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**PROJECT TITLE:** Comparison of Spring Wheat and Barley Varietal Response Under Conditions of Low Versus Optimum Fertility Off-Station at Turner.

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**OBJECTIVES:**

1. To evaluate and demonstrate the general, long-term effects of optimum fertility on dryland spring wheat and barley production under conditions common to the "Big Flat" area of northern Blaine County.
2. To add "lower and moderate level" protein observations for spring wheat cultivars to existing databases utilized for evaluation of cultivar performance on the basis of gross production value as influenced by yield, protein and market.
3. To explore and classify potential differences, if any, among cultivars in their response to fertilizer, particularly nitrogen.

**RESULTS:**

General spring wheat and barley response to applied fertilizer at Turner was dramatic in 1994. Similarly dramatic protein responses, but without meaningful yield differences, were obtained in 1986 at the same location (data not reported here). Growers have reported that solid responses to fertilizer under commercial-scale dryland production systems on the Big Flat have been inconsistent. This is one reason this work is being conducted (5 year duration, beginning in 1994).

Agronomic and economic performance data for 17 hard red spring wheat cultivars, "Unfertilized" are presented in Table 1. Performance data in an identical format for the same cultivars, "Fertilized" are presented in Table 2. Table 3 presents a factorial analysis of the combined spring wheat data with Fertility as Main Effects and Cultivars as Sub-Plot Effects. Table 4 presents "Fertilized" spring wheat performance in terms of Stand Percent, Plant Height, Yield, Test Weight, Protein and Gross Return - expressed as "Percentages of the performance for the same parameters when Unfertilized." Table 4 also presents each fertilized cultivar's additional net dollar return attributable to fertilization; and the cultivar's associated added return per fertilizer dollar invested. Figures 1-4 graphically display Main Effect (Low vs Optimum Fertility - Over All Cultivars) data previously detailed in Tables 3-4.

It is important to remember that these responses are associated with observations in a single year at a single location; and that few conclusions can be drawn at this point. Differences between unfertilized and fertilized spring wheat (over all cultivars) were statistically significant for all parameters measured.

Varietal effects were also significant for various parameters including yield, protein and gross "base" return; but varieties were not significantly different for those gross return values influenced by protein.

Agronomic performance data for 20 spring barley cultivars, "Unfertilized" are presented in Table 5. Performance data in an identical format for the same cultivars, "Fertilized" are presented in Table 6. Overall responses to fertilizer were dramatic. Agronomic responses were similar to those seen in spring wheat. Fertilized barley stands were slightly reduced; plant heights, yield, protein and percent thins were increased; while test weight and percent plump were reduced.

#### SUMMARY:

Four adjacent trials were established on unfertilized fallow (2 each for spring wheat and barley cultivars) with one trial for each crop fertilized at planting time. Standard plot techniques were employed with 3 replications in a randomized complete block design. Entries were planted in 3-row plots, 20 feet in length on a 12-inch spacing utilizing a self-propelled cone seeder equipped with 'haybuster' hoe openers and capability to band fertilizer 1.5 inches directly below the seed. Plots were trimmed to 16 feet and harvested with a 'Hege 125C' plot combine. Other variables specific to the trials are listed in the respective data tables.

#### FUTURE PLANS:

It is planned that these investigations be continued on an annual basis with the same cultivars at the same location for the duration of the proposed 5-yr study period (1994-1998). Arrangements have been made with the cooperating landowner to reserve a specified block of land from commercial fertilization during the study period. Depending upon future results, related investigations may be initiated under other environments. Similarly, investigations with fewer, prominent cultivars may be initiated where several rates of fertility would further be involved.

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TABLE 1. AGRONOMIC AND ECONOMIC PERFORMANCE OF UNFERTILIZED HARD RED SPRING WHEAT CULTIVARS GROWN UNDER DRYLAND FALLOW CROPPING CONDITIONS OFF-STATION AT THE LEON CEDERBERG FARM, TURNER. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1994.

