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SOUTH CENTRAL RESEARCH FARM
Presho, South Dakota

INTRODUCTION

This is the seventh annual progress report of the South Central Research Farm. The weather conditions which have taken place during this period cover all extremes. In one year the last frost occurred on the 22nd of May with the first frost of the fall occurring on October 29. Moisture conditions have ranged from 13.28" which was 3.17" below normal to 24.68" which was 8.23" above.

Plot yields have been excellent to poor with winter wheat averaging 36.0 Bu/A to 9.0 Bu/A. In 1959 the winter wheat was severely reduced by wheat streak mosaic, in 1962 by black stem rust, and in 1963 by frost.

The growing season in 1964 was sporadic, being extremely dry early in the season, then wet in April, dry in May, wet in June and July, and dry for the remainder of the year. Overall the precipitation was above normal. Temperatures were above normal during the spring and early summer, and below normal during late summer and fall. These conditions resulted in good winter grain yields, but poor spring grain and forage yields.

SOUTH CENTRAL RESEARCH FARM ADVISORY COMMITTEE

Officers	Address	County
Walter Stolte	Chamberlain	Brule
Fred Lucas	Platte	Charles Mix
Ed Bailey	Lucas	Gregory
Lyn Lyman	Murdo	Jones
John Quillan	Kennebec	Lyman
Dwight Schaffer	Wood	Mellette
Ray Norman	Hayes	Stanley
John Fernen	Mission	Todd
Don Jorgenson	Ideal	Tripp

This report was prepared by members of the South Dakota Agricultural Experiment Station. It is an annual progress report and results published herein are for one year only and are therefore neither complete nor conclusive.

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Table 1. Weather Data - South Central Research Farm* 1964

Month	Jan.	Feb.	Mar.	Apr.**	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Rainfall in inches	.01	.06	.20	4.82	1.27	3.99	4.84	1.13	.29	0	0	.79	17.40
Longtime Average***	.52	.56	1.08	1.69	2.36	3.28	1.54	2.03	1.38	1.04	.54	.43	16.45
Departure from Longtime Average	-.51	-.50	- .88	3.13	-1.09	.71	3.30	-.90	-1.09	-1.04	-.54	.36	.95
Average Air Temperature	----	----	----	52.1	62.6	69.0	82.1	71.5	62.0	49.2	----	----	
Longtime Average***	19.0	22.7	32.2	48.0	59.0	68.7	77.3	75.1	64.8	51.5	34.9	23.5	
Departure from Longtime Average	----	----	----	----	3.6	0.3	4.8	-3.6	-2.8	-2.3	----	----	
Average Maximum -1964	----	----	----	62.6	75.7	82.9	95.6	82.4	75.1	62.2	----	----	
Average Minimum -1964	----	----	----	41.6	49.5	55.2	68.4	71.5	48.9	35.7	----	----	
Average Soil Temperature @ 4"	----	----	----	52.5	65.7	73.9	84.1	76.7	65.8	61.6	----	----	
Average Maximum Soil Temp.	----	----	----	56.2	70.3	79.2	89.5	81.1	68.3	63.3	----	----	
Average Minimum Soil Temp.	----	----	----	48.7	61.1	68.8	78.8	72.3	63.5	59.6	----	----	

Maximum Recorded Air Temperature - 109° - 22-23 July 1964

Last Frost - 29 April, First Frost - 20 September
Growing Season - 144 days

* Data taken and recorded at South Central Research Farm
** Temperature data collected for the period 16-30 April only
*** Longtime averages were recorded at Kennebec, South Dakota

SMALL GRAIN VARIETY TESTING

D. G. Wells, P. B. Price, R. S. Albrechtsen, J. J. Bonnemann, and H. A. Geise

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

Winter Wheat

Excellent yields of winter wheat were obtained in 1964. Several factors contributed to making it the highest average yield in the history of the South Central Research Farm. First of all, rain showers fell just prior to seeding and continued on through the fall. This was followed in the spring by a wet snow which fell in early April and added to the soil moisture necessary for spring growth.

Air temperature during late April and May was above average. This contributed to the earlier maturity, higher test weights, and better quality. Although these were the highest yields recorded, they undoubtedly would have been higher had it not been for the excessive growth and consequent loss of soil moisture permitted by the lateness of the fall frost which did not occur until October 29. The yield data for this test is presented in table 2.

Rye

Four varieties of rye were grown in the 1963-64 season. Stands were excellent, yields were high, and grain quality good. These varieties headed about the normal time which is late May, and ranged in height from 42 to 46 inches. They stood well and are all extremely hardy except Elk. The yield data for this test is presented in table 3.

Winter Barley

The winter barley varieties presently under test vary in winter hardiness with Kearney and Dicktoo being most hardy, Chase intermediate, and Mo. B969 and Mo. B1222 being least hardy. It is for this reason they are not recommended for planting. However, under conditions where winter survival is high, one can expect good yields, as indicated in table 4. All of the varieties have weak straw and can be expected to lodge.

Spring Wheat, Durum, Oats, and Spring Barley

These trials were seeded in mid-April. At that time moisture conditions were favorable, but low rainfall during May placed the plants under stress. In addition to moisture stress, the air temperatures were above normal. It was during this period of time when spring grains were in the active or developmental stage requiring cool temperatures and abundant moisture. On the other hand, the winter grains were several weeks more advanced and went ahead to produce excellent yields, while spring grains could only produce small yields of low quality. The yield data for these trials are presented in tables 5-8.

