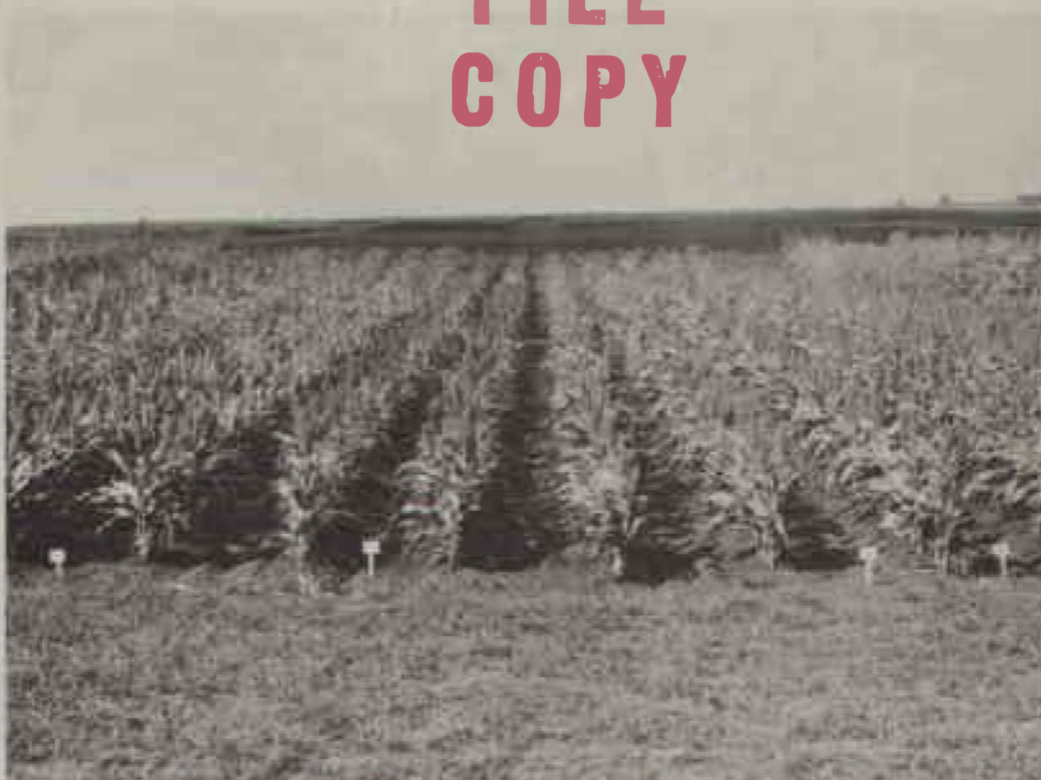
Agronomy Pamphlet #52

ANNUAL PROGRESS REPORT DECEMBER 1959

SOUTHEAST RESEARCH FARM

MENNO, SOUTH DAKOTA



This picture of Commercial Sorghum indicates the worth of this type crop under dry adverse conditions. Further information of yields, maturity and height may be found in the "Sorghum Section."

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

Origin and History of Mobile Unit Farms

During the past several years there has been an increasing need for research work on crops and soils in the northeast and southeast areas of the state. After several meetings of the people interested in research for these areas, plans were made to ask the State Legislature for additional appropriations for this work. Adequate funds were granted and two new Research Farms or "Mobile Units" were started in 1956. The term "Mobile Unit" was used for two reasons: (a) some of the equipment could be moved from one unit to another to prevent purchasing a full line of machinery for each location, (b) after 5 to 8 years (depending on the nature of the experiments selected) the experimental units would be moved to a new location within the area with an entirely new set of problems such as slope, drainage, fertility, soil type, etc.

In each of the two areas, meetings of interested farmers and county agents were held. Area committees were set up to assist the Agricultural Experiment Station in selecting the research farms and planning the experiments. The area committees are composed of the county agents and one farmer from each county in the area.

After looking at several possible locations, a joint committee of farmers and college representatives selected the present farms. The amounts of land devoted to each form of agronomic research, and also the specific experiments on fertility and soil management, were selected by the respective area committees.

Each farm or unit represents a particular soil and problem area that is characteristic to that geographical region. The experimental work is performed precisely where the problems occur. Therefore, the results of these investigations are directly applicable to the regions studied, and in addition it is considerably easier for the people in these areas to observe experiments when the research is conducted near their homes.

Field days are held to observe first hand the results and progress of all experiments in the field. In addition, winter meetings in each area permit the presentation and discussion of results for all people who are interested.

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Research Farm
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Note: This is a progress report and therefore the results presented are not necessarily complete nor conclusive. Any interpretation given is strictly tentative because additional data resulting from continuation of these experiments may result in conclusions different than those of any one year.

INTRODUCTION

In the spring of 1955, money was appropriated by the State Legislature to begin new research on crops, soils and crop diseases in the southeastern part of the state. A site involving 20 acres was originally selected. It is location on the Theo. Handel farm, 4 miles east of Menno on Highway 18, and 1/4 mile north.

The purpose of this farm is to provide facilities for research to obtain solutions of local problems in crop production and soil management. Experiments involving fertilizers, plant disease control, crop management, soil fertility, soil moisture and crop variety testing have already been started.

The Field Day which was scheduled for September 17, 1959 was postponed entirely. The many adverse conditions reduced most phases of experimentation to a degree where they didn't show differences. A tour was then anticipated for sorghums only, but it was rained out. This variety experiment showed up very well, and also indicated its value in the farming program.

The Annual Winter Meeting was held in Centerville, January 26, 1959. The 1958 results were discussed, and also many short term experiments. The one experiment on rates or pounds per acre, and corn planted versus grain drill for planting grain sorghum was completely washed out during a heavy rain in May. It is hoped to try this experiment again this coming crop season.

This report was prepared by the staff members of South Dakota State College as indicated in each section, and assembled by Q.S. Kingsley, Agronomy Department.

