Plant Science Pamphlet 3

ANNUAL PROGRESS REPORT

NORTHEAST RESEARCH FARMS
Garden City, Watertown and Twin Brooks, South Dakota

INTRODUCTION

The State Legislature appropriated money in 1955 for new research in crops, soils and crop diseases in northeastern South Dakota. A 20-acre site was originally selected. It is located on the Otto Korth farm, 15 miles north of Watertown at the junction of Highways 81 and 20. A second site was added in 1965 at Garden City. It is located on the Everett Fletcher farm, 2 miles north and a half mile west of the Garden City junction on Highway 25. There are 45 acree in this farm for crop and soil management and 15 acres for weed control studies.

In 1969, a third research unit was added to the Northeast Research Farms. It is located one mile east and one and one half miles north of Twin Brooks, on the Max Goerke farm. This farm was established through the combined efforts of the farmers and business men in Grant and Roberts counties. These people solicited contributions for use in paying the land rental and use of a building on the Goerke building site. The new unit will be known as the Whetstone Valley Research Farm. There are 20 acres in this farm for crop and soil management and weed control studies.

These farms provide research facilities to obtain solutions for local problems in crop production and soil management. Soil and crop management experiments include tillage methods and the use of fertilizers and the soil fertility. Crop oriented experiments are conducted on disease control, weed control, and the testing of potentially adaptable varieties.

Evaluation of plant materials by plant breeders in the Plant Science Department are carried on at these farms. Local weather conditions aid in the selection of plants adapted to the area.

There will be a field day at the Garden City Unit July 8, 1970. Tours may be scheduled by the County Extension Agents at either Research Unit.

BRIEF HISTORY

During the coming 1970 season at Garden City, the following general work will be continued: winter wheat hardiness and yield trials; to determine and control the local diseases and insects of potatoes; influence of sorghum row spacing and population on yield; sunflower seed production, and plots to increase the seed supply of some experimental and plant introductions. All experiments are on the contour with roadways located in the grassed drainways for access to the experiments.

The Watertown Unit is utilized for adaptation studies with corn, small grain, winter grain, and for plant disease observations. These studies will be continued on this farm due to its environment and soil condition.

The Whetstone Valley Unit is utilized for corn, sorghum, legume, soybean, small grain weed control in soybeans and plant disease observations. During the 1969 season, three experiments were started namely: Fertilizer rates of nitrogen; Row spacing and plant populations of corn; and corn, sorghum, and alfalfa forage study. In 1970, three more experiments are to be started: Tillage methods for corn; Methods of fertilizer application and Fertilizer rates of phosphorus.

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GARDEN CITY AND WATERTOWN

WHETSTONE VALLEY

1969 CROP SEASON

Table 1. Total Rainfall and Average Tamperature by Months with Their Departure from Long-Time Average at Northeast Research Farms*

Garden City, Watertown and Whetstone Valley Unite

	April	May	June	July	Aug.	Sept.	Oct.	Total
RAINFALL**								
Total in Inches								
Watertown	1.52	3.44	1.96	4.52	2.48	1.86	2.18	17.96
Garden City	1.13	3.44	2.47	6.51	0.76	0.56	2.27	17.14
Milbank	1.89	3.54	2.17	4.66	0.47	0.73	2.62	16.08
Departure from Long-time Avg.								
Watertown	-0.54	+0.57	-1.74	+1.85	-0.30	+0.01	+1.02	+0.87
Garden City	-1.06	+0.59	-1.53	+3.64	-2.20	-1.71	+0.75	-1.52
Milbank	-0.28	+0.66	-1.60	+1.94	-2.40	-1.53	+1.12	-2.09
TEMPERATURE								
Average Monthly in degrees F								
Watertown	37.7	55.0	56.3	66.7	70.2	60.0	46.5	——
Garden City	43.5	54.8	59.3	67.4	70.1	58.3	39.0	——
Milbank	46.7	60.1	61.2	71.8	73.9	62.8	43.6	——
Departure from Long-Time Avg.								
Watertown	-5.5	-1.0	-7.6	-5.6	+1.2	+0.1	-1.2	——
Garden City	-0.8	-2.0	-6.7	-5.4	-0.9	-2.4	-9.6	——
Milbank	+1.3	-1.5	-6.6	-2.4	+1.7	+0.5	-6.9	——
Frost free days								
Watertown	June 21 to October 8 = 109 days							
Garden City	May 11 to October 7 = 149 days							
Milbank	April 28 to October 12 = 167 days							

** Longtime rainfall average for 12 months
Watertown Airport 20.85
Clark 22.46
Milbank 22.81

The past crop season had below normal average temperatures for all months of the growing season, at Garden City. Rainfall was above average at Garden City for May, July and October, and at Watertown for May, July, September and October, but below normal for the rest of the season. Corn was not mature by frost or safe for satisfactory storage. Fall subsoil moisture reserves were 3.72 inches lower than in the spring for wheat and 5.00 inches lower under corn.

* The above rainfalls and temperatures were taken and recorded at the Northeastern Research Farms. The departure from long-time average was obtained by comparing data taken at the farm to the long-time average at the Watertown, Clark, and Milbank Weather Stations, courtesy U. S. Weather Bureau.

Table 2. Periods of Frost-Free Days Recorded at the Northeast Research Farm, Watertown Unit

Year	Last Frost	First Frost	Frost-Free Days
1956	May 4	Sept. 6	125
1957	May 20	Sept. 16	119
1958	May 23	Sept. 16	116
1959	May 22	Sept. 10	110
1960	May 11	Sept. 19	123
1961	May 10	Sept. 25	138
1962	April 30	Sept. 20	143
1963	May 23	Oct. 28	158
1964	June 11	Sept. 10	92
1965	May 28	Sept. 9	104
1966	May 20	Oct. 5	138
1967	May 21	Sept. 26	129
1968	May 24	Oct. 3	132
1969	June 21	Oct. 8	109
		1956-69 Average Frost Free Days	124

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

Garden City and Watertown Units

Q. S. Kingsley

TITLE: The Long Term Effect of Row Versus Broadcast Method of Fertilizer Application on Soil Fertility and Crop Rotation.

OBJECTIVES OF EXPERIMENT:

1. To compare the effect on crop yields of fertilizer applied in a row with that broadcast and then plowed under or disked in.

2. To determine the relative management efficiency of the three methods in terms of economic returns for labor, equipment, and other inputs for the typical South Dakota farms.

3. To determine the effect of the three methods on soil tests and the effect of residual carryover on the succeeding crop yield.

NEED TO STUDY:

1. Should the farmer buy equipment for the row application of most of the phosphare required for small grain and row crops: Additional labor would be needed during busy planting time for this applciation in comparison to the other methods.

2. Should he eliminate the additional labor by having higher rates of phosphate broadcast with nitrogen and plowed under?

3. What is the long term effect on yield and soil fertility of (1) a small amount of fertilizer applied to a small part of the surface soil as compared to (2) a large amount of fertilizer mixed throughout the surface soil?

EXPERIMENTAL PLAN:

The plots receiving nitrogen are to receive the same amount, but the two crops will receive different amounts. Corn has received 50 pounds of nitrogen and wheat 30 pounds of nitrogen per acre. The phosphate applications very according to the following summary. In this summary the rates are expressed as elemental phosphorus and nitrogen in pounds per acre. Phosphorus may be converted to phosphorus pentoxide by multiplying the elemental P shown in formula by 2.3. To reverse this procedure multiply 0.44 times P_2O_5 to get the elemental quality.

Corn - 6 treatments	Wheat - 6 treatments
N-P-K	N-P-K
0-0-0	0-0-0
0-0-0	30-0-0
50-0-0	30-7-0
50-7-0	30-15-0
50-15-0	30-15-0
50-30-0	30-30-0

The three initial corrective treatments were included in each experimental block, as is shown below. These ratios are also in terms of the elements N,P, and K. A maintenance treatment will be applied to each of these plots starting with the first crop season. No K is added in the maintenance fertilizer. The fertilizer treatment for corn is to be:

Corrective	Maintenance*
100-0-0	50-0-0
100-60-0	50-7-0
100-60-100	50-7-0
for wheat	
100-0-0	30-0-0
100-60-0	30-7-0
100-60-100	30-7-0

*The fertilizer will be broadcast in the fall and spring plowed.

There are 8 replications of the plots for each crop-year block and treatment, except for the corrective treatments which was applied to 3 plots in each of the 16 blocks. These three plots are on one end of each block. A randomized block design was used and the plots will remain as whole plots.

N and P contents will be determined for the grain, the corn stover, wheat straw and for the soil at the beginning and the end of the experiment.

Fertilizer will be applied at three different times:

1. Fall application, with plowing the following spring.
2. Spring application after plowing, then disk in.
3. Drill-with-the-seed application or starter.

Weed control will be maintained at the discretion of the farm manager.

RESULTS:

Table 3. Time, Rate and Placement of Fertilizer for Wheat

	Time of Method of Fertilizer Application Yield in Bushels per Acre								
Treatment	Broadcast Fall		Av. protein	Broadcast Spring		Av. protein	Drill with Seed		Av. protein
	1969	65-69	65-68	1969	65-69	65-68	1969	65-69	65-68
0-0-0	14.3	20.8	12.4	13.4	22.0	12.4	12.1	19.8	12.3
30-0-0	20.8	26.0	13.9	18.6	26.4	13.6	20.8	26.3	14.0
30-7-0	27.0	29.7	14.7	20.8	28.0	13.8	27.4	31.1	13.5
30-15-0*	29.0	31.7	13.7	18.3	28.0	12.8	27.9	30.7	13.3
30-15-0**	23.8	29.7	13.8	15.5	26.1	12.7	23.0	29.5	13.4
30-30-0	28.1	31.3	13.5	18.4	28.6	12.7	24.0	31.2	13.0

*30-15-0 Preceded by corn 1968 with 50-15-0 treatment
**30-15-0 Preceded by corn 1968 with 0-0-0 treatment
planted April 26, harvested August 11.

DISCUSSION AND INTERPRETATION OF RESULTS:

For the past 5 years, the addition of phosphorus with nitrogen increased yields more than nitrogen alone when compared to the untreated plots. Fall broadcasting of fertilizer at 30-15-0 pounds per acre, produced 14.7 bushels more wheat than the untreated plot in 1969 and 10.9 bushesl more on the 5 year average. Spring broadcasting of fertilzer at a rate of 30-7-0 pounds per acre, produced 7.4 bushels more than the untreated plots this year, whereas the 5 year average indicates the 30-30-0 treatment to be a better treatment over a period of years. At a rate of 30-15-0 pounds per acre, preceded by 50-15-0 for corn in 1968, fertilizer drilled with the seed in 1969 increased yields 15.8 bushels per acre more than the unfertilized plot. When cost of fertilizer is considered for this treatment, the best treatment for the 5 year period is 30-7-0.

RESULTS:

Table 4. Time, Rate and Placement of Fertilizer for Corn

	Time and Method of Fertilizer Application Yield in Bushels per Acre								
Treatment	Broadcast Fall		Av. protein	Broadcast Spring		Av. protein	Starter In Row		Av. protein
	1969	65-69	65-68	1969	65-69	65-68	1969	65-69	65-68
0-0-0*	88.2	53.4	8.3	77.5	50.3	7.7	67.4	51.0	7.9
0-0-0	85.4	53.3	7.7	76.9	51.6	7.8	68.2	49.1	7.8
50-0-0	93.0	65.4	8.9	84.5	64.7	8.8	82.8	61.3	8.6
50-7-0	102.3	70.4	9.0	87.8	64.3	8.2	84.1	63.6	8.2
50-15-0	98.5	68.6	8.9	90.3	67.5	8.4	85.0	63.3	8.1
50-30-0	97.9	65.9	9.0	87.8	62.8	8.2	80.5	62.1	8.1

*This treatment received 30-15-0 for wheat in 1968
Planted May 20, picked October 3

DISCUSSION AND INTERPRETATION OF RESULTS:

The broadcasting of fertilizer in the fall was the better method for corn in 1969 and during the past 5 years. Yield, Table 4, response from nitrogen alone was not as high in 1969 as those having phosphorus in the ratios. A residual carryover for the 0-0-0 treatment, which was preceded by 30-15-0 in 1968, helped increase yields in fall and spring broadcasting of fertilizer, but not where fertilizer was applied as starter. The results of the 5 year study indicate a small response to residual fertilizer from the wheat crop for fall application and starter treatments. The yields and grain moisture on an over all average are higher than for 1968.

Three plots of each replication received high applications of fertilizer for wheat and corn in 1965. Subsequent to this large application, a maintenance amount is to be applied each year as indicated in Tables 5 and 6.

RESULTS:

Table 5. Large Initial Application of Fertilizer plus Maintenance Fertilizer for Wheat

Rate 1965	Rate 1969	Yield Bu/A	Av. 65-69	Av. Protein 65-68
100-0-0	30-0-0	22.5	27.5	13.6
100-60-0	30-7-0	24.3	30.6	13.9
100-60-100*	30-7-0	25.8	31.5	14.1

*Potassium was applied in 1965 only.

DISCUSSION AND INTERPRETATION OF RESULTS:

As a brief resume, wheat was planted initially in the spring of 1965 after the plots received the initial heavy application of fertilizer reported in Table 5. Each fall starting with 1965, the maintenance amounts of fertilizer were applied and then plowed under the following spring.

