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December 1969

SOUTH CENTRAL RESEARCH FARM
Presho, South Dakota

INTRODUCTION

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

Rainfall in 1969 was below normal for the entire year. However, soil moisture was sufficient to produce good yields of winter wheat and rye. A late spring frost injured and reduced yields in plots with headed wheat and rye.

Spring seeded small grain produced fair yields of grain even though they were dependent on the soil moisture which had accumulated the previous season. Above normal temperatures during April and May prevented the plants from tillering, thus enabling the main head to fill while utilizing the short moisture supply.

Grain sorghum seeded on soil which had a thick snow cover the previous winter produced a good yield. However, where rows were narrow and soil moisture was low the plants were not able to produce heads.

More than seventy people attended a field tour held on July 8, 1969. The Soil Fertility and Management plots, Wheat Streak Mosaic Control plots, Variety Trials, Grain Sorghum Production, Insect Problems, and the Area Weather and Climate were discussed.

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 Ferner	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 for one year only. They are therefore neither complete nor conclusive.

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Table 1. Weather Data - South Central Research Farm, 1969.

Month	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Rainfall in inches*	.38	.65	.06	.45	2.29	1.68	3.38	.82	.73	1.73	.03	.14	12.55
Longtime Average**	.47	.57	1.02	1.79	2.38	3.11	1.66	2.08	1.45	.98	.67	.39	16.57
Departure from Longtime Average	-.09	.08	-.71	-1.34	-.09	-1.43	1.68	-1.26	-.72	.75	-.64	-.25	-4.02
Average Temperature*	----	----	23.6	52.0	60.5	65.2	74.2	79.2	66.6	45.2	----	----	
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	----	----	-8.2	4.4	1.6	-3.5	-2.6	4.2	2.1	-6.2	----	----	
Av. Monthly Maximum - 1969*	----	----	----	65.5	73.9	77.5	89.0	94.0	82.9	57.9	----	----	
Av. Monthly Minimum - 1969*	----	----	----	38.4	47.2	52.8	66.3	64.5	54.8	34.6	----	----	
Average inches of water evaporated from free surface	----	----	----	5.43	5.15	8.33	6.95	11.99	9.26	3.01	----	----	

Note: The maximum recorded air temperature for the year was 106° and occurred on August 12 and 16.
Last killing frost - May 9; First frost - October 12; First killing frost - October 13; Growing season - 157 days.

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

Light frost was reported by the U.S. Weather Bureau at Kennebec and Vivian on May 17, June 2, and June 14. Frost was present in low areas on the Research Farm although the minimum temperature recorded at the instrument site was 34° Fahrenheit.

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 experimental strains for winterhardiness, grain yield, disease resistance, and other characteristics of area adaptability.

Rye

Seven varieties of rye were grown in the 1969 season. Data on grain yield and some plant characteristics are shown in Table 2. Von Lochow was introduced from West Germany. It is a stiff strawed variety with a yield slightly greater than Frontier. Von Lochow is as hardy but heads several days later than Frontier, Caribou, or Pierre.

Frontier is a new variety developed at Swift Current, Saskatchewan. It has excellant winterhardiness and medium maturity. Frontier is medium-tall and has fair lodging resistance. The seeds of this variety are small and predominantly blue-gray in color. It has high bushel weight.

Pearl was also developed at the Swift Current station and is thought to have originated from seed imported from Denmark. It is high yielding, and has fair winterhardiness. The seed is medium sized, brown and green in color and has medium test weight.

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

Variety	Date of Heading	Height Inches	Percent Survival	Test Wt Lbs/ Bu	Grain Yield-Bu/Acre 1969	Av. 1968-69
Von Lochow	May 25	36	94	55.6	48.5	50.9
Pearl	27	37	94	54.6	43.9	
Frontier	25	37	89	56.0	36.5	45.1
Elk	26	40	93	54.8	35.6	30.2
Antelope	23	37	95	54.8	35.0	41.9
Caribou	23	39	95	54.8	32.4	33.9
Pierre	22	44	93	55.6	23.9	31.8
LSD(05) - 2.1 Bu/Acre				Average	36.5	

The plots were seeded on September 24, 1968, using a deep furrow drill. The seeding rate was 5 pecks or 70 pounds per acre. Commercial fertilizer was applied with the seed at the rate of 15 pounds of phosphorous per acre. The soil had also received an application of 40 pounds of Nitrogen and 9 pounds of Phosphorous per acre in 1967. Harvesting was completed on July 19 using a self-propelled combine. The values presented in Table 2 are an average of 4 replications.

Winter Wheat

Winter wheat varieties were evaluated in two separate trials in 1969. The larger test, containing the recommended varieties (Table 5, Page 6), was seeded in large drill-sized plots and harvested with a self-propelled combine. They were seeded on September 21, 1968 and harvested directly from the field on July 24, 1969.

The second trial (Table 4) contained a number of new selections in varying stages of development. It was seeded on September 20, 1968 and harvested on July 16, 1969.

Table 4. Regional Winter Wheat Performance Trial, 1969.

Entry	Date		Height	Percent*	Test Wt	Grain Yield
	Headed	Mature	Inches	Stand	Lbs/ Bu	Bu/Acre
SD66166	June 6	July 8	28	46	58	37.3
SD6689	4	8	28	71	58	35.2
SD6687	4	8	26	89	60	34.8
Warrior	1	5	26	93	59	34.7
NB66404	May 30	7	26	99	59	34.0
Trapper	June 4	6	25	96	59	33.5
NB66403	May 30	7	26	100	59	33.2
SD66174	June 4	7	27	78	59	33.0
MT6326	5	8	27	96	59	32.6
SD66117	4	8	26	70	58	32.6
NB66408	May 31	7	25	98	60	31.9
SD66171	June 6	8	30	63	61	31.8
Trader	3	6	26	99	59	31.7
NB64365	2	8	27	83	60	31.5
NB64308	4	8	27	85	59	31.2
NB64334	3	8	27	91	60	31.0
Winoka	6	8	28	89	60	31.0
Kharkof	6	8	26	95	58	31.0
Winalta	6	8	27	83	60	31.3
DeKalb Hyb 028	May 30	7	30	99	58	30.9
DeKalb Hyb 031	June 1	7	28	99	60	30.8
NB66490	May 29	6	25	91	59	30.6
MT6319	June 5	8	29	97	57	30.2
DeKalb Hyb 029	May 30	6	29	95	59	30.1
SD66176	June 2	8	28	84	59	29.8
DeKalb Hyb 027	May 30	7	30	99	58	29.8
SD66173	June 1	8	27	96	60	29.7
SD66168	5	8	28	33	58	29.5
MT6320	6	8	29	98	59	28.5
Froid	7	9	29	96	57	27.7
SD66169	5	8	28	91	60	27.3
SD66167	5	8	30	36	57	26.6
DeKalb Hyb 026	May 31	5	28	98	59	25.8
DeKalb Hyb 030	June 1	7	29	98	58	25.0

*Percent stand estimates were made on April 16, 1969.

