

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 entire 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, 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 only 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
James Mickelson	Nisland 57762	Butte
Fenton Bros.	Nisland 57762	Butte
Melvin Pittman	Nisland 57762	Butte
John Niemi	Buffalo 57720	Harding
Pat Halstead	Spearfish 57783	Lawrence
Joe Komes	Sturgis 57785	Meade
Robert Brunner	Box Elder 57719	Pennington

The following County Extension Agents assisted in locating cooperators, and conducting the research: Gary C. Niese-Martin, Ronald L. Stee-Belle Fourche, Roger E. Moul-Buffalo, Ray Rezek-Spearfish, John C. Hansen-Sturgis, and Lyndell H. Petersen-Rapid City.

The results reported in this pamphlet were funded under Plant Science Project 7110-971, 7110-624, and 7110-5243. Research was conducted by H. A. Geise - Project Leader, J.R. Johnson - Extension Agronomist, and V.K. Mosley - Assistant in Plant Science at Rapid City, and in conjunction with M.D. Rumbaugh, P.L. Carson, A.O. Lunden, J.D. Colburn, W.S. Gardner, J.J. Bonnemann, and E.P. Adame at Brookings.

This is an annual report and results published herein are therefore neither complete nor conclusive. 1000 copies printed at estimated cost of .09¢ each.

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Table 1. Weather Data - 1974 (Information presented is from nearest U.S. Climatological Reporting Station).

Month	Temperature*	Departure**	Precipitation*	Departure**
Ludlow (Harding County Reporting Point)				
March	30.4	2.9	0.87	0.41
April	44.2	1.8	2.46	1.07
May	49.6	-3.5	2.51	0.20
June	63.0	1.2	1.56	-2.61
July	74.1	4.4	2.66	0.81
Martin (Bennett County Reporting Point)				
March	38.9	6.8	0.22	-0.45
April	48.3	2.5	4.49	2.84
May	56.9	0.8	2.12	-0.83
June	67.9	2.7	0.72	-3.16
July	79.9	6.6	0.70	-1.76
Newell (Butte County Reporting Point)				
March	34.7	5.9	0.44	-0.20
April	45.6	1.7	2.33	0.70
May	53.2	-1.3	1.54	-1.15
June	65.2	1.8	2.93	-0.59
July	76.1	4.2	2.05	0.20
South Central Research Farm (Lyman County Reporting Point)				
March	46.8	-0.8	2.60	0.81
April	56.2	-2.7	2.00	-0.38
June	68.2	-0.5	2.04	-1.07
July	80.6	3.8	0.83	-0.83
Spearfish (Lawrence County Reporting Point)				
March	35.7	3.9	0.77	-0.69
April	45.1	0.5	3.65	1.08
May	53.0	-1.4	2.82	-0.82
June	65.3	2.6	2.23	-2.37
July	74.5	3.5	1.90	0.29
Vale (Meade County Reporting Point)				
March	36.9	5.8	0.38	-0.34
April	47.9	2.1	2.82	0.82
May	55.0	-0.9	2.08	-0.86
June	67.5	2.9	1.82	-1.99
July	75.8	3.4	1.20	-0.70

* Average temperature and precipitation are an average of period 1931-1960.

** Departures from normal are based on average for years 1931-1960.

SMALL GRAIN VARIETY TRIALS

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

Rye

The plots were seeded at Presho with a deep furrow drill. The seeding rate was 5 pecks or 70 pounds per acre. The soil was fertilized by applying 15 pounds of elemental phosphorus with the seed. The results of the trial are presented in Table 2.

Table 2. Rye Variety Performance Trial - South Central Crops and Soils Research Station - Presho, South Dakota - 1974.

Variety	Date of Heading	Height (Inches)	Percent Stand	Test Wt (Lbs/Bu)	Grain Yield (Bushels/Acre)
Coloma	June 19	46	96	48.8	24.7
Cougar	21	44	92	51.0	32.6
Kodiak	23	49	91	47.0	24.8
Puma	22	45	96	52.1	31.2
Rymin	19	45	96	52.3	35.0
Von Lochow	19	45	96	52.1	31.2
LSD (05) - 2.6 Bu/A		C.V. - 4.2%		Mean - 30.1	

Winter Wheat

Plots were located in Bennett, Harding, Lawrence, Lyman, and Meade Counties. All trials were seeded in fallow with a deep furrow drill. The seeding rate ranged from 30 pounds per acre in Harding County to 68 pounds in Lawrence County. Fertilizer rate was also variable.

None of the five locations were damaged by hail, and although less than normal moisture was received during the growing season, the yields were good. At two of the five locations there was indication of moisture stress. These locations were Lyman and Meade counties where test weights were below normal or standard weight.

With the exception of Harding County, which was hand harvested, the plots were harvested with a Massey-Ferguson Model 35 Self-Propelled combine. Machine harvested areas contained a minimum of 100 square feet per sample.

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

The yield results from the five trials conducted in 1974 are reported in Tables 3 through 7.