The 30-0-0 fertilizer treatment increased wheat yielde by 1.7 bushels, Table 3, but there was no residual effect of the 100-60-0 and the 100-60-100 treatments in 1969 when compared to the 30-7-0 fall broadcast treatment, Table 3.

RESULTS:

Table 6. Large Initial Application of Fertilizer Plus Maintenance Fertilizer for Corn

Rate 1965	Rate 1969	Yield, Bu/A	Av. 65-69	Av. Protein 65-68
100-0-0	50-0-0	86.9	66.9	8.4
100-60-0	50-7-0	87.0	69.3	8.4
100-60-100*	50-7-0	95.9	70.8	8.8

*Potassium was applied in 1965 only.

DISCUSSION AND INTERPRETATION OF RESULTS:

Corn was planted following these heavy applications of 1965 and the management was the same as for fertilized wheat. By comparing Table 6 to the fall broadcast treatment in Table 4 the effect of residual fertilizer becomes apparent. There are no increases in yield above those shown in Table 4 for the fall broadcast treatment.

RESULTS:

Table 7. Time, Rate and Placement of Fertilizer for Wheat. Fall Broadcast Fertilizer, Moisture Use and Bushels Per Inch of Water Utilized

Treatment N+P Lbs/A	Yield Bu/A	Water Loss Inches*	Precip. During Season	Loss from Profile and Precip. **Inches Used	Bushels Per Inch of Water Used***
0-0-0	14.3	3.80	13.52	17.32	0.83
30-0-0	20.8	3.56		17.08	1.22
30-7-0	27.0	3.53		17.05	1.58
30-15-0(1)	29.0	2.63		16.15	1.80
30-15-0(2)	23.8	5.01		18.53	1.28
30-30-0	28.1	2.91		16.43	1.71
1000-0-0(3)	22.5	4.03		17.55	1.28
100-60-0(4)	24.3	4.30		17.82	1.36

*Soil water loss in the 3-foot section of the soil from April 22 to Sept. 2 when the soil was near the wilting point.

**Loss includes water used by plant, evaporation, and runoff after receiving precipitation. Even though some is lost, all figure into the total used.

***Calculated by $\frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}}$ = bushels of grain produced per inch of water used.

(1) Preceded by 50-15-0 in 1968
(2) Preceded by 0-0-0 in 1968
(3) 100-0-0 applied 1965 with 30-0-0 applied every year after.
(4) 100-60-0 applied 1965 with 30-7-0 applied every year after.

Table 8. Time, Rate and Placement of Fertilizer for Corn, Fall Broadcast Fertilizer, Moisture Use, and Bushels of Grain Per Inch of Water Utilized

Treatment N+P Lbs/A	Yield Bu/A	Water Loss Inches*	Precip. During Season Inches	Loss from Profile and Precip. Inches** Used	Bushels per Inch of Water Used***
0-0-0	85.4	5.52	12.66	18.18	4.70
0-0-0(2)	88.2	4.76		17.42	5.06
50-0-0	93.0	5.43		18.09	5.14
50-7-0	102.3	5.78		18.44	5.55
50-15-0	98.5	6.01		18.67	5.28
50-30-0	97.9	4.01		16.67	5.87
100-0-0(3)	86.9	4.52		17.18	5.06
100-60-0(4)	87.0	3.91		16.57	5.25

*Soil water loss in the 3-foot section of the soil from May 14 to Oct. 15 when the soil was near the wilting point.

**Loss includes water used by plant, evaporation and runoff after receiving precipitation. Even though some is lost, all figure into the total used.

***Calculated by $\frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}}$ = bushels of grain produced per inch of water used.

(2) Preceded by 30-15-0 in 1968
(3) 100-0-0 applied in 1965 with 50-0-0 applied every year after.
(4) 100-60-0 applied in 1965 with 50-7-0 applied every year after.

DISCUSSION AND INTERPRETATION OF RESULTS:

The use of stored soil moisture and precipitation during the growing season to produce wheat or corn was studied in the plots fertilized by the fall-broadcast method. With the addition of fertilizer, plants made better use of the moisture and produced more bushels of grain per inch of water used this season. The residual response for fertilizer applied in previous years increased wheat yields and the use of moisture in comparison to untreated plots. The results are reported in Tables 7 and 8.

TITLE: DEPTH PLACEMENT OF FERTILIZER FOR WHEAT AND SILAGE CORN

OBJECTIVES OF EXPERIMENT:

1. Evaluate various methods of fertilizer application.
2. How much will placement increase yield or profits?
3. What effect will fertilizer placement have on moisture extraction?

EXPERIMENTAL PLAN:

1. Land was laid out by areas and each Block contained 8 plots which represented 1 replication. There are five replications in each phase.

2. A rotation of wheat and silage corn is being used.

3. Treatment No. 1 - The fertilizer is broadcast on the stubble and plowed in;
Treatment No. 2 - Plow Sole fertilizer is banded at 21 inch intervals;
Treatment No. 3 - Deep Application - fertilizer is banded at 21 inch intervals and from 14 to 16 inches deep.

4. All fertilizers are applied in the fall except in the first year. Plots not receiving deeply placed fertilizer are subjected to the same deep ripping treatment.

5. Plowing is on the contour along the long axis of the block with beginning and finish of plowing in the alleyways between blocks.

6. Direction of plowing must be altered every year.

7. Planting is on the contour. Silage corn in 30 inch rows, small grain in 7 inch rows.

8. A plant mulch is maintained for winter cover.

9. Soil moisture is sampled with a soil auger at depths of 12 inches, 24 inches, and 36 inches.

10. Soil analysis - Soil samples to be taken at 0-6", 6-12" , and 12-18" for Organic matter, Soluble Nitrates, Available P, Available K, pH, and Soluble Salts.

ROTATION:

1. Wheat-Silage Corn

TREATMENTS:

	Wheat	Corn
Broadcast on stubble	60-0-0 + 15# P*	0-0-0
	120-0-0 + 15# P*	0-0-0
Plow Sole	60-0-0 + 15# P*	0-0-0
	120-0-0 + 15# P*	0-0-0
Deep Placement	60-0-0 + 15# P*	0-0-0
	120-0-0 + 15# P*	0-0-0
Check plot (Ripped)	0-0-0	0-0-0
Check plot (Not ripped)	0-0-0	0-0-0

* The 15 pounds of phosphorus will be applied with the grain drill at planting time.

Ratios expressed in actual N and P.

PLANTING DATES:

1. Wheat; 1 Bushel-1 1/4 Bushel per acre. Chris wheat.
Corn, Silage 17-18 thousand plants per acre.

WEED CONTROL

Small grain; 2, 4-D
Corn - Ramrod and 2,4-D

RESULTS:

Table 9. Depth Placement of Fertilizer for Wheat. Fall Applied in 1968. Moisture Used and Bushels of Grain Per Inch of Water Used.**

Treatment N+P (4) Lbs/A		Yield Bu/A	Water Loss Inches*	Precip. During Season	Loss From Profile and Precip. Inches Used**	Bushels per Inch of Water Used***
0-0-0	No Rip	16.5	2.49	13.52	16.01	1.03
0-0-0	Rip	14.9	2.12		15.64	0.95
60-0-0	Broadcast (1)	27.8	1.74		15.26	1.82
60-0-0	Plow Sole (2)	26.6	1.47		14.99	1.77
60-0-0	Deep (3)	24.7	4.24		17.76	1.39
120-0-0	Broadcast	26.7	2.87		16.39	1.63
120-0-0	Plow Sole	28.2	1.22		14.74	1.91
120-0-0	Deep	26.8	2.96		16.48	1.63

Planted April 26, harvested August 11

*Soil water loss in 3-foot section of the soil from April 22 to Sept. 2 when the soil was near the wilting point.

**Loss includes water used by plant, evaporation and runoff after receiving precipitation. Even though some is lost, all figure in the total used.

***Calculated by $\frac{\text{Bu. of grain produced}}{\text{Loss + precipitation}}$ = bushels of grain produced per inch of water used.

(1) Fertilizer broadcast on surface and plowed in.
(2) Fertilizer applied at 21 inch spacing 6-7 inchs deep.
(3) Fertilizer applied at 21 inch spacing 14-16 inches deep.
(4) At planting time, 15# of P is applied with grain drill to the nitrogen treatments.

DISCUSSION AND INTERPRETATION

Deep tillage loosens and shatters the soil to increase water penetration. It is most effective when the soil is dry as was the case last fall when the plots were prepared for 1970.

The number of bushels of wheat produced, Table 9, per inch of water lost, which was stored in the soil and added by precipitation, was not increased by ripping but was increased by nitrogen application. There were no wheat yield increases due to ripping of unfertilized plots. Water loss from the 3 foot profile was not as great as in Table 7, and the yields were slightly higher for bushels of wheat produced per inch of water used.

TITLE: WINTER WHEAT MANAGEMENT

OBJECTIVES OF EXPERIMENT

1. The effect of various fertilizer rates and ratios and methods of application to winter wheat yield.

2. Comparison of equipment used to plant in stubble mulch maintained by minimum tillage.
3. Relationship of protein content to yield at various fertilizer ratea and tillage methods.

EXPERIMENTAL PLAN

1. Winter wheat follows either oats, barley or flax depending upon the plots available that year.

2. There are 4 replications in the experiment.

3. Fertilizer treatments
   All fertilizers are applied in the fall.
   Levels in different treatments.
   (1) Nitrogen - 30 and 60 pounds per acre.
   (2) Phosphorus - 7 and 15 pounds of actual P per acre.
   (3) One no treatment in each replication.
   (4) Nitrogen and phosphorus are used singly or combined in all ratios.

4. Mechanical treatments
   (1) The fertilizer is broadcast on the stubble and wheat is planted with a press drill, with 7 inch spacings.
   (2) The fertilizer is applied with the seed using a press drill with 7 inch spacings.
   (3) The fertilizer is applied with the seed using a deep furrow drill with 12 inch spacings.

5. Planting rate 1 to 11/4 bushels of Lancer winter wheat per acre.

6. Soil analysis - soil samples to be taken at 0-6" and 6-12" depths for organic matter, soluble nitrates, available P, available K, pH, and soluble salts.

7. Protein analysis (Kjeldahl Method) of the grain from all treatments.

RESULTS:

Table 10. Fertilizer Placement and Plant Methods for Winter Wheat, Yield in Bushels per Acre. Garden City Unit

Actual N and P	Broadcast Press Drill		With Seed Press Drill		With Seed Deep Furrow	
	1969	68-69	1969	68-69	1969	68-69
0-0-0	28.4	24.4	23.8	23.6	17.7	14.9
0-7-0	31.3	25.6	31.7	26.6	21.5	20.3
0-15-0	29.5	25.2	34.9	27.8	22.0	19.4
30-0-0	32.8	29.0	35.6	31.0	21.4	18.0
30-7-0	35.0	35.9	34.0	32.7	24.5	25.2
30-15-0	34.0	37.3	36.0	35.9	26.2	26.0
60-0-0	33.1	33.5	37.2	34.1	24.6	20.4
60-7-0	36.6	39.1	41.8	46.2	28.9	30.6
60-15-0	40.3	46.1	39.3	46.7	30.6	32.2

Planted September 7, 1968, harvested August 1, 1969

DISCUSSION AND INTERPRETATION:

The stubble mulching for this experiment is performed about 1½ weeks after combining. Tillage is 3 to 4 inches deep which is deep enough to cut all weed roots but not deep enough to bury the stubble. Tillage must be at sufficient speed to disturb the soil without turning the stubble under.

The winter wheat yield, Table 10, for the broadcast treatment 30-0-0 plots was 4.4 bushels more than the untreated plots. The addition of phosphorus at 7# and 15# to the 30-0-0 treatment increased yields 6.6 and 5.6 bushels. Where 60-0-0 was applied, yield for the broadcast treatment increased 4.7 bushels. The 60-7-0 and 60-15-0 treatments increased yields by 8.2 and 11.9 bushels per acre more than the 0-0-0 treatment.

The yields where the fertilizer is applied with the seed using a press drill, are higher for some treatments than those where the fertilizer was broadcast. The addition of phosphorus to the 30# and 60# nitrogen treatments increased yields as much as 0.4 bushels for the 30-15-0 when compared to the 30-0-0 and 12.2 bushels more than 0-0-0. A 2.1 bushel increase over 60-0-0 resulted for the addition of 15# of phosphorus to the 60# rate of nitrogen and 15.5 bushel increase over 0-0-0.

The yields for application of fertilizer with the seed using a deep furrow drill or hoe drill are much lower at the Garden City Unit than for plantings using the press drill. Rainfall during the growing season was not normal. Rainfall minimized the yield increase occasionally obtained from wider row spacings. Yield increases of 12.9 bushels were obtained at the 60-15-0 level of fertilization but this yield was 9.2 bushels below the average yield of the 60-15-0 level for the other 2 methods using a press drill.

The combining of 2 fertilizer elements in this fertility program resulted in higher yields for all methods of application. Winter wheat requires fertility for fall starting and again in the spring to continue the growth cycle. Being a two season user of fertility, its requirements are higher than for spring grains, which require fertilizer for one season.

SOIL AND WATER LOSS DEMONSTRATION (RUNOFF)

E. J. Williamson

OBJECTIVES

1. To demonstrate soil and water losses affected by up and down slope farming for two cropping sequences:

   a) 2 year: row crop - small grain
   b) 2 year: row crop - small grain - legume - legume

2. To demonstrate soil and water losses affected by contour farming for the two year cropping sequence.

3. To quantitatively show and compare the effects of up and down slope versus contour farming on crop yield, soil moisture, soil erosion and runoff.