Table 2. Winter Wheat Variety Trial - South Central Research Farm - 1964

Variety	Days to Emerge	Date of Heading	Lodging (1-5)	Height Inches	Leaf* Rust	Stem Rust* Race 56	Percent Protein	Test Wt Lbs/Bu.	Yield Bu/A.
Northern									
Minter	7	8-6	3	33	S	R	14.0	61	32.8
Winalta	7	5-6	3	31	S	MR	13.9	61	36.5
Yogo	6	9-6	2	32	S	S	14.8	57	26.5
Central									
Cheyenne	7	6-6	4	31	S	S	14.1	62	36.8
Gage	6	3-6	3	33	R	R	14.5	61	38.9
Lancer	6	3-6	3	33	MS	R	14.2	60	35.8
Nebred	7	5-6	4	32	S	S	14.3	61	33.6
Omaha	6	3-6	2	32	S	S	15.0	60	34.0
Ottawa	6	1-6	2	33	R	R	14.6	62	39.3
Scout	6	1-6	3	34	S	R	13.6	62	41.2
Shoshoni	7	8-6	4	30	S	S	14.1	61	38.4
Hume	7	6-6	3	33	S	R	14.6	58	28.4
Warrior	6	5-6	3	32	S	S	14.0	61	43.6
Southern									
Aztec	8	9-6	3	32	S	S	14.0	63	33.1
Bison	7	2-6	3	34	S	S	14.3	62	35.4
Pawnee	8	2-6	3	34	S	S	14.7	60	41.6
Rodco	7	3-6	3	33	MR	R	15.0	61	34.1
Triumph	6	30-5	4	33	S	S	13.8	61	38.1
Wichita	7	1-6	4	35	S	S	14.1	62	36.7
Average								61	36.0

Note: Date of Planting - 20 September 1963; Values in table are an average of three replications.

*R - Resistant; MR - Moderately Resistant; MS - Moderately Susceptible; S - Susceptible

Table 3. Rye Variety Trial - South Central Research Farm - 1963-64

Variety	Test Weight	Grain Yield - Bushel/Acre	
	Lbs/Bu	1964	Ave. 1963-64
Antelope	57	31.8	25.6
Elk	55	31.8	28.0
Caribou	56	26.3	23.2
Pierre	56	23.0	19.9
Average		28.2	

Table 4. Winter Barley Variety Trial - South Central Research Farm- 1963-64

Variety	Test Weight	Grain Yield - Bushel/Acre	
	Lbs/Bu	1964	Ave. 1963-64
Chase	48	36.9	26.8
Mo. B969	49	36.8	25.3
Kearney	49	35.1	27.0
Dicktoo	49	34.5	25.7
Mo. B1222	48	31.7	25.0
Average		35.0	

LSD at 5% level - 2.3 bu/A

Table 5. Spring Wheat Variety Trial - South Central Research Farm -1963-64

Variety	Test Weight	Grain Yield - Bushel/Acre	
	Lbs/Bu	1964	Ave. 1963-64
Canthatch	49	4.4	5.8
Justin	47	6.5	5.0
Crim	50	8.2	7.1
Pembina	46	6.2	5.1
Rushmore	47	4.6	4.3
Selkirk	52	12.8	8.6
C.I. 13751	47	8.8	---
Lee	53	3.6	4.3
Average		6.9	

LSD at 5% level - 4.3 bu/A

Table 6. Durum Wheat Variety Trial - South Central Research Farm

Variety	Test Weight	Grain Yield - Bushel/Acre	
	Lbs/Bu	1964	Ave. 1963-64
Langdon	54.5	13.4	11.0
Ramsey	57.0	10.9	10.4
Wells	55.7	14.0	12.5
Lakota	52.0	14.1	13.3
Average		13.1	

Table 7. Oat Variety Trial - South Central Research Farm

Variety	Test Weight	Grain Yield - Bushel/Acre	
	Lbs/Bu	1964	Ave. 1963-64
Burnett	38.5	60.1	49.4
Andrew	37.5	56.6	47.4
Tippecanoe	38.0	55.8	----
Neal	38.0	51.2	48.5
Dupree	37.5	50.6	49.8
Tonka	40.0	49.8	----
Mo. 0-205	38.0	49.1	49.2
Garland	38.5	47.3	43.8
Garry	36.5	46.9	----
Ransom	37.0	46.0	43.5
Dodge	38.0	45.9	44.6
Clintland 60	38.5	44.8	42.6
Nehawka	38.0	44.0	40.6
Santee	37.0	44.0	----
Minhafer	38.5	42.2	41.2
Clintland 64	37.5	35.5	----
Average		48.1	

LSD at 5% level - 9.2 bu/A

Table 8. Spring Barley Variety Trial - South Central Research Farm

Variety	Test Weight	Grain Yield - Bushel/Acre	
	Lbs/Bu	1964	Ave. 1963-64
Otis	49.0	30.6	26.7
Spartan	45.5	23.6	18.0
Larker	46.0	21.8	17.6
Custer	41.0	20.8	20.1
Traill	40.5	20.0	18.2
Plains	46.0	17.4	18.0
Liberty	40.0	17.1	17.0
Trophy	38.0	16.9	14.7
Average		21.0	

LSD at 5% level - 2.9 bu/A

SPECIALTY CROP TESTING

Objective: To observe and compare various specialty crop varieties and selections for grain yield, disease resistance, management practices, and other characteristics for area adaptability.

Safflower Testing

H. A. Geise

A more thorough program on safflower was initiated in 1963. Several tests are now being grown and a somewhat complete set of agronomic notes obtained. Part of the data are presented in tables 9 through 11.

Table 9. South Dakota Safflower Variety Trial - South Central Research Farm

Variety	Date of 50% Bloom	Spinescense* (1-5)	Lodging* (1-5)	Height inches	Test Wt Lbs/Bu	Yield lb./A 1964	Yield lb./A 1963
N472848C	17-7	4.5	1.5	26	44	1006	363
N472148C	19-7	4.0	1.6	24	43	1150	420
N472248C	19-7	4.0	1.8	25	44	850	151
N472349X	19-7	4.5	1.5	25	44	1111	416
N472449X	19-7	4.0	1.6	25	44	1026	295
N8	16-7	4.8	2.0	24	42	720	258
N848C	18-7	4.0	1.5	26	44	1122	198
N2377	17-7	4.8	1.6	23	43	896	165
N4036	16-7	4.5	1.6	25	41	1146	388
N4042	17-7	4.5	1.5	25	42	940	341
N6	16-7	4.8	1.6	24	46	1191	125
N10	17-7	4.5	2.0	24	41	1273	115
Pacific 1	10-7	4.8	2.1	22	39	1198	81
Average						1048	