Table 1. Total Rainfall and Average Temperature by Montha, with their Departure from Long-time Averages at S.E. Research Farm.*

	April	May	June	July	Aug.	Sept.	Oct.	Total
Total Rainfall in Inches	0.80	7.20	2.05	0.60	3.02	4.78	3.56	22.01
Departure from Long-Time Average	-3.07	+3.96	-2.23	-1.78	-0.04	+2.80	+2.30	+1.94
Average Monthly Temperature in Degrees F.	46.9	57.9	71.1	72.1	77.6	58.9	42.6	
Departure from Long-time Average	-2.3	-2.1	+1.0	-4.6	+3.6	-5.9	-10.0	
Frost free days	May 15 to September 10 117 days							

The past crop season was not ideal for small grain or corn but sorghum seemed to do quite well under these adverse conditions. The lack of subsoil moisture and rain during the month of April had a detrimental effect on small grains. The crop germinated quite well, but they did not develope into the four and five-leaf stages as they normally do. The month of May had 7.2 inches of rain, but 3.65 inches of it came in two rains, which was mostly lost through runoff. The next rain of any amount, fell about the middle of June, and the end of June. During the intervening time, the temperatures were quite high and evaporation losses were great. The small grain grew rapidly at this time, but was later subjected to high temperatures and low rainfall. This combination in conjunction with abundant top growth caused many grains to fall over and not produce grain. This effect was more noticeable in the salty areas than in well drained soils.

The past crop season indicates quite well what happens to crops when the subsoil moisture is low, and rains were of such quantity that evaporation immediately takes it from the soil. If these conditions continue to exist, there will be need of change from the methods now used to some type of mulch farming to insure preservation of the small amount of rain that does fall.

The corn crop received very severe treatment this year also. There was a lack of moisture during the growing period, and during this time the daytime temperatures were high. At tasseling time the temperatures were in the high 80's and 90's, which is one element that hinders pollination at this particular time. The high temperature-low moisture condition effects were very prominent in the plant and the ear. Most of the plants did not produce ears worth harvesting, and those that pollinated were not filled on the tips. This condition necessitated the cutting of much corn for silage, or letting it stand with no yields taken due to the great irregularity of stands. Accurate results depend on uniformity within varieties, numbers, or experiments, and if this cannot be attained to a certain degree, the results are meaningless.

The months of September and October showed an increase of moisture over the long time average. The most of this moisture soaked into the ground, and at the last sampling showed an average increase in subsoil moisture of from 3-4%. The rainfall of April through October was 1.94 inches more than normal for this period.

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* The above rainfall and temperature data were taken and recorded at the Southeast Research Farm.

The departure from long-time average was obtained by comparing the data taken at the farm to the long-time average at the city of Menno Weather Station, Courtesy U.S. Weather Bureau, Huron, South Dakota.

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

Q. S. Kingsley and F. E. Shubeck

Fertility Experiment #1

Objectives of Experiment

1. To measure the effect on yield of several different fertilizer nitrogen carriers.
2. To determine the effect of different nitrogen carriers on quality of grain (measured by percent of protein).

Table 2. Effect of Several Different Nitrogen Fertilizer Carriers on Oats Yields and Per Cent Protein in Grain.

Source of Nitrogen	Pounds per acre of N	P_2O_5	K_2O	Per Cent Protein in Grain *	Yield in Bu/Acre
None	0	0	0	12.90	19.2
Ammonium Nitrate	40	20	0	15.34	25.9
Urea	40	20	0	14.00	28.9
Anhydrous Ammonia	40	20	0	15.46	35.7
Solution 13-13-0	40	40	0	14.60	23.3
Solution 15-10-0	40	26.6	0	15.44	22.5
Fertilaid	300 lb Fertilaid/Acre			13.05	27.6
Super-Gro	300 lb Super-Gro/Acre			13.16	21.9
L.S.D. at 5% confidence level				----	N.S.

* analyzed by Experiment Station Biochemistry Department

Yields of oats were severely restricted by the adverse weather conditions in 1959. It is interesting to note that the nitrogen fertilizer did not decrease the oats yields this dry year. However, there were no significant yield increases due to nitrogen.

The yields of oats with anhydrous ammonia were more favorable this year than the results on oats obtained in 1957 (corn was the test crop in 1958). The soil was in a more desirable physical condition when the ammonia was applied for the 1959 crop year, and very likely this reduced the amount of nitrogen lost to the atmosphere.

The per cent protein in the grain was increased about 1% to 2% by all of the treatments except the two "organics." These two materials had a somewhat lesser effect on per cent of protein in oats grain.

Fertility Experiment #2

Objectives of Experiment

1. Compare the efficiency of biennial sweet clover, annual sweet clover, red clover and alfalfa for increasing grain yields when used as a catch crop.
2. Compare commercial nitrogen fertilizer to legume nitrogen as a means of increasing grain yields and percent protein in grain.
3. From a standpoint of maximum yield is it better to use a catch crop legume, or to let the legume stand over one year?
4. Will legumes cause a decrease in yield of the following corn crop by reducing the reserves of subsoil moisture?

Table 3. Influence of Commercial Fertilizer and of Legumes in Rotation on Yield of Corn and Per Cent Protein in Grain.

	Preceding Legume	Pounds per Acre N	P_2O_5	K_2O	Corn Forage Yields in tons/acre with no water	at 15% water	at 65% water	% Protein in Corn Forage*
1.	None	0	20	0	1.45	1.71	4.14	6.26
2.	None	40	20	0	1.86	2.19	5.31	9.28
3.	Biennial Sweet Clover Catch Crop	0	20	0	1.34	1.58	3.83	8.56
4.	Annual Sweet Clover Catch Crop	0	20	0	1.33	1.56	3.80	7.24
5.	Red Clover Catch Crop	0	20	0	1.68	1.98	4.80	7.25
6.	Alfalfa Catch Crop	0	20	0	1.10	1.29	3.14	8.23
7.	Red Clover for Hay	0	20	0	1.10	1.30	3.14	10.06
8.	Alfalfa for Hay	0	20	0	0.98	1.15	2.80	10.85
	L.S.D. at 5% confidence level				0.33	0.39	0.94	----

* analyzed by Experiment Station Biochemistry Department

In this experiment, there was only a small amount of ear corn present so the entire plants were chopped up and reported as forage yields at zero moisture, 15% moisture and 65% moisture. The reason for reporting the same yields at three different moisture levels was that some people may be interested only in tons of dry matter produced. Others may wish to make comparisons to air dried corn fodder which roughly has 15% moisture. For silage yields, the material was reported at 65% moisture,

Forty pounds of nitrogen per acre increased the yield of corn forage. In the rotations where a legume preceded the 1959 corn crop, there was generally a reduction in the amount of corn forage produced. This was especially true in rotation 8 where alfalfa was held over the second year for a hay crop.