HISTORY AND INSTALLATION:

The demonstration is a cooperative effort between the Soil and Water Conservation Districts of Area I and South Dakota State University. The level N Districts (ten counties) of the Northeast Area provided the funds for the construction materials of the demonstration. Installation was done in the spring of 1968 by personnel of the Experiment Station and Cooperative Extension Service.

DEMONSTRATION DESIGN:

There are nine plots involved in the demonstration. Each plot is 72' long and 14' wide, approximately 1/50 acre. Runoff from each plot is collected in catch basins and measured for both soil and water runoff. All plots are on a 4 2/3% slope. The soil type is Poinsett silty clay loam.

OPERATIONAL PLAN:

1. Two cropping sequences are used:
   a) Corn and oats (2 year)
   b) Corn - oats - alfalfa & brome - alfalfa & brome (4 years)

2. The two year cropping sequence is compared to both up and down slope and across slope planting directions, and the four year sequence to the up and down slope only.

3. Minimum tillage for maximum residue surface cover is maintained.

4. Varieties recommended for the area, fertilizer rates from soil tests and recommended rates of herbicides and insecticides are used. 1969: Kelsey

oats, Pioneer 3956; Vernal alfalfa and Smooth Brome; Fertilizer treatments: Corn 60-35-0, Oats 35-35-0, Alfalfa-oats 30-140-0, all broadcast prior to seeding; Aldrin cutworm control.

5. Planting of small grain in 7 inch rows; row crop in 36" rows.

6. Soil moisture is sampled at 6, 12, 24, and 36 inch depths at beginning and end of growing season for small grain plots, and to the 60 inch depth for all others.

RESULTS:

Table 11. Crop Yields, Moisture Use and Water Use Efficiency-Runoff Demonstration - Garden City Unit - 1969

		Up and Down Slope					Across Slope (Contour)				
Cropping System	Crop	Yield Bu/A or T/A	Season Precip. less Runoff	Water Loss*	Profile Loss + (Precip.- Runoff)**	Water Use Efficiency Bu/In. Water***	Yield Bu/A or T/A	Season Precip. less Runoff	Water Loss*	Profile Loss + (Precip.- Runoff)**	Water Use Efficiency Bu/In. Water***
2 year sequence:	Corn	69.8	10.22	4.18	14.40	4.85	80.5	11.13	4.66	15.79	5.10
Row Crop-Sm. Grain	Oats	79.6	9.68	1.30	10.98	7.25	117.3	9.89	2.55	12.44	9.43
4 year sequence:	Corn	69.8	10.22	4.61	14.83	4.71	--	--	--	--	--
Row Crop-Sm. Grain-	Oats	92.1	9.29	2.89	12.18	7.56	--	--	--	--	--
Legume-Legume	Alfalfa	1.7	--	--	--	--	--	--	--	--	--
	Alfalfa	3.4[1]	--	--	--	--	--	--	--	--	--

* Soil water loss during growing season in 3' soil profile for oats and 5' profile for corn. Initial sampling 5/26/69 and concluding sample September 2 for oats and October 15 for corn.

** Loss includes water used by plant evaporation and precipitation less runoff.

*** Bushels of grain produced divided by profile loss equals bushels of grain produced per inch of water used.

[1] Two cuttings, yield of other plot of the rotation is for one cutting.

Table 12. Rainfall, Runoff and Soil Loss from Runoff Demonstration on 4 2/3% Slope at Garden City Unit - 1969

Year	Rainfall Apr.-Oct.	Cropping Sequence	Crop	Runoff % Rainfall	Runoff Inches	Soil Loss Lbs/Acre
1969	17.14	2 year sequence: Corn-Oats Up & down slope	Corn	12.3	2.10	1924
		"	Oats	5.7	0.98	558
		2 year sequence: Corn-Oats Across slope (contour)	Corn	6.0	1.03	412
		"	Oats	1.2	0.20	91
		4 year sequence: Corn-Oat-Alf-Alf Up & down slope	Corn	11.5	1.97	1506
		"	Oats	7.4	1.27	1149
		"	Alf	1.5	0.26	42
		"	Alf	1.6	0.27	22

Table 13. Effect of Storm Intensity on Runoff and Soil Loss from Corn in a Row Crop-Small Grain Sequence. Runoff Demonstration - Garden City Unit - 1969

Storms			Slope	Rainfall		Runoff		Soil Loss	
				Amount	%	Amount	%	Amount	%
No.	Date	Duration	Direction	Inches	Total	Inches	Total	Inches	Total
1	May 2	—	Up & down	1.70	24	0.13	6	104	5
			Across			0	-	0	-
2	June 25	0.5" in ½ hour and 0.75" in 15 min.	Up & down	1.35	19	0.39	19	560	29
			Across			0.03	3	58	14
3	July 2	—	Up & Down	0.51	7	0.08	4	94	5
			Across						
4	July 16	0.7" in 5 hours and 0.5" in ½ hour	Up & down	1.30	18	0.12	6	50	3
			Across			0	-	0	-
5	July 18	½ hour	Up & down	1.83	26	1.29	61	962	50
			Across			0.98	95	264	64
6	July 21	—	Up & down	0.40	6	0.09	4	154	8
			Across			0.02	2	90	22

DISCUSSION AND INTERPRETATION:

Corn, oats and alfalfa yield comparisons for the two and four year cropping sequences for up and down slope and across slope direction of planting are given in Table 11 and range from 80 to 117 bushels per acre for oats, 70 to 80 bushels per acre for corn and above three ton per acre for two cuttings of alfalfa. The yields are quite similar for the two cropping sequences involved in the up and down slope system but when compared to those of the across slope system of the two year sequence, a 10 and 38 bushel per acre increase is noted for the corn and oats respectively. This yield increase apparently is a result of the more effectiveness of precipitation provided by the across slope (contour) system.

Table 12 shows the total runoff and soil loss for the two cropping sequences that were measured during the 1969 season. The greatest runoff and soil loss occurred with the row crop planted in the up and down slope direction. The runoff and soil loss were two and four times greater respectively in the up and down slope system as opposed to losses occurring in the across the slope system for the two year cropping sequences. This demonstrates the effectiveness that contour systems of farming provide in reducing soil and water loss.

Runoff and soil losses were measured from six different storms that occurred during the season. Table 13 shows the intensity of these storms as well as the amount of runoff and soil loss for each storm occurrence. Two of the six storms were of relatively high intensity, varying from 0.75 inches of rain falling in 15 minutes to as much as 1.83 inches in 30 mnutes. It is the short intensive storms that provided the greatest runoff and soil loss measurements in 1969.

High Nitrogen Experiment

Garden City Farm
1969

Paul Carson

OBJECTIVES:

1. Determine the effect of high rates of nitrogen fertilizer in the yield, maturity, protein content, and nitrate-nitrogen content of the corn produced.

2. Determine over a period of years what happens to the nitrogen that was not used in the production of the first group.

3. Determine if nitrogen not utilized in the growth of the corn causes a pollution problem.

The soil at the site of this experiment is a silty clay loam. It is located toward the base of a north facing elope. Soil tests on the samples taken at planting showed a total of 186 pounds of nitrate-nitrogen in the first 48 inches of this profile. The phosphorus was in the medium range and the potassium was high. The pH was 6.5 and no appreciable soluble salts were present. Samples have been taken to determine the nitrate-nitrogen content of the soil profile. The plant material produced have been sampled for total N and nitrate-nitrogen analysis.

The yields, the percent moisture at harvest time and the protein percent are reported in the accompanying table.

The yield and the moisture content of the grain at harvest do not show much effect of the added nitrogen until the 1000 pound per acre rate is encountered. Here the yield is depressed and the percent moisture at harvest is increased. Part of the yield depression was due to a serious reduction in stand in the plots receiving 1000 pounds of nitrogen per acre.

The Effect of Rates of Nitrogen on the Yield, Moisture Content of the Grain At Harvest Time and the Protein Percent of Corn Grown at the Garden City Experimental Farm in 1969.

Treatments N + P + K	Yield Bu/A	Moisture %	Protein %
0+0+0	71	35	
32+0+0	78	35	
100+0+0	65	37	
320+0+0	74	35	
1000+0+0	36	40	

Planted May 20, picked November 4

PERFORMANCE TRIALS, NORTHEAST RESEARCH FARMS, 1969

Joseph J. Bonnemann

Topography, soil and climate generally define certain areas or boundries across South Dakota. Testing only at Brookings would be an insufficient guide to varietal performance of the major crops grown across the state. Hence, testing is conducted at substations and with farmer-cooperators so those interested can be better informed on the relative performance of the varieties grown under similar environmental conditons.

Winter grain trials failed to survive the winter or material surviving was poor and stands erratic so the trials, at Watertown, were not harvested.

STANDARD VARIETY SMALL GRAIN TRIALS

The spring sown small grains were seeded on April 23 and harvested from August 5 through 14. Spring grains were seeded only at the Watertown unit.

Temperatures were below normal much of the small grain growing season. Precipitation was above normal in May, below normal in June, above in July. This moisture pattern allowed the plants to start off quite well, maintain themselves through June and again take advantage of the above normal rainfall in July. The abnormally low June temperatures complemented the lack of precipitation as growth was slow and moisture needs were not as demanding.

Yields were good to excellent, depending upon the crop, and the quality was generally acceptable.

Spring wheat yields were not high but are considered satisfactory. Manitou, Chris and Polk have performed well the past several years. The semi-dwarfs also have good yields but the results are for only one year. The durums did not yield as well as in past years and the test weights were lower.

The barley yields were high and the grain quality good.

The oat trials were very good. The new Experiment Station release, Kota, did very well and has had a good performance record at this location for several years. Burnett, Clintland 64 and Holden also have good records at Watertown. The test weight was high for most entries.

The flax trial was seeded on May 14 and harvested August 26. The newly recommended lines, Foster and Linott, did quite well in 1969. Foster is a yellow seeded flax. The recommended varieties Nored, Summit and Windom have commendable five-year records.

GRAIN SORGHUM PERFORMANCE TRIALS

The grain sorghum trials were again grown at the Garden City unit in 1969. This is closer to the area where grain sorghums are grown than the Watertown site. The material was seeded on May 27 and harvested on October 7.

The location was subjected to below normal temperatures and below normal precipitation all during the crop year. Only July precipitation exceeded the norms. These conditions do not favor plants of tripical origin. All grain contained at least 33% moisture in the grain on September 24. October 7 was the first frost.

The resulting yields were very good and test weights high. The lateness of severe killing frosts permitted the grain to physiologically mature.

Fifteen entries were included in the 1969 trials. Further information will be found in Circular 199, 1969 Grain Sorghum Performance Trials.

Table 14. Standard Variety Flax Trials, Watertown Unit, 1969

Variety	Test Wt. lb/bu	Yield, b/A 1969	1965-69
Foster	53.5	23.2	
Summit	53.0	22.8	22.6
Nored	54.0	21.8	22.3
Linott	54.0	21.2	
Redwood	53.5	21.2	21.6
Redwood 65	53.0	20.7	
B-5128	55.0	20.1	20.2
CI 2444	53.5	20.0	
Noralta	53.0	19.0	
Windom	55.0	18.8	21.1
Norstar	54.0	18.5	
Norland	53.0	17.0	19.6
Bolley	53.0	13.7	
	Mean yield	19.8	

Table 15. Grain Sorghum Performance Trial, Garden City, 1969

Variety	Height inches	Test Wt. lb/bu	Yield lb/A
DeKalb A-25	43	56.0	4890
NK X3004	42	57.5	4640
NK 120	48	57.0	4610
SD 451	48	57.0	4580
SD 503	54	56.0	4530
Pioneer 894	37	57.5	4470
DeKalb B-32a	52	57.0	4190
Pioneer 887	36	55.0	4140
SD 441	52	55.0	4080
Coop SG10	45	57.0	4000
RS 610	51	54.0	3970
NK 127	40	56.0	3850
Frontier Grassy Grain I	45	57.0	3650
NK Mini-Milo 50A	43	58.0	3500
FMC Rapido	38	53.5	3290
		Mean yield	4160

C.V. = 11.9%

Table 16. Spring-seeded Wheat Trial, Watertown Unit, 1969

Variety	Test Wt. lb/bu	Yield, B/A 1969	Yield, B/A 1965-69
Manitou	60.5	33.8	33.7
6W01859	61.0	33.5	
6W01879	60.0	33.2	
Chris	59.0	32.3	34.8
Tobari 66	57.0	32.3	
Sheridan	60.0	31.6	32.3
Hercules	59.0	30.1	
6W01812	58.0	30.0	
Polk	59.5	29.8	34.6
Wells	57.0	29.7	35.0
Neepawa	59.5	28.9	
Waldron	56.5	25.8	
Leeds	60.0	25.3	
Red River 68	57.0	23.1	
Justin	56.0	20.8	28.5
Thatcher	57.0	17.9	23.2
Fortuna*	54.0	14.2	
	Mean yield	27.8	

*Seed used found to be low in germination and resulting stands were poor.

