

ANNUAL PROGRESS REPORT

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December 1991

WEST RIVER AGRICULTURAL RESEARCH AND EXTENSION CENTER
CROPS AND SOILS RESEARCH

Rapid City, South Dakota

HARDING, MEADE, & PERKINS COUNTIES

Introduction

This is an annual progress report of the West River Crops and Soils Research Projects, South Dakota Agricultural Experiment Station. The equipment storage and processing facilities are located approximately 1 mile southwest of the village of Box Elder. The office facilities are located on the Central States Fairgrounds at 801 San Francisco Street, Rapid City. Telephone 605/394-2236.

The Research Projects serve the western part of the state. They are unique in that all experimental plots are cooperatively located with Farmers, Ranchers, or Crop Improvement Associations, through Extension Agents.

The research conducted is not restricted to a specific area, crop, or soil, but by necessity of workload, investigates only those problems which are pertinent to general areas. This report contains results of selected research. It does not include results of work conducted by projects headquartered from the campus at Brookings.

FIELD PLOT COOPERATORS

<u>Name</u>	<u>Address</u>	<u>County</u>
Roger Rosenow	Ralph 57650	Harding
Gary Hawks	Plainview 57771	Meade
Tim Komes	Sturgis 57785	Meade
Duane Shea	Bison 57620	Perkins
Gary Wunder	Bison 57620	Perkins

This is an annual report and results published herein are therefore neither complete nor conclusive. 100 copies printed at an estimated cost of \$1.17 each.

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This publication was written and edited by Harry A. Geise, Ass't Professor.

Weather Summary

The weather summaries presented in Tables 1 through 3 were obtained from the National Oceanic and Atmospheric Administration publication, Climatological Data - South Dakota, and from South Dakota Crop-Weather Summary published by the South Dakota Statistical Reporting Service-USDA.

Average air temperatures in August were above normal in Northwestern South Dakota but were near normal in Southwestern South Dakota. September temperatures were over seven degrees above normal in the Northwest and over four degrees above normal in the Southwest. During October they were near normal over the entire region. November temperatures ranged from 5-6 degrees above normal. In December the situation changed and temperatures averaged from 5-8 degrees below normal. In early January conditions were far below normal with nighttime temperatures falling below zero. The last half of January was above normal and these conditions continued over into February and March. During February the average temperatures ranged from five to 12 degrees above normal. From April through June average temperatures were from one to three degrees above the longtime average. During July the averages were from 2 degrees above to 2 degrees below normal.

Climatological records during the year indicate below normal precipitation was received from August through March. In April, conditions started to improve with heavy rainshowers and in May records indicate rainfall varied from 0.5 inch to 5.5 inches above normal. However, topsoil moisture (Table 3) was spotted and generally in short supply after mid-June.

The total usable moisture (Table 2) for the entire crop year varied from 13.9 inches at Oelrichs in Fall River county to 9.4 inches at Kirley in Stanley county. The Spring season usable moisture ranged from 12.0 inches at Oelrichs to 7.6 inches at Kirley.

TABLE 1. Weather Data - Average Temperatures and Total Precipitation by Months, with Departures from Normal.

Month & Year	Average Temperature*	Departure from Normal**	Total Precipitation*	Departure from Normal**
<u>Ralph (Harding County Reporting Station)</u>				
Aug. 1990	71.9	4.0	1.11	-0.52
Sept. 1990	63.9	7.4	0.21	-1.00
Oct. 1990	45.9	0.5	0.43	-0.40
Nov. 1990	35.1	5.3	0.21	-0.13
Dec. 1990	14.0	-5.7	0.48	0.20
Jan. 1991	12.5	-0.8	0.27	0
Feb. 1991	32.2	12.2	0.56	0.24
Mar. 1991	35.3	6.9	0.40	-0.06
Apr. 1991	45.1	2.9	2.52	0.98
May 1991	56.1	2.3	3.10	0.49
June 1991	66.2	3.5	3.12	-0.36
July 1991	71.8	2.2	1.60	-0.32
<u>Bear Butte Valley (Ft. Meade-Meade County Reporting Station)***</u>				
Aug. 1990	73.6	1.9	0.95	-0.77
Sept. 1990	66.9	5.3	0.63	-0.56
Oct. 1990	49.9	-1.0	0.61	-0.43
Nov. 1990	41.5	5.6	0.62	-0.08
Dec. 1990	30.3	-7.8	0.50	-0.06
Jan. 1991	20.2	-2.6	0.34	-0.13
Feb. 1991	37.9	10.0	1.22	0.50
Mar. 1991	38.8	5.2	1.31	0.29
Apr. 1991	46.6	-1.1	3.96	1.55
May 1991	57.6	1.2	6.78	3.47
June 1991	67.6	1.8	3.86	0.05
July 1991	73.6	0.6	1.58	-0.65
<u>Plainview (Meade County Reporting Point)***</u>				
Aug. 1990	75.0	1.6	0.32	-1.23
Sept. 1990	67.2	8.0	0.67	0.48
Oct. 1990	47.5	-0.2	0.34	-1.48
Nov. 1990	37.3	5.1	Tr	-0.50
Dec. 1990	14.2	-4.9	0.38	0.08
Jan. 1991	14.2	-3.0	0.17	0.02
Feb. 1991	32.0	7.7	0.94	0.46
Mar. 1991	37.3	3.6	0.70	-0.63
Apr. 1991	47.3	1.0	2.23	0.65
May 1991	58.0	-0.6	4.16	1.77
June 1991	69.2	1.4	3.13	0.51
July 1991	M	M	0.73	-1.41

*Average temperatures and precipitation obtained from NOAA Climatological Data from reporting station nearest the experimental sites. Temperatures are reported in degrees Fahrenheit and precipitation in inches.

**Departures from normal are based on records for the period 1951-1980.

***Departures are based on records for 1977-1987 at specific location.

TABLE 1. Continued

Month & Year	Average Temperature*	Departure from Normal**	Total Precipitation*	Departure from Normal**
<u>Bison</u> (Perkins County Reporting Station)				
Aug. 1990	73.6	7.6	0.11	-1.64
Sept. 1990	65.8	7.4	0.19	-1.02
Oct. 1990	47.5	-3.2	0.99	0.17
Nov. 1990	37.1	5.1	0.05	-0.46
Dec. 1990	15.8	-2.2	0.14	-0.25
Jan. 1991	14.6	-1.2	0.23	-0.13
Feb. 1991	33.6	9.4	0.69	0.17
Mar. 1991	36.3	6.3	0.90	0.07
Apr. 1991	46.4	3.0	2.45	0.60
May 1991	57.0	0	3.40	0.84
June 1991	67.9	-1.1	1.67	-1.61
July 1991	73.0	-0.9	1.28	-0.92

*Average temperatures and precipitation obtained from NOAA Climatological Data from reporting station nearest the experimental sites. Temperatures are reported in degrees Fahrenheit and precipitation in inches.

**Departures from normal are based on records for the period 1951-1980.

TABLE 2. Weather Data - Date of Critical Temperatures and Total Usable-Precipitation in Counties with Experimental Plots, (1990-1991).

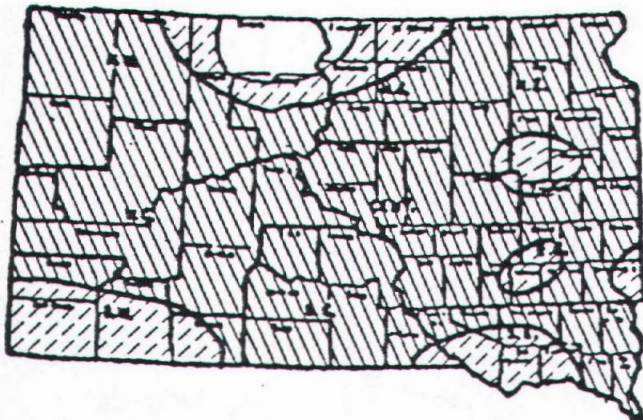
Location	Date of Temperature*		Total Usable Moisture**	
	Fall-First	Spring-Last	Aug 90-July 91	April 91-July 91
Fall River County (Oelrichs)	Oct. 8 (27°)	May 6 (23°)	13.88	12.05
Harding County (Ralph)	Sep. 23 (25°)	May 6 (24°)	7.09	6.17
Meade County (Ft. Meade)	Oct. 7 (27°)	May 3 (28°)	14.15	11.72
Meade County (Plainview)	Oct. 7 (27°)	May 6 (27°)	6.62	5.34
Perkins County (Bison)	Oct. 24 (26°)	May 6 (26°)	5.92	4.99
Stanley County (Kirley)	Oct. 7 (28°)	May 6 (28°)	9.41	7.61

*First 28 degree temperature in Fall or last 28 degree temperature in Spring reported in degrees Fahrenheit.

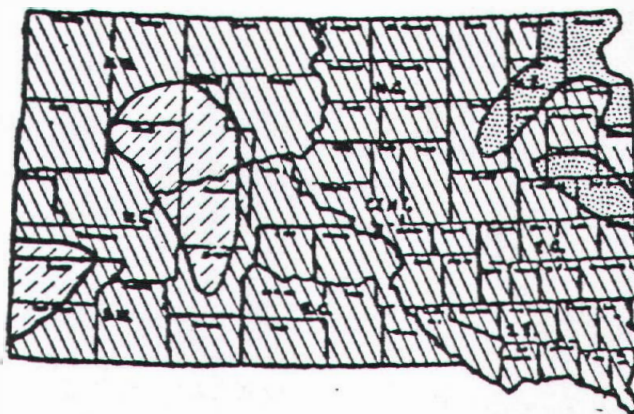
**Sum of all precipitation where amounts were greater than 0.25 inch or totaled 0.25 inches in two contiguous days.