Table 5. Winter Wheat Variety Trial - South Central Research Farm, 1969.

Variety	Date of Heading	Height Inches	Rust Reaction* Leaf	Rust Reaction* Stem	Percent Survival	Percent** Protein	Test Weight Lbs/Bu	Grain Yield-Bu/Acre 1969	Grain Yield-Bu/Acre Av.1967-69
Scout	May 29	28	S	R	95	15.8	61.1	42.5	44.9
Winalta	June 1	27	S	R	95	15.9	61.9	41.1	44.8
Trapper	4	29	S	R	82	16.2	61.5	41.1	46.6
Gage	May 30	28	MR	R	94	16.6	60.0	39.9	48.8
Trader	June 5	30	S	R	88	16.2	60.8	38.2	45.0
Winoka	June 5	31	S	R	91	16.6	61.8	38.9	40.2
Lancer	3	28	S	R	89	16.4	61.2	36.7	43.5
Scout 66	May 30	26	S	R	85	17.0	60.1	35.0	41.9
Guide	29	25	S	R	94	16.4	59.9	34.1	38.7
Minter	June 6	34	S	R	95	17.3	60.8	33.7	38.7
Omaha	May 29	26	S	S	92	17.7	59.0	32.8	38.4
Hume	June 3	28	S	R	91	17.6	59.9	32.4	38.3
Nebred	3	28	S	S	85	16.7	58.7	27.4	37.8
Turkey	4	31	S	S	95	19.0	57.0	23.4	----
SD 6689	June 3	30	R	S	95	16.8	61.0	44.9	
SD 66108	3	29	R	S	95	17.4	61.6	44.5	
NB 64365	4	31	S	S	95	16.9	61.4	42.9	
SD 66117	4	28	R	Mix	94	16.8	61.0	42.8	
SD 66174	4	28	Mix	R	94	17.6	60.8	41.1	
SD 66171	June 4	32	R	S	94	17.9	61.6	39.2	
SD 66169	4	30	S	MR	95	17.1	61.9	36.2	
SD 66176	3	28	R	S	95	19.0	61.6	35.2	
SD 66140	3	29	S	R	95	18.6	59.1	33.7	
SD 66167	3	30	S	Mix	91	17.6	57.8	31.2	
LSD(05) - 4.0 Bu/A for 1969							Average	38.0	41.0

*Letter indicates reaction to rust: S-Susceptible R-Resistant MR-Moderately Resistant
**Protein content was calculated from Kjeldahl nitrogen analysis and is reported on an oven-dry basis.

Note: Plots were seeded on Sept. 21, 1968 and were harvested on July 24, 1969. Phosphorous was applied with the seed at planting at the rate of 15 pounds per acre.

Winter Barley

The winter barley varieties tested vary in 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 winter 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.

Kearney is a 6-rowed, hulled, rough-awned variety which was released by the Nebraska Agricultural Experiment Station in 1961. It has some resistance to Greenbugs. This variety is objected to by the Malting Industry because of small kernels, low extract, and high nitrogen. Dicktoo is similar to Kearney in appearance and is comparable in winter hardiness. It was released by Nebraska in 1952. Chase is similar to Kearney, but is superior in straw strength. It has a deciduous-type awn and was released by Nebraska in 1961. Mo. B1222 is similar to Kearney in straw strength and hardiness, but has a lower yield. Mo. B969 is similar to Mo. B1222

The winter barley plots were seeded on September 24, 1968, and received 15 pounds of phosphorous with the seed at planting time. They were harvested on July 19, 1969.

Table 6. Winter Barley Variety Trial - South Central Research Farm.

Variety	Date of Heading	Percent Survival	Height Inches	Test Wt Lbs/ Bu	Grain Yield-Bu/Acre 1969	Grain Yield-Bu/Acre Av.1963-69*
Dicktoo	5-31	80	21	48.3	33.2	39.6
Kearney	5-30	80	20	47.4	27.7	38.5
Chase	5-31	94	22	48.5	35.2	37.6
Mo. B1222	5-30	83	21	47.0	26.9	35.4
Mo. B969	5-30	88	20	48.5	29.7	32.1
LSD(05) - 2.4 Bu/Acre for 1969				Average	30.5	

*1965 test was lost because of winterkill.

Oats

Several new varieties were grown in the yield trials at South Central Research Farm in 1969. They were Sioux, Kelsey, Kota, E-68, and M-68. Sioux and Kelsey were developed by the Canada Department of Agriculture. Sioux is a medium-early, medium-tall variety which has large, plump, creamy-white seed. It has good resistance to lodging. It is resistant to stem rust, crown rust, and smut. Kelsey is similar to Rodney in general appearance. It has tolerance to crown rust and Barley Yellow Dwarf Virus (Red Leaf).

Kota is a new release from South Dakota which is of medium-maturity, of medium-height, and has moderate resistance to crown and stem rust. It has a medium-plump yellow-colored seed. E-68 and M-68 were released by the Iowa Agricultural Experiment Station. They are comprised of a number of closely related lines which give them moderate resistance to crown and stem rust. The seed is yellow and medium in size. E-68 is an early-maturing variety, whereas M-68 is of medium maturity. Neither variety has tolerance to Barley Yellow Dwarf Virus.

All varieties listed in Tables 7 and 8 were seeded on fallow. The soil was fertilized with 80 pounds of nitrogen per acre in 1967 and 15 pounds of phosphorous per acre applied with the seed when planted. The plots were seeded on April 11, and harvested with a self-propelled combine on July 26, 1969.