Table 17. Standard Variety Barley Trials, Watertown Unit, 1969

Variety	Test Wt. lb/bu	Yield, B/A 1969	Yield, B/A 1965-69
CI 11864	49.0	81.8	
Primus II	49.0	75.9	
Paragon	48.5	74.7	
Primus	49.0	72.8	
Larker	48.5	72.4	55.6
Conquest	49.0	69.9	
Dickson	48.5	68.3	49.0
Liberty	48.0	62.0	57.9
	Mean yield	72.2	

Table 18. Standard Variety Oat Trials, Watertown Unit, 1969

Variety	Test Wt. lb/bu	Yield, B/A	
		1969	1965-69
Kota	37.5	126.7	94.4
Sioux	34.5	125.9	
Kelsey	36.5	119.4	
Orbit	35.0	113.5	
CI 8304	36.5	113.3	
Portal	36.0	113.2	
Brave	37.0	110.6	88.5
Rodney	35.0	109.6	80.0
Wyndmere	36.0	107.6	
Burnett	38.0	106.8	91.4
Clintland 64	34.5	104.8	88.3
Dupree	34.0	104.3	86.8
Pettis	39.0	104.0	
Multi M69	35.0	102.9	
Coachman	39.0	100.7	81.7
Lodi	36.0	100.4	79.4
O'Brien	37.0	99.4	
Tyler	35.0	99.2	83.5
Clintford	38.0	98.9	87.1
Jaycee	36.0	96.8	
Holden	35.0	96.1	87.2
Tippecanoe	36.0	94.5	83.8
Fraser	30.0	93.1	
Dawn	35.0	90.7	
Garland	37.5	89.8	80.8
Santee	33.5	88.0	86.2
Multi E69	35.0	70.8	
	Mean yield	103.2	

Table 19. Sorghum Yields at Garden City Plots, 1969 - A. O. Lunden

Entry	Yield per Acre Pounds	Yield per Acre Bu/A	Plant Height	Test Weight
SD102	3090	55	43	54
SD441	4390	78	54	55
SD451	4410	79	49	54
SD503	4840	86	51	56
RS610	4320	77	48	54
RS633	3010	54	46	52
SD25265	5020	90	52	56
SD25228	4170	75	45	56
FSR73	4880	87	50	56
FRS82	5800	103	53	56
LSD	835	14.9		

PERFORMANCE TRIALS OF WINTER GRAIN, SPRING GRAIN, SUNFLOWERS AND POTATOES. GARDEN CITY UNIT, 1969. QUENTIN KINGSLEY

Table 20. Standard Variety Wheat Trials

Variety	Yield Bu/A	Test Wt. Lb/Bu
Chris	42.5	57.5
Sheridan	39.3	58.5
Waldron	35.6	57.0
Manitou	33.3	58.0
Rushmore	32.9	58.0
Selkirk	32.7	58.0
Crim	31.5	55.5
Justin	29.6	55.5
Polk	27.5	56.5
Red River 68	26.3	56.5
Fortuna		
Durum		
Leeds	34.8	59.5
Wells	30.6	54.5

Planted April 29, harvested August 6.

Table 21. Standard Variety Barley Trials

Variety	Yield Bu/A	Test Wt. Lb/Bu
Larker	70.2	45.5
Dickson	68.7	46.0
Primus 2	66.8	47.0
Conquest	65.5	44.5
Liberty	61.0	45.5

Table 22. Standard Variety Oat Trials

Variety	Yield Bu/A	Test Wt. Lb/Bu
Kelsey	114.3	35.0
Kota	104.2	37.5
Orbit	104.2	34.5
Portal	102.2	37.0
Lodi	97.7	35.0
Sioux	94.1	33.5
Garland	93.5	35.5
Burnett	85.3	36.0
Clintland 64	84.5	36.0
Holden	84.5	35.5
Brave	83.6	36.0
M 68	82.8	36.5
Clintford	80.5	38.5
Tyler	78.8	35.0
Jaycee	77.7	36.0
O'Brien	74.6	37.5
E 68	73.7	36.0
Pettis	70.4	39.0
Tippecanoe	66.7	35.5
Ortley	63.9	32.0

Planted April 29, harvested August 6

Table 23. Standard Variety Winter Wheat Trials

Variety	Garden City Test Wt Lb/Bu	Garden City Yield, Bu/A 1969	Garden City Yield, Bu/A 1967-69	Watertown Test Wt Lb/Bu	Watertown Yield, Bu/A 1969	Watertown Yield, Bu/A 1967-69
Winoka	58.0	34.7	42.7	58.0	36.3	41.5
Lancer	57.0	29.7	41.0	57.5	32.7	39.5
Minter	57.5	29.9	36.9	58.5	34.2	39.6
Hume	56.0	27.4	33.1	57.5	34.2	39.4
Trapper	58.0	31.3		57.5	23.6	
Gage	56.5	28.9		58.5	29.4	
Scout 66	56.5	27.6		58.0	29.9	
Trader	57.0	27.2		57.5	30.9	
Guide	55.5	21.2		57.0	23.0	

Planted September 7, 1968, harvested August 1, 1969

Table 24. Standard Variety Rye Trials

Variety	Garden City Test wt. Lb/Bu	Garden City Yield, Bu/A 1969	Garden City Yield, Bu/A 1967-69	Watertown Test wt Lb/Bu	Watertown Yield, Bu/A 1969	Watertown Yield, Bu/A 1967-69
Von Lochow	51.0	36.4	43.5	53.5	47.1	39.2
Frontier	49.5	23.7	38.7	53.0	38.6	33.6
Caribou	48.0	17.5	33.0	53.0	34.9	30.2
Pierre	49.0	17.9	30.8	53.0	28.5	27.1
Pearl	49.0	25.6		52.5	48.4	
Elk	48.5	19.8		52.5	40.5	

Planted September 7, 1968, harvested August 1, 1969

Table 25. Sunflower Performance Trials

Variety	Yield Lb/A
Peredovik	1216.4
68-61	1033.2

Planted May 26, harvested October 24

Table 26. Potato Performance Trials

Variety	Yield lbs/A
Pontiac*	22,070.4
Pontiac**	24,087.1
Iowa 6413*	12,680.8
Shur Chip***	10,018.8
Sioux***	8,857.0

*Received 300# of 20-20-10 fertilizer per acre, no insect treatment.
**Received 300# of 20-20-10 fertilizer per acre, and 2.5# of Thimet per acre row, actual or 25# of 10% granule.
***No fertilizer or insect treatment.
Pontiac and Iowa 6413 planted May 12, Dug September 8.
Shur Chip and Sioux planted May 28, dug September 29.

SUNFLOWER VARIETY TESTING

Harry A. Geise

OBJECTIVE:

To compare different types, varieties, and experimental lines of domestic sunflowers for seed yield, seed quality, adaptability, and performance.

MATERIALS AND METHODS:

A test containing 23 selections of domestic sunflowers were seeded May 13. All plots received a herbicide treatment of Ramrod 20G broadcast at 4 pounds of active chemical per acre. The herbicide was applied as a postplant-pre-emergence treatment.

Harvesting was completed on September 30. Seed yields are an average of 4 replications and are reported as pounds of clean seed per acre.

RESULTS:

Table 27. Sunflower Variety Yield Trial - Northeast Research Farm (Garden City Unit), 1969.

Variety	Date of Flowering	Height Inches	Test Weight Pounds/Bushel	Seed Yield Pounds/Acre
OILSEED TYPE				
P-21-4-1#-4-6# x HA 60	8-3	64	32	2420
P-21ms x HA 60	8-3	80	31	2360
Valley	8-4	68	31	2130
P-21-4-4-12# x HA 60	8-4	63	30	2130
P-21-4-4-6# x HA 60	8-4	65	30	2110
P-21-4-1#-18# x HA 60	8-3	65	31	2090
VNIIMK 89.31	8-3	70	30	1850
P21ms sel. x Menn. RR 18-1	8-2	61	30	1770
VNIIMK 89.31 (66)	8-4	67	31	1700
SD 68002	8-2	61	32	1650
SD 68001	8-3	59	31	1550
Majak	8-5	67	32	1500
Peredovik	8-4	62	30	1480
NK HO 1	8-5	65	33	1460
Peredovik (66)	8-4	66	30	1450
P-21-4-1#-18# x HA 61-1	8-4	60	34	1390
P-21-4-4-6# x HA 61-1	8-4	62	35	1290
P-21ms x HA 61	8-5	57	35	1250
Krasnodarets	8-2	54	31	1250
EDIBLE OR BIRDFEED TYPE				
D-672	8-4	62	26	1900
Lyng Hybrid 1	8-8	69	26	1800
Mingren	8-3	62	24	1710
Arrowhead	8-4	58	28	1510

WHEAT IMPROVEMENT

D. G. Wells, C. L. Lay and W. S. Stegmeier

Regional and advanced winter wheat yield tests were seeded in stubble. The tests were abandoned because of a severe infestation of wild oats in half of the nursery and because of poor stands in many plots due to the shortcomings of our plot seeder for use in stubble.

Several hundred advanced winter wheat selections were tested on summer fallow for hardiness. Some lines survived well enough to permit taking of notes.

A cooperative regional test of durum wheats was grown. The highest yielding line was DT 316 from Canada which yielded 10.0 bushels more than Leeds and 7.0 bushels more than Wells.

A cooperative regional test was grown of spring bread wheats. Chris, the best yielding variety at 34.0 bushels, was 6.0 bushels under the highest yielding semi-dwarf which was 9 inches shorter than Chris.

Table 28. Uniform Regional Spring Wheat Tests, South Dakota, 1969

Entries*	Entry No.	CI or sel. no.	Watertown Lodging 8/13 %	Watertown Leaf rust 7/22 %	Watertown Stem rust 8/13 %	Watertown Test wt. #	Watertown Yield bu.
Marquis	1	3461	40	100S	65S	58.3	19.1
Thatcher	2	10003	33	M	15S	57.3	22.7
Selkirk	3	13100	12	M	R	55.7	18.0
Justin	4	13462	22	MR	5MS	57.8	23.4
Chris	5	13751	33	R	10S	59.7	33.6
Polk	6	13773	15	R	trS	60.1	28.6
Waldron	7	13958	2	R	10MR	56.8	22.8
Neepawa	8	RL4200	5	R	25S	59.8	30.8
Pb*s/Magnif Entererriana	9	RL4220	5	R	R	60.1	31.7
Fta/61-107	10	56579	5	R	R	56.2	25.7
Fta/62-85	11	56694	7	R	65S	59.6	32.2
Polk/ND363	12	ND492	8	R	5MS	58.7	30.8
ND259/Cly/2/Cly/ND122	13	ND493	0	R	1R	57.0	31.0
ND259/Chy/2/Cly/ND122/ etc	14	ND494	7	R	R	57.9	31.0
Jtn*2/3/ND259/C/2/C/ ND122	15	ND495	0	R	5MS	55.4	24.2
Pj60/3/H*7/P54/K184/7* etc	16	Wis271	2	R	R	59.3	39.5
Pj60/3/H*7/P54/K184/7* etc	17	678-1-6-9	0	R	15M	58.4	40.2
II62-2	18	--	13	R	R	56.2	28.7
II62-61	19	--	10	R	R	58.1	30.2
Nrml0/Bvr14//6*Cnb	20	MT677	8	100S	1S	52.1	19.5
Nrml0/Bvr14//6*Cnb	21	MT6723	22	100S	R	52.0	16.3
Red River 68	22	14193	5	R	5MS	59.9	29.8
LSD .05							2.9
CV							7%

*Entries 13 onward are semi-dwarfs
**On 7/16 100% of Marquis was 65% to stem rust and Chris was R

Table 29. Uniform Regional Durum Wheat Tests, South Dakota, 1969

Entries	CI or sel no.	Brookings Stem rust 8/15 %	Watertown Test wt #	Watertown Yield bu.
Mindum	5296	100S	58.2	21.6
Wells	13333	40M	60.2	27.4
Leeds	13768	R	60.7	24.4
Hercules	DT191	R	60.5	27.3
Lk*2/Pelissier	DT316	R	60.5	34.2
Lk*2/Pelissier	DT317	20M	56.9	25.5
D6517	D6517	R	60.6	24.6
61-130/L	D6580	R	59.7	27.5
Lds//Ldn/Br134	D6586	R	60.9	27.2
60-62/61-42	D6674	R	59.0	27.3
60-62/61-42	D6676	R	60.0	29.1
60-62/61-42	D6678	R	55.7	19.7
61-130/61-42	D6687	R	59.4	25.2
61-130/61-42	D6688	5R	60.0	24.3
61-130/61-42	D6690	R	58.9	25.4
61-130/Lds	D6647	R	59.4	24.5
61-130/Lds	D6654	R	59.1	24.6
61-130/Lds	D6655	R	59.3	23.9
61-130/Lds	D6659	R	60.1	23.7
61-130/Lds	D6660	R	59.2	25.6
LSD .05				3.5
CV				10%

SUMMARY OF THREE YEARS RESULTS FROM INSECT CONTROL USING A SYSTEMIC INSECTICIDE

B. H. Kantack, Q. S. Kingsley and Wayne L. Berndt

Demonstration plots have been set up for three consective years of the SDSU research farm at Garden City, South Dakota. Treatments of Thimet (Phorate), a systematic insecticide were applied each year as replicated treatments at planting time. The insecticide was applied as a band treatment at the rate of 2½ pounds actual per acre row (25 pounds 10% granules per acre row). Insect control was excellent in all treated replicates for each of the three years. Light to medium infestations of flea beetles and leafhoppers developed in the untreated plots each year. No foliar sprays were applied to any of the plots during any of the three test years. Yield checks for each of the three years shows the advantage of this treatment.

