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December 1970

SOUTH CENTRAL RESEARCH FARM
Presho, South Dakota

INTRODUCTION

This is the thirteenth annual report of the South Central Research Farm. The experimental area, located on the Glen Hutchinson farm, is approximately ten and one-half miles south of Presho, South Dakota. The soil, a fine clay, derived from Pierre shale is identified as Promise clay. It contains 3.3% organic matter, is medium in available phosphorus, and is high in potassium.

Rainfall in 1970 was below normal for almost the entire year. However, soil moisture was sufficient to produce good yields of grain sorghum. A severe hail storm on June 15 destroyed all winter grains, specialty crops, and most of the grass plots.

Spring seeded small grain, although severely damaged by the hail prior to heading recovered sufficiently to produce small yields of grain. Normal temperatures during July promoted regrowth and tillering so grain was produced with the limited soil water and precipitation.

Grain sorghum which was just emerging from the soil or was small enough so it was not permanently damaged by the hail storm, was able to produce a good yield. The sorghum forages, on the other hand, produced abundant foliage and used the available soil moisture before they were able to shoot heads.

The annual field day, scheduled for July, was cancelled as a result of the hail storm, but numerous visitors were given tours to explain the research in progress.

SOUTH CENTRAL RESEARCH FARM ADVISORY COMMITTEE

Officers	Address	County
Walter Stolte	Chamberlain 57325	Brule
Fred Lucas	Platte 57369	Charles Mix
Ed Bailey	Lucas 57549	Gregory
Lyn Lyman	Murdo 57559	Jones
John Quillan	Kennebec 57544	Lyman
Jerry Bruning	Wood 57585	Mellette
Lyle Hedman	Hayes 57537	Stanley
John Fernen	Mission 57555	Todd
Don Jorgensen	Ideal 57541	Tripp

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

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Table 1. Weather Data - South Central Research Farm, 1970.

Month	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Rainfall in inches*	0.18	tr	0.38	2.56	2.37	2.73	1.42	1.67	0.82	0.72	0.67	0.26	13.78
Longtime Average**	0.47	0.57	1.02	1.79	2.38	3.11	1.66	2.08	1.45	0.98	0.67	0.39	16.57
Departure from Longtime Average	-0.29	-0.57	-0.64	0.77	-0.01	-0.38	-0.24	-0.41	-0.63	-0.26	0.00	-0.13	-2.79
Average Tempearature*	--	--	--	44.1	60.8	71.3	76.8	76.4	62.5	48.3	--	--	
Longtime Average**	18.6	21.9	31.8	47.6	58.9	68.7	76.8	75.0	64.5	51.4	34.8	23.9	
Departure from Longtime Average	--	--	--	-3.5	1.9	2.6	0.0	1.4	-2.0	-3.1	--	--	
Av. Monthly Maximum - 1970*	--	--	--	57.4	75.0	84.2	93.5	91.1	75.2	59.7	--	--	
Av. Monthly Minimum - 1970*	--	--	--	30.8	45.6	58.5	60.2	61.6	49.8	38.0	--	--	
Inches of water evaporated from free surface	--	--	--	--	6.61	10.48	10.01	13.05	7.20	2.52	--	--	

Note: The maximum recorded air temperature for the year was 104° and occured on July 17.
Last killing frost - May 2; First frost - September 26; First killing frost - October 9; Growing Season - 147 days.

* Data taken and recorded at South Central Rearch Farm.
**Longtime averages were recorded at Kennebec, South Dakota, based on 30 year period 1931-1960 inclusive.

A severe hail storm accompanied by a rain shower of 1.50" was experienced on June 15.

SMALL GRAIN VARIETY TESTING

D. G. Wells, P. B. Price, D. L. Reeves, J. J. Bonnemann, and H. A. Geise

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 by using a deep furrow drill. The seeding rate was 5 pecks or 70 pounds per acre. The soil was fertilized by broadcasting ammonium nitrate at the rate of 30 pounds of nitrogen per acre, and by applying 15 pounds of elemental phosphorus with the seed. The three year averages for the trials are presented in table 2.

Table 2. Drill-Strip Rye Variety Trial - South Central Research Farm, 1967-69.

Variety	Date of Heading	Height Inches	Test Weight Lbs/Bu	Grain Yield Bu/Acre
Von Lochow	June 1	43	52.2	50.0
Elk	May 29	44	54.0	36.0
Caribou	May 28	44	52.2	33.4
Antelope	May 29	41	55.0	32.3
Pierre	May 26	46	56.6	22.5

Winter Wheat

Winter wheat varieties were evaluated in large drill-sized plots. They were fertilized by broadcasting 30 pounds of nitrogen per acre and applying 15 pounds of elemental phosphorus with the seed by using a drill box attachment. The information published in table 4 is an average of the data collected in 1967, 1968, and 1969.

Winter Barley

The winter barley varieties tested have varied each year in their winterhardiness. Previous tests have shown Kearney and Dicktoo to be the most hardy, Mo. B1222 to be intermediate, and Mo. B969 and Chase to be the least hardy. However, due to the mild conditions during the winters those varieties which have had the least hardiness had a better stand in the spring than those varieties which have had the highest degree of winterhardiness.

Table 3. Winter Barley Variety Trial - South Central Research Farm, 1967-69.