ID	CULTIVAR or SELECTION	STAND %	PLNT HT Inches	YIELD Bu/Ac	TEST WT Lbs/Bu.	PROTEIN %	GROSS	PROTEIN	GROSS	GROSS
							@ FEED \$/Ac	PREMIUM \$/Ac	w/PREM \$/Ac	-FERT \$/Ac
							1/		2/	2/
CI 13596	FORTUNA	100.00	29.02	26.27	61.80	9.03	86.16	.00	86.16	86.16
PI483235	GLENMAN	98.97	26.50	26.13	61.17	8.53	85.72	.00	85.72	85.72
ND 582	STOA	98.97	26.89	25.20	62.20	8.70	82.66	.00	82.66	82.66
CI 17430	NEWANA	99.30	22.82	25.00	62.77	8.17	82.00	.00	82.00	82.00
ND 677	ND622*2/CUTLESS	98.97	28.27	24.67	62.83	9.07	80.91	.00	80.91	80.91
PI574642	MCNEAL	99.30	25.04	24.63	60.43	8.80	80.80	.00	80.80	80.80
ND 606	AMIDON	98.97	29.45	24.57	61.87	9.13	80.58	.00	80.58	80.58
WPB 926	WESTBRED 926	96.87	21.94	24.43	61.67	9.20	80.14	.00	80.14	80.14
CI 17790	LEN	97.60	24.95	24.30	62.13	10.27	79.70	.00	79.70	79.70
CI 17429	LEW	100.00	28.81	24.23	62.13	8.37	79.48	.00	79.48	79.48
PI549275	HI-LINE	99.30	22.38	24.13	62.17	8.73	79.16	.00	79.16	79.16
ND 626	GRANDIN	98.97	24.02	23.53	62.40	9.37	77.19	.00	77.19	77.19
CI 17828	PONDERA	97.57	25.33	23.33	62.63	9.50	76.53	.00	76.53	76.53
NDCUT	CUTLESS	98.27	27.49	23.10	62.80	9.10	75.77	.00	75.77	75.77
CANLANC	LANCER	99.30	30.49	23.07	62.03	9.23	75.66	.00	75.66	75.66
C982-324	RAMBO	99.33	23.32	23.07	63.47	9.13	75.66	.00	75.66	75.66
BZ984326	BORDER	97.23	23.58	21.57	61.93	9.50	70.74	.00	70.74	70.74
EXPERIMENTAL MEANS		98.76	25.90	24.19	62.14	9.05	79.34	0.00	79.34	79.34
C.V. 2: (S OF MEAN/MEAN)*100		.84	2.17	2.81	.27	2.32	2.81	-	2.81	2.81
LSD (0.05)		2.38	1.62	1.96	.48	.60	6.43	-	6.43	6.43

1/ 1994 annual average 'Harvest States' quotes for "Feed Wheat" arriving at the West Coast

2/ Same as "feed gross" due to insufficient protein for breadwheat market, and no fertilizer costs

#### CLIMATIC and NURSERY MANAGEMENT DATA

Seeding Date: 05/02/94      Soil Temp @ Sdg: 61F @ 2in., 53F @ 4in.  
 Harvest Date: 08/16/94      Root Penetration Depth: 48.0 in.  
 Seeding Depth: 1.50 in.      Depth to Moisture at Sdg: 0.50 in.  
 Soil Texture: Sandy Clay Loam      Probed Moist.Depth @ Sdg: 55.0 in.+  
 Previous Crop: Fallow      Herbicide: 2,4-D+`BanvelSGF'@.5#+2oz/ac  
 Initial Stored Soil Water at Seeding: 6.82 in. (sampling depth = 48 in.)  
 Measured Soil Water at Harvest: 3.64 in. (sampling depth = 48 in.)  
 Growing Season Precipitation (Sdg.to 14 days prior to harvest maturity `HM'):  
   Total - all measurable events: 3.93 in. (electronic accum. guage)  
   Total - all events >.1 inches: N/A  
 Post Growing Season Precipitation (within 14 days of harvest maturity):  
   Total - all measurable events: .00 in.  
 Adj'd Residual Soil Water @ (HM-14d): 3.64 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)= 30 , P(ppm olsen)= 16 , K(ppm)= 269 , pH= 6.6, O.M.(%) = 0.6  
 Fertilizer: None Applied - Untreated Control  
 Harvest Soil Analysis (NO3,P,K at 0-6 in.; NO3 at 6-24, 24-36 & 36-48 in.):  
   NO3(lbs/ac)= 16 , P(ppm olsen)= 19 , K(ppm)= 306 , pH= 6.2, O.M.(%) = 1.2

TABLE 2. AGRONOMIC AND ECONOMIC PERFORMANCE OF FERTILIZED HARD RED SPRING WHEAT CULTIVARS GROWN UNDER DRYLAND FALLOW CROPPING CONDITIONS OFF-STATION AT THE LEON CEDERBERG FARM, TURNER. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1994.

