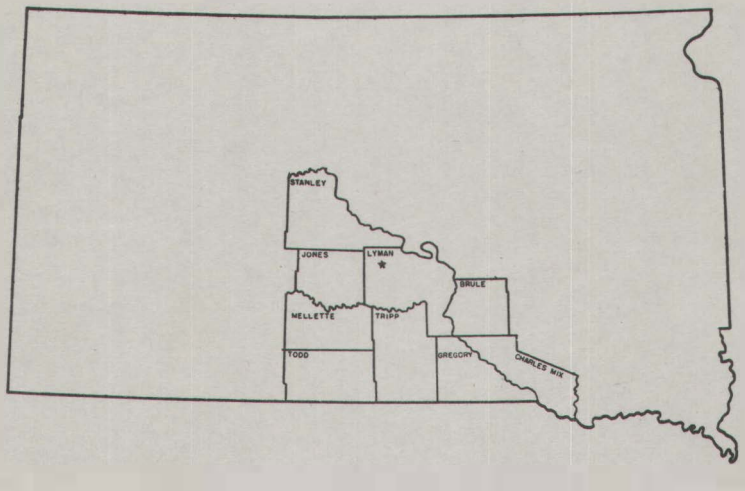
Pamphlet 62

Annual Progress Report

December 1960

SOUTH CENTRAL RESEARCH FARM
Presho, South Dakota



This map illustrates the area of the state which is cooperating with the South Central Research Farm. There are nine counties involved, each county being represented on the Advisory Committee of the farm.

Agronomy and Plant Pathology Departments
South Dakota State College
Agricultural Experiment Station
Brookings, South Dakota

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Introduction

The 1960 season at the farm was discussed at two farm tours. The first was held in late June at which time, Ralph Cline, Extension Agronomist, discussed varieties of winter wheat, winter barley, oats, spring wheat and spring barley. The regularly scheduled Field Day was held in September. At that time sorghum varieties, fertilizer experiments, cultural practices, and other experiments were discussed.

The results of the past year were quite satisfactory. Precipitation, although slightly below normal, fell at critical times, providing us with good yields in cereals, corn, and sorghum.

The coming season looks very promising. Rain in September helped to develop vigorous wheat plants, and snow which fell during December should provide additional soil moisture to promote good spring recovery and growth.

1960 Weather Summary

The 1960 growing season was marked by a beginning which was short of subsoil moisture. This was partially alleviated by a wet snow which fell in April. The remainder of the small grain season (May, June, and July) was again below normal for rainfall although enough fell to mature the small grain. The corn and sorghum were fortunate in receiving almost 2 3/4 inches of rain in early August which provided ample moisture during the critical time of heading and pollinating. Rainfall in September was limited to light showers until late in the month, with October being far below normal. The rainfall during the season ended with subsoil moisture being approximately the same as in the fall of 1959.

Temperatures for the growing season were slightly below the longtime average with only short periods of extreme highs during July and August.

This is an Annual Progress Report. The results published herein are not complete or conclusive. As additional data are accumulated, the conclusions reached may result in interpretation differing from those of any one year.

This report was prepared by staff members of South Dakota State College and assembled by H. A. Geise, Agronomy Department.

Table 1. Weather Data - South Central Research Farm, 1960*

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Inches of Rainfall	.25	.82	.12	2.98	2.03	2.71	.90	3.88	1.13	.13	.62	.07	15.64
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**	-.27	.26	-.96	1.29	-.33	-.57	-.64	1.85	-.25	-.91	.08	-.36	---
Average Air Temperature					55.2	64.7	76.7	73.5	63.4	52.4	37.6	20.4	
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					-3.8	-4.0	-0.6	-1.6	-1.4	0.9	2.7		
Average Soil Temperature at 4" Depth				44.5	52.7	63.2	73.8	70.4	62.2				

Last Frost in Spring May 10
First Frost in Fall September 29
Growing Season 142 days

Maximum Recorded Air Temperature 104° - July 21 and August 2

* Weather data taken and recorded at South Central Research Farm.

** Longtime Averages were recorded at Kennebec, South Dakota

WINTER AND SPRING CEREAL CROP VARIETY TESTING

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

Wheat and Rye Variety Testing

V. A. Dirks and H. A. Geise

Wheat is the most important crop in South Central South Dakota. The three years since the South Central Station was begun have included the two favorable seasons of 1958 and 1960, as well as the drouth of 1959. The superiority of winter wheat over spring wheat is clearly indicated by the average performance of all varieties of these crops at Presho.

Table 2. Yield in Bushels per Acre of Winter Wheat, Spring Wheat, and Rye at the South Central Research Farm, 1958-60.

	1958	1959	1960	Av.
Hard Red Winter Wheat	30.8	10.0	18.9	19.9
Hard Red Spring Wheat	12.0	0	8.9	7.0
Durum Wheat	20.3	0	5.8	8.7
Rye	29.7	7.3	25.7	20.9

The results in the above table clearly show that in this area spring wheat has been reduced to a replanting alternative for winter wheat.