Table 4. Influence of Preceding Crop on Per Cent Water in Soil Under Corn, July 30, 1959.

	Crops and Fertilizers Preceding Corn							
Depth in feet	Oats + 0-20-0	Oats + 40-20-0	Oats + Biennial Sw. Cl. 0-20-0	Oats + Annual Sw. Cl. 0-20-0	Oats + Red Cl. 0-20-0	Oats + Alf. 0-20-0	Oats + Red Cl. Hay 0-20-0	Oats + Alf. Hay 0-20-0
0-1	9.2	10.0	8.9	7.7	9.7	9.2	8.9	8.3
1-2	8.4	9.0	8.5	8.3	8.7	7.9	8.6	7.4
2-3	12.0	11.4	10.5	12.9	11.5	10.5	9.5	8.6
3-4	13.8	15.7	12.2	13.2	13.4	12.5	12.4	9.5
4-5	14.8	14.8	14.0	11.3	15.2	14.4	14.0	10.4

When Alfalfa Hay preceded corn, the yield or corn forage was reduced (Table 3.) Table 4 shows that the subsoil moisture under corn, that followed alfalfa hay, had not been replenished by July 30.

Fertility Experiment #3

Objectives of Experiment

1. Investigate the possibility of wide row corn spacing with legumes planted between the rows. This is an attempt to build up organic matter and yet grow continuous corn.
2. Compare the effect of commercial fertilizer, legumes planted between corn rows, and manure for raising continuous corn.

Table 5. Comparative Influence of Manure, Legumes, and Commercial Fertilizer on Yields of Corn and Forage.

Treatment	Yield of Forage in Tons/Acre With no water	at 15% water	at 65% water
10 tons of manure per acre	1.41	1.66	4.03
60-40-0 from commercial fertilizer	1.17	1.38	3.34
Skip row planting with legumes between rows plus 0-40-0	1.10	1.29	3.14
Check (no legumes, manure, or commercial fertilizer)	1.39	1.64	3.97
L.S.D. at 5% confidence level	1.11	1.31	3.17

In this experiment, the entire plants were chopped, weighed, and reported at three different moisture levels to correspond to tons of dry matter, tons of air dry fodder, and tons of silage produced per acre. No significant differences were found due to the different treatments. There was not enough rainfall to make use of the added fertility.

Fertility Experiment #4

Objectives of Experiment

1. Evaluate the method of planting corn in tractor wheel tracks in fresh plowing with no additional seedbed preparation.
2. Investigate the possibility of hard ground listing with speedy inexpensive cultivations - twice with the drag, once with the rotary hoe and once with the cultivator.
3. With less tillage and with the expected slower rate of organic matter oxidation and nitrogen release, will the application of commercial nitrogen become more necessary?

Table 6. Effect of Tillage and Plant Methods on Yield of Corn

Pounds per Acre N	P_2O_5	K_2O	Method of Tillage and Planting	Yield in By/Acre	Weeds in Rows reported in T/A at 15% moisture
0	40	0	Plow, disc, drag, plant (drilled)	22.4	0.75
60	40	0	Plow, disc, drag, plant (drilled)	18.5	1.08
0	40	0	Wheel track planting (drilled)	20.9	0.41
60	40	0	Wheel track planting (drilled)	10.8	0.56
0	40	0	Hard ground listing (drilled)	25.8	0.46
60	40	0	Hard ground listing (drilled)	18.9	0.50
L.S.D. at 5% level (to compare fertilizer treatments only)				10.4	0.42

The yields from hard ground listing held up farily well for this dry crop year.

For the first time since this continuous corn experiment was started, there was a decrease in yield of ear corn caused by the application of 60 lbs. of nitrogen per acre. Results with nitrogen were similar with all three methods of planting.

There have been several questions regarding control of weeds with these minimum tillage methods. As a result, the weeds in each plot were pulled at corn picking time, weighed, dried and reported at 15% moisture in Table 6. The minimum tillage plots had no more weeds than the plots planted with the conventional plow, disc, drag, plant method. When 60 pounds of nitrogen per acre was applied, the weeds were more of a problem.

E ch particular method of planting seemed to have its own weed problem. With wheel track planting, for instance, the weeds in the drilled row were particularly troublesome, but not the weeds between the rows. The loose plowing between the rows severely retarded weed growth. The weeds in the tractor wheel track were quick to come, however, and were difficult to control by cultivation if the plowing dried hard and lumpy. To overcome this drawback, some experiments were started on private farms using a pre-emergence band spray just over the row or wheel track. The chemical used was Simazin, and it was applied at time of planting. This method appeared to be moderately successful under the temperature and rainfall conditions which the experiment was performed.

Fertility Experiment #5

Objectives of Experiment

1. In a year of low subsoil moisture reserves, which of the following crops will give the greatest return: corn, oats, soybeans, forage sorghum, grain sorghum or sudangrass?
2. What is the comparative forage yields of these different crops?

Table 7. Comparison of Yield and Value of Various Grain and Forage Crops

Crop	Yield of Grain/A	Price per Unit*** Dec. 1959	Value of Grain	Yield of stover in tons/A	Value per ton of stover	Value of stover	Total Value
Corn	19.5	$ .95/bu	$18.53	0.43#	$9.00*	$ 3.87	$22.40
Oats	18.3 bu	.65	11.90	1.29##	9.00**	11.61	23.51
Soybeans	8.3 bu	1.78	14.77	----	----	----	14.77
Forage Sorg.	567.5 lb	1.50/100	8.51	1.45#	9.00*	13.05	21.56
Grain Sorg.	1070.0 lb	1.50/100	16.05	1.07#	9.00*	9.63	25.68
Sudangrass	----	---	----	1.52#	9.00*	13.68	13.68

* Based on the price of unbaled prairie hay which is similar in feeding value.
** Based on the price of $15 per ton for baled straw less estimated cost of baling.
*** At Farmers Coop Elevator, Brookings, Dec. 23, 1959.
# Oven dried and calculated at 15% moisture.
Reported on air dry basis.