Table 7. Oat Variety Trial - South Central Research Farm

Variety	Date of Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield-Bushels/Acre 1969	Av.1967-69
Burnett	6-11	29	36.2	67.8	87.1
Rodney	6-23	31	34.8	66.6	75.5
Lodi	6-20	35	33.2	65.3	82.4
E68	6- 6	29	38.2	65.0	----
Garry	6-22	34	37.7	64.7	76.5
Clintford	6-10	26	38.5	62.9	72.8
Portal	6-16	32	37.0	61.1	83.6
Ortley	6-22	33	35.8	59.5	75.0
Dupree	6- 5	26	38.0	59.2	----
M68	6-11	29	36.8	58.4	----
Wyndmere	6- 7	35	37.0	55.5	87.7
O'Brien	6- 7	30	39.2	55.3	77.8
Garland	6-13	28	37.5	55.3	71.0
Brave	6-10	30	36.8	55.0	87.2
Jaycee	6- 4	25	37.5	55.0	74.2
Tyler	6- 7	25	36.5	53.2	86.1
Kota	6-17	28	38.2	54.4	----
Kelsey	6-12	30	37.0	52.9	----
Clintland 64	6-12	30	37.5	51.4	65.7
Tippecanoe	6- 5	25	37.2	48.6	83.9
Holden	6-11	28	37.0	48.3	76.3
Pettis	6- 5	30	38.5	47.7	----
Sioux	6- 7	29	38.5	46.2	----
LSD(05) - 8.9 Bu/Acre for 1969			Average	56.9	

Table 8. Oat Variety Trial (Forage Type) - South Central Research Farm, 1969.

Variety	Date of Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield Bu/Acre	Forage Yield* % Protein	%D.M.	Ton/A
Rodney	6-23	31	34.8	66.6	10.6	46.8	2.6
Lodi	6-20	35	33.2	65.3	10.6	48.4	2.6
Garry	6-22	34	37.7	64.7	10.0	51.2	2.6
Kelsey	6-12	30	37.0	52.9	10.6	53.8	2.4
Sioux	6- 7	29	38.5	46.2	9.4	56.4	2.3
Ortley	6-22	33	35.8	59.5	10.9	56.5	2.3
			Average	59.2			2.5

*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.

Spring Wheat

The yield of spring wheat in small plots ranged from 30.8 to 23.4 bushels per acre. The highest yield of hard red spring wheat was obtained from Waldron, a variety recently released by North Dakota Agricultural Experiment Station. Waldron is early maturing and has good lodging resistance. It is beardless, with good resistance to both stem and leaf rust. It is a satisfactory milling wheat, However, it is very susceptible to ergot. Grain yields and other agronomic data pertaining to hard red spring wheat are shown in Table 9. The yields and other data for durum wheat are shown in Table 10.

All varieties reported in Tables 9 and 10 were seeded on fallow. The soil was fertilized with 80 pounds of nitrogen per acre in 1967 and 15 pounds of phosphorous per acre applied with the seed when planted. The plots were seeded on April 11, and harvested with a self-propelled combine on July 26, 1969.

Table 9. Hard Red Spring Wheat Variety Trial - South Central Research Farm

Variety	Date of Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield-Bu/Acre 1969	Av 1967-69
Waldron	6-17	27	56.5	30.8	----
Fortuna	6-19	28	57.0	30.6	33.8
Manitou	6-20	28	57.2	29.5	32.8
Sheridan	6-22	31	56.8	28.4	30.0
Crim	6-18	28	56.0	27.0	30.9
Chris	6-19	28	57.2	26.9	29.1
Red River 68	6-12	24	56.8	26.8	----
Rushmore	6-22	28	56.0	26.4	27.8
Selkirk	6-23	28	53.5	25.8	22.3
BH 631	6-12	27	57.0	25.4	29.3
BH 632	6-19	28	57.0	25.4	26.6
Polk	6-17	25	57.2	24.6	29.4
Justin	6-22	28	53.8	23.4	24.4
LSD(05) - 3.4 Bu/Acre for 1969			Average	27.0	

Table 10. Durum Wheat Variety Trial - South Central Research Farm

Variety	Date of Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield-Bu/Acre 1969	Av 1967-69
Wells	6-19	26	57.2	28.5	27.1
Stewart 63	6-25	34	57.2	28.0	24.6
Leeds	6-17	26	58.8	27.6	30.3
N.S.			Average	28.0	

Spring Barley

Weather conditions during the spring growing season were not as favorable for production of barley as they were in the 1968 season. The below normal rainfall and above normal temperature were not favorable for tillering in spring seeded grain. Soil moisture was sufficient to produce a fair yield of grain with satisfactory test weight. The incidence of foliar diseases was low.

Paragon was released from Manitoba, Canada, in 1968. It is a tall, loose-smut resistant, blue aleurone variety. Paragon is similar to Conquest in plant stature and disease reaction but heads several days later. It is considered a feed barley in South Dakota.

Conquest was developed and released in Canada. It is a blue aleurone barley with Parkland as one of its parents. It is accepted for malting purposes in Canada. Conquest is smooth awned, tall growing, has good straw strength, and is of medium maturity. It is susceptible to the foliar diseases of barley, moderately resistant to stem rust and resistant to loose smut.

Primus II was released jointly by South Dakota Agricultural Experiment Station and Crops Research Division, Agricultural Research Service, United States Department of Agriculture. It is an early maturing, six-row, spring-type barley with long, spreading smooth awns. The kernels are medium sized, plump, free threshing, and have tightly adhering hulls and a colorless aleurone. Primus is resistant to prevalent races of stem rust but susceptible to loose smut and to leaf and head blights.

The plots were seeded in fallow and received 80 pounds of nitrogen in 1967. Phosphorous fertilizer was applied at the rate of 15 pounds of elemental phosphorous per acre with the seed at planting time. The yields and other agronomic data are reported in table 11.

Table 11. Spring Barley Variety Trial - South Central Research Farm

Variety	Date of Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield-Bushel/Acre 1969	Grain Yield-Bushel/Acre Av 1967-69
Liberty	6-17	26	47.5	55.7	62.2
Dickson	6-17	24	48.2	54.1	69.1
Paragon	6-21	26	45.5	54.1	----
Trophy	6-15	26	46.0	51.6	56.4
Conquest	6-18	28	46.0	48.0	52.4
Spartan	6-23	22	49.0	46.2	----
Larker	6-17	25	48.5	42.7	60.1
Primus II	6- 7	23	48.0	38.7	60.4
LSD(05) - 5.0 Bu/Acre for 1969			Average	48.9	

SPECIALTY CROP TESTING

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

Sunflower Yield Trial

H. A. Geise

Sunflowers are grown as a crop for several purposes. The large-seed types are grown for whole-seed-uses in the confectionery trade. They are also preferred by some bird feeders because the large seed is less likely to attract sparrows and is less likely to be lost on the ground.