The South Central Research Farm has been used to test selected winter wheat progenies from the South Dakota breeding program for adaptation to the state's main winter wheat area. Decisions as to superior selections for preliminary increase involve, above all, the consideration of quality to fit in the basic Nebred quality pattern established for this area.

The implementation of the results of yield, quality and survival tests is the farmer's choice of variety. To that end, the results of yield tests and the observations made in connection with them are published. The data reported for winter wheat in Table 3 are taken from replicated rod row plots. The spring wheat results in Table 4 are taken from drill sown plots. The yields of rye are from rod row plots.

The fall growth of the previous season was adequate for good growth of the 1960 crop. The first six weeks of the 1960 growing season were almost ideal, and the subsequent hot dry period affected mainly the late winter wheat varieties and the spring wheats. Low test weights reflect the degree of heat injury.

Leaf rust built up in the cooler part of the season. Western wheat streak mosaic infection appeared to be very light. This may have been due to the drying up of grass and volunteer wheat hosts of the carrier mite of this disease in advance of fall seeding in 1959.

Table 3. Winter Wheat Variety Test at the South Central Research Farm, 1958-60

Variety	1960 Yield bu./A	Wt/bu. lbs.	Percent* survival	Date headed	Height inches	Stem rust	Leaf rust	1958-60 Yield av. bu./A
Northern Types								
Minter	26.2	56	81	6-23	38	18	20	22.0
Minturki	15.2	51	52	6-25	38	30	30	17.5
Marmin	18.6	53	75	6-23	36	22	50	18.1
Yogo	16.6	51	74	6-25	38	40	40	16.7
Kharkof MC22	7.7	46	58	6-26	39	55	60	12.2
Central Types								
Nebred	18.3	55	65	6-20	34	30	40	17.0
Cheyenne	21.8	56	76	6-23	34	20	60	21.8
Cheyenne Sel 432	19.6	57	72	6-21	34	30	60	21.2
Omaha	24.1	58	69	6-16	32	18	30	20.1
Warrior	23.2	55	71	6-19	33	22	30	19.7
Aztec	17.2	57	58	6-18	35	35	60	20.4
Kharkof	21.1	54	75	6-24	37	19	20	19.0
C.I. 13280	26.1	57	75	6-20	36	2	20	25.1
C.I. 13526	17.0	58	64	6-18	30	2	20	18.4
C.I. 13528	19.8	57	60	6-20	32	9	20	22.0
C.I. 13198	20.7	56	74	6-24	34	18	20	20.2
Turkey	19.3	56	74	6-23	34	28	50	17.1
Southern Types								
Pawnee	20.6	57	59	6-16	34	18	60	21.0
Comanche	12.1	52	61	6-26	38	30	25	16.2
Tenmarq	22.9	55	71	6-19	34	20	30	22.6
Wichita	22.5	57	74	6-16	34	18	30	18.7
Bison	14.8	55	51	6-17	34	35	50	16.8
Triumph	23.0	59	71	6-14	32	30	60	21.4
Ponca	22.2	58	70	6-17	35	18	20	21.3
Concho	23.9	57	88	6-15	32	20	20	20.3
Kiowa	20.4	57	74	6-17	33	25	40	21.2
Westar	20.9	55	62	6-16	35	28	40	18.1
Rodeo	23.3	58	70	6-17	34	22	30	--
L.S.D.	4.9							

* Survival differences not due to winter killing but irregular erosion and soil blowing. Survival and rust notes in percent.

Table 4. Spring Wheat Variety Tests at the South Central Research Farm, 1958-60

Variety	1960 Yield bu./A	Wt/bu lbs.	Date headed	Height inches	Stem rust*	Leaf rust*	1958-60 Yield av. bu./A
Bread Wheats	8.9						
Selkirk	14.2	48	7-4	32	0	0	14.2
Pembina	9.4	44	7-8	27	tr	30	10.7
Canthatch	6.9	45	7-8	25	0	80	8.5
Conley	2.5	42	7-15	26	tr	40	5.2
Rushmore	9.4	48	7-8	28	tr	40	11.6
Lee	10.7	48	7-8	30	3	20	13.9
Mida	5.0	44	7-9	31	tr	40	--
Ceres	3.4	46	7-10	30	30	45	--
Durums	5.8						
Langdon	4.3	39	7-12	34	0	10	11.8
Ramsey	9.4	46	7-8	34	0	10	--
Wells	4.3	43	7-12	29	0	0	--
Lakota	5.2	39	7-12	29	0	0	--
L.S.D.	2.5						

* Rust notes in percent

Table 5. Rye Variety Test at the South Central Research Farm, 1958-60

Variety	1960 Yield bu./A	Percent survival	Wt/bu. lbs.	1958-60 Yield av. bu./A
Pierre	23.4	85	55	20.3
Antelope	25.3	88	54	24.1
Caribou	24.9	85	54	23.6
Elk	29.3	70	53	--