The prices listed are those for Dec. 23, 1959, at the Farmers Coop Elevator at Brookings, They will be different at other markets in the state and may vary considerably from time to time. Some of the prices were rather arbitrary - for example the forage sorghum seed. The figures in the table were intended only as a guide to assist individual farmers in computing the costs and returns associated with their own specific farming enterprise.

The numbers given in "total value" column do not take into consideration the production costs of various crops. The costs of the fertilizer (40-20-0 per acre) alone was approximately $7.60 per acre.

In calculating the yield of stovers, each crop was oven dried at 106°C. and then brought to a standard figure of 15% moisture except oats straw. The oats straw was weighed in the field on an air dry basis. Actual field weights of some of the stovers were much greater than the pounds listed in the table, because some of the forage was over 50% water when the plots were harvested.

There is no figure given in the table for sudangrass seed because hot weather and wind shelled most of it out before other work could be rearranged in order to harvest it.

The sorghums made a better showing relative to corn this dry year than they did in 1958. This is due in part to the higher relative value of forage. On Dec. 23 at Brookings, alfalfa hay was selling at $24.00 per ton. This is about twice the price that was being paid in 1958.

The oats crop rated rather high in total value - due largely to the value attributed to the straw.

CORN BREEDING AND YIELD TESTING

By D. B. Shank and D. E. Kratochvil

The data reported in table 8 for 1959 is taken from a test plot about 3 1/2 miles southeast of Alcester, in Union County. Due to the failure at the Research Farm, this data was considered to be applicable for the general area.

In table 8 each hybrid has been ranked on the basis of a performance rating which evaluates the entries on their relative yields and maturity. This rating was obtained by first converting yields for each hybrid to a percentage of the average yield of all the entries. Similar calculations were made for moisture at harvest time after first subtracting each moisture percentage from 100, so as to rank the hybrids on their ability to produce sound, rather than soft, corn. The performance rating then equaled:

$$\frac{6(\text{yield percentage}) - 4(\text{moisture percentage})}{10}$$

Table 8

Union County - Corn Performance Test - 1959

Hybrid	1959 Perf. Score	Yield bu/A*	Moisture %	2-Year Average Yield bu/A	2-Year Average Moisture %
SD Exptl. #27	110.7	92.4	31.2		
Tekseed T563	106.9	88.1	32.1		
SD 604 ms Rf	106.1	85.4	30.1		
DeKalb 488	104.9	86.6	33.6		
Curry c-62	104.8	86.6	33.7		
Pfister PAG 277	104.7	84.6	31.4	87.6	24.2
DeKalb 3 x 1	104.7	87.8	35.5		
Curry C-58	104.6	86.0	33.3		
SD Exptl. #24	104.2	85.0	32.7	89.0	26.4
Sokota SD 622	103.9	84.3	32.4	88.3	25.7
Beeghly Reg. Storm Breaker	102.9	84.8	34.6		
Tomco 449	102.8	81.5	30.7		
Pfister PAG 234	102.3	80.5	30.3		
Funk G-76	102.2	83.4	34.0	85.5	26.3
Kingscost KT 7	101.8	82.5	33.6	83.1	27.0
United Hagie UH 52B	101.7	83.3	34.8	82.9	27.9
Iowealth AQ	101.6	83.9	35.7	87.5	28.9
Cornelium C-49	100.6	79.6	31.9		
Disco 111 AA	99.4	76.8	30.5	82.9	24.8
Funk G-75A	99.0	78.6	33.4	81.0	26.5
Jacobsen J-38	98.2	78.8	34.9		
Gurneys 118C	97.9	78.0	34.5		
Sokota SD 604	97.7	75.4	31.6	79.6	24.1
Pioneer 345	97.3	76.1	33.1	82.9	24.7
Jacques 1208J	97.1	77.3	35.0		
Pride WM 500	97.0	72.2	28.6		
Moews 535	96.8	78.8	37.3		
Farmer 427A	96.3	73.3	31.2	71.8	24.5
Haapala H243	95.8	74.2	33.2		
Pioneer 352	95.4	71.8	30.8	77.1	23.4
Green Acres 667	94.9	74.1	34.6		
Vinton U-35	92.1	69.1	33.0	74.0	25.0
Cargill 251	88.5	65.4	34.3	73.6	26.0
Turner T-49	85.4	63.6	37.2	73.2	29.5
Average		(79.7)	(33.1)	(81.3)	(25.9)

* Least significant difference = 13.7 bu/acre.

SORGHUM AND SOYBEAN TESTING

by C. J. Franzke

Table 9. Height, Maturity and Yield of Sorghum Varieties, 1959.

Variety	Height	Maturity	Bu/A
Northrup King NK 135	46	2	40.9
Northrup King NK 140	39	2	38.3
Northrup King NK 3000	42	2	40.1
Northrup King NK 210	45	2	60.2
Northrup King NK 230	35	2	42.4
Northrup King NK Expt 3026	42	2	54.6
Northrup King NK Expt 3005C	40	2	28.7
Northrup King NK Expt 3021	43	2	50.1
Northrup King NK Expt 3022	44	2	40.7
Northrup King NK Expt 3000B	39	2	50.4
Northrup King NK Expt 3000C	41	2	33.6
Northrup King NK 145	60	2	77.3
Steckley R-99	47	2	35.6
Steckley R-103	42	2	39.0
Steckley R-104A	37	2	43.7
Steckley R-106	37	2	50.6
Steckley R-108	36	2	31.8
DeKalb C-44-A	39	2	50.0
DeKalb x-30	44	2	42.1
DeKalb x-49	34	2	41.6
Frontier 400B	41	2	37.3
Frontier 400C	40	2	55.9
Frontier 410B	35	2	55.3
Frontier 410C	36	2	46.0
Frontier S-210	56	2	35.4
Norghum	42	1	34.7
Reliance	44	1	36.9
Dual	58	1	26.3
Frontier 411	40	--	31.7
Frontier 410E	33	--	35.8

Key to Maturity: 1. Very Ripe
2. Ripe
3. Hard Dough Stage

The sorghums with a maturity number of "one" can be combined without excessive moisture in the grains, "two" requires extra drying, anything number "three" on down are immature and contain too high moisture content.

