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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.

The 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, and are initiated at their request.

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

Name	Address	County
County Crop Impr. Ass'n	Martin 57551	Bennett
David Winkler	Newell 57760	Butte
Terry Buchert	Philip 57567	Haakon
Tyrone Moos	Philip 57567	Haakon
Fred Beets	Spearfish 57783	Lawrence
Lon Bachand	Sturgis 57785	Meade
Charles Hawks	Plainview 57771	Meade
Joe Komes	Sturgis 57785	Meade
County Crop Impr. Ass'n	Bison 57620	Perkins
Harry Nordby	Dupree 57623	Ziebach

This is an annual report and results published herein are therefore neither complete nor conclusive. 1000 copies printed at an estimated cost of 19¢ each.

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Weather Summary

The weather summaries presented in tables 1 and 2 were obtained from the National Oceanic and Atmospheric Administration publication, Climatological Data-South Dakota.

Some of the information, which is identified by footnotes, was obtained from The South Dakota Division of Weather Modification because data from the primary source was missing.

The effects of weather had a major influence on yields of small grain in 1978. The mild fall of 1977 ended abruptly with extremely low temperature and heavy snow. The result varied from complete loss of winter wheat in the northern part of the state to light loss in the southern part of the state.

Temperatures during the spring were below normal resulting in late plantings and poor growing conditions. Moisture was in short supply during June resulting in yields which were below longtime averages.

Hail which fell just prior to harvest destroyed or reduced yields at two locations.

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 1977	68.2	-4.1	4.56	2.48
September 1977	64.4	2.9	1.80	0.38
October 1977	51.0	0.3	1.42	0.38
November 1977	34.8	-0.8	1.27	0.92
December 1977	23.9	-2.8	0.70	0.41
January 1978	13.0	-9.5	0.19	-0.10
February 1978	15.5	-11.2	0.63	0.22
March 1978	35.9	3.8	0.14	-0.53
April 1978	46.3	0.5	2.74	1.09
May 1978	56.9	0.8	4.38	1.43
June 1978	67.9	2.7	0.91	-2.97
July 1978	72.8	-0.5	4.67	2.21
Newell (Butte County reporting station)				
April 1978	45.6	1.7	2.44	0.81
May 1978	55.5	1.0	3.99	1.30
June 1978	64.6	1.2	0.81	-2.71
July 1978	71.1	-0.8	1.88	0.03
August 1978	69.4	-1.6	1.49	0.24
Philip (Haakon County reporting station)				
August 1977	68.4	-5.3	2.65	1.03
September 1977	62.9	1.4	2.29	1.11
October 1977	49.1#	-1.2#	2.59	1.81
November 1977	32.0#	-2.7#	1.64	1.32
December 1977	19.3	-4.1	0.35	0.05
January 1978	5.0	-13.2	0.03	-0.25
February 1978	11.6	-11.7	0.52	0.21
March 1978	33.4	2.9	0.03	-0.62
April 1978	45.1	-0.7	3.12	1.62
May 1978	58.0	1.3	2.92	0.24
June 1978	68.4	2.2	2.00	-1.79
July 1978	73.6	-1.1	2.65	0.94
Spearfish (Lawrence County reporting station)				
August 1977	65.4	-4.9	3.51	1.91
September 1977	60.3	0.7	1.47	-0.44
October 1977	46.8	-1.4	4.08	2.87
November 1977	35.4	-0.6	1.05	-0.27
December 1977	22.9	-6.0	1.10	0.33
January 1978	12.4	-12.1	0.28	-0.45
February 1978	17.7	-10.1	1.35	0.58
March 1978	35.0	3.2	0.44	-1.02
April 1978	45.9	1.3	3.00	0.43
May 1978	54.0	-0.4	5.24	1.60
June 1978	63.7	1.0	1.44	-3.16
July 1978	69.7	-1.3	4.08	2.39

*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 1941-70.

#Data obtained from source other than NOAA.

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**
Bear Butte Valley (Vale reporting station)				
August 1977	66.3	-4.6	4.27	2.99
September 1977	60.1	0.8	2.11	0.72
October 1977	48.3	-0.1	3.06	2.16
November 1977	31.6	-2.0	1.12	0.47
December 1977	19.2	-4.7	0.75	0.40
January 1978	6.6	-12.8	0.73	0.35
February 1978	12.7	-11.4	1.14	0.69
March 1978	33.5	2.4	0.07	-0.65
April 1978	45.5	-0.3	2.46	0.46
May 1978	--	--	--	--
June 1978	65.3	0.7	1.34	-2.47
July 1978	70.7	-1.7	3.19	1.29
August 1978	--	--	1.48#	--
September 1978	--	--	0.39#	--
Plainview (Meade County reporting station)				
August 1977	69.1	--	1.83	--
September 1977	62.8	--	3.43	--
October 1978	51.1	--	1.90	--
November 1977	32.3	--	1.10	--
December 1977	15.8	--	0.66	--
January 1978	2.8	--	0.13	--
February 1978	11.2	--	0.66	--
March 1978	33.3	--	0.14	--
April 1978	45.7	--	3.36	--
May 1978	--	--	2.58	--
June 1978	--	--	1.54	--
July 1978	--	--	3.98	--
Bison (Perkins County reporting station)				
March 1978	30.9	--	0.70	-0.03
April 1978	41.6	--	3.32	1.72
May 1978	56.3	--	2.01	-0.52
June 1978	64.4	--	2.50	-1.45
July 1978	69.4	--	2.89	0.84
August 1978	69.7	--	0.63	-1.18
September 1978	--	--	1.09#	--
Dupree (Ziebach County reporting station)				
August 1977	67.7	-4.9	1.29	-0.29
September 1977	62.6	1.8	2.27	1.11
October 1977	49.3	-0.3	2.02	1.15
November 1977	31.1	-1.8	1.42	0.96
December 1977	15.9	-5.6	0.51	0.18
January 1978	2.7	-13.0	0.12	-0.32
February 1978	9.7	-10.7	0.90	0.44
March 1978	31.7	2.8	0.09	-0.64
April 1978	44.3	-0.8	2.99	1.25
May 1978	59.7	3.6	2.97	0.39
June 1978	67.5	2.4	2.49	-1.04
July 1978	72.2	-1.3	3.57	1.74

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

**Departures from normal are based on records for the period 1941-70.

Data obtained from source other than NOAA.

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, 1977-78.

Location	Date of Temperature*		Total Usable Moisture**	
	Fall-First	Spring-Last	Aug 76-Jul 77	Mar 77-Jul77
Bennett County				
(Martin)	Oct 11, 77	Apr 21, 78	14.83	8.18
Butte County				
(Newell)	---	Apr 20, 78	---	6.57
Haakon County				
(Philip)	Oct 11, 77#	Apr 21, 78	9.88	6.30
Lawrence County				
(Spearfish)	Nov 8, 77	Apr 21, 78	19.23	11.53
Meade County				
(Plainview)	Oct 11, 77	Apr 21, 78	13.14##	5.48
(Vale)	Oct 12, 77	Apr 21, 78	12.73	4.22
Perkins County				
(Bison)	---	Apr 25, 78	---	7.10
Ziebach County				
(Dupree)	Oct 11, 77	Apr 21, 78	13.47	9.29

* 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.
# Data obtained from Cottonwood Field Station.
Data obtained from source other than NOAA.

SMALL GRAIN VARIETY TRIALS

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

Hard Red Winter Wheat

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

Of the five locations, two had hail just prior to harvest. The trial at Martin received heavy damage which caused considerable shatter while the trial at Plainview received only light hail with slight shatter.

Moisture was adequate at most points during the growing season except during June. 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.

All locations, except Spearfish, were damaged by extreme cold in early November. The extreme cold came very suddenly after a long warm fall. The wheat had not hardened and severe winterkill resulted.

Table 3. Hard Red Winter Wheat Variety Performance Trial - Bennett County (Martin Airport), 1976-78.

Variety	Height (Inches)	Percent* Survival	Percent** Protein	Test Wt (Lbs/Bu)	Grain Yield-Bu/A 1978	Grain Yield-Bu/A (3 yr av)
Buckskin	35	85	14.9	59.2	29.0	30.2
Winoka	37	95	16.8	58.5	29.0	32.6
Agate	36	85	15.2	58.2	29.0	32.7
Lancer	38	67	14.9	57.7	27.3	30.4
YTO-117	41	83	14.6	55.8	26.9	--
Sentinel	31	62	16.9	55.5	26.5	29.5
Roughrider	36	95	17.6	59.2	25.2	--
Larned	33	87	14.9	57.3	25.2	--
Stud	35	50	17.5	57.0	24.9	28.2
Rall	34	85	15.8	58.2	24.4	--
Scout 66	36	83	15.2	56.8	22.9	31.4
Homestead	29	68	15.4	56.7	22.9	28.6
Centurk	34	77	15.4	57.8	22.1	28.9
Eagle	32	65	17.5	54.3	21.5	30.9
Kirwin	32	80	17.1	57.8	20.4	27.3
Cloud	36	60	15.7	58.0	20.1	28.4
Lancota	34	27	17.8	54.3	19.6	27.5
Crest	34	42	15.2	56.3	19.0	--
Hiplains	35	20	16.4	54.5	19.0	25.3
Synthetic	26	55	15.3	54.0	18.9	25.2
Lindon	29	32	15.7	55.7	18.8	--
Gage	33	30	17.3	55.2	17.9	24.8
Gent	34	78	16.9	58.0	17.3	27.6
Sage	32	85	16.5	56.2	16.9	30.8
7660	34	80	17.2	54.8	16.2	--
7665	32	67	14.8	53.7	15.6	--
2148	27	55	17.1	53.5	14.7	--
Bronze	37	88	17.4	55.7	14.6	25.6
4555	24	52	16.1	53.0	13.9	--
Scoutland	32	48	17.1	57.5	13.6	23.1
Baca	33	87	15.0	57.7	13.5	22.1
Vona	27	21	15.4	55.3	11.3	--
TAM 101	27	3	16.3	53.5	5.0	22.1
Trison	28	12	14.6	54.2	9.5	19.1

LSD(05) - 7.4 Bu/A Mean - 19.6

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 September 14, 1977 and harvested on July 28, 1978. Seeding rate was 60 pounds per acre. Fallowed soil was dry and cloddy on surface at seeding time.