Oat Variety Testing

D. D. Harpstead and H. A. Geise

Table 6. Oat Variety Test at the South Central Research Farm, 1958-60

Variety	Average yield, bu./A 1960	Average yield, bu./A 1958-1960	Wt./bu. 1960	Date of heading	% of location yield average
Dupree	49.7	42.8	27	6-29	115.0
Nehawka	46.6	--	28	6-29	107.9
Burnett	44.6	38.8	28	6-30	103.2
Mo-0-205	43.2	38.0	27	7-1	100.0
Andrew	42.9	36.6	27	6-28	99.3
Cherokee	42.6	--	27	6-29	98.6
Clintland 60	41.2	--	29	6-30	95.4
Marion	40.5	--	28	7-1	93.8
Minhafer	37.3	32.0	28	6-29	86.3

Oat varieties which produced the best yields at this station in 1960 were western type oats of which Dupree and Nehawka are typical. Heavy rainfall during April and May delayed planting of spring grains until late in the season. This delay resulted in reduced tillering and restricted development among varieties less heat tolerant than the western types.

Spring Barley

P. B. Price and H. A. Geise

Table 7. Spring Barley Variety Test at the South Central Research Farm, 1960

Variety	Yield bu./A	Test wt.	Date of heading	Stem rust*	Leaf* blotch
Custer	38.7	34	6-29	28	4.0
Feebar	22.0	36	7-1	0	2.0
Kindred (Malting)	16.4	38	7-2	0	3.0
Liberty	35.9	34	7-3	0	1.0
Traill (Malting)	26.2	35	7-2	0	2.5
Velvon 11 x Spartan	41.1	36	6-29	35	2.0
Plains	38.3	37	6-29	0	2.0
Spartan	30.8	38	6-29	22	2.0
Otis	37.8	40	6-29	30	5.0
Average	31.9				

L.S.D. at 5% = 5.0 bu./A

* Stem rust readings in percent; Leaf blotch on 1-5 scale, 1 best.

Spring barley culture in the South Central area of South Dakota should be limited to feed barley types. The two varieties recommended for the area are Custer and Liberty. From the standpoint of disease resistance, Liberty is more desirable but from the earliness of maturity standpoint, Custer is more desirable.

Winter Barley

P. B. Price and H. A. Geise

Table 8. Winter Barley Variety Test at the South Central Research Farm, 1960

Variety	Yield Bu/A.	Wt/Bu. Lbs
Mo. B969	32.3	51
Nebraska 52434	26.8	50
Dicktoo	31.4	50
Kearney	36.9	52
L.S.D. at 5%	9.4 Bu/A.	

Of the four varieties listed above only Dicktoo and Kearney are recommended for the South Central Area. Winterhardiness is the main problem in barley culture, and until more hardy varieties are developed this recommendation probably will not change.

SORGHUM TESTING

Sorghum Variable Row Spacing Study

C. J. Franzke and H. A. Geise

Objective: To compare row spacings of sorghum to determine the optimum spacing for the production of grain.

Table 9. Yield of a White Seeded Experimental Grain Sorghum Grown in Various Row Spacings, 1960

Row Spacing	~~Yield~~ Wt/Bu. ~~Bu/A.~~ Lbs	~~Wt/Bu.~~ Yield ~~Lbs~~ Bu/A.
6"	60	40.8
12"	58	46.9
24"	57	30.7
42"	58	19.8

This experiment was seeded on June 29, 1960. The planting rate was established at 6 lb/acre with 42 inch rows and increased in proportion to the number of rows seeded. The experiment was seeded with a 7' John Deere press drill. These yields indicate that the 12" spacing is the most productive for the particular variety and date of planting used in this experiment. It should be recognized that some varieties of sorghum will not react in this manner and the above data should not be applied without caution to types distinctly unlike the one used in this experiment.

Sorghum Variety Testing

C. J. Franzke and H. A. Geise

Objectives: To compare sorghum varieties and hybrids, both commercial and experimental, as to yield potential and certain other agronomic characteristics.

Table 10. South Dakota Hybrid Sorghum Yield Test at South Central Research Farm, 1960

Row No.	Variety	Yield Bu/A.	Heading Date	Pollination Date	Height Inches
1	SD 102	49.4	7/26	7/29	36
2	SD 441	50.0	7/26	7/29	44
3	SD 451	54.1	8/1	8/4	45
4	SD 59100	57.2	7/26	7/28	40
5	SD 59101	40.6	7/27	7/29	42
6	SD 59102	54.8	7/31	8/2	37
7	SD 100	25.9	7/29	7/30	36
8	SD 59103	67.5	7/28	7/29	41
9	SD 59104	40.3	7/27	7/29	44
10	SD 59105	67.2	7/27	7/29	43
11	SD 59106	61.6	8/1	8/3	40
12	SD 59107	56.2	8/1	8/2	42
13	White Seeded	28.9	7/27	7/29	32
14	Norghum	56.5	7/29	7/31	38
15	Reliance	50.1	7/27	7/29	40
16	Dual	37.4	7/27	7/31	51
17	RS 501	41.6	8/2	8/3	45
18	RS 608	71.8	8/6	8/10	38
19	RS 610	66.0	8/4	8/6	42
20	Martin	48.6	8/7	8/12	38