The small seeded varieties have a much thinner hull resulting in a proportionally larger meat. These thin hulled types are used primarily for their oil. Certain varieties contain over 50% high quality oil in the seed.

Sunflowers have several major problems, the most important being insects. A seed crop can be destroyed by the Sunflower Moth. The moth's larvae tunnel through the seeds leaving a mass of insect frass and strands of weblike material which cover the face of the heads. The insect injury weakens the plants so they are frequently attacked by stalk and head rots. Late maturing fields may become infected with mildew.

Two insecticides have recently been approved for control of the Head Moth on Sunflowers. Thiodan, and Methyl Parathion will both provide satisfactory control. However, the cost will vary considerably. The time to spray for these insects is when the sunflowers are beginning to bloom. At this time the plants are rather tall and brittle, which necessitates aerial application.

At present there is only one chemical herbicide cleared for use in South Dakota. This is the preplant chemical "Treflan". Treflan is decomposed by light and therefore must be thoroughly incorporated into the soil immediately after application.

Sunflower seed yields were markedly reduced in 1969. The major factors were planting date and stand establishment. Rodents and pheasants destroyed the first planting as the seedlings emerged from the soil. The second planting was made in Mid-June. Planting at this date resulted in plants which were not as vigorous as normal and which flowered in August during a period of extreme heat and moisture stress. The average yield in 1969 was only 332 pounds per acre compared to 1968 when the average was 877 pounds per acre.

Yield and other agronomic data are reported in Table 12.

Table 12. Sunflower Variety Trial - South Central Research Farm, 1969.

Cultivar	Date of Flowering	Percent Leaf Rust	Height Inches	Test Wt Lbs/ Bu	Seed Yield Lbs/Acre
OILSEED TYPE					
P21-4-4-12# x HA60	8-16	17	50	28.5	444
P21-4-1#-4-18# x HA60	8-17	8	50	28.2	419
P21-4-4-6# x HA61-1	8-14	13	52	29.0	383
P21ms x HA61	8-15	12	48	27.0	326
P21-4-4-6# x HA60	8-15	6	48	29.0	324
Valley	8-15	28	50	28.2	324
Majak	8-15	25	50	27.2	320
P21ms x HA60	8-14	14	50	26.5	320
VNIIMK 89.31 (66)	8-14	28	50	29.0	318
Peredovik (66)	8-14	40	48	26.2	310
NK HO 1	8-12	24	49	25.2	313
VNIIMK 89.31	8-12	29	47	26.8	291
Krasnodarets	8-13	38	49	23.8	278
P21-4-1#-4-18# x HA61-1	8-15	20	51	28.8	266
Peredovik	8-11	38	50	27.2	260
CONFECTIONERY or BIRDFEED TYPE					
Arrowhead	8-12	20	46	26.0	402
Mingren	8-15	9	45	29.8	352
D-672	8-15	21	50	28.2	334
				Average	332

Crambe Testing

H. A. Geise

Crambe abyssinica is a new oil crop which is being tested for adaptability to the area. The oil contains Erucic acid which is used in the manufacture of plastics, such as brush bristles and bearings.

Crambe can be planted after danger of killing frost is past. It should be seeded with a grain drill at 15 to 30 pounds per acre. The plants will mature in 75 to 85 days and may be harvested by direct combining. Crambe may lodge but this can be prevented by swathing while still slightly immature.

The market for Crambe seed and oil has been established but because of the cost of shipping and location of processors only carload lots should be considered. Marketing could best be accomplished by forming a growers association. Yield data of selections from a plant introduction are shown in Table 13. The plots were seeded on May 23 and harvested on August 14. They were on fallow land and received 15 pounds of phosphorous with the seed at planting time.

Table 13. Crambe Selection Yield Trial - South Central Research Farm, 1969.

Entry Number	Height Inches	Test Weight Lbs/ Bu	Seed Yield Lbs/Acre
6707	33	22.7	2995
6713	34	22.7	2765
6702	32	23.7	2575
6723	36	22.2	2565
6704	34	22.7	2560
6710	33	21.5	2520
6708	36	22.6	2430
6724	36	22.7	2415
6715	36	22.3	2415
6720	33	22.8	2305
6722	35	22.2	2305
6709	33	23.3	2270
6701	36	22.8	2230
6728	34	22.3	2230
6705	34	23.5	2215
6727	34	22.0	2195
6706	35	23.5	2170
6729	36	23.3	2140
6712	33	23.3	2140
6703	34	22.5	2140
6721	36	21.7	2140
6725	34	23.5	2015
6726	34	24.0	2010
6730	36	24.0	1830
6711	32	22.7	1670
6737	33	22.7	1580
		Average	2265

SORGHUM PERFORMANCE TESTING

Sorghum Breeding

A. O. Lunden

Experimental sorghum plantings at Presho included the Regional Uniform Yield Test, an experimental hybrid test block and a crossing block for hybrid seed production.

Grain sorghum yields ranged to about 3500 pounds or 60 bushels per acre in 1969 which is about 1500 pounds or 30 bushels under the seasonal average. Growing conditions were ideal in spring and early summer with good stands and excellant weed control but yield loss resulted from severe drought stress in late summer. Yields of standard open pedigree hybrids and some of the new experimental hybrids are presented in Table 14.

The best yields were obtained from full season hybrids but even the very late hybrids matured before the unusually late killing frost on October 13. Two new experimental hybrids, SD 25265 and SD 25228, did not perform as well as in 1968 but are still superior on the basis of four-year averages. Other desirable features are early heading, reduced plant height, lodging resistance relative to other early hybrids and resistance to loss from birds.

Table 14. Experimental and Open-pedigree Grain Sorghum Hybrid Yield Trial-South Central Research Farm.