Table 30. Increases inYields Obtained Using a Systemic Insecticide for Control of Potato Insects

Year	Increase in Yield Treatment Over Check Bu./Acre	*Net Profit Per Acre Realized From Treatment
1969	33.6	$40.38
1968	20.1	20.38
1967	11.3	9.52

*Cost of treatment deducted

Deducting $5.75 for insecticide cost a net profit of $40.38 was realized by using the systemic treatment for insect control. Thimet and Disyston are two systemic insectidices currently recommended for use on potatoes in South Dakota.

WEED RESEARCH

EFFECT OF ROTATIONS AND HERBICIDES ON WILD OATS

J. F. Stritzke, C. E. Stymiest, and Q. S. Kingsley

OBJECTIVE:

To evaluate the effect of crop rotation on wild oats (Avena fatua) control and to evaluate the effect of combining herbicide treatments and crop rotations to reduce wild oat infestation.

LOCATION: Garden City, South Dakota

SOIL TEXTURE: Silty clay loam, 4% organic matter

PLANTING INFORMATION:

On April 28, 1969, ammonium nitrate was added to the corn plots to give 66# actual N. This was plowed down and pop-up of 6-15-0 was used at time of planting corn. The barley plots were fertilized at time of planting with 50-7-0 lb/A of actual. Larker barley was drilled on April 28 and corn was planted May 20, 1969.

SPRAYING INFORMATION:

Triallate (Avadex BW) and Barban (Carbyne) were evaluated for wild oats control in barley grown under two management systems. One and one-half lb/A triallate (15 lb./A granular Avadex BW) was applied to plots in which barley was to be drilled in wheat stubble. The granular triallate was incorporated several days later by a blading operation. One and one-fourth lb/A triallate (1¼ qt. Avadex BW) was applied to spring plowed plots. This chemical was immediately incorporated with a tandem disk. Three-eighths lb/A Barban (3/8 gallon/A Carbyne) was applied to plots when the wild oats were in the 2½ leaf stage of growth. On the other

rotations in the experiment where corn was grown, 4 lb/A propachlor (6 lb./A Ramrod 65W) was banded over row for annual grass control. One-half of each corn plot was band treated with 1 lb/A atrazine plus 1 gallon per acre oil post emergence for wild oats control. The corn was four inches tall and wild oats were 5 inches tall at time of spraying of atrazine and oil.

DATA TAKEN:

The number of wild oats and barley heads were counted in six 6 x 36 inch quadrats in each subplot on July 22, 1969. Barley yields were taken at harvest and corn yields were also taken. The number of wild oats seed in a 80 gm. sample was also determined for each subplot to evaluate wild oats control.

Table 31. The Corn and Barley Yields and Wild Oats Infestation from the Various Treatment

Rotation[1]	Treatment	Stand Counts[2]		Number of Wild Oats seeds/80 gm barley	Yields (bu/A)
		Barley	Wild Oats		
			BARLEY		
1	Triallate	25.9	0.7	82	56
	Carbyne	26.0	0.8	53	48
	No Herb.	25.7	5.0	174	46
2	Triallate	27.7	0.0	40	44
	Carbyne	25.9	0.4	64	40
	No Herb.	23.3	5.5	220	36
			CORN		
3	Atrazine				39
	Control				34
4	Atrazine				37
	Control				33
5	Atrazine				37
	Control				33

[1]Rotation 1 is continual barley with plowing
Rotation 2 is continual barley with stubble
Rotation 3 is corn-barley rotation with plowing
Rotation 4 is corn-barley rotation with stubble
Rotation 5 is corn-corn-barley-barley-barley rotation with plowing
[2]Nine square feet

CORN SCREENING AT NORTHEAST RESEARCH FARM

J. F. Stritzke and C. E. Stymiest

OBJECTIVE:

To compare the effectiveness of new herbicides with some of the recommended herbicides for annual weed control.

MATERIALS AND METHODS:

LOCATION: Garden City, South Dakota

SOIL TEXTURE: Silty clay loam O.M. 4%

PLOT INFORMATION: Plots were 9 x 30 ft. and replicated 3 times. Pioneer 3956 was planted May 20, 1969. Preplant incorporated treatments and pre-emergence treatments were also applied May 20. Preplant treatments were incorporated by disking 4 inches deep with a tandem disk. Herbicide treated plots were cultivated twice and the no herbicide plots 3 times. The herbicides used are given in Table 32. Postemergence treatments were applied June 3 when foxtail were in the 2-leaf stage of growth. Early weed control notes were taken June 24.

RESULTS:

All of the preplant incorporation treatments gave satisfactory control of weedy grasses. Propachlor and alachlor alone and in combinations with other herbicides gave satisfactory control of weedy grasses. A 6 lb./A rate of propachlor gave control of pigweed and lambsquarters but not wild buckwheat. Damage was noted on corn sprayed with C-6989 and S-6115. C-6989 caused brittle leaves whereas S-6115 caused temporary stunting of the corn. SD-15418 applied preemerge did not give satisfactory control of any weeds. However, in an adjacent study at Garden City where the same rate of SD-15418 was incorporated with a shallow disking, 95% control of all weeds was obtained.

Table 32. Weed Control and Corn Yield on Plots Treated With Herbicides

Treatment	Rate lb/A	% Foxtail[1] Control early	% Foxtail[1] Control late	Control of BLW early[2]	Corn Yield Bu/A
Preplant Inc.					
Atrazine	3	90	95	good	77
Butylate	4	82	72	poor	65
Butylate + atrazine	3 + 1	90	96	good	70
Preemergence					
Propachlor	4	87	70	poor	72
Propachlor	6	93	78	good	71
Alachlor	2.5	75	72	poor	64
ACD 15M	3	28	30	poor	62
SD-15418	3	37	33	poor	61
Atrazine	3	57	88	fair	62
Dicamba + alachlor	½ + ½	78	58	good	70
C-6989	4½	83	72	fair	76
Atrazine + Prometryne	1½ + 1½	60	83	poor	57
Atrazine + Propachlor	1½ + 2.9	83	92	good	60
Atrazine + GS-14260	1½ + 1½	48	73	fair	61
GS-14260 + GS-13529	1½ + 1½	58	68	fair	69
Propachlor + Linuron	3 + 1½	93	80	fair	75
Poat emergence					
Atrazine + oil	1 + 1 gal.	80	80	good	62
ACD 15M + oil	1 + 1 gal.	58	40	poor	53
S-6115	1	90	85	good	70
No Herbicide			740 lb.		59

[1]Yellow and green foxtail
[2]Redroot pigweed and lambsquarter

LASSO TIME OF SPRAYING

J. F. Stritzke and C. E. Stymiest

OBJECTIVE:

To determine the effectiveness of applying alachlor (Lasso) preemergence, early and late postemergence for weed control.

LOCATION: Garden City, South Dakota

PLOT SIZE AND DESIGN:

Plots were 9 ft. by 30 ft. and were replicated three times in a randomized complete block design.

PLANTING DATA:

Pioneer 3956 hybrid corn was planted in 36-inch rows on May 20, 1969.

SPRAYING INFORMATION:

Preemergence applications of alachlor were made on May 20, 1969. Early spikelet stage of application was sprayed late when the first leaf of corn was unrolled and the foxtail grasses were in 1- to 2-leaf stage of growth. The late post treatment was applied June 10, when the foxtail grasses were 3 to 4 inches tall.

DATA TAKEN:

Notes on foxtail and wild buckwheat control, number of pigweeds present in 180 sq. ft. and other seed species present, were taken on June 30, 1969. The plots were not cultivated and no yield samples were taken.

Table 33. Date of Application Study of Alachlor Study, 1969

Treatment	Rate #/A	% Control Foxtail	% Control wild buck-wheat	Number of Pigweed Plants	Other Broadleaf Weeds: Lambs quarter	Russian thistle	Kochia
Preemerge							
Ramrod	4	88	33	2.3	X		X
Ramrod	6	90	22	1.3		X	XX
Lasso	2	70	23	0.3	X	X	X
Lasso	3	72	10	0.0	X	X	X
Lasso	4	87	37	1.0	X	XX	XX
Ram + Atr.	2.4 + 1	75	70	1.0			
Early Spike							
Lasso	2	50	23	0.3	X	X	X
Lasso	3	70	53	0.7	XXX	XXX	
Lasso	4	72	48	0.0	XXX	XX	
Late Post							
Lasso	2	30	7	23.3	X	X	XXX
Lasso	3	43	17	13.0	XX		XX
Lasso	4	47	23	22.3			X
No herbicide	--	0	0	13.3	XX	XX	XXX

X - Indicates specified weed is present in one replication out of possible three.

FORMULATION OF SD-15418 (Bladex)

J. F. Stritzke and C. E. Stymiest

OBJECTIVE:

To compare three rates and formulations of SD-15418

LOCATION: Garden City, South Dakota

SOIL TEXTURE: Silty clay loam O.M. 4%

PLOT INFORMATION:

Plots were 9 ft. x 30 ft. and replicated 3 times.

PLANTING DATA:

Pioneer 3956 was planted in 36-inch rows on May 20, 1969.

OTHER INFORMATION:

Plots were not cultivated and no yields were taken.

RESULTS:

None of the preemergence treatments gave satisfactory weed control (Table 1). A shallow incorporation of 3 lb/A of SD-15418 gave excellent control of the broadleaf weeds and the foxtails.

Table 34. Weed Control With Various Rates of SD-15418

Treatment	Rate lb/A	Average Control	
		Foxtail[1]	BLW[2]
Preemerge			
SD-15418 80% WP	2	5	7
" " "	3	33	53
" " "	4	38	58
SD15418 WDL-4	2	7	30
" "	3	40	57
" "	4	23	53
SD15418 10% gran	2	10	23
" " "	3	20	38
" " "	4	23	70
Preplant incorporated			
SD-15418 WDL-4	3	92	95

[1]Green and yellow foxtail
[2]BLW = Redroot pigweed, Lambsquarter, Kochia, and wild buckwheat

SMALL GRAIN SCREENING - 69

J. F. Stritzke and C. E. Stymiest

OBJECTIVE:

To evaluate the weed control properties of currently recommended and new herbicides.

LOCATION: Garden City, South Dakota

PLOT SIZE AND DESIGN:

Plots were 10 ft. wide and 7 ft. strips of wheat, oats and barley were planted across these plots. The plots were replicated 4 times in a randomized complete block design.

PLANTING DATA:

Chris wheat, Larker barley, and Garland oats were drilled in 7-foot stips across plots on April 24.

SPRAYING INFORMATION:

The plots were sprayed with a tractor-type sprayer applying 20 gallons spray solution per acre on June 3, 1969. The wheat, oats, and barley were in the 5-leaf stage of growth and weather conditions were cool. Wild buckwheat, kochia and pigweed were 2 to 3 inches tall and lambsquarter and sunflower were 4 inches tall at time of spraying.

DATA TAKEN:

Early notes on weed control, crop injury, and weed species present were taken on June 30, 1969. Grain samples were taken in the wheat, oats and barley at harvest time. The number of wild buckwheat seeds per 250 grams of grain was determined for each plot.

Table 35. Notes on Weed Control, Crop Injury and Number of Wild Buckwheat Seeds/250 Grams of Grain

Treatment	Rate oz/A	% Wild buckwheat control	Crop Injury			No. of WBW seeds per 250 gms.		
			Wheat	Oats	Barley	Wheat	Oats	Barley
Tordon 202	½ + 4	92				4	12	0
Tordon 202	3/8 + 6	86			0	1	4	12
Tordon 303	3/8 + 6	81			000	4	2	12
Diuron	.8	99	000		0000	1	2	2
2,4-D amine	12	62		00		20	7	8
2,4-D HL ester	8	42		000	0	9	26	7
2,4-D LV ester	8	60		0000		2	1	4
Brom. + MCPA	4 + 4	90		0	0	4	7	8
Dicamba + 2,4-D	1 + 4	76	0		0000	3	1	2
Dicamba + 2,4-D	2 + 4	85		00	000	3	2	8
Dicamba + MCPA	1 + 4	66			0000	3	2	4
Dicamba + MCPA	2 + 4	84			0000	2	2	3
Bromoxynil	4	90				12	2	0
Bromoxynil	6	98				4	2	2
MCPA amine	12	45				104	45	35
Brom. + 2,4-D	4 + 4	98	0	0	00	2	9	11
No Herbicide	--					354	168	237

0 indicates injury to specific crop in one replication out of a possible four replications.
X indicates weed is present in one relication out of a possible four replications.

BROADLEAF WEED CONTROL WITH BROMOXYNIL

J. F. Stritzke and C. E. Stymiest

OBJECTIVE:

To evaluate the weed control and crop injury when oil and a wetting agent is added to bromoxynil.

LOCATION: Garden City, South Dakota

SOIL TEXTURE: Silty clay loam O.M. 4%

PLOT INFORMATION:

Plots were 10 feet wide and 7-foot strips of wheat, oats, and barley were planted across the blocks. Each treatment was replicated 4 times in a randomized complete block design.

PLANTING INFORMATION:

Chris wheat, Garland oats, and Larker barley were planted April 24, 1969.

SPRAYING INFORMATION:

Treatments were applied with a tractor type sprayer applying 20 gallons spray solution per acre on June 3, 1969. All small grains were in the 5-leaf stage and about 6 inches tall. Wild buckwheat was 2-5 inches tall and had 4-5 leaves.