Table 11. Sorghum Extension Variety Yield Test at the South Central Research Farm, 1960

Row No.	Variety	Bu/ Acre	Date Headed	Date Poll.	Height Inches
1	De Kalb Sudax-SX-11	23.6	8/5	8/10	64
2	" X-49	13.5	8/8	8/11	46
3	" FS-1A	46.0	8/13	8/16	48
4	Volkman Sudan Sorghum Hybrid	27.8	8/4	8/8	62
5	Frontier S-210	0.0	8/12	8/16	55
6	Northrup King 145	27.8	8/2	8/3	51
7	Rancher	21.5	8/1	8/4	49
8	39-30-S	30.7	7/28	7/30	51
9	Rox Orange	3.9	8/3	8/6	59
10	Waconia	2.2	8/20	8/22	60
11	Norkan	19.7	8/11	8/14	58
12	Sorghum (Almum) Grass	13.8	7/26	7/28	71
13	Sweet Sudan	15.6	7/30	8/1	56
14	Piper Sudan	8.7	7/22	7/24	67
15	Dual	38.0	7/29	7/31	43
16	Steckley's R-99	57.2	8/1	8/3	41
17	" R-103	59.5	8/5	8/7	36
18	" R-106	36.5	8/10	8/13	34
19	Northrup King 120	62.1	7/27	7/29	33
20	" " 135	49.0	8/1	8/3	34
21	" " 210	99.0	8/4	8/7	34
22	Pfister 305-S	93.6	8/1	8/3	41
23	" 405-S	68.5	8/5	8/11	42
24	" 425-S	43.4	8/5	8/10	39
25	" 435-S	90.8	8/5	8/10	37
26	" 515-S	20.7	8/16	8/21	39
27	De Kalb C-44-a	61.5	8/3	8/8	38
28	" D50a	82.1	8/4	8/11	45
29	" E56a	74.8	8/5	8/9	39
30	" F62a	56.7	8/8	8/13	43
31	Frontier 400 B	60.5	8/5	8/7	39
32	Jacques J 31	59.4	8/2	8/5	53
33	" J 53	48.0	8/6	8/12	43
34	" J 59	66.1	8/4	8/10	43
35	RS 501	88.2	8/2	8/5	48
36	RS 608	55.1	8/2	8/5	41
37	RS 610	55.4	8/5	8/10	44
38	Brown Marval	61.6	8/1	8/4	41
39	Prairie Rose	59.1	8/3	8/5	46
40	Martin	56.4	8/7	8/11	36
41	Reliance	50.1	7/27	7/29	38
42	Norghum	43.0	7/27	7/29	35

Table 12. Sorghum Commercial Hybrid Yield Test at the South Central Research Farm, 1960

Row No.	Variety	Yield Bu/Acre	Date Headed	Date Poll.	Height Inches
1	Northrup King 120	43.7	7/30	8/1	33
2	" " 135	41.0	8/1	8/2	40
3	" " 140	50.4	8/2	8/3	35
4	" " 210	51.8	8/4	8/7	36
5	" " X3012	39.5	8/1	8/2	38
6	" " X3017	51.8	7/29	8/1	33
7	" " X3005C	41.3	7/29	8/1	33
8	" " X2114	41.7	7/30	7/31	32
9	" " 145	38.1	8/2	8/5	57
10	Asgrow AMAK R10	30.7	8/5	8/9	36
11	" Ranger	21.1	8/13	8/15	33
12	" Rocket	32.8	8/4	8/7	31
13	" Grazer	5.2	8/15	8/20	57
14	Frontier 400 B	33.8	8/5	8/9	35
15	" 400 C	26.5	8/6	8/9	36
16	" 400 E	10.9	8/9	8/12	35
17	" 400 F	18.1	8/12	8/15	29
18	" 14X	9.2	8/10	8/16	32
19	" 31X	11.6	8/13	8/15	33
20	" 36X	6.0	8/5	8/9	66
21	" 37X	3.1	8/7	8/13	63
22	" 38X	4.0	8/13	8/17	67
23	" S-210	1.2	8/17	8/20	62
24	" 44X	7.2	8/15	8/17	69
25	De Kalb C-44a	52.7	8/4	8/9	39
26	" X45	45.8	8/2	8/6	34
27	" X49	36.2	8/4	8/7	41
28	Norghum	37.0	7/28	7/30	32
29	Reliance	43.5	7/28	7/30	38
30	Dual	34.1	7/28	8/1	49

LEGUME AND GRASS TESTING

Alfalfa Variety Testing

M. D. Rumbaugh and H. A. Geise

Objective: To compare alfalfa varieties in forage yielding ability in areas where moisture stress is prevalent.

