COMPAR. AVERAGE YIELD 4/	PERCENT OF FORTUNA YIELD 5/	TEST WEIGHT (POUNDS PER BUSHEL) 1985	1986	1987	1988 3/	1989	AVERAGE FOR YEARS TESTED	6-YR. COMPAR. AVERAGE TEST WT. 4/	PERCENT OF FORTUNA TEST WT. 5/
CI 17911 WAVERLY (sft white)	3	6.0	44.6	-	-	-	21.9	26.3	143.2	50.8	59.1	-	-	-	55.7	56.0	99.0
PI483235 GLENMAN	5	6.1	47.1	32.2	-	24.2	25.1	25.1	136.6	47.4	60.6	54.6	-	55.8	55.1	55.1	97.5
CI 17920 MARSHALL (+)	4	-	48.1	26.6	-	21.6	27.3	23.3	126.7	-	60.2	56.0	-	54.4	56.8	55.0	97.3
CI 17903 McKAY	3	6.2	38.0	-	-	-	19.2	23.1	125.5	47.1	60.2	-	-	-	55.1	55.4	98.0
CI 17904 OWENS (soft white)	5	7.1	43.9	25.2	-	25.3	23.0	23.0	124.8	47.4	60.1	55.4	-	56.2	55.4	55.4	98.1
CI 17430 NEWANA	5	5.6	43.9	25.6	-	23.3	22.7	22.7	123.2	50.0	61.1	56.7	-	58.1	57.1	56.0	99.1
CI 17828 PONDERA	5	7.8	44.3	24.3	-	22.2	22.6	22.6	122.8	50.7	62.3	55.7	-	57.4	57.2	56.1	99.3
CI 17429 LEW	5	5.2	37.9	32.8	-	21.9	22.3	22.3	121.2	49.6	62.0	56.4	-	57.3	56.8	55.6	98.5
CI 17790 LEN	3	-	43.0	26.0	-	21.8	30.3	22.0	119.5	-	60.5	55.1	-	55.7	57.1	55.1	97.5
CI 17910 ALEX	4	7.4	41.0	23.3	-	23.5	23.8	21.3	115.8	50.8	61.7	56.3	-	58.1	56.7	57.1	101.0
ND 582 STOA	5	8.0	42.5	22.4	-	18.2	20.8	20.8	112.9	49.0	60.7	56.7	-	57.1	56.3	56.3	99.6
CI 13596 FORTUNA	5	6.2	29.8	24.1	-	22.1	18.4	18.4	100.1	49.1	61.8	56.3	-	57.6	56.5	56.5	100.1
CI 15930 OLAF	3	-	-	20.5	-	21.2	18.0	17.7	96.4	-	-	56.1	-	56.4	57.0	56.2	99.5
MEAN (ENTRIES LISTED)		6.6	42.0	25.7	-	22.3		22.2		49.2	60.9	55.9	-	56.7	-	55.8	-
6/ Growing Season Precip. (in.)		1.65	8.24	3.42	-	5.49		4.15									
7/ Soil PAW (in.) to SD @Plntng.		2.75	7.36	7.91	-	6.18		5.84									
Total Plant Avail. Water (in.)		4.40	15.60	11.33	-	11.67		9.99									
Soil NO3 (lbs.) to SD @Plntng.		-	116.0	34.0	-	84.0											
SD (Sampling Depth in inches)		-	48.0	48.0	-	48.0											
Fertilizer Applied (# N)		86.0	75.0	70.0	-	90.0											
(# P205)		33.0	35.0	35.0	-	0.0											

Check variety is Fortuna.

1/ See MCES Bulletin 1093 for evaluation of other important variety characteristics to include protein, quality, disease resistance, etc. before making variety selection decisions.

2/ P = Private variety, + = Protected variety.

3/ 1988 Nursery lost to severe drought.

4/ 6-yr. CA = (x/y) * z where x = average yield and test weight of the entry for years tested, y = average yield and test weight of Fortuna for the same years, and z = 4-yr. average yield or test weight for the check variety Fortuna.

5/ Percent of Fortuna yield and test weight for the same data years as those in which the entry was tested.