ID	CULTIVAR or SELECTION	STAND %	PLNT HT Inches	YIELD Bu/Ac	TEST WT Lbs/Bu	PROTEIN %	GROSS	PROTEIN	GROSS	GROSS
							@12% \$/Ac	PREMIUM \$/Ac	w/PREM \$/Ac	-FERT \$/Ac
							1/	1/	1/	2/
WPB 926	WESTBRED 926	91.33	24.45	35.60	57.77	14.53	145.96	44.40	190.36	172.25
CI 17828	PONDERA	96.87	26.68	36.43	58.90	14.13	149.38	39.66	189.03	170.92
ND 677	ND622*2/CUTLESS	93.77	28.90	33.83	59.90	14.57	138.72	43.78	182.49	164.38
ND 582	STOA	94.43	30.88	33.93	57.73	14.37	139.13	39.56	178.69	160.58
C982-324	RAMBO	98.27	24.65	34.20	59.70	14.23	140.22	37.24	177.46	159.35
ND 626	GRANDIN	94.80	27.57	34.60	58.77	14.20	141.86	34.51	176.37	158.26
CI 17790	LEN	94.47	26.47	31.67	57.47	14.93	129.83	44.99	174.82	156.71
PI483235	GLENMAN	98.27	26.96	37.53	57.73	13.27	153.89	20.64	174.53	156.42
CI 13596	FORTUNA	96.87	29.46	32.77	60.10	14.33	134.34	35.66	170.01	151.90
CI 17429	LEW	98.27	31.08	31.53	59.60	14.47	129.29	38.35	167.64	149.53
ND 606	AMIDON	94.43	29.62	32.33	58.53	13.97	132.57	33.63	166.20	148.09
PI574642	MCNEAL	96.53	26.39	30.33	57.13	14.67	124.37	38.01	162.38	144.27
CI 17430	NEWANA	95.47	24.62	36.33	58.57	12.90	148.97	12.42	161.39	143.28
PI549275	HI-LINE	97.57	24.55	30.60	57.33	14.03	125.46	31.92	157.38	139.27
BZ984326	BORDER	87.17	25.46	28.87	57.47	14.67	118.35	37.87	156.23	138.12
NDCUT	CUTLESS	97.93	27.17	29.47	60.13	14.37	120.81	34.82	155.64	137.53
CANLANC	LANCER	96.53	33.48	28.33	59.20	14.83	116.17	38.03	154.19	136.08
EXPERIMENTAL MEANS		95.47	27.55	32.85	58.59	14.26	134.66	35.62	170.28	152.17
C.V. 2: (S OF MEAN/MEAN)*100		2.18	2.16	5.35	.49	2.52	5.35	17.95	6.53	7.31
LSD (0.05)		5.99	1.71	5.06	.82	1.03	20.76	18.42	32.04	32.04
1/ 1994 annual average Portland quotes for 12, 13, 14, & 15% protein DNS (quarter-ups calculated)										
2/ 1994 actual material price paid F.O.B. Chinook, MT (granular blend = \$ 18.11/Ac)										

## CLIMATIC and NURSERY MANAGEMENT DATA

Seeding Date:	05/02/94	Soil Temp @ Sdg:	64F @ 2in., 58F @ 4in.
Harvest Date:	08/16/94	Root Penetration Depth:	48.0 in.
Seeding Depth:	1.50 in.	Depth to Moisture at Sdg:	0.50 in.
Soil Texture:	Sandy Clay Loam	Probed Moist.Depth @ Sdg:	55.0 in.+
Previous Crop:	Fallow	Herbicide:	2,4-D+`BanvelSGF'@.5#+2oz/ac
Initial Stored Soil Water at Seeding:	6.84 in.	(sampling depth = 48 in.)	
Measured Soil Water at Harvest:	3.08 in.	(sampling depth = 48 in.)	
Growing Season Precipitation (Sdg.to 14 days prior to harvest maturity `HM'):			
Total - all measurable events:	3.93 in.	(electronic accum. gauge)	
Total - all events >.1 inches:	N/A		
Post Growing Season Precipitation (within 14 days of harvest maturity):			
Total - all measurable events:	.00 in.		
Adj'd Residual Soil Water @ (HM-14d):	3.08 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)=	28	P(ppm olsen)=	16
K(ppm)=	278	pH=	6.4
O.M.(%) =	0.7		
Fertilizer:	66#N,33#P2O5/ac via 46-0-0+11-52-0 banded 1.5" below seed at plntg		
Harvest Soil Analysis	(NO3,P,K at 0-6 in.; NO3 at 6-24, 24-36 & 36-48 in.):		
NO3 (lbs/ac)=	16	P(ppm olsen)=	21
K(ppm)=	354	pH=	6.3
O.M.(%) =	1.4		

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TABLE 3. EFFECT OF FERTILITY MANAGEMENT AND CROP CULTIVAR ON AGRONOMIC AND ECONOMIC PERFORMANCE OF HARD RED SPRING WHEAT UNDER DRYLAND FALLOW CROPPING CONDITIONS OFF-STATION AT THE LEON CEDERBERG FARM, TURNER. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1994.