Table 3. Topsoil Moisture Conditions During Growing Season, April-September 1991. (Crop and Livestock Reporting Service-USDA)

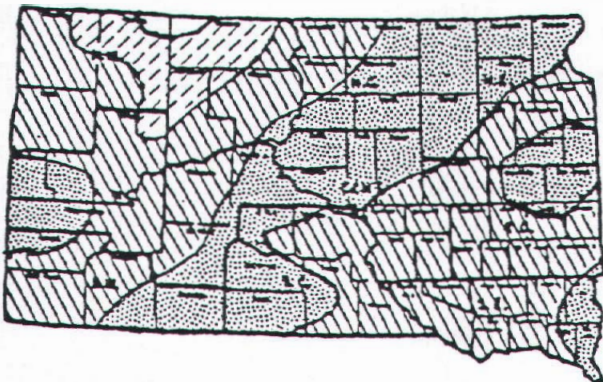
As of Friday April 12, 1991



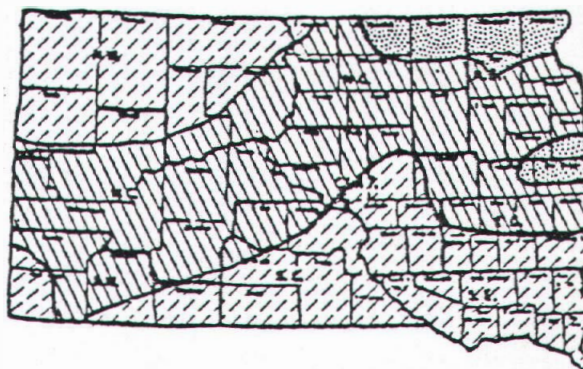
As of Friday May 10, 1991



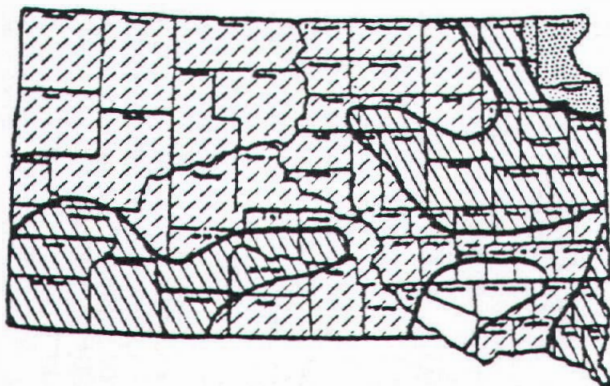
As of Friday June 14, 1991



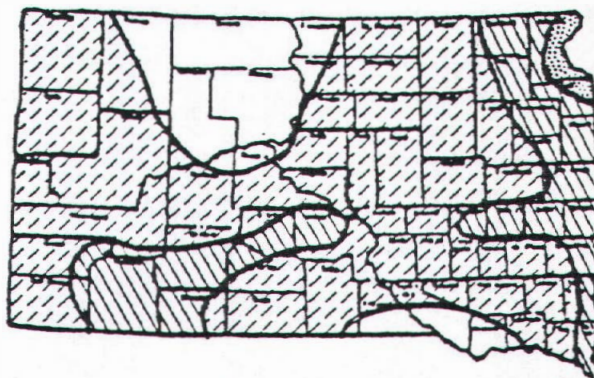
As of Friday July 12, 1991



As of Friday August 16, 1991



As of Friday September 13, 1991



SMALL GRAIN VARIETY TRIALS

Objective: To observe and compare standard small grain varieties and experimental lines for winter hardiness, grain yield, grain quality, disease resistance, insect resistance, and other characteristics for area adaptability.

Hard Red Winter Wheat

Trials and demonstrations were located in Harding, Meade, and Perkins Counties. The trial plots were seeded with a deep furrow seeder with fertilizer attachment. The seeding rate was 60 pounds per acre. The plots were harvested with a Hege Model 125B self-propelled plot combine. Machine harvested plots contained a minimum of 125 square feet per sample. All samples were weighed for plot yield and bushel weight at the harvest site.

Harding County

The Harding County trial was seeded on September 21. Soil moisture was absent to depth of seeding but a soil moisture probe could be inserted to a depth of 20 inches. There was no appreciable rain from August until April. Stand notes taken in mid-November indicated less than 2% emergence. Those plots which did emerge were heavily grazed by wildlife. Spring emergence was fair but was also accompanied by a heavy stand of Wild Oats. The trial was destroyed to prevent the weeds from developing seed.

Meade County (Bear Butte Valley)

The winter wheat variety trial was seeded in Bear Butte Valley on September 18. The soil was loose, dry, and contained a heavy straw mulch. Precipitation was below normal for the entire year of 1990. Emergence in the fall was less than 50% but improved during the spring. Spring growth was good, plants were tall with big heads. Grain production averaged 39 bushel per acre and was of good quality. The data are reported in Table 4.

Meade County (Plainview)

The variety trial at Plainview was seeded on September 18. The soil was dry both in the surface and the subsoil. There was very little fall germination. Early spring moisture resulted in stands of 80%. High temperatures in mid-July resulted in premature ripening, high protein grain, and low test weights. The data are reported in Table 5.

Perkins County

The variety trial at Bison was seeded on September 20. Soil moisture was limited at the surface, but was measured to a depth of 36 inches. Spring stands ranged from 41-87%. Grain yields averaged 33.7 bushel per acre, with fair test weight and normal protein content. Data are listed in Table 6.

TABLE 4. Hard Red Winter Wheat Variety Trial - Meade County(Bear Butte), 1989-91.

Variety	Percent Stand		Height Inches	Date of Heading	Percent Protein*	Test Wt (Lbs/Bu)	Grain Yield-Bu/A	
	11/90	5/91					1991	(3 yr av)
Karl	50	68	36	June 2	12.7	61.3	51.2	--
Arapahoe	41	63	37	June 4	12.8	58.0	48.8	42.7
TAM 107	39	69	34	May 31	11.6	58.5	46.7	40.9
Sage	55	76	42	June 1	13.0	62.1	45.4	40.0
SD 88185	28	53	41	June 5	11.9	60.4	44.4	--
Bronco	31	53	34	June 4	12.0	57.8	43.9	--
Siouxland	60	66	40	June 4	11.5	56.5	43.8	39.6
SD 87143	50	66	40	June 5	11.9	59.8	43.2	--
SD 88191	35	48	33	June 7	12.7	56.3	42.8	--
Scout 66	53	63	44	June 1	--	61.4	42.5	36.4
Rio-Blanco	40	56	32	June 4	13.6	56.9	42.3	--
Rose	55	75	44	June 8	14.1	58.3	42.2	35.4
Thunderbird	55	73	38	June 4	14.6	58.8	41.7	37.4
TAM 200	36	45	33	June 4	11.7	61.0	41.6	39.3
Redland	30	59	36	June 7	14.1	55.4	41.6	36.5
Quantum 562	46	56	36	June 4	14.2	55.4	41.5	38.2
SD 88253	51	53	38	June 5	12.4	58.2	40.5	--
SD 87128	46	61	43	June 5	14.7	59.6	40.0	--
Quantum 549	18	48	36	June 5	12.5	57.2	39.8	--
Bennett	45	59	38	June 2	14.6	58.2	39.0	39.6
Abilene	32	54	32	June 4	12.9	56.5	38.6	37.3
Quantum 542	22	46	41	June 5	12.3	57.6	38.5	35.2
Rawhide	33	49	35	June 3	11.7	57.8	38.0	--
Brule	31	45	37	June 5	13.2	55.8	37.9	39.5
SD 87127	58	59	43	June 4	12.3	61.5	37.4	--
SD 88231	49	60	40	June 2	12.6	59.2	37.2	--
Siouxland 89	10	29	38	June 5	11.3	58.0	37.0	--
Lamar	38	62	39	June 6	13.2	60.0	36.8	--
Centura	35	41	38	June 4	12.4	58.6	36.8	39.7
Seward	26	56	42	June 10	12.4	57.3	35.0	33.8
Dawn	34	50	34	June 4	12.3	60.0	34.8	33.8
Carson	23	53	39	June 4	12.2	57.4	34.6	--
Agassiz	46	69	45	June 10	14.5	58.5	30.5	28.1
Roughrider	27	58	43	June 9	15.7	58.7	27.6	28.7
Norstar**	50	61	46	June 11	12.5	55.5	22.3	19.8
Tiber**	36	47	42	June 10	12.1	51.8	21.4	28.3

LSD(5%)- 11.7 Bu/Acre

C.V.- 20.9%

Mean - 39.1

*Percent protein determined with a Technicon 300 InfraAnalyzer.

**Variety susceptible to stem rust.

NOTE: Seeded September 18, 1990 and harvested July 29, 1991. Fertilizer was applied for an anticipated yield of forty bushels per acre. Weeds were controlled by Ally at 1/10 oz/A. and 2,4D at 8 oz/A. applied in mid-May.

Table 5. Hard Red Winter Wheat Variety Trial - Meade County(Plainview), 1989-91.

Variety	<u>% Stand</u> 7/91	Height Inches	Maturity (0-7)*	Percent Protein*	Test Wt. (Lbs/Bu)	<u>Grain Yield-Bu/A</u> 1991 (3 yr av)	
Arapahoe	89	29	Medium 2	16.6	55.6	31.2	37.5
Dawn	91	29	Medium 4	14.9	56.0	30.5	36.1
Karl	86	27	Early 0	16.1	58.0	29.5	--
TAM 200	87	27	Early 2	14.4	57.7	28.7	25.8
Bronco	90	29	Medium 3	15.2	54.5	28.6	--
Scout 66	86	26	Early 2	13.8	55.7	28.2	27.3
Siouxland	80	32	Early 1	14.8	51.9	26.7	30.2
Thunderbird	80	30	Medium 4	14.5	55.8	25.6	30.8
Sage	89	34	Early 2	14.8	56.2	25.2	29.6
Redland	87	33	Medium 3	15.1	53.0	25.0	38.7
Siouxland 89	79	32	Early 2	15.4	51.9	24.2	--
Quantum 542	85	29	Early 3	15.4	53.9	23.8	28.6
Centura	86	32	Early 3	16.3	54.1	23.8	33.9
TAM 107	90	28	Early 0	15.4	51.6	22.4	24.5
Abilene	80	25	Medium 2	15.5	53.1	20.8	36.3
Brule	73	32	Medium 3	15.5	50.9	19.8	32.4
Seward	84	35	Med-Late 5	15.9	52.3	19.6	30.8
Rose	84	33	Med-Late 5	15.8	52.5	19.6	32.7
Roughrider	85	34	Med-Late 6	16.1	54.3	17.3	27.3
Norstar	65	37	Late 7	15.2	48.4	13.5	26.4
Agassiz	76	39	Med-Late 6	14.4	55.8	12.5	25.8
LSD(5%) - 5.0 Bu/Acre		C.V. - 14.7%		Mean - 23.9			

*Maturity rating and days headed after earliest variety has headed.

**Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Seeded September 18, 1990 and harvested July 23, 1991.

Table 6. Hard Red Winter Wheat Variety Trial - Perkins County(Bison), 1989-91.

Variety	Percent Stand		Height Inches	Maturity (0-7)*	Percent Protein**	Test Wt (Lbs/Bu)	Grain Yield-Bu/A	
	11/90	5/91					1991	(3 yr av)
Centura	60	83	34	Early 3	13.6	59.4	44.3	32.7
SD 87143	58	84	33	Medium 3	13.1	60.4	43.0	--
Arapahoe	64	80	32	Medium 2	13.3	57.1	41.4	33.7
SD 87127	66	81	35	Medium 2	13.1	61.0	40.6	--
SD 87128	65	87	36	Medium 2	13.4	60.8	39.0	--
Quantum 562	58	83	29	Medium 2	13.0	57.3	38.2	32.0
Siouxland 89	56	81	33	Early 2	13.8	58.4	38.2	--
SD 88185	56	82	32	Medium 3	13.0	60.9	38.1	--
Brule	55	83	34	Medium 3	11.7	57.4	38.0	33.5
Bennett	61	80	32	Early 1	12.8	59.4	37.3	30.9
Quantum 542	48	76	36	Early 3	12.7	56.6	36.9	33.5
SD 88253	59	79	33	Medium 3	13.0	59.4	36.8	--
Siouxland	56	77	34	Early 1	12.5	59.0	36.4	30.2
Redland	53	73	34	Medium 3	12.2	55.8	36.4	33.5
SD 88191	66	71	28	Early 3	13.4	58.7	36.2	--
SD 88231	59	72	34	Early 2	13.1	59.9	35.9	--
Sage	56	83	34	Early 2	12.7	59.8	35.7	29.6
Karl	48	72	27	Early 0	13.6	59.1	35.5	--
Quantum 549	55	63	31	Medium 3	13.5	56.6	34.6	--
Rawhide	55	78	30	Medium 2	12.3	58.2	34.4	--
Scout 66	63	81	35	Early 2	12.4	60.0	34.2	27.3
Dawn	64	64	33	Medium 4	13.7	58.6	33.8	31.0
Seward	46	77	39	Med-Late 5	12.9	56.4	33.8	30.8
Abilene	59	68	28	Medium 2	13.8	58.5	32.8	33.9
Thunderbird	68	63	32	Medium 4	12.4	59.4	32.2	30.8
Agassiz	59	68	28	Med-Late 6	12.5	58.5	30.4	33.9
Carson	53	70	33	Early 2	12.4	57.0	29.6	--
Bronco	64	45	29	Medium 3	13.3	55.3	29.4	--
Rose	45	72	34	Med-Late 5	12.2	58.6	29.1	32.4
Roughrider	48	84	37	Med-Late 6	14.0	59.2	29.0	26.7
TAM 107	45	59	28	Early 0	13.8	56.0	27.6	24.5
Lamar	56	51	34	Medium 2	13.8	58.4	25.2	--
Tiber***	45	80	36	Med-Late 5	13.3	54.6	24.4	29.4
Norstar***	53	82	41	Late 7	13.6	54.9	22.9	26.9
Rio-Blanco	58	41	25	Medium 3	12.3	57.3	21.5	--
TAM 200	49	45	27	Early 2	13.4	57.6	21.2	25.8

LSD(5%) - 7.0 Bu/A

C.V.- 14.4%

Mean - 33.7

*Maturity rating and days headed after earliest variety has headed.

**Percent protein determined with a Technicon 300 InfraAnalyzer.

***Variety susceptible to stem rust.

NOTE: Seeded September 20, 1990 and harvested July 30, 1991. Starter fertilizer was applied at 11-37-0 #/A. Weeds were controlled with Ally at 1/8 oz/A plus Banvel at 1/4 lb/A.

Hard Red Spring Wheat

Plots were seeded at four locations in 1991. All trials were seeded on fallow with a six row plot seeder having eight inch row spacing. Individual plots contained a minimum of 120 square feet with four replications per variety.

Seeding rate was controlled by prepackaging all seed. Fertilizer requirements were predetermined by soil test. Harvesting was accomplished with a self-propelled plot combine. Machine harvested plots contained a minimum of 100 square feet per sample. Grain yields and other data are reported in Tables 7 through 11.

Harding County

Spring grain plots were seeded at Ralph on April 24. The soil was mellow and moist from recent spring rains. Germination and emergence was good resulting in uniform stands. Weather conditions were favorable for growth and resulted in plants with good height and well tillered. Grain yield averaged over 40 bushels per acre. The grain was of high quality with test weights over 60 pounds. The data are reported in Table 8.

Meade County (Bear Butte Valley)

The hard red spring wheat trial at Bear Butte was seeded on April 10. The soil was mellow with moisture to a depth of 24 inches. Rainshowers during late April and May provided moisture necessary for the plants to grow vigorously with numerous tillers. However, moisture became critical in mid-July resulting in forced maturity. Grain yield averaged 31 bushel per acre. Test weights were low and ranged from 47 to 57 pounds per bushel. Protein levels were very high. The data are reported in Table 9.

Meade County (Plainview)

The spring wheat trial was seeded at Plainview on April 18. The soil was mellow, with moisture at the surface and measured to a depth of 18 inches. Spring rainshowers provided sufficient moisture to maintain plant growth. However, hot dry weather in mid-July resulted in forced maturity. Weights per bushel and protein level were normal for the early maturing varieties but test weights were low and protein level high in the later maturing varieties. The data are listed in Table 10.

Perkins County

Spring wheat variety trials were seeded near Bison on April 23. The soil was loose, friable, with subsoil moisture to a depth of 24 inches. Good rainshowers were received intermittently through May and June. Air temperatures were below normal during June and July as was precipitation. Moisture stress in late July resulted in forced maturity with reduced weight per bushel, and increased protein levels. Grain yield averaged over 40 bushel per acre. The yield data are given in Table 11.

TABLE 7. Hard Red Spring Wheat Variety Trial - Harding County(Ralph), 1989-91.

Variety	Height (Inches)	Relative Maturity*	Percent Moisture	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre 1991	(3 yr av)
SD 8070	35	-1	13.7	15.7	63.2	51.9	--
SD 3080	35	-1	13.8	16.0	62.7	51.1	--
SD 8072	33	-1	14.0	13.8	62.6	48.6	--
Gus	32	3	19.1	14.0	59.4	48.5	37.1
Nordic	32	4	15.7	13.4	60.4	47.8	40.8
N86-0542	28	4	14.2	13.5	60.2	47.2	--
Grandin	32	1	15.1	13.1	62.0	46.9	36.3
Stoa	37	3	14.6	13.3	61.0	46.8	38.2
Butte 86	37	0	14.0	12.0	61.9	46.1	36.7
Prospect	31	2	13.9	14.2	62.6	45.4	36.9
SD 8074	33	-1	14.6	13.5	62.1	45.4	--
SD 3056	33	-1	13.9	13.8	61.7	45.3	--
Bergen	27	2	13.7	12.2	61.5	44.7	--
NDWX371	30	3	13.9	13.8	60.2	44.7	--
Guard	30	1	13.9	13.5	62.4	44.0	35.3
Celtic	30	4	13.3	12.8	62.3	43.4	34.8
SD 8073	33	-1	14.2	13.5	62.2	43.2	--
Fjeld	28	1	13.9	13.3	60.4	42.9	33.3
2369	28	3	15.9	12.4	61.5	42.8	34.9
Vance	29	4	14.0	13.4	59.6	42.4	33.5
MN 85324	29	1	14.4	13.3	61.0	42.3	--
Amidon	35	2	14.6	12.4	60.0	42.2	35.5
ND 655	33	3	14.0	12.3	62.7	42.2	--
W2502	29	3	11.2	12.4	57.6	41.8	33.6
2375	31	0	13.2	12.2	62.2	41.7	35.4
Dalen	29	1	14.5	12.5	62.6	41.7	--
SD 3055	31	0	13.8	14.1	61.5	41.3	--
Sharp	35	-2	15.0	14.6	63.7	41.2	33.8
W2501	27	3	11.2	12.4	58.6	39.5	32.4
Telemark	25	2	13.7	13.9	61.2	39.2	33.0
Marshall	27	6	13.8	13.3	60.4	37.2	31.5
Chris	37	3	15.6	13.4	58.5	36.4	28.0

LSD(5%) - 6.3 Bu/A

C.V. - 8.9%

Mean - 43.9

*Indicates relative maturity based on 58 days from seeding to heading.
 **Percent protein was determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 24 and harvested August 1, 1991.

TABLE 8. Hard Red Spring Wheat Advanced Line Yield Trial - Harding County (Ralph), 1990-91.