Table 13. Alfalfa Variety Forage Yield Test at the South Central Research Farm, 1960 (one cutting, late June)

Variety	Tons/Acre	Rank
Nomad	.83	6
Ladak	1.26	1
Grimm	.97	5
A 225	1.03	4
Vernal	1.09	3
Rambler	1.21	2

L. S. D. = .11 T/A

Table 14. Yields of Forage of Alfalfa Varieties used in Alfalfa Forage and Pature Study (one cutting, late June)

Variety	Tons/Acre	Pasture
Cossack	.67	.61
Ranger	.82	.56
DuPuit	.65	.62
Teton	.72	.75
Semipalatinsk	.69	.80
Carlson CK	.76	.71

The data presented in Table 13 indicate the relative ability of six alfalfa varieties to produce moderate amounts of hay under conditions of restricted moisture availability. The top ranking variety, Ladak, is recommended by the South Dakota Experiment Station primarily for use as a dry land variety west of the Missouri River. Under irrigation or when rainfall is more adequate, Vernal will usually yield more than Ladak. These stands were established in April, 1958.

Table 14 shows the after-effects on forage yield of alfalfa when the plants are subjected to frequent clipping or grazing versus normal clipping. The varieties which do not show a decrease in yield are of a decumbent or somewhat prostrate type of growth which prevent the extremely short clipping. These stands were established in April, 1958. The "pasture" treatment was clipped twice in 1959, the "forage" treatment, once.

Alfalfa Seed and Forage Production

M. D. Rumbaugh and H. A. Geise

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

Table 15. Yields of Forage obtained From Two Varieties of Alfalfa with Two Row Spacings

Row Spacing	Variety	Fertilizer*	Forage Tons/Acre
6"	Teton	P	2.00
		O	1.63
6"	Vernal	P	2.38
		O	2.17
42"	Teton	P	2.30
		O	1.86
42"	Vernal	P	2.97
		O	2.29
Average			2.20

* Indicates a significant difference exists for fertilizer treatment

Stands of Vernal and Teton alfalfa were established at 6 and 42 inch row spacings in 1958. Half of each plot has received an annual spring application of 30# of P_2O_5. Drought conditions at the test site have not permitted an adequate evaluation of the seed production potential of these varieties and treatments. Forage yields for 1960 are shown in Table 15.

As anticipated, Vernal out-yielded Teton at all treatment-stand combinations. Both varieties, however, responded to applications of phosphorus. It will be noted that more forage was produced at the 42 than at the 6 inch spacing. Although this difference is not statistically significant, it is believed to be a reflection of the extent to which moisture was a limiting factor in this experiment.

SWEET CLOVER VARIETY TESTING

M. D. Rumbaugh and H. A. Geise

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

Table 16. Forage Yields of Biennial Sweet Clover Varieties, 1st Year Growth, October, 1960

Variety	Tons/Acre
Madrid	6.24
Artic	1.82
Common white	2.65
Common yellow	2.78
Cumine	3.55
Evergreen	5.68
Goldtop	3.00
Melilotus officinalis	3.71
Spanish	6.93
W-7 (Intermediate Coumarin)	5.47
W-31 (Low Coumarin)	4.70
Average	4.23

L. S. D. at 5% level = .96 Tons/Acre

First year forage yields of eleven biennial sweet clover varieties are shown in Table 16. The average production level in this test is exceptionally high for the first year of a sweet clover stand in this area. Goldtop and Madrid are the two varieties recommended for use in this state. The yield of the second year growth of Goldtop is usually relatively better in comparison with other varieties than is indicated here for the seeding year.

GRASS VARIETY TRIALS

J. G. Ross, R. A. Moore 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 17. Forage Yields of Smooth Bromegrass Varieties, seeded September, 1958

Variety	Tons/Acre
Homesteader	1.30
Lancaster	1.37
Southland	1.38
South Dakota 5	1.30
Lincoln	1.39
Canadian Commercial	1.04
Average	1.30

No significant differences between varieties

Table 18. Forage Yields of Crested Wheatgrass Varieties, seeded September, 1958

Variety	Tons/Acre*
Nebraska 3576 Fairway Crested	.72
Common Crested	.86
Nordan	1.00
Nebraska 10	.90
Summit	.84
P-27 (A. Sibericum, Crested)	.53
Average	.81

* Differences between varieties were not statistically significant

Table 19. Forage Yields of Miscellaneous Wheatgrasses, seeded September, 1958

Variety	Species	Tons/Acre*
S-64	Fall	1.28
Mandan 1422	"	.59
Nebraska 50 Intermediate	Intermediate	.96
Amur	"	1.09
Greenar	"	.91
Ree	"	.92
S.D. 20	"	1.74
Idaho #3	"	.84
Idaho #4	"	1.02
S.D. Syn. 2-2d cycle	"	1.04

* Differences between varieties were not statistically significant

The highest yielding species of grass in these tests is smooth bromegrass with a yield of approximately 1-1/3 tons of hay per acre as shown in Table 17. Canadian Commercial is lowest yielding of these but little difference is present between the others.

The highest yielding grass of all those tested is an intermediate wheatgrass, S.D.-20, which is a high seed producing strain originated at the South Dakota Experiment Station. Other intermediate wheatgrass varieties are lower in yield than most of the bromegrass varieties. The crested wheatgrass varieties yielded a little less than 1 ton per acre of which Nordan is the highest. Crested wheatgrass is particularly useful as an early and late pasture grass making it valuable as a supplement to the range grasses.