Variety	Days to Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield-Lbs/Acre 1966	1967	1968	1969	Av 1966-9
SD 441	64	50	55	3200	3560	3870	2830	3365
SD 451	68	43	57	3420	3060	4970	2800	3560
SD 503	71	51	58	3760	3140	5370	3420	3920
NB 505	68	42	58	4090	2160	3980	2460	3200
RS 610	75	40	56	4780	2870	4150	3490	3820
SD 25265	68	44	58	4090	4380	4600	2970	4010
SD 25228	66	44	56	4570	4900	4530	2460	4115
SD 67873*	74	46	54	----	----	----	2940	----
SD 67882*	81	46	54	----	----	----	2560	----
			LSD (05)	720	660	510	670	

*Experimental forage sorghum hybrids

Two new forage sorghum hybrids also performed well and are very promising in the state. These are designed to produce maximum yields of good quality silage and to utilize the full growing season for late fall harvest. Major advantages over taller hybrids such as SD 252F include reduced height, lodging resistance, succulent stalks, and a high proportion of leaf tissue in the silage.

A crossing block was planted at Presho in 1969 to aid production of hybrid seed on three full-season male-sterile lines. Thirty-six paired rows of male sterile and pollinator lines produced a significant bulk of good quality seed for 1970 yield testing. A large number of heads in each male sterile row were bagged and hand crossed with pollen from desired restorer lines. Eight other rows of pollinator lines which were hand bagged to enable selfing also produced a good quantity of good quality seed.

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 15 presents the 1969 yields and agronomic data. Long term averages and other information can be found in Circular 199, 1969 Grain Sorghum Performance Trials, South Dakota Agricultural Experiment Station.

Table 15. Grain Sorghum Performance Trial - South Central Research Farm, 1969

Variety	Height Inches	Percent* Moisture	Percent Lodging	Test Wt Lbs/ Bu	Grain Yield Lbs/ Acre
Pioneer 883	39	19.9	3	55.0	3060
DeKalb B-32a	35	16.2	0	58.0	2930
RS 633	42	32.5	0	57.0	2780
DeKalb A-25	30	13.7	5	52.0	2770
SD 503	45	15.2	10	57.0	2730
NK x 3004	38	13.6	2	56.0	2730
NK 120	38	14.0	3	53.0	2670
Pioneer 894	35	16.7	0	56.0	2620
ACCO R920	40	14.9	7	56.0	2530
SD 451	46	15.1	10	56.0	2530
ACCO Pawnee	39	15.3	10	58.0	2500
RS 610	38	20.7	2	56.0	2470
ACCO R94	38	14.9	2	58.0	2350
Frontier Grassy Grain I	41	15.3	2	56.0	2340
ACCO BL 101	43	14.0	10	55.0	2300
Pioneer 887	32	15.7	0	51.0	2290
NK 133	40	21.4	5	57.0	2280
NK 127	34	18.8	2	57.0	2230
MFA Coop SG 20	35	17.3	2	58.0	2060
NK 125	45	14.6	3	54.0	2030
FMC Rapido	29	19.8	0	56.0	2000
MFA Coop SG 10	36	22.3	2	59.0	1760
NK Mini-Milo 50A	38	14.3	8	57.0	1520
				Average	2410

*Moisture content is reported as of September 23, 1969 and indicates maturity of grain. Grain was harvested Oct. 1, 1969 and was dried in a drier before weighing.

Sorghum Forage Testing

H. A. Geise

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

A number of forage sorghum varieties, hybrids, and sudangrasses were tested. The entries were scored for various characters. The results of the trials are reported in Table 16.

Table 16. Performance Trial of Forage Sorghum and Sudangrass Varieties - South Central Research Farm, 1969.

Cultivar	Lodging (1-5)	Maturity (1-5)	Height Inches	% Sugar in Sap	Percent D. M.	Percent* Protein	Forage Yield** Tons/Acre
FORAGE SORGHUM							
Pioneer 931	1.4	4.8	67	10.0	14.5	9.7	2.1
Asgrow Titan R	1.0	3.0	48	12.6	17.1	10.7	1.8
Asgrow Beefbuilder T	1.1	5.0	--	15.2	16.9	9.8	1.8
Advance 1071F	1.0	4.0	60	15.7	22.0	6.8	1.8
Excel Silo-Fill 33	1.0	4.2	37	14.4	17.7	9.7	1.7
Rudy-Patrick 24F	1.0	2.5	45	9.7	21.1	9.5	1.7
DeKalb FS4	1.6	1.8	54	14.0	21.2	6.8	1.7
Barzan-Stockman's FS446	1.1	2.5	37	14.6	19.2	9.0	1.5
Advance 1085F	1.0	4.0	48	14.7	16.9	10.9	1.5
Asgrow Dino	1.0	4.2	34	15.6	16.4	12.6	1.5
Rudy-Patrick Sumax	1.0	4.0	47	16.4	19.2	8.9	1.4
Asgrow Dairy D	1.0	3.5	43	15.6	20.7	8.4	1.4
NK 318S	1.0	5.0	--	12.8	17.3	11.1	1.4
Barzan-Stockman's FS444	1.1	3.5	49	14.2	17.3	9.6	1.3
DeKalb FS1A	1.0	2.0	38	14.2	17.2	10.6	1.3
Frontier	1.0	3.8	33	15.3	19.2	10.7	1.3
Asgrow Duet	1.0	4.8	34	11.8	16.6	9.9	1.1
Waconia	1.0	5.0	--	17.4	19.0	8.1	1.1
Rancher	1.6	1.0	54	15.5	19.6	5.8	1.0
						LSD(01) -	0.6
SUDANGRASS							
Rudy-Patrick Trudy	1.2	1.0	63	12.5	34.0	8.9	1.9
Caladino-Monarch	1.1	1.0	67	12.4	29.4	6.5	1.8
NK-Trudan 2	1.5	1.0	64	12.5	26.9	5.9	1.3
Piper	1.9	1.0	70	11.4	31.3	6.0	1.0

* Protein content was calculated from Kjeldahl analysis and is reported on an oven-dry basis. LSD(01) - 0.3

**Forage Yields are reported on an oven-dry basis.

Note: Yield differences are significant at the 1% level.

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 17) and Russian Wildrye (Table 18) were fertilized with 40# of nitrogen per acre.

Table 17. Smooth Bromegrass Forage Yield Trial - South Central Research Farm. (Seeded August 1958)

Variety	Forage Yield -- Tons/Acre	
	1969	10-Year Average
Southland	.20	1.26
Lincoln	.59	1.27
Lancaster	.43	1.27
Homesteader	.39	1.20
South Dakota 5	.50	1.12
Wisconsin 55	.56	1.08
Canadian Common	.48	.93

Table 18. Wildrye Variety Forage Yield Trial - South Central Research Farm. (Seeded August 1958)

Variety	Forage Yield -- Tons/Acre	
	1969	10-Year Average
Common Russian Wildrye	.24	.85
Vinall Russian Wildrye	.23	.94

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 19). 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 19. Wheatgrass Forage Yield Trial* - South Central Research Farm.

