

WEST RIVER AGRICULTURAL RESEARCH AND EXTENSION CENTER  
CROPS AND SOILS RESEARCH

Rapid City, South Dakota

INTRODUCTION

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

This Research Project serves the western part of the state and does not have research plots at one central location. It is unique in that all experimental plots are cooperative with farmers, ranchers, crop improvement associations, and county agents, are initiated at their request, and are conducted at one site for no longer than usually a three year period.

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 incomplete work nor work conducted by projects headquartered from the campus at Brookings.

FIELD PLOT COOPERATORS

<u>Name</u>	<u>Address</u>	<u>County</u>
County Crop Impr Ass'n	Martin 57551	Bennett
Art Ollila	Newell 57760	Butte
Jim & Vic Hulm	Timber Lake 57656	Dewey
Walt Johnson	Firesteel 57628	Dewey
Jerry Patterson	Phillip 57567	Haakon
Willard Korsma	Reeder ND 58649	Harding
John Niemi	Buffalo 57720	Harding
Frank Smolnik	Buffalo 57720	Harding
Lawrence Brown	Buffalo 57720	Harding
Fred Beets	Spearfish 57783	Lawrence
Lon Bachand	Sturgis 57785	Meade
Robert Grubl	Sturgis 57785	Meade
Charles Hawks	Plainview 57771	Meade
Joe Komes	Sturgis 57785	Meade
Ted Brockel	Bison 57620	Perkins
County Crop Impr Ass'n	Bison 57620	Perkins
Louis Twiss	Pine Ridge 57770	Shannon
Herman Rosenau	Glad Valley 57629	Ziebach
Jake Schauer	Dupree 57623	Ziebach

This is annual report and results published herein are therefore neither complete nor conclusive. 1600 copies printed at an estimated cost of 15¢ each.

# TABLE OF CONTENTS

	Page
Introduction . . . . .	Cover
<b>Weather Summary</b>	
Bennett County . . . . .	4
Butte County . . . . .	4
Haakon County . . . . .	4
Harding County . . . . .	5
Lawrence County . . . . .	5
Meade County . . . . .	5
Perkins County . . . . .	5
Shannon County . . . . .	5
Ziebach County . . . . .	6
<b>Small Grain Variety Trials</b>	
<b>Winter Wheat</b>	
Bennett County . . . . .	8
Haakon County . . . . .	9
Lawrence County . . . . .	10
Meade County . . . . .	11-12
Ziebach County . . . . .	13
<b>Spring Wheat</b>	
Bennett County . . . . .	15, 18
Harding County . . . . .	15
Meade County . . . . .	16, 18
Ziebach County . . . . .	17, 19
<b>Oats</b>	
Bennett County . . . . .	20
Harding County . . . . .	20
Meade County . . . . .	21
Ziebach County . . . . .	22
<b>Spring Barley</b>	
Bennett County . . . . .	23
Harding County . . . . .	23
Meade County . . . . .	24
Ziebach County . . . . .	24
<b>Triticales</b>	
Bennett County . . . . .	25
Meade County . . . . .	25, 26
<b>Sorghum Variety Testing</b>	
<b>Grain Sorghum</b>	
Meade County . . . . .	26
Perkins County . . . . .	26
<b>Forage Sorghum</b>	
Meade County . . . . .	28
Perkins County . . . . .	30
<b>Sorghum-Sudan</b>	
Meade County . . . . .	29
Perkins County . . . . .	30-31
<b>Sudangrass</b>	
Meade County . . . . .	29
Perkins County . . . . .	31
<b>Corn Variety Trial</b>	
Perkins County . . . . .	32

<b>Specialty Crop Testing</b>	
<b>Safflower Variety Trial</b>	
Perkins County . . . . .	33
<b>Sunflower Variety Trial</b>	
Shannon County . . . . .	34
<b>Management, Tillage, and Cultural Practices</b>	
<b>Rate of Seeding Spring Wheat</b>	
Bennett County . . . . .	35
Meade County . . . . .	36
<b>Rate of Seeding Winter Wheat</b>	
Haakon County . . . . .	37
<b>No-Till Studies with Winter Wheat</b>	
Harding County . . . . .	37
<b>Fertilizer Studies on Winter Grain</b>	
<b>Influence of Fertilizer on Grain Yield of HRW Wheat</b>	
Bennett County . . . . .	38
Haakon County . . . . .	40
<b>Fertilizer Studies on Spring Grain</b>	
<b>Spring Barley Variety Fertilizer Demonstration</b>	
Bennett County . . . . .	41
Ziebach County . . . . .	42
<b>Oat Variety Fertilizer Demonstration</b>	
Bennett County . . . . .	43
Ziebach County . . . . .	44
<b>Spring Wheat Variety Fertilizer Demonstration</b>	
Bennett County . . . . .	45
Ziebach County . . . . .	46
<b>Fertilizer Studies on Specialty Crops</b>	
<b>Safflower Fertilizer Study</b>	
Perkins County . . . . .	47
<b>Crop Disease Control</b>	
<b>Effects of Date of Seeding and Seed Treatment on HRW Wheat</b>	
Bennett County . . . . .	48
Meade County . . . . .	50

The following County Extension Agents assisted in locating cooperators and conducting the research: Gary C. Nies-Martin, Don E. Anderson-Philip, Roger E. Moul-Buffalo, Ray Rezek-Spearfish, Thomas C. Warren-Sturgis, Elbert Bentley-Bison, and Ronald E. Schremp-Dupree.

The results reported in this pamphlet were funded under Plant Science Project 7110-971. Research was conducted by H. A. Geise-Project Leader, J. R. Johnson-former Extension Agronomist and now Extension Range Specialist, J. R. Bishop-Assistant in Plant Science, and D. B. Hewlett-Assistant in Plant Science of Rapid City, and in conjunction with P. D. Carson, D. J. Reid, D. L. Reeves, P. B. Price, D. L. Kelm, D. G. Wells, J. D. Colburn, J. B. Weber, J. J. Bonnemann, E. P. Adams, and E. J. Williamson of Brookings.

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

Month & Year	Average Temperature*	Departure from Normal**	Total Precipitation*	Departure from Normal**
Martin (Bennett County reporting station)				
August 1976	73.5	1.2	2.83	0.75
September 1976	64.4	2.9	1.64	0.22
October 1976	46.8	-3.9	0.64	-0.40
November 1976	30.8	-4.8	0.15	-0.20
December 1976	27.4	0.7	0.33	0.04
January 1977	19.1	-7.4	0.25	-0.04
February 1977	34.7	8.0	0.49	0.08
March 1977	34.3	2.2	5.08	4.41
April 1977	50.3	4.5	1.64	-0.01
May 1977	62.4	6.3	5.05	2.10
June 1977	71.1	5.9	3.68	-0.20
July 1977	75.8	2.5	1.55	-0.91
Bear Butte Valley (Vale reporting station)				
August 1976	72.2	1.3	0.86	-0.42
September 1976	62.3	3.0	0.32	-1.07
October 1976	44.7	-3.7	0.58	-0.32
November 1976	29.3	-4.3	0.60	-0.05
December 1976	26.2	2.3	0.39	0.04
January 1977	11.6	-7.8	0.76	0.38
February 1977	33.4	9.3	0.66	0.21
March 1977	36.1	5.0	3.63	2.91
April 1977	48.5	2.7	0.91	-1.09
May 1977	62.7	6.8	1.41	-1.53
June 1977	70.0	5.4	1.15	-2.66
July 1977	73.9	1.5	1.70	-0.20
August 1977	6.63m	-4.6	4.27	2.99
September 1977	60.1m	0.8	2.11	0.72
Phillip (Haakon County reporting station)				
August 1976	75.5	1.8	0.81	-0.81
September 1976	64.0	2.5	0.49	-0.69
October 1976	46.0	-4.0	0.29	-0.49
November 1976	29.0	-5.4	0.06	-0.26
December 1976	23.8	0.4	0.18	-0.12
January 1977	10.2	-12.2	0.35	0.07
February 1977	32.2	8.9	0.19	-0.12
March 1977	35.8	5.3	2.45	1.80
April 1977	50.7	4.9	1.19	-0.31
May 1977	64.1	7.4	5.05	2.37
June 1977	71.3	5.1	1.69	-2.10
July 1977	75.3m	0.6	2.29	0.58

\* Average temperatures and total precipitation obtained from NOAA climatological data for reporting station nearest the experimental sites.

\*\*Departures from normal are based on records for the period 1941-1970.

m=one to ten days of data missing for the month.

Note: Temperatures are reported in degrees Fahrenheit and precipitation in inches.



Table 1. Continued.

Month & Year	Average Temperature*	Departure From Normal**	Total Precipitation*	Departure From Normal**
Ludlow (Harding County reporting station)				
March 1977	35.7	8.2	1.40	0.94
April 1977	51.1m	8.7	0.04	-1.35
May 1977	62.3	9.2	1.62	-0.69
June 1977	68.4	6.6	2.44	-1.73
July 1977	71.8	2.1	1.61	-0.24
Spearfish (Lawrence County reporting station)				
August 1976	71.2	0.9	0.52	-1.08
September 1976	62.5	2.9	0.84	-1.07
October 1976	44.5	-5.5	0.77	-0.44
November 1976	33.7	-2.3	0.80	-0.52
December 1976	32.0	3.1	0.35	-0.42
January 1977	17.2	-7.3	0.55	-0.18
February 1977	36.2	8.4	0.82	0.05
March 1977	35.3m	3.5	4.29	2.63
April 1977	49.4	4.8	1.48	-1.09
May 1977	60.6	6.2	2.16	-1.48
June 1977	68.9	6.2	1.93	-2.67
July 1977	72.6	1.6	2.46	0.77
Plainview (Meade County reporting station)				
August 1976	76.0m	-	1.64	-
September 1976	65.9	-	0.05	-
October 1976	43.8	-	0.10	-
November 1976	30.5	-	0.09	-
December 1976	23.1m	-	0.10	-
January 1977	8.4	-	0.40	-
February 1977	30.8	-	0.31	-
March 1977	36.5	-	2.78	-
April 1977	50.4	-	0.81	-
May 1977	64.6	-	3.03	-
June 1977	72.9	-	1.42	-
July 1977	78.3	-	1.32	-
Bison (Perkins County reporting station)				
March 1977	34.4	-	1.93	1.20
April 1977	49.2	-	0.49	-1.11
May 1977	61.8	-	1.23	-1.30
June 1977	69.0	-	1.81	-2.14
July 1977	72.4	-	4.21	2.16
August 1977	64.7	-	2.07	0.26
September 1977	57.5	-	4.18	2.88
Porcupine (Shannon County reporting station)				
March 1977	37.6	-	3.63	-
April 1977	50.9m	-	2.00	-
May 1977	63.5	-	3.46	-
June 1977	71.7	-	2.25	-
July 1977	77.6m	-	4.92	-
August 1977	68.3	-	3.34	-
September 1977	65.3	-	1.34	-

Table 1. Continued

Month & Year	Average Temperature*	Departure From Normal**	Total Precipitation*	Departure From Normal**
Spring (Ziebach County reporting station)				
August 1976	75.2	2.6	0.82	-0.76
September 1976	64.4	3.6	0.76	-0.40
October 1976	46.3	-3.3	0.31	-0.56
November 1976	28.6m	-4.3	0.11	-0.35
December 1976	22.8	1.3	0.14	-0.19
January 1977	7.5	-8.2	0.32	-0.12
February 1977	30.1	9.7	0.44	-0.02
March 1977	37.6	8.7	2.95	2.22
April 1977	51.7	6.6	0.39	-1.35
May 1977	64.7	8.6	3.06	0.48
June 1977	70.8m	5.7	5.48	1.95
July 1977	74.9	1.4	3.16	1.33
Gladi Valley (Ziebach County reporting station)				
March 1977	35.9m	-	1.45	-
April 1977	49.9	-	0.75	-
May 1977	63.5m	-	3.30	-
June 1977	68.1m	-	3.85	-
July 1977	73.0m	-	3.24	-

\* Average temperatures and total precipitation obtained from NOAA climatological data for reporting station nearest the experimental sites.

\*\*Departures from normal are based on records for the period 1941-1970.

m=one to ten days of data missing for the month.

Note: Temperatures are reported in degrees Fahrenheit and precipitation in inches.

Table 2. Weather Data - Date of Critical Temperatures and Total Usable Precipitation in Counties with Experimental Plots, 1976-77.

Location	Date of Temperature*		Total Usable Moisture**	
	Fall-First	Spring-Last	Aug 76-Jul 77	Mar 77-Jul 77
Bennett County (Martin)	Oct 15, 76	Apr 5, 77	15.68	12.02
Haakon County (Phillip)	Sep 27, 76	Apr 6, 77	9.02	8.46
Harding County (Ralph)	---	Apr 28, 77	--	8.97
Lawrence County (Spearfish)	Oct 15, 76	Apr 4, 77	9.40	8.20
Meade County (Vale)***	Sep 27, 76	Apr 7, 77	6.34	5.54
(Plainview)	Sep 27, 76	Apr 5, 77	7.07	5.81
Perkins County (Bison)	---	Apr 13, 77	--	9.38****
Shannon County (Porcupine)	---	Apr 7, 77	--	12.10****
Ziebach County (Dupree)	Oct 5, 76	Apr 5, 77	11.40	10.91
(Glad Valley)	---	Apr 6, 77	--	8.55

\* First 28° temperature in Fall or last 28° in Spring.

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

\*\*\* Vale was used as reporting point for Bear Butte Valley even though it is located in Butte County.

\*\*\*\*Covers period 1 March 77 through 30 September 1977.

### SMALL GRAIN VARIETY TRIALS

Objective: To observe and compare small grain varieties and experimental strains for winterhardness, grain yield, disease resistance, and other characteristics for area adaptability.

#### Hard Red Winter Wheat

Plots were located in Bennet, Haakon, Lawrence, Meade, and Ziebach counties. All trials were seeded in non-fertilized fallow with a deep furrow drill. The seeding rate averaged 60 pounds per acre.

None of the locations were damaged by hail, but some received wind damage. Moisture was adequate at most points during the growing season. The plots were harvested with a Massey-Ferguson Model 35 self-propelled combine. Machine harvested areas contained a minimum of 150 square feet per sample.