Table 3. Winter Wheat Variety Performance Test - Bennett County - 1974

Variety	Height (Inches)	Rust Reaction ¹⁰		Wheat Streak Mosaic ¹¹	Straw Strength	Percent Protein	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
		Leaf	Stem					
Sage	37	MS	R	Tol	Good	10.3	63.5	46.0
Sentinel	40	S	R	S	Stiff	10.7	63.0	42.6
Gage	43	MR	R	S	Stiff	10.6	62.5	42.6
Centurk	43	MR	R	MR	Stiff	10.4	64.0	40.8
Homestead	39	S	R	S	Stiff	12.4	61.2	40.6
Scoutland	38	S	R	Tol	Fair	10.5	64.0	40.0
Buckskin	43	S	R	MS	Good	11.5	62.0	39.0
Cloud	41	MS	R	MR	--	11.2	63.0	37.5
Bronze	42	MR	R	S	Good	11.3	62.5	37.0
Hiplains	42	S	R	S	Stiff	9.5	63.5	34.8
Winoka	43	S	R	S	Good	10.0	64.0	34.0
TAM 101	33	S	R	S	--	12.0	63.5	33.5
Lancer	44	S	R	MR	Good	10.9	63.5	32.0
Eagle	39	S	R	Tol	Good	11.6	63.5	31.3
Caprock	37	R	S	S	--	10.9	64.0	30.5
Hume	48	S	R	S	Good	10.9	62.5	30.0

LSD (05) - 7.2 Bu/A

C.V. - 9.1%

Mean - 37.0

Note: Values presented within the table are averages of 2 samples. Seeded-September 10, 1973, Harvested-July 19, 1974.

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

Table 4. Winter Wheat Variety Performance Trial - Harding County - 1974

Variety	Winter Hardiness	Rust Reaction**		Wheat Streak Mosaic**	Straw Strength	Test Weight (Lbs./Bu.)	Grain Yield (Bu/Acre)
		Leaf	Stem				
Centurk	Moderate	MR	R	MR	Stiff	62.3	35.1
Buckskin	Good	S	R	MS	Good	62.0	33.3
Winoka	Excellent	S	R	S	Good	64.5	33.2
Sage	Moderate	R	R	Tol	Good	64.2	32.5
Caprock	Poor	R	S	S	--	61.7	32.3
Gage	Moderate	R	R	S	Stiff	60.5	31.5
Homestead	Good	S	R	S	Stiff	62.0	31.3
Eagle	Moderate	S	R	Tol	Good	63.0	31.1
Sentinel	Moderate	S	R	S	--	60.7	30.3
Gent	Moderate	R	R	MR	Fair	62.5	29.7
Cloud						61.0	28.9
Scoutland	Moderate	S	R	Tol	Fair	62.5	27.9
Scout 66	Moderate	S	MR	Tol	Fair	63.0	27.6
Minter	Excellent	S	R	S	Good	62.0	26.7
Bronze	Very Good	MR	R	S	Good	60.5	26.1
Lancer	Good	S	R	MR	Good	61.5	24.5
Froid	Excellent	S	R	--	Weak	59.5	22.5
Hume	Excellent	S	R	S	Good	60.5	17.6
Hiplains	Good	MR	R	S	Stiff	60.0	16.8

Mean - 28.4

Seeded - September 7, 1973: Harvested - July 22, 1974

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

Table 5. Winter Wheat Variety Performance Trial - Lawrence County - 1974

Variety	Height (Inches)	Rust Reaction**		Wheat Streak Mosaic**	Straw Strength	Percent Protein	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
		Leaf	Stem					
Sage	43	MS	R	Tol	Good	14.5	61.5	61.1
Sentinel	38	S	R	S	Stiff	14.8	59.0	59.5
Scout 66	42	S	MR	Tol	Fair	14.3	62.0	58.3
Bronze	44	MR	R	S	Good	14.2	60.0	57.7
TAM 101	29	S	S	Tol	--	14.4	62.5	57.2
Centurk	45	MR	R	MR	Stiff	13.9	60.0	57.2
Caprock	29	R	S	S	--	14.6	60.0	57.2
Homestead	40	S	R	S	Stiff	15.0	60.0	57.0
Eagle	37	S	R	Tol	Good	15.7	62.0	55.0
Cloud	47	MS	R	MR	--	14.6	61.0	54.6
Buckskin	49	S	R	MS	Good	13.8	60.0	54.2
Gage	47	MR	R	S	Stiff	15.5	61.0	52.4
Scoutland	43	S	R	Tol	Fair	16.3	61.5	51.6
Hiplains	45	S	R	S	Stiff	14.1	62.0	50.5
Winoka	50	S	R	S	Good	14.0	62.5	49.8
Lancer	45	S	R	MR	Good	14.0	60.5	48.4
Hume	49	S	R	S	Good	14.9	61.5	42.1
Winter Graze	43	--	--	--	--	15.5	57.0	7.2

LSD(05) - 4.1 Bu/A

C.V. -3.8%

Mean - 51.9

Note: Values presented in table are the average of two samples. Seeded-September 22, 1973, Harvested-July 22, 1974