The 1959 sorghum crop was planted May 25, and maturity readings were taken September 28. The season was favorable for maturing late varieties as the table will indicate.

A planting was made of Perennial Sweet Sorgrass to study its winter hardiness, and also to find out if plowing will kill it after the plant has been established. A new planting of this crop will be established in 1960 to determine its forage yield.

FORAGE LEGUME VARIETY TESTS S.E. FARM

M. D. Rumbaugh, R. A. Moore, and Q. S. Kingsley

The forage legume variety testing program at the Southeast Research Farm is directed toward the evaluation of the performance of standard and recently developed strains in this part of the state. Primary emphasis is placed upon comparative yield levels and the consistency of performance from year to year. Recent results obtained with alfalfa, red clover, sweet clover, and birdsfoot trefoil are indicated in the following tables.

Table 10. Alfalfa variety test at the Southeast Research Farm, Menno. Seeded in 1956 and harvested in 1957 - 1959.

	Total Annual Tons of Dry Forage Per Acre			
Variety	1957**	1958**	1959*	Average
Cossack	5.28	1.52	2.17	2.99
Du Puits	5.37	1.62	1.55	2.85
Grimm	4.42	1.64	1.72	2.59
Ladak	5.15	1.43	1.52	2.70
Lahontan	4.51	1.48	1.52	2.50
Narragansett	5.17	1.76	2.33	3.09
Nomad	4.44	1.23	2.14	2.60
Ranger	5.30	1.59	1.94	2.94
Rhizoma	5.25	1.68	1.98	2.97
Terra Verde	5.36	1.79	0.71	2.62
Teton	4.83	1.00	1.53	2.45
Vernal	5.12	2.00	1.99	3.04
Average	5.02	1.56	1.76	2.78
L.S.D. (0.05)	----	0.18	0.73	----

* One cutting
** Two cuttings

Despite the rather severe weather conditions experienced in 1959, the non-hardy alfalfa varieties maintained sufficient stand density to produce considerable forage. A variety such as Terra Verde would be expected to suffer a stand reduction of between 90 and 100 per cent. Additional data are required to fully differentiate the relative adaptation of these strains of alfalfa at this location.

Table 11. Yields of second year growth of Sweet Clover varieties tested at the Southeast Research Farm, Menno. Seeded in 1956-1958 and harvested in 1957-1959.

Variety	Tons of Dry Forage Per Acre 1957	1958	1959
Common White	3.24	----	2.84
Common Yellow	4.48	----	2.94
Evergreen	3.72	2.63	2.79
Goldtop	4.41	2.54	2.36
Grundy County White	----	----	1.69
Intermediate Coumarin	----	2.57	----
Madrid	4.08	1.27	2.90
Spanish	4.42	2.39	2.63
Average	4.06	2.28	2.59
L.S.D. (0.05)	----	0.28	0.70

Evergreen and Spanish are late maturing varieties, most valuable as green manure. Madrid is early maturing as well as having the characteristic of being a good seed producer. Goldtop was developed by selecting for low coumarin content, intermediate maturity, and resistance to foilage disease.

Table 12. Birdsfoot Trefoil test at the Southeast Research Farm, Menno. Seeded in 1957 and harvested in 1958-1959.

Variety	Original Stand (percent)	Tons of Dry Forage Per Acre 1958	1959	Average
Cascade	80	.66	1.18	.92
Empire	94	.82	1.67	1.24
French Imported	92	.79	.60	.69
Granger	91	.77	1.09	.93
Iowa Empire 2297	85	.16	1.17	.66
Iowa Empire 2306	91	.67	1.96	1.32
Italian Imported	95	.74	1.04	.89
Leofoil	92	.38	1.20	.79
Mansfield	86	.62	1.02	.82
South Dakota #9	92	.12	.77	.44
Tana	91	.84	1.41	1.12
Viking	85	1.01	1.38	1.20
Average	90	.63	1.21	.92
L.S.D. (0.05)		.27	.50	---

The recommended Trefoil variety, Empire, and its derivative, Iowa Empire 2306, have been found to yield slightly more forage than other available strains. Trefoil is recommended for utilization in pasture mixtures where adapted, rather than for production of hay.

Table 13. Red Clover variety test at the Southeast Research Farm, Menno. Seeded in 1957 and harvested in 1958 and 1959.

Variety	Tons of Dry Forage Per Acre 1958	1959	Average
Dollard	1.02	.54	.78
Kenland	.97	.45	.71
La Salle	.92	.38	.65
Pennscott	.83	.19	.51
Stevens	.82	.35	.58
Lakeland	.92	.54	.73
Average	.91	.41	.66
L.S.D. (0.05)	.25	.29	.12

Table 14. Red Clover variety test at the Southeast Research Farm, Menno. Seeded in 1958 and harvested in 1959.

Variety	Tons of Dry Forage Per Acre	Relative Maturity	Percent Stand
Dollard	.57	40	32
Kenland	.22	75	25
La Salle	.60	60	44
Mammoth	.52	90	59
Pennscott	.44	75	40
Wegner	.61	85	25
Lakeland	.36	50	40
Average	.47	68	38
L.S.D. (0.05)	.35		

Forage yields from two Red Clover trials planted in 1957 and 1958 are shown. The recommended variety, Dollard, has consistently performed well at Menno. Lakeland was named and released by the Wisconsin Agricultural Experiment Station in 1959 but has previously been tested under the experimental designation of "Wisconsin Synthetic." It is noted for its resistance to Northern Anthracnose and Mildew but the average level of yield has not exceeded that of Dollard in southern South Dakota.

GRASS TESTING

By J. G. Ross and R. A. Moore

The grass tests were established in 1957 and were fertilized by a top dressing of 60 lbs. of nitrogen and 40 lbs. of phosphorus per acre in the spring of 1959.