* Percent survival is an average of visual estimates made on April 14, 1978.

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

Table 4. Hard Red Winter Wheat Variety Performance Trial - Haakon County(Philip), 1977-78.

Variety	Height (Inches)	Percent* Survival	Percent** Protein	Test Wt (Lbs/Bu)	Grain Yield-Bu/A 1978	Grain Yield-Bu/A (2 yr av)
Roughrider	39	93	19.1	59.2	40.4	43.3
Winoka	41	85	16.8	61.8	37.6	42.1
Lancer	39	45	15.3	59.8	34.3	42.1
Gent	36	58	16.8	58.3	33.6	41.1
Bronze	37	90	19.1	57.2	33.3	35.5
Agate	36	60	16.6	60.0	32.4	40.2
Scout 66	38	67	16.3	59.7	30.2	39.4
Cloud	35	43	16.6	58.3	28.2	37.9
Sentinel	34	30	16.8	58.7	27.2	37.8
Sage	37	50	17.1	59.2	27.0	39.0
Eagle	34	43	16.4	58.2	25.7	32.4
Baca	37	47	15.6	58.0	24.7	37.3
Scoutland	36	60	17.1	58.8	24.0	34.8
Buckskin	35	25	16.1	57.3	22.5	35.5
Homestead	34	41	16.5	57.2	21.5	32.7
Lancota	34	12	16.6	57.3	20.8	31.7
Crest	34	32	15.2	58.0	20.2	--
Stud	42	43	17.4	60.8	19.8	--
Centurk	34	42	16.1	57.8	19.5	34.4
Larned	34	27	16.7	57.3	19.4	--
Rall	34	33	16.4	57.3	19.0	35.0
Hiplains	33	42	16.2	58.5	16.5	35.4
Gage	35	20	16.5	56.0	13.3	30.4
Lindon	30	15	15.7	57.5	12.8	28.6
Synthetic	30	2	--	55.5	12.8	38.9
Trison	38	11	18.0	56.8	9.0	25.6
TAM 101	29	1	16.5	55.0	4.9	26.4
4555	26	5	20.4	52.5	4.3	--
7665	30	4	21.3	52.2	3.3	--
7660	29	1	17.3	50.8	2.8	--
2148	25	2	19.2	51.8	2.7	--
Vona	30	1	16.8	56.5	2.7	27.2
				Mean -	20.5	

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 15, 1977 and harvested on July 27, 1978. Seeding rate was 60 pounds per acre. Fallowed soil had adequate moisture for germination and emergence.

* Percent survival is an average of visual estimates made on April 26, 1978.
**Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Table 5. Hard Red Winter Wheat Variety Performance Trial - Lawrence County (Spearfish), 1975-78.

Variety	Height (Inches)	Winter Hardiness	Percent** Protein	Test Wt (Lbs/Bu)	Grain Yield-Bu/A 1978	Grain Yield-Bu/A (4 yr av)
YTO-117	47	Excellent	13.8	62.8	60.4	--
Rall	42	Fair	16.0	61.3	59.5	55.8
Vona	31	Fair	14.0	63.3	57.8	56.1
Larned	39	Fair	15.3	63.0	55.9	--
Centurk	38	Good	14.5	62.2	55.1	53.6
Buckskin	43	Good	15.3	64.0	51.8	54.0
Roughrider	44	Excellent	15.1	63.5	51.5	--
Agate	36	Fair	14.8	62.3	50.8	--
Gent	44	Good	16.1	62.7	48.6	50.2
Sage	39	Good	17.3	63.7	48.4	49.8
Hiplains	40	Good	15.0	63.5	48.4	49.1
Baca	34	Fair	16.3	64.7	47.6	52.9
Lindon	35	Good	14.0	65.0	46.8	47.6
Lancota	39	Good	17.1	60.2	46.5	--
Winoka	44	Excellent	--	64.5	45.9	47.4
Homestead	33	Good	--	61.0	44.1	47.9
7660	40	--	18.1	62.0	43.5	--
4555	30	--	14.9	61.0	43.4	--
7665	39	--	18.0	62.9	43.4	--
2148	31	--	18.4	59.8	43.4	--
Trison	41	Poor	16.5	62.5	40.6	44.4
Eagle	38	Fair	16.9	64.3	39.1	42.6
Sentinel	38	Fair	--	60.0	37.9	--
				Mean -	33.7	

Note: Yield data presented within the table are averages of 3 replications. Plot size was 5' x 50' with 10 inch spaced rows. Seeded on September 12, 1977 and harvested on July 25, 1978. Seeding rate was 60 pounds per acre. Soil moisture was adequate for germination and emergence.

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

Table 6. Hard Red Winter Wheat Variety Performance Trial - Meade County (Bear Butte Valley), 1976-78.

Variety	Height (Inches)	Percent* Survival	Percent** Protein	Test Wt (Lbs/Bu)	Grain Yield-Bu/A 1978	Grain Yield-Bu/A (3 yr av)
4555	31	90	16.1	52.5	49.0	--
Eagle	38	90	16.4	57.3	47.4	41.8
Scout 66	40	88	15.3	57.5	47.3	46.3
Gent	40	90	16.0	56.3	45.9	4.32
Sentinel	38	91	17.1	55.3	45.6	--
Larned	42	85	15.4	56.0	45.1	--
Sage	42	88	16.9	56.8	44.8	43.2
Homestead	37	88	15.7	56.5	44.4	45.5
Rall	40	90	16.1	56.5	43.9	--
Synthetic	40	85	16.9	56.8	43.1	--
Buckskin	40	82	16.5	55.8	43.0	47.8
Scoutland	42	88	17.6	57.3	42.5	39.7
Cloud	38	90	16.1	56.8	42.5	--
Lindon	34	80	14.9	55.5	42.1	--
Lancer	38	90	17.0	56.8	41.9	42.9
Centurk	36	88	17.2	54.3	41.7	47.2
Roughrider	40	96	16.9	57.3	40.9	--
Winoka	42	96	16.5	57.3	40.7	43.8
Lancota	37	85	17.8	56.0	40.2	--
7665	39	73	18.1	55.8	40.1	--
Gage	42	85	17.6	54.8	39.9	--
YTO-117	46	97	16.9	56.0	39.8	--
Hiplains	38	92	18.0	56.5	39.7	39.7
Kirwin	38	80	18.4	57.5	39.7	--
Vona	34	75	14.7	54.0	39.4	--
Baca	36	92	15.6	56.0	39.3	37.9
TAM 101	32	60	16.5	55.5	38.8	43.7
Agate	38	88	16.8	57.8	38.6	48.4
Crest	38	75	15.4	55.3	38.0	--
Trison	40	78	16.4	57.5	37.9	41.4
2148	30	68	17.4	55.5	37.0	--
7660	41	60	19.0	54.5	35.5	--
Bronze	40	92	18.0	55.3	34.5	37.4
					Mean - 41.5	

Note: Yield data presented within the table are averages of two replications. Plot size was 6' x 40' with 12 inch row spacing. Seeded in fallow on September 13, 1977 at the rate of 60 pounds per acre. Adequate soil moisture was available for germination and emergence. Plots were harvested on July 26, 1978.

* Percent survival is an average of visual estimates made on April 17, 1978.

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

Table 7. Hard Red Winter Wheat Variety Performance Trial - Meade County (Plainview), 1977-78.

Variety	Height (Inches)	Percent* Survival	Percent** Protein	Test Wt (Lbs/Bu)	Grain Yield-Bu/A 1978	Grain Yield-Bu/A (2 yr av)
Roughrider	40	82	15.8	58.8	44.2	--
Winoka	40	90	15.2	58.8	40.9	36.5
Scout 66	32	38	16.0	56.5	39.0	38.9
Scoutland	34	65	17.8	57.3	35.2	35.1
YTO-117	40	95	16.1	57.5	35.1	--
Trison	32	31	16.1	57.5	34.8	36.0
Bronze	38	52	17.7	57.0	30.4	30.5
Larned	34	75	15.8	56.8	29.5	--
Kirwin	30	30	17.3	58.0	28.6	--
4555	32	63	16.5	55.8	24.2	--
Lindon	27	18	16.2	53.8	24.2	30.9
Sage	35	33	16.6	56.0	23.1	32.2
Sentinel	34	10	16.3	55.5	23.0	--
Agate	38	26	16.5	57.5	22.5	--
7665	36	52	21.6	57.5	20.1	--
Buckskin	40	13	15.9	56.5	18.9	32.7
Cloud	34	6	16.4	59.5	17.9	--
7660	36	33	20.4	56.5	17.9	--
Baca	30	10	16.6	55.5	17.3	28.0
2148	25	38	18.8	55.5	16.1	--
Centurk	36	16	16.0	55.0	14.0	25.6
Gage	32	4	16.2	57.8	11.4	--
Rall	28	3	17.2	57.0	9.4	24.6
TAM 101	25	3	17.0	56.0	8.2	25.4
Hiplains	30	2	16.2	54.8	6.5	24.4
Gent	30	2	15.8	51.5	6.1	22.9
					Mean - 23.0	

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 16, 1977 at the rate of 60 pounds per acre. Soil moisture was adequate for germination and emergence. Plots were harvested on August 1, 1978.
* Percent survival is an average of visual estimates made on May 16, 1978.
**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 low grain yields as a result of severe winterkill and a hail storm just prior to harvest. The average, 19.6 bushels per acre, was considerably lower than the previous year, but slightly higher than the 1976 average of 18.4 bushels per acre. The precipitation in the fall of 1977 was above normal which resulted in good germination and emergence. Fall growth was good and warm weather continued through October. Early in November, extreme cold accompanied by heavy snow was experienced. Overall the severe winterkill was not attributable to any one condition.