The results from the trials conducted in 1977 are reported in Tables 3 thru 8.

Table 3. Hard Red Winter Wheat Variety Performance Test - Bennett County (Martin Airport) - 1975-77.

Variety	Height (Inches)	Rust Reaction <sup>*</sup>		Wheat Streak Mosaic <sup>*</sup>	Percent Shatter	Percent <sup>**</sup> Protein	Test Wt (Lb/Bu)	Grain Yield-Bu/A	
		Leaf	Stem					1977	(3 yr. av.)
Lindon	32	S	MR	S	0	13.8	56.7	54.9	---
Sage	39	MS	R	MR	2	14.2	56.2	54.5	42.7
Eagle	35	S	R	MR	2	15.4	55.7	53.2	38.2
Scout 66	38	S	MR	MR	2	13.5	57.0	51.4	39.5
Lancota	36	MR	R	MR	2	14.3	57.0	49.6	31.4+
Gent	41	R	R	MR	5	15.4	56.0	48.8	38.5
Rail	37	MS	R	MR	2	13.8	56.8	48.7	---
Agate	40	S	R	MS	2	15.3	56.8	48.6	34.6+
Homestead	33	S	R	S	0	14.6	56.7	47.7	36.1
Centurk	35	MS	R	MS	0	13.8	55.5	46.8	38.9
Yona	30	R	R	S	0	13.8	53.0	46.7	---
Sentinel	35	S	R	MS	0	14.9	55.7	44.1	37.4
Rough Rider	37	S	R	S	0	15.2	57.0	43.6	---
Gage	39	MR	R	S	2	15.3	55.7	43.1	33.8
Stud	40	MR	R	-	2	15.8	56.8	43.0	29.8+
Kirwin	38	MR	S	MS	2	15.4	56.5	42.8	37.4
Hiplains	37	MR	R	S	5	15.6	56.2	42.7	36.5
Bronze	37	MR	R	S	0	14.8	56.8	42.3	33.3
Winoka	40	S	R	S	0	13.6	57.7	42.0	35.8
Cloud	35	MR	R	MR	2	15.0	55.7	41.8	39.0
TAM 101	27	S	S	MR	0	13.7	54.3	41.4	37.8
Buckskin	37	S	R	MS	2	12.4	55.2	41.2	37.8
Scoutland	37	S	R	MR	2	15.2	56.8	40.6	27.8+
Lancer	42	S	R	MS	2	14.0	56.8	39.7	36.6
Synthetic	36	Mixed	R	R	0	12.3	56.2	39.3	28.4+
Baca	36	S	R	MR	2	13.6	56.7	36.8	35.2
Trison	36	S	S	S	0	14.7	55.3	29.5	32.0

LSD(05) - 8.9 Bu/A

C.V. - 12.2%

Average - 51.6

Note: Yield data presented within the table are averages of three replications. Plot size was 6' x 50' with 12 inch spaced rows. Seeded on 22 September 1976 and harvested on August 11, 1977. Seeding rate was 60 pounds per acre.

Fallowed soil was cloddy on surface at seeding time.

\* Letter indicates reaction to disease: S-susceptible, MS-moderately susceptible, MR-moderately resistant, R-resistant, Tol-tolerant.

\*\* Protein content was calculated from Kjeldahl analysis and is reported on an oven-dry basis.

+ Two year average only (1976-77).



Table 4. Hard Red Winter Wheat Variety Performance Test - Haddon County (Phillip) - 1977.

Variety	Height (Inches)	Rust Loaf	Reaction <sup>a</sup> Stem	Wheat Streak Necrotic <sup>a</sup>	Percent Shatter	Percent <sup>**</sup> Protein	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Hiplains	33	MR	R	S	3	15.4	58.0	54.3
Sage	33	MS	R	MR	0	15.1	58.3	51.0
Rail	32	MS	R	MR	0	15.0	58.0	51.0
Lancer	33	S	R	MS	3	15.0	59.5	49.9
Scout 66	33	S	MR	MR	2	14.8	58.3	48.6
Gent	32	R	R	MR	0	14.9	58.2	48.6
Buckskin	33	S	R	MS	0	15.2	57.7	48.5
Sentinel	31	S	R	S	3	15.0	57.5	48.4
Agate	32	S	R	MS	0	15.3	58.3	48.0
Winoka	37	S	R	S	0	15.8	58.3	48.0
TAM 101	26	S	S	MR	0	14.6	57.0	48.0
Cloud	30	MR	R	MR	2	15.6	59.0	47.6
Synthetic	32	Mixed	R	R	3	15.3	57.7	47.5
Gage	34	MR	R	S	3	16.2	57.3	47.5
Roughrider	36	S	R	S	2	16.7	59.5	46.1
Baca	32	S	R	MR	0	14.9	58.7	45.7
Scoutland	32	S	R	MR	3	15.1	59.0	45.5
Lindon	26	S	MR	S	0	14.1	59.2	44.4
Centurk	32	MS	R	MS	0	15.5	57.2	44.4
Homestead	28	S	R	S	2	16.0	56.0	43.9
Vona	25	R	R	S	0	14.2	58.0	43.5
Kirwin	32	MR	S	MS	2	15.6	60.2	43.0
Lencota	34	MR	R	MR	2	16.5	58.0	42.6
Trison	31	S	S	S	5	14.4	58.8	42.1
Eagle	31	S	R	MR	0	15.6	58.0	39.2
Bronze	33	MR	R	S	0	16.0	54.5	37.7
Stud	31	MR	R	---	0	16.6	59.0	33.9

LSD(05) - 6.8 Bu/A

C.V. - 9.0%

Average - 45.9

Note: Yield data presented within the table are averages of three replications. Plot size was 6' x 50' with 12 inch spaced rows. Seeded on September 17, 1976 and harvested on July 22, 1977. Seeding rate was 60 pounds per acre. Fallowed soil was dry requiring seed to be placed deeper than normal.

\* Letter Indicates reaction to disease: S-susceptible, MS-moderately susceptible, MR-moderately resistant, R-resistant, Tol-tolerant.

\*\*Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an over-dry basis.

Table 5. Hard Red Winter Wheat Variety Performance Test - Lawrence County (Spearfish) - 1974-77

Variety	Height (Inches)	Rust Reaction*		Wheat Streak Mosaic*	Percent Moisture	Percent** Protein	Test Wt. (Lbs/Bu)	Grain Yield-Bu/Acre 1977	Yield-Bu/Acre (4 yr av)
		Leaf	Stem						
Baca	38	S	R	MR	8.0	12.7	63.7	58.2	52.3
Bronze	39	MR	R	S	7.6	12.8	62.7	56.2	51.5
Buckskin	36	S	R	MS	7.2	12.4	62.7	56.1	55.1
Lancer	39	S	R	MS	7.8	11.7	63.5	55.7	52.3
Vona	32	R	R	S	7.8	13.0	65.2	54.4	--
Scout	37	S	MR	MR	8.0	13.7	63.7	53.6	54.2
TAM 101	29	S	S	MR	7.9	15.8	63.0	53.6	48.7
Centurk	36	MS	R	MS	8.0	12.6	62.7	52.2	56.5
Rail	38	MS	R	MR	8.4	12.5	64.2	52.0	--
Gent	36	R	R	MR	7.7	12.9	63.5	51.9	47.8
Homestead	34	S	R	S	7.2	14.1	62.7	51.7	--
Sage	38	MS	R	MR	8.0	14.5	63.7	51.2	54.1
Hiplains	36	MR	R	S	6.2	13.9	62.5	49.8	52.3
Winoka	41	S	R	S	7.8	14.8	65.0	49.0	49.1
Scoutland	38	S	R	MR	6.2	13.8	63.0	49.0	--
Lindon	36	S	MR	S	8.0	12.3	64.0	48.3	--
Trison	39	S	S	S	7.5	15.0	63.5	48.1	46.4
Eagle	36	S	R	MR	6.9	13.2	63.0	46.2	49.4
Froid	42	S	MR	S	7.3	13.9	61.7	42.8	--

LSD(05) - 4.5 Bu/A

C.V. - 4.0%

Average - 51.6

Note: Yield data presented within the table are averages of two replications. Plot size was 5' x 40' with 10 inch spaced rows. Seeded on September 17, 1976 and harvested on July 18, 1977. Seeding rate was 60 pounds per acre. Soil moisture was sufficient for germination although precipitation during the late summer was below normal.

\* Letter indicates reaction to disease: S-susceptible, MS-moderately susceptible, MR-moderately resistant, R-resistant Tol-tolerant.

\*\*Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Table 6. Hard Red Winter Wheat Variety Performance Test - Meade County (Bear Butte Valley) - 1974-77.

Variety	Height (Inches)	Rust Reaction*		Wheat Streak Mosaic*	Percent Shatter	Percent** Protein	Test Wt (Lbs/Bu)	Grain Yield-Bu/A	
		Leaf	Stem					1977	(4 yr Av)
Sage	32	MS	R	MR	0	14.8	58.2	42.6	49.4
Rail	33	MS	R	MR	0	14.0	53.0	41.8	--
Scout 66	36	S	MR	MR	5	14.9	59.2	40.9	49.3
TAM 101	28	S	S	MR	10	15.0	58.0	40.8	47.9
Gent	36	R	R	MR	0	14.9	56.5	38.8	42.0+
Centurk	34	MS	R	MS	0	15.2	59.5	37.6	53.0
Homestead	28	S	R	S	0	15.9	56.8	37.0	48.6
Trison	35	S	S	S	0	15.4	58.0	36.5	43.0+
Buckskin	34	S	R	MS	10	17.0	57.5	36.2	48.4
Winoka	38	S	R	S	20	15.4	58.8	34.6	47.7
Scoutland	34	S	R	MR	5	15.4	57.8	32.8	38.4+
Eagle	30	S	R	MR	0	15.1	57.0	30.4	46.0
Bronze	34	MR	R	S	10	15.2	58.5	30.0	41.8
Hipplains	35	MR	R	S	15	12.9	57.5	29.0	44.8
Vona	28	R	R	S	10	13.7	57.2	28.7	--
Baca	32	S	R	MR	10	12.7	57.0	28.1	37.2+
Lancer	37	S	R	MS	25	14.9	58.5	27.9	48.2
Lindon	32	S	MR	S	10	14.2	56.8	19.2	--
Teton	37	-	-	-	35	17.5	55.5	16.9	--
Froid	32	S	MR	S	10	16.0	56.0	15.4	--

LSD(05) - 5.2 Bu/A

C.V. - 7.6%

Average - 32.3

Note: Yield data presented within the table are averages of two replications. Plot size was 6' x 50' with 14 inch row spacing. Seeded in fallow on September 14, 1976 at the rate of 60 pounds per acre. Adequate soil moisture was available for germination and emergence. Plots were harvested on July 30, 1977.

\* Letter indicates reaction to disease: S-susceptible, MS-moderately susceptible, MR-moderately resistant, R-resistant, Tol-tolerant.

\*\*Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

+ Symbol indicates a two year average (1976-77).



Table 7. Hard Red Winter Wheat Variety Performance Test - Meade County (Plainview) - 1977

Variety	Height (Inches)	Rust Reaction*		Wheat Streak Mosaic*	Percent Shatter	Percent** Protein	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
		Leaf	Stem					
Buckskin	34	S	R	MS	5	15.4	57.7	46.5
Eagle	32	S	R	MR	10	17.7	58.2	43.0
Homestead	30	S	R	S	5	16.0	58.0	42.6
TAM 101	25	S	S	MR	5	15.4	56.5	42.6
Hiplains	32	MR	R	S	10	16.1	59.2	42.4
Sage	32	MS	R	MR	5	15.8	57.0	41.4
Gent	31	R	R	MR	10	15.4	58.0	39.7
Rail	28	MS	R	MR	10	15.3	57.0	39.7
Vona	25	R	R	S	5	14.8	57.0	39.4
Baca	34	S	R	MR	10	15.8	57.5	38.8
Scout 66	34	S	MR	MR	5	15.7	57.0	38.8
Lindon	25	S	MR	S	0	14.6	57.7	37.6
Centurk	31	MS	R	MS	0	14.4	58.5	37.2
Trison	31	S	S	S	0	15.1	58.0	37.2
Lancer	34	S	R	MS	5	15.4	60.0	36.2
Scoutland	32	S	R	MR	5	16.2	57.7	35.0
Winoka	36	S	R	S	5	15.9	57.0	32.1
Bronze	32	MR	R	S	5	16.1	56.2	30.6
Froid	34	S	MR	S	10	17.1	54.5	29.4
Teton	38	-	-	-	15	15.7	54.0	28.2

LSD(05) = 13.7 Bu/A

C.V. = 17.2%

Average = 38.0

Note: Yield data presented within the table are averages of two replications. Plot size was 6' x 50' with 12 inch row spacing. Seeded in fallow on September 17, 1976 at the rate of 58 pounds per acre. Soil moisture was adequate for germination and emergence. Plots were harvested on July 29, 1977.

\* Letter indicates reaction to disease: S-susceptible, MS-moderately susceptible, MR-moderately resistant, R-resistant, Tol-tolerant.

\*\*Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.



Table 8. Hard Red Winter Wheat Variety Performance Test - Ziebach County (Dupree) - 1976-77.