GRASS SEED AND FORAGE PRODUCTION WITH VARIOUS FERTILIZERS AND ROW SPACINGS

J. G. Ross, R. A. Moore, and H. A. Geise

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

Table 20. Seed and Forage Production of Two Species of Grass in which Row Spacings and Fertilizer Levels were Varied,(established August 1958)

Species	Row space	Fertilizer	Tons/Acre forage	Lbs/Acre seed
Smooth Bromegrass	6"	0-0-0	2.1	174.5
		20-0-0	2.5	298.0
	42"	0-0-0	2.6	328.0
		20-0-0	2.5	349.2
Ree Wheatgrass	6"	0-0-0	2.7	198.0
		20-0-0	3.7	395.2
	42"	0-0-0	2.6	376.2
		20-0-0	2.8	464.2

L.S.D. at 5% (Forage) = .6 Tons/Acre
L.S.D. at 5% (Seed) = 129.6 Lbs/Acre

Seed and forage yields of Homesteader bromegrass and Ree intermediate wheatgrass were obtained from row spacings of 6 and 42 inches and from fertilizer applications of 20-0-0 on each of the row spacings. Four replications of these treatments were made. The average seed yield for each treatment is shown in Table 20.

The 6 inch row spacing is inferior from the standpoint of seed production for both grasses. The 42 inch row spacing increases the yield in both, but to a much greater extent for intermediate wheatgrass than for bromegrass. Likewise fertilizer application was more effective in raising yield on the intermediate wheatgrass than on the brome.

Forage yield, for each treatment shown in Table 21, indicates that there is not a great response to row spacings or fertilizer treatment. Intermediate wheatgrass appears to yield more forage at both row spacings and to respond to a greater degree to increased fertilizer than does bromegrass.

In gerneral intermediate wheatgrass yields somewhat more forage and seed than bromegrass in this test. This difference is more marked for seed production at the 42 inch row spacing.

TILLAGE AND CULTURAL PRACTICES

Comparison of Different Techniques in Growing Winter Wheat

H. A. Geise

Objectives: To compare yields of winter wheat grown continuously with or without commercial nitrogen, wheat grown in rotations with conventional fallow or sweet clover fallow, and to investigate the possibility of substituting wide space corn or sorghum as a moisture conserving technique to precede winter wheat.

Table 21. Yields of Winter Wheat from Plots Having Six Different Management Practices, 1960

Management Practice	Yield Bu/A	Test Wt.	%Protein
Continuous Wheat	26.2	59	15.31
Continuous Wheat + 30# N/yr.	25.2	59	15.19
Winter Wheat - Fallow	28.4	57	15.65
Winter Wheat - Sweet Clover Fallow	25.3	59	15.36
Winter Wheat - W.S. Corn	24.2	58	15.25
Winter Wheat - W.S. Sorghum	25.2	56	14.64

No significance between treatments

Table 22. Yield of Grain Obtained from Wide Spaced Corn and Wide Spaced Sorghum, 1959, and 1960 (row spacings, 84 inches)

Crop	Yield in Bu/Acre 1959	1960
Corn	0	11.1
Sorghum	.62	7.3

The yield differences of winter wheat from this experiment were not significant. However, a glance at Table 21 will show that summer fallow practices tend to increase the yields of wheat over the other practices. The yield of corn and sorghum were greatly reduced in 1959 by drought. 1960 stands were reduced because of pheasant damage, so this does not provide us with the true picture..

METHODS OF SUMMER FALLOW

H. A. Geise

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

Table 23. Yields of Winter Wheat Obtained from Plots Where Six Different Fallow Practices were Compared, 1960

Fallow Practice		Yield of Winter Wheat		
Fall	Summer	Bu/Acre	Test Wt.	% Protein
1. One Way	One Way	27.9	56	14.91
2. One Way	Noble blade	26.6	55	14.88
3. One Way	Noble blade, or 2,4-D	31.0	55	14.20
4. One Way	Noble blade, or no treat	31.4	58	14.54
5. Chisel	Noble blade	27.2	54	14.34
6. One Way	Chemical	31.6	56	14.59

L.S.D. at 5% level = 3.61 Bu/Acre

Table 24. Inches of Moisture Stored in the Soil (0-48") Under Six Different Fallow Techniques, 1960

Technique	Inches of Soil Moisture in Soil Profile*					Years loss or
Fallow 1960	Fall '59	Spring '60	Fall '60	Winter gain	Summer loss	gain
1	11.27	13.08	12.08	1.81	-1.00	0.81
2	11.34	15.06	14.72	3.72	- .34	3.38
3	11.19	13.32	12.64	2.13	- .68	1.47
4	11.15	15.18	13.64	4.03	-1.54	2.49
5	11.43	14.28	12.48	2.85	-1.80	1.05
6	10.86	13.55	12.40	2.69	-1.15	1.54
Wheat 1960						
1	9.80	12.69	10.00	2.89	-2.69	-.20
2	9.91	12.98	10.46	3.07	-2.52	.55
3	10.27	13.26	10.32	2.99	-2.94	.05
4	10.14	12.75	10.02	2.61	-2.71	-.10
5	9.82	12.94	9.80	3.12	-3.14	-.02
6	10.70	12.64	10.96	1.94	-1.68	.26

* Based on measurements in Reps. III & IV only

The yields of winter wheat (Table 23) in this experiment appear as two distinct groups between which there is a significant difference. The only character which separates these two groups is the number of tillage operations. The group producing the higher yields received only two tillage operations during 1959, whereas the low groups received four.

