Plant Science Pamphlet 5 — December 1970

ANNUAL PROGRESS REPORT

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

BRIEF HISTORY

During the 1970 season at Garden City and Watertown winter wheat was again grown successfully for the sixth year, in stubble mulch conditions. The yields produced by Hume, Lancer, Minter and Winoka exceeded that produced by the spring wheat, Chris. Other work which will be continued in 1971 on the Garden City Unit: disease and insect control on potatoes; sunflower seed production; sorghum variety testing; depth placement of fertilizer; erosion control; fertilizer movement in the soil; winter grain--spring grain yield and chemical analysis comparisons; a spring wheat seasonal planting trial; and winter wheat management.

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

The Whetstone Valley Unit is utilized for corn, sorghum, legume, soybean, small grain, weed control in soybeans and plant disease observations. In 1970, three experiments were started: Tillage methods for corn; methods of fertilizer application and fertilizer rates of phosphorus.

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 Hurlbert	Clark	Raymond
William Peterson	Day	Lily
Alfred Skovly	Deuel	Astoria
Lyle Kriesel	Grant	Summit
Lee Bevers	Hamlin	Hazel
Donald Naddy	Marshall	Britton
Elmer Greseth	Roberts	Sisseton

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.

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GARDEN CITY, WATERTOWN AND TWIN BROOKS

WHETSTONE VALLEY

1970 CROP SEASON

TABLE 1. TOTAL RAINFALL AND AVERAGE TEMPERATURE BY MONTHS WITH THEIR DEPARTURE FROM LONG-TIME AVERAGE AT NORTHEAST RESEARCH FARMS*

Garden City, Watertown and Whetstone Valley Units

	April	May	June	July	Aug.	Sept.	Oct.	Total
RAINFALL**								
Total in Inches								
Watertown	2.00	1.98	2.07	2.29	1.00	1.66	2.01	13.01
Garden City	2.03	2.65	4.70	1.52	0.22	1.66	1.75	14.53
Milbank	2.88	3.05	3.77	0.84	1.65	1.57	3.00	16.76
Departure from Long-time Avg.								
Watertown	-0.06	-0.99	-1.63	-0.38	-1.78	-0.19	+0.85	-4.08
Garden City	-0.16	-0.20	+0.70	-1.35	-2.74	-0.61	+0.33	-4.03
Milbank	+0.71	+0.17	0.00	-1.88	-1.22	-0.69	+1.50	-1.41
TEMPERATURE								
Average Monthly in degrees F								
Watertown	42.5	58.0	68.7	73.0	71.0	56.9	44.9	--
Garden City	38.9	55.3	65.8	71.4	70.7	58.1	43.0	--
Milbank	43.6	60.0	70.3	74.2	73.0	63.6	48.8	--
Departure from Long-time Avg.								
Watertown	-0.7	+2.0	-4.8	-0.7	+2.0	-3.0	-2.8	--
Garden City	-5.4	-1.5	-0.2	-1.4	-0.3	-2.6	-5.6	--
Milbank	-1.8	+1.4	+2.5	0.0	+0.8	+1.3	-0.7	--
Frost free days								
Watertown	May 1 to September 26 = 148 days							
Garden City	May 1 to September 25 = 147 days							
Milbank	May 2 to October 8 = 159 days							

**Longtime rainfall average for 12 months

Watertown Airport	20.85
Clark	22.46
Milbank	22.81

* 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.

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

Garden City and Watertown Units

Q. S. Kingsley

TITLE: Mulch Tillage and Fall Application of Fertilizer for Corn and Wheat. Garden City Unit.

OBJECTIVES OF EXPERIMENT:

1. Determine the effect of residual carryover on the succeeding crop yield.

2. What effect does stubble mulching have on weed growth?

CROP YEAR HISTORY: CORN

Planted: May 9
Variety: Pioneer 3956
Row Spacing: 36 inches

Harvested: October 3
Plant Population: 14,000/A
Soil Moisture Sampling Dates: May 13 and October 14

RESULTS:

TABLE 2. MULCH TILLAGE AND FERTILIZER RATES FOR CORN

Treatment N-P-K Lbs/A	Yield Bu/A	Water Loss Inches	Precip. During Season Inches	Loss From Profiles and Precip.* Inch Used	Bushels per Inch of Water Used
(1) 0-0-0	30.2	1.0	11.4	12.4	2.44
(2) 100-0-0	38.8	1.2		12.6	3.08
(3) 50-30-0	38.2	1.3		12.7	3.01
(4) 100-30-0	41.3	1.2		12.6	3.28
(5) 100-60-100	41.8	0.9		12.3	3.40
(6) 100-30-100	39.2	1.6		13.0	3.02

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

DISCUSSION AND INTERPRETATION OF RESULTS:

This is the first year for this experiment and it is a mulch program where no plowing is performed. The corn yields are low and do not show an appreciable difference between fertility treatments. When compared to the 0-0-0 or no fertility, yields are increased from 8.0 to 11.6 bushels per acre. The fertilized areas also produce more bushels per inch of water used.