Variety	Height (Inches)	Percent Protein*	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
				1991	(2 yr av)
SD 3055	35	14.3	61.1	41.4	35.9
SD 8070	38	13.5	62.7	39.7	34.2
SD 8074	38	13.1	61.2	38.5	34.2
Butte 86	34	14.2	60.9	38.2	34.0
SD 3102	37	13.2	63.2	36.9	--
SD 3088	33	--	61.1	36.7	--
SBE398A4	29	--	60.3	36.6	--
SD 3097	36	13.2	59.9	36.6	--
ND 655	30	--	61.1	36.6	33.0
SD 3105	36	11.9	69.5	36.1	--
SD 3120	33	12.9	61.3	35.9	--
SD 3092	30	--	59.9	35.8	--
2375	25	12.7	61.9	35.1	33.6
SD 3113	36	13.9	61.2	34.7	--
SBE398A2	26	--	61.2	34.7	--
Sharp	32	12.9	62.5	34.1	31.0
SD 3098	33	12.7	62.2	34.1	--
SD 3056	32	13.1	62.6	34.0	30.9
SBE398A1	32	--	60.5	34.0	--
MN85324	29	11.7	61.1	33.8	30.4
SD 3122	35	12.0	62.0	33.3	--
SD 3112	31	--	61.1	33.3	--
SBE398A3	28	--	60.3	33.2	--
Stoa	34	13.5	59.2	32.5	31.2
SD 8073	30	13.5	62.2	32.2	28.8
SD 8067	29	--	61.5	32.2	30.5
SD 3096	34	--	58.8	31.6	--
SD 3110	32	--	63.2	31.2	--
Prospect	32	12.6	55.4	30.6	30.4
SD 3116	37	12.4	63.2	30.3	--
SD 3121	28	12.2	58.9	30.0	--
SD 3080	27	13.1	62.3	29.6	30.6
Chris	39	14.1	57.1	29.1	25.0
SD 3109	26	--	58.9	28.7	--
SD 8072	28	12.5	60.3	28.1	30.0
SBE340A3	30	--	60.8	27.8	--

LSD(5%) - 6.4 Bu/A

C.V. - 10.8%

Mean - 33.8

*Percent protein was determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 24 and harvested August 1, 1991.

TABLE 9. Hard Red Spring Wheat Variety Trial - Meade County(Bear Butte Valley), 1989-91.

Variety	Height (Inches)	Relative Maturity*	Percent Moisture	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre 1991	(3 yr av)
2375	31	0	12.4	17.2	57.7	36.6	23.1
SD 3056	32	-1	10.7	17.3	55.4	36.4	--
SD 3055	31	0	10.6	17.8	55.1	35.2	--
SD 8073	34	-1	10.8	17.1	54.7	35.2	--
ND 655	33	3	11.8	17.1	55.4	34.8	--
SD 3080	34	-1	11.9	17.0	58.2	34.6	--
Sharp	35	-2	11.6	16.7	57.2	34.5	26.8
Prospect	32	2	10.5	17.6	52.8	34.5	22.6
SD 8072	34	-1	9.9	17.3	53.9	34.3	--
SD 8074	34	-1	11.1	16.9	56.2	34.1	--
Guard	31	1	10.7	17.4	54.2	33.7	21.0
Dalen	28	1	10.4	18.1	52.1	33.2	--
Butte 86	35	0	11.4	17.4	54.4	33.0	22.2
SD 8070	35	-1	11.2	17.1	56.4	32.9	--
Amidon	36	2	11.4	16.8	55.4	32.6	19.2
Bergen	28	2	10.3	17.4	52.9	32.2	--
NDWX371	30	3	9.8	17.8	50.2	31.3	--
Grandin	31	1	10.6	17.3	52.2	30.6	19.6
Fjeld	29	1	9.6	17.1	50.8	30.5	18.1
Telemark	26	2	9.6	17.8	49.3	30.1	17.3
Gus	32	3	10.8	18.4	53.6	29.8	18.3
Stoa	35	3	10.5	17.8	52.8	29.5	20.6
MN 85324	31	1	9.7	18.0	50.9	29.4	--
Celtic	33	4	9.9	17.8	49.5	29.3	21.3
N86-0542	28	4	8.7	18.3	48.2	28.5	--
Nordic	29	4	9.8	17.2	51.6	28.2	19.0
W2501	28	3	8.8	16.9	47.8	27.9	17.0
W2502	27	3	8.3	17.8	47.2	27.8	18.4
Vance	29	4	9.1	18.0	50.3	26.7	15.5
2369	29	3	10.8	17.7	52.1	26.4	19.1
Chris	38	3	10.3	17.5	53.2	23.6	17.2
Marshall	27	6	9.5	17.7	47.5	21.9	15.6

LSD(5%) - 2.4 Bu/A

C.V. - 4.8%

Mean - 31.2

*Indicates relative maturity based on 65 days from seeding to heading.

**Percent protein determined with a Technicon 300 infraanalyzer.

NOTE: Plots were seeded April 10 and harvested July 24, 1991.

Table 10. Hard Red Spring Wheat Variety Trial - Meade County(Plainview), 1989-91

Variety	Height (Inches)	Relative Maturity*	Percent Moisture	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/A 1991	(3 yr av)
Sharp	33	-2	11.0	14.9	62.3	33.6	18.3
Bergen	26	2	8.9	17.1	58.0	32.1	--
Fjeld	26	1	9.2	17.1	55.6	31.0	21.3
Grandin	32	1	10.9	14.1	59.4	31.0	17.2
Butte 86	32	0	11.1	14.2	61.0	30.9	22.2
Prospect	30	2	9.6	--	59.1	30.8	21.0
2375	30	0	--	--	59.6	30.2	22.6
Nordic	30	4	10.2	17.6	57.6	28.6	19.6
Amidon	36	2	9.5	15.8	58.3	27.3	19.2
Gus	30	3	9.3	17.6	57.7	25.9	18.1
2369	29	3	10.8	14.7	57.7	24.8	19.0
Stoa	34	3	9.1	17.1	56.4	24.7	15.6
Guard	26	1	9.2	17.1	56.6	23.5	8.3
LSD(5%) - 6.6 Bu/A		C.V. - 13.5%		Mean - 28.8			

*Indicates relative maturity based on 60 days from seeding to heading.
 **Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 18 and harvested July 30, 1991.

TABLE 11. Hard Red Spring Wheat Variety Trial - Perkins County(Bison), 1989-91.

Variety	Height (Inches)	Relative Maturity*	Percent Moisture	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre 1991 (3 yr av)	
SD 8073	34	-1	10.4	15.3	59.4	49.0	--
SD 8074	35	-1	10.7	15.1	58.8	48.0	--
Dalen	30	1	11.5	15.9	59.0	47.7	--
SD 8072	35	-1	10.8	15.0	58.7	45.3	--
SD 3055	35	0	10.4	15.0	58.7	45.0	--
SD 3056	33	-1	10.7	16.9	57.6	44.9	--
ND 655	33	3	10.5	15.7	59.1	44.3	--
Sharp	34	-2	10.8	14.8	58.9	43.9	26.8
Prospect	32	2	11.5	14.1	56.8	43.0	22.6
Bergen	29	2	10.0	15.9	57.2	42.8	--
N86-0542	29	4	9.8	15.5	54.5	42.8	--
Nordic	33	4	12.0	12.8	57.2	42.0	19.0
Fjeld	30	1	9.2	15.5	54.8	42.0	18.1
2375	30	0	11.0	15.6	60.5	42.0	23.1
SD 8070	33	-1	11.8	12.9	60.9	41.4	--
NDWX371	28	3	10.4	16.2	56.7	40.6	--
Guard	31	1	10.1	15.2	56.8	40.1	21.0
Stoa	38	3	9.1	16.9	54.0	39.8	20.6
Amidon	36	2	10.8	15.5	56.4	39.8	19.2
Butte 86	34	0	11.0	16.2	58.8	39.4	22.2
Grandin	33	1	10.4	15.8	58.0	39.3	19.6
Celtic	33	4	10.1	16.3	56.7	39.2	21.3
Gus	32	3	10.1	17.2	56.3	39.2	18.3
MN 85324	32	1	9.9	15.6	55.4	38.8	--
SD 3080	34	-1	11.4	14.4	61.3	38.6	--
W2502	29	3	7.8	16.0	51.1	38.4	18.4
W2501	29	3	8.2	15.5	49.9	37.4	17.0
2369	32	3	10.6	15.4	56.9	37.1	19.1
Telemark	26	2	10.7	15.2	54.9	36.3	17.3
Marshall	29	6	9.4	15.2	55.2	35.6	15.6
Vance	30	4	9.4	16.3	52.7	34.1	15.5
Chris	37	3	10.9	16.2	54.4	30.7	17.2

LSD(5%) - 5.0 Bu/A

C.V. - 7.6%

Mean - 40.9

*Indicates relative maturity based on 60 days from seeding to heading.
 **Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 23 and harvested July 31, 1991.

Durum Wheat

Durum wheat variety trials were seeded at three locations in 1991. The remarks and discussion pertinent to these trials were included in the Hard Red Spring Wheat section and can be found on page 11. The yields and other data are listed in Tables 12 through 14.

TABLE 12. Durum Wheat Variety Trial - Harding County (Ralph), 1989-91.

Variety	Height (Inches)	Relative Maturity*	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
					1991	(3 yr av)
Renville	34	0	12.9	63.1	26.3	27.5
Fjord	35	-1	13.3	63.6	25.5	--
Stockholm	29	1	12.4	63.2	25.4	26.8
Monroe	34	-3	11.8	63.0	25.1	25.9
Ward	34	0	12.3	62.6	24.8	25.5
Vic	35	0	12.4	62.4	24.4	25.4
Sceptre	29	-1	11.8	61.3	24.0	25.4
LSD(5%) - 3.5 Bu/A		C.V. - 4.8%		Mean - 41.8		

*Indicates maturity based on 58 day interval between seeding and heading.

**Protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 24 and harvested August 5, 1991.

TABLE 13. Durum Wheat Variety Trial - Meade County(Bear Butte), 1989 & 91.

Variety	Height (Inches)	Relative Maturity*	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
					1991	(2 yr av)
Fjord	38	-1	17.1	58.8	34.2	30.5
Vic	39	0	18.2	58.7	33.0	29.7
Monroe	38	-3	17.6	56.8	32.9	27.3
Ward	37	0	18.1	56.8	32.7	26.6
Stockholm	28	1	17.9	55.9	31.3	26.5
Renville	36	0	18.9	55.8	31.2	27.3
Sceptre	35	-1	18.0	54.8	30.4	26.8
LSD(5%) - 3.6 Bu/A		C.V. - 6.2%		Mean - 32.2		

*Indicates maturity based on 58 day interval between seeding and heading.

**Percent protein was determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 10 and harvested July 24, 1991.

TABLE 14. Durum Wheat Variety Trial - Perkins County (Bison), 1989-91.