Variety	Height (Inches)	Rust Reaction*		Wheat Streak Mosaic*	Percent Moisture	Percent Protein	Test Wt (Lbs/Bu)	Grain Yield-Bu/A	
		Leaf	Stem					1977	(2 yr av)
Rall	29	MS	R	MR	12.4	13.0	58.2	30.1	--
Lancota	28	MR	R	MS	12.1	15.7	57.0	26.6	35.4
Lancer	30	S	R	MS	12.0	13.8	58.0	24.2	38.4
Sage	24	MS	R	MR	12.9	15.0	56.2	24.1	37.0
Centurk	24	MS	R	MS	11.8	14.2	57.5	23.4	36.3
Sentinel	24	S	R	S	12.1	13.8	56.7	22.9	34.6
Eagle	26	S	R	MR	11.9	15.9	58.0	22.8	33.4
Kirwin	21	MR	S	-	12.5	15.4	58.5	22.3	33.4
Scoutland	26	S	R	MR	12.0	15.9	56.2	21.2	32.8
Gent	23	R	R	MR	12.4	15.0	56.5	20.9	33.3
Trison	26	S	S	S	13.2	13.1	56.5	20.8	31.8
Scout 66	24	S	MR	MR	11.8	15.0	57.5	20.7	35.6
Cloud	25	MR	R	MR	13.0	15.4	57.5	20.6	28.7
Buckskin	29	S	R	MS	13.4	15.1	57.0	20.4	35.1
Hiplains	26	MR	R	S	12.2	15.2	56.7	20.2	32.4
Winoka	32	S	R	S	13.7	13.8	57.0	20.0	33.3
TAM 101	22	S	S	MR	13.2	12.8	55.2	20.0	31.6
Lindon	20	S	MR	S	11.9	15.0	58.5	18.0	--
Bronze	28	MR	R	S	12.6	15.6	55.7	17.2	24.3
Agate	26	S	R	MS	13.8	15.1	55.0	16.3	--
Gage	22	MR	R	S	12.7	15.1	56.5	15.7	28.7
Homestead	20	S	R	S	13.5	15.8	54.7	15.2	30.7

LSD (05) - 5.2 Bu/A

C.V. - 11.9%

Average - 21.1

Note: Yield data presented within the table are averages of two replications. Plot size was 8' x 50' with 13.5 inch row spacing. Seeded in fallow on October 4, 1976 at the rate of 45-60 pounds per acre. Plots were harvested on July 20, 1977 with a MHF SP-35 combine.

\* Letter indicates reaction to disease: S-susceptible, MS-moderately susceptible, MR-moderately resistant, R-resistant, Tol-tolerant.

\*\*Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

## DISCUSSION:

Winter wheat plots in Bennett county (table 3) produced an excellent grain yield. The average, 51.6 Bu/Acre, was considerably higher than those of the last 3 years. The precipitation in the fall of 1976 was above normal which resulted in good germination and emergence of vigorous seedlings. Spring moisture was excellent with heavy snow in March, and above normal rain in May. Foliage was heavy and heads were well filled with plump kernels. Test weights were reduced by several pounds because of equipment problems which delayed harvest until several weeks after the grain was mature.

The trial in Haakon county (table 4) was seeded in mid-September 1976. Soil moisture was very limited resulting in poor germination and emergence. Heavy snow in March and good rains in May resulted in heavy tillering and consequently good grain yield at harvest.

The variety demonstration plots in Lawrence county (table 5) were seeded on September 17, 1976. Soil moisture was limiting during the germination and emergence period. However, good moisture during March provided a reserve for the rest of the season. The yields were excellent with the average being higher than those of the last two years, and equal to that of 1974. The quality of the grain was very good with weight per bushel ranging from 65.2 pounds to 61.7. Harvesting was completed immediately after the wheat matured, and that factor helped to maintain the high test weights which are lost if the grain receives rain and kernel wetting after it is mature.

Two trials were conducted in Meade county. The plots in Bear Butte Valley (table 6) were seeded in mid-September and had adequate soil moisture available. Germination was good and emergence uniform. Spring moisture was above normal contributing to the vigor and health of the plants. Lack of moisture during May, June, and July resulted in a yield average of 32.3 bushels per acre. The test weights which ranged from 55.5 pounds per bushel up to 59.5 were reduced because of rain which fell between maturity and harvest.

The trial in eastern Meade county near Plainview (table 7) was seeded several days later than the one in Bear Butte Valley. The soil and soil moisture conditions were adequate, consequently germination and emergence occurred within a few days. Winterkill was not noticeable even in the most non-hardy varieties. Rainfall during May helped the plants to develop large heads. Moisture during June and early July restricted growth so that protein content was higher than normal. Grain yield averaged 38 bushels per acre with bushel weight ranging from 54.0 pounds up to 60.0 pounds.

The winter wheat variety performance test in Ziebach county (table 8) was not seeded until early October. The delay was due to an extreme shortage of soil moisture. Although stands were good, the plants showed a general lack of vigor which is associated with poor crown development during the fall growing period. Rainfall during the spring provided the moisture necessary for plant growth and grain development which resulted in an average yield of 21.1 bushels per acre. The yield was considerably lower than those of 1976 as indicated by the 2 year average. Grain quality was nearly normal with weights per bushel in the upper fifties and protein content varying from 12.8% up to 15.9%.

### Hard Red Spring Wheat

Plots were seeded at five locations in four counties in 1977. The trials conducted in Bennett, Harding, and Meade counties were seeded in fallow, while Ziebach county was in spring grain stubble. The seeding rate was 60 lbs/acre.

Table 9. Hard Red Spring Wheat Variety Trial - Bennett County(Martin), 1975-77

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre	
			1977	(3 yr av)
Semidwarf				
Funk's W444	24	55.2	20.2	--
Prodax	26	51.6	20.1	18.4
Bounty 208	26	53.8	19.4	18.5
Profit 75	25	54.5	19.4	18.4
WS 1809	24	54.4	19.0	15.7
Protor	25	53.6	18.2	15.8
WS 25	26	53.6	16.3	--
Olaf	26	54.0	15.1	17.1
Era	26	53.5	14.5	15.9
Kitt	25	52.8	14.7	15.1
Standard				
WS 54	31	54.4	19.6	--
Butte	32	54.1	16.7	--
Nowesta	30	52.2	15.0	15.0
Waldron	32	52.8	14.9	16.1
Ellar	33	53.8	14.2	15.0
LSD(05) - 5.1 Bu/A			Mean -	17.2
				16.4

Note: Plots were seeded on May 3 at 60 pounds per acre. Row spacing was 8 inches. Harvesting was completed on August 17.

Table 10. Hard Red Spring Wheat Variety Trial - Harding County(Buffalo), 1977

Variety	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Semidwarf		
Era	51.5	11.8
Protor	53.8	11.0
Kitt	48.8	9.0
Olaf	53.5	8.3
Profit 75	54.2	6.4
WS 25	49.5	5.7
Funk's W444	52.7	4.8
WS 1809	52.5	4.8
Bounty 208	47.5	3.8
Standard		
Waldron	46.0	8.8
WS mp54	55.0	6.6
Ellar	50.7	6.6
Nowesta	49.0	5.0
Butte	49.8	2.9

Note: Plots were seeded in fallow in Spring of 1977. Each plot consisted of 5 rows spaced 8 inches apart. Harvesting was completed on August 3.



Table 11. Hard Red Spring Wheat Variety Trial - Meade County(Bear Butte Valley), 1976-77.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre	
			1977	(2 yr av)
Semidwarfs				
WS 25	27	56.8	31.3	39.8
Protor	26	55.3	31.0	40.4
Profit 75	25	56.3	29.2	39.8
Bounty 208	24	55.3	26.5	40.1
Prodax	25	53.0	25.8	35.2
Olaf	27	55.0	24.2	36.7
WS 1809	25	54.2	22.4	34.6
Funk's W444	23	55.2	21.9	--
Era	26	52.2	21.8	33.6
Kitt	25	48.0	17.7	28.8
Standard				
Waldron	30	55.3	26.6	38.6
WS 54	34	55.7	25.8	--
Butte	31	55.2	24.5	--
Ellar	32	53.7	23.9	37.9
Nowesta	31	54.0	21.3	32.8
LSD (05) - 6.4 Bu/A		Mean -	24.9	36.5

Note: Plots were seeded in fallow on April 27. Row spacing was 12 inches. Harvesting was completed on July 30 with a self-propelled plot combine.

Table 12. Hard Red Spring Wheat Variety Trial - Meade County (Plainview), 1976-77.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre	
			1977	(2 yr av)
Semidwarfs				
Bounty 208	25	55.2	28.7	28.0
Prodax	28	51.2	27.9	32.8
Protor	28	54.3	27.7	27.8
Profit 75	29	54.5	27.6	29.1
WS 25	27	52.7	25.8	30.1
Funk's W444	25	56.0	23.1	--
Era	28	50.0	22.7	30.8
WS 1809	26	50.2	21.1	25.4
Olaf	29	53.0	19.0	25.5
Kitt	29	47.0	17.9	24.6
Standard				
WS 54	34	53.0	21.6	--
Nowesta	34	54.3	21.5	28.4
Ellar	36	54.0	20.2	20.4
Butte	32	53.2	19.5	--
Waldron	36	53.0	19.4	28.3

Note: Plots were seeded in fallow on April 27. Row spacing was 12 inches. Harvesting was completed on July 29 with a self-propelled plot combine.



Table 13. Hard Red Spring Wheat Variety Trial - Ziebach County (Glad Valley)

Variety	Height	Test Weight	Grain Yield-Bu/Acre	
	(Inches)	(Lbs/Bu)	1977	(2 yr av)
Semi dwarf				
Profit 75	21	59.6	16.9	15.1
Prodax	18	58.5	16.2	--
Era	21	60.5	16.0	14.6
Bounty 208	17	59.2	15.4	15.4
Funk's W444	20	58.6	14.9	--
WS 25	20	58.8	14.0	--
WS 1809	20	58.0	13.8	14.3
WS 54	20	61.1	13.2	--
Protor	19	59.0	12.9	12.4
Kitt	18	57.8	9.6	10.0
Olaf	18	59.0	9.2	10.7
Standard Height				
Butte	23	60.9	16.4	--
Nowesta	22	57.4	14.0	12.6
Ellar	21	58.0	10.5	9.8
Waldron	19	57.9	10.5	10.6

LSD(05) - 5.7 Bu/A

Mean - 13.5

**Note:** Plots were seeded on April 27 at 60 pounds per acre. Row spacing was 8 inches. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on August 5 with a MHF SP35 combine.

The spring wheat variety trials conducted in 1977 varied considerably from previous years. In Bennett county (table 9) the average of 18.2 bushels per acre was a bushel above the 1965-1970 mean yield as reported by the Crop and Livestock Reporting Service. When compared to the 3 year average of 1975-77, they were the same to slightly higher but varied with varieties. The 1977 test was probably reduced by several bushels because of the late planting date of May 3. This was due to the late heavy snow which prevented tillage and seeding at an earlier date.

In Harding county (table 10) the yields were about one-third of the average for the period 1965-70. Rainfall during the spring season was much below normal. With limited soil moisture and above normal temperatures the plants were under severe stress and had limited crown development. Without tillering the yield potential was restricted, and the resulting yields ranged from 11.8 to 2.9 bushels per acre.

At Bear Butte Valley in western Meade county the average yield (table 11) was slightly more than half that of 1976 (48.1), and only slightly below the average for the years 1974 and 1975. The 1977 average, which was 24.9 bushels per acre, is 4 bushel above the mean for the years 1965-1970. A study of the precipitation record (table 1) indicates below normal precipitation during the entire spring growing season. In view of that alone, it would appear the spring wheat varieties utilized the available moisture quite efficiently.

The study at Plainview (table 12) which averaged 22.9 bushel per acre was slightly below the two year average (1976-77). At this location there was

also moisture stress due to low precipitation during the preceding fall and winter. The moisture stress is also evident from the low Test Weights.

The spring wheat at Glad Valley was grown on continuous cropped soil which had no reserve moisture and only limited rainfall during the growing season. Moisture stress was evident during the entire season because of short plants and limited tillering. However, those plants which produced heads also had good quality grain as evidenced by the test weights which ranged from 57.4 to 61.1 pounds per bushel. The results of this study are reported in table 13.

### Durum Wheat

Durum wheats were compared in four separate trials in 1977. The results are reported in Tables 14 through 17. The discussions which pertain to the Hard Red Spring Wheat trials also describe the conditions which influenced the durum wheats at respective locations. Grain yields of the durums were slightly lower than the Hard Red Varieties. However, durum varieties had higher weight per bushel tests than did the Hard Red Spring Wheats.

Table 14. Durum Wheat Variety Trial - Bennett County (Martin), 1975-77.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre	
			1977	(3 yr av)
Rugby	34	56.9	16.3	22.6
Botno	35	55.5	15.8	14.5
Rolette	34	56.4	15.6	15.0
Ward	34	56.5	15.0	15.4
Crosby	36	55.9	14.9	15.2
Cando	26	54.8	14.2	16.0*
LSD(05) - N.S.			Mean - 15.3	

\* 2 year average only (1976-77)

Note: Replicated plots were seeded on May 3. Plot size was 4' x 25' with 8 inch spaced rows. Seeding rate was 60 pounds per acre. They were harvested with a self-propelled plot combine on August 17.

Table 15. Durum Wheat Variety Trial - Meade County (Bear Butte Valley), 1977.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield	
			(Bu/Acre)	
Rolette	33	59.5	28.8	
Botno	34	57.8	26.9	
Crosby	34	57.2	25.4	
Ward	33	58.0	24.6	
Cando	24	58.0	23.5	
Rugby	36	56.8	22.5	
LSD(05) - 4.1 Bu/A			Mean - 25.3	

Note: Plots were seeded on April 27. Seeding rate was 60 lbs/acre. Plot size was 6' x 25' with a 12 inch row spacing. Harvesting was completed on July 30 with a self-propelled plot combine.

Table 16. Durum Wheat Variety Trial - Meade County (Plainview), 1977.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Ward	35	53.3	24.1
Botno	35	56.0	23.0
Rugby	34	53.2	21.9
Cando	27	47.0	21.4
Rolette	34	57.0	21.3
Crosby	35	48.8	21.3

LSD(05) - 11.5.

Mean - 22.2

Note: Plots were seeded on April 27. Seeding rate was 60 lbs/acre. Plot size was 6' x 25' with a 12 inch row spacing. Harvesting was completed on July 29 with a self-propelled plot combine.

Table 17. Durum Wheat Variety Trial - Ziebach County (Glad Valley), 1976-77.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1977	(2 yr av)
Ward	19	59.0	12.4	11.4
Botno	21	59.5	11.9	12.8
Rolette	21	59.9	11.7	12.0
Crosby	22	58.2	10.7	11.5
Cando	20	59.2	10.0	10.8
Rugby	20	59.1	9.6	9.6

LSD(05) - 4.6 Bu/A

Mean - 11.1

Note: Replicated plots were seeded on April 27. Plot size was 5' x 25' with 8 inch spaced rows. Seeding rate was 60 pounds per acre. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on August 4 with a MHF SP35 combine.