CROP YEAR HISTORY: WHEAT

Planted: May 5 Harvested: August 15
Variety: Chris Row Spacing: 7 inches
Soil Moisture Sampling Dates: April 29 and August 13

RESULTS:

TABLE 3. MULCH TILLAGE AND FERTILIZER RATES FOR WHEAT

Treatment N-P-K Lbs/A	Yield Bu/A	Water Loss Inches	Precip. During Season Inches	Loss From Profiles and Precip.* Inch Used	Bushels per Inch of Water Used
(1) 0-0-0	15.9	6.3	9.0	15.3	1.04
(5) 0-0-0	19.1	6.1		15.1	1.26
(4) 0-30-0	18.3	6.3		15.3	1.20
(2) 50-0-0	21.2	6.8		15.8	1.34
(6) 50-7-0	24.3	7.3		16.3	1.49
(3) 50-30-0	24.5	6.6		15.6	1.57

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

DISCUSSION AND INTERPRETATION OF RESULTS:

The fertilizer was fall broadcast and a stubble mulching tool was used to prepare the soil.

The numbers 1, 2, 3, etc., along the edges of Tables 2 and 3 are the fertility levels which follow each other from one year to the next. Number 5 for wheat, 0-0-0, follows number 5 for corn, 100-60-100. Residual carryover of fertility will then be measured from this one example, and others.

Yields and subsoil moisture were adversely affected in 1970 due to the extreme growth of wild oats. The moisture loss from the soil is high and 2.5 to 3 inches of this water loss may be attributed to the wild oats. A chemical program is to be incorporated with this experiment to combat the weed.

The 50-30-0 fertility treatment produced 8.6 bushels more than the 0-0-0 treatment but only 0.2 bushels more than 50-7-0. Soil moisture was utilized better when the crop was fertilized.

SOIL AND WATER LOSS DEMONSTRATION (RUNOFF)

E. J. Williamson

OBJECTIVES:

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

   a. Two year: row crop-small grain
   b. Four year: row crop-small grain-legume-legume

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

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.

CROPPING YEAR HISTORY:

Kelsey oats planted May 7, in 7 inch row and harvested August 14; 60-35-0 fertilizer broadcast prior to seeding; Vernal Alfalfa - oats seeding 60-140-0 fertilizer.

Pioneer 3956 planted May 9 in 36 inch rows, 14,000 population; harvested October 3; 60-30-0 fertilizer broadcast prior to planting.

DISCUSSION AND INTERPRETATION:

Yield and water use efficiency comparisons for the two and four year cropping sequences for up and down slope and across slope direction of planting are shown in Table 3. The yield range from 67 to 88 bushels per acre for oats, 76 to 98 bushels per acre for corn and almost five ton per acre for two cuttings of second year alfalfa. Yields are comparable for the two cropping systems associated with the up and down slope system but a 15 and 21 bushel per acre advantage for oats and corn respectively is notable for the two-year sequence on the across slope (contour) farming system. This yield increase apparently is a result of the more effectiveness of precipitation provided by the contour system and indicated by the more efficient soil moisture use. Three bushels more corn were produced for each inch of water used in the contour farming system and almost one-half bushel more oats for each inch of water.

Beginning with the 1970 season, a continuous fallow plot was initiated to compare the effectiveness of erosion control of both cropping sequences and the slope direction farming systems. Table 4 presents the 1970 season total losses of runoff and soil for the two cropping sequences and the fallow. The severest soil loss and runoff was from the fallow almost one ton of soil loss and 1.8 inches of runoff. Soil losses for the row crop planting was about a half ton per acre for the season regardless of the slope orientation pattern of farming; however, an advantage for small grain with countour planting was evident.

Only two rain storms during the season were of intensity for erosion, while in 1969, six storms provided measurable losses. Table 5 shows the intensity

of these two storms as well as the amount of runoff and soil loss for each occurrence. Both storms occurred rather early in the 1970 growing season and were on consecutive days with relative high intensity--as much as one inch of rain in 30 minutes.

TABLE 3. CROP YIELD AND WATER USE EFFICIENCY OF RUNOFF DEMONSTRATION
Garden City Unit - 1970

		Up and Down Slope		Across Slope (Contour)	
Cropping System	Crop	Yield Bu/A or T/A	Water Use Efficiency: Bu/In Water Used	Yield Bu/A or T/A	Water Use Efficiency: Bu/In Water Used
Two year sequence:	corn	75.8	6.92	97.7	9.03
Row Crop - Small Grain	oats	71.9	5.04	87.7	5.51
Four year sequence:	corn	86.6	6.98	--	--
Row Crop - Small Grain	oats	67.3	4.61	--	--
Legume - Legume	alf., 2 yr	4.92[1]	--	--	--
	alf., 1 yr	1.89[1]	--	--	--

[1] Yield low because of uneven stand; other plot, the rotation is 2 year stand, both are 2 cutting yield.