The trial in Haakon county (table 4) was seeded in mid-September. There was adequate soil moisture to provide good germination and emergence. The fall growing season was cooler than normal and had extremely heavy rain showers which saturated the soil. Early November brought extremely cold temperatures and heavy snow. The spring stand notes indicated an average of only 35% of the plants survived the winter. Consequently, the average yield was only 20.5 bushels per acre. Grain quality was also poor due to a moisture shortage in June.

The variety demonstration plots in Lawrence county (table 5) were seeded on September 12, 1977. Soil moisture was adequate for germination and emergence. The fall growing conditions lasted through early October, but in late October temperatures dropped. December, January, and February air temperatures were much below normal with precipitation near normal. Winter survival was over 90% for all varieties. This was undoubtedly influenced by the snow cover in the area. Yield average was below that for the previous three years and was largely influenced by two factors. First, the plots were heavily grazed during the late fall, and secondly, precipitation was over 3 inches below normal during June.

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. Moisture was near normal for the growing season, except during June. Temperatures were below normal for all months reported except March and June. Winter survival was fair at 60% or better. Yields were better than 1977 but grain quality was not. Weight per bushel was lower and protein content higher because of the droughty conditions in June.

The trial in eastern Meade county near Plainview (table 7) was seeded several days later than the one in Bear Butte Valley. Soil moisture was adequate for germination and emergence. Temperatures and precipitation appeared to be much below normal when compared to surrounding areas. Snow cover was blown free of part of the plot site and complete winterkill resulted. The spring was exceptionally cool, and as in other areas, precipitation during June was far below normal. The plots also received hail and high wind just prior to harvest. Grain yields were very low because of the severe winterkill, while weights per bushel were slightly reduced, and protein content was slightly higher. The grain quality factors were altered by the lack of moisture when the kernels were filling.

Hard Red and Durum Spring Wheat

Plots were seeded at seven locations in 1978. All trials were seeded on fallow with the exception of Butte and Haakon counties. The Butte county site had been in corn the previous year while the Haakon county site had been seeded to winter wheat which winterkilled. The site in Bennett county was destroyed by hail before yield data could be collected.

Table 8. Hard Red Spring Wheat Variety Trial - Butte County (Newell), 1978.

Variety	Height (Inches)	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Semidwarfs				
James (SD2273)	34	15	58.3	72.4
WS 25	32	12	59.2	70.7
Profit 75	31	12	59.3	67.0
Solar	31	22	58.7	66.1
WS 1809	31	17	59.2	65.6
Olaf	35	10	59.0	65.3
Angus	32	15	59.7	63.4
Funk's W444	29	17	58.5	62.2
Protor	32	13	59.7	60.3
Bounty 208	30	35	59.0	59.8
Prodax	30	15	55.0	59.5
Era	31	15	58.3	58.8
Kitt	35	18	56.3	57.6
Standard Height				
Butte	35	22	60.8	65.8
Eureka	40	17	58.0	61.5
Waldron	38	17	58.3	60.7
Nowesta	36	22	59.0	58.1
Coteau	40	20	58.3	56.4
Ellar	39	17	59.5	55.7
Fortuna	35	40	58.3	49.9

LSD(05) - 11.6 Bu/A C.V. - 11.3% Mean - 61.8

Note: Plots were seeded on April 13 at 120 pounds per acre, and harvested on August 16. Row spacing was 8 inches. They were flood irrigated twice during the season. Phosphorus pentoxide was applied with the seed at 66 pounds per acre, while nitrogen was surface broadcast at the rate of 150 pounds per acre.

Table 9. Durum Spring Wheat Variety Trial - Butte County (Newell), 1978.

Variety	Height (Inches)	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Semidwarfs				
Cando	28	12	58.7	89.1
Calvin	27	10	58.8	82.3
Standard Height				
Ward	39	23	60.5	81.1
Edmore	41	27	60.2	77.7
Rugby	40	30	59.2	70.2
Crosby	40	30	59.5	69.5
Rolette	40	30	61.0	67.0
Botno	38	32	59.3	65.1

LSD(05) - 12.1 Bu/A C.V. - 9.2% Mean - 75.2

Note: Plots were seeded on April 13 at 120 pounds per acre, and harvested on August 16. Row spacing was 8 inches. They were flood irrigated twice during the season. Phosphorus pentoxide was applied with the seed at 66 pounds per acre, while nitrogen was surface broadcast at the rate of 150 pounds per acre.

Table 10. Hard Red Spring Wheat Variety Trial - Haakon County (Philip), 1978.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Semidwarfs			
Funk's W444	24	55.5	25.4
Protor	26	53.0	23.2
James (SD2273)	30	51.3	20.8
WS 1809	26	51.3	20.6
Profit 75	25	51.8	20.6
Bounty 208	24	52.0	19.8
Prodax	25	48.5	19.4
Solar	25	51.0	17.4
WS 25	29	51.8	16.2
Olaf	27	54.5	16.0
Era	23	49.8	15.0
Angus	22	50.8	13.6
Kitt	26	47.8	13.3
Standard Height			
Butte	30	52.7	18.9
Eureka	30	50.2	18.1
Nowesta	31	51.2	16.9
Ellar	30	50.8	16.9
Fortuna	31	54.5	16.5
Waldron	29	50.2	16.2
Coteau	29	49.0	13.3

LSD(05) - 4.6 Bu/A C.V. - 15.5% Mean - 17.8

Note: Plots were seeded on April 26 at 60 pounds per acre and harvested on July 27. Row spacing was 8 inches. Phosphorus was drilled with the seed, and nitrogen in the urea form was broadcast on the surface after emergence.

Table 11. Durum Wheat Variety Trial - Haakon County (Philip), 1978.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Semidwarfs			
Cando	24	52.8	19.1
Calvin	21	55.2	17.7
Standard Height			
Botno	31	55.5	23.0
Rolette	30	56.5	22.7
Ward	30	54.8	22.5
Rugby	30	54.7	21.8
Edmore	32	54.5	21.8
Crosby	31	54.3	20.6

LSD(05) - 3.6 Bu/A C.V. - 7.4% Mean - 21.2

Note: Plots were seeded on April 26 at 60 pounds per acre and harvested on July 27. Row spacing was 8 inches. Phosphorus was drilled with the seed, and nitrogen in the urea form was broadcast on the surface after emergence.

Table 12. Hard Red Spring Wheat Variety Trial - Meade County (Bear Butte Valley), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Semidwarfs				
Funk's W444	26	55.7	31.9	--
Protor	25	55.7	30.2	37.0
WS 1809	27	52.7	29.5	32.9
Prodax	25	50.0	28.1	32.9
Olaf	28	53.2	28.1	33.8
Bounty 208	24	55.0	27.6	35.9
James (SD2273)	29	54.0	27.6	--
Profit 75	27	54.3	27.3	35.7
WS 25	26	53.0	27.1	35.6
Kitt	26	50.2	25.4	27.7
Solar	24	50.0	24.0	--
Era	24	52.3	22.1	29.8
Standard Height				
Butte	31	57.7	36.5	--
Eureka	32	53.8	30.3	--
Ellar	32	55.2	30.0	35.3
Waldron	32	54.5	28.8	35.3
Nowesta	30	54.3	26.6	30.7
Fortuna	31	56.0	25.2	--
Coteau	28	51.7	24.4	--

LSD(05) - 4.9 Bu/A C.V - 10.6% Mean - 27.8

Note: Plots were seeded on April 18 at 60 pounds per acre, and harvested on August 26. Drill row space was 8 inches. Phosphorus fertilizer (0-44-0) was applied with the seed at the rate of 100# per acre. Nitrogen fertilizer was surface applied at the rate of 167 pounds per acre.

Table 13. Durum Wheat Variety Trial - Meade County (Bear Butte Valley), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Semidwarfs				
Calvin	22	54.5	22.3	--
Cando	24	53.3	22.7	28.5
Standard Height				
Edmore	35	55.5	29.5	--
Rolette	31	59.2	29.0	--
Botno	32	58.2	28.6	33.2
Rugby	32	56.0	27.1	32.7
Crosby	31	56.5	26.9	25.9
Ward	32	56.7	26.6	34.0

LSD(05) - 3.6 Bu/A C.V. - 7.9% Mean - 26.6

Note: Plots were seeded on April 18 at 60 pounds per acre, and harvested on August 26. Drill row space was 8 inches. Phosphorus fertilizer (0-44-0) was applied with the seed at the rate of 100 pounds per acre. Nitrogen fertilizer was surface applied at the rate of 167 pounds per acre.