*Spinescence: 1-No Spines, 5-Heavily spined; Lodging: 1-No Lodging 5-Lodged

Table 10. Regional Safflower Variety Trial - South Central Research Farm

Variety	Date of 50% Bloom	Spinescense* (1-5)	Lodging* (1-5)	Height inches	Test Wt Lbs/Bu	Yield lb./A 1964	Yield lb./A 1963
US 10	13-7	4	1.6	20	40	1302	85
Gila	12-7	4	1.5	19	42	1688	169
U5	15-7	4	1.8	22	42	1360	225
U15	14-7	4	1.9	20	41	1460	135
A0104	14-7	4	1.5	20	38	1453	229
A1049	13-7	4	1.5	19	38	1228	---
River Road	15-7	4	1.5	20	37	1063	---
12417	14-7	4	1.5	20	37	1349	---
Average						1363	

LSD at 5% level - 279 Lbs/A

*Spinescense: 1-No Spines, 5-Heavily Spined; Lodging: 1-No Lodging, 5-Heavily Lodged.

Table 11 lists eighteen introduced strains of safflower. These were selected from over one hundred strains because of their agronomic traits, especially seed yield potential, and disease resistance. A more thorough study involving such factors as per cent hull, oil content, iodine number, and foliar diseases must be concluded before they can be released to growers.

Table 11. Introduced Safflower Variety Trial - South Central Research Farm

S.D. No.	P.I. Number	Date of 50% Bloom	Spinescense* (1-5)	Lodging* (1-5)	Height inches	Test Wt Lbs/Bu	Yield 1964	Lb/A 1963
12	199-877	16-7	5	1.5	24	43	782	500
18	209-282	12-7	2	1.9	27	41	619	541
24	220-647	13-7	1	1.6	28	42	652	503
25	220-240	16-7	3	1.8	24	41	756	542
30	237-538	9-7	3	1.6	26	45	643	574
38	237-545	16-7	3	1.8	25	44	741	556
39	237-546	15-7	5	1.6	25	44	664	571
46	239-227	14-7	2	2.1	25	42	705	646
47	239-353	14-7	3	2.0	24	43	619	507
82	250-981	20-7	1	1.6	27	45	644	533
83	251-262	12-7	1	1.6	24	42	832	594
84	251-289	13-7	3	1.8	22	43	726	516
85	252-040	22-7	5	1.6	27	43	675	804
87	253-386	14-7	3	1.6	24	41	858	664
94	253-911	16-7	2	2.2	25	44	586	617
96	258-411	14-7	3	2.0	22	40	667	553
102	262-448	17-7	4	2.0	29	43	568	548
103	262-452	12-7	4	1.9	27	44	677	628
Average							690	

*Legend: Spinescense: 1-No Spines, 5-Heavily Spined
Lodging: 1-No Lodging, 5-Prostrate

Recent reports indicate that planting safflower in rows permit the development of lateral buds. These buds grow to form branches that produce secondary flowers which contain seeds having a higher percent of oil because the hills are thinner. Preliminary studies at the South Central Research Farm indicate that optimum row space is about 12 inches. This spacing permits development of lateral buds while utilizing soil moisture efficiently.

Weeds which have been a major problem in growing safflower can be controlled by several chemicals that are or will be available in the near future. These are preemergence chemicals that are incorporated into the soil at seeding time. Safflower should be grown where there is sufficient soil moisture and low relative humidity. An adequate moisture supply is necessary during flowering to insure a good seed set, whereas low relative humidity is essential because of the inherent susceptibility to foliage diseases.

Sunflower Yield Trial

H. A. Geise

Sunflowers are grown as a crop in the United States for two purposes. The large seeded types are grown for whole seed uses in the confectionary or bird seed trades. The second and potentially larger demand for sunflower seed is as a source of high linoleic acid edible oil. This purpose would require seeds of high oil content, and at present is not being commercially exploited.

Entry 1 is a rust resistant experimental hybrid, which had the highest mean yield for the 1962 and 1963 seasons. It is being increased by several neighboring states for release. Entries 2 and 3 are high oil producing introductions from Russia. Entries 4 and 5 are classed as high oil medium-maturing selections. Entry 6 is a high oil selection but is late in maturity. Entries 7 and 8 are early maturing selections from Russia. Entries 9 through 13 are Russian selections being tested for adaptability to certain environmental conditions. Entries 14 through 18 are varieties released for use in either confectionary or bird seed trades. The yield data and agronomic notes are listed in table 12.

Table 12. Regional Sunflower Yield Trial, 1964

Variety	Height inches	Percent Lodging	Disease Score*	Insect Damage*	Bird Damage*	Test Wt Lbs/Bu	Yield Lbs/A
T56002	61	12	2.1	1.4	1.6	32	264
Morden 883	57	19	2.4	2.2	2.8	30	186
Peredovik 15659	60	14	2.4	2.0	2.0	32	210
Smena	58	21	2.5	2.1	2.2	33	142
VNIIMK 89.31	62	20	2.2	2.9	1.9	32	222
VNIIMK 16.46	62	13	1.9	1.6	1.9	31	170
Ienissei	54	15	3.8	2.1	2.2	30	140
Tchernianka	47	12	2.8	2.2	2.0	35	243
Armavirsky 93.43	63	18	2.4	1.9	2.0	32	173
Armavirsky 93.45	59	15	1.9	2.0	1.9	32	143
VNIIMK 88.83	60	16	2.2	2.2	2.0	34	209
Jdanorsky 82.81	62	12	2.1	1.6	2.0	34	156
Stepnyak	64	12	1.8	1.8	1.6	32	145
Mingren	60	14	2.5	2.0	1.9	26	274
Commander	60	14	2.2	1.9	1.9	26	156
Arrowhead	55	21	2.8	2.2	1.6	33	298
NK Hybrid I	63	19	2.4	1.8	1.8	29	208
NK Hybrid II	58	19	2.2	2.4	1.8	30	222
Average							216

Scoring: The notation indicates that a portion of the plants were affected and is not an indication that seed yields were reduced by this amount.