TABLE 4. RAINFALL, RUNOFF AND SOIL LOSS FROM RUNOFF DEMONSTRATION
GARDEN CITY - 1970

Year	Rainfall Apr. - Oct.	Cropping Sequence	Crop	Runoff % Rainfall	Runoff Inches	Soil Loss lb/Acre
		2 year sequence corn - oats up and down slope	corn	9.6	1.79	1153
1970	18.56	2 year sequence corn - oats across slope (contour)	corn	8.4	1.56	943
		4 year sequence corn - oats - alf. - alf. up and down slope	corn	9.0	1.67	1388
			oats	8.6	1.60	176
			alf., 2 yr	0.3	0.05	7
			alf., 1 yr	1.3	0.24	60
		Fallow	--	9.8	1.81	1968

TABLE 5. EFFECT OF STORM INTENSITY ON RONOFF AND SOIL LOSS FROM CORN IN 2 YEAR CROPPING SEQUENCE, GARDEN CITY UNIT -1970

Storms			Slope	Rainfall		Runoff		Soil Loss	
				Amt.	%	Amt.	%	Amt.	%
No.	Date	Duration	Direction	Inches	Total	Inches	Total	Lb/A	Total
1	June 14	1.0" in 1/2 hr. and 0.4" in 1 hr.	up and down	1.88	61	1.02	30	709	57
			across (contour)			0.93	28	714	76
			(Fallow)*			(1.21)	(67)	(1038)	(52)
2	June 15	0.8" in 1/4 hr. and 0.3" in 1 hr.	up and down	1.20	38	0.77	23	444	43
			across			0.63	19	229	24
			(Fallow)*			(0.60)	(33)	(930)	(48)

*up and down slope

PERFORMANCE TRIALS, NORTHEAST RESEARCH FARMS, 1970

J. J. Bonnemann

Standard Variety Small Grain Trials - Watertown Unit

Seeding was late and all seeding was done on May 7. All plots received 60#N and 40# P_2O_2 per acre plowed down. The grain was harvested as the bulk of that crop was mature. Harvest dates ranged from July 31 for barley to August 18 for flax. Stands of the winter grain trials were poor and the trials were not harvested. Yields were low because of the dry weather.

TABLE 6. SPRING-SEEDED WHEAT TRIALS, WATERTOWN, 1970

Variety	Test Wt. lb/bu	Yield, Bu/A 1970	Yield, Bu/A 1968-70
Spring Wheats			
Polk	59.5	21.0	27.9
Manitou	55.5	20.5	28.7
Waldron	55.0	19.7	27.7
Fortuna	56.5	18.6	
Chris	55.5	18.3	28.3
RL 4220	55.5	18.1	
Neepawa	54.5	17.7	
Sheridan	55.5	16.9	27.4
Thatcher	54.5	9.1	14.8
Durums			
Hercules	58.5	18.5	
Leeds	60.5	18.1	25.6
Wells	58.0	16.9	26.4
DT 316	57.0	15.5	
Semi-Dwarfs, etc.			
World Seeds 1809	55.0	21.0	
Wisc. 271	55.5	20.0	
Era	56.5	20.0	
DeKalb Bonanza	54.0	18.3	
World Seeds 1812	55.0	18.2	
Fletcher	55.5	13.1	
Rosner Triticale	42.5	7.2	
	Mean yield	17.5	

TABLE 7. STANDARD VARIETY BARLEY TRIALS, WATERTOWN, 1970

Variety	Test Wt. lb/bu	Yield, Bu/A 1970	Yield, Bu/A 1968-70
Paragon	42.0	28.8	49.0
Bonanza	41.0	28.5	
Liberty	43.0	27.5	48.2
Primis II	39.0	26.9	
Conquest	39.0	26.4	46.4
Dickson	42.0	24.2	44.0
Larker	42.0	23.6	49.5
Firlbecks III	46.0	20.9	
	Mean Yield	25.9	

TABLE 8. STANDARD VARIETY FLAX TRIALS, WATERTOWN, 1970

Variety	Test Wt. lb/bu	Yield, Bu/A 1970	Yield, Bu/A 1968-70
CI 2444	54.5	14.5	18.1
Summit	54.0	13.2	18.2
Redwood 65	54.0	12.9	17.8
B-5128	54.0	12.7	16.5
Linott	54.5	12.5	18.5
Foster	55.0	12.1	
Noralta	54.5	12.0	15.9
Windom	54.5	11.9	16.3
Norstar	53.5	11.8	17.1
Nored	54.0	11.6	18.4
Norland	53.0	11.6	15.7
Bolley	54.0	11.0	14.7
Redwood	55.0	10.5	17.0
	Mean yield	12.2	