Variety	Date of Heading	Percent Survival	Height Inches	Test Weight Lbs/Bu	Grain Yield Bu/Acre
Dicktoo	June 7	84	28	48.5	46.8
Kearney	June 7	84	27	47.6	41.7
Chase	June 6	86	28	48.0	41.5
Mo. B1222	June 9	84	27	48.1	40.1
Mo. B969	June 7	85	26	47.7	33.6

Table 4. Winter Wheat Variety Performance Record - South Central Research Farm, 1967-70

Variety	Date of Heading	Height Inches	Rust Reaction* Leaf	Rust Reaction* Stem	Percent Survival	Percent** Protein	Test Weight Lbs/Bu	Grain Yield-Bu/Acre Av. 1967-69
Gage	6- 5	34	MR	R	92	14.7	60.0	48.8
Trapper	6- 8	37	S	R	89	14.2	61.3	46.6
Trader	6-10	37	S	R	92	13.9	61.3	45.0
Scout	6- 5	35	S	R	94	14.2	60.7	44.9
Lancer	6- 6	35	S	R	88	14.4	61.7	43.5
Scout 66	6- 4	32	S	R	85	15.2	60.5	41.9
Winoka	6-11	38	S	R	90	14.2	60.3	40.2
Minter	6-11	39	S	R	91	14.8	59.7	38.7
Guide	6- 4	33	S	R	92	14.5	59.5	38.7
Omaha	6- 4	34	S	S	92	15.7	61.0	38.4
Hume	6- 9	36	S	R	91	14.4	60.7	38.3
Nebred	6-11	36	S	S	92	14.1	60.0	38.3
Turkey	6- 8	37	S	S	86	16.3	59.0	31.4+
Wichita	6- 5	39	S	S	85	14.4	61.0	36.5++

* Letter indicates reaction to rust: S-Susceptible, R-Resistant, MR-Moderately Resistant.
**Protein content was calculated from Kjeldahl analysis and is reported on an oven-dry basis.
+ Includes yield from 1968 and 69 only.
++Yield data from 1968 only.

Oats

All varieties listed in tables 5, 6, & 7 were seeded on fallow. The soil was fertilized by broadcasting nitrogen at the rate of 30 pounds per acre, while phosphorus was applied with the seed at the rate of 15 pounds of the element per acre. The plots were seeded in early April, and harvested with a self-propelled combine in late July.

Table 5. Oat Variety Trial* - South Central Research Farm, 1967-69.

Variety	Date of Heading	Height Inches	Test Weight Lbs/Bu	Grain Yield Bu/Acre
Wyndmere	6- 7	37	35.6	87.7
Brave	6-17	35	35.6	87.2
Burnett	6-19	34	35.3	87.1
Tyler	6-16	30	35.3	86.1
Tippecanoe	6-16	31	37.0	83.9
Portal	6-22	36	35.0	83.6
Lodi	6-27	40	31.6	82.4
O'Brien	6-17	36	37.6	77.8
Garry	6-27	39	34.0	76.5
Holden	6-20	32	36.3	76.3
Rodney	6-29	36	33.6	75.5
Ortley	6-26	39	35.3	75.0
Clintford	6-18	30	38.6	72.8
Garland	6-19	32	36.0	71.0
Jaycee	6-15	30	36.6	74.2
Clintland 64	6-19	35	36.3	65.7

*All data in table are an average of three years 1967-1968-1969.

Table 6. Oat Variety Trial* (Forage Type) - South Central Research Farm, 1967-69.

Variety	Date of Heading	Height Inches	Test Wt. Lbs/Bu	Grain Yield Bu/Acre	Forage Yield**	
					% Protein	Ton/A
Lodi	6-27	40	31.7	83.0	8.5	3.6
Garry	6-27	39	34.0	77.3	8.5	3.8
Rodney	6-22	36	33.7	76.3	9.0	3.8
Ortley	6-26	39	35.5	76.0	8.6	3.4

* All data in table are an average of three years 1967-1968-1969.
**Forage yield is reported in tons dry matter per acre, protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Table 7 contains only the information collected from a variety trial conducted in 1970. This test was severely damaged by hail in mid-June. The plots were left to recover and produce grain on the tillers. It was harvested in mid-August.

Table 7. Oat Variety Trial - South Central Research Farm, 1970.

Variety	Date of Heading	Height Inches	Test Weight Lbs/Bu	Grain Yield Bu/Acre
Kelsey	--	22	33.6	26.8
Lodi	--	24	31.0	25.2
Froker	--	24	34.4	23.5
Burnett	6-13	19	34.6	22.4
Otter	6-13	17	32.9	22.2
Dupree	6-12	16	32.5	20.9
Portal	--	19	34.6	19.7
Pettis	6-12	19	35.8	18.9
Brave	6-15	20	33.1	18.9
Tyler	6-13	16	33.1	17.7
Kota	--	20	34.4	16.8
Holden	--	18	36.3	14.8
Sioux	--	23	27.6	13.1
Garland	6-14	17	33.8	12.8
Nodaway 70	6-11	20	35.2	12.1
Clintland 64	6-13	19	34.6	11.8
O'Brien	6-14	19	34.7	10.7
Jaycee	6-13	14	32.9	6.3

Spring Wheat

All varieties reported in tables 8 & 9 were seeded on fallow. The soil was fertilized with 30 pounds of nitrogen per acre, and 15 pounds of phosphorus per acre applied with the seed when planted. The plots were seeded in early April and harvested with a self-propelled combine in late July.

Table 8. Hard Red Spring Wheat Variety Trial* - South Central Research Farm, 1967-69.

Variety	Date of Heading	Height Inches	Test Weight Lbs/Bu	Grain Yield Bu/Acre
Fortuna	6-24	34	56.3	33.8
Manitou	6-24	34	54.3	32.8
Crim	6-24	35	53.6	30.9
Sheridan	6-27	36	54.3	30.0
Polk	6-16	30	54.5	29.4
BH 631	6-20	34	55.6	29.3
Chris	6-23	35	55.6	29.1
Rushmore	6-25	34	55.3	27.8
BH 632	6-24	35	54.6	26.6
Justin	6-26	35	51.6	24.4
Selkirk	6-28	34	50.0	22.3

*All data in table are an average of three years 1967-1968-1969.

Table 9. Durum Wheat Variety Trial* - South Central Research Farm, 1967-69.