Castorbean Testing

A. O. Lunden

Four dwarf selections from colchicine treated lines were planted for yield and performance testing. These strains averaged only 26 inches in height which would provide ease of harvest and allow growth under limited rainfall. Yields are reported in table 13. The equivalent value of the best strain would be equal to about 30 bu/A of barley based on the long time market price of the two crops. Further testing will be necessary to evaluate the potential value of this crop in South Dakota.

Table 13. Castorbean Seed Yield Trial - South Central Research Farm

Strain	Grain Yield Lbs/Acre
SD 63 - 1	455
SD 63 - 6	745
SD 63 - 7	619
SD 63 -15	583

SORGHUM PERFORMANCE TESTING

Grain Sorghum Performance Trial

J. J. Bonnemann

Objective: To compare the relative performance abilities of grain sorghum hybrids as to yield and other agronomic characters.

Performance trials with grain sorghum have been conducted on a fee basis at the South Central Research Farm for three years. Yields reported in the accompanying table include only two-year averages, where available, because blackbirds caused heavy damage to the 1962 trials.

The trial at Presho was quite uniform. Moisture was limited immediately after seeding but germination was quite uniform and moisture fell in adequate amounts during June and July to sustain the crop until harvest. The plots were seeded on May 26 and harvested on September 30.

Yields averaged 34.2 hundred pounds per acre, ranging from 41.4 down to 24.9. Moisture in the grain at harvest ranged from 9.2 to 18.8 percent. Test weights ranged from 51 to 59 pounds per bushel. Further information on these and other grain sorghum trials can be found in Circular 167 - 1964 Grain Sorghum Performance Trials.

Table 14. Grain Sorghum Performance Trial - South Central Research Farm

Variety	Height inches	Percent Moisture	Test Wt. Lbs/Bu	Yield - Cwt/A 1964	Yield - Cwt/A 1963-64
Pioneer 848	41	12.0	56	41.1	
Pawnee	41	16.7	59	38.8	
DeKalb B32	41	11.2	55	38.1	
NK 133	42	9.2	55	38.1	
RS 608	39	18.8	55	37.6	40.1
NK 125	41	9.8	55	37.5	37.1
RS 501	46	11.1	57	37.2	41.9
TE 44	38	14.7	51	37.2	
RS 610	40	11.7	57	35.9	40.2
SD 503	40	14.2	56	34.9	37.5
NK 120	38	18.7	55	34.7	38.0
Shorty 33	37	16.2	57	34.2	37.4
NK 212	40	13.3	54	33.4	
SD 502	42	14.0	56	33.1	
NK 144	36	13.5	57	32.5	35.8
PAG 304	35	12.4	57	31.2	
SD 451	42	15.3	56	31.0	35.5
PAG 275	38	13.0	57	30.9	
Ute	40	16.2	57	30.8	
Comanche	42	19.1	55	30.5	35.8
SD 441	47	18.5	54	28.0	33.4
SD 102	40	14.0	54	24.9	25.5
Mean Yield				34.2	

LSD at 5% level - 7.7 bu/A

Grain Sorghum Breeding

A. O. Lunden and C. J. Franzke (Emeritus)

Objective: Preliminary testing of South Dakota sorghum lines and hybrids, and regional sorghum hybrids. This is in cooperation with the regional sorghum testing program composed of sorghum breeders in the various State Experiment Stations.

Field plots of 27 South Dakota lines and hybrids and 47 regional hybrids were planted for yield and/or preliminary observation. These are hybrids which have not been released for commercial production but will be released by the various Experiment Stations if test results are favorable. Several hybrids in the 600 series of maturity performed quite well in this season but often these would be "high risk" selections, which would not mature before killing frost, and would produce very low yields of low quality grain.

Table 15. Sudan and Forage Sorghum Performance Trial - South Central Research Farm - 1964

Variety	Height inches	Maturity (1-5)	Lodging (1-5)	Leafiness (1-5)	Percent Protein	Percent Moisture	Forage Yield, Tons/A Wet Wt	Dry Wt
Forage Sorghum Hybrids								
Dual	52	1.0	2.3	3.3	6.8	37	4.4	2.8
Frontier 131F	48	2.0	1.0	1.3	7.5	50	8.4	4.2
Frontier S210	54	2.7	1.0	2.0	6.8	48	9.3	4.8
Northrup 145	53	1.0	3.7	4.0	7.1	34	5.4	3.6
Pioneer 930	68	5.0	2.0	3.0	7.2	48	11.8	6.1
Sudan grass Hybrids								
Northrup King Trudan	72	1.3	1.0	3.3	4.7	52	6.4	3.1
Volkman S-100	64	1.3	1.0	3.3	6.0	22	8.0	6.2
Sorghum-Sudangrass Hybrids								
DeKalb SX-11	57	1.3	1.0	2.7	6.6	34	7.1	4.7
Disco Su-Graze	59	1.0	1.0	2.7	6.8	45	7.6	4.2
Frontier Hi-dan 37	64	1.0	1.0	2.3	5.8	51	8.6	4.2
Frontier Hi-dan 38	62	1.3	1.0	2.3	6.9	48	10.3	5.4
Northrup King Sordan	60	1.7	1.0	2.3	6.8	46	9.3	5.0
Paymaster Sweet Sioux	64	1.0	1.0	3.0	6.3	51	9.9	4.8
Pioneer 980	68	1.0	1.0	3.0	5.9	49	8.5	4.3
Sexauer Excel Grazer	68	1.7	1.0	2.3	7.2	46	10.0	5.4
Forage Sorghums								
Northrup King FS-1a	50	3.3	1.0	1.7	7.3	54	10.9	5.0
Rancher	54	1.0	1.0	2.7	4.8	42	6.8	3.9
Rox Orange	58	2.3	3.0	2.0	5.3	42	10.9	6.3
Sorghum Grass	74	1.0	1.0	2.3	5.0	40	4.6	2.8
Waconia	54	3.7	2.0	2.7	5.6	41	8.7	5.1
Grain Sorghum Hybrid								
S.D. 503	46	1.0	1.0	3.0	5.8	39	5.8	3.6