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

Table 6. Winter Wheat Variety Performance Trial - Lyman County - 1974

Variety	Height (Inches)	Rust Reaction** Leaf	Stem	Wheat Streak Mosaic**	Straw Strength	Percent Protein	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Gent	36	R	R	MR	Fair	15.8	59.8	46.8
Sentinel	36	S	R	S	Good	14.8	57.3	45.1
Centurk	39	MR	R	MR	Stiff	14.6	57.7	43.9
Scout 66	36	S	MR	Tol	Fair	14.1	59.7	42.9
Weathermaster 106	39	--	R	---	---	13.7	59.2	41.9
Gage	39	R	R	S	Stiff	15.3	58.2	41.0
Homestead	34	S	R	S	Stiff	15.0	58.5	40.6
Shawnee	43	--	---	---	---	15.7	57.0	40.3
Scoutland	38	S	R	Tol	Fair	14.7	60.7	38.9
Eagle	37	S	R	Tol	Good	14.3	59.5	38.6
Cloud	39	MS	R	---	---	15.4	59.2	38.4
Buckskin	40	S	R	MS	Good	15.0	56.2	37.8
Caprock	35	R	S	S	---	15.4	57.2	37.3
Sage	38	R	R	Tol	Good	14.9	60.0	36.6
Trapper	43	S	R	S	Good	15.4	56.2	36.0
Hiplains	41	MR	R	S	Stiff	14.2	57.8	35.6
Sturdy	31	R	S	---	Good	15.6	56.2	34.0
TAM 101	38	S	S	Tol	---	12.8	57.5	33.6
Lancer	41	S	R	MR	Good	13.8	57.3	33.6
Hume	44	S	R	S	Good	14.9	56.5	33.2
SD 66169	43	---	R	---	Good	16.2	56.2	33.2
Winoka	44	S	R	S	Good	14.9	56.8	33.0
Bronze	38	MR	R	S	Good	16.2	55.8	31.2
Cream	42	---	---	---	---	14.0	57.3	29.8
Golden 50	44	S	---	---	Stiff	14.8	55.5	29.6
Guide	34	S	R	---	Stiff	14.3	59.8	29.4
Froid	46	S	R	---	Weak	15.5	55.5	27.8
Clark Sel. 64-21	46	---	---	---	---	13.1	60.0	26.2
Golden Chief	44	---	---	---	Good	14.8	56.2	23.0
LSD(05) - 5.8 Bu/A		C.V. - 10.0%				Mean - 55.8		

Note: Data is an average of 3 replications; Seeded - September 18, 1973; Harvested - July 17, 1974.

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

Table 7. Winter Wheat Variety Performance Trial - Meade County - 1974

Variety	Height (Inches)	Rust Reaction**		Wheat Streak		Strength	(lb/bu)	(bu/acre)
		Leaf	Stem	Hosiac**				
Centurk	36	MR	R	MR		Stiff	54.0	58.7
Caprock	33	R	S	S		--	54.0	58.1
Scout 66	37	S	MR	Tol		Fair	56.5	57.5
Sentinel	37	S	R	S		Stiff	53.0	56.3
Sage	34	MS	R	Tol		Good	59.0	55.7
Gage	42	MR	R	S		Stiff	54.0	54.4
Eagle	38	S	R	Tol		Good	58.0	53.2
Winoka	43	S	R	S		Good	56.5	52.6
Lancer	41	S	R	MR		Good	54.5	52.0
Scoutland	41	S	R	Tol		Fair	57.5	51.4
Homestead	27	S	R	S		Stiff	56.5	45.4
Hiplains	35	S	R	S		Stiff	56.5	44.2
TAM 101	25	S	S	Tol		--	54.5	43.6
Hume	43	S	R	S		Good	54.0	43.0
Cloud	39	MS	R	MR		--	57.5	41.8
Buckskin	40	S	R	MS		Good	58.0	39.9
Bronze	40	MR	R	S		Good	54.0	38.7
Winter Graze	36	--	-	---		--	54.5	8.5

Mean - 47.5

Seeded - September 8, 1973; Harvested - July 25, 1974

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

Spring Wheat

Spring wheat varieties were harvested in Harding and Meade counties in 1974. Both locations were seeded in late April. Temperatures were near normal for all months except May which was below normal. Precipitation was below normal during June when the plants were making the most rapid rate of growth. The lack of moisture during the period when the kernels were filling is quite evident by the low test weights. The yields are shown in Tables 8 and 9.

Table 8. Spring Wheat Variety Trial - Harding County, 1974.

Variety	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Standard Height		
Ellar	54	25.5
Fortuna	55	25.0
BW 25	56	23.8
Polk	57	23.4
Waldron	51	23.0
Nordak	54	22.7
Chris	55	22.4
Nowesta	51	22.4
Semi-Dwarf		
Olaf	57	24.6
Era	56	23.8
Kitt	56	23.8
WS 1809	52	22.8
WS 3	57	21.8
Protor	55	21.5
Bounty 208	56	20.5
MP-19	52	20.0
WS 6	52	18.5
Bonanza	53	17.0
Durum		
Hercules	60	29.5
Botno	61	27.6
Rolette	61	27.2
Rugby	59	25.2
Crosby	58	24.8
Ward	60	21.9
Leeds	61	21.2

Mean - 23.2

Note: Data is from non-replicated trial. Seeded-April 29, 1974, Harvested-August 5, 1974.