Table 14. Hard Red Spring Wheat Variety Trial - Meade County (Plainview), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Semidwarfs				
James (SD2273)	27	57.5	26.4	--
Protor	22	57.0	25.0	26.9
Profit 75	23	58.0	24.9	27.7
Era	23	57.8	24.6	28.7
Bounty 208	22	57.8	24.4	26.8
Prodax	24	55.8	23.6	29.8
Olaf	26	57.0	23.0	24.7
Kitt	24	55.5	22.9	24.0
WS 1809	23	57.0	21.1	24.0
Solar	22	57.8	20.7	--
Angus	24	57.3	19.1	--
Funk's W444	22	56.5	18.9	--
Standard Height				
Butte	29	58.7	27.5	--
Waldron	28	55.8	23.2	26.6
Nowesta	29	56.8	20.7	25.9
Coteau	27	55.8	19.1	--
Fortuna	29	57.0	16.7	--

LSD(05) - 5.8 Bu/A C.V. - 15.4% Mean - 22.4

Note: Plots were seeded on May 16 and harvested on August 24. Drill row space was 8 inches with a seeding rate of 60# per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Light hail and wind damage were received just prior to harvest.

Table 15. Durum Wheat Variety Trial - Meade County (Plainview), 1977-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(2 yr av)
Semidwarfs				
Cando	23	56.7	24.3	22.9
Calvin	22	56.5	20.9	--
Standard Height				
Rugby	32	57.0	24.7	23.3
Ward	30	58.0	23.4	23.7
Botno	28	58.0	22.9	23.0
Rolette	30	58.0	21.8	21.5
Crosby	26	57.0	21.4	21.4
Edmore	32	57.0	20.0	--

LSD(05) - 2.5 Bu/A C.V. - 4.7% Mean - 22.4

Note: Plots were seeded on May 16 and harvested on August 24. Drill row space was 8 inches with a seeding rate of 60# per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Light hail and wind damage were received just prior to harvest.

Table 16. Hard Red Spring Wheat Variety Trial - Perkins County (Bison), 1978.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Semidwarfs			
Era	28	58.5	19.1
Solar	28	57.0	18.3
Kitt	28	56.0	17.6
Protor	25	57.8	17.1
WS 1809	24	57.0	17.1
James (SD2273)	30	57.0	16.9
Olaf	28	56.3	16.9
WS 25	26	54.5	16.9
Prodax	28	55.0	16.5
Profit 75	25	54.8	16.5
Angus	27	59.5	16.2
Bounty 208	25	59.8	15.8
Funk's W444	24	55.5	15.2
Standard Height			
Butte	32	61.0	19.4
Coteau	35	59.3	18.5
Eureka	34	57.0	18.3
Waldron	33	57.3	17.8
Ellar	32	57.8	16.7
Nowesta	30	55.3	16.0
Fortuna	32	57.8	14.5

LSD(05) - 2.1 Bu/A C.V. - 7.3% Mean - 17.1

Note: Plots were seeded on May 10 and harvested on August 18. Drill row space was 8 inches with a seeding rate of 60 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed.

Table 17. Durum Wheat Variety Trial - Perkins County (Bison), 1978.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Semidwarfs			
Cando	25	57.0	19.1
Calvin	25	56.5	18.9
Standard Height			
Rugby	30	56.0	17.3
Crosby	31	57.8	16.9
Botno	31	56.5	16.9
Rolette	29	54.3	15.5
Edmore	29	55.5	15.1
Ward	25	56.0	14.0

LSD(05) - 2.6 Bu/Acre C.V. - 8.2% Mean - 16.7

Note: Plots were seeded on May 10, and harvested on August 18. Drill row space was 8 inches with a seeding rate of 60 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed.

Table 18. Hard Red Spring Wheat Variety Trial - Ziebach County (Dupree), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Semidwarf				
Solar	24	59.0	30.0	--
Profit 75	24	58.8	28.1	19.4
Prodax	24	57.3	27.3	18.8
Era	22	58.8	27.1	18.8
WS 25	24	57.3	26.9	20.4*
Olaf	25	59.3	26.4	15.9
WS 1809	23	56.3	26.1	18.2
Protor	23	58.0	26.1	17.3
Kitt	23	56.2	26.1	15.4
James (SD2273)	26	57.8	25.4	--
Angus	23	58.3	24.0	--
Bounty 208	20	57.5	18.6	16.6
Funk's W444	20	56.0	17.4	16.2*
Standard Height				
Butte	28	59.2	30.0	23.2*
Ellar	29	58.8	27.3	15.7
Coteau	28	58.0	25.9	--
Waldron	29	56.3	25.7	15.6
Nowesta	28	57.2	24.2	16.4
Eureka	27	57.0	22.3	--
Fortuna	28	58.2	20.3	--

LSD(05) - 1.5 Bu/A C V - 10.8% Mean - 25.3

*(1977-78 only)

Note: Plots were seeded on May 10 and harvested on August 21. Drill row space was 8 inches with a seeding rate of 60 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed.

Table 19. Durum Wheat Variety Trial - Ziebach County (Dupree), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Semidwarf				
Calvin	25	59.7	31.7	--
Cando	24	59.3	28.8	16.8
Standard Height				
Rugby	29	59.2	30.2	16.5
Ward	29	59.0	30.2	17.7
Botno	27	58.2	30.2	18.6
Edmore	27	59.2	26.9	--
Crosby	28	59.0	23.7	15.6
Rolette	30	59.5	22.5	15.5

LSD(05) - 1.9 Bu/A C.V. - 11.6% Mean - 28.0

Note: Plots were seeded on May 10 and harvested on August 21. Drill row space was 8 inches with a seeding rate of 60 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed.

DISCUSSION:

Spring wheat variety trials were seeded at seven locations in 1978. Weather conditions were quite varied during April and May resulting in some seeding not being completed until mid-May. Temperatures (table 1) were near normal during May and June. Moisture (table 1) which was favorable in April and May was much below normal in June. The shortage of moisture during heading resulted in lowered yields and weights per bushel (tables 10 thru 19).

The Butte county site (tables 8 & 9) was irrigated and fertilized at a high rate in order to make maximum use of the moisture available. The average yield of Hard Red Spring wheat nearly tripled the average of the six dryland sites, while Durum wheat more than tripled the average of dryland yields. Weights per bushel were also several pounds heavier in the irrigated trial (tables 8 & 9) than in the dryland trials.

The Haakon county trials (tables 10 & 11), seeded in late April, had normal precipitation and temperatures (table 1) except for the month of June when rainfall was extremely short. Stands were excellent but heads were not filled and kernels were shrivelled.

Spring wheat trials in eastern-Meade county at Bear Butte Valley (tables 12 & 13) were seeded in mid-April and had adequate soil moisture. Average temperatures were below normal which delayed growth. Drought conditions during June affected grain yield and weight per bushel. Grain yields were between 4 and 8 bushels below the three year average, with weights per bushel ranging from 50 to 57 pounds.

The trials at Plainview in eastern-Meade county were seeded late because of unfavorable weather conditions in April and early-May. The Hard Red Spring varieties (table 14) yielded slightly less than the three year average, and had weights per bushel several pounds below normal. The Durum wheats (table 15) yielded slightly better and test weights were several pounds heavier than in 1977. A further factor which influenced yields at Plainview was the occurrence of a light hailstorm and high winds shortly before harvest. The two variety trials would have had higher yields and weights per bushel had they been planted earlier. Earlier planting would have permitted increased tillering, as well as escape from drought and high air temperatures during heading and filling. They would also have been harvested prior to the hail.

Spring wheat trials in Perkins county (tables 16 & 17) were seeded in early-May and had good germination and emergence. However, they did not tiller, but those heads which formed were of normal size. Kernels were small and shrivelled because of the lack of adequate moisture during the time they were filling.

The wheat variety trials in Ziebach county were seeded in early-May. The average yield in 1978 was more than double those of the previous two years. The plots were seeded on winter wheat stubble in 1976, and suffered from both soil moisture shortage and below normal rainfall. In 1977 there was a lack of soil moisture from the previous year as well as severe drought stress. The increased yields in 1978 were the result of the plots being located on fallow soil as well as the moisture accumulation resulting from heavy winter snow. Weights per bushel in both trials (tables 18 & 19) indicated that moisture stress was not acute during the heading and filling.

Oat Variety Trials

Oat variety trials were conducted on a cooperative basis at seven locations in 1978. Seeding dates ranged from April 5 for the Bennett county site to May 16 for the Plainview site. Heavy snow cover and rain showers prevented soils from drying and delayed tillage necessary for planting.

The Bennett county trial was the earliest seeded in 1978. Soil moisture was favorable for germination and emergence. The plants were well tillered and had heavy foliage as a result of favorable weather during the late spring. However, yields were severely reduced by hail received several days prior to harvest. Test weights were also below normal because of the drought stress during June.

Table 20. Oat Variety Trials - Bennett County (Martin), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	Grain Yield-Bu/Acre (3 yr av)
Stout	30	36.5	20.6	33.8
Lancer (SD9095)	33	29.2	20.2	--
Astro	28	22.3	20.0	32.0
Wright	35	30.0	19.7	35.1
Marathon (WSx2456-2)	37	26.0	19.5	--
Benson (MN71211)	34	31.8	19.0	--
Lyon	36	26.5	19.0	26.2*
Spear	33	30.0	18.2	34.6
Noble	30	25.8	16.3	32.4
Lang	31	25.5	15.9	29.4*
Chief	35	30.7	15.4	27.1
Burnett	34	27.3	15.0	28.1
Otee	31	28.5	14.7	28.2
Bates	29	30.0	14.5	30.9*
Froker	35	28.0	13.2	29.8
Diana	32	26.2	12.7	25.8
Multiline E-77	34	26.2	12.7	25.6*
Nodaway 70	35	33.3	12.5	29.5
Dal	32	29.0	11.6	26.2
Multiline M-73	36	32.2	10.7	25.8*
			Mean - 16.1	

*(1977-78 only)

Note: Plots were seeded on April 5 and harvested on July 28. Drill row space was 8 inches with a seeding rate of 60 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Heavy hail damage was received just prior to harvest.