FACTOR ANALYSIS - FACTOR 1 (main effects) = FERTILITY MANAGEMENT SCHEME (across 17 cultivars)												
ID	FERTILITY	STAND %	PLNT Inches	HT	YIELD Bu/Ac	TEST Lbs/Bu	WT	PROTEIN %	GROSS	PROTEIN	GROSS	GROSS
									BASE \$/Ac	PREMIUM \$/Ac	w/PREM \$/Ac	-FERT \$/Ac
									1/	2/	3/	4/
1	UNFERTILIZED	98.76	25.90		24.19	62.14		9.05	79.34	0.00	79.34	79.34
2	FERTILIZED	95.47	27.55		32.85	58.59		14.26	134.70	35.62	170.32	152.21
	T =	7.25	7.69		6.16	23.69		53.08	8.88	16.78	11.63	9.32
	P =	.0185	.0165		.0253	.0018		.0000	.0124	.0035	.0073	.0113
FACTOR ANALYSIS - FACTOR 2 (sub effects) = CROP CULTIVAR (across 2 fertility management schemes)												
ID	CULTIVAR	STAND %	PLNT Inches	HT	YIELD Bu/Ac	TEST Lbs/Bu	WT	PROTEIN %	GROSS	PROTEIN	GROSS	GROSS
									BASE \$/Ac	PREMIUM \$/Ac	w/PREM \$/Ac	-FERT \$/Ac
									1/	2/	3/	4/
17	WESTBRED 926	94.10	23.20		30.02	59.72		11.87	113.10	22.50	135.60	126.20
14	PONDERA	97.22	26.00		29.88	60.77		11.82	113.00	19.83	132.83	123.70
13	ND 677	96.37	28.58		29.25	61.37		11.82	109.80	21.89	131.69	122.60
16	STOA	96.70	28.88		29.57	59.97		11.53	110.90	19.78	130.68	121.60
5	GLENMAN	98.62	26.73		31.83	59.45		10.90	119.80	10.32	130.12	121.10
4	FORTUNA	98.43	29.24		29.52	60.95		11.68	110.30	17.83	128.13	119.00
9	LEN	96.03	25.71		27.98	59.80		12.60	104.80	22.50	127.30	118.20
6	GRANDIN	96.88	25.79		29.07	60.58		11.78	109.50	17.25	126.75	117.70
15	RAMBO	98.80	23.98		28.63	61.58		11.68	107.90	18.62	126.52	117.50
10	LEW	99.13	29.94		27.88	60.87		11.42	104.40	19.17	123.57	114.50
1	AMIDON	96.70	29.53		28.45	60.20		11.55	106.60	16.82	123.42	114.20
11	MCNEAL	97.92	25.72		27.48	58.78		11.73	102.60	19.00	121.60	112.50
12	NEWANA	97.38	23.72		30.67	60.67		10.53	115.50	6.21	121.71	112.60
7	HI-LINE	98.43	23.46		27.37	59.75		11.38	102.30	15.96	118.26	109.20
3	CUTLESS	98.10	27.33		26.28	61.47		11.73	98.29	17.41	115.70	106.60
8	LANCER	97.92	31.98		25.70	60.62		12.03	95.91	19.01	114.92	105.90
2	BORDER	92.20	24.52		25.22	59.70		12.08	94.55	18.94	113.49	104.04
	*F =	2.52	40.47		3.49	22.30		4.82	3.32	1.64	1.32	1.33
	P =	.0047	.0000		.0002	.0000		.0000	.0003	.0838	.2104	.2093
	LSD (.05) =	3.16	1.16		2.66	.47		.59	10.67	9.03	16.02	16.02
GRAND MEANS (102 obs)		97.11	26.72		28.52	60.37		11.66	107.00	17.81	124.80	115.70
Fert x Cultivar interactions		ns	*		ns	**		ns	ns	ns	ns	ns
P =		.3396	.0183		.0802	.0000		.3604	.0539	.0838	.5176	.5151

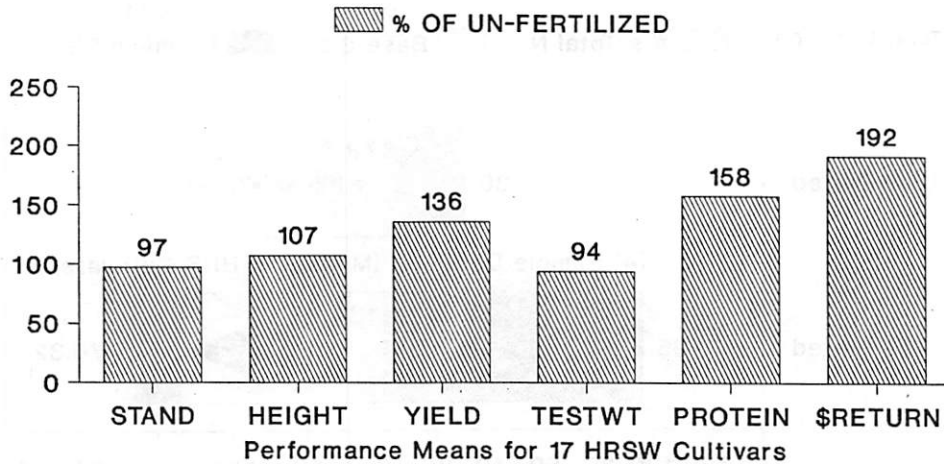
- 1/ Gross return for yield at 1994 annual average 'Portland' quotes for 12% base protein DNS, OR: 1994 annual average 'Harvest States' quotes for low-protein feed wheat at the west coast.
- 2/ Additional gross premium return for protein =>12.25% based on 1994 annual average 'Portland' quotes for 12, 13, 14, & 15% protein DNS (quarter-up values calculated).
- 3/ Sum of gross base return plus gross premium return.
- 4/ Sum of gross base return plus gross premium return minus fertilizer materials cost.