Scoring Legend:
Maturity: 1-Mature Seeds; 2-Hard Dough; 3-Soft Dough; 4-Heading; 5-No Heads.
Lodging: 1-(0-10% Lodged); 2-(10%-35% Lodged); 3-(35%-65% Lodged); 4-(65%-90% Lodged); 5-(90%-100% Lodged);
Leafiness: 1-Very Leafy; 2-Leafy; 3-Average; 4-Mostly stems; 5-All Stems;

Sudangrass and Forage Sorghum Testing

H. A. Geise

Objective: To compare various Forage Sorghums, Forage Sorghum Hybrids, Sudangrass, and Sorghum-Sudangrass hybrids, as to their ability to produce high quality forage, and for adaptability to the South Central area.

Twenty selections of Sudangrass, Forage Sorghum, their hybrids and crosses were compared for forage yield and other Agronomic characters. All plots were seeded in early June and were harvested at the same time as neighboring fields. The Agronomic notes and yield data are reported in table 15.

LEGUME AND GRASS TESTING

Sweetclover Variety Testing

H. A. Geise and M. D. Rumbaugh

Objective: To compare various sweetclover varieties as to their ability to produce forage in the South Central area of South Dakota.

Table 16. Summary of Biennial Sweet Clover Forage Yield Trials-South Central Research Farm - (1962-1964)

Variety	Sum of Yields-T/A		Average of Two tests-Total T/A		
	1962-3	1963-4	1st Yr	2nd Yr	Ave of Totals
Madrid	6.7	1.74	1.70	2.51	4.22
Goldtop	6.5	1.45	1.63	2.34	3.98
Evergreen	6.5	.98	1.49	2.25	3.74
Spanish	5.0	1.19	1.22	1.87	3.10
Common White	6.3	1.40	1.46	2.39	3.90
Arctic	5.3	1.10	1.23	1.97	3.20
N-13	5.1	1.14	.81	2.31	3.12
N-20	5.1	1.14	.98	2.14	3.12
Cumino	5.0	.77	.64	2.24	2.89
Denta	4.8	1.45	1.34	1.78	3.12
Erector	4.7	1.64	.92	1.75	2.67
Common Yellow	---	1.55			
N-19	---	1.35			

A number of Biennial Sweetclover varieties were seeded in rows and without a companion crop in April 1962 and again in April 1963. First and second year forage yields were obtained from both tests. The results indicate that Biennial Sweetclover produced more growth the second year than in the first, but the quality of the first year forage was more superior. The data are summarized in table 16.

Alfalfa Forage Production

H. A. Geise, and M. D. Rumbaugh

Objective: To compare the forage production of two varieties of alfalfa when grown under various row spacings with and without the addition of phosphorous fertilizer.

Table 17. Effects of Row Spacing and Fertility on Forage Production of Two Varieties of Alfalfa - South Central Research Farm.

Row Space	Variety	Fertilizer 60# P_2O_5/A	Percent Protein	Forage Yield - Tons/Acre 1964	Ave. 1962-64
6"	Teton	P	18.2	1.0	1.7
		0	18.3	.7	1.6
	Vernal	P	15.6	1.2	1.8
		0	15.1	1.0	1.5
42"	Teton	P	18.5	.8	1.6
		0	20.3	.8	1.4
	Vernal	P	15.3	.9	1.6
		0	16.4	.6	1.4

The yields of forage harvested in 1964 suggested that alfalfa will have a higher production when seeded in a solid stand than in rows.

The application of phosphorous fertilizer to alfalfa does not appear to be an immediate economical practice. Although there is an increase in yield of forage, it is not large enough to pay the cost of the fertilizer. However, because all returns can not be measured directly and immediately, the cost of fertilizer should not be assumed a complete loss.

Alfalfa Variety Trial

H. A. Geise, and M. D. Rumbaugh

Objective: To compare the forage production of six varieties of alfalfa

Six varieties of alfalfa were seeded in 1958. The four year average reflects the shortage of soil moisture which is a result of overcropping. The soil has been under continuous cropping since 1957. The forage yields are reported in table 18.

Table 18. Alfalfa Variety Forage Yield Trial - South Central Research Farm

Variety	Forage Yield - Tons/Acre	
	1964	4 Yr Average
Nomad	.68	.78
Ladak	.98	.83
Grimm	.81	.68
A 225	.86	.70
Vernal	.82	.71
Rambler	.89	.77

Grass Variety Trials

J. G. Ross and H. A. Geise

Objective: To determine which species and varieties of introduced grasses are best adapted to the South Central area on the basis of their forage production.

Table 19. Smooth Bromegrass Forage Yield Trial - South Central Research Farm.

Variety	Forage Yield-Tons/Acre			
	Seeded August 1958		Seeded August 1960	
	1963	Ave. 1960-64	1963	Ave. 1962-64
Lancaster	1.2	1.7	.5	1.1
Southland	1.2	1.7	.6	1.2
Wisconsin 81	---	---	.4	1.0
Homesteader	.9	1.4	.5	1.0
Achenbach	---	---	.4	1.0
South Dakota 5	1.1	1.4	.4	.9
Wisconsin 55	1.3	1.4	.4	.8
Lincoln	1.1	1.7	.5	.9
Canadian Common	.7	1.1	.4	.8
Manchar	---	---	.4	.8
Saratoga	---	---	.5	.8
Lyon	---	---	.5	.9
Fischer	---	---	.5	.9

Smooth Bromegrass produced slightly more forage in 1964 than in 1963. The yields of the plots seeded in 1958 were comparable with the wheatgrasses, but those seeded in 1960 which have not formed a thick sod produced only about half the amount. All of the plots have been fertilized each year with a 40-20-0 fertilizer and produce an excellent quality of forage.