6/ Seeding to 14 days prior to harvest maturity.

7/ Depth of moist soil (ft.) * 2.00 in. PAW/ft except starting in 1986 where soil PAW values are actual gravimetric measurements.

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TABLE 3. DRYLAND TILL-PLANT RECROP SPRING BARLEY VARIETY NURSERY GROWN OFF-STATION AT THE MARK & NANCY PETERSON FARM, HAVRE. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1989.

VARIETY OR SELECTION	PLNT HT INCHES	YIELD BU/AC	TEST WT LBS/BU	PLUMP %	THIN %	PROTEIN %
CI 15857 Clark	24.68	64.49	45.77	43.00	25.90	14.90
PI491534 Gallatin	23.74	63.47	47.17	44.90	22.70	15.00
CI 9558 Piroline	25.76	60.23	45.60	44.20	27.80	15.20
PI483237 Bowman	26.12	56.05	47.13	70.90	8.70	15.20
CI 15514 Hector	26.92	54.62	46.83	54.70	18.10	14.40
MT 81616 TR440/Clark	24.40	52.17	45.53	58.90	16.60	15.70
MT140523 Hector/Klages	22.81	52.07	45.37	20.80	49.00	15.30
MT 81161 Lewis//Kgs/Smt	24.45	51.93	42.80	24.00	47.00	15.30
CI 15856 Lewis	23.52	51.80	47.70	47.00	23.00	15.90
CI 15229 Steptoe	25.47	51.04	40.17	44.60	22.60	13.00
SK 76333 Harrington	22.51	47.42	45.57	58.10	14.90	15.60
BA 1202 Busch Agr 1202	22.98	44.34	43.13	14.40	54.40	16.40

STATISTICAL SUMMARY	PLNT HT INCHES	YIELD BU/AC	TEST WT LBS/BU	PLUMP %	THIN %	PROTEIN %
EXPERIMENTAL MEANS	24.45	54.14	45.23	43.79	24.31	15.16
C.V. 2: (S OF MEAN/MEAN)*100	4.49	9.50	1.64	-	-	-
LSD (0.05)	3.22	15.08	2.18	-	-	-

CLIMATIC and NURSERY MANAGEMENT DATA

Seeding Date: 05/01/89
Harvest Date: 08/10/89
Seeding Depth: 2.00 in.
Soil Series: Telstad
Previous Crop: Winter Wheat
Soil Temp @ Sdg: 68F @ 2in., 62F @ 4in.
Root Penetration Depth: N/A in.
Depth to Moisture at Sdg: 0.00 in.
Probed Moist.Depth @ Sdg: 24.0 in.
Herbicide: MCP Ester @ 1 pt/ac + surf.
Initial Stored Soil Water at Seeding: 6.18 in. (sampling depth = 48 in.)
Measured Soil Water at Harvest: 2.95 in. (sampling depth = 48 in.)
Growing Season Precipitation (Sdg.to 14 days prior to harvest maturity `HM'):
Total - all measurable events: 5.49 in.
Total - all events >.1 inches: 4.91 in.
Adj'd Residual Soil Water @ (HM-14d): 2.95 in. (sampling depth = 48 in.)
Initial Soil Analysis (NO3,P,K at 0-6 in.; NO3 at 6-24, 24-36 & 36-48 in.):
NO3(lbs/ac)= 84 , P(ppm olsen)= 15 , K(ppm)= 327 , pH= 7.6, O.M.(%) = 1.0
Fertilizer: 90#N via 46-0-0 broadcast & disked in prior to planting

TABLE 4. SIX-YEAR YIELD AND TEST WEIGHT SUMMARY ON SELECTED ENTRIES FROM A RECROP BARLEY VARIETY NURSERY GROWN OFF-STATION AT THE MARK & NANCY PETERSON FARM, NORTH HAVRE. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1984-1989.