Variety	Date of Heading	Height Inches	Test Weight Lbs/Bu	Grain Yield Bu/Acre
Leeds	6-22	35	56.7	30.5
Wells	6-24	35	54.7	27.3
Stewart 63	6-29	43	55.0	24.7

*All data in table are an average of three years 1967-1968-1969.

The data presented in table 10 was obtained from a trial conducted in 1970. The wheat was severely damaged by hail in mid-June. The information is presented only to show the ability of the various varieties to recover from that type of damage.

Table 10. Spring Wheat Variety Trial - South Central Research Farm, 1970.

Variety	Height Inches	Test Weight Lbs/Bu	Grain Yield Bu/Acre
HARD RED SPRING			
Rushmore	19	52.9	6.0
Waldron	18	52.8	5.5
Manitou	16	52.4	5.2
Neepawa	16	50.8	4.9
Chris	16	53.6	4.6
Sheridan	18	54.6	4.4
BH 631	16	54.0	4.4
BH 632	18	53.4	4.4
Polk	16	53.1	4.1
Fortuna	16	52.6	3.5
SEMI-DWARFS			
Fletcher	14	54.0	8.7
Era	14	55.2	7.1
Red River 68	14	55.2	4.0
Bonanza	12	53.0	3.0
WS 1809	11	53.1	2.2
WS 1812	12	53.5	1.4
DURUM			
Wells	14	55.9	3.0
Leeds	14	57.0	2.7
Hercules	14	55.5	1.9

Spring Barley

The plots were seeded in fallow and received 30 pounds of nitrogen fertilizer each year. Phosphorus fertilizer was applied at the rate of 15 pounds of elemental phosphorus per acre with the seed at planting time. The yields and other data presented in table 11 are an average of three years, 1967-69.

Table 11. Spring Barley Variety Trial* - South Central Research Farm, 1967-69.

Variety	Date of Heading	Height Inches	Test Weight Lbs/Bu	Grain Yield Bu/Acre
Dickson	6-21	32	47.3	69.1
Liberty	6-20	32	47.6	62.2
Primus II	6-14	30	49.0	60.4
Larker	6-20	32	48.3	60.1
Trophy	6-20	33	46.6	56.4
Conquest	6-20	35	46.3	52.4

*All data in table are an average of three yars 1967-1968-1969.

SORGHUM PERFORMANCE TESTING

Sorghum Breeding

A. O. Lunden

Experimental plantings at South Central Research Farm included a Regional Uniform yield test, a South Dakota Hybrid yield test and a crossing block for seed production of experimental restorer lines. Grain sorghum yields for 1970, reported in table 12 ranged to 3,400 pounds, or about 60 bushels, per acre which is considerably below the five-year-average maximum yield of about 4,500 pounds per acre. Yields were probably limited most by injury from a severe hailstorm in mid-June when plants were in the four-leaf stage. Drought stress was not critical to the grain sorghum although average temperature was about one degree above normal while rainfall was nearly 20% below normal.

Table 12. Yields of Open-Pedigree or Experiment Station Grain Sorghum Hybrids - South Central Research Farm.

Entry	Grain Yield - Pounds/Acre						Bu/Acre 5 Yr. Ave.
	1966	1967	1968	1969	1970	5 Yr. Ave.	
SD 441	3200	3560	3870	2830	2030	3098	55.3
SD 451	3420	3060	4970	2800	2370	3324	59.4
SD 503	3760	3140	5370	3420	3420	3822	68.2
NB 505	4090	2160	3980	2460	2810	3100	55.4
RS 506	4570	4900	4600	2970	2820	3972	70.9
RS 610	4780	2870	4150	3490	2850	3628	64.8
LSD(05)	720	660	510	670	840		

Table 13. Characteristics of Open-Pedigree or Experiment Station Grain Sorghum Hybrids - South Central Research Farm

Entry	Days to Bloom	Height Inches	Percent Lodging	Test Weight Lbs/Bu
SD 441	60.3	48.2	17.0	56.1
SD 451	61.3	45.0	16.3	55.3
SD 503	63.5	47.7	6.8	57.2
NB 505	63.8	43.5	9.3	58.5
RS 506	63.0	43.8	14.3	56.5
RS 610	70.5	41.3	2.5	55.0

RS 506 is a new midseason grain sorghum hybrid which has just been released by the South Dakota Agricultural Experiment Station at Brookings. This hybrid shows excellent yield potential over a wide range of locations, from the results of five years of state and regional testing, and from the 1970 Grain Sorghum Performance Tests. RS 506 is similar in maturity to SD 503 or NB 505 and is several days earlier than RS 610. The five-year-average yield is 6 bushels above RS 610 at Presho in spite of the earliness of this hybrid and the semi-open head which should allow natural field drying and early harvest. It is intermediate between SD 451 and RS 610 for lodging resistance so timely harvest or swathing is recommended.

A limited quantity of RS 506 seed which was produced through cooperation of the Nebraska and South Dakota Foundation Seed Stock Divisions, is available for planting in 1971. This seed is being sold directly to all interested companies who will then sell it to the grain sorghum producers.

A short, leafy forage sorghum hybrid with high grain content is being considered for release in 1972 and a similar release procedure is contemplated.

Grain Sorghum Performance Testing

Joseph J. Bonnemann

Objective: To compare the performance of grain sorghum hybrid varieties as to yield and other agronomic characteristics.

Performance trials with grain sorghum hybrids have been conducted on a fee basis at the South Central Research Farm since 1962. Table 14 presents the 1970 yields and agronomic data. Long term averages and other information can be found in Circular 202, 1970 Grain Sorghum Performance Trials, South Dakota Agricultural Experiment Station.

Table 14. Grain Sorghum Performance Trial - South Central Research Farm, 1970.