TABLE 9. STANDARD VARIETY OAT TRIAL, WATERTOWN, 1970

Variety	Test Wt. lb/bu	Yield, Bu/A 1970	Yield, Bu/A 1968-70
Orbit	35.0	69.1	82.6
Santee	37.0	66.6	72.7
Holden	38.0	65.3	79.7
Garland	37.5	64.1	69.6
Portal	37.5	62.2	80.0
Burnett	38.0	60.6	83.5
Nodaway 70	38.0	59.8	
Otter	34.0	59.7	
Froker	36.0	59.4	
Pettis	38.0	58.1	74.3
Clintford	39.0	57.2	76.3
Sioux	34.5	56.9	83.7
Multi M70	38.0	56.7	
Jaycee	37.0	56.6	74.3
Lodi	32.0	56.6	74.0
Brave	36.5	56.1	77.9
Dupree	38.5	56.0	78.6
Kota	39.0	52.8	85.3
Kelsey	34.0	51.2	78.2
O'Brien	39.0	50.3	70.7
Wyndmere	35.5	50.2	74.5
Dawn	35.0	48.5	64.4
Clintland 64	38.0	46.1	74.6
Multi E70	39.0	35.2	
	Mean yield	56.5	

TABLE 10. GRAIN SORGHUM PERFORMANCE TRIAL, GARDEN CITY UNIT, 1970

Brand and Variety	Percent Lodging 10/1/70	Height, Inches	Percent Moisture 9/23/70	Test Wt. lb/Bu	Yield lb/A
Northrup-King Mini-Milo 54BR	20	40	13.7	56.0	2440
Pioneer 894	5	36	13.8	57.0	2250
DeKalb A-25	35	40	14.1	51.0	2140
RS 610	30	43	27.0	50.0	2080
Northrup-King 120	60	41	16.3	54.0	2020
DeKalb B-32a	30	40	19.8	57.0	2000
SD 441	55	48	13.9	54.0	1940
SD 451	90	44	14.7	54.0	1830
DeKalb B-36	65	41	20.4	55.0	1770
SD 25265	90	43	20.1	54.0	1660
SD 503	75	45	17.6	54.0	1650
				Mean yield	1980

Seeded: May 26 Harvested: October 1 Fertilizer: 60# N, 40# P_2O_5 per acre.

PERFORMANCE TRIALS OF SPRING AND WINTER GRAIN
Garden City and Watertown Units
Q. Kingsley

TABLE 11. STANDARD VARIETY OATS TRIALS - GARDEN CITY

Variety	Test Wt. Lb/Bu	Bu/A
Kelsey	35.0	91.9
Otter	34.5	86.3
Burnett	39.0	83.8
Froker	37.5	80.3
Brave	38.0	79.5
Holden	36.0	78.4
Kota	35.5	76.6
Lodi	35.0	76.0
Portal	37.5	75.7
Sioux	37.0	74.7
Garland	36.5	71.1
Clintland 64	36.5	67.6
Nodaway 70	38.5	47.5
Jaycee	36.0	40.6

TABLE 12. STANDARD VARIETY FLAX TEST - GARDEN CITY

Variety	Test Wt. Lb/Bu	Bu/A
Summit	53.0	18.2
Linott	53.0	17.4
Nored	52.0	17.4
Windom	52.5	16.9
Foster	52.5	16.8
Bolley	52.5	15.7
B-5128	53.0	15.5
Norstar	52.5	15.2

TABLE 13. STANDARD VARIETY BARLEY TRIALS - GARDEN CITY

Variety	Test Wt. Lb/Bu	Bu/A
Firlbecks III	47.5	53.1
Dickson	47.0	50.7
Primus II	47.0	48.2
Larker	47.0	46.8
Conquest	45.0	46.4
Liberty	46.5	42.1

TABLE 14. STANDARD VARIETY WHEAT TRIALS - GARDEN CITY

Variety	Test Wt. Lb/Bu	Bu/A
Hard Red Spring		
6 WO 1809	60.0	40.1
Bonanza	60.0	37.6
Fortuna	60.0	36.0
W. Seeds 1812	60.5	35.2
Era	59.0	35.0
Neepawa	58.0	33.4
Chris	59.0	33.1
Sheridan	59.0	32.5
Polk	60.0	32.4
Manitou	59.0	32.2
Fletcher	59.5	31.8
Durum		
Leeds	62.5	34.1
Wells	60.5	32.2
Hercules	59.5	28.7
Speltz	39.0	78.3

Planted May 4, harvested August 14
Barley, Oats and Wheat fertility 60-40-0
Flax fertility 30-20-0

TABLE 15. WINTER WHEAT TRIALS - GARDEN CITY

Variety	Test Wt. Lb/Bu	Yield, Bu/A 1970	Yield, Bu/A 1967-70
Lancer	57.5	40.8	41.0
Gage	58.0	39.9	34.4*
Minter	57.5	39.2	37.5
Winoka	58.0	37.6	41.4
Trader	57.0	37.6	32.4*
SD 66171	59.5	36.5	
Scout 66	58.0	36.5	32.1*
Hume	57.5	35.3	33.6
Guide	57.0	30.6	25.9*
Trapper	57.0	28.2	29.8*
Omaha	56.5	27.4	