Variety	Forage Yield - Tons/Acre**			
	Seeded August 1958		Seeded August 1960	
	1969	10-Year Av.	1969	8-Year Av.
Crested Wheatgrass				
Common	.52	.96	---	---
Common Fairway	.44	.72	.49	1.00
Mandan 2359	.65	.86	.68	1.08
Nebraska 10	.58	.89	---	---
Nebraska 20	---	---	.68	.99
Nebraska 3576 Fairway	.42	.83	.64	1.07
Nordan	.52	.90	.58	1.11
Summit	.42	.88	---	---
Tall Wheatgrass				
Alkar	---	---	.53	1.27
A12465	---	---	.50	1.23
Mandan 1422	.57	1.13	.69	1.26
Nebraska Tall	.59	.98	---	---
S-64	.53	.80	.54	1.16
Intermediate Wheatgrass				
Amur	.50	1.20	.42	1.20
Greenar	.56	1.21	.56	1.27
Idaho #3	.50	1.02	.55	1.24
Idaho #4	.52	1.26	---	---
Mandan	---	---	.44	1.16
Nebraska 50	.46	1.20	.59	1.13
Oahe	.56	1.29	.66	1.33
Ree	.52	1.17	.54	1.29
Miscellaneous Wheatgrass				
P-27 (A. sibericum)	.53	.94	.55	1.02
Topar Pubescent (A. trichophorum)	.49	.90	.63	1.00
Whitmar (A. inerme)	.46	.75	---	---

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

Grass Forage Production with Various Fertilizers and Row Spacings

H. A. Geise

Objectives: 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 20. Influence of Row Space and Fertilizer on Forage Yield of Smooth Bromegrass and Intermediate Wheatgrass.

Species	Row Space	Fertilizer* Applied	Forage Yield-Tons/A 1969	Av 1960-69
Smooth Bromegrass	6"	0-0-0	.37	.73
		20-0-0	.37	1.06
		40-0-0	.52	1.18
		40-9-0	.72	1.28
		40-9-0+Zn	.64	----
	42"	0-0-0	.28	1.07
		20-0-0	.64	1.22
		40-0-0	.45	1.27
		40-9-0	.48	1.32
		40-9-0+Zn	.56	----
Intermediate Wheatgrass	6"	0-0-0	.46	1.09
		20-0-0	.77	1.55
		40-0-0	.41	1.34
		40-9-0	.48	1.37
		40-9-0+Zn	.78	----
	42"	0-0-0	.50	1.24
		20-0-0	.57	1.38
		40-0-0	.59	1.46
		40-9-0	.57	1.48
		40-9-0+Zn	.58	----

* Nitrogen and phosphorous 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.

Yields and agronomic data concerning various management technics are reported in Tables 21 and 22. Several factors should be considered when interpreting these results. First, there is the soil moisture content to consider. The fallowed soil contained a good supply of stored moisture in the fall of 1968. This supply was adequate to carry the wheat through the spring and produce a crop of grain. In those treatments which were cropped in 1968 the moisture supply in the topsoil was insufficient for germination in the fall and therefore stands were thin. The thin stands eventually lead to a weed

problem. The second factor to consider is commercial fertilizer. The addition of nitrogen does not appear to be of any benefit at this time. In some cases it is detrimental to yield because the plants produce more vegetation and thus use up the soil moisture prior to heading and filling.

The addition of phosphorous is a different situation. It appears to be beneficial in several ways. Phosphorous promotes earliness. There are instances of as much as 10 days difference in heading date between the fertilized and unfertilized areas. Phosphorous increases height of plants under moisture stress. In those plots where soil moisture was limited, the differences were greater than where there was sufficient soil moisture. Phosphorous increased the wheat yield in all plots and the test weight of grain where moisture was the limiting factor. Yield differences were greatest where the nitrogen-phosphorous ratio was upset by the addition of large quantities of nitrogen fertilizer.

Table 21. Yields of Winter Wheat from Plots Having Eight Different Management Practices - South Central Research Farm, 1969.

Management Practice	Fertilizer*	Date of Heading	Height Inches	Test Wt Lbs/ Bu	Grain Yield Bu/Acre
Continuous Wheat	P	5-31	17	55	9.9
	0	6- 7	13	53	7.6
Cont. Wheat - 40# N/Yr	P	5-31	18	54	9.2
	0	6- 9	12	53	6.3
Cont. Wheat - 80# N/Yr	P	5-30	20	55	12.4
	0	6- 7	13	55	4.6
Cont. Wheat -120# N/Yr	P	5-31	18	53	10.8
	0	6-10	13	53	4.9
Wheat - Fallow	P	5-30	25	57	32.1
	0	6- 3	22	58	28.2
Wheat - Sw Cl Fallow	P	5-31	24	57	30.8
	0	6- 3	22	57	26.8
Wheat - Corn(Silage)	P	6- 4	24	54	14.7
	0	6-11	20	51	10.3
Wheat - Sorghum(Silage)	P	6- 4	23	56	9.7
	0	6-11	22	54	7.1
				Average	14.1

*Phosphorous fertilizer was applied with the seed at the rate of 15# of elemental phosphorous per acre.

Table 22. Yields of Forage Obtained from Corn and Sorghum - 1964-69.

Crop	Percent Dry Matter	Percent Protein	Forage Yield-Tons/Acre Wet	Dry	Av 1964-69
Silage Corn Pioneer S-100	29.2	10.0	7.2	2.1	3.1
Forage Sorghum Pioneer 931	28.6	14.1	6.6	1.9	3.7

Methods of Fallow

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

The fallow methods listed in Table 23 have been studied for eleven years. The largest grain yield in 1969 was from the treatment which received only surface tillage. However, all treatments which received tillage regardless of the type, had significantly higher yields than treatments using only chemicals.

Table 23. Yields of Winter Wheat from Plots where Six Different Fallow Practices were Compared.