Brand & Variety	Percent* Lodging	Height Inches	Date of Heading	Percent** Moisture	Test Wt Lbs/Bu	Yield Lbs/A
Pioneer 883	2	39	7-31	15.4	57.0	3410
RS 506 (SD25265)	10	45	7-26	15.0	57.0	3410
Pride P-550 BR	0	43	7-31	18.4	56.0	3300
Northrup-King MM 54BR	0	38	7-26	16.0	57.0	3250
Frontier GX 410	3	36	8- 2	17.8	57.0	3090
RS 610	3	41	8- 4	22.2	57.0	3090
Frontier Super 400A	0	41	8- 1	22.5	56.0	3070
Weathermaster GS-30A	2	42	7-28	13.5	59.0	3050
ACCO R 1010	5	41	7-28	13.6	59.0	3040
Frontier GX 389	0	39	7-31	17.5	59.0	2990
Pioneer 894	0	33	7-28	13.6	58.0	2950
DeKalb B32a	2	38	7-27	14.4	58.0	2929
Weathermaster GS-30B	0	42	7-26	15.1	57.0	2920
SD 503	2	56	7-28	14.5	57.0	2890
DeKalb A-25	2	38	7-26	14.4	54.0	2890
Pride P-500A	5	38	7-26	13.6	56.0	2880
DeKalb B-36	0	42	7-28	16.3	58.0	2850
Weathermaster GS-31Y	0	41	7-29	17.3	59.0	2850
Northrup-King 120	5	40	7-23	14.4	57.0	2830
Acco R 920	5	39	7-26	13.8	56.0	2830
Frontier Grassy Grain I	0	44	7-27	15.1	57.0	2710
ACCO R 1019	2	41	8- 7	19.5	58.0	2620
Frontier 388A	2	42	7-29	17.0	58.0	2620
SD 451	15	45	7-27	13.6	55.0	2570
RS 633	0	44	8-10	25.5	58.0	2550
W'master Grazor Grain 27	0	44	7-27	14.5	58.0	2480
Pride P-200	10	37	7-21	13.9	56.0	2190
Coop SG-10	0	39	8-11	35.0+	52.0	1740

* Percent lodging observations were made on September 28, 1970.
**Moisture content of the grain was determined on September 25, 1970.

Sorghum Forage Testing

H. A. Geise

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

The results of these trials are reported in tables 15, 16, 17, 18, and 19.

Table 15. Performance Trial of Forage Sorghum Varieties - South Central Research Farm, 1970.

Brand & Cultivar	Lodging (1-5)	Maturity (1-5)	Height Inches	% Sugar in Sap	Percent D. M.	Percent* Protein	Forage Yield** Tons/Acre
Barzen-Stockmen's FS445	1.1	4.8	71	10.5	29.7	7.25	4.60
Asgrow Beefbuilder T	1.5	4.0	80	12.8	32.1	8.06	4.41
DeKalb FS1A	1.1	1.2	50	7.6	50.6	7.69	4.40
Pioneer 931	1.6	4.8	87	10.1	30.4	9.19	4.29
DeKalb FS4	1.4	1.2	76	9.8	34.6	6.56	4.24
Advance 1085F	1.4	4.0	76	12.1	29.5	9.12	4.20
Acco FS401R	1.0	2.1	56	13.0	36.4	9.12	4.15
Asgrow Titan R	1.5	3.0	72	11.5	30.3	8.56	4.12
Rudy-Patrick Sumax	1.6	1.0	72	14.2	33.9	6.94	4.07
RX882G	1.2	1.4	57	11.2	43.2	8.38	4.00
Asgrow Duet	1.2	1.2	61	9.8	39.0	7.62	4.00
Barzen-Stockmen's FS500	1.1	3.5	70	13.9	34.5	7.62	3.87
Asgrow Dino	1.0	4.8	46	15.4	39.1	9.19	3.82
NK 300	1.0	1.9	46	14.4	46.0	7.25	3.74
Asgrow Dairy D	1.4	3.8	64	15.0	34.2	6.88	3.73
Frontier	1.0	3.0	48	13.7	38.5	9.44	3.66
NK 318S	1.2	3.8	66	13.0	29.7	8.06	3.64
Acco Aztec	1.4	3.8	69	12.1	28.6	9.00	3.61
Pioneer 936	1.4	4.0	82	11.4	28.8	8.00	3.60
Excel Silo-Fill 33	1.0	4.5	60	15.0	33.0	9.12	3.58
Acco FS402R	4.0	2.5	44	12.5	37.1	9.06	3.52
Advance 1071F	1.6	1.0	75	11.5	32.2	6.62	3.50
Waconia	3.5	1.5	71	13.5	30.2	5.69	3.48
Rudy-Patrick 24F	4.4	1.0	66	6.6	48.2	5.75	3.42
NK 315	1.1	2.1	59	12.0	34.1	8.25	3.36
Acco FS403R	2.2	1.9	70	8.4	30.6	9.19	3.21
Acco FS300R	1.2	1.2	68	10.2	27.8	9.12	3.20
Barzen-Stockman's FS446	1.2	4.0	70	14.1	29.3	8.12	3.07
NK 145	3.2	1.0	72	5.8	47.1	7.12	2.83
Barzen-Stockmen's FS444	1.9	1.0	68	9.8	30.7	7.38	2.77
Rancher	1.2	1.0	64	13.9	45.4	4.56	2.73

* Protein content was calculated from Kjeldahl analysis and is reported on an oven-dry basis.
**Forage Yields are reported on a 12% moisture content.

Table 16. Agronomic Characteristics of Forage Sorghum Grown in Performance Test - South Central Research Farm, 1970.