TABLE 4. AGRONOMIC AND ECONOMIC PERFORMANCE OF FERTILIZED HARD RED SPRING WHEAT CULTIVARS GROWN UNDER DRYLAND FALLOW CROPPING CONDITIONS OFF-STATION AT THE LEON CEDERBERG FARM, TURNER. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1994.

ID	CULTIVAR	----- % of "UN-FERTILIZED" PERFORMANCE -----					ADDED		ADDED	
		STAND	PLNT HT	YIELD	TEST WT	PROTEIN	\$GROSS	\$RTN	\$RTN	\$RTN
							>FERT\$S	>FERT\$S	/FERT\$	
		(%)	(%)	(%)	(%)	(%)	2/	3/	4/	
							(%)	(\$/Ac)	(\$)	
CI 17828	PONDERA	99.37	105.30	156.70	94.07	148.78	224.25	94.39	5.21	
WPB 926	WESTBRED 926	94.23	111.93	146.80	93.70	157.95	216.45	92.11	5.09	
C982-324	RAMBO	98.93	105.83	148.93	94.10	155.83	210.71	83.70	4.62	
ND 626	GRANDIN	95.83	115.30	147.47	94.20	151.55	204.39	81.07	4.48	
ND 677	ND622*2/CUTLESS	94.77	102.23	136.73	95.33	160.61	201.69	83.48	4.61	
CI 17790	LEN	96.83	106.07	130.27	92.50	145.49	196.24	77.01	4.25	
ND 582	STOA	95.37	114.97	134.73	92.80	166.14	194.86	77.92	4.30	
BZ984326	BORDER	89.67	107.93	132.60	92.77	154.48	192.98	67.38	3.72	
CI 17429	LEW	98.27	107.87	130.53	95.90	173.24	189.30	70.04	3.87	
ND 606	AMIDON	95.47	100.67	131.67	94.63	153.12	183.68	67.51	3.73	
PI483235	GLENMAN	99.30	101.70	144.30	94.40	155.80	183.45	70.70	3.90	
NDCUT	CUTLESS	99.77	98.80	127.00	95.73	157.88	179.92	61.76	3.41	
CANLANC	LANCER	97.23	110.20	122.37	95.43	160.75	178.86	60.42	3.34	
CI 13596	FORTUNA	96.87	101.70	126.23	97.27	158.69	178.38	65.74	3.63	
PI574642	MCNEAL	97.23	105.50	121.40	94.53	166.71	175.81	63.47	3.51	
CI 17430	NEWANA	96.10	107.93	145.87	93.30	158.11	175.64	61.28	3.38	
PI549275	HI-LINE	98.27	109.73	126.43	92.27	160.77	175.31	60.12	3.32	
EXPERIMENTAL MEANS		96.68	106.69	135.88	94.29	157.99	191.88	72.83	4.02	
C.V. 2: (S OF MEAN/MEAN)*100		2.35	3.07	6.40	.55	3.01	7.83	15.23	15.23	
LSD (0.05)		6.56	9.45	25.04	1.48	13.72	43.31	31.95	1.76	

- 1/ Fertilized performance expressed as percent of the same cultivar's unfertilized performance.
- 2/ Fertilized Gross \$ Return after Fertilizer Costs (expressed as % of unfertilized pair mate).
- 3/ Additional Gross \$ Return/Ac (over unfertilized pair mate) after meeting fertilizer costs.
- 4/ Additional \$ Return Impact for each Fertilizer \$ Invested.

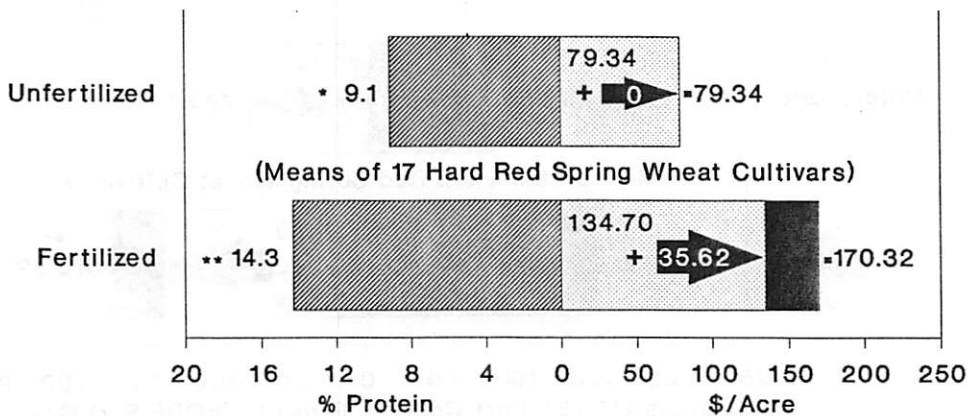
## Fertilized Spring Wheat Performance (Relationships with Unfertilized Pairs) Leon Cederberg Farm, Turner - 1994