2/ VARIETY OR SELECTION	NO. OF YEARS TESTED 3/	1/ YIELD (BUSHELS PER ACRE) 1985	1986	1987	1988 4/	1989	AVERAGE FOR YEARS TESTED	6-YR. COMPAR. AVERAGE YIELD 5/	PERCENT OF PIROLINE YIELD 6/	TEST WEIGHT (POUNDS PER BUSHEL) 1985	1986	1987	1988 4/	1989	AVERAGE FOR YEARS TESTED	6-YR. COMPAR. AVERAGE TEST WT 5/	PERCENT OF PIROLINE TEST WT. 6/
CI 15857 CLARK	5	3.3	60.2	54.0	-	64.5	40.1	40.1	107.3	35.4	48.0	49.4	-	45.8	45.8	45.8	98.3
PI491534 GALLATIN	5	4.5	54.5	56.3	-	63.5	40.0	40.0	106.8	37.8	50.4	49.9	-	47.2	47.5	47.5	101.7
CI 15856 LEWIS	5	4.0	62.3	58.6	-	51.8	39.4	39.4	105.4	38.9	51.0	50.9	-	47.7	48.1	48.1	103.1
CI 9558 PIROLINE	5	3.3	63.3	41.6	-	60.2	37.4	37.4	100.0	33.4	51.9	49.9	-	45.6	46.6	46.6	100.0
CI 15514 HECTOR	5	4.4	60.2	45.2	-	54.6	37.3	37.3	99.6	36.3	51.4	51.0	-	46.8	47.5	47.5	101.9
CI 15229 STEPTOE	4	6.4	49.3	59.7	-	51.0	41.6	37.0	98.9	30.3	45.4	44.7	-	40.2	40.1	41.4	88.8
CI 15860 KARLA	3	5.2	55.9	-	-	-	27.7	36.5	97.4	36.1	48.0	-	-	-	44.8	45.6	97.7
PI483237 BOWMAN	4	6.3	47.0	54.4	-	56.1	41.0	36.4	97.3	37.5	49.1	49.6	-	47.1	45.8	47.3	101.4
SK 76333 HARRINGTON	5	0.8	63.2	54.3	-	47.4	36.1	36.1	96.5	-	49.1	49.2	-	45.6	49.2	46.0	98.5
MT 81616 BEARPAW	3	-	55.9	49.6	-	52.7	52.7	35.9	95.8	-	49.3	49.6	-	45.5	48.1	45.7	98.0
ND 5569 HAZEN	4	4.6	51.2	45.9	-	-	29.4	34.7	92.7	35.0	48.7	46.8	-	-	45.2	45.0	96.4
MN 36 ROBUST (+)	3	3.6	47.6	-	-	-	22.8	30.0	80.1	37.0	49.9	-	-	-	45.9	46.6	100.0
MEANS (ENTRIES LISTED)		4.2	55.9	52.0	-	55.8	-	36.7	-	35.8	49.3	49.1	-	45.7	-	46.1	-
7/ Growing Season Precip. (in.)		1.65	8.24	3.42	3.24	5.49	3.97										
8/ Soil PAW (in.) to SD @Plntng.		2.75	7.36	7.91	6.56	6.18	5.96										
Total Plant Avail. Water (in.)		4.40	15.60	11.33	9.80	11.67	9.93										
Soil NO3 (lbs.) to SD @Plntng.		-	116.0	34.0		84.0											
SD (Sampling Depth in inches)		-	48.0	48.0	48.0	48.0											
Fertilizer Applied (# N)		86.0	75.0	70.0		90.0											
(# P2O5)		33.0	35.0	35.0		0.0											

Check variety is Piroline.

1/ See MCES Bulletin 1094 for evaluation of other important variety performance characteristics to include malting potential, disease resistance, etc. before making variety selection decisions.

2/ P = Private variety, + = Protected variety.

3/ Omit the five most recent years shown, but summary calculations include all years noted.

4/ 1988 Nursery lost to severe drought.

5/ 6-yr. CA = (x/y) * z where x = average yield or test weight of the entry for years tested, y = average yield or test weight for Piroline for the same years, and z = 6-yr. average yield or test weight for the check variety Piroline.

6/ Percent of Piroline yield or test weight for the same data years as those in which the entry was tested.

7/ Seeding to 14 days prior to harvest maturity.

8/ Depth of moist soil (ft.) * 2.00 in. PAW/ft except starting in 1986 where soil PAW values are actual gravimetric measurements.