Brand & Cultivar	Late of Heading	Number of Tillers	Number of Leaves	Stem Diam. Millimeters	Plant* Type	Percent Plant by Weight		
						Leaf	Head	Stem
Barzen-Stockmen's FS445	--	4	18	19	5	40.2	48.9	54.9
Asgrow Beefbuilder T	--	5	18	19	2	58.4	--	41.6
DeKalb FS1A	8-25	3	16	18	8	28.8	54.2	17.0
Pioneer 931	--	5	18	19	2	44.1	1.6	54.3
DeKalb FS4	8-24	5	15	16	4	24.8	36.1	39.1
Advance 1085F	--	4	18	18	2	57.7	--	42.3
Acco FS401R	8-28	4	17	20	6	38.9	35.2	25.9
Asgrow Titan R	--	4	18	18	3	36.2	16.6	47.1
Rudy-Patrick Sumax	8-22	4	16	20	3	33.7	19.7	46.6
RX882G	8-25	4	16	18	6	37.3	37.6	25.0
Asgrow Duet	8-23	4	15	20	3	32.0	35.8	32.2
Barzen-Stockmen's FS500	--	4	18	17	5	38.5	9.7	51.8
Asgrow Dino	--	5	17	22	7	67.3	6.3	26.3
NK 300	8-24	4	16	22	6	37.6	42.8	19.6
Asgrow Dairy D	9- 7	5	16	17	4	41.7	7.3	51.0
Frontier	--	4	17	19	7	46.7	24.2	29.4
NK 318S	--	4	16	19	2	47.6	11.3	41.1
Acco Aztec	--	6	17	18	2	41.3	10.1	48.6
Pioneer 936	--	5	18	20	2	46.7	1.4	51.9
Excel Silo-Fill 33	--	4	17	20	7	40.2	5.0	54.8
Acco FS402R	--	5	18	20	6	42.2	32.8	25.0
Advance 1071F	8-22	4	15	22	4	21.9	39.6	38.5
Waconia	8-26	5	16	19	3	26.0	22.2	51.7
Rudy-Patrick 24F	8- 6	4	13	21	4	17.4	60.7	21.9
NK 315	8-28	5	16	16	3	37.4	17.6	45.0
Acco FS403R	8-24	6	16	18	3	25.1	32.3	42.6
Acco FS300R	8-27	4	16	17	4	28.3	31.6	40.1
Barzen-Stockmen's FS446	8-11	4	18	19	4	37.8	12.6	49.5
NK 145	7-31	5	12	16	4	14.4	60.2	25.4
Barzen-Stockman's FS444	8-16	4	15	19	4	24.8	41.7	33.4
Rancher	7-28	5	9	17	4	18.0	40.4	41.7

*Legend for plant type is found on page 14.

*Legend for Plant Type - Table 16, page 13.

Score	Description	Score	Description
1	Tall-Extra Leafy-Grainy	6	Short-Extra Leafy-Grain
2	Tall-Leafy-No Grain	7	Short-Extra Leafy-No Grain
3	Tall-Leafy-Grain (50-50)	8	Short-Leafy-Grain (50-50)
4	Tall-Few Leaves-Grain	9	Short-Few Leaves-Grain
5	Tall-Few Leaves-Little Grain	10	Short-Few Leaves-Little Grain

Table 17. Performance of Sorghum-Sudangrass Crosses - South Central Research Farm, 1970.

Brand & Cultivar	Date of Heading	No. of Tillers	Maturity (1-5)	Height Inches	% Sugar in Sap	Percent D. M.	Percent* Protein	Forage Yield-Tons/Acre** 1970	Forage Yield-Tons/Acre** 2 Yr Av.(1968&70)
Acco Sweet Sioux	8- 8	9	1.2	86	17.5	48.0	6.25	4.4	3.9
DeKalb SX-6	9- 2	6	3.0	80	18.0	31.7	7.44	4.0	4.4
NK Sordan	8-27	5	1.0	84	12.9	37.0	8.06	3.9	5.4
Pioneer 988	8-27	6	1.2	80	12.6	41.5	6.38	3.4	4.2
Asgrow Grazer A	8-27	5	1.5	81	15.2	32.3	7.19	3.2	5.0
DeKalb SX-5	8-18	6	1.0	84	12.8	36.7	7.62	3.1	3.8
Weathermaster FS554	8-25	6	1.2	80	12.9	31.2	8.69	3.0	3.6
Frontier Hidan 35	8- 6	6	1.0	84	10.8	45.9	5.56	3.0	3.6
Pioneer 980	8-25	6	1.0	84	14.5	41.8	8.19	3.0	3.7
Frontier Hidan 39a	8-26	8	1.0	82	10.2	37.0	8.06	3.0	3.8
Asgrow Grazer K	8-12	5	1.2	82	11.8	35.5	9.06	2.9	3.5
Pioneer 985	8-24	4	1.0	82	9.9	41.3	5.19	2.9	4.4
Stockman's FS556	8-24	5	1.2	89	12.5	36.3	6.94	2.6	3.5
Asgrow Astro	8- 8	6	1.5	85	9.3	39.2	6.69	2.6	3.4
Rudy-Patrick Su-4	8- 5	6	1.0	86	15.1	46.3	6.50	2.5	3.4
Sexauer S-100	8- 9	5	1.2	82	10.5	42.1	5.44	2.4	--
Acco SS-1	8-27	4	1.0	89	12.8	38.6	7.50	2.5	3.4

* Protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis.
**Forage yields are reported on a 12% moisture basis.

Table 18. Performance of Sorghum Forage Blends - South Central Research Farm.

Brand & Cultivar	Date of Heading	Lodging (1-5)	Maturity (1-5)	Height Inches	Percent D. M.	Percent* Protein	Forage Yield-Tons/Acre** 1970	2 Yr Av (1968&70)
Acco FS403R	8-26	2.0	1/2	72	42.7	6.31	5.1	--
Acco FB400R	8-27	1.5	1/3	62	36.1	8.31	4.9	5.8
Acco 3 Little Indians	8-26	1.4	1/2	78/52	50.7	8.75	4.2	--
Acco FB44	8-25	1.5	1/3	70/37	27.0	8.94	2.4	4.0

* Protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis.
**Forage Yields are reported on a 12% moisture basis.