Table 20. Wheatgrass Forage Yield Trial - South Central Research Farm

Variety	Forage Yield - Tons/Acre			
	Seeded August 1958		Seeded August 1960	
	1964	Ave.1960-64	1964	Ave.1962-64
Crested Wheatgrass				
Summit	1.0	1.2	---	---
Mandan 2359	1.1	1.0	1.2	1.4
Nebraska 10	1.0	1.1	---	---
Common Fairway	.9	1.1	.9	1.2
Common	1.1	1.2	---	---
Nordan	1.1	1.2	1.2	1.5
Nebraska 3576 Fairway	.9	1.1	1.0	1.3
Nebraska 20	---	---	.8	1.2
S.D. 15	---	---	.6	.5
Tall Wheatgrass				
S-64	.9	.8	.9	1.9
Nebraska Tall	.9	1.4	---	---
Mandan 1422	.9	1.4	1.0	1.9
A12465	---	---	1.0	2.0
Alkar	---	---	.9	1.9
Intermediate Wheatgrass				
Nebraska 50	1.2	1.5	.9	1.5
Idaho #3	.8	1.2	1.0	1.8
Idaho #4	1.0	1.6	---	---
Greenar	1.2	1.5	1.0	1.9
Ree	1.0	1.5	1.0	1.9
Oahe	1.1	1.7	1.2	2.0
Amur	1.1	1.5	1.0	1.7
Mandan	---	---	1.0	1.6
Misc Wheatgrasses				
S.D. Syn 2-2nd Cycle	1.0	1.5	---	---
Slender (A. trachycaulum)	.8	.9	---	---
Topar Pubescent(A.trichophorum)	.8	.9	.7	1.2
P-27 (A. sibericum)	.9	1.0	.9	1.4
Whitmar (A. inerme)	1.0	.7	---	---

Intermediate and Tall Wheatgrasses have consistently produced the highest forage yields. Oahe, an intermediate wheatgrass recently released, although not the highest in 1964, has the highest average of both tests. The most adapted intermediate wheatgrass varieties are Oahe, Ree, and Greenar. The tall wheatgrass is a strong competitor of intermediate, but is not as desirable or palatable. Nordan crested wheatgrass was the highest forage producer of the varieties of crested seeded in either test and is also the most desirable from other agronomic standpoints.

Table 21. Misc. Grass Species Forage Yield Trial-South Central Research Farm

Variety	Forage Yield-Tons/Acre			
	Seeded August 1958		Seeded August 1960	
	1964	Ave. 1962-64	1964	Ave. 1962-64
Vinall Wildrye	.6	1.0	.7	.9
Common Russian Wildrye	.6	1.0	.5	.8
Blackwell Switchgrass	.9	1.6	--	--
Nebraska 28 Switchgrass	.8	1.4	--	--
Ricegrass (Stipa oryopsis)	.3	.6	--	--

Vinall Russian Wildrye is in general more easily established and is a better seed producer than the common. The new switchgrass varieties may be useful for establishment of summer pastures.

Grass Forage Production with Various Fertilizers and Row Spacings

J. G. Ross and H. A. Geise

Objectives: To determine optimum rates and ratios of fertilizers to be used in the production of grass forage. The effects of row spacing and solid stand are also included.

Table 22. Influence of Row Space and Fertilizer on Forage Yield of Smooth Bromegrass and Ree Wheatgrass

Species	Row Space	Fertilizer	Forage Yield-Tons/Acre	
			1964	Ave. 1961-64
Intermediate Wheatgrass	6"	0-0-0	.86	1.4
		20-0-0	1.02	1.8
		40-0-0	1.18	1.6
		40-20-0	1.16	1.8
	42"	0-0-0	.88	1.5
		20-0-0	.96	1.6
		40-0-0	1.28	1.8
		40-20-0	.88	1.7
Smooth Bromegrass	6"	0-0-0	.60	.9
		20-0-0	1.04	1.3
		40-0-0	1.04	1.4
		40-20-0	1.45	1.6
	42"	0-0-0	.60	1.4
		20-0-0	.63	1.4
		40-0-0	.82	1.6
		40-20-0	.66	1.5

The forage yield of these two species was somewhat below that of previous years. A critical analysis of yields and weather seems to indicate that a definite lack of soil moisture limited the production. The increase in yield due to fertilizer, although highly significant, was not large enough, except in the solid stand of Smooth Bromegrass, to pay the cost of the fertilizer.

The four year average indicates that for forage yield, the only profitable application of fertilizer has been on solid stands, and only at lower rates.

MANAGEMENT, TILLAGE, AND CULTURAL PRACTICES

H. A. Geise

Comparison of Different Techniques in Growing Winter Wheat

Objective: To compare yields of winter wheat grown continuously with and without commercial nitrogen, wheat grown in rotation with conventional fallow or sweetclover fallow, and wheat grown in rotation with corn or sorghum harvested as an ensilage crop.

Table 23. Yields of Winter Wheat from Plots Having Six Different Management Practices.

Management Practice	1964 Test Wt Lbs/Bu	1964 Percent Protein	1964 Yield Bu/A	Ave. Yield Bu/Acre (1959-64)
Continuous Wheat	59	14.9	9.7	8.0
Continuous Wheat + 30# N/Yr	58	14.7	8.7	7.5
Winter Wheat - Fallow	57	15.5	18.8	14.3
Winter Wheat - Sw. Cl. Fallow	59	15.0	6.4	11.4
Winter Wheat - Corn (Silage)	58	14.4	7.4	8.6
Winter Wheat - Sorghum (Silage)	58	13.7	6.3	8.9

LSD at 5% level - 4.9 Bu/A

Table 24. Yields of Forage obtained from Corn and Sorghum - 1964

Crop	Average Yield - Tons/Acre
Corn	5.0
Sorghum	5.7

The average winter wheat yields reported in table 23 show the effects of limited soil moisture and competition. A soil in which a continuous one crop system is practiced tends to build up a population of hard to control competitive weeds. The substitution of a row crop is beneficial because cultivation of it controls the weeds although not increasing cash returns.