The oat variety trial in Butte county (table 21) was on an irrigated site. The plots were seeded on April 13 and twice during the growing season received supplemental water. Stands were excellent. The area was heavily fertilized in order to obtain maximum yields. The results were heavy foliage and subsequently, severely lodged. Yields were high and ranged from 136.1 to 97.6 bushels per acre. Weights per bushel were above normal and ranged from 38.2 to 35.0 pounds per bushel.

Table 21. Oat Variety Trial - Butte County (Newell), 1978.

Variety	Seed Color	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Astro	White	23	35.7	136.1
Lyon	White	18	36.8	123.4
Stout	Ivory	28	35.5	123.0
Moore (MN73231)	White	40	36.8	121.2
Noble	Yellow	20	36.7	117.1
Multiline E-77	Yellow	28	37.2	115.3
Lang	Yellow	28	37.3	113.9
Froker	Yellow	27	36.3	113.4
Lancer (SD9095)	White	27	36.0	111.2
Dal	Ivory	20	36.5	110.7
Bates	Dark	33	36.0	110.7
Otee	Ivory	40	36.8	110.3
Wright	Ivory	27	37.2	109.8
Nodaway 70	White	38	37.2	107.5
Burnett	Ivory	32	37.7	106.6
Benson (MN71211)	White	42	36.7	102.5
Marathon (WSx2456-2)	White	18	35.0	99.4
Diana	Ivory	40	36.7	99.4
Spear	White	22	36.0	98.0
Chief	Yellow	27	38.2	97.6

LSD(05) - 29.8 Bu/A C.V - 16.4% Mean - 110.4

Note: Plots were seeded on April 13 and harvested on August 16. Drill row spacing was 8 inches with a seeding rate of 80 pounds per acre. They were flood irrigated twice during the season. Phosphorus pentoxide was applied with the seed at 66 pounds per acre, while nitrogen was surface broadcast at the rate of 150 pounds per acre. Previous crop was corn.

The oat variety trial in Haakon county (table 22) was a dryland site containing 23 entries. It was seeded in late April and topdressed with nitrogen after emergence. The area had been seeded to winter wheat which was completely winterkilled.

The stand was uniform but because of late seeding did not tiller. There was drought stress in June due to subnormal precipitation. Yields and weights per bushel of earlier varieties were generally good but later maturing varieties generally had both lower yields and weights per bushel.

Table 22. Oat Variety Trial - Haakon County (Philip), 1978.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Bates	26	36.2	65.3
Lang	27	37.0	55.8
Nodaway 70	30	39.0	53.1
Noble	27	35.0	50.4
Burnett	28	35.0	48.6
Garland	28	33.5	47.6
Wright	30	34.0	47.0
Otana	30	29.0	45.6
Stout	24	32.2	45.6
Dal	27	33.8	45.4
Moore (MN73231)	30	30.5	43.6
Lancer (SD9095)	28	33.5	43.6
Otee	24	37.3	43.6
Diana	29	32.7	43.6
Astro	25	30.3	43.1
Benson (MN71211)	27	33.5	41.7
Multiline E-77	28	34.5	41.3
Spear	27	34.0	38.8
Chief	29	33.2	38.6
Froker	28	32.0	38.1
Lyon	29	34.3	36.3
Marathon (WSx2456-2)	28	28.8	32.2
Multiline M-73	24	34.5	28.6

LSD(05) - 9.4 Bu/A C.V. - 13.0% Mean - 44.2

Note: Plots were seeded on April 26 and harvested on July 27. Drill row spacing was 8 inches with a seeding rate of 64 pounds per acre. Phosphorus (0-44-0) was drilled with the seed at 44 pounds per acre, and nitrogen in the urea form (45-0-0) was broadcast on the surface at 120 pounds per acre.

The oat variety trial at Bear Butte in Meade county (table 23) was seeded in mid-April, and experienced good germination and emergence. Cool temperatures in late April and May contributed to tillering and vigorous plants. However, droughty conditions in June restricted head development. Grain yields were much higher than the previous three years as indicated by the 4 year average. The yields of the varieties did not appear to be influenced by the maturity index since late varieties yielded as well as early varieties. Grain quality was good with weights per bushel ranging from 37.3 to 32.7 pounds per bushel.

Table 23. Oat Variety Trial - Meade County (Bear Butte Valley), 1975-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	Grain Yield-Bu/Acre (4 yr av)
Bates	26	36.5	89.4	--
Lang	30	35.0	88.5	--
Lancer (SD9095)	31	35.8	87.6	--
Moore (MN73231)	37	36.0	84.9	--
Lyon	35	34.2	82.6	--
Burnett	34	37.3	82.6	73.6
Multiline E-77	32	36.7	81.7	--
Noble	30	36.2	80.8	78.6
Chief	33	34.2	80.8	75.2
Spear	32	35.5	80.3	70.6
Otana	35	33.8	79.4	--
Otee	29	36.7	78.5	65.6
Froker	34	37.2	78.5	72.6
Benson (MN71211)	33	35.7	76.7	--
Nodaway 70	34	34.5	76.2	81.0
Astro	27	32.7	75.8	67.8
Marathon (WSx2456-2)	39	33.5	75.3	--
Garland	31	34.5	73.5	--
Wright	35	34.8	73.1	74.8
Multiline M-73	33	34.2	72.1	59.7
Diana	32	35.7	70.3	73.6
Dal	32	34.5	70.3	50.2
Stout	28	33.3	69.4	77.3

LSD(05) - 13.7 Bu/A C.V. - 10.6% Mean - 78.6

Note: Plots were seeded on April 18 and harvested on August 26. Drill row spacing was 8 inches with a seeding rate of 64 pounds per acre. Phosphorus fertilizer (0-44-0) was applied with the seed at the rate of 100 pounds per acre. Nitrogen fertilizer (44-0-0) was surface applied at the rate of 167 pounds per acre. Plots were seeded in fallowed soil.

The oat variety trial at Plainview in eastern Meade county (table 24) was seeded in mid-May and experienced good germination and emergence. Cool temperatures in May contributed to tillering. However, droughty conditions in June restricted head development.

Grain yields were similar to the previous three years as indicated by the 3 year average. The yields of the varieties did not appear to be influenced by maturity index since late varieties yielded as well as early varieties. Grain quality was good with weights per bushel ranging from 39.5 to 34.8 pounds per bushel.

Table 24. Oat Variety Trial - Meade County (Plainview), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	Grain Yield-Bu/Acre (3 yr av)
Lang	26	37.0	52.6	--
Astro	26	34.8	50.4	45.7
Bates	28	37.8	49.7	--
Stout	25	35.2	47.4	42.4
Marathon (WSx2456-2)	35	35.5	47.0	--
Noble	26	37.3	46.7	48.3
Benson (MN71211)	30	38.0	44.2	--
Lancer (SD9095)	28	38.3	43.8	--
Lyon	35	38.0	43.8	--
Wright	34	39.5	42.9	42.4
Dal	30	36.3	42.4	40.6
Froker	32	35.7	41.1	40.5
Nodaway 70	30	39.2	40.2	42.7
Otee	27	38.5	38.1	41.3
Spear	29	36.7	38.1	39.9
Moore (MN73231)	31	36.8	36.8	--
Multiline E-77	30	39.5	36.8	--
Burnett	32	36.2	35.4	42.9
Chief	29	35.5	32.7	34.4
Diana	29	35.5	32.0	35.9
Multiline M-73	30	35.5	28.9	33.4

LSD(05) - 6.8 Bu/A C.V. - 9.9% Mean - 41.4

Note: Plots were seeded on May 16 and harvested on August 24. Drill row space was 8 inches with a seeding rate of 64 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Light hail and wind damage were received just prior to harvest. Seeded in fallowed soil.

The oat variety trial at Bison in Perkins county (table 25) was seeded in early-May and experienced good germination and emergence. Cool temperatures in May resulted in normal growth. However, droughty conditions in late-May and June restricted head development. Grain yields were low ranging from 30.0 to 19.1 bushels per acre.

The yields of the varieties did not appear to be influenced by the Maturity Index since late varieties yielded as well as early varieties. Grain quality was excellent with weights per bushel ranging from 42.2 to 36.8 pounds per bushel.

Table 25. Oat Variety Trial - Perkins County (Bison), 1978.

Variety	Seed Color	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Moore (MN73231)	White	38	42.2	33.0
Bates	Dark	28	39.2	33.0
Wright	Ivory	40	38.0	31.0
Marathon (WSx2456-2)	White	40	38.0	31.0
Astro	White	29	36.8	30.6
Spear	White	32	38.8	30.3
Benson (MN71211)	White	33	41.0	30.0
Lang	Yellow	28	38.5	29.6
Otee	Ivory	29	38.5	27.9
Noble	Yellow	29	39.2	26.6
Stout	Ivory	28	36.8	25.8
Froker	Yellow	35	42.2	25.5
Lancer (SD9095)	White	31	41.2	25.5
Dal	Ivory	31	40.0	24.8
Burnett	Ivory	34	39.8	24.5
Multiline E-77	Yellow	31	39.2	24.2
Chief	Yellow	31	39.0	23.8
Lyon	White	36	39.0	23.5
Diana	Ivory	32	39.0	22.4
Nodaway 70	White	28	39.0	19.8
Multiline M-73	Yellow	28	39.2	19.1

LSD(05) - 6.5 Bu/Acre C.V. - 2.1% Mean - 25.4

Note: Plots were seeded on May 10 and harvested on August 18. Drill row spacing was 8 inches with a seeding rate of 64 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Plots were seeded in fallowed soil.