Variety	Height (Inches)	Relative Maturity*	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
					1991	(3 yr av)
Renville	36	0	14.6	60.3	43.6	32.5
Monroe	33	-3	15.9	60.1	42.5	30.9
Ward	38	0	15.2	60.4	41.5	30.1
Stockholm	27	1	16.3	60.8	41.3	31.4
Fjord	34	-1	16.8	61.3	39.9	30.9
Vic	36	0	16.0	60.4	37.4	30.2
Sceptre	28	-1	15.5	59.4	33.6	27.6

LSD(5%) - 13.0 Bu/A

C.V. - 18.2%

Mean - 40.0

*Indicates maturity based on 58 day interval between seeding and heading.

**Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 23 and harvested July 31, 1991.

Winter Triticale

Plots were seeded at two locations in 1990. All trials were seeded in fallow soil with a six row plot seeder having a ten inch row spacing. Seeding rate was controlled by prepackaging all seed. Fertilizer requirements were predetermined by soil test. Harvesting was accomplished with a self-propelled plot combine. Grain yield and other data are reported in Tables 15 through 16.

TABLE 15. Winter Triticale Variety Trial - Meade County (Bear Butte), 1989-91.

Variety	Percent Stand		Date of Heading	Height (Inches)	Percent Protein*	Test Wt. (Lbs/Bu)	Grain Yield-Bu/A	
	11/90	5/91					1991	(3 yr av)
Newcales	48	73	May 27	47	13.7	51.4	66.1	46.8
18249	38	72	May 30	53	13.6	51.6	52.2	37.7
Jenkins	43	82	June 8	57	14.3	44.4	42.9	27.1
Winteri	59	73	June 8	60	14.3	44.4	30.5	22.8
Thunderbird**	44	80	June 3	38	14.8	60.1	48.1	42.7

LSD(5%) - 10.1 Bu/A.

C.V. - 13.1%

Mean - 47.9

*Percent protein determined with a Technicon 300 InfraAnalyzer.

**HRW Wheat (var.) Thunderbird was used as a standard for comparison.

NOTE: Plots were seeded September 19, 1989 and harvested July 19, 1990.

TABLE 16. Winter Triticale Variety Trial - Perkins County (Bison), 1989-91.

Variety	% Stand		Days to Heading*	Height (Inches)	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/A	
	11/90	7/91					1991	(3 yr av)
18249	51	79	150	50	13.1	51.5	45.7	32.5
Jenkins	40	78	159	50	13.2	48.6	42.5	34.8
Winteri	48	85	159	55	13.5	48.1	35.3	32.4
Newcales	60	55	147	39	13.7	49.4	28.9	26.6
Thunderbird+	66	80	154	32	12.4	60.3	34.1	31.4
LSD(5%) - 8.3 Bu/A.			C.V. - 13.9%		Mean - 38.2			

*Days to heading from January 1.

**Percent protein determined with Technicon 300 InfraAnalyzer.

+HRW Wheat (var.) Thunderbird was used as a standard for comparison.

NOTE: Plots were seeded September 20, 1990 and harvested July 30, 1991.

Discussion: Winter survival of the triticales was equal to winter wheat classed as good for winter survival. Weights per bushel varied from the standard 48 pounds per bushel. The variation resulted from a combination of moisture stress and heat damage. Early heading varieties produced better quality grain with higher test weights because they were not damaged as much by the high air temperature of mid-July. The conditions under which the tests were conducted are discussed under the hard red winter wheat trials.

Spring Triticale

Plots were seeded at three locations in 1991. All trials were seeded in fallow soil a six row plot seeder having an eight inch row spacing. Seeding rate was controlled by prepackaging all seed. Fertilizer requirements were predetermined by soil test. Harvesting was accomplished with a self-propelled plot combine. Grain yields and other data are reported in Tables 17 through 19.

TABLE 17. Spring Triticales Variety Trial - Harding County (Ralph), 1989-91.

Variety	Height (Inches)	Percent Moisture*	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
					1991	(3 yr av)
Kramer	29	10.4	11.3	47.8	52.5	37.7
Trical Grace	29	22.6	11.5	45.6	52.1	--
Marval	32	12.5	10.9	45.6	49.3	41.1
Trical Victoria	30	16.4	10.7	47.6	44.9	44.0
LSD(5%) - 5.5 Bu/A.		C.V. - 5.6%		Mean - 49.7		

*Percent protein was determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 23 and harvested August 3, 1990.

TABLE 18. Spring Triticales Variety Trial - Meade County (Bear Butte), 1991.

<u>Variety</u>	<u>Height (Inches)</u>	<u>Percent Moisture*</u>	<u>Percent Protein**</u>	<u>Test Wt. (Lbs/Bu)</u>	<u>Grain Yield (Bu/Acre)</u>
Kramer	37	7.4	15.9	44.0	39.4
Trical Victoria	37	10.3	16.5	43.0	31.7
Marval	42	7.6	17.0	39.3	28.7
Trical Grace	38	14.3	18.7	38.1	25.7
LSD(5%) - 8.3 Bu/Acre		C.V. - 13.2%		Mean - 31.4	

*Percent moisture in grain was determined in field at harvest.

**Percent protein was determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 10 and harvested July 24, 1991.

TABLE 19. Spring Triticale Variety Trial - Perkins County (Bison), 1989-91.

<u>Variety</u>	<u>Height (Inches)</u>	<u>Percent Moisture</u>	<u>Percent Protein*</u>	<u>Test Wt. (Lbs/Bu)</u>	<u>Grain Yield-Bu/Acre</u>	
					<u>1991</u>	<u>(3 yr av)</u>
Kramer	36	7.8	13.5	45.5	53.0	21.8
Trical Grace	39	20.1	14.3	42.4	47.8	27.9
Marval	41	11.6	13.5	41.6	45.0	23.7
Trical Victoria	35	14.4	13.0	45.3	38.9	22.5
LSD(5%) - 6.9 Bu/A		C.V. - 7.5%		Mean - 46.2		

*Percent moisture in grain determined in field at harvest.

**Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 23 and harvested July 31, 1991.

Discussion: Spring triticale varieties grown under normal moisture conditions had grain yields equal to the higher yielding spring and durum wheats. The weights per bushel were reduced slightly below standard where the plants were drought stressed but were above standard weight when moisture was available to permit normal maturity. The conditions under which the trials were conducted are discussed under the hard red spring wheat trials. The Triticales have a standard weight of 48 pounds per bushel. It is best utilized as a grain feed for swine or poultry.

Oat Variety Trials

Oat variety trials were conducted on a cooperative basis at four locations in 1991. Seeding dates ranged from April 10 to April 30. All trials were seeded on fallow with a six row plot seeder having an eight inch row spacing. Seeding rates were controlled by prepackaging all seed. Fertilizer requirements were predetermined by soil test. Harvesting was accomplished with a self-propelled plot combine. Grain yield and other data are reported in Tables 20 through 23.

Harding County

Oat varieties in Harding County were seeded near Ralph on April 24. The soil had been recently tilled and was moist to a depth of 20 inches. Germination and emergence was good and plants grew tall with many tillers. Grain quality was excellent with test weights from 36 to 40 pounds per bushel. Grain yield averaged 72.8 bushels per acre with a top yield of 114 bushels per acre. The trial data are listed in Table 20.

TABLE 20. Oat Variety Trial - Harding County (Ralph), 1989-1991.

Variety	Height (Inches)	Date of Heading	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
				1991	(3 yr av)
Dumont	39	July 2	36.4	114.2	--
Riel	35	July 3	38.9	107.1	--
Robert	35	July 3	36.4	104.7	--
Newdak	37	July 2	36.1	97.4	75.4
Monida	37	July 3	34.4	82.8	80.0
Hamilton	36	June 28	36.9	75.6	62.0
Dane	34	June 27	36.1	74.8	--
Webster	36	July 1	35.7	74.1	57.7
Settler	35	July 2	37.7	73.2	61.1
WIX5229-1	34	July 2	33.8	73.1	--
Valley	34	July 5	37.8	70.7	68.0
Troy	40	July 5	36.9	70.4	62.3
Tibor	42	July 1	39.1	69.8	--
Hazel	34	June 29	37.3	68.7	57.0
Don	34	June 30	36.7	67.6	58.7
SD 87572	38	July 1	39.1	67.3	--
Ogle	35	June 30	35.3	67.3	64.5
Premier	37	July 2	39.9	65.4	58.1
Hyttest	39	June 30	40.5	64.5	57.3
SD 87063	40	June 26	36.0	64.3	--
Y933-11-2	39	June 25	36.3	63.4	--
Steele	37	July 4	36.8	63.1	58.5
Moore	38	July 4	36.8	62.5	59.1
Burnett	37	June 30	37.6	61.5	57.2
Starter	34	June 28	37.4	61.4	53.0
SD 87675	37	July 1	37.9	59.8	--
Porter	33	July 6	37.7	59.7	62.0
Kelly	37	June 27	36.4	52.8	46.9
LSD(5%) - 17.7 Bu/Acre		C.V. - 14.9%	Mean - 72.8		

NOTE: Plots were seeded April 24 and harvested August 5, 1991.

Meade County
(Bear Butte Valley)

The Meade County trial in Bear Butte Valley was seeded into fallow soil on April 10. The soil was moist and received an additional 2 inches of rain the day after seeding was completed. Growth was good with numerous tillers. However, in mid-July moisture was in short supply when high temperatures caused premature ripening. Weight per bushel and grain yield were reduced as a result. Data are reported in Table 21.

TABLE 21. Oat Variety Trial - Meade County (Bear Butte), 1989-91.