### Oats

Oat variety trials were conducted on a cooperative basis at five locations in 1977. Three of the sites were on fallow, one on spring wheat stubble, and one on a combination of wheat stubble and fallow.

The yields of Oats in the 1977 studies closely aligned with the 1965-1970 averages, except in the case of Ziebach county. In both Bennett (table 18) and Meade (tables 20 & 21) counties, where the plots were located on fallow, the mean yield for 1977 was slightly above the six year average, while in Ziebach county (table 22), which was located in stubble, the mean for 1977 was less than half of the six year average.



Table 18. Oat Variety Trial - Bennett County (Martin), 1976-77.

Variety	Seed Color	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre	
				1977	(2 yr av)
Wright	Ivory	37	34.4	48.3	42.8
Bates	Dark	30	33.9	47.3	--
Noble	Yellow	31	32.8	44.9	40.4
Spear	White	32	32.5	43.5	42.8
Lang	Yellow	30	30.2	42.8	--
Stout	Ivory	29	33.2	41.5	40.4
Multiline M-73	Yellow	33	32.9	40.9	--
Astro	White	29	31.2	39.4	38.0
Otee	Ivory	29	33.8	38.8	34.9
Multiline E-77	Yellow	35	32.4	38.4	--
Froker	Yellow	36	32.0	38.4	38.2
Lyon	White	36	30.9	33.3	--
Nodaway 70	White	33	33.5	32.6	38.0
Chief	Yellow	34	31.9	32.3	33.0
Dal	Ivory	31	32.9	31.6	33.5
Burnett	Ivory	35	33.1	31.3	34.7
Diana	Ivory	31	33.5	27.9	32.3

LSD(05) ~ 13.8 Bu/A

38.4 - 37.4

Note: Plots were seeded on May 3. Plot size was 5' x 25' with 8 inch rows. Harvesting was completed on August 17.

Table 19. Oat Variety Trials - Harding County, 1977.

Variety	Continuous Cropping		Fallow Cropping	
	Test Wt-Lbs/Bu	Yield-Bu/A	Test Wt-Lbs/Bu	Yield-Bu/A
Astro	28.0	15.6	28.5	47.3
Froker	33.5	22.4	33.2	46.1
Lyon	30.5	21.4	29.5	45.4
Wright	28.0	24.3	29.8	43.4
Bates	30.5	16.5	32.0	43.4
Diana	30.0	7.8	31.0	40.7
Noble	34.0	14.1	31.8	40.1
Burnett	32.0	14.6	34.0	36.8
Spear	29.0	13.6	32.2	34.4
Nodaway 70	23.5	8.8	34.2	28.7
Stout	32.0	7.8	29.0	27.5

Average

15.2

39.4

Note: Plots were seeded in both stubble and fallow in Spring of 1977. Each plot consisted of 5 rows spaced 8 inches apart. Harvesting was completed on August 3.



Table 20. Oat Variety Trial - Meade County (Bear Butte), 1975-77.

Variety	Seed Color	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1977	(3 yr av)
Lang	Yellow	29	31.0	54.6	78.0
Bates	Dark	30	28.0	45.9	--
Otee	Ivory	30	28.8	45.7	61.3
Stout	Ivory	28	35.0	45.4	79.9
Multiline E-77	Yellow	32	31.0	45.4	--
Nodaway 70	White	33	32.7	45.1	82.6
Spear	White	32	35.8	44.8	67.4
Lyon	White	37	31.5	44.2	60.2
Noble	Yellow	30	30.2	44.2	77.9
Multiline M-73	Yellow	33	35.8	43.4	55.5
Burnett	Ivory	33	30.7	39.8	70.6
Astro	White	26	27.2	39.5	65.1
Wright	Ivory	34	31.3	39.1	75.7
Diana	Ivory	32	32.8	38.7	64.7
Froker	Yellow	33	31.8	37.0	70.6
Chief	Yellow	33	30.2	34.7	73.3
Dal	Ivory	29	30.2	31.4	66.9

LSD(05) - 11.0 Bu/A

Mean - 43.4

Note: Plots were seeded on April 27. Plot size was 6' x 25' with 12 inch rows. Harvesting was completed on July 30.

Table 21. Oat Variety Trial - Meade County (Plainview), 1976-77.

Variety	Seed Color	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1977	(2 yr av)
Lang	Yellow	28	31.3	51.7	50.8
Bates	Dark	30	33.0	46.2	--
Burnett	Ivory	31	32.8	43.2	46.6
Noble	Yellow	28	32.0	39.0	49.1
Astro	White	26	29.0	38.1	43.4
Stout	Ivory	26	32.0	37.8	39.9
Multiline E-77	Yellow	30	34.5	37.2	--
Diana	Ivory	30	33.8	37.2	37.8
Otee	Ivory	29	34.2	36.9	43.0
Multiline M-73	Yellow	31	33.3	36.9	35.6
Froker	Yellow	32	31.2	36.9	40.2
Nodaway 70	White	29	33.0	36.7	44.0
Wright	Ivory	33	34.2	35.4	42.2
Spear	White	31	31.7	34.8	40.8
Dal	Ivory	31	33.2	33.5	39.6
Lyon	White	33	29.7	32.7	37.6
Chief	Yellow	30	31.2	32.3	35.2

LSD(05) - 12.2 Bu/A

Mean - 38.0

Note: Plots were seeded on April 27. Plot size was 6' x 25' with 12 inch rows. Harvesting was completed on July 29.

Table 22. Oat Variety Trial - Ziebach County (Glad Valley) - 1976-77.

Variety	Seed Color	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre	
				1977	(2 yr av)
Lang	Yellow	19	37.5	27.2	25.0
Noble	Yellow	20	38.8	19.1	17.0
Stout	Ivory	20	36.8	18.4	16.2
Lyon	White	22	38.8	17.7	16.1
Wright	Ivory	18	40.5	17.4	18.7
Nodaway 70	White	22	40.6	17.0	14.2
Multiline E-77	Yellow	23	36.7	16.3	--
Bates	Dark	15	37.8	15.6	--
Spear	White	20	38.8	15.6	14.6
Otee	Ivory	20	39.2	15.3	15.3
Burnett	Ivory	19	40.6	14.0	14.5
Froker	Yellow	19	39.2	13.9	14.9
Chief	Yellow	20	38.0	13.0	12.8
Dal	Ivory	16	40.0	12.9	14.6
Astro	White	14	36.5	12.2	15.2
Diana	Ivory	20	38.9	12.2	12.4
Multiline M-73	Yellow	20	38.4	9.5	11.4

LSD(05) - 8.2 Bu/A

Mean - 15.7

Note: Plots were seeded on April 27 at 64 pounds per acre. Row spacing was 8 inches. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on August 4 with a MHF SP35 combine.

In Harding county (table 19) where plots were located on both fallow and continuous cropped land, the mean of the two treatments approached the six year average. However, the yields from the fallow portion averaged 140% of the six year mean whereas the yields from continuous cropping were only 55% of the six year mean.

The six year average yields were obtained from the Historic Estimates compiled by the Crop & Livestock Reporting Service and are as follows: Bennett - 34.0 Bu/Acre, Harding - 27.8 Bu/Acre, Meade - 37.6 Bu/Acre, and Ziebach - 37.3 Bu/Acre.

An inspection of the precipitation records for the experimental sites show subnormal rainfall for most of the previous season. Consequently, when spring rains finally arrived they were primarily utilized for soil moisture recharge rather than for plant growth.

#### Spring Barley

Spring barley varieties were compared at five locations in 1977. In Bennett county (table 23) they were grown in fallow. Heavy snow in April delayed seeding until early May. In addition to late planting, temperatures were above normal and few tillers were formed. The average yield was below the 1965-1970 average of 32.0 bushels per acre.

Table 23. Spring Barley Variety Trial - Bennett County (Martin), 1976-77.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1977	(2 yr av)
Beacon*	31	43.8	36.3	29.9
Primus II	34	44.4	30.6	28.0
Prillar	34	43.4	28.0	24.4
Larker*	34	43.1	27.4	27.2
Morex	32	43.0	24.9	--

LSD(05) - 11.2 Bu/A

Mean - 29.4

\*Approved for malting.

Note: Replicated plots were seeded on May 3. Plot size was 4' x 25' with 8 inch spaced rows. Seeding rate was 72 pounds per acre. They were harvested with a self-propelled plot combine on July 26.

In Harding county (table 24) the plots were grown on fallow but the soil was dry because of subnormal rainfall. Air temperatures were considerably higher than normal and these two factors contributed to few tillers, short straw, and low yields. The test average of 15.2 bushel per acre was about half of the 1965-1970 average of 31.2 bushels which was reported by Crops and Livestock Reporting Service.

Table 24. Spring Barley Variety Trial - Harding County, 1977.

Variety	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Bonanza*	42.5	25.6
Stephoe	37.0	17.4
Prillar	44.0	14.6
Larker*	39.8	14.0
Morex*	41.2	13.2
Primus II	41.5	12.0
Vanguard	46.0	9.6

\*Approved for malting

Mean - 15.2

Note: Plots were seeded on fallow in spring of 1977. Each plot consisted of 5 rows spaced 8 inches apart. Harvesting was completed on August 3.

In Meade county (tables 25 & 26) both trials were seeded in fallow on April 27. The late arrival of warm weather and subsequent above normal temperatures greatly influenced the plant responses. The results indicate both sites were under moisture stress during the latter part of the growing season with weight per bushel values much below the normal 48 pounds per bushel.

The barley variety trial in Ziebach county (table 27) was grown on continuously cropped land. The soil was very dry not only as a result of the previous crop but also because of the lack of rain during the previous summer, fall, and winter. Few tillers developed and heads were small but the grain produced was of fair quality with weights per bushel measurements nearly up to 48 pound standard weight.



Table 25. Spring Barley Variety Trial - Meade County (Bear Butte Valley), 1974-76-77.

Variety	Height (Inches)	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1977*	(3 yr av)
Primus II	27	30	35.0	68.1	59.1
Larker**	28	10	35.0	57.1	59.1
Morex	29	40	32.0	54.6	--
Prilar	30	15	34.5	51.3	52.9
Beacon**	30	10	31.0	38.7	50.0

\* Non-replicated data

Mean - 54.0

\*\* Approved for malting

Note: Plots were seeded on April 27. Plots were 6' x 25' with 12 inch spaced rows. Seeding rate was 72 pounds per acre. They were harvested with a self-propelled plot combine on July 30.

Table 26. Spring Barley Variety Trial - Meade County (Plainview), 1977.

Variety	Height (Inches)	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Larker*	26	28	38.2	18.6
Primus II	24	20	37.0	18.2
Prilar	25	25	37.2	17.9
Beacon*	24	22	36.7	16.9
Morex	27	35	35.8	16.7

LSD(05) = 4.5 Bu/A

Mean - 17.7

\* Approved for malting

Note: Replicated plots were seeded on April 27. Plots were 6' x 25' with 12 inch spaced rows. Seeding rate was 72 pounds per acre. They were harvested with a self-propelled combine on July 29.

Table 27. Spring Barley Variety Trial - Ziebach County (Glad Valley), 1976-77.

Variety	Height (Inches)	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1977	(2 yr av)
Primus II	18	4	46.8	14.5	16.0
Morex	19	9	46.4	14.0	--
Larker*	18	2	47.5	13.4	16.2
Prilar	19	4	47.0	11.8	14.6
Beacon*	16	1	46.8	11.6	13.0

LSD(05) - N.S.

Mean - 13.1

\* Approved for malting

Note: Replicated plots were seeded on April 27. Plots were 5' x 25' with 8 inch spaced rows. Seeding rate was 72 pounds per acre. They were harvested on August 4 with a self-propelled plot combine. Soil moisture was not adequate for uniform germination and emergence.



# Triticales

Three variety trials were conducted in 1977. All were seeded on fallow. The test in Bennett county (table 28) contained only spring types and had ample moisture from that stored by fallowing, heavy late spring snow, and good rain during May. Moisture during June was near normal with July below normal. The combination of temperature and moisture produced good grain yields but they were of low quality.

Table 28. Triticale Variety Trial - Bennett County (Martin), 1976-77.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Lbs/Acre	
			1977	(2 yr av)
Triticales 419	35	44.8	2885	2006
Triticales 418	35	44.8	2759	1903
Triticales 203	34	44.1	2677	1737
Triticales 204	34	43.4	2467	1733

LSD(05) - N.S.

Mean - 2697

Note: Replicated plots were seeded on May 3. Plot size was 4' x 25' with 8 inch spaced rows. Seeding rate was 50 pounds per acre. They were harvested with a self-propelled plot combine on August 17.

In Meade county (tables 29 & 30) the trials included a winter type in addition to the spring types. The low yields and poor test weights were probably influenced by the above normal temperatures, below normal precipitation, and short growing season.

Table 29. Triticale Variety Trial - Meade County (Bear Butte Valley), 1976-77.

Variety	Height (Inches)	Test Weight* (Lbs/Bu)	Grain Yield-Lbs/Acre	
			1977	(2 yr av)
Spring Type				
Triticales 203	35	44.3	1373	1555
Triticales 419	36	42.2	1243	1507
Triticales 418	38	41.7	1133	1457
Triticales 204	39	41.5	1090	1623
Winter Type				
Triticales 131	42	48.5	1306	----

LSD(05) - 200 lbs/acre

\* Standard test weight is 48 pounds per bushel.

Note: Replicated plots of spring types were seeded on April 27, 1977.

Winter type was seeded on September 14, 1976. Seeding rate was 50 pounds per acre. Harvesting was completed on July 30, 1977.

Table 30. Triticale Variety Trial - Meade County (Plainview), 1977

Variety	Height (inches)	Percent Lodging	Test Weight* (Lbs/Bu)	Grain Yield (Lbs/Acre)
Spring Type				
Triticale 203	41	25	40.5	1404
Triticale 418	43	32	40.0	1336
Triticale 204	42	25	38.7	1288
Triticale 419	41	22	40.3	1016
Winter Type				
Triticale 131	38	--	48.8	1402

LSD (05) - 247 lbs/acre

\* Standard Test Weight is 48 pounds per bushel.

Note: Replicated plots of spring types were seeded on April 27, 1977.