Table 19. Performance of Sudangrasses, Silage Corn, and Grain Sorghum as Forage Crops - South Central Research Farm, 1970.

Brand & Cultivar	Date of Heading	No. of Tillers	No. of Leaves	Height Inches	Percent of Plant			% Sugar in Sap.	Percent* Protein	Percent D. M.	Forage Yield** Tons/Acre
					Leaf	Stem	Head				
SUDANGRASS											
Caladino-Monarch	8-5	8	10	75	28.7	57.1	14.2	12.1	7.25	48.6	2.62
Acco HS-33	8-7	8	11	78	25.0	54.0	21.0	14.6	6.12	44.6	2.50
NK Trudan II	8-4	6	12	82	28.8	63.0	8.2	13.7	5.75	40.5	2.25
Rudy-Patrick Trudy	8-5	9	11	70	32.4	43.6	24.4	8.3	6.25	47.1	2.12
SILAGE CORN											
Pioneer S-100	8-5	1	16	79	29.8	22.6	57.6	--	7.31	72.0	404
Pioneer 3681	8-8	1	15	74	41.9	25.5	32.5	--	8.62	60.6	2.99
GRAIN SORGHUM											
SD 503	8-1	3	11	49	18.8	14.8	66.3	--	9.19	59.1	3.54

* Protein content was determined by Kjeldahl analysis and is reported on an oven-dry basis.
**Forage yields are reported on a 12% moisture basis.

GRASS TESTING

Grass Variety Trials

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.

All varieties of Smooth Bromegrass (Table 20) and Russian Wildrye (Table 21) were fertilized with 40 pounds of nitrogen per acre per year.

Table 20. Smooth Bromegrass Forage Yield Trial - South Central Research Farm (Seeded August 1958).

Variety	Forage Yield - Tons/Acre* 1970	11-Year Average
Wisconsin 55	1.05	1.44
Southland	0.99	1.66
Lancaster	0.86	1.64
South Dakota 5	0.76	1.46
Lincoln	0.66	1.63
Canadian Common	0.65	1.20
Homesteader	0.62	1.43

*Reported as hay with 12% moisture.

Table 21. Wildrye Variety Forage Yield Trial - South Central Research Farm (Seeded August 1958).

Variety	Forage Yield - Tons/Acre* 10 Year Average, 1960-1969
Vinall Russian Wildrye	1.07
Common Russian Wildrye	0.96

*Reported as hay with 12% moisture.

Intermediate and Tall Wheatgrasses have consistently produced the highest forage yields of the wheatgrasses. Oahe, an intermediate wheatgrass, has the highest average of the groups seeded in 1958 and 1960 (Table 22). The recommended intermediate wheatgrass varieties are Oahe, Amur, and Greenar. Tall wheatgrass yields nearly as well as intermediate but it is not as palatable. Nordan crested wheatgrass although not the highest forage producer of the crested wheatgrass varieties is the most desirable from other agronomic standpoints.

Table 22. Wheatgrass Forage Yield Trial - South Central Research Farm.

Variety	Forage Yield - Tons/Acre** Seeded August 1958 10-Year Average	Seeded August 1960 8-Year Average
Crested Wheatgrass		
Common	0.96	--
Common Fairway	0.72	1.00
Mandan 2359	0.86	1.08
Nebraska 10	0.89	--
Nebraska 20	--	0.99
Nebraska 3576 Fairway	0.83	1.07
Nordan	0.90	1.11
Summit	0.88	--
Tall Wheatgrass		
Alkar	--	1.27
A12465	--	1.23
Mandan 1422	1.13	1.26
Nebraska Tall	0.98	--
S-64	0.80	1.16
Intermediate Wheatgrass		
Amur	1.20	1.20
Greenar	1.21	1.27
Idaho #3	1.02	1.24
Idaho #4	1.26	--
Mandan	--	1.16
Nebraska 50	1.20	1.13
Oahe	1.29	1.33
Ree	1.17	1.29
Miscellaneous Wheatgrass		
P-27 (A. sibericum)	0.94	1.02
Topar Pubescent (A. trichophorum)	0.90	1.00
Whitmar (A. inerme)	0.75	--

* This variety trial was fertilized with 40# of Nitrogen/Acre each year.
**Absence of a yield indicates variety was not included in trial seeded that year.

Grass Forage Production with Various Fertilizers and Row Spacings

H. A. Geise

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

Table 23. Influence of Row Space and Fertilizer on Forage Yield of Smooth Bromegrass and Intermediate Wheatgrass.

Species	Row Space	Fertilizer* Applied	Forage Yield-Tons/A 1970	Av 1960-70
Smooth Bromegrass	6"	0-0-0	0.48	0.71
		20-0-0	0.57	1.01
		40-0-0	0.51	1.12
		40-9-0	0.74	1.23
		40-9-0+Zn	1.02	--
	42"	0-0-0	0.57	1.02
		20-0-0	0.66	1.17
		40-0-0	0.49	1.20
		40-9-0	0.48	1.24
		40-9-0+Zn	0.48	--
Intermediate Wheatgrass	6"	0-0-0	0.20	1.01
		20-0-0	0.41	1.45
		40-0-0	0.36	1.25
		40-9-0	0.42	1.28
		40-9-0+Zn	0.47	--
	42"	0-0-0	0.22	1.15
		20-0-0	0.30	1.28
		40-0-0	0.29	1.35
		40-9-0	0.37	1.37
		40-9-0+Zn	0.37	--

*Nitrogen and phosphorus fertilizers were applied as pounds of element at the rate indicated. Zinc was applied at 10 pounds per acre as zinc sulphate.