Table 36. Wild Buckwheat Control with Bromoxynil at Garden City During 1969

Treatment	Rate oz/A	Early Weed Control						WBW seed 250 grams		
		% WBW Control	Broadleaf Control K	RT	M	LQ	RW	Wheat	Oats	Barley
Bromoxynil	2	99	XXXX	XXX	X	XX		1	8	3
Bromoxynil	2 + 1 gal. oil	97	XXXX	XXX	X	XXX		0	6	5
Bromoxynil	2 + Tronic	99	XXXX	XX	XX		X	0	4	2
Bromoxynil	4	99	XXXX		X			0	4	4
Bromoxynil	4 + 1 gal. oil	99	XXXX		XXX	X	X	0	2	4
Bromoxynil	4 + Tronic	98	XXX	X		XX		1	4	0
Bromoxynil	6	99	X					0	1	0
Bromoxynil	6 + 1 gal. oil	99	XX			X	X	0	4	3
Bromoxynil	6 + Tronic	99						0	3	0
No Herbicide	--	7 plants / ft.^{2}	XXXX	XX	XXX	XXXX		13	28	19

DATA TAKEN: Early weed control notes were taken July 2, 1969.

(x) The species of broadleaved weeds present in each plot was noted at the time early weed control notes were taken.

The number of wild buckwheat seeds in 250 grams of grain was determined after harvest.

TRIAZIN CARRYOVER AT GARDEN CITY

J. F. Stritzke and C. E. Stymiest

OBJECTIVE:

To evaluate carryover of triazin herbicide

MATERIALS AND METHODS

LOCATION: Garden City, South Dakota

PLOT INFORMATION:

Corn plots in 1968 were 9 x 30 ft. Each treatment was replicated 3 times. In 1969 7-foot wide strips of barley, wheat, oats, and flax were planted across each plot.

OTHER INFORMATION:

The 1968 treated area was worked in the spring of 1969 with a field cultivator. The area was also disked before planting. Chris wheat, Larker barley and Garland oats were planted April 24, 1969. Flax was planted April 30, 1969. The area has silty clay loam soil with 4% organic matter.

Table 37. Atrazine Carryover - Garden City, 1968-1969

		Barley		Oats		Wheat		Flax	
Treatment	Rate #/A	Head Counts	Yield	Head Counts	Yield	Head Counts	Yield	Stand Counts	Yield
Preplant									
Atrazine	2.5	64	48	73	81	80	32	61	18
Pre emergence									
GS-14260	2.5	53	53	70	91	72	30	67	13
Atrazine	2.5	63	40	57	85	64	29	66	16
Ramrod	4.0	70	51	78	102	83	34	63	11
Combinations									
Ramrod + Atr.	2 + 1	55	45	59	68	58	23	57	15
Post Emerg.									
Atr.	1	63	51	70	86	85	32	60	12
Atr. + oil	1 + 1 gal.	50	26	56	46	64	16	73	10
No Herbicide	--	65	61	74	100	71	30	55	10

ATRAZINE CARRYOVER
1967-1969

J. F. Stritzke and C. E. Stymiest

OBJECTIVES:

To evaluate the carryover of atrazine applied two years prior to planting of oats.

LOCATION: Garden City, South Dakota

SOIL TEXTURE: Silty clay loam O.M. 4%

PLOT SIZE AND DESIGN:

The plots were replicated seven times in a randomized complete block design. Plots were 9 ft. by 30 ft. long.

CULTURAL DATA:

Sorghum was grown the first year and small grains the second. The soil was plowed between each cropping season. An oats crop was grown in 1969.

DATE OF SPRAYING:

Treatments were applied by a tractor type sprayer June 28, 1967.

RESULTS:

Yield data from these plots indicated that if there was any carryover from the 1967 application it did not affect the yield of oats. Data from these plots in 1968 indicated that the atrazine had caused yield reductions in wheat and barley.

Table 38. Atrazine Carryover on Oats

Treatment	Rate #/A	Average Yield Bu/A
Atrazine	1	97
Atrazine	2	92
Atrazine	3	98
No Herb.	0	98

CORN DISEASE CONTROL

C. M. Nagel

New Corn Disease in Midwest

A new fungus (a mold) leafspot disease which kills the corn leaves in mid-season, was first observed in southern Wisconsin in 1968. Pathologists at the Wisconsin Agricultural Experiment Station were unable to determine the cause of this serious disease until last summer. The disease also occurred in south eastern Minnesota, northern Illinois and north eastern Iowa. Bushel yields were reduced by as much as 1/2 in some fields.

1969 EXPERIMENTS

Experiments involving the search for resistance and the control of root and stalk rot in hybrid corn was continued in 1969. The tests were different from previous years, in that new inbred lines resulting from current selection studies were introduced into the experimental hybrids included in the test reported in Table 39.

The experimental corn plots experienced both hail and freeze damage in 1969. A late freeze in June and hail damage in mid season undoubtedly reduced yields. However, since the entire experiment received the same amount and type of damage, the results should be comparable between the many different hybrid combinations in the tests.

The experiment contained three different tests and each test contained 40 experimental hybrids (a total of 120), plus the four commercial checks, which appeared in each of the three tests. However, to save space only the top 20 hybrids are reported in Table 39.

The ear moisture at harvest was higher than other years. This lateness, is thought to be due to the slow down in growth, caused by the June freeze and hail damage in mid season.

The yields obtained in 1969 suggests that these experimental hybrids are better adapted to the area than the combinations tried in past years.

Table 39. Performance of 120 Experimental Hybrids, Possessing Varying Degrees or Root and Stalk Rot (Lodging) Resistance in Comparison with 4 Commercial Hybrids Adapted to the Area. Planting Date: May 23. Harvest Date: November 10, 1969. Northeast Research Farm. Watertown.

Experimental Hybrid or Commercial Check	Performance score ranking	Yield Bu/A	Ear Moisture at Harvest %
	Test I		
Expt'l # 1	1	57.07	33.4
" 2	2	56.93	36.2
" 3	4	54.73	33.2
" 4	12	52.43	37.5
" 5	8	52.17	34.2
S.D. 250 (check)	5	51.93	31.7
S.D. Exp' 59	3	51.90	26.2
Expt'l # 6	7	51.77	33.1
" 7	11	51.60	33.7
" 8	6	51.57	32.3
" 9	9	51.40	32.9
" 10	16	51.07	36.0
" 11	15	50.67	34.8
" 12	20	49.90	36.1
Pioneer 3956 (check)	17	49.57	33.9
Expt'l #13	10	49.37	28.8
" 14	19	49.17	34.4
" 15	13	48.90	30.6
" 16	14	48.13	29.2
" 17	26	47.60	26.4

Ave. yield 46.68 bu/acre; ave. % moisture 32.92%; significant diff. (Duncan) - 1.7 bu/acre

Test II

Expt'l # 1	1	64.70	33.2
" 2	4	55.20	32.1
" 3	5	55.13	35.5
" 4	7	55.03	36.6
" 5	3	54.60	29.7
S.D. Exp- 59 (check)	2	53.97	28.0
Expt'l # 6	6	53.53	32.4
" 7	8	53.53	34.6
" 8	9	52.87	33.9
S.D. 250 (check)	10	52.23	33.6
Expt'l # 9	13	52.23	35.8
" 10	17	52.17	40.0
" 11	11	51.73	33.4
" 12	14	51.17	34.7
" 13	16	50.50	34.9
" 14	18	49.77	35.3
" 15	15	49.70	32.1
S.D. 248 (check)	28	49.70	41.3
Pioneer 3956 (check)	12	49.53	29.7
Expt'l #16	20	48.97	35.5

Ave. yield 47.03 bu/acre; ave. % moisture 34.03%; significant diff. (Duncan) - 2.52 bu/acre.

Test III

Expt'l # 1	1	66.17	34.4
" 2	2	60.73	30.5
" 3	3	59.93	30.8
S.D. 250 (check)	7	59.57	35.9
Expt'l # 4	6	58.50	33.0
S.D. Exp' 59 (check)	4	57.73	26.9
Expt'l # 5	9	56.67	33.6
" 6	8	56.63	33.4
" 7	14	56.63	37.9
" 8	10	56.40	35.6
" 9	5	55.90	27.7
" 10	15	55.33	35.8
" 11	17	55.33	36.4
" 12	11	54.70	32.5
" 13	18	54.57	35.3
" 14	12	54.53	32.3
" 15	26	54.40	37.3
Pioneer 3956 (check)	19	54.27	35.2
S.D. 248 (check)	33	54.23	41.2
Expt'l #16	23	53.93	36.0

Ave. yield 52.62 bu/acre; ave. % moisture 33.51%; significant difference (Duncan) - 2.20 bu/acre.

Many factors are necessary to develop a good hybrid and yield is only one of the important characteristics. If a high yielding hybrid does not possess significant protection against root and stalk rot and other diseases its yield may be reduced 15-20 percent in bad disease years such as occurred in 1967 and 1968 in the south eastern section of the state.

CROP DISEASE CONTROL

Winter Wheat Planted in Stubble on Six Different Dates

W. S. Gardner and Q. S. Kingsley

In major South Dakota winter wheat regions, August and early September plantings usually suffer considerable yield reduction due to wheat streak mosaic virus (WSMV) infection. This virus is carried and transmitted to wheat by the feeding activity of the wheat curl mite, Aceria tulipae. In South Dakota control of WSMV usually is achieved by planting winter wheat between September 10th and September 15th.

In 1968-1969 the date-of-planting experiment was extended to the Northeast Research Farms at Watertown and Garden City. Winter wheat was planted on August 15, and every 10 days after that with the final planting on October 4. The experiment was designed to: 1) determine whether or not WSMV was present in the areas, and 2) determine yields of wheat from the different planting dates.

RESULTS:

Repeated disease surveys, inoculation experiments and electron microscopic tests, failed to show any evidence that wheat streak mosaic virus was present in any date-of-planting at either Garden City or Watertown. These tests were conducted both spring and fall at both locations. Symptoms that resembled a virus disease did appear in trace amounts in the fall of 1968 and in greater amounts in the spring of 1969. Tests failed to identify the cause of this disease. Yields were not measurably affected by the presence of the disease.

Some evidence was found that the wheat curl mite was present in corn at both locations in the fall of 1968. The feeding activity of this mite causes symptoms on dent corn called kernel red streak. Trace amounts of this disorder were observed on an unidentified corn hybrid at Watertown. Kernel red streak also was observed at Garden City on the corn varieties Sokota SK-42, TS-49, TS-50; Trojan M-95 and F-99; and on South Dakota 320.

As shown in Table 40, plant height and bushel weight of Hume winter wheat were quite uniform at each location. Yields showed no definite trend in response to planting date, and results from this first experiment appear to be random variation at both Watertown and Garden City. This is definitely different from locations where WSMV is known to occur. At Presho for 10 years and at Highmore for two years, August planted wheat yielded significantly less than September plantings.

Based upon experience with WSMV and other factors controlling wheat production, it appears that early to mid-September would be the recommended time for planting winter wheat in stubble at the Watertown and Garden City locations. Even where yields were good in late September and October, late seeding is not recommended

because of danger of winter killing, and the delayed maturity might predispose plants to greater damage from stem rust in an epidemic year for that disease. August plantings of winter wheat in fallow or stubble are not recommended because of danger of depleting available soil moisture supply. In a dry year this could contribute to conditions favoring winter killing.

It is not possible to state that winter wheat in the Garden City, and Watertown areas would remain free from WSMV. If extensive acreages of winter wheat were planted this virus disease might become a problem. Additional experiments and observations will be required before positive recommendations can be made. The present state-wide recommendations that winter wheat should be planted between September 10 and 15 are supported by these experiments at Garden City and Watertown, and by more extensive experiments carried out at Presho, Highmore and Brookings.

Table 40. Performance of Hume Winter Wheat Planted in Stubble on Six Different Dates at Garden City, and Watertown. 1968-1969.

	Garden City			Watertown		
Planting Date	Mature Height inches	Bushel Weight lbs/bu	Yield bu/A	Mature Height inches	Bushel Weight lbs/bu	Yield bu/A
Aug 15	29	58	29	37	58	38
Aug 25	30	58	35	36	58	29
Sept 4	29	58	27	37	58	34
Sept 14	40	58	37	37	58	42
Sept 24	29	58	32	36	58	33
Oct 4	29	57	40	37	58	23

WHETSTONE VALLEY RESEARCH FARM 1969

TWIN BROOKS, SOUTH DAKOTA

The soil on this farm is mainly Peever silty clay loam with some Cavour silt loam (claypan) spots dispersed throughout the field.

In 1969, all fertility treatments had to be spring broadcast on the surface and worked into the soil. Normally, the fertilizer would be broadcast in the fall and plowed under or to conform to the experimental plan of the experiment.

Corn is the main crop being observed in all but one experiment. The selection of the corn variety for each experiment was made by the Board of Directors for the Whetstone Valley Research Farm. Any changes in varieties will be made with their consent and recommendations for a replacement variety. Long season corn is being used due partly to the length of the frost free period in this area.

The past crop season had below normal average temperatures for the months of June and July of the growing season at the Whetstone Valley farm. The rainfall during the growing period was above average for the months of May and July and below for June, August and September. Corn was not mature by frost or safe for satisfactory storage. The frost free period was from April 28 to October 12, a period of 167 days.