The best yielding species were bromegrass, intermediate wheatgrass, tall wheatgrass and pubescent wheatgrass. Crested wheatgrass yielded half or less than a higher yielding species.

Manchar and Lincoln were the highest yielding bromegrass varieties while Canadian Commercial was the lowest. Nordan was the highest yielding of the crested wheatgrass varieties. The intermediate wheatgrass variety Idaho #3 and Mandan 579 yielded more than other grass varieties, but the first of these has not performed as well at other locations. The intermediate wheatgrass varieties Idaho #4, Ree Amur and A 12496 and the pubescent wheatgrass Utah 109 yielded about equally. A certain correspondence of per cent stand to yield is present so that the lowest yielding grasses may have the lowest stand.

Table 15. Bromegrass Variety Trial. Harvested June 24, 1959.

Variety	Headed %	Stand %	Yield Tons/Acre
Saratoga	40	84	.80
Southland	50	82	.84
Lancaster	85	81	.83
Wis. 55	60	79	.79
Canadian Comm.	90	58	.56
Achenback	90	85	.88
Lincoln	85	88	1.00
Wis. 63	85	72	.89
Manchar	95	84	1.12
Homesteader	60	81	.78
L.S.D.			.24

Table 16. Wheat Grass Variety Trial. Harvested June 24, 1959.

Variety	Headed %	Stand %	Yield Tons/Acre
Crested Wheatgrass			
Standard Commercial	90	50	.40
Nordan	90	58	.55
Summit	70	58	.40
Mandan 2359	75	66	.40
Utah 42-1	80	64	.44
Neb. 10	70	68	.43
P-27	90	28	.22
Fairway Commercial	60	81	.40
Neb. 3576 Fairway	95	59	.42
A 1770 Fairway	100	24	.25
Intermediate Wheatgrass			
Idaho #4	60	86	1.12
Ree	40	89	1.19
Amur	75	86	1.15
Greenar	75	88	.94
A 12496	70	89	1.20
Neb. 50	60	89	.96
Idaho #3	50	86	1.58
Tall Wheatgrass			
Neb. 98526	50	80	.96
S-64	40	74	.87
A 13044	10	72	.63
A 1876	5	72	.89
Mandan 1422	40	76	.88
Pubescent Wheatgrass			
A 1488	80	72	.86
Utah 109	80	78	1.10
Mandan 759	40	91	1.32
Topar	90	64	.77
Streambank Wheatgrass			
Sodar	20	98	.10
L.S.D.			.34

SMALL GRAIN VARIETY TESTING

Small Grain Results from tne Southeast Station in 1959.

V. A. Dirks, D. D. Harpstead, P. B. Price

One critical week of hot dry southwest winds in mid-June reduced the relatively promising small grain crop at the Menno Station to failure and near failure levels.

Winter grains, sown on fallow in the fall of 1958, made remarkably good yields. Part of this must be attributed to the presence of greater soil moisture reserves in the fallow at the critical June period; part to the more advanced stage of maturity of these crops at that critical time. The yields of winter wheat and rye, seen in Tables 17 and 18 respectively, suggest that the planting of limited acreages of these fall sown crops might be wise as a form of drought insurance. At the same time, fall sown crops fit well into recommended practices for the control of perennial weeds.

Spring wheat, both bread and durum types, did very poorly in 1959, as might be expected from a crop quite poorly adapted to this area. The 1959 spring wheat plot results, as well as 4 year averages, are seen in Table 19. The results indicate that where spring wheat is to be grown, earliness and high disease resistance are major factors in choosing varieties.

Oat production at the Menno Station in 1959 must be classed es a virtual crop failure in view of the low grain yields and its very poor quality. The highest yielding varieties were those which mature early and are known to be somewhat heat tolerant. The new varieties, Nehawka and Macon, were developed in Nebraska and Missouri respectively for use under high temperature conditions. The recommended variety Minhafer appears to fullfill the needs of this oat growing area well under conditions similar to those in 1959.

The barley was planted under better conditions than existed at the Northeast Research Farm. The actual precipitation was adequate, but effective precipitation was rather low due to hot drying winds which caused rapid soil moisture evaporation. The barley was planted March 31, and harvested July 21, 1959.

The soil for all small grains was fertilized with 60-40-0 and plowed under.

Table 17 Winter Wheat Variety Test at the Southeast Station. Menno, 1958-1959.

Variety	Average Yield Bushels Per Acre 1959	1958-59	Test wt. 1958	Survival percent 1958-59
Northern Types				
Minter	21.4	30.8	56	88
Minturki	22.2	29.4	57	80
Central Types				
Nebred	23.8	29.3	58	76
Cheyenne	22.1	34.2	59	86
Kharkof	19.0	29.0	58	68
Omaha	22.5	26.6	57	59
Warrior	24.7	31.5	56	78
C. I. 13279	28.4	31.4	57	71
Cheyenne 432	24.6	----	58	63*
Southern Types				
Wichita	27.2	31.8	58	64
Pawnee	24.5	30.2	56	77
L.S.D.	7.8	5.3		

* 1959 only.

Table 18. Rye Yields From the Southeast Farm, 1959.

Variety	Yield Bu/Acre 1958	1959	1958-59	Test Wt 1959	Survival % 1959	Vigor 1959
Pierre	38.3	28.3	33.3	56	88	1.0
Caribou	40.1	31.3	35.7	56	90	1.2
Antelope	49.8	30.4	40.1	56	91	1.8
Tetra Petkus	28.5	17.6	23.0	52	34	2.5
Emerald	41.4	24.0	32.7	55	45	2.0
Balboa	31.3	26.4	28.8	54	86	1.0

Average yield 26.3 bu/Acre; least significant difference 6.6 bu/Acre.

Table 19. Spring Wheat Variety Test at the Southeast Station, Menno, 1956-59

Variety	1959	Average yield bushels per acre 1958-59	1956-59	Test wt. lbs. 1959
Bread Wheats				
Rushmore	10.0	15.4	16.9	56
Lee	7.4	13.6	16.1	56
Selkirk	7.4	14.4	17.8	55
Conley	8.4	13.8	13.1	57
Mida	7.3	15.0	17.5	60
Spinkota	7.5	14.0	15.7	58
Thatcher	10.8	16.6	17.4	57
Canthatch	8.7	15.2	----	57
Lee 6 K.F.	7.2	13.1	----	54
Durum Wheats				
Sentry	5.5	16.0	18.9	59
Yuma	5.5	13.4	14.0	58
Ramsey	2.5	10.8	15.3	57
Langdon	3.0	13.4	16.0	58
Lakota	3.5	14.4	18.4[a]	56
L.S.D.	N.S.	3.1	2.4	

[a/] yield adjusted for 1956.