Variety	Height (Inches)	Date of Heading	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
				1991	(3 yr av)
SD 87572	36	June 27	35.3	78.4	--
Riel	39	June 29	31.8	77.8	--
Robert	38	June 29	29.0	76.0	--
Moore	39	June 28	31.9	76.0	43.0
Troy	38	June 27	32.2	75.5	44.5
WIX5229-1	36	June 26	29.2	72.2	--
Monida	56	June 28	27.2	71.9	40.3
Newdak	36	June 25	31.8	71.3	44.6
Porter	35	June 27	29.6	69.4	39.8
Dumont	38	June 28	28.4	67.7	--
Webster	33	June 23	34.2	67.3	45.3
Ogle	35	June 25	30.6	66.5	49.5
Settler	37	June 27	32.2	66.4	43.6
Hamilton	34	June 23	32.8	65.7	47.3
Premier	35	June 24	36.7	64.2	--
Steele	37	June 27	31.7	63.3	38.4
SD 87063	36	June 22	29.1	62.5	--
Dane	34	June 22	33.1	60.3	--
Valley	33	June 22	33.8	60.3	38.7
Tibor	42	June 27	32.8	58.7	--
Y933-11-2	36	June 25	32.7	57.1	--
Hazel	31	June 25	33.6	57.1	44.6
Starter	34	June 23	35.4	56.8	47.4
Hyttest	39	June 25	37.2	55.2	37.3
Burnett	38	June 25	33.3	54.9	40.4
Don	32	June 22	35.9	54.2	44.9
Kelly	36	June 25	34.6	53.2	42.1
SD 87675	35	June 27	31.6	53.1	--

LSD(5%) - 9.9 Bu/Acre C.V. - 9.3% Mean - 64.8
NOTE: Plots were seeded April 10 and harvested July 24, 1991.

Meade County
(Plainview)

The Meade County trial at Plainview was seeded into fallow soil on April 18. The soil was loose with good moisture at the surface. Further moisture was received in late-April and through June. The plants were able to grow quite tall as a result of cool temperatures and intermittent rainshowers. A mid-July drought resulted in forced maturity causing low test weights and reduced yields. The data are reported in Table 22.

TABLE 22. Oat Variety Trial - Meade County (Plainview), 1990-91.

Variety	Height (Inches)	Date of Heading	Seed Color	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre 1991	Yield-Bu/Acre (2 yr ave)
Troy	38	June 23	White	32.2	68.5	51.0
Monida	35	June 21	Creamy White	27.2	65.2	48.5
Newdak	36	June 20	White	31.8	64.6	49.6
Porter	35	June 24	Lt Tan	29.6	62.9	--
Ogle	35	June 18	Yellow	30.6	60.2	--
Settler	37	June 20	White	32.2	60.2	47.4
Premier	35	June 20	Yellow	36.7	58.2	42.8
Valley	33	June 23	Ivory	33.8	54.6	44.2
Hazel	31	June 17	White	33.6	51.8	43.8
Hytest	39	June 18	Lt Cream	37.2	50.0	38.4
Burnett	38	June 18	Ivory	33.3	49.8	40.8
Don	32	June 18	White	35.9	49.1	40.0
Kelly	36	June 15	White	34.6	48.3	36.8
LSD(5%) - 10.6 Bu/Acre		C.V. - 11.0%		Mean - 57.2		

NOTE: Plots were seeded April 18 and harvested July 30, 1991.

Perkins County

Oat varieties in Perkins County were seeded near Bison on April 23. The soil had been recently tilled and was in a good state of tilth. Fall moisture was short but spring rainshowers during April, May, and early June provided sufficient moisture to produce healthy plants. Subnormal moisture in early July and high temperatures in mid-July resulted in high yields, with reduced test weights for later maturing varieties. Data are listed in Table 23.

TABLE 23. Oat Variety Trial - Perkins County (Bison), 1989-91.

Variety	Height (Inches)	Days to Heading*	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre 1991 (3 yr av)	
Monida	34	70	26.6	110.4	84.8
WIX5229-1	34	69	31.2	108.0	--
Troy	37	72	29.3	107.1	77.6
Dumont	39	66	30.2	106.2	--
Newdak	34	69	32.3	105.5	78.8
SD 87572	35	65	32.9	103.7	--
Riel	38	67	33.8	103.0	--
Valley	35	72	32.1	102.1	75.5
Settler	39	69	33.8	102.0	73.4
Porter	37	73	31.0	101.3	75.5
Robert	35	67	30.9	100.9	--
Ogle	34	67	34.1	100.0	72.1
Steele	39	71	31.4	96.7	69.1
SD 87063	37	62	33.7	96.7	--
Y933-11-2	37	63	37.4	96.2	--
Webster	33	68	34.8	95.4	67.0
Moore	40	71	32.5	93.5	70.6
Dane	35	64	33.3	92.1	--
Starter	36	65	38.0	91.8	63.0
SD 87675	36	65	34.9	90.4	--
Hyttest	38	67	40.4	88.8	65.2
Premier	36	69	38.3	88.6	--
Hamilton	33	65	34.7	84.2	62.9
Don	31	67	36.8	82.8	65.6
Burnett	35	67	36.3	79.7	62.5
Hazel	31	69	37.3	79.7	64.6
Kelly	34	64	37.6	72.6	57.6
Tibor	41	65	33.1	62.8	--
LSD(5%) - 16.6 Bu/A		C.V. - 10.8%	Mean - 94.4		

*Days to Heading - Values based on 64 days from seeding to heading.
NOTE: Plots were seeded April 23 and harvested July 31, 1991.

Spring Barley Trials

Spring barley variety trials were conducted on a cooperative basis at four locations in 1991. Soil moisture was adequate for germination and emergence at all sites. Seeding was accomplished with a six row plot seeder having an eight inch row spacing. Rate of seeding was controlled by prepackaging all seed. Fertilizer requirements were predetermined by soil test. The dates of seeding ranged from April 18 to April 30. Harvesting was completed with a self-propelled plot combine between July 21 and August 2. Trial data are reported in Tables 24 through 27.

Harding County

Experimental plots containing 11 varieties of spring barley were seeded near Ralph on April 23. Soil moisture was adequate for germination and emergence. Precipitation during late April, May, and June provided necessary moisture to produce good plant growth. Subnormal precipitation and high temperatures in mid-July resulted in fair grain yields. Weights per bushel were normal for early varieties but were below standard for later maturing varieties. The data are listed in Table 24.

TABLE 24. Spring Barley Variety Trial - Harding County (Ralph), 1989-91.

Variety	Height (Inches)	Relative Maturity*	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
					1991	(3 yr av)
Hazen	24	2	9.2	41.3	64.2	62.6
Bowman	25	-3	9.6	48.1	60.6	65.6
Robust	26	3	9.8	45.1	58.1	58.9
Gallatin	23	1	9.2	48.4	58.0	69.0
Bearpaw	28	6	10.0	44.7	56.4	--
Azure	27	3	10.6	44.2	54.0	61.1
Stark(ND 9866)	26	1	8.8	49.3	53.8	--
Excel(M52)	27	5	8.8	43.2	50.8	57.7
Bl614	27	-	9.0	43.8	50.3	--
Bl603	27	5	9.6	46.4	47.2	--
SD 71-672	24	-3	9.5	46.0	46.5	--
Bl602	27	8	7.7	43.8	46.0	55.9
Morex	27	1	9.7	42.5	42.9	51.5
LSD(5%) - 13.3 Bu/A		C.V. - 14.9%		Mean - 53.0		

*Indicates maturity based on 60 day interval between seeding and heading.
 **Percent protein was determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 24 and harvested August 1, 1991.

Meade County
 (Bear Butte Valley)

Spring barley varieties were seeded in Bear Butte Valley on April 10. The seedbed was in good condition with moisture from recent rain. Precipitation received in late April, May, and June was sufficient to carry the plants to mid-July. At that time hot weather forced the plants into maturity. The result was test weights of later maturing varieties being several pounds below standard. Data are reported in Table 25.

TABLE 25. Spring Barley Variety Trial - Meade County(Bear Butte), 1989-91.

Variety	Height (Inches)	Date of Heading	Percent Protein*	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
					1991	(3 yr av)
Excel (M52)	35	June 21	13.1	43.4	57.8	34.8
Gallatin	35	June 18	13.0	48.5	57.2	41.6
Bowman	35	June 18	12.3	51.6	54.7	44.6
Bl603	35	June 20	13.9	44.2	52.5	--
EX Bl614	34	June 21	12.2	45.4	51.8	--
Hazen	36	June 20	13.6	42.2	48.4	35.1
Robust	37	June 19	12.6	46.1	46.7	30.5
Stark(ND 9866)	34	June 20	13.2	48.3	46.6	--
SD 71-672	35	June 17	14.1	51.3	46.5	--
Azure	36	June 18	12.4	48.5	44.7	34.5
Bl602	37	June 19	13.7	42.2	44.4	30.4
Morex	36	June 19	13.8	43.5	41.9	33.0
Bearpaw	34	June 22	14.7	40.8	41.0	--
LSD(5%) - 5.0 Bu/A		C.V. - 6.1%		Mean - 48.8		

*Percent protein determined with a Technicon 300 InfraAnalyzer.
NOTE: Plots were seeded April 10 and harvested July 24, 1991.

Meade County
(Plainview)

The spring barley variety trial at Plainview was seeded on April 18. The surface soil was mellow from recent rains. Rain was received after seeding, and as intermittent showers during May and June. Drought conditions in mid-July accompanied by high temperatures resulted in premature ripening. The early maturing varieties had good test weights but late maturing varieties were up to 8 pounds below standard. Data are shown in Table 26.

TABLE 26. Spring Barley Variety Trial - Meade County(Plainview), 1990-91.

Variety	Height (Inches)	Days to Heading*	Percent Protein**	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre	
					1991	(2 yr av)
Bowman	30	65	12.5	51.5	57.7	40.1
Gallatin	32	65	13.3	48.3	53.3	37.1
Hazen	30	67	13.4	42.4	51.5	35.3
SD 71-672	31	64	13.5	52.5	48.7	--
Excel	32	68	14.1	46.5	48.7	33.3
Robust	32	66	13.5	46.4	41.6	29.3
Bl603	31	67	14.2	41.8	40.1	--
Bearpaw	32	69	15.1	42.3	39.5	28.8
Morex	34	66	13.1	47.8	39.2	29.8
Bl602	34	66	14.4	40.9	37.7	26.2
LSD(5%) - 7.9 Bu/A		C.V. - 10.1%		Mean - 45.8		

*Days from seeding to 50% headed.
**Percent protein determined with a Technicon 300 InfraAnalyzer.
NOTE: Plots were seeded April 18 and harvested July 23, 1991.