The substitution of a green manure crop increases the cash returns while improving the soil by providing organic matter, controlling the competition, and increasing soil moisture in the partial fallow year. At the present time, however, when the soil nutrients have not been depleted, high cash returns can be obtained simply by conservation of soil moisture. This is most easily accomplished by using a wheat-fallow rotation.

Methods of Summer Fallow

Objectives: To compare various fallow techniques in which the type of tillage and number of tillage operations vary.

Table 25. Yields of Winter Wheat Obtained from Plots where Six Different Fallow Practices were Compared. (1959-1964)

Fallow Practice		Grain Yield of Winter Wheat			
Fall	Summer	Test Weight	Percent Protein	Bu/A 1964	Average 1959-64
1) One-Way	One-Way	57	15.3	21.5	13.4
2) Noble Blade	Noble Blade	57	15.0	21.7	15.0
3) Noble Blade	Noble Blade or 2,4-D	57	15.4	20.5	16.1
4) Noble-Chem*	Chemical**	57	15.4	21.6	15.6
5) Chisel	Noble Blade	57	15.0	23.4	15.3
6) Noble Blade	Chemical***	57	15.1	15.3	14.7

LSD at 5% level - 3.0 Bu/A

*Fall Treatment consists of 5# of Dalapon + 1/2# of 2,4-D per acre.

**Spring Treatment consists of 5# of Dalapon + 1/2# of 2,4-D per acre.

***Two applications of Dalapon + 2,4-D; and 2 applications of 2,4-D per year.

Table 26. Soil Moisture Conditions as Influenced by Six Different Fallow Techniques. (1963-1964)

Fallow Treatment	Inches of Soil Moisture (0-48")						
	Stubble Oct 64	Stubble Oct 63 (A)	Fallow May 64 (B)	Fallow Oct 64 (C)	Winter Gain (B-A)	Summer Loss (B-C)	Gain for Year* (C-A)
1	10.02	11.64	14.05	11.66	2.41	2.39	.02
2	10.29	12.18	14.10	11.85	1.92	2.25	-.33
3	9.97	11.77	13.64	11.30	1.87	2.34	-.47
4	9.61	11.89	13.67	9.61	1.78	4.06	-2.28
5	10.28	12.60	14.41	11.71	1.81	2.70	-.89
6	9.45	10.68	13.00	9.12	2.32	3.88	-1.56

* Revision of experiment incorrectly infers practices as undesirable.

The grain yields reported in table 25 show a leveling trend which undoubtedly reflect the long fall conditions of 1963. The averages, however, still support previous findings that relate yield to soil moisture. Soil which received tillage that destroyed all residue, such as that of a one-way disc plow, lost its structure and ability to absorb water.

Soil which received only a chemical treatment, while retaining all of its residue and water absorbing capacity, lost much of its moisture to weeds that were not readily controlled. In this case it was grassy weeds which grew after the period when the grass killing chemical could have been applied. This practice also did not permit preparation of the seed bed.

Fallow practices involving subsurface tillage were most desirable because they retained the residue on the surface thus preventing erosion while permitting maximum absorption, and consequently the highest yields.

Management, Methods of Seeding Sorghum, and Fertilizer Effects on a Sorghum-Spring Wheat Rotation

Objectives: To determine the optimum time, implement, and row spacing for planting grain sorghum, and the effects of these practices on the yield of the following spring wheat.

Table 27. Effects of Fertilizer, and Date and Method of Planting of Sorghum on Grain Yield in a Sorghum-Spring Wheat Rotation. (1959-1964).

Date of Planting Sorghum	Method of Planting Sorghum	Fert-ilizer*	Grain Yield - Bushel/Acre Spring Wheat 1964**	Spring Wheat Percent Protein	Spring Wheat 6 Yr Ave.	Grain Sorghum 1964***	Grain Sorghum 6 Yr Ave.
May 21	Deep Furrow Drill	0	5.7	15.4	10.0	11.0	13.6
		N	6.7	16.6	9.9	13.6	14.3
	Lister	0	8.4	17.0	10.8	17.9	13.2
		N	7.9	17.2	10.7	19.5	12.6
	Corn Planter	0	7.7	16.5	10.6	19.9	13.8
		N	8.0	17.2	11.0	21.7	15.8
June 2	Deep Furrow Drill	0	4.8	16.1	10.0	41.6	20.7
		N	5.2	17.3	9.3	37.4	20.5
	Lister	0	7.1	17.7	10.3	22.8	18.4
		N	7.9	18.1	10.4	37.8	22.3
	Corn Planter	0	7.2	16.8	10.7	34.7	21.5
		N	8.5	17.8	11.0	28.4	20.3
June 14	Deep Furrow Drill	0	8.2	15.7	10.1	43.1	25.8
		N	10.7	16.5	11.7	40.4	28.1
	Lister	0	12.1	16.8	12.0	28.0	21.7
		N	9.8	17.5	11.2	32.9	22.2
	Corn Planter	0	10.0	16.1	10.7	38.7	24.9
		N	10.5	17.0	11.1	42.6	26.8

* "N" indicates 30# of Nitrogen per acre
** Sig. Dif. in wheat because of Date, and Method of Planting Sorghum
*** Sig. Dif. in grain sorghum yields between Dates of Planting

The grain sorghum yields reported for 1964 (table 27) indicate real differences exist between dates of planting, and have been found in three years out of six. The main factor involved was the stand obtained. Stand is dependent upon soil conditions at seeding time, therefore, it is desirable to delay planting until conditions are most favorable.

A study of the soil temperatures indicated that the soil in the South Central area does not reach the acceptable temperature until Mid-June. This is preferable because it permits the grower to destroy many competitive weeds prior to seeding sorghum.

The yields of spring wheat following sorghum have shown significant differences because of the method used in seeding the prior crop of sorghum. The differences appear to be caused by a moisture shortage as a result of growing sorghum in heavier stands. These same plots also suffered from a definite moisture stress the previous year.