Winter type was seeded on September 17, 1976. Seeding rate was 50 pounds per acre. Harvesting was completed on July 29, 1977.

## SORGHUM VARIETY TESTING

### Grain Sorghum

Objective: To compare the performance of grain sorghum hybrids and varieties for yield and other agronomic characteristics.

A grain sorghum variety trial was seeded in Meade county in 1977. Included were a number of lines which exhibited a cold tolerance in the seedling stage, and others which had either a resistance or a tolerance to green bugs. The commercial varieties varied in maturity from short season, or very early, to medium.

The quality of the grain obtained from this study was very low. The lateness of seeding resulted in heading occurring during the hot dry period of August. The consequence was dormancy because of drought stress. In those plants which were able to produce heads, pollination and seed set was very poor.

Rain during the late summer resulted in production of new shoots, but cool temperatures reduced the growth rate. The secondary heads did not pollinate until late September, or early October. At the time of harvesting some of the plants were still pollinating, and seed varied from hard dough to milk stage.

A grain sorghum variety trial was also seeded in Perkins county in 1977. It contained the same entries as the study in Meade county. The plots were seeded on June 20. A heavy shower which occurred prior to emergence resulted in heavy crusting. The seedlings were unable to penetrate the crust and as a result stands were very poor. The trial was observed throughout the growing season but was not harvested.

Table 31. Grain Sorghum Variety Trial - Meade County - 1977

Brand & Variety	Height (inches)	Maturity* (1-5)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Pioneer 894	32	2	52	49.7
SD 75005	35	2	50	49.7
Acco R920	34	2	44	46.1
RS 506	39	2	48	45.4
SD 75002	35	2	47	45.4
Pride P500A	33	2	49	41.7
SD 75006	34	2	47	35.3
Oisco 180	34	2	45	33.5
Northrup King MM52	30	2	46	30.2
SD 104	33	2	48	28.1
SD 106	31	3	47	27.4
Northrup King 121	36	2	41	25.9
GB4 62-183	33	2	49	25.2
CT3 22-122	34	2	44	23.0
Frontier 399	33	3	43	22.3
CT3 26-129	38	3	42	22.3
Cenex 333	32	3	32	21.6
Frontier Super 400A	31	2	42	20.9
CT3 262	35	3	47	20.2
Cenex 322	30	2	39	20.2
Frontier 401R	37	3	41	14.4
CT3 27-132	41	3	51	12.2
GB4 60-207	35	3	50	10.8
Cenex 300T	32	2	39	10.1
Frontier 400R	32	3	43	9.8

LSD(05) = 11.0 Bu/A

Mean = 27.4

\* Maturity Scale used is as follows: 1-Mature Hard Seed, 2-Hard Dough Stage, 3-Milk Stage, 4-Pollinating Stage, 5-Not Headed. Notes taken at harvest.

Note: Plots were seeded with a plot seeder in 36 inch rows on June 14.

Rate of seeding was approximately 4 lbs/acre. Harvesting was completed on October 18, 1977.

### Sorghum Forage Trials

Objective: To compare the various forage sorghums, and sudangrasses, or their hybrids, as to their adaptability, their forage production, and their forage quality.

Replicated single row plots of forage sorghum, sorghum-sudans, and sudangrasses were seeded in Meade and Perkins counties. The trials were seeded in fallow soil. The seedbeds were excellent. Forage yields are reported in tables 32 through 35.



Table 32. Forage Sorghum Variety Trial - Meade County - 1977

Brand & Variety	Height (Inches)	Stem Diameter (millimeters)	% Sugar In Sap	Percent Protein*	Percent D. M.	Yield-T/A <del>30% DM</del>
Rudy-Patrick 55F	58	19	13.5	11.0	23.2	7.4
Warner W56I	35	16	15.6	11.4	32.1	6.2
Northrup King 300	36	18	11.7	11.6	38.8	6.1
Frontier S211A	46	17	14.7	10.4	24.9	5.9
DeKalb FS4	54	19	14.8	9.9	20.0	5.8
Pioneer 93I	68	21	13.3	12.1	21.6	5.2
Warner W55	29	18	17.6	12.2	31.9	5.1
T.E. Haygrazer	59	16	15.7	10.9	24.0	5.1
Asgrow Grazer N	42	17	14.4	11.7	21.9	5.0
Frontier S209	57	16	11.6	10.1	26.4	4.9
Frontier 402R	33	18	13.6	13.9	21.4	4.9
Asgrow Duet	58	16	13.5	11.4	21.6	4.8
Acco FS53I	61	20	12.5	13.4	18.4	4.7
Sokota 320F	52	19	14.6	10.5	21.4	4.6
Disco 211A	55	14	11.9	11.9	24.9	4.4
Frontier S212A	45	22	14.3	10.6	23.5	4.4
Waconia	55	20	13.9	10.6	21.6	4.1
Warner W60I	32	16	12.4	12.4	28.3	3.8
Sokota 488Y	33	17	17.1	12.4	29.2	3.7
Sokota 300F	56	17	13.7	13.0	18.5	3.6
Warner W600	32	16	9.8	12.6	36.8	3.3
SD275F	38	18	12.1	13.0	23.4	3.2
Rancher	53	11	13.4	8.0	22.4	2.8
Frontier 385A	30	19	13.2	12.2	24.9	2.3
Frontier 389	29	18	17.0	12.3	21.0	2.1

LSD(05) - 2.1 T/A

Mean - 4.5

\* Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded with a plot seeder in 36 inch rows on June 14. Harvesting was completed on September 27, 1977.

Sorghum forage trials in Meade county were seeded in mid-June. Each plot consisted of a single row twenty five feet long. Populations were based on plant spacings with forage sorghum plants 6 inches apart, sorghum-sudan 4 inches apart, and sudangrasses 3 inches apart. Row spacing was 36 inches.

The forage yields are reported as tons of silage produced with a dry matter content of 30%, or water content of 70%. The plants were harvested prior to killing frost and were in various stages of maturity. Percent sugar was determined by measuring the content in juice expressed from the lowest node of the mainstem. An adjacent internode section was used to determine stem diameter.

Table 33. Sorghum-Sudan Variety Trial - Meade County - 1977

Brand & Variety	Height (Inches)	Stem Diameter (millimeters)	% Sugar In Sap	Percent Protein*	Percent D. M.	Yield-T/A @ 30% DM
Frontier HiKane I	59	16	15.4	11.9	18.9	5.0
NK Munchmore	58	15	16.3	12.1	20.2	4.9
DeKalb ST-6	60	14	14.3	8.8	21.5	4.5
Frontier HiKane II	51	18	19.7	10.9	19.1	4.5
DeKalb SX-17	50	15	17.1	9.9	21.5	4.2
Frontier Hidan 35	58	16	14.9	10.9	19.5	4.2
Frontier Hidan 39	57	16	14.9	12.0	18.6	3.8
Acco Sweet Sioux	58	17	16.4	11.6	19.2	3.8
SuQueen	57	16	14.6	11.9	18.9	3.6
DeKalb SX-4	51	16	15.3	11.9	19.4	3.1
Acco Hay-R-Graze	61	17	13.7	12.1	14.5	3.1
NK Sordan 70A	54	16	16.0	12.3	14.0	3.1

LSD(05) - 2.2 T/A

Mean - 4.0

\* Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded with a plot seeder in 36 inch rows on June 14. Harvesting was completed on September 27, 1977.

Table 34. Sudangrass Variety Trial - Meade County - 1977

Brand & Variety	Height (Inches)	Stem Diameter (millimeters)	% Sugar In Sap	Percent Protein*	Percent D. M.	Yield-T/A @ 30% DM
Cal/West Monarch	54	11	12.2	12.4	22.0	3.9
Acco HS33	51	11	11.6	12.6	19.9	3.5
NK Trudan 6	60	12	12.6	11.1	20.6	3.0
Piper	58	10	12.0	11.4	18.5	2.1

LSD(05) - 0.8 T/A

Mean - 3.9

\* Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded with a plot seeder in 36 inch rows on June 14. Harvesting was completed on September 27, 1977.

Table 35. Sorghum Forage Trials - Perkins County (Blson), 1977.

Brand & Variety	Height (Inches)	Maturity* (1-5)	Stem Diameter (Millimeters)	% Sugar In Sap	Percent Protein**	Percent D. N.	Yield-T/A @ 30% DM
FORAGE SORGHUM							
Acco FS531	--	5	17	9.7	14.1	16.4	3.5
Asgrow Grazer N	38	4	14	13.5	11.3	20.3	3.1
Asgrow Duet	58	5	14	9.9	12.9	18.6	2.5
DeKalb FS4	59	5	20	9.9	10.9	18.2	5.7
Disco 211A	--	5	14	10.7	12.2	15.4	1.4
Frontier S-209	66	5	16	11.9	11.3	18.9	3.9
Frontier S211A	--	5	13	9.7	10.7	21.3	3.3
Frontier S212A	--	5	18	11.9	10.6	20.5	4.3
Frontier 385A	38	4	9	13.0	10.4	24.4	4.0
Frontier 389	36	4	7	11.2	10.5	22.5	2.6
Frontier 402R	33	5	16	9.2	13.6	20.0	3.8
Northrup King 300	40	4	14	13.2	10.8	23.1	4.1
Pioneer 931	--	5	16	12.5	13.0	18.3	3.3
Rancher	50	4	10	17.0	8.9	22.9	2.5
Rudy-Patrick 55F	--	5	16	13.1	9.8	22.5	6.4
SD 275F	47	4	15	11.6	11.0	22.8	4.1
Sokota 300F	--	5	12	12.3	11.8	20.7	2.7
Sokota 320F	--	5	11	9.8	11.9	21.7	2.4
Sokota 488Y	36	4	14	12.7	12.6	24.9	3.5
Taylor-Evans Haygrazer	--	5	13	10.2	12.4	20.7	2.8
Waconia	--	5	11	9.3	11.3	16.2	--
Warner W55	34	4	12	11.2	11.3	24.4	2.0
Warner W561	37	4	11	12.9	10.8	25.5	4.3
Warner W600	35	4	11	13.9	11.9	22.5	1.6
Warner W601	34	4	13	26.8	11.6	26.8	4.3



Table 35. Sorghum Forage Trials - Perkins County (Bison), 1977. (Continued)

Brand & Variety	Height (Inches)	Maturity* (1-5)	Stem Diameter (Millimeters)	% Sugar in Sap	Percent Protein**	Percent D. M.	Yield-T/A at 30% DM
<b>SORGHUM-SUDAN</b>							
Acco Hay-R-Graze	--	5	13	12.2	11.9	19.6	3.9
Acco Sweet Sioux	--	4	11	13.8	11.1	22.7	4.7
DeKalb ST-6	--	5	13	13.2	12.7	19.4	3.9
DeKalb SX-4	--	5	12	12.0	14.6	20.0	3.9
DeKalb SX-17	--	4	12	14.1	11.3	20.2	4.3
Frontier Hidan 35	--	4	12	14.3	12.3	18.9	4.0
Frontier Hidan 39	--	4	12	14.4	11.6	20.7	4.5
Frontier HiKane I	--	5	13	13.3	12.8	16.7	3.2
Frontier HiKane II	--	5	13	15.5	7.5	20.4	4.2
Northrup King Munchmore	--	4	14	13.3	10.8	21.8	6.6
Northrup King Sordan 70	--	4	11	12.5	11.3	18.2	3.9
SuQueen	--	4	12	13.0	12.9	19.7	3.9
<b>SUDANGRASS</b>							
Acco HS-33	65	4	10	12.8	12.1	20.5	4.6
Cal/West Monarch	67	4	8	13.3	12.4	20.4	3.0
Northrup King Trudan 5	--	4	10	11.8	13.3	20.2	2.1
Northrup King Trudan 6	66	4	11	13.2	11.4	17.1	2.8
Piper	67	4	9	14.6	10.9	24.7	4.4

\* Maturity Scale used is as follows: 1-Mature Hard Seed, 2-Hard Dough Stage, 3-Milk Stage, 4-Pollinating Stage, 5-Not Headed. Notes taken at harvest.

\*\*Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded on June 20 in a 36 inch row. Harvesting was completed on September 28.

Sorghum forage trials in Perkins county were seeded on June 20. Individual plots consisted of a single row. Anticipated populations were similar to those in Meade county but were quite irregular due to a thick soil crust resulting from a high intensity rain. The crust prevented many seedlings from emerging.

The plants went through a period of dormancy during August and did not head at that time. At harvest in late September, many of the varieties were trying to head and some were pollinating. The yields and other agronomic data are reported in table 35.

# Corn

Objective: To compare various corn hybrids as to their adaptability and grain production.

Multiple row plots of 25 hybrids of corn were planted in mid-June in Central Perkins county. The varieties tested were based on availability of seed from local seed sources. All local dealers were contacted and invited to submit materials for testing.

The varieties were seeded in 4 to 8 row plots a half mile long. The primary purpose was to provide ensilage for the cooperators livestock enterprise. Samples were taken on October 20. Both forage and grain yields were measured. The results are reported in table 36.

Table 36. Corn Variety Study - Perkins County (Bison), 1977.

Variety	Grain Yield		Forage Yield	
	% Moisture	Bu/A @ 12% H <sub>2</sub> O	% D.M.	T/A @ 30% DM
Weathermaster 236	56.8	64.5	43.0	14.7
Dekalb XL-12	45.5	76.6	50.2	12.4
Dekalb XL-10	51.3	44.8	44.6	12.1
Weathermaster CR-36	44.2	47.5	62.7	10.7
Pioneer 3978	57.1	51.1	44.3	10.6
Pioneer 3965	69.4	40.0	40.5	10.2
Sokota SK-68-A	53.5	59.5	36.3	9.9
Pioneer 3955	39.0	58.1	39.4	9.8
Sokota SK-90	-----	-----	32.7	9.6
Sokota 24-A	47.7	42.6	52.6	9.5
Weathermaster 246	54.3	41.2	37.0	9.3
Trojan TSC-85	53.1	35.2	49.1	8.6
Trojan TX-70	36.2	47.5	59.4	8.4
Sokota SS-38	59.2	36.5	46.9	8.1
Sokota SS-67	68.2	36.3	32.0	8.1
Pioneer 3968	51.1	54.9	42.2	7.8
Sokota SK-54	58.5	38.0	34.9	7.4
Sokota SS-15	58.2	36.4	49.5	7.4
Sokota 214	45.4	40.0	48.9	7.3
Sokota SS-82	-----	-----	24.2	7.1
Weathermaster Exp. 111A	41.0	53.2	35.2	7.1
Sokota 407	69.0	26.4	26.9	6.2
Weathermaster Exp. 221	65.5	27.2	34.2	5.6
Sokota TS-28	60.8	35.1	31.6	5.1
Sokota 232	62.4	27.5	19.8	3.1

Note: Plots were seeded June 15 at 13,500 seeds per acre. Row spacing was 36 inches. Harvesting was completed October 20.