Perkins County

Spring barley plots in Perkins county were seeded on April 23. The soil had been fallowed in 1990. It contained adequate topsoil moisture for germination and emergence. Rainshowers were received during the April through June. Cool temperatures during June and early July helped the plants to continue growth until mid-July when high temperatures forced early maturity of the later varieties. The data are reported in Table 27.

TABLE 27. Spring Barley Variety Trial - Perkins County (Bison), 1989-91.

<u>Variety</u>	<u>Height (Inches)</u>	<u>Relative Maturity*</u>	<u>Percent Protein**</u>	<u>Test Wt. (Lbs/Bu)</u>	<u>Grain Yield-Bu/Acre</u>	
					<u>1991</u>	<u>(3 yr av)</u>
Bowman	31	-3	12.3	53.1	78.9	59.0
Gallatin	32	1	12.3	51.5	75.6	63.0
Excel (M52)	32	5	11.7	48.4	74.6	56.2
B1614	28	-	13.0	49.5	73.4	--
Azure	35	3	12.4	49.9	71.9	58.0
Hazen	31	2	11.7	48.6	71.4	57.9
Robust	32	3	12.1	50.5	71.3	55.2
B1602	31	8	12.0	47.7	69.8	55.5
Stark(ND 9866)	33	1	12.2	51.1	69.0	--
Bearpaw	28	6	12.2	47.0	64.5	--
B1603	33	5	13.3	48.8	62.2	--
Morex	32	1	12.0	48.6	57.3	47.6
SD 71-672	34	-3	13.7	51.2	56.4	--
LSD(5%) - 11.6 Bu/A		C.V.- 10.0%		Mean - 69.0		

*Indicates maturity based on 60 day interval between seeding and heading.
 **Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded April 20 and harvested August 2, 1990.

OILSEED CROPS

Canola

Objective: To evaluate Canola for adaptation to western South Dakota.

Meade County

Location: Tim Komes farm in Bear Butte Valley in Western Meade county.

Procedure: The variety Westar was seeded in 8 inch rows June 10, 1991. The soil was in winter wheat during the previous summer. Treflan was applied for weed control at the rate of 1 pound per acre and incorporated with a disc harrow. The plots were harvested with a Wintersteiger plot combine on October 10, 1991. The yield was 158 pounds per acre with a test weight of 50.0 pounds per bushel.

Perkins County

Location: Duane Shea farm near Bison in Perkins county.

Results:

Table 28. Canola Variety Trial - Perkins County (Bison), 1990-91.

<u>Entry Identity</u>	<u>Height (Inches)</u>	<u>Percent Shatter</u>	<u>Test Weight (Lbs/Bu)</u>	<u>Seed Yield-Lbs/Acre</u>	
				1991	(2 yr av)
NS-Alto	39	0	51.4	494	---
Legend	40	10	50.6	492	---
Westar	35	0	52.2	406	258
Global	43	0	53.2	228	---
AG0075	38	75	51.4	174	---

Mean - 359

NOTE: Plots were seeded May 8, 1991 and harvested September 10, 1991.

Safflower Varieties

Objective: To evaluate the adaptation of safflower varieties in western South Dakota.

Meade County

Procedure: The field had a good winter wheat crop in 1990 and the stubble had not been worked. The field was disked in the spring and had 1 quart per acre of Treflan applied and incorporated with a tandem disk. The plots were seeded on June 10, 1991. The stand was spotty with few weeds. Because of the late planting the plots were not harvested until October 8, 1991. The data are reported in Table 29.

Results:

Table 29. Safflower Variety Trial - Meade County(Bear Butte), 1991.

<u>Variety</u>	<u>Percent Stand</u>	<u>Height (Inches)</u>	<u>% Oil Content</u>	<u>Test Wt. (Lbs/Bu)</u>	<u>Seed Yield (Lbs/Acre)</u>
S-317*	80	17	40.3	39.2	823
Finch	80	17	38.2	40.2	758
Girard	81	18	41.9	38.0	745
Montola 2000*	76	13	40.7	38.2	719
Centennial*	79	17	41.1	39.2	718
S-541	70	18	44.7	37.5	677
S-208	74	16	39.7	36.3	663
Oker	68	16	39.3	35.0	578
LSD(5%) - 187 Lbs/Acre			C.V. - 17.9%	Mean - 635	

*High Oleic acid oil.

NOTE: Plots were seeded June 10 and harvested October 8, 1991.

Perkins County

Location: Duane Shea farm southwest of Bison, SD.

Procedure: The field, which had produced a spring wheat crop in 1990, received an application of 1 pound per acre of Treflan with tillage in the fall. Prior to seeding a second application of Treflan was incorporated with a harrow. The soil contained sufficient moisture for germination from rainfall in mid-April. Rainfall during the summer was below normal. The plots were harvested with a Hege plot combine on September 10. The yield data are reported in Table 30.

Results:

Table 30. Safflower Variety Trial - Perkins County(Bison), 1990-91.

<u>Variety</u>	<u>Percent Stand</u>	<u>Height Inches</u>	<u>% Oil Content</u>	<u>Test Wt. (Lbs/Bu)</u>	<u>Seed Yield-Lbs/A 1991</u>	<u>(2 yr av)</u>
S-317*	89	26	40.3	39.7	635	267
Girard	79	30	40.6	41.6	604	257
S-208	74	28	39.7	41.4	586	219
S-541	83	28	45.0	40.6	581	190
Mantola 2000*	93	21	37.9	37.0	570	171
Finch	80	28	37.5	43.1	549	169
Centennial*	70	26	41.3	38.7	483	163
Oker	68	25	42.2	38.5	439	136
LSD(5%) - 118 Lbs/A			C.V. - 14.5%	Mean - 556		

*High Oleic acid oil.

Discussion: The trials in Meade and Perkins counties were on recrop soil. The shortage of soil moisture under recrop conditions resulted in low yield of seed. Weed control of all trials was good, however, some hand weeding was required. The crop is adapted to the area and can be grown with normal small grain planting and harvesting equipment. Weed control is very important, therefore it is necessary to select a clean field and use a herbicide. Potential oil content and the quality of the oil in a given variety should be considered in selecting seed because of price differential when selling product.

Sunflower Varieties

Objective: To evaluate the adaptation of sunflower varieties to western South Dakota.

Meade County

Procedure: The sunflowers were seeded in 30 inch rows, with 2 rows in each plot. The field produced a crop of winter wheat in 1990 and had not been tilled. The herbicide Roundup was applied after seeding to kill any growing plants. No further weed control was used. End of season conditions indicated a heavy infestation of wild lettuce and a sunflower population of 7 thousand plants per acre. The plots were harvested with a small plot combine. The sunflowers produced 325 pounds of seed per acre with a test weight of 28 pounds.

Flax

Objective: To evaluate the adaptation of Flax varieties in western South Dakota.

Table 31. Flax Variety Trial - Harding County (Ralph), 1991.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Seed Yield (Bu/Acre)
Omega	22	48.8	22.1
Prompt	22	46.1	20.6
Verne	22	46.0	19.5
Clark	22	49.0	19.3
Nече	22	48.2	18.2
Culbert 79	20	47.9	17.5
Day	22	45.6	16.0
Rahab*	22	44.3	12.5
LSD(5%) - 2.2 Bu/Acre		C.V. - 8.2%	Mean - 18.2

*Variety had low germination and poor stand.

NOTE: Plots were seeded April 24, 1991 and harvested August 5, 1991.

Table 32. Flax Variety Trial - Perkins County (Bison), 1991.

Variety	Height (Inches)	Percent Moisture	Test Weight (Lbs/Bu)	Seed Yield (Bu/Acre)
Omega	21	5.5	45.5	20.4
Prompt	23	6.9	46.1	20.3
Clark	22	6.5	49.0	20.1
Day	21	7.8	45.6	18.8
Culbert	22	7.1	47.9	17.0
Nече	22	7.1	48.2	16.9
Verne	21	6.9	46.0	16.7
Rahab*	21	10.1	44.3	11.3
LSD(5%) - 3.0 Bu/Acre		C.V. - 11.5%	Mean - 17.7	

*Variety had low germination and poor stand.

NOTE: Plots were seeded April 23, 1991 and harvested July 31, 1991.

FORAGE PRODUCTION RESEARCH

Objective: To compare various annual crops for forage production, forage quality, and the relationship of grain to forage production.

Spring Seeded Small Grain Forage Trial

Fifteen varieties of spring seeded small grain including Barley, Oats, Hard Red Wheat, and Triticales were seeded in replicated plots at Bison in Perkins county in April of 1991. The rate of seeding in pounds per acre was: Barley - 72 lbs, Oats - 64 lbs, Spring Wheat - 60 lbs, and Triticales - 75 lbs. Plots were located in proximity of variety trials so that grain yields would be comparable. Soil moisture was adequate for germination and emergence.

The forage plots were harvested 21 days after heading when the oat seeds were in the dough stage. The seed plots were harvested for grain on July 31.

The overall results indicated that dollar returns for forage production from barley was 38% greater than for grain, Oats forage returns were 38% more than from grain, and wheat forage returns were 33% greater than from grain.

Table 33. Small Grain Forage Trial - Perkins County(Bison), 1991.

Crop & Variety	Height (Inches)	Forage Production			Grain Production	
		% Dry Matter	Percent Protein*	Yield-T/A (@ 12% H2O)	Test Wt. (Lbs/Bu)	Yield (Bu/A)
Spring Barley						
Gallatin	30	42.0	8.8	3.45	51.5	75.6
Hazen	29	46.0	9.1	3.41	48.6	71.4
SD 71-672	31	43.0	10.1	3.38	51.2	56.4
Robust	31	43.0	10.2	3.30	50.5	71.3
Bowman	28	43.0	10.8	<u>3.01</u>	53.2	<u>78.9</u>
				Mean - 3.31		70.7
Oats						
Newdak	31	42.0	8.0	3.44	32.3	105.5
Steele	34	42.0	8.1	3.12	31.4	96.7
Burnett	35	35.0	10.3	2.58	36.3	79.7
Moore	35	31.0	9.9	<u>2.33</u>	32.5	<u>93.5</u>
				Mean - 2.87		93.8
Triticales						
Winter Triticale	9	24.0	15.5	0.9	--	--
Marval	42	36.0	9.5	2.74	41.6	45.0
Grace	39	38.0	10.4	<u>2.70</u>	42.4	<u>47.8</u>
				Mean - 2.10		46.4
Spring Wheat						
Butte 86	34	43.0	8.6	3.43	58.8	39.4
Nordic	31	38.0	9.8	3.43	57.2	42.0
Guard	31	43.0	10.2	3.16	56.8	40.1
Stoa	36	41.0	11.5	<u>3.11</u>	54.0	<u>39.8</u>
				Mean - 3.28		40.3
LSD(5%) - .66 T/A		C.V. - 16.3%		Mean - 2.9	62.8	

NOTE: Plots were seeded on April 23 and harvested July 31, 1991.