**Figure 1.**  
MSU/AES/NARC-Havre

## Fertilized vs Unfertilized Spring Wheat (Gross \$ Rtn, Base + Protein Premium) Leon Cederberg Farm, Turner - 1994

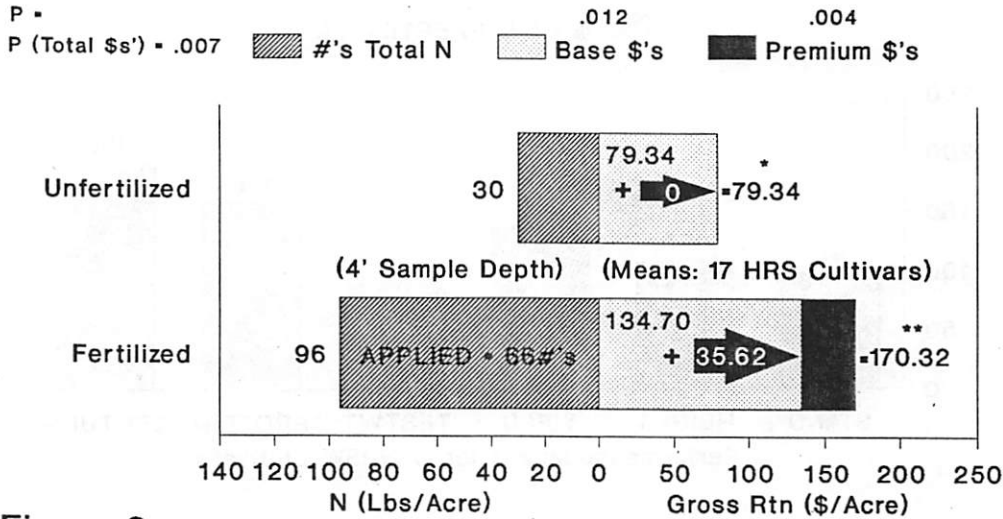
P = .000      .012      .004  
 P (Total \$s') = .007      % Protein      Base \$'s      Premium \$'s



**Figure 2.**  
MSU/AES/NARC-Havre

\* @ Annual Ave. Feed Wheat Quote - PNW Delivery  
 \*\* @ Annual Ave. Bread Wheat Quote - PNW Delivery

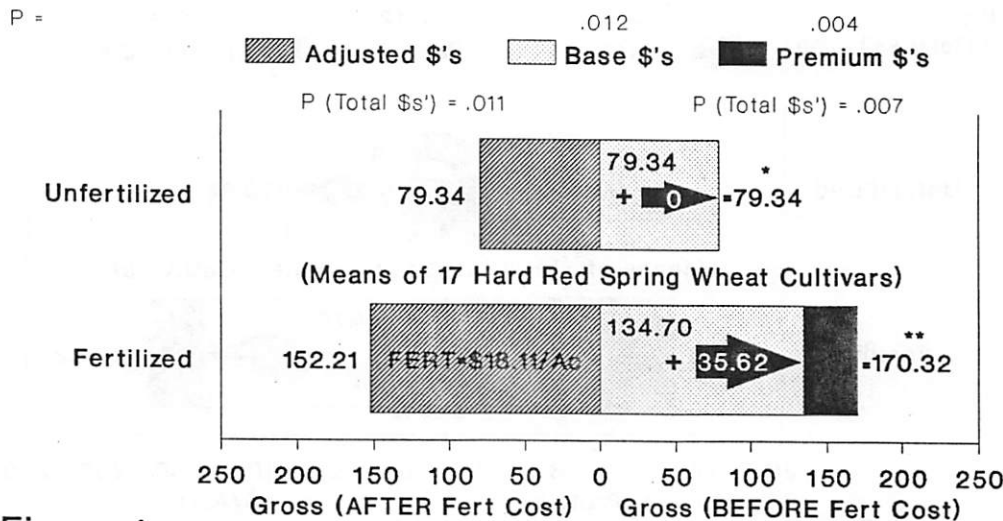
## Fertilized vs Unfertilized Spring Wheat (Gross \$Rtn x Soil+Fert N Relationships) Leon Cederberg Farm, Turner - 1994