* 2-year average

TABLE 16. RYE TRIALS - GARDEN CITY

Variety	Test Wt. Lb/Bu	Yield, Bu/A 1970	Yield, Bu/A 1967-70
Pearl	53.5	51.5	38.6*
Von Lochow	54.0	51.1	45.4
Frontier	55.0	50.8	41.7
Cougar	52.5	41.7	
Caribou	54.5	39.9	34.8

* 2-year average
Winter wheat and rye planted September 19, 1969, harvested August 14, 1970
Fertility 60-40-0

TABLE 17. WINTER WHEAT TRIALS - WATERTOWN

Variety	Test Wt. Bu/A	Yield, Bu/A 1970	Yield, Bu/A 1967-70
Winoka	57.5	34.1	39.0
Minter	57.0	33.9	37.7
Hume	56.0	32.3	37.0
Lancer	56.0	31.9	37.0
Trader	56.5	31.2	31.1*
Scout 66	56.0	29.2	30.0*
Gage	54.5	26.4	27.9*
Omaha	56.0	26.1	
Trapper	56.0	25.9	24.8*
SD 66171	57.5	24.6	
Guide	55.5	21.9	22.5*

TABLE 18. RYE TRIALS - WATERTOWN

Variety	Test Wt. Bu/A	Yield, Bu/A 1970	Yield, Bu/A 1968-70
Cougar	52.0	57.5	
Frontier	52.5	53.3	39.1
Von Lochow	53.5	51.8	44.5
Pearl	49.0	50.6	42.4
Caribou	52.5	40.5	33.7

Winter wheat and rye planted September 20, 1969, harvested August 11, 1970
Fertility 60-40-0

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 teat containing 20 selections of domestic sunflowers was seeded on May 18. All plots receiving two cultivations for weed control. Insect damage was negligible, but seed loss from birds and wind was severe in some varieties. Seed yields were reduced to less than a third of previous years productions because of drought.

Harvesting was completed on September 11, Seed yields are an average of 6 replications and are reported as pounds of clean seed per acre.

RESULTS:

TABLE 19. SUNFLOWER VARIETY YIELD TRIAL - NORTHEAST RESEARCH FARM (GARDEN CITY UNIT), 1970

Variety	Date of Flowering	Height Inches	Test Wt. Lbs/Bu	Seed Yield Lbs/A
OILSEED TYPE				
P21 VR2 x HA 60	7-26	70	30.2	772
CM 316-T7-3 x HA 60	7-29	75	35.3	736
P21 ms x HA 60	7-27	74	30.6	718
P21 VR2 X HA 60	7-27	73	28.2	555
Krasnodarets	7-25	68	28.9	539
P21 ms x HA 61	7-25	68	37.6	535
PI 323442 x HA 60	7-27	73	30.2	532
SD 68003	7-27	75	30.6	519
Majak	7-29	71	31.3	500
(21 VR1 x P21 VR2) x HA 60	7-27	72	31.5	487
Peredovik-66	7-28	76	29.2	469
SD 68002	7-27	76	31.2	457
VNIIMK 89.31-66	7-28	76	29.5	434
SD 68001	7-26	72	29.5	400
Exp Hyb 3	8-1	70	35.5	332
GOR 101	7-29	75	32.9	252
EDIBLE OF BIRDFEED TYPE				
P21 VR2 x Menn. RR-18-1	7-25	71	30.1	786
Mingren	7-26	69	25.1	544
Arrowhead	7-25	68	30.3	446
Manchurian	--	85	24.0	170
			Mean	509

SUMMARY OF FOUR 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 four consectutive years at 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 2 1/2 pounds actual per acre row (25 pounds 10% granules per acre row). Insect control was excellent in all treated replicates for each of the four 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 four test years. Yield checks for each of the four years shows the advantage of this treatment.

TABLE 20. INCREASES IN YIELDS OBTAINED USING A SYSTEMIC INSECTIDICE FOR CONTROL OF POTATO INSECTS

Year	Increase in Yield Treatment over Check Bu/Acre	*Net Profit for Acre Realized From Treatment Over Check
1970	30.3	$48.60
1969	33.6	40.38
1968	20.1	20.38
1967	11.3	9.52

*Cost of treatment deducted each year.

The cost of insecticide ranging from $5.50 to $6.00 per acre was deducted each year to show the net profit realized from insect control. Research studies have also shown that potato quality increases where systemic insecticides are used. The largest differences in yields were obtained when insect population pressures were the heaviest.

Thimet and Di-Syston are two systemic insecticides currently recommended for use on potatoes in South Dakota.

EFFECT OF ALUMINUM FOIL MULCH ON POTATO PRODUCTION

P. Prashar, W. Urdahl and Q. Kingsley

Potatoes are an important crop in northeastern South Dakota. Most of the potatoes are grown under dry conditions. For this reason water is a limiting factor for maximum production. Any practical method to conserve moisture should increase the yield of the crop.