The difference that the two operations made in inches of water in the soil profile, can be seen in the wheat phase - (Table 24 - fall, 1959). Here we see that as little as .23 inch of water may account for the three bushel difference in wheat yield in 1960.

SORGHUM SPACING AND DATE OF PLANTING

H. A. Geise

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 25. Yields of Spring Wheat and Grain Sorghum Obtained From a Rotation Involving Three Dates and Three Methods of Planting Sorghum, 1960

Date of Planting	Method of Planting	Fertilizer*	Yield in Bu/A of Spring Wheat	Yield in Bu/A. of Grain Sorghum
May 21	Deep furrow drill	0	26.8	4.5
		N	26.0	4.9
	Lister	0	25.1	11.2
		N	25.5	13.1
	Corn planter	0	26.5	8.3
		N	27.9	10.8
June 2	Deep furrow drill	0	26.6	22.4
		N	26.9	18.0
	Lister	0	22.2	20.4
		N	24.2	23.8
	Corn planter	0	25.9	16.4
		N	26.3	15.8
June 14	Deep furrow drill	0	26.2	21.6
		N	26.5	27.5
	Lister	0	25.2	14.4
		N	23.0	15.6
	Corn planter	0	24.7	22.4
		N	27.0	21.6

L.S.D. at 5% for wheat = 3.9 Bu/A
No significant difference for sorghum
* "N" indicates 30# of nitrogen applied per acre

An analysis of the data from this experiment indicates that the method of planting the sorghum has a greater effect on the wheat than any other factor. The use of a lister decreases the yield of the wheat probably because the movement of the soil during the season tends to dry it more than the other tillage practices. In nearly every case the addition of nitrogen fertilizer tended to increase the yields of wheat.

In the sorghum plots, the first date of plantings produced the lowest yields for all methods. This is probably due to the soil temperature and its influence on the germination of the sorghum. The plots seeded with a deep furrow drill produced the lower yield which may have been caused by large populations which ran short of moisture before the seeds were developed.

At the later dates of planting the yields were superior to the early dates, with the effect of method, and of fertilizer not showing any consistency. However, it should be noted that there is no significance for any differences in the sorghum yields and therefore no valid conclusions that can be made.

CROP DISEASE CONTROL

Objective: To determine the disease resistance of experimental corn hybrids to root and stalk rot, and the date of planting winter wheat which is most effective in the control of wheat streak mosaic.

Corn Diseases

C. M. Nagel

Root rot and lodging due to stalk rot are serious disease problems of hybrid corn in the south central area of the state. Both of these diseases are caused by fungi (molds) which live in the soil and are capable of infecting corn plants in midseason, resulting in important yield losses to farmers.

The performance experiments with new disease resistant corn hybrids were continued in 1960. Moisture conditions were improved over that of 1959 when the corn was killed in midseason by drought. With the more adequate moisture supply, coupled with the timely rains of 3.8 inches during August (a critical month for corn because of pollen shedding and kernel set) certain of the commercial hybrids showed improved yields in comparison to the 1958 experiments, in which all were at the bottom of the list. However, the top yielders, as in 1958, were again the new experimental disease resistant hybrids. Data from experiments conducted in other areas of the state as well as at South Central Research Farm, involving many of these new disease resistant hybrids strongly indicate that these new hybrids perform much better than present commercial hybrids when weather and soil moisture are less favorable. More years' data will be needed at the South Central Research Farm to arrive at definite information on this point. However, as indicated above, these hybrids have performed well under "tougher" growing conditions when compared to the best commercial hybrids in most all instances over a four year period. In any event, until such time as sufficient data are accumulated at the South Central Research Farm to clarify this point, such as are available from other locations in the state, it can be pointed out that this is the type of crop performance needed to make crop production more stable in years when rainfall is below normal, or in areas of the state where the rainfall is more or less inadequate for profitable production.

Many crop varieties may perform well under ideal weather and soil conditions but few perform well under unfavorable weather conditions or diseased soil conditions.

The performance of these corn hybrids is presented in Table 26.