## SPECIALTY CROP TESTING

Objective: To observe and compare various special purpose crops for adaptation based on seed production, disease resistance, insect resistance, and other agronomic characteristics.

### Safflower Variety Testing

A combination of eleven varieties and strains of safflower were seeded in replicated plots in Perkins county. They were grown on continuously cropped land that was treated with Treflan prior to planting. Weed control was spotty. Harvesting was completed in mid-October with a small plot combine. The results are presented in table 37.

Table 37. Safflower Variety Performance Test - Perkins County (Blison) - 1977

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Lbs/ Acre)
Carmex 353	19	39.5	1515
S-208	20	39.9	1496
VF stp - 1	23	37.4	1389
Gila	19	41.1	1373
A-24	22	41.9	1362
UC-1	20	40.5	1351
74-B-233	22	39.1	1269
74-B-232	21	38.4	1179
Oleic Leed	19	41.1	1176
74-B-141	21	42.1	1164
US-10	20	42.1	1160

LSD(05) - 282 lbs/a

Mean - 1312

Note: Area was cropped to Hard Red Spring Wheat the previous year. Plots were seeded on May 9 at 18 pounds per acre. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on October 13 with a MF SP35 combine.

The production of safflower, as with other crops, requires a knowledge of the plant. It differs from most crops in that after emergence it forms a rosette stage which lasts about three weeks. During this period it can withstand temperatures as low as 20 degrees fahrenheit, but cannot compete with annual weeds.

Weed control, in safflower production, is probably the most important factor to consider. In early growth stages, safflower does not shade the soil which permits weeds to flourish because of available sunlight and moisture. In later stages the weeds shade the crop which limit its growth. A further disadvantage is that green weed seed and inert materials are mixed with the safflower seed at harvest.

The crop should not be harvested when the moisture content is above 8% because it cannot be stored. Consideration should also be given to the fact that prolonged rainfall can result in seed germination in the head.



The selective herbicide trifluralin provides long lasting control of most annual weeds that affect safflower. When grown in a rotation, safflower should be followed by a crop resistant to the herbicide. However, barley and wheat may be planted on the treated land after a lapse of 12-18 months.

### Sunflower Variety Testing

Eighteen varieties of sunflower were included in a field trial in Shannon county. They were seeded on May 24. The same evening the area received a high intensity rain shower which resulted in the formation of a thick soil crust. The end effect was very poor emergence and uneven stands. A number of the plots had so few plants that they were considered to be completely out. Agronomic notes and seed yields were taken only on those plots which had a uniform stand. The results are reported in table 38.

Table 38. Sunflower Variety Trial - Shannon County (Pine Ridge) - 1977

Brand & Variety	Height (Inches)	Percent Oil*	Test Weight (Lbs/Bu)	Seed Yield (Lbs/Acre)
Interstate 894	46	40.2	30.5	2800
Sun Hi 304	46	40.9	31.2	2600
Sun Gro 372A	53	43.3	30.7	2590
Cal/West 903	44	44.0	32.2	2580
Sunbred 212	47	43.2	32.0	2525**
NK 894	42	41.4	31.8	2480
Cargill 204	42	42.4	30.0	2460
Sunbred 254	45	40.4	32.7	2400
Sigco 894	44	42.3	30.5	2370
Interstate 8943	50	41.4	34.3	2330
Sputnik 71	57	43.0	27.5	2200**
Sungro 380	44	42.5	32.2	1986
Sun Hi 301A	42	43.6	32.9	1910
USDA 903	52	38.0	31.1	1750
Sunoll 100	43	41.6	30.5	1740
Big Top +	41	40.3	30.0	1720
Cal/West 894	42	34.9	32.0	1500**
Sunbred 223	44	37.3	29.0	1340

\* Percent oil determined by NMR procedure.

\*\* One replicate only.

A second trial containing the same entries was seeded near Ralph in Harding county on May 24. It was destroyed by hail in early summer.

# MANAGEMENT, TILLAGE, AND CULTURAL PRACTICES

## Rate of Seeding of Spring and Winter Wheat

Objective: To determine the optimum rate of seeding required for wheat in order to produce the highest yield of quality grain.

Two rate of seeding experiments with Hard Red Spring Wheat were conducted in 1977. The experiments involved both semidwarf and standard height varieties. The plots were located in Bennett and Meade counties. The varieties were seeded at eight rates which ranged from one to eight pecks per acre. The results are reported in tables 39 and 40.

Table 39. Spring Wheat Rate of Seeding Study-Bennett County (Martin), 1975-77.

Variety	Seeding Rate (Lbs/Acre)	Height (Inches)	Percent Protein*	Test Weight (Lbs/Bu)	Grain Yield-Bu/A	
					1977	(3 yr av)
WS 1809	15	24	19.2	53.2	9.9	13.3
	30	27	19.0	51.5	12.1	12.2
	45	26	18.9	53.8	21.8	18.4
	60	30	19.6	53.7	21.1	17.8
	75	26	17.5	55.7	27.5	21.1
	90	24	19.2	55.8	24.8	17.4
	105	27	18.4	55.8	22.7	17.8
	120	27	19.0	55.9	24.0	19.5
Mean -					20.5	17.2
Waldron	15	30	20.2	51.8	10.2	13.2
	30	32	20.2	52.8	10.9	15.4
	45	32	20.3	53.6	9.2	15.0
	60	31	20.0	54.9	13.8	19.5
	75	30	19.2	54.9	12.6	16.8
	90	32	19.3	54.7	16.2	17.7
	105	31	20.0	54.3	17.7	19.0
	120	33	19.8	54.0	16.4	19.3
Mean -					13.4	17.0

LSD (05) - 5.8 Bu/A

Average - 17.0 17.1

\* Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded on May 3. Row spacing was 8 inches. Harvesting was completed on August 17.

The spring wheat rate of seeding study in Bennett county has been continued for three years. The three year means of the varieties indicated there was no real difference between the yielding ability of the varieties during that period. There also was no differences in response between the averages of 1977 and the other years of the study. However, in 1977 there was a significant difference between the two varieties. The variety response was probably due to the late planting which gave little time for crown development and production of tillers.

The yields reported for 1977 in table 39 indicate a significant increase for the semidwarf, WS 1809, when planting rate was raised from 30 pounds to 45 pounds per acre. There was a second yield increase when seeding rate went from 60 pounds to 75 pounds per acre. In the case of Waldron, a standard height variety, there was no real yield increase until the rate of seeding reached the 75 pound level.



A statistical analysis for years indicated the semidwarf did not produce a real yield difference until a seeding rate of 75 pounds was used. The standard height variety had a real yield increase at the 60 pound per acre seeding rate.

Table 40. Spring Wheat Rate of Seeding Study - Meade County (Bear Butte Valley) 1976-77.

Variety	Seeding Rate (Lbs/Acre)	Height (Inches)	Percent Protein*	Test Weight (Lbs/Bu)	Grain Yield-Bu/A 1977	(2 yr av)
WS 1809	15	25	21.2	50.0	10.2	14.4
	30	26	20.6	51.0	16.6	20.3
	45	24	20.4	51.3	18.2	22.6
	60	26	19.1	52.8	20.6	23.6
	75	25	20.7	53.2	24.3	25.4
	90	26	20.1	53.8	25.0	27.4
	105	25	20.4	53.2	20.4	23.2
	120	24	20.3	53.5	25.9	28.0
				Mean -	20.2	23.1
Waldron	15	32	22.3	51.0	11.2	13.0
	30	32	21.7	51.8	14.6	16.2
	45	33	22.7	52.5	18.1	18.4
	60	31	23.1	51.8	17.6	17.2
	75	31	22.8	52.7	20.5	22.8
	90	32	22.7	52.8	20.5	20.9
	105	30	23.0	53.2	20.1	19.8
	120	32	23.3	52.8	20.3	20.0
				Mean -	17.9	18.5

LSD (05) - 3.6 Bu/A

Average - 19.0 20.8

\* Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded in fallow on April 27. Row spacing was 12 inches. Soil moisture was adequate for germination and emergence. Harvesting was completed on July 30 with a MFH SP35 self-propelled combine.

At Bear Butte Valley in Meade county, the study was continued for two years. At that location the 1977 yields were below the 1976 yields as indicated by the two year average. The means for varieties in 1977 indicate only a slight difference between the varieties when considering all rates of seeding. However, the two year average indicates the semidwarf to be more productive than the standard height variety.

When comparing the seeding rates, the semidwarf had three, (30, 60, and 75 pounds per acre), where real yield increases occurred. The standard height variety had only two, (45 and 75 pounds per acre), where real differences occurred.

When comparing the two studies, Martin and Bear Butte, there is a highly significant difference due to the rates of seeding. The average yield of the two varieties shows an increase in yield with each increase in seeding rate until a high was reached at the 90 pound level. However, a statistical difference occurs between 60 and 75 pounds of seed per acre. The varieties, show a similar trend with the semidwarf, WS 1809, producing the highest yield



at the 75 pound seeding rate; and the standard height variety, Waldron, producing the highest yield at the 105 pound seeding rate. Although not the highest yield, a noticeable increase occurred between the 75 and 90 pound seeding rate of Waldron.

A rate of seeding study of Hard Red Winter Wheat was conducted in Haakon county in 1977. The rates were in 1 peck increments ranging from 15 pounds up to 120 pounds, or 2 bushel per acre. In this study there were 3 true increases in yield. The first occurred at the 30 pound seeding rate which resulted in a ten bushel yield increase, the second occurred at the 60 pound rate which resulted in a seven bushel increase, and the third at the 105 pound seeding rate.

Weight per bushel measurements were quite consistent as were the protein contents.

Table 41. Hard Red Winter Wheat Rate of Seeding - Haakon County - 1977.

Seeding Rate	Height (Inches)	Percent Protein*	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
15 lbs/acre	34	16.7	58.7	31.2
30	36	16.1	58.5	41.5
45	34	16.0	58.0	38.9
60	33	16.0	58.5	48.8
75	34	15.8	58.3	49.1
90	34	16.1	58.7	53.9
105	33	16.6	58.5	55.4
120	32	16.0	57.7	55.0

LSD (05) - 6.5 Bu/A

Mean - 46.7

\* Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded in fallow soil on September 18, 1976. Plot size was 6' x 5' with 12 inch spaced rows. Harvested on July 22, 1977.

#### No-Till Studies with Winter Wheat

Objective: To determine the most suitable equipment to obtain maximum stands and grain yield when seeding into soil not previously tilled or prepared for seeding.

A No-Till study was conducted near Ludlow in Harding county during 1977. A grain drill especially constructed for seeding in untilled grain stubble was used. The drill was so constructed as to permit an easy exchange of openers, packer wheels, and seed firming wheels. The combinations are shown in table 42.

The yields reported in the table do not reflect the success or failure of the experiment but do reflect the total lack of soil moisture. There was almost no precipitation during the previous summer, and very little snow during the winter. Most of the wheat seeds did not have enough moisture to germinate.

The stands obtained were very thin and exhibited moisture stress through the summer. The weights per bushel indicate the very low quality grain produced.

Table 42. No-Till Studies with Hard Red Winter Wheat - Harding County, 1977.

Type of Opener	Type of Packer Wheel	Wheat Stand	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Double Disk	Seed Firming Wheel	Good+	48	2.8
Double Disk	2 Inch Rubber Tire	Good	46	2.0
Spear Point	2 Inch Rubber Tire	Poor	45	1.1
Spear Point	Steel "V" Wheel	Poor	42	1.2
HZ	Seed Firming Wheel	Good	47	1.6
HZ	2 Inch Rubber Tire	Fair	45	2.0
HZ	Steel "V" Wheel	Fair+	44	2.0
Open Furrow Shoe	2 Inch Rubber Tire	Poor	46	1.1
Open Furrow Shoe	6 Inch Tire	Good	49	2.0

LSD (05) - .97 Bu/A

+ Symbol indicates stand was better than qualitative note indicates.

#### FERTILIZER STUDIES ON WINTER WHEAT

Objective: To study winter wheat response to various rates and ratios of fertilizer in a continuous cropping system.

##### Influence of Fertilizer on Grain Yield of Hard Red Winter Wheat

A study was initiated in 1976 to study the effects of various rates and ratios of nitrogen, phosphorus, and potassium on grain quality and yield of Hard Red Winter Wheat. The fertilizer was applied with the seed by using a fertilizer attachment on the drill. The fertilizers were Urea, Treble Superphosphate, and Potassium Chloride. The results of the two locations are reported in tables 43 through 46.

Table 43. Hard Red Winter Wheat Fertility Study - Bennett County (Martin)-1977

Fertilizer Treatment	Height (Inches)	Percent Protein*	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
0-0-0	36	15.1	55.0	41.2
15-0-0	37	15.4	53.3	30.1
30-0-0	39	15.7	54.3	32.7
0-15-0	39	15.7	55.0	46.0
15-15-0	36	15.2	55.0	39.7
30-15-0	36	14.9	50.7	21.3
0-25-0	36	15.0	54.0	30.8
15-25-0	38	13.9	56.0	30.8
30-25-0	38	16.2	55.5	37.8
0-35-0	38	16.0	54.5	41.5
15-35-0	40	15.8	53.3	25.3
30-35-0	40	16.1	53.5	32.3
0-30-20	38	15.4	55.0	41.0
15-30-20	35	15.7	55.7	46.5
30-30-20	37	15.6	55.8	46.2

LSD (05) - 11.6 Bu/A

Mean - 37.7

\* Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded on September 27. Row spacing was 12 inches. Soil moisture was excellent at seeding. Harvested on July 20.