With moisture conservations the main objective to increase potato yield, a research project was initiated to use paper coated with aluminum foil as a mulch. The paper mulch was laid over the soil surface by a special machine. Advantages of aluminum foil paper as well as some of its limitations were considered before using this material as a mulch.

The experiment was conducted at the Northeast Research Farm near Garden City. Six 50 foot rows of Kennebec potatoes were planted on May 23, 1970, in each replication and the center two rows were harvested for yield on October 2. The experiment was replicated. The rows were 36 inches apart and the plants were spaced 12 inches apart within the row. The paper mulch was 54 inches wide, with a 9 inch black strip in the middle. The purpose of the black strip in the middle of the mulch was to absorb more heat and raise the soil temperature for favorable growth of potatoes. Six inches of the edge of each side of the mulch was covered with soil. Potato seed pieces were planted by hand through the paper mulch. Weeds in the mulch plots were controlled by chemicals and in the check plots by cultivation. Rainfall amounted to 4.7 inches in June, 1.52 in July, 0.22 in August, and 1.66 in September.

TABLE 21. YIELD AND SIZE DATA OF POTATO EXPERIMENTS, GARDEN CITY, SOUTH DAKOTA, 1970 SEASON

Replication	No. Tubers Per Bu.	Total Yield Per 100 Feet Row	% Yield Over 2 In.	% Green Over 2 In.	% Rotted Over 2 In.	% No. I Over 2 In.
Control 1	191	64.00	90.23	30.28	5.40	64.32
Control 2	189	66.50	88.34	18.50	3.60	77.90
Mulch 1	219	58.00	79.31	55.69	1.63	42.68
Mulch 2	203	61.00	85.24	43.26	4.89	51.94

RESULTS:

There was no significant difference between control and mulch plots for total yield, number of tubers per bushel, size of tubers, and percentage of rotted potatoes. In the average of control plots there were 24.39% green potatoes as compared to 49.48% in the mulch plots. No. I potatoes yielded 71.11% in control plots as compared to 47.31% under mulch. These differences were highly significant for green potatoes and No. I potatoes under control and mulch conditions.

Although the potato hills were planted through a small hole in the mulch, as the season progressed and plants grew larger the paper hole also increased in size, and the sunlight through these holes caused the potatoes to turn green.

Green potatoes have a bitter taste and may be poisonous because of the alkaloid, solanine, which developes in the potato along with the chlorophyll. Since solanine is a poisonous alkaloid, its presence in increased amounts in the green potato tubers is considered to be a health hazard. Potatoes containing more than 0.1% solanine are considered to be unfit for human consumpiton. Green potatoes are not acceptable for processing or table use. The green potatoes have to be graded out before marketing the crop which decreases the yield, increases the expense, and results in a lowered income. There is no practical way that these potatoes could be covered to avoid sunlight. Potatoes commonly set tubers near the soil surface. The Kennebec variety is particularly notorious in this regard. The percentage of green tubers in control plots was very high in this experiment, but this could be reduced to 5% or less with proper ridging.

CONCLUSIONS:

Under mulch soil moisture was undoubtedly higher but it did not increase the yield of the crop. This was due to low soil temperature in the early part of the growing season. The aluminum foil reflected the sunlight and prevented the soil from reaching optimum temperature for best potato growth. As in other experiments, soil temperature was lowered 6° F. or more when an aluminum mulch was used. Plant yield is reduced if subjected to temperatures below the optimum for growth. Low temperature decreases both rate of photosynthesis and respiration, but photosynthesis rate decreases to a greater extent than that of respiration. When the temperature is below the optimum range for any given plant, rate of protein formation is low and in turn cell division is slowed. As a result, growth rate is reduced and the yield is accordingly low. This is why aluminum mulch did not increase the potato yield in this experiment.

Other operational difficulties in using aluminum mulch should not be overlooked.

1. The cost of the aluminum paper is about $200 per acre. To justify mulching in commercial production an economic return must be realized either from increasing yield or from savings in operating costs. Aluminum mulch does not appear to be justified in this area for general potato production.

2. A special machine is needed to lay the mulch.

3. It is difficult to control weeds between the mulch strips.

4. At present there is no known method by which numbers of green potatoes can be decreased under paper mulch.

5. Difficulties were encountered in digging potatoes in mulched rows because the paper mulch was too wide when two rows were dug together. This problem can be solved by cutting the mulch paper in the middle.

6. The mulch paper did not deteriorate as expected. It could present some problem to the grower, such as litter in the field when plowing and catching in fences.

SORGHUM RESEARCH

Garden City Research Farm, 1970

A. O. Lunden

Grain sorghum yields were considerably below average due to drought conditions in late summer and variability was extremely high because of uneven stand and lack of moisture. Severe lodging occurred in early fall as the result of this drought stress and only a few entries were somewhat resistant to this unusual type of lodging. Data are presented in Table 22.