Table 9. Spring Wheat Variety Trial - Meade County, 1974

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Standard Height			
Nowesta	35	50.0	27.2
Waldron	36	48.0	25.4
Chris	35	50.0	24.8
Polk	35	52.5	22.4
Sheridan	38	51.5	22.4
Nordak	37	52.5	20.6
Semi-Dwarf			
Protor	25	49.5	36.9
MP-19	29	49.0	30.2
Olaf	30	50.0	29.6
WS 3	25	49.5	29.6
WS 1809	29	49.0	29.6
Bounty 208	26	51.0	27.2
WS 6	26	47.0	26.0
Bonanza	24	48.0	25.4
Kitt	27	46.5	21.8
Era	26	47.0	20.6

Mean - 26.2

Note: Data is from non-replicated trial. Date of Seeding - April 19, 1974,
Harvested - July 25, 1974.

OATS

Oat variety drill strips were harvested in Bennett, Harding, and Meade Counties. Results are listed in Tables 10 thru 12. Plots were seeded on fallow. The fertilizer applied and seeding rates for each location are listed in the plot information section. The trials which were planted in late April benefited by the cool temperature of May by producing numerous tillers. This resulted in yields ranging from 80 to 30 bushels per acre. However, because of the limited rainfall during June the test weights were below normal for oats. The trials in Bennett and Meade counties were harvested with a self-propelled plot combine while those in Harding county were hand clipped and threshed with a Chain plot thresher.

Table 10. Oat Variety Drill Strips - Bennett County (Martin Airport), 1974

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Noble	28	32.0	74.0
Spear	32	33.7	65.6
Chief	33	32.5	54.6
Nodaway 70	33	33.7	63.0
Astro	25	29.7	62.8
Trio	36	32.7	59.3
Diana	31	31.5	49.2
Dal	34	29.0	47.6
Otee	34	35.0	44.1
Burnett	38	31.7	42.5

LSD(05) - 16.6 Bu/A

C. V. - 11.2%

Mean - 57.3

Table 11. Oat Variety Trial - Harding County, 1974

Variety	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Cayuse	26	71.0
Noble	27	59.3
Holden	30	55.0
Dupree	31	54.0
Diana	27	53.9
Kelsey	28	53.8
Nodaway 70	35	53.6
Grundy	24	52.9
Random	26	51.9
M-73	29	49.3
Trio	28	49.1
Kota	33	47.0
Astro	16	46.9
Chief	30	46.4
Portal	32	45.6
Russell	33	44.5
Harmon	27	44.1
E-74	25	39.3
Dal	29	38.4
Froker	28	37.5
Burnett	35	34.7
Lodi	26	33.5
Otee	31	32.9
Spear	34	29.8

Mean - 46.8

Table 12. Oat Variety Drill Strips - Meade County, 1974

Variety	Height (Inches)	Lodging* (1-5)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Noble	32	1	28.5	83.9
Trio	36	4	30.5	81.6
Spear	32	3	32.5	76.0
Cayuse	30	2	24.0	76.0
Nodaway 70	37	5	31.0	75.6
Portal	37	4	31.0	74.8
Dal	33	1	31.5	69.2
Grundy	32	3	31.0	68.0
E-74	34	1	33.5	66.9
Burnett	36	5	32.0	66.9
Chief	36	4	30.5	66.9
Froker	35	3	32.5	64.6
Diana	32	4	31.0	64.6
Holden	32	3	30.0	59.0
M-73	35	2	31.5	53.3
Astro	28	1	28.0	53.3
Kelsey	34	5	28.5	44.2

Mean - 67.3

Note: Non-replicated trial

*Lodging score: 1 - upright, 5 - prostrate.

Spring Barley

The variety plots at Bennett, Harding, and Meade counties (Tables 13-15) were seeded in fallow in late April. Only the trial in Harding county received fertilizer. At that site an application rate equivalent to 8 pounds of elemental phosphorus was applied per acre. The grain yields reported in these studies for Bennett county was 10 bushels above the county average for 1974, but 6 bushels below the 1965-70 average. In Harding county the average plot yield was equal to the 1965-70 average and was also equal to the 1974 county average. The average yield in Meade county was 5 bushels above the county average and about 2.5 times above the 1965-70 average yield for the county. Weight per bushel in all trials was low because of the lack of moisture and resultant unfilled kernels.

Table 13. Spring Barley Variety Trials - Bennett County (Martin Airport) 1974

Variety	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Beacon	31	45.5	31.9
Conquest	35	41.5	29.7
Prilar	32	42.5	28.8
Primus II	31	42.7	18.9
LSD(05) - 6.2 Bu/A		C. v. - 3.8%	Mean - 26.0

Table 14. Spring Barley Variety Trials - Harding County, 1974

Variety	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Larker	43	42.7
Prilar	42	42.7
Primus II	43	36.5
Cree	42	35.5
Dickson	45	34.1
Nordic	47	33.1
Beacon	44	30.6

Note: Non-replicated trial.

Mean - 31.4

Table 15. Spring Barley Variety Trials - Meade County (Bear Butte Valley) 1974

Variety	Height (Inches)	Lodging* (1-5)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Larker	34	2	36.0	45.4
Prilar	32	4	38.0	43.8
Beacon	34	2	33.5	43.1
Conquest	35	5	34.5	40.8
Primus II	33	4	38.0	38.6
Cree	32	3	33.5	37.0

Note: Non-replicated trial.

Mean - 41.4

*Lodging score: 1-upright, 5-prostrate.