Table 20. Barley Yield Tests From the Southeast Research Farm.

Variety	Bu/A	Test Wt.	Rank
Betzes	9.1	41	8
Custer	9.3	35	7
Feebar	6.5	36	10
Kindred	2.9	35	12
Liberty	15.3	39	2
Manchuria	6.9	35	9
Otis	15.6	39	1
Plains	10.0	37	6
Spartan	12.2	40	3
Traill	5.2	39	11
Trebi	11.2	38	5
Velvon 11	11.8	33	4
L.S.D. at 5%	5.6		

Table 21. Oat Yields from the Southeast Farm, 1959.

Variety	1957	1958	1959	Avg. 1957-59	Test Wt. 1959
	Yield Bushels Per Acre				
Andrew	83.4	64.1	7.3	51.6	27
Minhafer	98.8	59.2	12.4	56.8	27
Ransom	81.9	62.7	7.4	50.7	27
Cherokee	89.3	57.0	9.5	51.9	23
Marion	79.4	59.4	7.0	48.6	27
Mo-O-205	84.6	69.9	6.9	53.8	30
Newton	90.5	48.3	6.7	48.5	27
Waubay	88.7	55.9	8.5	51.0	31
Burnett	89.9	64.9	8.3	54.4	28
Garry	80.6	64.1	3.5	49.4	25
Sauk	91.9		8.0	45.5(2)	28
Clintland 60	103.2	53.1	4.4	53.6	29
Minton		44.9	7.0		30
Goodfield		41.1	5.4		31
Nehawka		44.0	14.6		31
Macon		46.6	8.9		32

Average yield 7.8 bu/A; least significant difference 4.6 bu/A.

CROP DISEASES AND THEIR CONTROL

Hybrid Corn

C. M. Nagel
Plant Pathology Department

Objective:

To determine the effects of root-rot resistant inbred lines of corn when incorporated into three-way hybrids on root-rot control, drought resistance and yielding ability.

Results:

Unfavorable weather conditions plus the alkali spots on land where these corn plots were grown on the Menno Research Farm presented problems in obtaining experimental data in 1959. However, aside from the alkali effects, the stress created by the drought provided the conditions desired for field testing and selecting the best performing hybrids from a disease control standpoint. Under favorable weather conditions many hybrids may make a good-to-reasonable performance, but under stress from some of our common hazards such as disease and accentuated by drought many of the same hybrids may fail to perform satisfactorily or perhaps fail to set ears at all such as occurred in some fields in 1959. A markedly fewer number appear to possess more of the tailor-made requirements needed to perform under unfavorable conditions such as occurs frequently in some selections of the corn area of the state. From the data in Table 22, although not conclusive, indicates certain of the new experimental disease resistant hybrids may possess superior characteristics which makes it possible for them to perform significantly better than commercial hybrids against drought and to produce acceptable yields despite the hazards which occurred during the 1959 growing season at the Menno Research Farm.

Table 22. The performance and rank of 21 experimental three-way root-rot resistant.corn hybrids in comparison with four high-yielding commercial hybrids commonly grown in the area. Southeast Research Farm 1959.

Experimental or Commercial Hybrid	Rank Based On Acre Yield Bushels	Ear Moisture At Harvest Percent	Rank Based on Performance Score
Expt'l. 1	52.22	20.5	1
" 2	42.00	18.6	2
" 3	33.34	17.9	3
*S. D. 420	32.41	27.5	5
Expt'l. 4	32.18	19.4	4
" 5	28.95	19.8	6
" 6	28.06	21.9	7
" 7	25.82	23.0	8
" 8	24.78	34.5	13
" 9	24.33	23.9	10
*Pioneer 352	24.05	27.2	11
Expt'l. 10	24.01	19.7	9
" 11	22.24	19.2	12
*S.D. 622	20.48	32.3	16
Expt'l. 12	20.38	19.9	14
" 13	18.80	23.0	15
" 14	15.61	24.3	17
" 15	15.53	24.0	18
" 16	11.32	22.6	21
" 17	8.45	29.8	22
" 18	7.27	23.1	20
" 19	6.65	20.0	19
" 20	6.25	27.3	23
" 21	5.64	36.8	25
*DeKalb 410	5.14	28.8	24

Differences in yield of less than 12.5 bushels per acre are not statistically significant.

The 1959 data are based on two replications: Alkali spots in the plots prevented using the data from other replications.

* Commercial hybrids used as checks. Selected on basis of state corn yield tests.

Planted May 14; harvested October 5, 1959.

Should further seasons' experiment substantiate the results of the 1959 season, it may be possible to provide farmers with corn hybrids with more "built in" qualities regarded as necessary to reduce the losses from certain disease problems and thereby provide greater stability to the farm operation.

SMALL GRAIN DISEASES

C. M. Nagel
Plant Pathology Department

The "new" yellow disease problem of oats, wheat and barley was widespread and destructive on these crops during the 1959 season. This disease has also been referred to as the red leaf disease of oats. The yellow dwarf disease has also been the most destructive disease affecting oats throughout the United States during the past season. This disease is caused by a virus which is spread by certain known aphids. Although the same virus is responsible for the disease on oats, wheat and barley, the symptoms are different. On oats it causes the upper leaves to turn a reddish-buff to a bright red color. On wheat and barley it causes the leaves to turn a pale yellow color.

Due to the drought conditions in 1959, which caused unfavorable growing conditions, it was difficult to distinguish between the disease symptoms of this disease on wheat and barley and the damage done by drought. However, there was less difficulty in distinguishing the red leaf symptom on the case of oats.