The new grain hybrid, SD 25265, which is being considered for release and an experimental forage hybrid FSR 882, were the best entries for both years. SD 25265 will probably be released as RS 506 and seed should be available from South Dakota Foundation Seed in time for planting in 1971. This hybrid normally has moderate resistance to lodging, is of midseason maturity and has excellent yield potential over a broad area of adaptation.

The forage hybrid, FSR 882, has a short, thick stalk, many long wide thick leaves and a large seed head and is designed for late fall silage harvest as it stands well and holds its leaves long after frost. Samples of this hybrid are available for 1971 planting and the hybrid should be released for production in 1972.

TABLE 22. SORGHUM GRAIN YIELDS, GARDEN CITY RESEARCH FARM

Hybrid	Bu/A 1969	Bu/A 1970	Bu/A $\bar{x}$	Height	% Lodging
SD 25265	90	57	74	38	98
SD 503	86	42	64	40	95
SD 441	78	28	58	45	98
SD 451	79	44	61	42	95
RS 610	77	47	62	42	15
FSR	103	49	76	52	3

WHEAT DISEASE CONTROL

Winter Wheat Planted in Stubble on Different Dates

W. S. Gardner and Q. S. Kingsley

Winter wheat continues to show promise of high yields when protected by planting in stubble in some traditional spring wheat regions of South Dakota. Early plantings in winter wheat areas usually suffer losses from wheat streak mosaic virus (mosaic). The best and cheapest mosaic control practice a farmer can use is correct seedbed preparation and choice of planting date. The recommendations are to kill volunteer wheat and grassy weeds in both fallow and nearby stubble at least a week before fall planting and to plant between September 10 and September 15. The planting dates could be earlier in the northern part and later in the southern part of the state. These recommendations were arrived at through

extensive studies involving different dates of planting winter wheat at Presho, South Dakota. Before any recommendations are made for the Garden City area, several years of experimentation should be conducted on the best dates at the new location. Also, some varieties of winter wheat might perform better at the different locations.

Two experiments were conducted at Garden City aimed at providing answers to mosaic control. In the first, Lancer winter wheat was planted on August 25, and every 10 days afterward until October 4, 1969. Yield and percent mosaic found in this crop are shown in Table 23. Mosaic was found in trace amounts for the first time in 1970 at Garden City and then only in the August planting. The best yields were obtained from the September 24 and 14, but none of the dates differed significantly.

The purpose of the second experiment was to test relative yields of four varieties Gage, Scoutt-66, Lancer, and Hume, when planted either on August 25, or September 24, 1969. The results are shown in Table 24.

The best yields were obtained on the September 24 planting date, and Gage was best followed by Scout-66, Hume and Lancer. A trace of mosaic was found in the August 25 planting of Hume and Lancer. The varieties Gage and Scout-66 are also susceptible to mosaic but escaped infection or detection of the disease. The identification of wheat streak mosaic virus was from leaf samples collected which showed virus-like symptoms. Of 30 samples collected only 3 showed evidence of virus by transmission and electron microscopic tests. There is another virus-like disease in the area on winter wheat that was observed for the 3rd straight year and appeared in a trace to as high as 4% of the August planted winter wheat. Evidence from our studies indicate that this virus-like disease has little effect on yield of winter wheat at Garden City.

We conclude that most any date after September 1 would be acceptable for planting winter wheat in stubble. Fertilizer (60-40-0) should be added at the time of planting. The past 2 years were very dry and early plantings either did not come up or sprouted unevenly until later fall rains. From this standpoint the September 15 date was most favorable for early, uniform germination.

Additional studies are needed on disease development and control of leaf rust, stem rust, septoria, root rots, soil inhabiting organisms and bacterial diseases as they relate to planting winter wheat in stubble.

TABLE 23. PERFORMANCE OF LANCER WINTER WHEAT PLANTED IN STUBBLE ON FIVE DIFFERENT DATES AT GARDEN CITY. 1969-1970

Planting Date	Mature Height Inches	Mosaic %	Bushel Weight Lbs/Bu	Yield Bu/A
August 25	33	TR	57	29
September 4	33	0	57	26
September 14	34	0	56	30
September 24	33	0	57	31
October 4	34	0	58	29

TABLE 24. PERFORMANCE OF FOUR WINTER WHEAT VARIETIES PLANTED IN STUBBLE ON TWO DIFFERENT DATES AT GARDEN CITY, 1969-1970

	Planting Dates					
	August 25, 1969			September 24. 1969		
Variety	Mature Height Inches	Bushel Weight Lbs/Bu	Yield Bu/A	Mature Height Inches	Bushel Weight Lbs/Bu	Yield Bu/A
Gage	35	58	35	37	58	40
Scout-66	35	57	29	36	57	37
Hume	38	57	28	38	58	36
Lancer	36	57	29	37	58	34

CARRYOVER FROM 1969 CORN HERBICIDES

W. E. Arnold, C. E. Stymiest, and W. B. O'Neal

OBJECTIVE:

To evaluate the persistance and injury of corn herbicides to succeeding crops of oats and flax.