MANAGEMENT, TILLAGE AND CULTURAL PRACTICES

H. A. Geise

Comparison of Different Techniques in Growing Winter Wheat

Objective: To compare yields of winter wheat grown, (1) continuously with and without commercial nitrogen, (2) in rotation with conventional fallow or sweet clover fallow, and (3) in rotation with corn or sorghum harvested as an ensilage crop.

Several factors should be considered when reviewing the results of the management study on winter wheat. First, there is the soil moisture content to consider. The fallowed soil usually contains a good supply of stored moisture, whereas the continuous cropped plots usually are relatively lower. This condition affects the wheat in two ways, (a) the seed bed is unsatisfactory

because the hard and cloddy soil does not pack and make contact with the seed so that soil water moves into the seed causing germination, and (b) the low moisture availability limits the growth of the plants so that ground cover is sparse, the plants are weak, and winter survival is low. These conditions ultimately result in a weed problem the following year because of a lack of competiton.

Secondly, commercial nitrogen fertilizer has been applied only to continuous wheat plots where moisture has limited the yield and therefore has not been able to show beneficial results. However, in other studies, (Table 27, Plant Science Pamphlet #2, 1969) small amounts of nitrogen fertilizer applied to fallowed soil have increased yields.

The use of sweet clover in the rotation as a source of nitrogen has increased the yield of wheat over that of continuous cropping but it has not increased up to the level of fallow wheat. A closer look at the data seems to indicate that moisture is more a factor in the yield increase than is the added nitrogen.

In the case of phosphorus fertilizer, all applications (Table 24) regardless of rate, have increased the grain yield of the wheat. However, only small applications, such as 15 pounds per acre (Table 39, Plant Science Pamphlet #2) have resulted in yield increases where dollar returns are greater than the cost of fertilizer.

Table 24. Yields of Winter Wheat from Plots Having Eight Different Management Practices - South Central Research Farm.

Management Practice	Fertilizer*	Date of Heading	Height Inches	Test Wt Lbs/Bu	Grain Yield Bu/A - 1969
Continuous Wheat	0- 0-0	6- 7	13	53	7.6
	0-15-0	5-31	17	55	9.9
Continuous Wheat	40- 0-0	6- 9	12	53	6.3
	40-15-0	5-31	18	54	9.2
Continuous Wheat	80- 0-0	6- 7	13	55	4.6
	80-15-0	5-30	20	55	12.4
Continuous Wheat	120- 0-0	6-10	13	53	4.9
	120-15-0	5-31	18	53	10.8
Wheat - Fallow	0- 0-0	6- 3	22	58	28.2
	0-15-0	5-30	25	57	32.1
Wheat - Sw Cl Fallow	0- 0-0	6- 3	22	57	26.8
	0-15-0	5-31	24	57	30.8
Wheat - Corn (Silage)	0- 0-0	6-11	20	51	10.3
	0-15-0	6- 4	24	54	14.7
Wheat - Sorghum (Silage)	0- 0-0	6-11	22	54	7.1
	0-15-0	6- 4	23	56	9.7

*Phosphorus fertilizer was applied with the seed at the rate of 15 pounds of element per acre, while nitrogen was broadcast on the surface at the rate indicated.

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

Objectives: To determine the effect of nitrogen and phosphorus fertilizers, planting dates, and varieties of grain sorghum on grain yield, and effects of these practices on the yield of spring wheat the next year.

Grain yields in the sorghum-spring wheat rotations have varied among years because of weather conditions. Although the yields have been above the county averages, they are below the yields in other studies at the research farm. Continuous cropping since 1957 may have depleated the subsoil moisture to cause the lower yields.

The spring wheat in this study has not yielded more even though nitrogen was applied. However, there has been a visual difference in the appearance of the fertilized and unfertilized plots. The nitrogen fertilized plots have had thicker stands, taller plants, and larger leaves per plant. While the test weights of the grain have been lower, the protein content has always been higher. These are characteristics of grain produced under moisture stress.

The grain sorghum study has been revised over the years as data has been collected and interpreted so the objectives could be changed. The best method for seeding sorghum was with a conventional corn planter or a grain drill. These implements placed the seed at a depth satisfactory for rapid seedling emergence. They also do not leave furrows which collect water from heavy rains. Standing water in the furrows usually causes a puddled soil surface and a hard crust when the soil dries.

Soil temperature was also studied in relation to date of planting for grain sorghum. The optimum temperature for rapid germination and emergence is usually reached in mid-June. This planting date also had other advantages in that it permits the early growing weeds to be destroyed before the sorghum is planted.

The next variable which was studied was row width. The most satisfactory width of those studied was found to be 24 inches. This width produced the highest grain yields with the least weed problems.

The last variable which has been studied is the length of growing season required for varieties. The results of the 1970 study indicate that the short-season variety produced a higher yield when planted later, the medium-maturing variety produced best when planted in mid-June, and the long-season variety produced the highest yields when planted early.

In the 1970 study, seed yields of grain sorghum were reduced because of the below normal rainfall. This was shown (Table 26) by the size of the sorghum heads and the seed set.

Table 25. Effects of Planting Date and Fertilizer Application on Yield of Grain Sorghum Varieties of Varying Maturity.