NORTHEAST EXPERIMENTAL FARM COMMITTEE

Member	County	Address
W. H. Schwanke (Chairman)	Codington	Watertown-Rt. #4
Fred Morris (Secretary)	Codington	Watertown
Grant Kellogg	Codington	Watertown-Rt. #2
Harold Hurlbut	Clark	Raymond
William Peterson	Day	Lily
Alfred Skovly	Deuel	Astoria
Lyle Kriesel	Grant	Summit
Oliver Heitsmeyer	Hamlin	Estelline
Donald Naddy	Marshall	Britton
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WHETSTONE VALLEY RESEARCH FARM

OFFICERS AND DIRECTORS

Member	County	Address
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Wilford Anderson, Vice President	Grant	LaBolt
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John Anderson	Roberts	Wilmot
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Gordon Ziemer	Roberts	Browns Valley

Farm Personnel		
Quentin Kingsley, Project Leader	SDSU Plant Sci. Dept.	Brookings
Donald W. Nelson	SDSU Employee	Garden City Unit
Edwin O. Noeldner	SDSU Employee	Watertown Unit

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

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

Whetstone Valley Research Farm
Twin Brooks, South Dakota
Quentin Kingsley

TITLE: Fertilizer Rates - Nitrogen (Area D)

OBJECTIVES OF EXPERIMENT:

1. What is the most profitable rate of nitrogen application for corn? (Soil test indicates available nutrients in soil. Total yield depends on available nutrients and weather conditions.)
2. Will adequate fertilization make soil moisture use more efficient?
3. How much nitrogen can be applied without seriously delaying maturity? Lodging?
4. How much nitrogen can be applied without stimulating insect and disease damage? (There is some evidence that nitrogen influences incidence of root and stalk rot.)
5. Uptake of potassium is restricted by unusually cool temperatures. What response can be expected from potassium in this area with soil testing medium to high for potassium?

EXPERIMENTAL PLAN

Method of Fertilizer Application

1. Broadcast and plow down.

Row Spacing:
1. Thirty (30) inches (8 row plots)

Populations:
1. 14,000 plants per acre final stand
2. Plant spacing - 14.9" in the row.

Variety:
1. Full season corn. (Var. DeKalb XL45)

Fertilizer Treatments: (all actual)

1.	0-0-0	5.	100-25-0
2.	0-25-0	6.	200-25-0
3.	100-0-0	7.	150-25-0
4.	50-25-0	8.	150-25-50

Conversion Factors:

$P \times 2.3 = P_2O_5$ $\quad 25 \times 2.3 = 57.50\ P_2O_5$

$K \times 1.2 = K_2O$ $\quad 50 \times 1.2 = 60.00\ K_2O$

Replications:
1. Six (6) replications

Area of Land in the Experimental Block
1. 1.56 acres

Plot Size:
1. 20' x 60' (8 row plots)

Soil Mosture Samples:
1. Take six (6) tests per plot, three (3) replications, and five (5) feet deep at 0-6", 6"-12" and at 1 foot increments from there down.
2. Take on these treatments:
   A. 0-0-0 B. 100-25-0 C. 200-25-0

RESULTS:

Table 41. Nitrogen Fertilizer Rates for Corn, Whetstone Valley Farm

Fertilizer	Yield Bu/A # 2 Corn	% Moisture in Corn at Harvest
0-0-0	37.4	33.1
0-25-0	75.1	28.2
100-0-0	86.6	32.1
50-25-0	89.8	30.3
100-25-0	90.4	31.1
150-25-0	96.0	28.3
200-25-0	91.0	31.8
150-25-50	83.6	30.5

Planted May 28, harvested October 17

DISCUSSION AND INTERPRETATION

The fertilizer used for this experiment was broadcast in the spring of 1969 on plowing and worked in. The ratios of fertilizer used are actual N-P-K which were applied this fall and plowed down. The phosphorus level is constant with nitrogen being the variable in this experiment. Potassium is included as a soil corrective treatment.

The addition of 50 pounds of potassium to the 150-25-0 treatment did not increase yields this year. The 200-25-0 treatment increased yields 0.6 bushels when compared to the 100-25-0 and 1.2 bushels more than the 50-25-0 treatment. At a ratio of 150-25-0, a yield of 96.0 bushels of corn was produced which was 58.6 bushels more than the 0-0-0 treatment.

A plant population of 14,000 was used for this experiment.

TITLE: Row Spacing and Plant Populations (Area E)

OBJECTIVES OF EXPERIMENT:

1. What is the optimum row spacing and plant population for this area?

2. Is there a greater need to go to narrower rows with higher plant populations?

EXPERIMENTAL PLAN:

Method of Fertilizer Application:

1. Broadcast and plow down

Row spacings:

1. 30", 35" and 40" (4 row plots)

Populations:

1. 9,000, 12,000, 15,000, 18,000, 21,000 plants per acre final

Variety:

1. Full season corn. (Var. 3582 Pioneer 103-105 day, Short Single Cross)

Fertilizer Treatment:

1. 150-25-50 (To eliminate fertility as a variable)

Replications:

1. Four (4) replications

Area of Land in Experiment:

1. 1.05 acres in the experimental block

Plot Size:

1. 13'4" x 40' (4 row plots)

RESULTS:

Table 42. Corn Row Spacing and Plant Populations

Plant Population Thousands	Yield Bushels Per Acre of #2 Corn Row Spacing in Inches					
	30"	% Moisture	35"	% Moisture	40"	% Moisture
9	88.3	28.5	93.0	23.9	64.1	29.7
12	83.6	26.9	94.3	29.3	76.7	30.1
15	73.6	25.8	69.6	30.5	66.9	31.7
18	71.3	25.5	65.0	31.5	53.8	28.9
21	81.6	27.0	86.4	30.9	81.9	28.5

Planted May 28, harvested October 17.
Fertilizer, 150-25-50 over all application.

DISCUSSION AND INTERPRETATION:

The highest yields of corn were produced in the 30 and 35 inch row spacings at 9 and 12,000 plants per acre. The lower yields occurred in the 15 and 18,000 plant population plantings and for all row spacings, except the 15,000 plants per acre in 40 inch rows. In the 40 inch rows, 21,000 plants per acre produced the highest yield of corn. The moisture in the corn varied somewhat with the yields from these different plant populations and row spacings.

The fertilizer used for this experiment is reported as actual N-P-K, and would be broadcast in the fall and plowed down. In the spring of 1969, the fertilizer was broadcast on top of plowing and disked in.

TITLE: Corn, Sorghum and Alfalfa Forage Study (Area F)

OBJECTIVES OF EXPERIMENT:

1. Determine yield of crop under similar conditions in 30 and 40 inch row spacings and various plant spacings in the row.

2. Which crop will produce the higher protein content and TDN.

EXPERIMENTAL PLAN:

Method of Fertilizer Application:

1. Broadcast and plow down

Row Spacing:

1. 30" and 40" (4 row plots)

Population:

1. Corn - 12,000, 16,000, 20,000, 24,000, Plants per acre final stand

2. Sorghum - 25,000, 50,000, 75,000, 100,000 Plants per acre final stand

Variety:

1. Corn - Funks G4384 - 100+ day

2. Sorghum - Waconia (Rox Orange)

3. Alfalfa - Team, Vernal, AR-1, Blackburns Ranger, Saranac, Glacier, Warrior, Dawson

Fertilizer Treatment for Corn and Sorghum:

1. 150-25-0

Replications:

1. Four (4) replications

Plot Size for Corn and Sorghum:

1. 13'4" x 30' (4 row plots)

Plot Size for Alfalfa:

1. 5'6" x 30'

Fertilizer Rate for Alfalfa:

1. 18-46-0

Area of Land in Experiment:

1. Corn - 0.66 A; Sorghum - 0.66 A; Alfalfa - 0.20 A.

RESULTS:

Table 43. Sorghum Forage, Tons Per Acre Wet and Dry

Row Space Inches	Population Thousands	Wet Tons/A	% Moisture	Dry Tons/A 12% Moisture
30	25	17.4	67.5	6.4
40		17.0	66.5	6.5
30	50	18.9	67.0	7.0
40		17.1	69.4	5.9
30	75	21.0	67.2	7.8
40		18.7	67.5	6.9
30	100	22.1	71.7	7.0
40		18.2	68.2	6.6

Planted May 29, silage taken September 17.

Table 44. Corn Forage, Tons Per Acre Wet and Dry

Row Space Inches	Population Thousands	Wet Tons/A	% Moisture	Dry/Tons/A@ 12% Moisture
30	12	13.6	72.2	4.3
40		14.3	70.6	4.8
30	16	14.8	72.8	4.6
40		14.0	74.6	4.1
30	20	14.4	71.6	4.6
40		14.9	73.2	4.5
30	24	15.7	72.3	4.9
40		14.6	72.1	4.6

Planted May 29, silage taken September 17.

DISCUSSION AND INTERPRETATION:

The sorghum and corn used in this experiment were seeded in excess of the highest population. When the plants had emerged above the ground they were then manually thinned to the right populations, on a per acre basis. A chemical weed control program will be used on this experiment.

Sorghum forage, Table 43, at 100,000 plants per acre, in 30 inch rows, increased wet tonnage 4.7 tons more than 25,000 plants with the same row spacing. The 100,000 plant 30 inch row combination increased yield 3.9 wet tons more than the same population in 40 inch rows.

Yield differences for corn forage, Table 44, were slight except at the 25,000 plant populations were the difference between 30 and 40 inch rows was 1.1 wet tons. The 24,000 plant population in 30 inch rows produced 2.1 wet tons more than 12,000 plants per acre in 30 inch rows. The percent moisture was higher in corn than the sorghum, Table 43.

HIGH NITROGEN EXPERIMENT

Whetstone Valley Research Farm
1969

Paul Carson

OBJECTIVES:

1. Determine the effect of high rates of nitrogen fertilizer on the yield, maturity, protein content and the nitrate content of the corn produced.

2. Determine over a period of years what happens to the nitrogen that was not used in the production of the first corn crop.

3. Determine the effect of large nitrogen additions on the sodium concentrations in the soil profile.

4. Determine if nitrogen not utilized in the growth of the crop causes a pollution problem.

The site chosed for this experiment is a composite of Peever and Cavour soils. The Cavour is a solonetz member of the composite. The soil samples taken at planting time did not have any appreciable quantities of nitrate-nitrogen present. The available phosphorus content of the surface soil was low. The phosphorus content of the samples taken at lower depths varied and in general were higher than normally encountered. The solonetzic site samples had soluble salts ranging from up to 9.5 mhos per cm somewhere in the profile. The normal profiles had no excess salts present.

The yields, the percent moisture at harvest time and the protein percent are reported in the accompanying table.

The yields were quite variable. This in part was due to the dry weather encountered in 1969 and in part to the experimental site. This site was selected because it had more of the solonetz type soil on it than any other site on the experiemntal farm. These soils because of their restricted root area provided a more limited supply of available mositure than the more normal soils. Soil and plant samples have been taken for nitrate-nitrogen analyses. These analyses have not been completed.

It was interesting to note that the plots receiving the very high nitrogen rates showed less ill effects of the dry weather on August 26th than the other plots. It should also be noted that the stand was poorer on these plots than the other plots. A further observation made on August 26th was that the surface soil to approximately 16 inches was extremely dry. The hard pan area is in the top 18 inches. At a depth of 36 inches the soil was saturated with water. The hard pan layer had prevented roots from obtaining this mosture.

Table 45. The Effect of Rates of Nitrogen on the Yield, Moisture Content of the Grain at Harvest Time and the Protein Percent of Corn Grown at the Whetstone Valley Research Farm in 1969.

Treatments N + P + K	Yield Bu/A	Moisture %
0+0+0	35	36.4
32+0+0	47	34.1
100+0+0	27	39.8
320+0+0	37	38.1
100+0+0	32	40.0

DISEASE PROBLEMS IN HYBRID CORN

C. M. Nagel

All plants, including corn are troubled with diseases, caused by fungi (parasitic molds) bacteria and viruses. Certain of these diseases account for some of our major yield losses in grower fields. One of these is stalk rot. When this disease becomes severe in a field, stalk breakage, ear drop and lodging result. Lodging may reach 60-80% in seasons favorable to development of the disease. Root rot is another but, different disease on corn. However, it is frequently associated with stalk rot. Both of these diseases are caused by parasitic fungi (molds) which live in the soil, and on old stalks from the previous season.

While the root rot disease is present on roots of corn in virtually all years as is stalk rot, there may be little evidence in the way of foliage symptoms from either of these diseases during the growing season except for occasional prematurily killed plants. For the most part, these two diseases do not become serious until about mid August or following pollination and kernel set. Once pollination has occurred and the kernels begin to fill, there becomes a stress on the plant and it is, at this stage that infection by both root rot and stalk rot takes place and spreads inside the stalk and in the roots, rotting away the healthy tissues.

The rotting of the roots causes them to turn brown and die. This results in a root system that has been abnormally reduced in capacity and size, and, does not operate efficiently. Therefore, since the unhealthy roots can no longer obtain from the soil the kinds, nor the proper amounts of nutrients and water from the soil, the corn plant becomes more susceptible to drought injury than a plant which possess resistance to the disease.

The stalk rot organism digests the tissues inside the stalk, thereby weakening its strength by late season and if the disease damage continues sufficiently, lodging and ear drop results. This disease accounted for a yield loss in 1967 and 1968 in the Southeastern portion of the state of 18-21%.

In 1969, 50 experimental hybrids, developed at Brookings over a period of years, were grown at the Whetstone Valley Research Farm. Included, were 5 commercial hybrids, commonly grown in the area, as checks for yield and other comparisons to be made throughout the season.