CROP DISEASE AND THEIR CONTROL

Plant Pathology Department

Root and Stalk Rot Disease Control in Hybrid Corn

C. M. Nagel

The corn experiments at the South Central Research Farm were so severely reduced in stand through rodent and bird damage following planting that the results obtained were invalid.

Spread of Wheat Streak Mosaic

G. B. Orlob

Experiments were continued to study the influence of successive plantings of resistant and susceptible small grains on the occurrence of wheat streak mosaic Oats, which is resistant to mite infestations but susceptible to the virus, and spring wheat, which is susceptible to both virus and mite vector, were planted at monthly intervals during the summer of 1963. Late in August, winter wheat was planted adjacent to each of these plots; and the following disease readings were obtained during the fall of 1963 and the spring of 1964.

Previous crop	Percent Mosaic in Winter Wheat	
	October 31, 1963	May 28, 1964
Oats	19	40
Spring Wheat	60	100

These data further emphasize the need for destruction of volunteer wheat prior to proper date of planting.

Wheat Streak Mosaic Control by Regulation of Planting Date

G. W. Buchenau and G. B. Orlob

Regulation of planting date has resulted in control of wheat streak mosaic for the sixth consecutive year (table 28). The data show that planting after September 4 results in good control of wheat streak mosaic and, consequently, higher yield and grain quality in moderate and severe mosaic years (1959, 1963, and 1964). Furthermore, good yields were obtained from these planting dates in a light mosaic year (1960).

On the other hand, severe rust epidemics cause greatest damage to later maturing crops. The 1962 data, however, do not indicate that early planting for rust control is particularly successful, especially considering the off-setting influence of mosaic infection in the South Central area. The five year averages clearly indicate that early planted winter wheat is more likely to be severly damaged by wheat streak mosaic than wheat planted after September 10.

Chemical Control of Wheat Rusts

G. W. Buchenau and L. W. Carlson

Rust control experiments were conducted at Presho and Hayes, South Dakota in 1964. Rust development was very light at Presho; consequently no yield differences were obtained; and the data are not presented here. In the Hayes experiments, conducted in cooperation with Mr. David Muirhead, stem rust was light; but sufficient leaf rust occurred to reveal treatment differences (table 29).

Three new chemicals (Dithane S-31, Manzate D, and TPTH) were tested in comparison with two older materials in 2- and 6-application schedules. Two applications are considered a practical schedule, whereas 6 applications were applied to obtain maximum control of rusts and also Septoria leaf spot. Leaf spot was not severe in 1964.

Two applications of Dithane S-31, Manzate D, and TPTH resulted in similar degrees of leaf rust control and increased yields by 10.9, 9.4, and 9.4 bu/A, respectively, over those of the unsprayed check. Although TPTH ranked among the better materials in this test (Hayes), it did not perform as well in tests at Brookings.

Certain treatments that looked particularly outstanding in the field (notably 6 applications of Dithane S-31 and Dithane Z-78) did not increase yield as much as expected. The relatively low yields of these plots are at least partially explained by damage incurred by a car driven through them sometime in late May.

Table 29. Effect of planting date on the incidence of wheat streak mosaic and yield of winter wheat in 1959, 1960, 1962, 1963, and 1964.

Planting	1959[a]		1960[b]		1962[c]		1963[d]		1964[e]		5-Year Ave.
	Mosaic %	Yield Bu/A	Mosaic %	Yield Bu/A	Mosaic %	Yield Bu/A	Mosaic %	Yield Bu/A	Mosaic %	Yield Bu/A	Yield Bu/A
August 15	97	1	TR	31	40	9	30	15	93	6	12
August 25	95	3	TR	38	10	8	15	20	87	10	16
September 4	65	8	TR	36	2	5	1	29	25	24	20
September 14	8	14	TR	32	TR	7	TR	33	13	28	23
September 24	6	14	0	24	TR	4	TR	36	8	31	22
October 4	1	10	0	18	TR	1	TR	34	5	27	18

[a]Dry year with severe mosaic and little rust.
[b]Good year with little mosaic and little rust.
[c]Good year with moderate mosaic and very heavy rust.
[d]Good year with moderate mosaic, little rust, and late spring frost.
[e]Very late fall after seeding in 1963; high temperatures and hot winds in June and July of 1964; severe mosaic and light rust.

Table 30. Effect of chemical sprays on rust development and yield of Nebred winter wheat at Hayes, S.Dak. in 1964.

Chemical	Rate per Application	Spray Dates[a]	Leaf Rust Level 19 June Pust./Flag Leaf LR	Terminal Rust Level % Severity LR	SR	Yield Bu/Acre
Dithane S-31	3 lbs/acre	10 June, 19 June	2.5	t	t	56.3
Manzate D	3 lbs/acre	28 Apr., 6 May, 18 May, 28 May, 10 June, 19 June	0.3	t	t	55.0
Manzate D	3 lbs/acre	10 June, 19 June	3.0	t	t	55.0
TPTH	1.5 lbs/acre	10 June, 19 June	2.7	t	t	55.0
Dithane S-31	3 lbs/acre	28 Apr., 6 May, 18 May, 28 May, 10 June, 19 June	0.3	t	t	53.9
Dithane Z-78	2 lbs/acre	28 Apr., 6 May, 18 May, 28 May, 10 June, 19 June	0.3	t	t	53.2
Actidione	100 ppm.	28 Apr., 6 May, 18 May, 28 May, 10 June, 19 June	30.0	5	t	51.2
Dithane Z-78	2 lbs/acre	10 June, 19 June	10.8	t	t	49.1
Actidione	100 ppm.	10 June, 19 June	35.3	10	t	47.4
TPTH	1.5 lbs/acre	28 Apr., 6 May, 18 May 28 May, 10 June, 19 June	3.3	t	t	47.0
Check (untreated)	---	---	120.0	25	8	45.6
			Least Significant Difference (5%)			6.7

[a]28 May, boot; 10 June, 1/4 berry; 19 June, milk.