Date of Planting	Brand & Cutlivar	Fertilizer*	Lodging (1-5)	Height Inches	Test Wt. Lbs/Bu	Grain Yield Lbs/Acre
June 1	NK-MM50A	0	2.9	30	57.4	1194
		N	3.1	28	57.5	734
		P	2.9	32	57.4	928
		NP	3.1	30	57.4	772
	NK-120	0	3.0	31	55.0	1145
		N	3.0	31	55.0	939
		P	2.6	33	54.9	967
		NP	2.9	32	55.0	1089
	NK-127	0	1.5	30	57.2	1467
		N	1.0	30	56.4	1739
		P	1.2	31	56.8	1516
		NP	1.0	32	56.0	1756
June 15	NK-MM50A	0	2.0	32	56.2	1334
		N	2.4	30	53.9	1045
		P	2.4	33	54.6	1144
		NP	2.6	28	53.1	922
	NK-120	0	1.9	39	54.6	1439
		N	2.2	40	54.5	1128
		P	2.1	38	52.4	1200
		NP	2.1	39	53.2	1122
	NK-127	0	1.9	33	54.9	1387
		N	1.5	30	55.4	1317
		P	1.5	33	54.6	1416
		NP	1.1	32	55.2	1403
June 30	NK-MM50A	0	1.4	38	54.4	1300
		N	1.4	38	55.0	1350
		P	1.6	38	54.0	1361
		NP	1.6	39	54.6	1172
	NK-120	0	3.0	38	52.4	800
		N	2.8	37	52.9	783
		P	3.4	37	52.4	650
		NP	2.5	41	52.4	520
	NK-127	0	1.0	34	51.2	1078
		N	1.0	34	52.9	1189
		P	1.0	34	51.9	1122
		NP	1.1	33	52.0	1216

* "0" indicates fertilizer was not applied, "P" indicates 15# of Phosphorus per acre was applied, "N" indicates 40# of Nitrogen per acre was applied, "NP" indicates that both fertilizers were applied at the rate stated.

Table 26. Effects of Planting Date on Sorghum Plant Characteristics - South Central Research Farm, 1970.

Date of Planting	Brand & Cultivar	Date of Heading	Head Size	Seed Set	Number of Tillers
June 1	NK-MM50A	7-17	Small	Fair	3
	NK-120	7-25	Very small	Varied	3
	NK-127	7-26	Large	Excellent	0
June 15	NK-MM50A	7-26	Small	Good	3
	NK-120	7-28	Large	Excellent	0
	NK-127	8- 2	Small	Poor	3
June 30	NK-MM50A	8-17	Large	Good	0
	NK-120	8-20	Large	Good	0
	NK-127	8-24	Large	Good	3

Influence of Fertilizers on Yield of Grain

Objective: To study plant responses influenced by residual fertilizer remaining in soil after winter wheat was destroyed by hail.

An experiment was initiated to study fertilization of winter wheat grown on a Promise clay soil. The fertilizers used contained the plant nutrient elements: Nitrogen, Phosphorus, Potassium, Sulphur, and Copper. The fertilizers were placed with the seed by using a drill attachment. The study which was placed on fallow land consisted of various rates and ratios of plant food. It was destroyed by hail in mid-June.

The hailed out plots were planted to a short-season grain sorghum NK-MM50A, so the fertilizers already applied would be utilized.

Ten pounds per acre of sorghum was planted on July 2, with a deep furrow drill equipped with 12-inch-spaced openers. It was harvested on October 6 with a self-propelled combine.

Germination, and thus the stand, was incomplete in parts of the rows because of the limited rainfall after planting. Only one replication had sufficient stand and grain for harvesting so the significance of the data (Table 27) is questionable.

Table 27. Effects of Residual Fertilizer on Grain Yield of Short Season Sorghum, Northrup-King Mini-Milo 50A.

Fertilizer Treatment* Pounds of Element/A	Height Inches	Percent** Protein	Test Wt Lbs/Bu	Grain Yield Lbs/Acre
0- 0- 0	35	12.75	55.0	3107
15- 0- 0	36	14.31	55.0	1500
30- 0- 0	36	14.00	54.5	1549
60- 0- 0	36	13.44	55.5	1863
0-15- 0	38	14.06	55.0	1888
15-15- 0	35	13.19	55.0	1912
30-15- 0	34	13.44	55.0	1658
60-15- 0	34	13.81	55.0	1440
0-30- 0	38	13.06	55.0	2238
15-30- 0	35	14.62	52.0	1851
30-30- 0	34	14.50	55.5	2021
60-30- 0	36	12.69	55.0	1646
0- 0-30	32	13.44	55.0	1803
0- 0-60	33	13.88	54.5	1609
30- 0-30	40	14.00	54.5	2214
30- 0-60	36	14.00	52.5	1924
30-15-30	36	13.94	55.5	1779
30-15-60	40	13.44	54.5	1924
$CuSO_4$	39	13.00	54.0	1754
$CuSO_4$ + 30- 0-0	38	14.25	55.5	2061
$CuSO_4$ + 30-15-0	40	13.88	48.5	1827

* Rate indicated is actual pounds of element applied per acre. $CuSO_4$ was applied at the rate of 15 lbs. of Copper and 7 lbs. of Sulpher per acre.
**Protein content calculated from Kjeldahl analysis and is reported on an oven-dry basis.

Management of Stubble, Fallow, and Seed Bed Preparation for Mosaic Control in Winter Wheat

W. S. Gardner

The wheat streak mosaic virus, which infects winter wheat, can be controlled through the management of wheat stubble by proper fallow practices and seed-bed preparation. The virus is spread by the wheat curl mite which reproduces on annual and perennial grasses as well as in wheat. Thus volunteer wheat and annual or perennial grasses may harbor the mite and the mosaic virus so that they can spread into wheat fields.

Tentative recommendations are that wheat stubble should be tilled before August 15 to kill volunteer wheat and grassy weeds so the mite and virus will be destroyed. The wheat stubble should be left exposed on the soil surface so the soil will be protected from erosion. Summer fallowing should destroy all volunteer wheat and grassy weeds but leave the soil surface protected by a stubble mulch. All volunteer wheat and grassy weeds should be destroyed 7 to 10 days before the wheat is planted. Otherwise these plants can act as a reservoir for mites and virus to infect the wheat planted after mid-September.