SORGHUM FORAGE TRIAL

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, sudangrass, blends, and a grain sorghum check were seeded in western Pennington county on June 8, 1974. At that time the soil was extremely dry and cloddy, and a very poor seedbed existed. Germination and emergence was slow and uneven, resulting in poor stands.

The extreme droughty conditions continued through the summer, with only a few plants reaching over 30 inches high at the end of the season. The data which was salvaged from the trial was the sugar content of plant sap which is presented in Table 16.

Table 16. Concentrations of Sugar in Plant Sap of Sorghum Forages when Grown Under Extreme Droughty Conditions-Pennington County, 1974.

Brand	Variety	% Sugar in Sap	Brand	Variety	% Sugar in sap
FORAGE SORGHUM			SORGHUM SUDAN		
Acco	FS401R	17.3	Acco	Sweet Sioux	15.0
Acco	FS403R	17.1	Acco	Sweet Sioux II	15.6
Acco	FS531	15.2	Acco	Sweet Sioux III	14.4
Acco	X7804	16.2	Acco	S-99	16.7
Advance	1071F	15.6	Dekalb	SX-4	15.0
Asgrow	Beefbuilder T	17.5	Dorman	Suregraze	17.0
Asgrow	Dairy D	14.8	Frontier	Hidan 35	14.3
Dekalb	FS1a	16.8	Frontier	Hidan 37	17.3
Dekalb	FS1b	17.4	Frontier	Hidan 39	15.6
Dekalb	FS4	18.2	Northrup King	Sordan 70	15.7
Excel	Silo-fill 33	16.6	Pioneer	988	16.1
Funk's	93F	15.8	Rudy-Patrick	Su-4	17.9
Frontier	Hi-Kane	18.0			
Frontier	S-209	14.8			
Frontier	S-211A	17.0			
Frontier	S-212A	19.1			
Taylor-Evans	Hay-Grazer	18.0	SUDANGRASS		
Northrup King	325	17.3	Acco	HS-33	18.4
Northrup King	367	16.9	Cal/West	Monarch	18.8
Pioneer	931	14.9	Northrup King	Trudan 5	17.9
Rudy-Patrick	22F	17.4	Wisconsin AES	Piper	19.1
Rudy-Patrick	55F	18.5	Rudy-Patrick	Trudy	16.8
Rudy-Patrick	Sumax	16.3			
SDAES	Rancher	14.7			
SDAES	SD252F	16.2			
Waconia Mills	Waconia	14.2	BLENDS		
Warner	W-55	17.6	Acco	FB-44	15.4
Warner	W-561	19.0	Acco	3 Little Indians	17.6
Warner	W-600	18.4			
Warner	W-601	18.2			
SDAES	SD XR873	16.6	GRAIN SORGHUM		
			SDAES	SD 503	19.5

SOYBEAN VARIETY TRIAL

Objectives: To observe and compare soybean varieties for grain yield, disease resistance, and management practices under irrigated conditions in the Belle Fourche Irrigation District.

Four varieties of soybeans were selected from maturity groups 0, I, & II. They were planted in 1/2 acre irrigated plots on May 24, 1974. Seeding rate was 60 pounds per acre. Row spacing was 36 inches.

Additional water was applied as the cooperators saw a need. Excellent growing conditions and good management practices resulted in plants which were vigorous and healthy. An unusually late killing frost permitted the long-seasoned varieties to yield high quality seed with normal test weights. The yields are reported in Table 17.

Table 17. Soybean Variety Trial (Irrigated) - Butte County, 1974.

Variety	Maturity*	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Evans	109	56.2	47.7
Corsoy	121	57.7	36.4
Chippewa	114	58.0	33.6
Steele	115	56.0	31.8
			Mean - 37.4

*Maturity - Number of days between planting and date when beans are dry enough to harvest.

IRRIGATED ALFALFA PRODUCTION

Objectives: To demonstrate the high level of alfalfa forage production obtainable under irrigation in Butte County by application of presently known technology.

Variety Trial

The variety trial of 20 entries was seeded without a companion crop in April 1974. The soil, a deep silt loam, did not receive fertilizer at the time of establishment. A preplant incorporated herbicide was used to control weeds during the first growing season. Additional water was applied to maintain soil moisture levels, based on tensiometer readings at one and two foot levels.

Yields during the first year are shown in Table 18. Two cuttings were obtained. There was no statistical difference, at the 5% confidence level, in yields among varieties for either cutting or for total yield. This was attributed to high plot-to-plot variation which appeared to be a result of differential weed control. An average of nearly 3 tons of hay was harvested during the first year.

Table 18. Alfalfa Variety Trial (Irrigated) - Butte County, 1974

Source	Variety	Tons per Acre (12% moisture)		
		1st cut	2nd cut	Total
USDA-Minn AES	Agate	1.57	.96	2.53
Teweles	Americana	2.23	1.44	3.72
USDA	Cossack	1.76	1.19	2.95
USDA-Neb AES	Dawson	2.50	1.33	3.83
Barzan	Flandria	2.37	1.09	3.46
Minn AES	Grimm	1.21	1.13	2.34
NY AES	Iroquois	1.31	1.55	2.86
Jacques	JX-80	1.03	1.42	2.45
Mont AES	Ladak 65	1.50	1.28	2.78
Dekalb	131	1.60	1.31	2.91
USDA-Neb AES	Ranger	1.09	1.34	2.43
NY AES	Saranac	1.53	1.27	2.80
King's Western	17 AA	1.60	1.39	2.99
Foster's	Siberian	1.60	1.32	2.92
Teweles	Superstan	1.11	1.28	2.39
USDA	Team	1.69	1.41	3.10
Northrup, King & Co	Thor	1.68	1.41	3.09
Wis AES	Vernal	1.27	1.11	2.38
Northrup, King & Co	Warrior	1.53	1.56	3.09
Farmer's For. Res.	Weevlchek	1.94	1.50	3.44
Mean		1.61	1.31	2.92
Least Significant Difference at 5% Level		N.S.	N.S.	N.S.
Coefficient of Variability		54%	19%	34%