Table 26. Performance of 67 Experimental Corn Hybrids Having Various Degrees of Resistance to Root Rot in Comparison to 4 of the Best Performing Commercial Hybrids Grown at the South Central Research Farm, 1960

Experimental Hybrid or Commercial Hybrid		Yield* Bu/A.	Percent Ear Moisture At Harvest	Performance Score
Expt'l	1	46.6	12.7	1
"	2	46.2	16.7	3
"	3	46.2	11.9	2
SD 420		45.9	18.9	4
SD 270		42.9	12.5	5
Expt'l	4	42.1	10.0	6
"	5	41.6	17.4	8
"	6	41.1	15.8	9
"	7	40.0	12.6	12
"	8	40.0	21.8	20
"	9	40.0	12.4	11
"	10	39.9	10.5	7
"	11	39.8	11.3	10
"	12	39.3	13.0	13
"	13	39.1	12.8	14
"	14	38.6	12.6	17
"	15	38.6	10.51	16
"	16	38.3	11.8	18
"	17	38.1	10.0	15
"	18	37.9	14.1	21
"	19	37.3	10.0	19
"	20	37.0	11.2	22
"	21	36.8	25.4	40
"	22	36.5	11.9	23
"	23	35.2	15.7	32
"	24	35.2	10.2	29
"	25	35.0	11.9	25
"	26	35.0	14.2	30
"	27	34.8	10.8	24
"	28	34.7	11.4	26
"	29	34.5	12.1	28
"	30	34.5	11.5	27
"	31	34.3	12.2	33
"	32	34.1	11.3	31
"	33	34.1	12.8	37
"	34	33.9	10.7	34

Experimental Hybrid or Commercial Hybrid		Yield* Bu/A.	Percent Ear Moisture At Harvest	Performance Score
Expt'l	35	33.9	11.7	36
"	36	33.8	10.9	35
"	37	33.8	11.8	38
"	38	33.2	12.7	42
"	39	33.2	10.6	39
"	40	33.1	13.6	44
	41	33.0	12.6	43
"	42	32.9	11.3	41
"	43	32.7	13.1	46
"	44	32.6	11.8	45
"	45	31.9	12.4	48
"	46	31.8	10.1	47
"	47	31.6	13.4	51
"	48	31.3	10.9	49
"	49	31.2	14.0	52
SD 250		30.9	10.4	50
Expt'l	50	30.4	14.9	54
"	51	30.2	16.4	58
"	52	30.1	11.1	53
"	53	30.0	13.5	56
"	54	29.4	13.3	57
"	55	29.4	22.4	66
"	56	29.0	17.2	62
"	57	28.9	9.6	55
"	58	28.8	12.3	59
"	59	28.7	12.1	60
PAG 62		28.6	18.9	65
Expt'l	60	27.8	10.9	61
"	61	27.5	13.3	63
"	62	27.3	13.3	64
"	63	26.3	22.4	70
"	64	26.1	11.1	68
"	65	25.9	10.3	67
"	66	25.5	12.2	69
"	67	21.8	16.9	71

* L.S.D. (Least Significant Difference) 12.81 Bu/Acre. This means that for any two hybrids to be significantly different in yield from one another, a yield difference of 12.81 bushels per acre is required.

Control of Wheat Streak Mosaic

G. W. Buchenau and C. M. Nagel

Table 27. Effect of Planting Date on Wheat Streak Mosaic and Yield of Nebred Winter Wheat in Severe (1959) and Mild (1960) Mosaic Seasons.

Planting Date	Mosaic Plants Diseased Percentage[1] 1959	1960	Yield[2] Bu/Acre 1959	1960
Aug. 15	97	Tr	0.8	30.6
Aug. 25	95	Tr	2.8	37.7
Sept. 4	65	Tr	7.6	35.6
Sept. 14	8	Tr	14.0	31.9
Sept. 24	6	0	14.0	23.8
Oct. 4	1	0	10.0	18.1

[1] Percent plants with symptoms in mid-May
[2] Average of three replications

A mid-September planting date has been shown to be instrumental in the control of wheat streak mosaic on winter wheat at the South Central Research Farm. The 1959-60 season was characterized by a low disease incidence and consequently provided valuable information on the suitability of this planting date in years of low disease.

On the basis of experiments in previous years a planting date of September 10 has been recommended to avoid major wheat losses when the disease is highly destructive.

Table 27 shows that in 1960, a mild disease year, maximum yields were obtained by planting in late August and early September. Although early planting may result in yield increases in light mosaic seasons, it may induce severe losses in years of heavy mosaic. The grower should note that satisfactory yields were obtained by planting on September 14 in both 1959 and 1960.

It is hoped that future results will enable the plant pathologist to predict in advance the advisability of a slightly earlier planting date on the basis of potential disease outbreaks. Until such results are available it is suggested that the grower anticipate a severe disease season and use the September 10 planting date in preference to a late August or early September date.

Table 28. South Central Research Farm Advisory Committee

Name	Adress	County Representing
Walter Stolte	Chamberlain	Brule
Fred Lucas	Academy	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

Table 29. Cooperating Counties and County Agents

Name	Adress	County Representing
Melvin Syring	Chamberlain	Brule
Joseph Speul	Lake Andes	Charles Mix
James Blackketter	Burke	Gregory
Thomas W. Strachan	Kennebec	Lyman
Eugene Zimmerman	White River	Mellette
Delwin A. Jensen	Ft. Pierre	Stanley
Louie DeSmet	Mission	Todd
Raymond H. Eilers	Winner	Tripp