Fallow Practice Fall	Summer	Fertil-ization*	Height Inches	Test Wt Lbs/ Bu	Grain Yield Bu/Acre
1) One-Way	One-Way	P	25	57.2	30.3
		O	21	56.5	27.4
2) Noble Blade	Noble Blade	P	26	57.2	30.2
		O	24	57.8	27.2
3) Noble Blade	Noble Blade or 2,4-D	P	26	57.2	29.8
		O	23	56.8	24.8
4) Noble-Chem**	Chemical*** + Tillage	P	24	57.2	26.5
		O	22	57.5	24.8
5) No Tillage	Noble Blade	P	26	57.5	27.3
		O	23	58.0	24.5
6) Noble Blade**	Chemical****	P	21	55.8	17.1
		O	18	56.5	13.5
LSD(05) - 3.2 Bu/A				Average	25.3

* "P" plots received 15 pounds of Phosphorous with the seed at planting.
** Fall Treatment consists of 5# of Dalapon + 1/2# of 2,4-D per acre.
*** Spring Treatment consists of 1/4# of Paraquat/Acre/each of 2 applications.
**** One application of 5# of Dalapon + 1/2# of 2,4-D + one application of Paraquat at 1/4#/acre.

A phosphorous treatment was added to the experiment in 1969. Each of the fallow treatments were split with one-half receiving phosphorous at the rate of 15 pounds per acre. The fertilizer was applied with a drill attachment and was placed with the seed. Observations made during the growing season indicated that the phosphorous treated plots headed from 1 to 2 days earlier, increased in height from 2 to 5 inches, and yielded from 1.7 to 5.0 bushels per acre more than the unfertilized plots.

Table 24. Soil Moisture Conditions as Influenced by Six Different Fallow Techniques. (1968-1969)

Fallow Treatment	Total Inches of Soil Moisture (0-48")						
	Stubble Oct 69	Stubble Oct 68	Fallow May 69	Fallow Oct 69	Winter Gain*	Summer Gain**	Gain for Year***
1	11.95	12.34	13.62	14.36	1.28	0.74	2.02
2	12.15	12.76	14.86	13.96	2.10	-0.90	1.20
3	12.56	12.57	15.15	15.14	2.58	-0.01	2.57
4	11.57	11.62	14.72	12.24	3.10	-2.48	0.62
5	11.90	11.88	14.05	13.72	2.17	-0.33	1.84
6	12.18	11.19	13.26	11.67	2.07	-1.59	0.48

* Moisture accumulated in soil October 1968 to May 1969.
** Moisture loss by evaporation or plant use from May 1969 to October 1969.
*** Difference between winter gains and summer loss.

Soil moisture changes have also been studied in relation to the various fallow methods. These studies indicate more soil moisture can be stored by using a good program of subsurface tillage. The most soil moisture was conserved in 1969 by the use of tillage plus a herbicide. This treatment consisted of the use of a subsurface implement which loosened the soil so summer rains could be absorbed, plus the application of 2,4-D to control the weeds, without the usual number of tillage operations.

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

Objectives: To determine the effect of nitrogen fertilizer, row spacing, and planting rate on grain sorghum yields and effects of these practices on the yield of spring wheat the next year.

Grain yields in the sorghum-spring wheat rotation have varied among years because of weather conditions. The spring wheat yield response in 1969 differed somewhat from those of previous years. In earlier reports the higher wheat yields were reported from plots which had moderate sorghum populations the year before. However, in 1969, the yields were highest where sorghum stands were heaviest in 1968.

Response to row spacing differed in that wheat yields were highest from plots where grain sorghum was seeded in 42 inch rows the previous year. Earlier results indicated higher yields came from the narrower rows.

Table 25. Effects of Fertilizer, Rate of Seeding, and Row Spacing of Grain Sorghum on Grain Yield of Spring Wheat in a Sorghum-Spring Wheat Rotation, 1969.

Rate of Planting Sorghum	Sorghum Row Spacing	Fertilizer*	Test Weight Pounds/Bushel	Grain Yield Bushel/Acre
2 lbs/acre	12"	O	53.5	6.7
		P	53.5	4.7
		N	48.8	6.8
		NP	49.2	4.9
	24"	O	53.5	7.6
		P	54.0	6.6
		N	52.5	7.4
		NP	49.2	5.4
	42"	O	55.2	6.2
		P	55.8	8.2
		N	52.5	11.8
		NP	52.5	11.6
4 lbs/acre	12"	O	55.2	7.6
		P	54.8	4.9
		N	52.5	11.3
		NP	51.5	9.2
	24"	O	54.8	6.3
		P	55.8	6.8
		N	51.8	10.0
		NP	52.0	8.7
	42"	O	54.8	9.0
		P	55.2	8.8
		N	50.8	8.7
		NP	52.5	9.1
8 lbs/acre	12"	O	56.2	6.3
		P	57.0	7.0
		N	53.8	11.9
		NP	52.5	10.6
	24"	O	55.8	7.2
		P	54.0	7.9
		N	52.2	11.8
		NP	52.0	10.8
	42"	O	57.5	9.8
		P	56.5	10.4
		N	52.5	13.5
		NP	52.8	10.4

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

Spring wheat yields were increased by nitrogen fertilizer more noticeably where sorghum stands were heavier in the previous year. The addition of phosphorous had no effect.

In the sorghum phase, the experiment was modified in 1969 to include three varieties. An early-, a medium-, and a late-maturing type were seeded at three dates, June 1, June 15, and June 30. All plots were seeded in 24 inch rows.

The extreme drought conditions limited heading and seed set. However, the following visual observations were made:

(1) Stands and weed control were excellent, regardless of date of planting or variety.
(2) Only a few heads were present in the plots with Northrup-King Mini-Milo 50A having the largest number.
(3) Seed set was extremely low.
(4) Northrup King Mini-Milo 50A and NK 120 headed 5 to 6 days earlier than NK 127 in the early planting, but 2nd and 3rd dates headed on the same day for all varieties.
(5) Heading date varied 16 days from 1st date of planting to 3rd date of planting for NK Mini-Milo 50A and NK 120, and only 11 days for NK 127.

Effects of Date of Planting and Row Spacing on Grain Sorghum

Objective: To study the effects of planting date, seeding rate, and row spacing on growth periods, grain quality, and grain yield of grain sorghum.

Table 26. Influence of Date of Planting, Seeding Rate, and Row Space on Grain Yield of an Early Maturing Grain Sorghum-NK Mini-Milo 50A.