Water Management Trials

A water management trial was initiated in 1974 to demonstrate production potential by timely harvest and water application. The three systems selected included a "casual" water management, an "intensive" water management, and an "intermediate" system. Irrigation intensity on the "casual" system was one irrigation after each cutting. The "intensive" system was irrigated three times between cuttings, except the final (4th) cutting. The "intermediate" system received two irrigations between cuttings. The "casual" system is the predominant practice on the Belle Fourche District.

The yields and protein content of the forage are reported in Table 19. In contrast to the 3.8 tons per acre average for the district (casual water management system), the intensively managed system produced yields in excess of 7.5 tons per acre.

This location was terminated at the end of the 1974 growing season because of a perched water table. The effect of the table was a water-saturated subsoil under all treatments, thus nullifying the anticipated low yields of the less intensive water management systems.

Table 19. Water Management Trial - Butte County, 1974

Date	Treatment 1		Treatment 2		Treatment 3	
	Yield*	Protein Content**	Yield*	Protein Content**	Yield*	Protein Content**
<u>June</u>						
4	4395#/A	18.6%	5461#/A	18.5%	4566#/A	19.1%
12	Water		Water		Water	
16					Water	
29			Water		Water	
<u>July</u>						
5	3300#/A	18.6%	3572#/A	18.9%	4513#/A	20.5%
8	Water					
11			Water		Water	
18					Water	
26			Water		Water	
<u>August</u>						
2	2379#/A	20.6%	2208#/A	20.5%	2327#/A	20.6%
8	Water					
12			Water		Water	
<u>September</u>						
7	Water		Water		Water	
10	2692#/A	20.2%	2222#/A	20.7%	2211#/A	20.6%
Total	12,766#/A		13,543#/A		13,617#/A	
Moisture at 12%	14,298#/A		15,160#/A		15,251#/A	

* Yield values are oven-dry weights except where indicated.

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

CROP DISEASE CONTROL

Date of Planting of Hard Red Winter Wheat:

In 1971 and 1972 experiments were carried out to determine if Furadan, a systemic insecticide and miticide, would control the Wheat Curl Mite vector of the virus and reduce the Wheat Streak Mosaic severity. The date of planting experiment was divided into a split plot design, with one half of each regular planting date treated with Furadan.

In 1971, an unexpected effect was noted on the August 15 planting. The untreated wheat had fewer plants per plot and yielded six bushels per acre less than the Furadan treated wheat. In 1972, no difference was noted between the appearance of Furadan-treated and untreated wheat, but there was an increase of 10 bushels per acre in the Furadan-treated wheat planted

on August 15. The possible beneficial effect of the Furadan treatment on early planted winter wheat was control of cutworms, greenbugs or other pests.

In 1973, the experiment was redesigned and included only 4 dates of planting, and a different Insecticide-Miticide treatment. The results as presented in Table 20, indicate the reactions of the wheat to this particular Insecticide-Miticide are not the same as the reactions to Furadan. The initial increase in plant vigor was not exhibited nor was there any increase in yield or test weight. The only positive influence was an increase in winter survival in the first two planting dates. The control of Wheat Streak Mosaic could not be determined in 1974 at this site because of the low incidence of the disease.

Table 20. Winter Wheat Date of Planting Experiment Using Di-Syston* for Control of Leaf Curl Mite, the Vector for Wheat Streak Mosaic. Lyman county, 1974.

Date of Planting	Seed Treatment	% Winter Survival**	Height (Inches)	Percent Lodging	Test Wt (Lbs/Bu)	Yield (Bu/A)
August 25	Check	91	39	2.0	56.8	34.4
	Treated	95	40	2.7	57.2	30.5
September 4	Check	60	39	2.3	58.3	35.8
	Treated	87	38	2.3	58.5	35.0
September 14	Check	89	38	5.0	58.0	31.6
	Treated	88	39	2.0	52.5	11.5***
September 24	Check	87	41	2.0	56.8	31.2
	Treated	58	39	2.0	56.8	32.1

* Di-Syston is a systemic Insecticide-Miticide.

** Percent winter survival is based on number of plants in fall vs number of plants in spring and not total number of plants in a given area of plot.

***Stands were very poor on September 24 treated plots because of drill malfunction.

Response of Hard Red Winter Wheat to Bacillus uniflagellatus Applied as a Seed Treatment

In Lyman county, 14 varieties of winter wheat were seeded in replicated paired plots to study the effects of treatment of the seed with B. uniflagellatus. The plots were seeded with a deep furrow drill on September 7, 1973.