Accurate information on length of growing season for hybrid corn was not sufficiently known for the area, therefore, in the first season a rather broad range of experimental hybrids were included. A more accurate selection will be possible for 1970 based on the 1969 tests.

Table 46. Performance of 50 Experimental Hybrids, Possessing Varying Degrees of Root and Stalk Rot Resistance (Lodging) in Comparison to 4 Commercial Hybrids Commonly Grown in the Area. Planting Date: May 28. Harvest Date: October 10, 1969

Experimental Hybrid or Commercial Check	Performance score ranking	Yield Bu/A	Ear Moisture at Harvest, %
S.D. 230 (check)	1	56.87	28.5
Expt'l #1	4	54.20	35.4
" 2	2	53.97	31.6
" 3	6	53.80	38.4
" 4	3	52.97	30.1
" 5	8	51.73	34.2
" 6	9	51.07	33.4
" 7	5	50.87	30.3
" 9	11	50.30	35.8
" 9	7	50.20	30.4
" 10	12	50.10	36.8
" 11	15	49.43	35.3
" 12	14	48.80	33.8
" 13	21	48.17	37.6
" 14	13	47.77	31.4
" 15	18	47.67	35.9
" 16	22	47.57	36.4
" 17	17	47.43	33.3
" 18	10	47.13	28.3
" 19	16	46.56	29.8
" 20	25	46.27	36.8
" 21	19	46.20	32.6
" 22	24	45.20	33.7
" 23	28	44.87	38.2
" 24	23	44.30	30.5
" 25	20	44.13	28.0
" 26	27	43.70	33.3
" 27	31	43.33	40.2
" 28	33	42.80	40.8
" 29	26	42.30	28.0
Pioneer 3956 (check)	29	42.23	32.3
Exp'l 30	30	42.13	35.8
DeKalb XL-45 (check)	37	41.70	41.1
Expt'l 31	32	41.33	37.3
S.D. 250 (check)	34	40.00	35.3
Expt'l 32	35	39.83	35.0
" 33	39	38.97	38.4
" 34	36	38.23	31.4

Table 46. (continued)

Experimental Hybrid or Commercial Check	Performance score ranking	Yield Bu/A	Ear Moisture at Harvest %
Expt'l #35	41	37.17	40.5
" 36	40	37.50	37.3
" 37	38	36.87	31.4
" 38	42	36.40	42.5
" 39	44	34.83	43.3
" 40	46	32.97	43.5
" 41	45	31.53	37.8
" 42	48	31.33	46.4
" 43	43	34.83	43.0
" 44	49	28.37	44.9
" 45	50	27.60	43.1
" 46	47	27.13	35.8
" 47	52	25.77	48.0
" 48	51	24.50	36.9
" 49	53	21.80	38.6
Pioneer 3773 (check)	54	21.23	48.1

Ave. yield 41.93 bu/A; ave. % moisture 36.27%; significant diff. (Duncan) - 4.92 bu/A

The experiment performed well until in July when rain fall lessened and, drought conditions intensified during the remainder of the growing season.

Based on the yield performance data, it appears that many of these new experimental hybrids possessed considerable drought resistance and yielded very well in comparison to the commercial check hybrids. The check which did well in the experiment was an Experiment Station release, normally South Dakota 230.

Based on a single years results it would appear that these new disease resistant experimental hybrids could substantially boost the yield in the Northeast area of the state.

Each individual hybrid was replicated 3 times throughout the experiment in a randomized block design.

WEED CONTROL

SOYBEAN SCREENING

J. F. Stritzke and C. E. Stymiest

OBJECTIVE:

Evaluate the weed control and plant injury properties of new and currently recommended herbicides at the Twin Brooks location.

SOIL TEXTURE: Silt clay loam 3.5% organic matter

PLOT SIZE AND DESIGN:

Plots were 10 ft. by 30 ft. and were replicated 3 times in a randomized complete block design.

DATE AND METHOD OF SPRAYING

The preplant and preemergence herbicides were applied June 4, 1969. The preplant treatments were incorporated after spraying with a tandom disk.

CULTIVATION:

All plots were cultivated twice early in the growing season.

RESULTS:

The herbicides used and results are given in Table 47. Foxtail control was taken on all replications, but yields were only taken from one replication. Amiben did not perform as well at this location as it has in other areas in the state. Ramrod and Londox had satisfactory weed control ratings during the season so yield differences may be due to soil variability and not weeda. Yield data were only taken on one replication of this experiment because soil variation was too great in the other replications.

Table 47. Soybean Screening and Foxtail Control, Whetstone Valley Research Farm, 1969

Treatment	Rate #/A	Foxtail Control in row	Foxtail Control between row	bu/A
Preplant Inc.				
Dacthal	10	2.7	2.7	19
Treflan	3/4	2.7	2.7	21
Vernam	3	3.0	2.3	19
Preemergence				
BAS2903	3	2.7	1.0	
BAS2903	4	3.0	1.0	
BAS2903	5	2.7	1.0	
RP-17623	1	2.3	2.0	
RP-17623	2	3.0	3.0	
Ramrod	4	3.0	1.3	17
Amiben	3	2.0	1.0	19
Lasso	2	3.0	2.7	21
Lasso	3	3.0	2.7	21
Preforan	4	3.0	2.7	20
Noraben	2.5	1.7	1.0	
Londax	2 + 1	3.0	1.3	14
Lasso + Lin	1½ + .6	2.3	1.3	
Linaron	2.5	2.3	1.0	19
No herbicide	--	--	--	12

Control ratings based on following:
Good = 3
Fair = 2
Poor = 1

SOYBEAN PRODUCTION

Whetstone Valley Research Farm, 1969

A. O. Lunden

Soybean yields ranged to about twenty bushels per acre but were limited by severe moisture shortage during August and early September. Droughty conditions were especially evident in solonetz (claypan) areas and plot variability was extremely high because of this lack of soil uniformity. The calculated coefficient of variability of over eighteen percent was extremely high for soybeans and no yield differences were significant from variety test plots, Regional Uniform Tests, breeding plots or soybean blend tests. Information obtained from an area planted to narrow rows was also inconclusive. A replicted test containing three row spacings and three varieties was extremely variable and yield differentials were meaningless.

Soybean management studies with the best varieties will be continued in 1970.

Three new soybean varieties are being released in 1970. Two of these, Wirth and Anoka should be especially adapted to the areas in which Chippewa soybeans have been popular as they are of similar early maturity. The third variety, Rampage, is somewhat later and is about two days earlier than Corsoy. Rampage performed very well at Revillo in 1967 and 1968.

SUNFLOWER VARIETY TESTING

Harry A. Geise

OBJECTIVE:

To compare different types, varieties, and experimental lines of domestic sunflowers for seed yield, seed quality, adaptability, and performance.

MATERIALS AND METHODS:

A test containing 23 selections of domestic sunflowers were seeded on May 26. All plots received a herbicide treatment of Ramrod 20G broadcast at 4 pounds of active chemical per acre. The herbicide was applied as postplant-preemergence treatment.

Harvesting was completed on October 8. Seed yields are an average of 4 replications and are reported as pounds of clean seed per acre.

RESULTS:

Table 48. Sunflower Variety Yield Trial - Northeast Research Farm (Whetstone Valley Unit), 1969

Variety	Date of Flowering	Height Inches	Test Weight Pounds/Bushel	Seed Yield Pounds/Acre
OILSEED TYPE				
Valley	8-3	65	33	1665
P-21ms HA 60	8-2	64	32	1590
P-21-4-4-12# x HA 60	8-1	62	30	1470
P-21-4-4-6# x HA 60	8-2	50	31	1460
P-21-4-1#-4-18# x HA 60	8-3	59	30	1430
NK HO 1	8-2	64	33	1350
P-21-4-1#-4-18# x 61-1	8-2	56	36	1325
VNIIMK 89.31 (66)	8-4	64	31	1240
SD 68002	8-1	56	31	1210
Peredovik (66)	8-4	71	30	1205
P-21ms x HA 61	7-31	60	35	1145
SD 68001	7-31	43	31	1548
Peredovik	8-4	63	30	1105
Majak	8-2	65	32	1090
VNIIMK 89.31	8-3	62	31	1030
SD 68003	8-2	52	28	1025
P-21-4-1#-2x3 x HA 61-1	8-4	60	35	985
Krasnodarets	8-1	56	32	840
P-21-4-1#-4-6# x HA 61-1	8-3	58	34	830
P-21-4-4-6# x HA 61-1	8-5	66	34	640
EDIBLE OR BIRDFEED TYPE				
D-672	8-2	60	28	1405
Arrowhead	8-1	62	29	1365
Mingren	8-2	54	22	1315

WHETSTONE VALLEY UNIT

CORN PERFORMANCE TRIAL

Joseph J. Bonnemann

With the establishment of the Whetstone Valley Unit, the corn performance trial previously conducted at Watertown were moved to the Whetstone site. The trials were initially seeded so the populations of approximately 12- and 15,000 plants per acre would be achieved in each of three replications. No statistical difference was found for population differences and the yields reported are the mean yield of six replications. Seeding was done on May 29 and harvesting completed October 23.

Thirty-seven corn hybrids were included in the trial. The yield averaged 68.3 bushels per acre and the average moisture in the shelled corn was 28.1 percent. The trials were havested with a picker-sheller.

Circular 198, 1969 Corn Performance Trails presents additional information on this trial.

Table 49. Corn Performance Trial, Whetstone Valley Unit, 1969

Variety	Cross	Performance rating	Percent mositure shelled corn	Yield B/A
SD PP103	M2x	1	26.4	80.7
SD PP112	M3x	2	25.5	77.2
Pioneer 3773	2x	7	30.7	76.8
SD Exp 75	3x	5	29.4	76.2
SD Exp 70	3x	4	27.8	75.4
Northrup-King PX 442	3x	3	23.0	75.1
Northrup-King PX 476	3x	8	25.8	73.7
SD Exp 52	3x	11	28.9	73.5
Pioneer 3910	2x	9	26.5	73.3
Pioneer 3956	2x	6	24.8	73.1
SD Exp 54	M3x	13	28.2	72.9
Coop S 102	2x	12	27.3	72.4
Coop D 110	4x	14	26.7	71.9
SD Exp 71	M3x	16	29.2	71.8
Stull 604 SX	2x	15	27.3	71.1
SD Exp 64	4x	18	27.8	69.9
Pioneer 3715	3x	21	30.7	69.7
Northrup-King PX 428	3x	10	21.6	68.9
SD Exp 53	3x	19	28.0	68.8
SD Exp 63	3x	27	30.8	68.3
SD Exp 65	3x	23	28.8	67.9
SD PP101	M2x	20	27.8	67.9
Pioneer 3935	2x	17	24.4	67.8
Stull 620 SX	2x	26	29.9	67.8
Lincoln Mellowdent HQ16	2x	24	29.2	67.8
Northrup-King PX 446	3x	25	25.9	65.7
Stull 608 Y	4x	29	28.7	65.2
Pioneer 3582	2x	31	30.1	64.7
SD 250	4x	28	26.5	64.5
SD 248	3x	30	28.3	63.9
Northrup-King PX 417	3x	22	20.4	63.1

Table 49. (continued)

Variety	Cross	Performance rating	Percent moisture shelled corn	Yield B/A
SD 270	4x	32	28.4	61.9
SD PP105	M3x	35	32.9	60.9
Pioneer 3666	4x	33	29.4	60.4
Stull 627 TX	3x	34	30.0	59.3
SD 420	4x	36	31.3	58.2
Lincoln Mellowdent HQ18	2x	37	41.3	38.5
		Mean	28.1	68.3

PERFORMANCE TRIALS OF SPRING GRAINS AND SUNFLOWERS

WHETSTONE VALLEY RESEARCH FARM 1969

Table 50. Standard Variety Sunflower Trials

Variety	Yield Lbs/A
Peredovik	1286.8
68-61	716.8

Planted May 29, harvested October 17.

Table 51. Standard Variety Oat Trials

Variety	Yield Bu/A	Test Wt. Lb/Bu
Holden	100.6	34.0
Sioux	81.5	36.0
Lodi	81.3	32.0
Kelsey	76.1	33.0
Garland	73.1	34.0
Portal	71.4	34.0
Brave	59.0	34.0
Burnett	55.9	36.0
Clintland 64	55.1	34.0
Tyler	54.9	34.0
Kota	51.1	34.0

Planted May 9, harvested August 7.

Table 52. Standard Variety Barley Trials

Variety	Yield Bu/A	Test Wt. Lb/Bu
Larker	55.3	44.0
Liberty	55.2	44.0
Conquest	47.2	43.0
Primus 2	45.2	44.0
Dickson	43.9	46.0

Planted May 9, harvested August 7.

Table 53. Standard Variety Spring Wheat Trials

Variety	Yield Bu/A	Test Wt. Lb/bu
Manitou	36.8	54.0
Chris	34.2	52.0
Horizon 101	33.2	50.0
Polk	32.4	54.0
Sheridan	29.9	54.0
6WO-1812	27.6	54.0
Waldron	25.0	53.0

Planted May 9, harvested August 7.

Table 54. Standard Variety Flax Trials

Variety	Yield Bu/A	Test Wt. Lb/bu
Linott	21.3	44.0
Redwood 65	21.3	45.0
Windon	17.2	48.0
Noralta	15.2	46.0
Noratar	13.1	47.0
Summit	12.7	50.0
Redwood	11.9	46.0
B-5128	11.8	46.0
Bolley	10.9	46.0
Nored	9.2	47.0

Planted May 9, harvested August 7.