Table 44. Hard Red Winter Wheat Fertility Yield Comparisons - Bennett County (Martin), 1977.

Nitrogen Lbs/Acre	Grain Yield - Bushel per Acre					+ 20# K <sub>2</sub> O
	30	15	0	0	0	
	32.7	30.1	41.2	0	15	46.2
	30.6	39.7	46.0	15	25	46.5
	37.8	30.8	44.0	25	35	41.0
	32.3	25.3	41.5	35	30	
Pounds of P <sub>2</sub> O <sub>5</sub> per Acre						

The data presented in tables 43 and 44 were obtained from the Martin site. The soil test indicated the plant nutrient level to be low for nitrogen, low-medium for phosphorus, and high for potassium. The rates selected for testing bracketed the recommended application rates.

Differences due to fertilizer application can be noted even in plant heights. There appears to be a trend toward height increases due to the addition of nitrogen. That trend was not as consistent as the increase due to the addition of phosphorus.

In the comparison of protein contents, there was an indication of increases as the rate of fertilizer application was increased. However, this was not true of the 30-15-0, 0-25-0, and 15-25-0 ratios which appear to be a situation of nutrient imbalance.

Grain yields were greatly reduced by the addition of the nitrogen fertilizer. The lack of soil moisture during the germination period resulted in death of the seedlings because of competition for water by the fertilizer. Table 44 shows the decline in yields as nitrogen rate was increased. The yields also show a decline as phosphorus rates were increased. However, when potash was added the yield was increased even though the stand was reduced. This does not mean fertilizer should not be used. It does show what can happen if moisture is limiting and fertilizer is applied at higher rates with the seed.

In Haakon county the situation was similar to that in Bennett county. The addition of fertilizer, primarily nitrogen, resulted in greater stand reductions where application rates were higher.

There was an increase in plant height as nitrogen rate increased when phosphorus was not applied. However, where phosphorus was available there was no consistent changes in height. Protein content decreased as phosphorus rate was increased but appeared not to be influenced by the nitrogen fertilizer. Weight per bushel did not show trends but was about normal for grain under drought stress during maturity.

Grain yields, as presented in table 46, reflect the abnormal stands resulting from the fertilizer-seed-soil competition for available moisture. It is quite evident, as nitrogen fertilizer rates increased the plant population decreased



and yields were reduced. Visual observations during the growing season indicated that the stands which were thinnest in the spring had more tillers at harvest. The increase in tillering, however, was not great enough to overcome the yield loss due to reduced stand.

Table 45. Hard Red Winter Wheat Fertility Study - Haakon County (Philip) 1977.

Treatment	Height (Inches)	Percent Protein*	Test Weight (Lbs/Bu)	Grain Yield Bu/Acre
0-0-0	29	17.0	57.5	51.5
15-0-0	34	16.6	57.3	43.9
30-0-0	34	17.7	58.5	40.6
0-13-0	31	17.2	57.5	55.3
15-13-0	35	16.8	57.0	46.7
30-13-0	36	17.0	57.0	47.0
0-26-0	34	15.7	58.0	56.2
15-26-0	33	16.0	58.2	54.1
30-26-0	34	16.4	56.5	41.6
0-39-0	34	16.2	58.0	56.1
15-39-0	32	16.4	57.0	52.7
30-39-0	34	16.1	57.7	43.0
0-0-20	34	15.6	56.7	45.9
15-39-20	33	15.4	57.6	45.8
30-39-20	34	15.7	57.2	41.9

LSD (05) - 5.5 Bu/A

Mean - 48.1

\* Protein content was calculated from Kjeldahl analysis and is reported on an oven-dry basis.

Note: Plots were seeded in fallow on September 18, 1976. Plot size was 6' x 50' with 12 inch spaced rows. Harvesting was completed on July 22, 1977.

Table 46. Hard Red Winter Wheat Fertility Yield Comparisons - Haakon County (Philip) - 1977.

Nitrogen Lbs/Acre	Grain Yield - Bushel per Acre					+ 20# K <sub>2</sub> O
30	40.6	47.0	41.6	43.0	41.9	
15	43.9	46.7	54.1	52.7	45.8	
0	51.5	55.3	56.2	56.1	--	
	0	13	26	39	39	
	Pounds of P <sub>2</sub> O <sub>5</sub> per Acre					

# FERTILIZER STUDIES ON SPRING GRAIN

Objective: To determine the optimum rate of fertilizer necessary to obtain the highest quality and maximum yield of grain.

## Spring Barley Variety Fertilizer Demonstration

### Bennett County

A spring barley fertilizer demonstration study conducted at Martin consisted of two varieties, three rates of phosphorus fertilizer, and four rates of nitrogen fertilizer. All of the phosphorus, but only ten pounds of the nitrogen, was applied with the seed. The remainder of the nitrogen was broadcast on the soil surface after emergence. The phosphorus fertilizer form used was Treble Superphosphate (0-46-0), and the nitrogen form was Urea (46-0-0). The results of the study are presented in tables 47 and 48.

Table 47. Spring Barley Variety Fertilizer Study - Bennett County, 1977.

Fertilizer Applied	Beacon		Primus II		Mean	
	Test Wt*	Yield*	Test Wt*	Yield*	Test Wt*	Yield*
0-0-0	45.0	21.8	46.2	28.6	45.6	25.2
10-0-0	44.8	39.7	46.9	37.4	45.8	38.6
20-0-0	43.8	39.9	46.5	36.7	45.2	38.3
40-0-0	45.2	37.0	47.2	27.2	46.2	32.1
0-20-0	44.9	34.7	45.8	27.9	45.4	31.3
10-20-0	45.0	45.6	47.5	33.3	46.2	39.4
20-20-0	44.9	50.1	48.0	35.4	46.4	42.8
40-20-0	43.1	29.3	46.5	35.6	44.8	32.5
0-30-0	46.2	29.2	47.4	24.2	46.8	26.8
10-30-0	46.2	33.1	45.9	34.4	46.0	33.8
20-30-0	43.2	34.2	45.2	25.2	44.2	29.7
40-30-0	43.5	32.0	44.2	25.8	43.8	28.9
Average	44.6	35.5	46.4	31.0	45.5	33.3

LSD (05) = 14.8 Bu/A

\* Test Weights are pounds per bushel, and Yield is bushels per acre.

Note: Plots were seeded on May 3. Seeding rate was 72 pounds per acre. All phosphorus fertilizer and ten pounds per acre of nitrogen were applied with the seed. All other nitrogen was broadcast after emergence of the seedlings.

Table 48. Grain Yield Comparisons of Spring Barley Fertility Demonstration. Bennett County, 1977.

Nitrogen Rate (Lbs/Acre)	Phosphorus Rate - Lbs/Acre			Mean
	0	20	30	
0	25.2	31.3	26.8	27.8
10	38.6	39.4	33.8	37.3
20	28.3	42.8	29.7	36.9
40	32.1	32.5	28.9	31.2
Average	33.6	36.5	29.8	33.3

A study of weights per bushel indicated very little differences existed between either varieties, nitrogen levels, or phosphorus levels. In the case of grain yields there was considerable variation between the various ratios, with a range of 25.2 to 42.8 bushels per acre. The use of phosphorus fertilizer, which hastens maturity, had the largest yield increases at the twenty pound rate. The largest increase due to nitrogen was also at the twenty pound rate. One factor which should be considered, is the characteristic of barley to shatter when mature. It is quite possible that when phosphorus was applied at the thirty pound rate that the heads were larger, matured earlier, and shattered before the plots were harvested. Further research would answer this question.

### Ziebach County

A spring barley fertilizer demonstration study conducted near Glad Valley consisted of two varieties, three rates of phosphorus fertilizer, and four rates of nitrogen fertilizer. All of the phosphorus, but only ten pounds of the nitrogen was applied with the seed. The remainder of the nitrogen was broadcast on the soil surface after emergence. The phosphorus fertilizer form used was Treble Superphosphate (0-46-0), and the nitrogen form was Urea (46-0-0). The results of the study are presented in tables 49 and 50.

Table 49. Spring Barley Variety Fertilizer Study - Ziebach County, (Glad Valley), 1977.

Fertilizer Applied	Beacon		Primus II		Mean	
	Test Wt*	Yield*	Test Wt*	Yield*	Test Wt*	Yield*
0-0-0	46.6	12.2	46.5	12.2	46.6	12.2
10-0-0	45.5	10.4	46.8	8.6	46.2	9.5
20-0-0	46.0	10.4	45.8	6.6	45.9	8.5
40-0-0	46.6	9.6	46.2	5.0	46.4	7.3
0-20-0	47.5	15.0	46.0	14.5	46.8	14.8
10-20-0	49.8	15.2	44.9	9.5	47.4	12.4
20-20-0	45.0	13.6	45.8	14.0	45.4	13.8
40-20-0	45.0	13.6	45.1	10.4	45.1	12.0
0-30-0	47.8	12.0	46.5	12.9	47.2	12.5
10-30-0	45.1	11.1	47.1	15.2	46.1	13.2
20-30-0	44.2	11.8	46.2	13.2	45.2	12.5
40-30-0	45.2	12.0	46.4	15.9	45.8	14.0
Average	46.2	12.2	46.1	11.5	46.2	11.9

LSD (05) - 5.7 Bu/A

\* Test Weights are pounds per bushel, and Yield is bushels per acre.

Note: Plots were seeded on April 27 at 72 pounds per acre. Row spacing was 8 inches. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on August 4 with a MHF SP35 combine.



The test weights in this study indicated no apparent change because of additional fertilizer. There was a very slight difference between varieties in that Beacon had higher weights at the 20 pound phosphorus level, while Primus 11 had higher weight at the 30 pound level. Both varieties had better test weights without nitrogen than when fertilizer was applied.

Table 50. Grain Yield Comparisons of Spring Barley Fertility Demonstration. Ziebach County (Glad Valley), 1977.

Nitrogen Rate (Lbs/Acre)	Phosphorus Rate - Lbs/Acre			Mean
	0	20	30	
0	12.2	14.8	12.5	13.2
10	9.5	12.4	13.2	11.7
20	8.5	13.8	12.5	11.6
40	7.3	12.0	14.0	11.1
Average	9.4	13.2	13.0	11.9

Note: Plots were seeded on April 27 at 72 pounds per acre. Row spacing was 8 inches. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on August 4 with a MF SP 35 combine.

The grain yields were extremely low because of drought in the previous year which continued through to the growing season. The general appearance of the plots indicated no or very little response to fertilizer. The data reported in table 50 shows a steady decline in yield as the nitrogen level was increased if no phosphorus was applied. The trend indicates larger plants were growing but they utilized all available moisture prior to heading.

When phosphorus was applied, the trend was not as clear. The light application of phosphorus produced the best yield because at that rate the plants were more reproductive than vegetative which was probably due to limited moisture.

### Oat Variety Fertilizer Demonstration

#### Bennett County

An experiment was initiated in 1977 to study the effects of two levels of nitrogen, and three levels of phosphorus, on four oat varieties. The varieties of oats utilized were: Burnett, which has been widely grown and has had consistent high yields; Noble, which has a low hull content, good test weights, and promise of good adaptability; Spear, which has a high protein content with good test weight and a record of high yield; and Stout, which has a high test weight and a good yield record.

The fertilizer was all applied with the seed at planting. The phosphorus was applied as Triple Superphosphate (0-46-0), and the nitrogen as Urea (46-0-0). The plots were seeded in fallow which had good soil moisture from heavy snow received during mid-April, and was relatively free of weeds. The results of the study are presented in table 51.

Table 51. Oat Variety Fertilizer Demonstration-Bennett County (Martin), 1977.

Fertilizer Applied	Grain Yield - Bushels per Acre				Mean
	Burnett	Noble	Spear	Stout	
0-0-0	41.5	40.8	37.1	37.0	39.1
10-0-0	51.5	41.6	34.0	38.8	41.4
0-20-0	43.4	44.9	45.2	42.6	44.0
10-20-0	49.7	51.4	39.9	46.6	46.9
0-30-0	38.5	42.9	47.3	40.8	42.4
10-30-0	44.6	39.7	42.5	32.6	39.9
Average	44.8	43.6	41.0	39.7	42.4

Note: Plots were seeded on May 3 at 64 pounds per acre. Row spacing was 8 inches. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on August 4 with a MHF SP combine.

A comparison of test weights, which are not reported here, indicated the addition of nitrogen resulted in an increase in the weights per bushel for all varieties except Noble. The changes either positive or negative were all small.

The addition of twenty pounds of phosphorus resulted in weight per bushel increases for all varieties except Spear. The thirty pound rate also resulted in an increase, although not as great as that noted with the twenty pound rate. The variety Spear, had decreases for all test weights as a result of phosphorus fertilization.

A study of the data as reported in table 51 indicates grain yields were increased where nitrogen was applied. This was true for Burnett, Noble, and Stout. However, the yield of Spear decreased. When phosphorus alone was applied at the rate of 20 pounds, all varieties responded with increased yields, but when phosphorus was applied at the rate of 30 pounds one variety had a further increase, whereas the other 3 had yields above the check plot but below the 20 pound level. When both nitrogen and phosphorus were considered together, each variety reacted differently. Burnett yields decreased as the phosphorus rate increased, if nitrogen was present. Spear yields increased with each increment of phosphorus added. Noble and Stout had increased yields at the 20 pounds of phosphorus level, and no change or a decrease when 10 pounds of nitrogen and 30 pounds of phosphorus were added.

#### Ziebach County

An oat fertility study in Ziebach county included nitrogen fertilizer applied at four rates, phosphorus fertilizer applied at three rates, and four varieties of oats. The varietal characteristics are described in the Bennett county discussion.

The yields reported in table 52 were extremely low because of severe drought stress. There were both increases and decreases due to addition of fertilizer. The addition of nitrogen at the ten pound rate caused a small yield increase, but additional nitrogen resulted in yields lower than the unfertilized plots.

The addition of phosphorus had the same effect as the addition of nitrogen. When phosphorus was added, the yields decreased. These data are inconclusive because of the low yields due to drought.



Table 52. Oat Variety Fertilizer Study - Ziebach County (Glad Valley), 1977.