Soil moisture was adequate at seeding and good uniform stands were obtained. Surface cover was sufficient to prevent soil erosion and winterkill was negligible.

Statistical analysis of the data collected and reported in Table 21 shows the differences between varieties for lodging, stand, height, test weight, and yield were real and significant at the 1% confidence level. However, the

differences due to the bacillus seed treatment were only significant for test weight. Further research is necessary to determine what mechanism or mechanisms cause the differences observed and how the differences may be increased so as to be useful to man.

Table 21. Agronomic Characteristics of Winter Wheat as Influenced by Treatment of Seed with Bacillus uniflagellatus - Lyman county, 1974.

Variety	Treatment	Percent Lodging	Percent Stand	Height (Inches)	Test Weight (Lbs/Bu)	Grain Yield (Bu/Acre)
Bronze	Check	11.0	92.0	37.5	55.8	29.2
	Treated	10.0	95.0	38.5	56.1	29.9
Buckskin	Check	9.0	95.0	40.0	56.5	38.8
	Treated	9.0	95.0	41.0	56.3	39.2
Centurk	Check	18.0	95.0	41.0	57.4	30.5
	Treated	15.0	95.0	42.0	57.1	43.7
Eagle	Check	10.5	91.5	36.8	59.2	42.6
	Treated	10.8	92.0	35.0	59.5	43.7
Hiplains	Check	3.0	94.2	38.2	56.9	37.8
	Treated	3.0	94.2	40.0	57.4	37.8
Homestead	Check	3.5	97.0	30.0	59.0	39.2
	Treated	3.0	96.5	31.5	59.4	38.2
Hume	Check	15.0	95.0	40.2	55.8	30.6
	Treated	15.0	95.0	40.0	56.0	30.5
Lancer	Check	25.0	95.5	44.5	56.4	32.8
	Treated	25.0	95.5	43.2	56.6	35.4
Sage	Check	10.5	95.0	39.0	60.7	46.1
	Treated	11.2	95.0	39.5	60.5	48.0
Scout 66	Check	37.5	97.0	36.8	59.9	45.7
	Treated	35.0	96.5	39.5	60.6	48.2
Sentinel	Check	5.0	95.5	34.0	56.8	39.4
	Treated	5.0	95.5	33.8	57.0	39.1
Sturdy	Check	3.0	96.5	30.8	58.1	38.8
	Treated	3.0	96.0	30.8	58.2	39.0
Scoutland	Check	22.5	96.0	38.8	60.9	37.5
	Treated	22.5	96.0	39.5	60.5	38.7
Winoka	Check	17.5	94.0	44.8	56.4	34.5
	Treated	21.7	93.0	45.7	56.4	31.5

LSD (05) - 3.8 Bu/A

C.V. - 5.9%

Mean - 38.3

Response of Hard Red Spring Wheat to *Bacillus uniflagellatus*
Applied as a Seed Treatment

In Bennett county, nine varieties of spring wheat were seeded in replicated paired plots to study the effects of the *B. uniflagellatus* seed treatment on spring wheat varieties. The plots were located in an area that had been seeded to winter wheat and later destroyed because of a severe infestation of Downy brome grass. The initial lack of soil moisture plus severe droughty conditions during the growing season resulted in extremely low yields.

In order to obtain somewhat uniform samples for yield determination, only yard square areas were harvested from each plot. The yields shown in Table 22 indicate an increase for all varieties except one. However, the increases were too small to be statistically significant.

Table 22. Effects on Grain Yield of Hard Red Spring Wheat as Influenced by Treatment of Seed with *Bacillus uniflagellatus* - Bennett County, 1974.

Variety	Seed Treatment	Test Weight (Lbs/Bu)	Train Yield (Bu/Acre)
WS 1809	Check	46.5	14.3
	Treated	49.0	14.4
Nordak	Check	51.5	12.1
	Treated	50.7	14.1
Waldron	Check	49.5	14.0
	Treated	51.0	17.3
Polk	Check	51.0	8.1
	Treated	50.5	9.2
Chris	Check	47.5	9.2
	Treated	49.0	7.7
Sheridan	Check	52.5	9.3
	Treated	51.0	9.8
Nowesta	Check	47.5	10.7
	Treated	47.0	12.1
Bounty 208	Check	48.3	13.7
	Treated	48.5	14.6
Bonanza	Check	46.5	11.5
	Treated	47.0	12.6

Mean - 11.9

PLOT INFORMATION

Winter Grain Variety Drill Strips

Martin Airport - (Bennett County)

Date of Seeding: September 10, 1973.
 Rate of Seeding: 60 pounds per acre.
 Plot Size: 5' x 20'.
 Row Space: 14 inches.
 Number of Replications: Two.
 Fertilizer Applied: None.
 Soil Condition: Fallow, soil dry to a depth of 4 inches.

Harding County - (10 miles North of Buffalo)

Date of Seeding: September 6, 1973.
 Rate of Seeding: 30 pounds per acre.
 Plot Size: 5 samples each 1 square yard combined into a single sample.
 Row Space: 14 inches.
 Number of Replications: One.
 Fertilizer Applied: 40 pounds per acre of 0-46-0.
 Soil Condition: Fallow.
 Pesticides Used: None.
 Date of Harvest: July 22, 1974.
 Other Factors: Hand harvested and threshed with a small thresher.
 Mild winter with no winterkill.