The oat variety trial at Dupree in Ziebach county (table 26) was seeded in early-May and experienced good germination and emergence. Cool temperatures in May resulted in normal growth. However, droughty conditions in June restricted head development.

Grain yields were much higher than the previous years as indicated by the 3 year averages. The yields of the varieties appeared to be influenced by their relative maturities since later maturing varieties yielded better than early maturing varieties. Grain quality was excellent with weights per bushel ranging from 43.4 to 36.8 pounds per bushel.

Table 26. Oat Variety Trial - Ziebach County (Dupree), 1976-78.

Variety	Seed Color	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Otana	White	33	41.4	82.6	--
Moore (MN73231)	White	31	42.6	64.0	--
Marathon (WSx2456-2)	White	33	41.0	59.9	--
Benson (MN71211)	White	32	40.6	58.1	--
Lyon	White	30	42.1	52.6	35.2*
Wright	Ivory	29	42.3	48.6	28.7
Astro	White	23	36.8	47.6	26.0
Garland	Yellow	29	41.4	46.7	--
Lancer (SD9095)	White	26	41.3	46.7	--
Stout	Ivory	24	39.6	43.6	25.3
Bates	Dark	24	41.0	42.2	28.9*
Dal	Ivory	26	36.8	42.2	23.8
Froker	Yellow	28	43.4	41.8	23.9
Noble	Yellow	25	39.0	35.4	23.2
Burnett	Ivory	28	40.3	34.5	21.2
Chief	Yellow	27	39.3	33.1	19.6
Otee	Ivory	25	42.0	32.7	21.1
Lang	Yellow	24	38.5	29.5	26.5
Nodaway 70	White	26	41.0	29.0	19.1
Diana	Ivory	27	37.7	29.0	18.0
Multiline M-73	Yellow	27	38.3	28.6	17.1
Spear	White	26	39.8	28.1	19.1
Multiline E-77	Yellow	27	39.3	17.2	16.8*

LSD(05) - 5.1 Bu/Acre C.V. - 4.8% Mean - 42.3
*(1977-78 only)
Note: Plots were seeded on May 10 and harvested August 18. Drill row spacing was 8 inches with a seeding rate of 64 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Seeded in fallow.

Spring Barley

Spring barley varieties were compared at seven locations in 1978. At five locations the soil was fallowed in 1977. At the sixth, the area had been seeded to winter wheat but had winterkilled. At the seventh site, which was also an irrigated site, the soil had produced a corn crop in 1977.

In Bennett county the trial was seeded in early April. Soil moisture was good resulting in rapid germination and emergence. The plants were well tillered and vigorous due to the cool weather which favored growth. Heavy hail was received prior to maturity and as the plots were being prepared for harvest. The resulting yields (table 27) were low as were weights per bushel. The only harvestable materials were late green tillers.

Table 27. Spring Barley Variety Trial - Bennett County (Martin), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Larker	32	49.0	32.1	28.8
Prilar	34	48.0	26.9	25.2
Park	31	47.8	26.9	--
Glenn	30	45.7	26.0	--
Beacon	31	46.5	23.6	18.8
Manker	30	48.7	21.2	--
Morex	32	47.3	19.7	22.3*
Firlbeck's III	27	48.8	15.4	--
Primus II	30	47.0	15.4	14.5

LSD(05) - 2.2 Bu/Acre C.V. - 16.5% Mean - 23.0
*(1977-78 only)

Note: Plots were seeded on April 5 and harvested July 28. Drill row spacing was 8 inches with a seeding rate of 72 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Heavy hail damage was received just prior to harvest. Plots were seeded in fallowed soil.

In Butte county the varieties (table 28) were grown under irrigation, and received two supplemental waterings during the season. The area was heavily fertilized at seeding in order to obtain maximum yields. The plants were extremely tall and lodged badly. Grain yields were excellent ranging from 109.5 to 68.7 bushels per acre. Grain quality was normal with test weights ranging from 49.0 to 45.7 pounds per bushel.

Table 28. Spring Barley Variety Trial - Butte County (Newell), 1978.

Variety	Height (Inches)	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Manker	41	25	49.3	109.5
Glenn	39	17	47.3	101.6
Beacon	43	28	47.3	101.6
Park	41	32	47.3	99.8
Primus II*	39	42	47.8	95.0
Larker	43	27	48.7	84.7
Firlbeck's III	42	23	52.5	81.4
Prilar	44	38	46.5	69.6
Morex	41	35	46.0	68.7

LSD(05) - 23.6 Bu/A C.V. - 15.1% Mean - 90.2

Note: Plots were seeded April 13 and harvested July 31. Drill row spacing was 8 inches with a seeding rate of 95 pounds per acre. They were flood irrigated twice during the season. Phosphorus fertilizer (0-44-0) was applied with the seed at 147 pounds per acre, while nitrogen fertilizer (44-0-0) was surface broadcast at the rate of 330 pounds per acre.

* Variety yields were corrected for an estimated 50% damage by raccoons.

In Haakon county the varieties were not seeded until late April. The plants were not as vigorous as at other locations and had limited tillering. Extreme drought during June reduced grain yields (table 29) and grain quality, with weights per bushel ranging from 42.7 to 37.0 pounds per bushel.

Table 29. Spring Barley Variety Trial - Haakon County (Philip), 1978.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Steptoe	25	37.0	44.8
Primus II	26	42.7	41.1
Morex	26	41.0	38.4
Prilar	26	41.3	36.9
Park	27	39.2	35.4
Larker	27	42.2	34.2
Glenn	26	37.8	33.3
Beacon	26	40.0	33.3
Manker	26	41.8	29.3

LSD(05) - 3.4 Bu/A C.V. - 5.3% Mean - 36.3

Note: Plots were seeded April 26 and harvested July 27. Drill row spacing was 8 inches with a seeding rate of 72 pounds per acre. Phosphorus fertilizer (0-44-0) was drilled with the seed and nitrogen (120-0-0) was broadcast on the surface at the rate of 100 pounds per acre.

The trial at Bear Butte in western Meade county (table 30) was seeded in mid-April and had adequate soil moisture for germination and emergence. However, droughty conditions in June restricted yield. Grain quality was below normal with weight per bushel ranging from 46.7 to 42.3 pounds per bushel.

Table 30. Spring Barley Variety Trial - Meade County (Bear Butte Valley), 1976-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Primus II	26	44.7	63.8	67.5
Larker	27	45.3	59.3	63.7
Morex	25	45.0	58.7	--
Firlbeck's III	23	46.7	58.4	--
Glenn	25	42.8	57.5	--
Park	27	44.0	57.5	--
Prilar	26	45.5	55.4	56.8
Beacon	25	42.3	52.0	52.9
Manker	26	44.2	47.5	--

LSD(05) - 7.3 Bu/A C.V. - 7.8% Mean - 54.8

Note: Plots were seeded April 18 and harvested July 26. Drill row spacing was 8 inches with a seeding rate of 72 pounds per acre. Phosphorus fertilizer (0-44-0) was applied with the seed at the rate of 100 pounds per acre. Nitrogen fertilizer (45-0-0) was surface applied at the rate of 167 pounds per acre. Plots were seeded in fallowed soil.

In eastern Meade county at Plainview, spring barley plots were seeded in mid-May. Cool temperatures and adequate moisture resulted in good stands and some tillering. lack of precipitation in June did not reduce yields (table 31) as much as anticipated and they were well above the 1977 yields as indicated by the 2 year averages.

Table 31. Spring Barley Variety Trial - Meade County (Plainview), 1977-78.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(2 yr av)
Firlbeck's III	24	49.5	40.4	--
Glenn	23	42.7	36.8	--
Park	22	44.5	35.2	--
Prilar	23	43.5	34.0	26.0
Larker	25	45.5	33.1	25.8
Morex	24	45.5	31.8	24.2
Manker	22	46.0	30.9	--
Beacon	29	42.5	30.4	23.7
Primus II	22	45.5	28.6	23.5

LSD(05) - 6.3 Bu/A C.V. - 10.0% Mean - 33.4

Note: Plots were seeded May 16 and harvested August 24. Drill row spacing was 8 inches with a seeding rate of 72 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Light hail and wind damage were received just prior to harvest. Plots were seeded on fallowed soil.

The Perkins county trial (table 32) was seeded in early May. Adequate soil moisture and cool temperatures favored growth of barley with resultant good yields. The droughty conditions in June did not affect barley as it did oats. The grain quality was good with weight per bushel near normal.

Table 32. Spring Barley Variety Trial - Perkins County (Bison), 1978.

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Larker	30	49.5	81.7
Manker	28	48.5	79.0
Morex	30	47.0	76.2
Beacon	30	46.2	75.8
Park	29	48.5	69.4
Primus II	29	48.5	65.3
Prilar	29	47.8	65.3
Glenn	24	45.8	49.0

LSD(05) - 6.7 Bu/A C.V. - 9.9% Mean - 70.2

Note: Plots were seeded May 10 and harvested August 18. Drill row spacing was 8 inches with a seeding rate of 72 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Plots were seeded in fallowed soil.