**Figure 3.**  
MSU/AES/NARC-Havre

\* @ Annual Ave. Feed Wheat Quote - PNW Delivery  
\*\* @ Annual Ave. Bread Wheat Quote - PNW Delivery

## Fertilized vs Unfertilized Spring Wheat (Gross \$Rtn vs \$Rtn After Fert Costs) Leon Cederberg Farm, Turner - 1994



**Figure 4.**  
MSU/AES/NARC-Havre

\* @ Annual Ave. Feed Wheat Quote - PNW Delivery  
\*\* @ Annual Ave. Bread Wheat Quote - PNW Delivery

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TABLE 5. PERFORMANCE OF UNFERTILIZED SPRING BARLEY VARIETIES UNDER DRYLAND FALLOW CROPPING CONDITIONS OFF-STATION AT THE LEON CEDERBERG FARM, TURNER. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1994.

ID	VARIETY or SELECTION	STAND %	PLNT Inches	HT	YIELD Bu/Ac	TEST WT Lbs/Bu	PLUMP %	THIN %	PROTEIN %
PI483237	Bowman	88.20	20.73		40.20	51.47	96.50	1.40	8.17
NS 78054	Baronesse	99.30	16.67		38.13	50.87	91.33	2.93	7.17
MT851195	MT851195	96.20	19.23		35.53	48.83	94.40	2.37	7.80
CI 9558	Piroline	98.97	21.18		35.47	51.93	89.47	2.90	7.43
MT890008	MT890008	98.27	17.10		35.30	48.73	88.00	4.60	7.13
MT140523	MT140523	91.63	18.20		35.17	49.53	86.73	4.63	7.77
CI 15229	Steptoe	97.93	16.60		35.07	44.67	86.70	4.27	8.03
ND 9866	Stark	92.73	19.44		34.80	52.63	94.37	2.53	8.00
MT861596	Lewis/MT 41549	94.10	19.25		34.80	50.83	83.50	5.80	7.60
MT860756	MT860756	95.83	19.04		34.73	50.60	94.57	2.00	7.87
MT886610	MT 81143/Lewis	98.60	19.42		34.43	49.83	85.57	5.43	7.60
MT889106	Apex/Lewis	97.57	18.57		34.10	51.97	95.73	1.67	8.00
H3860224	Lewis/Apex (MT860224 HR #	94.80	18.86		33.43	48.80	90.47	3.53	8.10
PI537967	Colter	95.83	17.09		33.30	46.67	84.37	5.17	7.20
CI 15856	Lewis	92.37	18.85		33.20	49.70	83.80	6.73	7.90
PI491534	Gallatin	97.20	20.51		33.20	50.43	91.20	2.57	7.57
SK 76333	Harrington	95.13	18.71		32.53	48.23	90.37	3.17	7.80
CI 15514	Hector	94.43	19.65		31.17	48.13	78.80	10.13	8.40
H5860219	Lewis/Apex (MT860219 HR #	92.37	17.68		30.50	49.07	92.73	2.57	7.80
WPB92 1	Medallion	97.20	16.47		28.53	46.73	69.57	8.27	8.07
EXPERIMENTAL MEANS		95.43	18.66		34.18	49.48	88.41	4.13	7.77
C.V. 2: (S OF MEAN/MEAN)*100		2.53	4.18		5.27	.94	3.11	36.54	2.58
LSD (0.05)		6.90	2.23		5.15	1.34	7.87	4.32	.57

## CLIMATIC and NURSERY MANAGEMENT DATA

Seeding Date:	05/02/94	Soil Temp @ Sdg:	61F @ 2in., 53F @ 4in.
Harvest Date:	08/10/94	Root Penetration Depth:	45.0 in.
Seeding Depth:	1.50 in.	Depth to Moisture at Sdg:	0.50 in.
Soil Texture:	Sandy Clay Loam	Probed Moist.Depth @ Sdg:	55.0 in.+
Previous Crop:	Fallow	Herbicide:	2,4-D+`BanvelSGF'@.5#+2oz/ac
Initial Stored Soil Water at Seeding:	6.82 in.	(sampling depth = 48 in.)	
Measured Soil Water at Harvest:	5.62 in.	(sampling depth = 48 in.)	
Growing Season Precipitation (Sdg.to 14 days prior to harvest maturity `HM'):			
Total - all measurable events:	3.93 in.	(electronic accum. guage)	
Total - all events >.1 inches:	N/A		
Post Growing Season Precipitation (within 14 days of harvest maturity):			
Total - all measurable events:	N/A	(believed little or none)	
Adj'd Residual Soil Water @ (HM-14d):	5.62 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)= 30 , P(ppm olsen)= 16 , K(ppm)= 269 , pH= 6.6, O.M.(%) = 0.6			
Fertilizer:	None Applied - Untreated Control		
Harvest Soil Analysis	(NO3,P,K at 0-6 in.; NO3 at 6-24, 24-36 & 36-48 in.):		
NO3(lbs/ac)= 20 , P(ppm olsen)= 15 , K(ppm)= 310 , pH= 6.5, O.M.(%) = 1.0			

TABLE 6. PERFORMANCE OF FERTILIZED SPRING BARLEY VARIETIES UNDER DRYLAND FALLOW CROPPING CONDITIONS OFF-STATION AT THE LEON CEDERBERG FARM, TURNER. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1994.