Spearfish - (Lawrence County)

Date of Seeding: September 22, 1973
 Rate of Seeding: 68 pounds per acre.
 Plot Size: 240 square feet.
 Row Space: 12 inches.
 Number of Replications: Two.
 Fertilizer Applied: 100# per acre of 11-48-0 with the seed.
 Soil Condition: Fallow.
 Pesticides Used: None.
 Date of Harvest: July 22, 1974.
 Other Factors: Soil was a silty clay, seeding was done with a deep furrow drill.

South Central Research Farm - (Lyman County, Presho)

Date of Seeding: September 18, 1973.
 Rate of Seeding: 60 pounds per acre.
 Plot Size: 6' x 50'.
 Row Space: 12 inches.
 Number of Replications: Three.
 Fertilizer Applied: 75# per acre of 0-46-0 with the seed.
 Soil Condition: Good tilth with good moisture, fallow.
 Pesticide Used: None.
 Date of Harvest: July 17, 1974.
 Other Factors: Soil was a silty clay. Plots were seeded with a deep furrow drill.

Joe Komes Farm - (Meade County, Bear Butte Valley)

Date of Seeding: September 8, 1973.
 Rate of Seeding: 60 pounds per acre.
 Plot Size: 6' x 30'.
 Row Space: 12 inches.
 Number of Replications: Two.
 Fertilizer Applied: None.
 Soil Condition: Fallow.
 Pesticides Used: None.
 Date of Harvest: July 22, 1974.

Spring Grain Variety Drill Strips

Martin Airport - (Bennett County)

Date of Seeding: April 6, 1974.
 Rate of Seeding: 60 pounds per acre.
 Plot Size: 5.8' x 50'.
 Row Space: 14 inches.
 Number of Replications: Two.
 Fertilizer Applied: None.
 Soil Condition: Summer fallow prepared with rod weeder in spring.
 Pesticide Used: None.
 Date of Harvest: July 19, 1974.
 Other Factors: Soil was sandy loam, soil moisture at seeding was adequate.

John Niemi Farm - (Harding County)

Date of Seeding: April 29, 1974.
 Rate of Seeding: 1.25 bushel per acre.
 Plot Size: Harvested area 5 square yards.
 Row Spacing: 7 inches.
 Number of replications: One with five subsamples.
 Fertilizer Applied: 40 pounds per acre of 0-46-0.
 Soil Condition: Fallow.
 Pesticides Used: None.
 Date of Harvest: July 26, August 5 - 10, 1974.

Joe Komes Farm - (Meade County - Bear Butte Valley)

Date of Seeding: April 19, 1974
 Rate of Seeding: 60 pounds per acre.
 Plot Size: 6' x 30'.
 Row Space: 8 inches.
 Number of Replications: One.
 Fertilizer Applied: None.
 Soil Condition: Fallow.
 Pesticide Used: None.
 Date of Harvest: July 22, 1974.

Soybean Variety Trial

James Mickelson Farm - (Butte County, Nisland)

Date of Seeding: May 24, 1974.
 Rate of Seeding: 60 pounds per acre.

Plot Size: Half acre with samples of 10 linear feet of row.
 Row Space: 36 inches.
 Number of Replications: Four.
 Fertilizer Applied: None.
 Soil Condition: Irrigated.
 Pesticide Used: Treflan at 1#/A. a.c. Preplant Incorporated.
 Date of Harvest: October 7, 1974.

Sorghum Forage Trial

Robert Brunner Farm - (Pennington County, Box Elder)
 Date of Seeding: June 8, 1974.
 Rate of Seeding: Forage Sorghum & Sorghum-Sudan 6#/A, Sudangrass - 4#/A.
 Plot Size: 3' x 25'.
 Row Space: 36 inches.
 Number of Replications: Four.
 Fertilizer Applied: None.
 Soil Condition: Extremely dry at seeding.
 Pesticide Used: None.
 Date of Harvest: N/A
 Other Factors: Extreme drought at seeding time and during growing season resulted in poor stands and stunted plants. Plots were not harvested.

Seed Treatment Studies with Hard Red Winter Wheat

South Central Research Farm - (Lyman County, Presho)
 Date of Seeding: September 7, 1973.
 Rate of Seeding: 70 pounds per acre.
 Plot Size: 4' x 25'.
 Row Space: 12 inches.
 Number of Replications: Four.
 Fertilizer Applied: None in 1973 (Adequate from previous years).
 Soil Condition: Good soil moisture.
 Pesticides Used: None.
 Date of Harvest: July 17, 1974.
 Other Factors: Plots received heavy hail in mid-May prior to heading or in early jointing stage. Rainfall during growing season was 6.5 inches.

Seed Treatment Studies with Hard Red Spring Wheat

Martin Airport - (Bennett County)
 Date of Seeding: May 4, 1974.
 Rate of Seeding: 70 pounds per acre.
 Plot Size: 4' x 24'.
 Row Space: 8 inches.
 Number of Replications: Four.
 Fertilizer Applied: None.
 Soil Condition: Very dry with large clods.
 Pesticides Used: None.
 Date of Harvest: August 14, 1974 (1 square yard from each plot)
 Other Factors: Rate of seed treatment - 4 oz/100 lbs of seed. Rainfall during growing season was 9.4 inches.