Fertilizer Applied	Grain Yield - Bushels per Acre				
	Burnett	Noble	Spear	Stout	Mean
0-0-0	7.4	4.9	5.8	8.2	6.6
10-0-0	6.2	6.8	5.2	8.4	6.7
20-0-0	6.0	5.1	4.1	3.6	4.7
40-0-0	3.8	2.2	3.8	2.5	3.1
0-20-0	2.8	3.8	3.5	4.4	3.6
10-20-0	6.2	4.6	3.3	4.1	4.6
20-20-0	6.0	3.3	4.6	4.9	4.7
40-20-0	3.0	4.4	6.0	5.4	4.7
0-30-0	2.8	5.5	2.5	5.2	4.0
10-30-0	4.1	5.4	2.8	3.8	4.0
20-30-0	4.4	2.7	5.7	4.9	4.4
40-30-0	4.4	4.9	6.0	3.0	4.6
Average	4.8	4.5	4.4	4.9	4.6

Note: Plots were seeded on April 27 at 64 pounds per acre. Row spacing was 8 inches. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on August 4 with a MHF SP combine.

### Spring Wheat Fertilizer Demonstration

#### Bennett County

A spring wheat variety fertilizer study was conducted in Bennett County in 1977. It included two rates of nitrogen fertilizer, three rates of phosphorus fertilizer, and four varieties of Hard Red Spring Wheat. All fertilizer was applied with the seed. The nitrogen form utilized was Urea (46-0-0) and the phosphorus form was Treble Superphosphate (0-46-0).

Soil moisture was good at seeding time. However, seeding date was delayed because of heavy snow in April. The results are shown in table 53.

Table 53. Hard Red Spring Wheat Variety Fertilizer Study-Bennett County (Martin), 1977.

Fertilizer Applied	Grain Yield - Bushels per Acre				
	Protar	US 1809	Olat	Howesta	Mean
0-0-0	19.8	17.2	16.5	17.7	17.8
10-0-0	16.9	20.3	16.4	15.8	17.3
0-20-0	26.3	16.6	18.5	18.0	19.8
10-20-0	19.5	18.9	14.9	14.1	16.8
0-30-0	19.4	14.9	14.2	16.6	16.3
10-30-0	19.6	11.3	12.8	14.5	14.6
Average	20.2	16.5	15.5	16.1	17.1

LSD(05) - 4.7 Bu/A

Note: Plots were seeded on May 3, and harvested on August 11, 1977.



The favorable moisture situation of March and April did not continue through the growing season. Normal precipitation was received in May but subnormal during June and July. Air temperatures during the same period were well above normal. Those two conditions combined with the late planting on May 3 resulted in few tillers. The low number of heads per unit area resulted in grain yields with small differences between treatments.

Although differences were small and not statistically significant, the mean indicated a yield increase was received from phosphorus at the 20 pound rate but a decrease resulted from the 30 pound rate. When 10 pounds of nitrogen was applied the yields fell below the unfertilized mean and continued to drop as the phosphorus rate was increased. The statistical analysis indicated a real difference existed between the average yield of Protor and Olaf. That difference existed because of less fertilizer damage to the stand of Protor than to the stand of Olaf.

#### Ziebach County

A spring wheat fertilizer trial of four varieties was conducted in which each variety received nitrogen at 4 rates, and phosphorus at three. The varieties consisted of two semidwarfs, an intermediate height, and a standard height. The plots were seeded in late April on spring grain stubble. Soil moisture was short and precipitation limited during the growing season. All plants were extremely short and tillering was negligible. Test weights at harvest were low and grain quality poor. Grain yields are reported in table 54.

Table 54. Hard Red Spring Wheat Fertilizer Study - Ziebach County (Glad Valley), 1977.

Fertilizer Applied	Grain Yield - Bushels per Acre				Mean
	Protor	WS1809	Olaf	Nowesta	
0-0-0	10.9	11.2	5.8	9.0	9.3
10-0-0	10.2	5.8	5.1	2.9	6.0
20-0-0	7.6	6.2	3.6	8.4	6.4
40-0-0	6.6	8.0	5.1	5.8	6.4
0-20-0	13.4	10.2	7.6	10.9	10.5
10-20-0	8.7	6.5	3.3	5.1	5.9
20-20-0	4.7	8.7	6.9	9.8	7.5
40-20-0	4.6	8.8	5.1	12.0	7.6
0-30-0	7.6	10.9	6.5	9.0	8.5
10-30-0	17.8	7.6	5.4	8.0	9.7
20-30-0	5.4	8.0	8.7	7.6	7.4
40-30-0	9.0	10.1	7.6	10.2	9.2
Average	8.9	8.5	5.9	8.2	7.9

LSD (05) - 5.9 Bu/A

Note: Plots were seeded on April 27 at 60 pounds per acre. Row spacing was 8 inches. Soil moisture was not adequate for uniform germination and emergence. Harvesting was completed on August 4 with a MHF SP35 combine.

The results shown in table 54 indicate lowered yields for all nitrogen treatments. The basic reason was stand reductions due to competition for moisture by the nitrogen fertilizer applied with the seed. The critical shortage of soil moisture prevented the dilution of the fertilizer, and thus the concentration remained at a toxic level.

The addition of phosphorus at the 20 pound rate increased the yields for three of the four varieties. This was the only pattern that developed in the yield table. The results of this study are inconclusive and should not be interpreted as a true reaction when commercial fertilizer is used.

### FERTILIZER STUDIES ON SPECIALTY CROPS

**Objective:** To determine the optimum rate of fertilization necessary to obtain the highest quality, and maximum yield of seed.

#### Safflower Fertilizer Study

A fertilizer study of safflower was conducted in Perkins county in 1977. The fertilizer treatments used included nitrogen at 4 rates, phosphorus at 3 rates, and potassium at 2 rates. The fertilizer was broadcast on the surface and incorporated into the soil. Trellan was applied at 1 pound active ingredient per acre and was incorporated in the same operation as the fertilizer. The variety utilized was S-208, and was seeded at 18 pounds per acre.

The soil, a silty clay, was analyzed for available plant nutrients prior to seeding. At that time, in the top 2 feet, there was 19 pounds of nitrate-nitrogen, 35 pounds of phosphorus, and a thousand pounds of potash. The recommended rate of fertilizing to obtain a safflower yield of 1000 pounds per acre was 30 pounds of nitrogen, no phosphorus, and no potash. The data for the study are presented in table 55.

Table 55. Safflower Fertilizer Study - Perkins County (Bison), 1977.

Fert. - Lbs/Acre (N-P <sub>2</sub> O <sub>5</sub> -K <sub>2</sub> O)	Height (Inches)	Test weight (Lbs/Gal)	Seed Yield (Lbs/Acre)
0-0-0	21	40.0	1048
22-0-0	22	38.4	1089
45-0-0	20	39.1	1191
90-0-0	22	38.2	1035
0-45-0	21	38.4	1144
22-45-0	20	39.4	1055
45-45-0	21	38.5	1190
90-45-0	20	38.9	1089
135-45-0	20	38.5	1096
45-22-0	21	39.6	1157
45-45-28	22	39.6	1110
90-45-112	22	39.1	1245
156(05) - 264 Lbs/A			Mean - 1121

Note: Area was cropped to Spring Wheat in previous year. Plots seeded on May 9. Soil moisture was adequate for germination. Harvested on October 13.

As shown in table 55, there were only minor differences in plant height with no pattern to indicate that changes were due to fertilizer application. Weight per bushel measurements were all less for treated plots than for the untreated, but none of the weight differences were greater than 2 pounds per bushel. Seed yield differences, except in one treatment, were not statistically significant. However, there were small increases due to fertilizer application. The addition of nitrogen resulted in yield increases at all but the 90 pound rate, with the maximum yield increase at the 45 pound rate.

The addition of phosphorus resulted in yield increases. However, they were not cumulative with the addition of nitrogen, and in some instances the yield of the combination was below that of the nitrogen alone. Potash did not produce a yield increase except at the 112 pound rate. That increase, although statistically real, was not great enough to pay the cost of the fertilizer.

Soil moisture utilization was compared between the check plot (0-0-0) and the maximum yield plot (90-45-112). It indicated that with fertilization a greater usage occurred at the 2-4 foot depth. The total utilization for the complete profile, to a depth of 4 feet, was 0.72 inches greater in the fertilized plots than in the unfertilized plots.

In summary, the study has indicated safflower responds to nitrogen fertilizer. It also utilizes soil moisture at a greater depth when receiving fertilizer.

#### CROP DISEASE CONTROL

##### Effects of Date of Seeding and Seed Treatment on Hard Red Winter Wheat

Objective: To study the effects of date of seeding and seed treatment with a non-pathogenic bacteria for the control of Wheat Streak Mosaic Virus in Hard Red Winter Wheat.

A study at two locations in western South Dakota was continued in 1977. It involved two varieties of winter wheat (Bronze and Winoka), planted at two dates (Aug. 20 and Sept. 20), in which comparison was made between plots which were treated at four different rates with a non-pathogenic bacteria Bacillus uniflagellatus. The bacteria was believed to influence the adverse effects of Wheat Streak Mosaic Virus in wheat. The results of the study are shown in tables 56 and 57.

The initial objective of this study was to investigate the possibility of control of Wheat Streak Mosaic Virus by use of the bacteria Bacillus uniflagellatus. However, in 1977 as in 1976, the WSMV did not develop in sufficient amounts to give a valid test.

##### Bennett County

The portion of this study conducted in Bennett county indicated that the major differences existed between the varieties. Bronze had a much better yield than Winoka when planted in August, but Winoka had the better yield when planted in September. In considering the best date for the variety, both had higher yields from the late planting.

The effect of the seed treatment on grain yield were all negative for Bronze.



This seems to indicate that the variety may have been positively influenced by the bacillus, either in the fall or early spring. Other research has shown that the rhizosphere can be altered. It may have been changed to the extent that more vigorous plants developed in early spring because of better root environment. As a result the plants created an artificial drought condition in June and July when they were trying to produce grain.

The Winoka, on the other hand, had slight yield increases for the 1 and 2 gram/kilogram treatment of early seeded wheat. That may be an indication that the variety did not respond to treatment because of a normal resistance to other soil organisms. The late seeded Winoka responded similar to Bronze. This would mean that the soil temperature might be the influencing factor.

The protein content for both varieties in the late planted plots had a very slight increase over the untreated plots. If test weight and protein content are considered together, it might be suggested that a plant induced drought actually existed because test weights are lower and protein contents higher, that situation is characteristic of plants under drought stress.

Table 56. Effects of Seed Treatment, *Bacillus unflagellatus*, and Date of Planting on Agronomic Characteristics of Hard Red Winter Wheat. Bennett County (Martin), 1977.

Variety	Seeding Date	Seed Treatment (Gms/Kg of Seed)	Height (Inches)	Percent Protein*	Test Weight (Lbs/Bu)	Yield (Bu/A)
Bronze	Early	Check	36	16.6	56.5	37.0
		1 gm/kg	36	16.6	55.9	33.7
		2 gm/kg	35	16.4	56.0	33.6
		3 gm/kg	35	16.0	55.4	33.6
	Late	Check	36	16.1	56.2	38.7
		1 gm/kg	36	16.2	55.1	38.0
		2 gm/kg	38	16.6	55.4	36.6
		3 gm/kg	36	16.4	55.3	36.2
Winoka	Early	Check	36	15.6	55.4	27.1
		1 gm/kg	38	15.4	55.3	27.5
		2 gm/kg	36	14.9	55.2	27.9
		3 gm/kg	37	15.9	55.0	26.6
	Late	Check	39	16.1	56.8	41.7
		1 gm/kg	39	16.4	56.6	40.7
		2 gm/kg	38	15.8	56.8	37.4
		3 gm/kg	39	15.9	56.8	38.2

LSO(05) - 3.0 Bu/A

Mean - 34.7

\*Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded with a deep furrow drill on August 27 and September 22, 1976. Seed was treated with a dry powder form of the *Bacillus* prior to date of seeding. Plot size was 6' x 50' with 12 inch rows. Harvesting was completed on August 10, 1977.

# Meade County

The study in Meade county was somewhat similar in results to that of Bennett county. For both varieties at both dates of seeding the 1 gm/kg treatment rate resulted in a yield increase. The higher treatment rates for all except early planted Bronze also had higher grain yield. At this site the moisture pattern was different so the moisture stress was not evident. Test weight and protein content did not show the relationship that existed at the Bennett county site.

Table 57. Effects of Seed Treatment, *Bacillus uniflagellatus*, and Date of Planting on Agronomic Characteristics of Hard Red Winter Wheat, Meade County (Alkali), 1977.

Variety	Seeding Date	Seed Treatment (Gms/Kg. of Seed)	Height (Inches)	Percent Protein*	Test Weight (Lbs/Bu)	Yield (Bu/A)
Bronze	Early	Check	33	16.6	58.8	36.9
		1 gm/kg	33	16.6	59.5	38.5
		2 gm/kg	34	16.4	58.9	32.4
		3 gm/kg	33	16.0	58.9	36.3
	Late	Check	34	16.6	60.0	36.2
		1 gm/kg	36	16.2	60.7	39.2
		2 gm/kg	36	16.6	60.3	37.6
		3 gm/kg	34	16.4	60.2	38.4
Winoka	Early	Check	36	16.1	60.8	37.5
		1 gm/kg	36	16.4	60.6	38.8
		2 gm/kg	39	15.8	60.3	38.1
		3 gm/kg	36	15.9	60.1	37.1
	Late	Check	38	15.6	61.2	39.7
		1 gm/kg	39	15.4	61.1	42.4
		2 gm/kg	39	14.9	60.9	40.2
		3 gm/kg	38	15.9	61.5	41.4
LSO(05) - 5.4 Bu/A					Mean - 38.2	

\* Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded with a deep furrow drill on August 26 and September 21, 1976. Seed was treated with a dry powder form of the *Bacillus* prior to date of seeding. Plot size was 6' x 50' with 12 inch rows. Harvesting was completed on July 19, 1977.

In summary, those theories presented in the discussion of the seed treatment studies have background from previous or related work. However, many facets, including varietal responses, soil differences, and climatological variations all need to be considered at the same time so that the complete picture can be seen.