ID	VARIETY or SELECTION	STAND %	PLNT Inches	HT	YIELD Bu/Ac	TEST WT Lbs/Bu	PLUMP %	THIN %	PROTEIN %
CI 15229	Steptoe	90.97	23.61		65.60	41.97	72.37	10.17	11.23
ND 9866	Stark	96.87	25.25		58.17	50.23	90.83	3.50	12.23
CI 9558	Piroline	96.53	24.46		58.10	50.27	71.00	8.37	11.87
MT851195	MT851195	94.10	23.98		57.73	47.10	78.67	7.30	13.00
MT889106	Apex/Lewis	92.33	24.40		57.13	48.90	91.43	3.57	12.33
PI537967	Colter	93.37	23.44		56.70	42.17	50.20	21.80	10.37
MT890008	MT890008	97.23	22.10		56.60	45.77	68.20	11.10	11.80
MT140523	MT140523	88.53	23.16		56.03	46.73	65.30	13.50	13.03
MT861596	Lewis/MT 41549	86.10	24.65		55.77	48.33	67.83	12.80	13.00
NS 78054	Baronesse	96.53	21.05		55.17	46.97	65.67	12.97	13.00
PI491534	Gallatin	92.00	24.78		54.07	47.80	67.30	11.70	12.20
PI483237	Bowman	90.97	23.08		53.77	48.80	88.97	4.43	12.53
CI 15856	Lewis	91.00	25.22		51.60	47.57	75.97	8.67	12.93
MT860756	MT860756	95.50	24.53		51.40	47.53	78.00	8.30	11.67
H3860224	Lewis/Apex (MT860224 HR #	85.07	23.71		50.80	45.07	78.57	10.80	13.50
CI 15514	Hector	91.00	26.04		50.57	46.73	70.50	11.83	13.03
MT886610	MT 81143/Lewis	91.67	24.93		50.20	46.27	67.67	14.47	13.03
SK 76333	Harrington	91.67	22.77		48.70	45.17	64.03	14.00	13.20
H5860219	Lewis/Apex (MT860219 HR #	80.53	23.27		48.43	45.53	73.63	11.40	13.43
WPB92 1	Medallion	93.77	18.40		42.23	42.13	33.53	33.10	12.83
EXPERIMENTAL MEANS		91.79	23.64		53.94	46.55	70.98	11.69	12.51
C.V. 2: (S OF MEAN/MEAN)*100		3.20	2.56		5.58	.99	3.74	12.19	1.90
LSD (0.05)		8.41	1.74		8.62	1.32	7.61	4.08	.68

## CLIMATIC and NURSERY MANAGEMENT DATA

Seeding Date:	05/02/94	Soil Temp @ Sdg:	64F @ 2in., 58F @ 4in.
Harvest Date:	08/10/94	Root Penetration Depth:	45.0 in.
Seeding Depth:	1.50 in.	Depth to Moisture at Sdg:	0.50 in.
Soil Texture:	Sandy Clay Loam	Probed Moist.Depth @.Sdg:	55.0 in.+
Previous Crop:	Fallow	Herbicide:	2,4-D+`BanvelSGF'@.5#+2oz/ac
Initial Stored Soil Water at Seeding:	6.84 in.	(sampling depth = 48 in.)	
Measured Soil Water at Harvest:	3.09 in.	(sampling depth = 48 in.)	
Growing Season Precipitation (Sdg.to 14 days prior to harvest maturity `HM'):			
Total - all measurable events:	3.93 in.	(electronic accum. guage)	
Total - all events >.1 inches:	N/A		
Post Growing Season Precipitation (within 14 days of harvest maturity):			
Total - all measurable events:	N/A	(believed little or none)	
Adj'd Residual Soil Water @ (HM-14d):	3.09 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)= 28 , P(ppm olsen)= 16 , K(ppm)= 278 , pH= 6.4 , O.M.(%) = 0.7			
Fertilizer: 66#N,33#P2O5/ac via 46-0-0+11-52-0 banded 1.5" below seed at plntg			
Harvest Soil Analysis (NO3,P,K at 0-6 in.; NO3 at 6-24, 24-36 & 36-48 in.):			
NO3(lbs/ac)= 16 , P(ppm olsen)= 20 , K(ppm)= 337 , pH= 6.3 , O.M.(%) = 1.3			