Date of Planting	Seeding Rate/ A	Row Space	Date of Heading	Height Inches	Percent Protein	Test Wt Lbs/ Bu	Seed Yield Lbs/Acre
June 1	4 lbs	12"	7-28	42	12.0	53.6	1450
		24"	7-27	41	13.3	54.0	1620
	8 lbs	12"	7-28	41	12.9	53.5	1680
		24"	7-26	42	13.9	52.7	1710
	12 lbs	12"	7-26	43	12.6	53.0	1960
		24"	7-25	42	13.8	52.5	1620
June 15	4 lbs	12"	8- 5	39	13.9	53.5	1030
		24"	8- 7	39	14.0	53.0	1180
	8 lbs	12"	8- 6	38	13.6	53.6	1300
		24"	8- 7	39	14.2	53.6	1300
	12 lbs	12"	8- 7	38	13.8	52.6	1300
		24"	8- 7	37	13.7	52.0	1320

The advent of short-season or early maturing grain sorghum varieties has presented some questions pertaining to proper time of planting, proper seeding rates or populations, and optimum row spacing.

Previous experimentation has shown that better stands are obtained by seeding when the soil temperature is high enough to promote rapid germination and emergence. However, it is important to plant early enough to provide a growing season in which the plants will mature. Planting date was one of the questions this study was investigating.

Seeding rates, or eventual plant populations, must be adjusted to the moisture supply available. The smaller or shorter stature of short-season hybrids should not require as much water per plant and therefore a higher population should be able to survive. In this study the normal rate of seeding for full season hybrids was doubled and trebled because of the smaller size of the plants being used.

Row spacing is important because of plant competition for light, moisture, and nutrients. The two row spacings selected were based on previous experimentation.

The results (Table 26) were obtained during a season of limited precipitation and therefore do not show the difference anticipated.

Influence of Fertilizers on Yield of Winter Wheat

Objective: To study winter wheat responses which are influenced by addition of fertilizers.

Two experiments were initiated to study the effects of fertilizing winter wheat in a Promise clay soil. The fertilizers used contained the plant nutrient elements: Nitrogen, Phosphorous, Potassium, and Sulphur. The fertilizers were placed with the seed by using a drill attachment.

The first experiment was placed on fallow land and consisted of various rates and ratios of plant food. The results of this trial (Tables 27 & 28) indicated the light rate of phosphorous (0-15-0), a combination of nitrogen and phosphorous in a 2 to 1 ratio (30-15-0), the same combination with potassium (30-15-30), and a fertilizer blend (15-10-5) to be the only ratios of those tested to provide a return large enough to be practical.

The second experiment was placed on winter wheat in stubble and consisted of similar fertilizer treatments. This experiment was a complete loss because of winter kill.

Table 27. Influence of Fertilizer on Winter Wheat in Fallow - South Central Research Farm, 1969.

Fertilizer Treatment	Vigor* (April 16)	Height Inches	Test Wt Lbs/ Bu	Grain Yield Bu/Acre
0- 0- 0	3.0	27	60.0	28.8
15- 0- 0	3.0	28	59.0	31.0
30- 0- 0	3.3	29	60.0	30.9
30- 0- 0 (S)	3.3	29	60.3	32.7
60- 0- 0	3.3	29	59.3	31.7
0-15- 0	2.0	30	60.0	35.8
15-15- 0	2.3	29	61.0	35.2
30-15- 0	2.6	28	60.0	38.0
60-15- 0	2.6	29	61.0	36.6
0-30- 0	2.0	28	59.6	33.7
15-30- 0	2.6	29	60.0	32.2
30-30- 0	2.6	30	60.6	30.8
30-30- 0 (S)	2.0	30	61.3	38.1
60-30- 0	2.3	29	60.6	35.4
0- 0-30	3.5	30	58.0	26.1
0- 0-60	3.3	30	59.6	28.3
30-15-30	2.3	28	61.3	39.5
30-15-60	2.6	29	59.0	31.7
15-10- 5	2.3	29	61.0	36.0
$CuSO_4$	3.3	29	60.0	34.2
LSD(05) - 6.3 Bu/A			Average	33.3

* Vigor Scale: 1-Most vigorous, 5-Least vigorous.

NOTE: All nitrogen applied in the ammonium nitrate form, except where applied as ammonium sulphate and designated by symbol (S).

Table 28. Economics of Fertilizer Applications on Fallow Winter Wheat - South Central Research Farm, 1969.

Rate of Application	Grain Yield Bu/A	Total Income per Acre	Increased Profit
0- 0- 0	28.8	$37.44	----
15- 0- 0	31.0	$41.34	$2.25
0-15- 0	35.8	$46.54	$5.95
0-30- 0	33.7	$43.81	.07
15-15- 0	35.2	$45.76	$3.52
30-15- 0	38.0	$49.40	$5.51
60-15- 0	36.6	$47.58	.39
30-15-30	39.5	$51.35	$5.96
15-10- 5	36.0	$46.80	$5.46

NOTE: The figures in the above table were calculated using the following prices: Wheat - $1.30 per bushel, Nitrogen Fertilizer - $.11 per lb., Phosphorous - $.21 per lb. Cost of application of fertilizer is not considered.

CROP DISEASE CONTROL

Chemical Rust Control in Winter Wheat

G. W. Buchenau

Experiments to control leaf and stem rusts with fungicide sprays were conducted at the South Central Research Farm in 1969. Stem and leaf rust infections were light in 1969 so that fungicide did not increase the yield. Yields may even have been reduced by fungicide, but these yield reductions were not statistically significant (Table 29). The details of a spray-advisory system for chemical rust control are expected to be available soon.

Table 29. Effect of Rust Fungicide on Grain Yield of Two Varieties of Winter Wheat - South Central Research Farm, 1969.

Fungicide	Dosage*	Sprays Applied	Leaf Rust Pustules/Leaf	Yield-Bu/A**	
				Lancer	Omaha
Manzate 200	2#	Head, H + 10, H + 20	3	44.8	34.9
Manzate 200	2#	Head, Head + 10	4	42.8	34.0
Manzate 200	1#	Head, Head + 10	2	46.9	35.1
Polyram	2#	Head, Head + 10	4	45.9	38.5
Check		Unsprayed	3	49.6	38.0

* Dosage is Pounds per Acre per Application.
** Yield Differences between Treatments of a Variety are not Significant.

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

W. S. Gardner

The wheat streak mosiac 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.

Tenative recommendations are that wheat stubble should be tilled before August 15 to kill volunteer wheat and grassy weeds so the mites and virus will be destroyed. The wheat stubble should be left exposed on the soil surface so the soil surface 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.