The disease also causes severe stunting, the tillers fail to produce heads, and yield may be reduced to a few bushels per acre. In fact, many fields were plowed under in 1959 because the plants in these fields were 100 percent severely diseased with virtually no prospects of any yield in sight. An estimate of the dollar loss to farmers would be upwards to a quarter million dollars; however, had the disease struck in a year in which weather conditions were favorable for high crop production, the loss would have been more like 10-50 millions of dollars.

The control of this disease is complicated by the fact that several strains of this virus disease are known to exist, and therefore developing grain varieties to a disease possessing more than a single strain of the disease makes its control much more difficult.

The map, Figure 1, will show the areas in the eastern part of the state where this disease was most damaging on oats, wheat and barley.

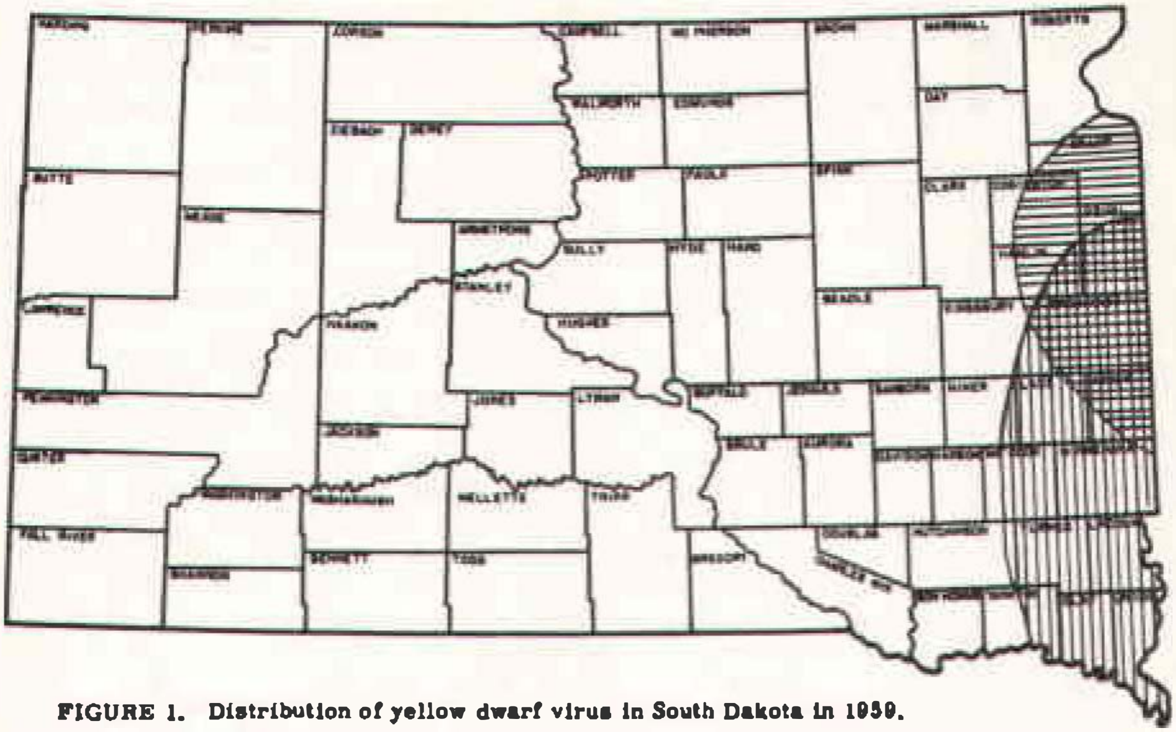

FIGURE 1. Distribution of yellow dwarf virus in South Dakota in 1959.

|||| = **area where BYDV occurred on oats.**

≡ = **area where BYDV occurred on wheat.**

▦ = **area where BYDV occurred on barley, oats, and wheat.**

Infection in oat fields ranged from a trace to 90 percent; wheat, trace to 80 percent; and barley trace to 50 percent. Percentage losses in the areas having the disease were estimated as follows: oats 50, wheat 30, barley 20.

About the second or third week in May, winds from the south carried aphids into eastern South Dakota. These aphids through their feeding process on yellow dwarf diseased oat fields in the southern states carried the yellow dwarf disease virus north in their bodies. Therefore, as they started to feed on the crops in South Dakota, they automatically injected the virus into the grain plants as they sucked the juice from the plants.

By early June, aphids had largely disappeared because of unfavorable conditions. However, the oat crop, spring wheat and barley began to show signs of the yellow dwarf disease and decline of these crops continued until harvest time. The major damage to the crop occurred after the aphids disappeared. It is important to note that the explanation for the delay in the development of the yellow dwarf symptoms is due to the fact that it requires about ten days for the incubation period; that is, between the time the virus first enters the plant and the time that the first disease symptoms appear.

The crop most damaged by this disease in South Dakota was oats, it appears to be the most susceptible of the three crops. Fortunately, a few varieties and unnamed selections of oats possess some degree of resistance to the barley yellow dwarf virus. However, none are well adapted to South Dakota conditions. Nevertheless, these resistant sorts can be useful in a breeding program to develop new virus resistant varieties suitable to our conditions, but this will take time to accomplish.

SOYBEAN CYST NEMATODE DISEASE SURVEY IN SOUTH DAKOTA

M. Komanetsky
Plant Pathology Department, State College
and
Plant Pest Control Branch
United States Department of Agriculture

The soybean cyst nematode* is a serious new disease to the soybean industry in the United States. Although the disease is not known to be in South Dakota, there is a chance this new disease could become established in the soybean growing areas of this state. It currently is spreading in the eastern and south central states.

The Plant Pathology Department in cooperation with the Plant Pest Control Branch of the United States Department of Agriculture has conducted a survey during November and December of 1958. Soil samples were collected in each of 15 counties which includes the principle soybean producing counties. Processing of the soil samples in the Plant Pathology laboratories has been completed and the soybean cyst nematode was not found.

It is fortunate the survey was contemplated and carried out prior to the appearance in South Dakota of this dangerous plant disease. Periodic surveys will be made every other season to determine if the disease has entered the state and, if found, a coordinated program will be worked out for its control.

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* *Heterodera glycines*, Ichinohe

THE SOUTHEASTERN SOUTH DAKOTA EXPERIMENTAL FARM BOARD

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