The Ziebach county trial (table 33) was seeded in early May. Good soil moisture and cool temperautures favored growth. However, droughty conditions in June did influence yields, which ranged from 53.5 to 46.3 bushels per acre. The 1978 yields were much higher than the previous two years as indicated by the 3 year averages. Weights per bushel were near normal.

Table 33. Spring Barley Variety Trial - Ziebach County (Dupree), 1976-78.

Variety	Height (inches)	Test Weight (Lbs/Bu)	Grain Yield-Bu/Acre 1978	(3 yr av)
Morex	26	48.2	53.5	33.8
Glenn	24	48.3	53.2	--
Larker	26	51.8	52.3	28.3
Steptoe	22	46.3	52.3	--
Prilar	23	49.7	49.9	26.4
Primus II	24	49.3	49.0	27.0
Beacon	28	47.7	48.7	42.3
Park	24	49.0	47.8	--
Manker	25	49.3	46.3	--

LSD(05) - 2.2 Bu/Acre C.V. - 7.4% Mean - 50.3

Note: Plots were seeded May 10 and harvested August 18. Drill row spacing was 8 inches with a seeding rate of 72 pounds per acre. Fertilizer (0-44-0) was applied at the rate of 100 pounds per acre with the seed. Plots were seeded in fallowed soil.

Flax

An irrigated flax variety trial (table 34) was seeded in Butte county in 1978. It consisted of four varieties: Linott and Culbert, both of which contain a high quantity of good quality oil. Dufferin which is a medium late maturing variety with only a satisfactory oil content, and Windom which is an old variety with a very low quality oil.

All varieties resisted lodging. They did not vary in their yields but did have low weights per bushel. It should be noted that the trial was harvested with a combine, and therefore contained seeds of varying maturity. This would explain the low test weights. At the time of harvest there had been considerable shatter loss and also development of new seed bolls.

Table 34. Flax Variety Yield Trial - Butte County (Newell), 1978.

Variety	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Windom	1	52.0	24.5
Dufferin	1	52.7	20.0
Linott	1	53.2	20.0
Culbert	1	51.0	20.0
LSD(05) - N.S.			Mean - 21.1

Note: Plots were seeded on April 13 and harvested September 8. Drill row spacing was 8 inches with a seeding rate of 56 pounds per acre. They were flood irrigated twice during the season. Phosphorus pentoxide was applied with the seed at 66 pounds per acre, while nitrogen was surface broadcast at the rate of 150 pounds per acre. Previous crop was corn.

SORGHUM VARIETY TESTING

Grain Sorghum

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

Grain sorghum variety trials were seeded in Meade and Perkins counties in 1978. Included were a number of commercial varieties which varied in maturity from short season, or very early, to medium.

The stands varied from excellent to very poor, but did provide sufficient area to obtain yield. The trial in Meade county had only a small amount of lodging but in Perkins county some varieties were 80% lodged.

Grain quality in Meade county was good with weights per bushel ranging from 58.5 to 39.2, and averaging 53.0 pounds. The grain quality in Perkins county was lower with the weights per bushel ranging from 55.0 to 38.8, and averaging 48.9 pounds.

Grain yields in Meade county were more than double those of Perkins county. The range in Meade county was from 90.0 to 22.0 bushels per acre, while in Perkins county the range was from 41.3 bushels to 10.7 bushels per acre.

Table 35. Grain Sorghum Variety Trial - Meade County (Bear Butte), 1978.

Brand and Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Pioneer 894	33	58.5	90.0
GSA E110	36	55.5	89.3
RS 506	43	54.3	87.8
Western WS103	40	56.8	79.7
Disco 180	38	57.3	77.0
Pride P500A	42	56.7	77.0
Western WS201	44	53.2	76.3
NK MM52	35	56.2	74.2
Frontier 385A	40	55.8	69.1
SD 104	35	57.5	67.0
Frontier 385B	38	54.3	65.5
Frontier 389	36	53.0	65.5
Acco R920	37	55.8	64.1
NK 121A	34	53.5	64.1
Frontier 379	36	53.8	62.6
DeKalb A28+	38	56.0	61.2
GSA 1060	38	54.3	60.8
DeKalb B38+	37	52.2	60.5
SD 106	38	54.7	57.6
Cenex 322	37	50.3	55.4
Cenex 333	39	45.3	47.5
Frontier 395R	35	44.5	46.1
Frontier 400R	32	39.2	32.1
Cenex 300T	41	43.7	22.0

Average - 64.7

Note: The plots were seeded on May 26 and harvested on October 24. Row spacing was 36 inches. Seeding rate was 4 pounds per acre with plants thinned to 4 per foot of row. No herbicide was used but plots were cultivated once. Previous crop was winter wheat.

Table 36. Grain Sorghum Variety Trial - Perkins County (Bison), 1978.

Brand and Variety	Height (Inches)	Percent Lodging	Test Weight (Lbs/Bu)	Grain Yield Lbs/Acre	Grain Yield Bu/Acre
Western WS103	40	50	53.7	2311	41.3
Frontier 389	43	40	50.8	2288	40.8
NK 121A	36	50	46.8	2169	38.7
Pioneer 894	35	40	55.0	2089	37.3
GSA 1060	42	50	47.3	2043	36.5
Frontier 385B	39	50	48.2	2041	36.4
GSA E110	42	70	51.5	1977	35.3
Disco 180	35	60	51.7	1940	34.6
Frontier 385A	41	60	51.8	1805	32.2
RS 506	46	60	50.0	1592	28.4
ACCO R920	44	70	51.7	1441	25.7
Western WS201	43	80	46.8	1418	25.3
Frontier 399	41	50	49.0	1411	25.2
DeKalb A28+	41	50	49.7	1406	25.1
DeKalb B38+	37	60	47.8	1402	25.0
Frontier 400R	34	40	38.8	1235	22.0
Frontier 395R	37	50	41.5	1225	21.9
Pride P500A	39	80	50.7	1175	21.0
NK MM52	36	40	44.5	708	12.6
SD 106	33	70	48.0	623	11.1
SD 104	35	30	52.5	600	10.7
LSD(05) - 821 Lbs/Acre		C.V. - 31.5%		Mean - 1567	28.0

Note: The plots were seeded on June 5 and harvested on November 2. The row space was 36 inches with a seeding rate of 4 pounds per acre and plants thinned to 4 per foot of row. Yields are an average of three replications. Seeded in fallowed soil.

Sorghum Forage Trials

Objective: To compare the various forage sorghums, and sorghum-sudangrass crosses, as to their adaptability, their forage production, and their forage quality.

Replicated single row plots of forage sorghum and sorghum-sudans were seeded in Meade county. The trial was seeded in fallow soil. The seedbed was excellent. Forage yields are reported in tables 37 and 38.

Table 37. Forage Sorghum Variety Yield Trial - Meade County (Bear Butte).

Brand & Variety	Height (Inches)	Percent Dry Matter	Forage Yield-Tons/A. 1978	Forage Yield-Tons/A. (2 yr av)
Warner W55	39	67.4	3.5	4.3
Warner W561	40	58.7	3.5	4.8
Sokota 300F	59	48.4	3.3	3.4
Rancher	65	47.2	3.2	3.0
GSA 30F	54	45.2	3.1	---
Warner W600	43	75.6	3.0	3.2
DeKalb FS25	59	42.1	3.0	---
NK Silomilo	55	60.6	2.9	---
DeKalb FS4	66	37.5	2.9	4.4
Sokota 320F	62	55.5	2.5	3.6
Western WS60	54	51.1	2.4	---
Disco Duo	48	63.0	2.3	---
Frontier S214	58	43.1	2.2	---
NK 367	60	36.5	2.2	---
Waconia	59	38.2	2.1	3.1
Pioneer 931	82	40.4	2.0	3.6
Disco S211A	62	41.9	1.9	3.2
GSA FS851	60	43.8	1.5	---

Mean - 2.6

Note: Plots were seeded May 26 and harvested October 24. Row spacing was 36 inches with a seeding rate of 4 pounds per acre (Final stand-4 plants per foot). Plots did not have herbicide treatment but had one cultivation. Previous crop was Hard Red Winter Wheat.

Table 38. Sorghum-Sudangrass Variety Yield Trial - Meade County(Bear Butte) 1977-78.

Brand & Variety	Height (Inches)	Percent Dry Matter	Forage Yield-Tons/A. 1978	Forage Yield-Tons/A. (2 yr av)
Disco HiKane	70	44.2	2.5	3.8
GSA 11	77	39.5	2.2	---
Western WS15	81	41.2	1.5	---
Frontier Hidan 37R	79	40.3	1.4	---
GSA SSS711	78	38.5	1.4	---
Frontier Hidan 35	76	48.1	1.3	2.8
DeKalb SX-7	77	43.0	1.2	---
NK Munchmore	72	42.5	1.1	2.8
NK Sordan 77	78	46.1	1.0	---

Mean - 1.5

Note: Plots were seeded May 26 and harvested October 24. Row spacing was 36 inches with a seeding rate of 4 pounds per acre (Final stand-4 plants per foot). Plots did not have herbicide treatment but had one cultivation. Previous crop was Hard red winter wheat.

DISCUSSION:

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

The forage yields are reported as tons of silage produced with a dry matter content of 30%, or water content of 70%. Yields reported in tables 37 and 38 were below those reported for the same variety in 1977. Although stands were satisfactory the plants were under drought stress most of the summer. It should be noted that varieties which had higher yields in 1977 when rainfall was heavier, did not produce as well under the droughty conditions of 1978. This would indicate that some of the varieties are more drought tolerant than others.