Fall Seeded Small Grain Forage Trials

Eleven varieties of Fall seeded small grain including Winter wheat and Winter Triticales were seeded in replicated plots in the fall of 1990. The rate of seeding in pounds per acre was: Winter Wheat - 60 lbs, and Triticales - 75 lbs. Plots were located in proximity of variety trials so that grain yields would be comparable.

Table 34. Fall Seeded Small Grain Forage Trial - Meade County(Bear Butte), 1991.

Crop & Variety	Height (Inches)	Forage Production			Grain Production	
		% Dry Matter	Percent Protein	Yield-T/A (@ 12% H ₂ O)	Test Wt. (Lbs/Bu)	Yield (Bu/A)
Winter Triticales						
Winteri	48	46.0	6.9	3.5	44.4	30.5
Jenkins	49	36.0	9.1	2.7	44.4	42.9
Newcales	36	40.0	9.2	2.2	51.4	66.1
				Mean - 2.8		46.5
Winter Wheat						
Arapahoe	32	42.0	9.7	3.0	59.0	48.8
Sage	33	61.0	7.1	2.8	62.1	45.4
TAM 107	27	63.0	7.2	2.7	58.5	46.7
Abilene	23	56.0	8.8	2.7	56.5	38.6
Agassiz	38	44.0	9.2	2.6	58.5	30.5
Rose	31	44.0	8.4	2.4	58.3	42.2
Thunderbird	29	51.0	6.9	2.4	58.8	41.7
Norstar	39	41.0	7.5	2.2	55.5	22.3
				Mean - 2.6		39.5
Least Significant Difference(5%)				T/A - 0.5	Bu/A - 11.7	
Average Yield				2.7	43.0	

Winter Wheat Starter Fertilizer Studies

Objective: Evaluate the effect of starter fertilizer on winter survival, plant height, grain quality, and yield of hard red winter wheat.

Introduction: The use of fertilizer to increase and stabilize production, by maintaining soil nutrient level, has been practiced since the beginning of plant cultivation. The method of application, time of application, and source of nutrients have all been studied. Each with a specific objective. These studies were initiated to determine (1) the effect of starter fertilizer on winter survival, (2) the effect on yield as a result of winter survival, and (3) the effect on grain quality.

Procedure: Three sites were selected in conjunction with area winter wheat variety trials. The initial treatment consisted of the presence or absence of starter fertilizer. The liquid fertilizer (Analysis 10-34-0) was applied at the rate indicated in the tables. The second step was the application of the liquid plus a granular fertilizer. The granular fertilizer was applied at a level required to produce a response without damaging germination.

Seeding was completed during the period September 13-24, 1990. Seeding rate was established at 60 pounds per acre and was controlled by prepackaging the seed. The seeded areas were 5 feet wide by 30 feet long. They were trimmed to a 25 foot length prior to harvest. The experiment contained four replications. Harvesting was completed with a Hege 125B self-propelled plot combine.

Meade County

The hard red winter wheat variety, Thunderbird, was seeded in fallow soil at Bear Butte on September 18, 1990. All nitrogen and phosphorus was applied in liquid form. The potash and sulfur was applied as granules, at the rate specified in Table 35. The nutrient content of the soil was above that required for a 40 bushel yield.

TABLE 35. Starter Fertilizer Demonstration with Hard Red Winter Wheat - Meade County (Bear Butte Valley), 1990-1991.

Treatment	Percent Stand*		Date of Heading	Percent Protein**	Test Wt (Lbs/Bu)	Grain Yield-Bu/A	
	11/90	5/91				1991	(2 yr av)
0- 0- 0	15	58	June 9	13.0	59.7	25.4	30.4
12-41- 0	14	48	June 8	13.5	60.2	31.4	32.2
12-41-20	16	41	June 8	11.8	60.0	27.4	31.4
0-41- 0	14	33	June 7	13.5	59.5	29.4	--
12-41- 0 +S	20	51	June 7	12.4	60.4	31.2	32.1
12-41-20 +S	24	60	June 7	13.3	60.0	35.6	33.9

LSD(5%) - 5.4 Bu/A

C.V. - 11.9%

Mean - 30.1

*Percent stand determined by visual observation.

**Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded September 18, 1990 and harvested July 19, 1991.

(Table 35 Continued)

Soil Analysis Data:

Nutrient	Pounds per Acre			
	Nitrogen	Phosphorus	Potash	Sulfur
In Soil	153	88	1760	104
Pounds Added*	12	41	20	20
Required for 40 Bu Yield	96	40	275	10

*Added pounds of nutrient indicated only to those plots receiving a specific treatment.

Results

Soil nutrient levels at this site were sufficient to produce the anticipated yield goal under normal moisture conditions. However, total rainfall for the year was 3.2 inches below normal. Useable rainfall for the period of April through July was 11.7 inches. Average air temperatures were slightly below normal in April, and were slightly above normal in May and June, but were high during mid-July. Due to the high nutrient content of the soil, the yield differences were not large. The major increases are due to a combination of nitrogen and phosphorus fertilizer. The data are reported in Table 35.

Meade County
(Plainview)

The hard red winter wheat variety Thunderbird was seeded in fallow soil at Plainview on September 18, 1990. The experiment contained four replications. All nitrogen and phosphorus was applied in liquid form. The potash and sulfur was applied as granules, at the rate specified in Table 36. The nitrogen fertilizer in the soil was sufficient nutrient for the wheat to produce a grain yield of 40 bushels per acre.

TABLE 36. Starter Fertilizer Demonstration with Hard Red Winter Wheat - Meade County (Plainview), 1991.

Treatment	Percent Stand*		Height (Inches)	Percent Protein**	Test Wt (Lbs/Bu)	Grain Yield (Bu/Acre)
	11/90	7/91				
0- 0- 0	8	68	31	16.5	53.9	18.0
12-41- 0	1	83	31	17.1	51.1	19.3
12-41-20	4	73	31	16.5	54.5	23.4
0-41- 0	0	76	31	16.8	51.5	20.4
12-41- 0 +S	1	74	32	16.2	51.2	20.4
12-41-20 +S	0	74	31	16.5	51.4	18.5
LSD(5%) - 5.4 Bu/A		C.V. - 17.8%		Mean - 20.0		

*Percent stand determined by visual observation.

**Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded on September 18, 1990 and harvested July 23, 1991.

(Table 36 Continued)

Soil Analysis Data:

Nutrient	Pounds per Acre		
	Nitrogen	Phosphorus	Potash
In Soil	102	60	990
Pounds Added	12	41	0
Required for 40 Bu Yield	96	40	275

Soil nutrient levels at this site were sufficient to produce the anticipated yield goal without additional fertilizer. Rainfall was sufficient only to produce wheat yields of 24 bushel per acre in adjacent plots. The lower yields received at this location were due to poor winter survival. The plots were harvested on July 23, 1991. Data are reported in Table 36.

Perkins County

The hard red winter wheat variety TAM 107 was seeded in fallow soil at Bison in September 20, 1990. All nitrogen and phosphorus was applied in liquid form.

The potash and sulfur was applied as granules, at the rate specified in Table 37. The total fertilizer applied raised the nutrient content in the soil to the yield goal level of 35 bushel per acre.

TABLE 37. Starter Fertilizer Demonstration with Hard Red Winter Wheat - Perkins County(Bison), 1990-91.

Treatment	Percent Stand*		Height (Inches)	Percent Protein**	Test Wt (Lbs/Bu)	Grain Yield-Bu/A	
	11/90	5/91				1991	(2 yr av)
0- 0- 0	39	71	24	13.5	56.4	18.8	22.8
12-41- 0	36	76	27	12.8	56.2	25.8	25.4
12-41-20	34	74	25	13.0	55.7	23.4	--
0-41- 0	34	74	25	13.0	55.7	23.4	--
12-41- 0 +S	38	64	25	11.9	56.3	24.2	24.0
12-41-20 +S	41	74	26	12.8	56.6	25.8	--
LSD(5%) - 5.8 Bu/A			C.V. - 15.9%		Mean - 24.0		

*Percent stand determined visually.

**Percent protein determined with a Technicon 300 InfraAnalyzer.

NOTE: Plots were seeded September 20, 1990 and harvested July 30, 1991.

(Table 37 Continued)

Soil Analysis Data:

Nutrient	Pounds per Acre			
	Nitrogen	Phosphorus	Potash	Sulfur
In Soil	49	26	990	56
Pounds Added*	12	41	20	20
Required for 35 Bu/A Yield	84	40	275	9

*Added pounds of nutrient indicated only to those plots receiving a specific treatment.

Results:

The winter wheat starter fertilizer study at Bison was seeded in late September 1990. The seedbed was loose with some topsoil moisture available. Fall stands averaged 35% and spring stands near 75%. Rainfall was below normal from March through July. Data are reported in Table 37.

Summary: The use of starter fertilizer generally results in better fall emergence and winter survival. The increase in survival was associated with the addition of phosphorus which favors root growth. Larger root masses permit more water intake resulting in less plant dehydration and eventual death. Increase in yield was also associated with phosphorus application. The difference in yield of unfertilized and fertilized was very small as should be expected when the nutrient levels in the soil are high enough so as to be readily available. However, longtime yield (Tables 35 & 37) increases favor the use of starter fertilizer. Test weights (Table 35) were increased by application of starter fertilizer. The increase appears to have been the result of delayed drying thus favoring further kernel development and normal maturity.