Corn

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

Single row plots of 33 hybrids of corn were planted in early-June in central Perkins county. The varieties tested were based on availability of seed from local sources. Local dealers were contacted and invited to submit materials for testing. There were also a quantity of short season experimental lines supplied by Sokota Hybrids of Brookings. The results are reported in table 39.

The yields reported were much lower than yields reported for corn in 1977. The weather data as reported in table 1 indicate below normal precipitation was received during most of the summer. However, the trial was seeded in soil which had been fallowed in 1977. The stored moisture was sufficient to provide an average yield of 41.5 bushels per acre.

Table 39. Corn Variety Demonstration Plots - Perkins County (Bison), 1978.

Brand & Variety	Rank	Percent Moisture	Grain Yield (Bu/Acre)
DeKalb XL-10	25	18.2	33.5
DeKalb XL-12	30	20.2	31.4
Disco 90A	11	18.9	46.3
Disco 95A	23	16.6	36.6
Disco SD135	15	23.6	45.6
Disco SD248	28	19.8	32.4
Disco SP130	26	18.6	33.0
Disco SX9B	5	21.5	49.2
Pioneer 3855	32	17.1	25.8
Pioneer 3965	33	19.0	21.0
Pioneer 3978	22	19.9	37.4
Sokota 214	27	16.4	32.1
Sokota 229	21	17.1	37.8
Sokota ms24a	24	18.7	36.2
Sokota ss25	9	17.7	47.0
Sokota ms27	4	16.1	50.9
Sokota TS28	7	17.1	47.7
Sokota TS36	17	19.5	44.2
Sokota TS44	6	17.4	48.8
Sokota 73-43A	20	19.2	39.4
Sokota 75-24	8	18.9	47.5
Sokota 75-25	29	19.1	31.9
Sokota 77-18	2	19.0	53.0
Sokota 77-19	18	21.9	43.4
Sokota 77-20	10	14.9	46.4
Sokota 77-21	16	21.2	44.6
Sokota 77-22	13	16.0	45.8
Sokota 77-23	1	22.4	54.6
Trojan TS-70	14	16.3	45.6
Trojan Silage	12	17.7	46.0
Western Student 4	31	18.2	28.8
Western KX20	19	16.1	42.6
Western KX32	3	16.1	52.6
			Mean - 41.5

Note: Yields are reported as #2 yellow corn with 12% moisture. Plots were seeded on June 6. Row spacing was 36 inches with plant spacing within the row at 14 inches.

MANAGEMENT, TILIAGE, AND CULTURAL PRACTICES

Fertilizer Studies on Spring Wheat

Objective: To determine the optimum level of fertilizer to apply, as well as the correct ratio of macronutrients and micronutrients, in order to obtain maximum grain yields.

Nutrient Deficiencies of Redbed Soils in Western South Dakota

A study was initiated in 1978 to study nutrient deficiencies of calcareous Nevee coarse silt soil. These soils commonly referred to as Redbeds are high in calcium (pH-8.2), very low in organic matter (1.1%), and available phosphorus (0# available). The area studied was also low in zinc, and extremely low in iron.

The area was topdressed with a 90-40-0 ratio at 100 pounds per acre, which was worked into the soil during seedbed preparation. A starter application of 5-20-0 was also applied with the seed. Micronutrients were applied by three methods: (1) a seed coating, (2) side banding, and (3) foliar spray. An Azotobacter treatment was also applied by mixing the bacteria with the seed at time of planting.

Table 40. Hard Red Spring Wheat Micronutrient Fertilizer Study - Lawrence County (Spearfish), 1978.

Treatment	Percent Stand	Height (Inches)	Heading Date	Percent Protein	Test Wt. (Lbs/Bu)	Yield (Bu/A)
Check	90	20	6-30	18.6	58.0	10.1
Seed Coating						
Zinc Sulfate	90	21	7- 1	20.1	57.9	10.1
6% Zinc Ke-min	95	19	6-30	19.4	57.5	8.9
6% Multi Ke-min	5	19	7- 2	18.6	56.0	1.2
4% Iron Ke-min	90	20	7- 1	19.6	57.2	7.4
8% Iron Ke-min	80	20	7- 2	19.2	56.8	5.0
4% Iron Seq.138	90	20	7- 1	20.5	59.5	8.7
8% Iron Seq.138	80	19	6-30	19.2	58.5	6.2
Ferrous Sulfate	80	20	7- 2	18.9	57.9	8.4
Side Bands						
Potassium Sulfate +Ferrous Sulfate	95	20	6-30	19.6	57.0	9.8
Potassium Sulfate	85	19	6-30	19.8	58.0	9.1
Potassium Chloride	90	20	6-28	19.6	58.9	9.7
Foliar Sprays						
Zinc Sulfate	85	19	6-30	19.8	57.6	9.8
Manganese Sulfate	90	20	6-30	19.9	58.3	7.6
In Furrow						
Azotobacter	90	20	6-30	19.4	57.9	8.0

See footnotes on following page.

Footnotes for Table 40.

4% Fe Ke-min applied at 0.10 pounds per acre -Fe.
8% Fe Ke-min applied at 0.21 pounds per acre -Fe.
6% Zn Ke-min applied at 0.20 pounds per acre -Zn.
6% Multi Ke-min contained an excess of boron.
4% Fe Seq.138 applied at 0.10 pounds per acre -Fe.
8% Fe Seq.138 applied at 0.21 pounds per acre. -Fe.
KCL applied at 40 pounds per acre -K_2O.
$ZnSO_4$ applied at 0.18 pounds per acre -Zn.
$FeSO_4 \cdot 7H_2O$ applied at 0.21 pounds per acre, and a foliar spray at 0.8 pounds per acre -Fe.
K_2SO_4 applied at 40 pounds per acre -K_2O.
K_2SO_4+$FeSO_4$ applied at 0.40 pounds per acre -K_2O+0.21 pounds per acre -Fe.
Azotobacter applied at 6 oz. per bushel of seed.
$ZnSO_4$ foliar applied at 0.53 pounds per acre -Zn.
$MnSO_4$ foliar applied at 0.50 pounds per acre -Mn.

DISCUSSION:

The results of this study are inconclusive for several reasons. First, it was only a one year study. Secondly, the field was badly infested with green foxtail, and thirdly, the rates of some of the micronutrients were to low to show a response. These rates were by necessity low because of the method of application.

Grain yields were all lower or equal to the check plot. It was assumed that because of the large amount of free calcium that phosphorus was not available at any time. For that reason growth as well as yield was restricted. Weights per bushel were higher for the Iron Sequestrene 138, Potassium Chloride, and Manganese Sulfate treatments. However, the increases were to small to be important.

Protein content was increased by all treatments except the 6% multi Ke-min which was equal to the check plot. Stands varied but the only large difference was due to the 6% muti Ke-min treatment which contained boron at a level which was toxic to germination.

Effects of Azotobacter as a Seed Treatment of HRW Wheat

Two sites were included in a study to determine the effects of an Azotobacter on Hard red winter wheat. The organism fixes nitrogen from the atmosphere, and should be beneficial to wheat plants.

The material was applied to the wheat seed at the recommended rate of 8 ounces per bushel of seed. Seeding of the untreated seed was done first, and then the treated seed, so that the seeder would not be contaminated. The results are shown in tables 41 and 42.

Table 41. The Influence of Azotobacter on Yield, Grain Quality, and Other Agronomic Characteristics of Hard Red Winter Wheat. Bennett County (Martin), 1978.

Variety	Seed Treatment	Percent Survival*	Height (Inches)	Percent Protein**	Test Wt (Lbs/Bu)	Yield (Bu/A)
Agate	Check	92	36	16.2	58.3	30.0
	Treated	95	35	16.8	58.2	31.5
Rall	Check	92	35	16.1	57.5	21.0
	Treated	90	33	15.8	57.8	21.7
Bronze	Check	90	36	17.6	56.5	19.5
	Treated	88	33	18.6	57.2	20.2

LSD(05) - 2.1 Bu/A C.V. - 9.5% Mean - 24.0

Note: Plots were seeded on September 14, 1977 and harvested on July 28, 1978. The plot size was 6' x 50' and contained 6 rows. Seeding rate was 60 pounds per acre. Fallowed soil was dry and cloddy at seeding time.

* Percent survival is an average of visual estimates made on April 14, 1978.

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

Table 42. The Influence of Azotobacter on Yield, Grain Quality, and Other Agonomic Characteristics of Hard Red Winter Wheat. Meade County (Bear Butte Valley), 1978.

Variety	Seed Treatment	Percent Survival*	Height (Inches)	Percent Protein**	Test Wt (Lbs/Bu)	Yield (Bu/A)
Agate	Check	95	42	14.9	57.5	42.7
	Treated	95	43	17.3	58.0	44.9
Rall	Check	95	42	14.4	57.7	48.6
	Treated	95	41	16.5	56.9	48.2

LSD(05) - 9.9 Bu/A C.V. - 6.1% Mean - 46.1

Note: Yield data are an average of 3 replications. Plot size was 6' x 40' with 12 inch row spacing. Seeded in fallow on September 13, 1977 at the rate of 60 pounds per acre. Adequate soil moisture was available for germination and emergence. Plots were harvested on July 26, 1978.

* Percent survival is an average of visual estimates made on April 17, 1978.

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

The Azotobacter had no appreciable effect on winter survival, but did show a trend toward shorter plants in the treated plots. Protein content was improved in all but one instance, with a 2.6% increase being the largest change. Weights per bushel did not show consistent changes either positive or negative. Grain yields were increased in all but one case, but the differences were not statistically significant.