PLANTING INFORMATION:

Oats and flax were planted in drill strips across the plots of the previous year's herbicide screening tests in corn.

RESULTS:

The greatest yield reduction was in the flax plots that had been treated with primaze the preceding year. Several other triazine herbicides (aatrex, ACD-15M, bladex, GS-14260, GS-13529, and S-6115) gave slight yield reductions in either the oats or flax yields. Other herbicides showing some yield reduction were sutan, ramrod, lasso, BASF 2903, and londax. Late season weed growth could have used up soil moisture in some plots resulting in yield reductions in the oats and flax.

TABLE 25. CARRYOVER FROM 1969 CORN HERBICIDES

Treatment in 1969	Rate Lbs/A	Oat Yields[1] (Bu/A)-1970	Flax Yields[2] (Bu/A)-1970
Preplant Inc.			
AAtrex	3	60.1	10.3
Sutan	4	55.9	8.4
Sutant AAtrex	3 + 1	55.1	9.2
Preemergence			
Ramrod	4	57.0	11.4
Ramrod	6	54.4	8.2
BASF 2903	3	55.5	9.8
BASF 2903	4	59.7	10.2
BASF 2903	5	49.9	8.0
Lasso	2.5	48.2	11.6
ACD-15M	3	54.6	10.1
Bladex	3	51.3	10.4
AAtrex	3	53.5	9.3
Banvel + Lasso	1/2 + 1 1/2	56.3	8.2
Preforan	4.5	68.8	10.4
Primaze	3	58.8	5.6
Ramrod + Atrazine	2.9 + 1 1/4	52.3	8.0
AAtrex + GS-14260	1 1/2 + 1 1/2	61.9	10.8
GS-14260 + GS-13529	1 1/2 + 1 1/2	47.9	8.9
Londax	3 + 1 1/2	50.5	8.2
Postemergence			
AAtrex + oil	1 + 1	57.3	8.7
ACD-15M + oil	1 + 1	54.2	7.2
S-6115	1	63.1	9.2
No Herbicide (2 cult)	--	53.3	10.3
No Herbicide (3 cult)	--	54.2	10.7

[1] Oats were harvested on July 30.
[2] Flax was harvested on August 12.

HERBICIDE SCREENING TESTS IN CORN

W. E. Arnold, C. E. Stymiest and W. B. O'Neal

OBJECTIVE:

To compare the effectiveness of new herbicides and herbicide combinations with some recommended herbicides for the control of annual weeds in corn.

PLANTING INFORMATION:

Pioneer 3956 corn was planted in 36 inch rows on May 8.

SPRAYING INFORMATION:

Preplant incorporated treatments were applied on May 8 and were incorporated with a tandem disk. Preemergence treatments were applied on May 9. Postemergence treatments were applied on May 26, when foxtail was in the 2-3 leaf stage of growth.

RESULTS:

Preemergence treatments were the only treatments that gave both good control of grasses and fair control of broadleaf weed. The preemergence combination of lasso plus aatrex gave the best overall performance. The preemergence treatment of aatrex and the postemergence treatment of aatrex + oil gave the best broadleaf weed control. Aatrex 80% wettable powder and the new flowable liquid formulation, aatrex 4L, were about equal in performance. Extremely dry conditions in the later part of the season resulted in low yields of the corn.

TABLE 26. HERBICIDE SCREENING TESTS IN CORN

Treatment	Rate #/A	Early Grass % Control June 17	Late Grass % Control July 10	Broadleaf Weed Control[1] WO	M	K	RT	LQ	PW	Corn[2] Yield (Bu/A)
Preplant Inc.										
AAtrex	2½	59	52	X	X*		X	X	XXXX	9.8
AAtrex + Sudan	1 + 3	68	74	XXXX	X		X		X	14.6
Bladex	3	59	50	XXX			XX	X	XXX	9.2
Bladex + Lasso	1½ + 1½	60	64	XXXX	XX			X	XXX	11.5
Bladex + Sutan	1 + 3	59	68	XXXX	X		X	X	XX	6.5
Lasso	2½	60	48	X	XX	X		XXX	XXX	3.8
Lasso + AAtrex	2 + 1	66	62	X	XXX		X	XX	XX	9.9
Sutan	4	68	76	XX	XX	XX	XXX	XX	XXX	2.8
Sutan + S-6115	3 + 3/4	69	61	XX	XX	X	X	XX	XX	13.0
S-6115	3/4	28	40	XX	X	XX		XX	XXX	4.6
AAtrex 4L	2½	55	55	X	X	XX	X	X	XXX	9.4
Pre emergence										
AAtrex	2½	56	59	X					X	8.3
AAtrex 4L	2½	55	64	XXX			XX			13.3
Bladex	3	85	76	XXX			X		XXX	10.5
Bladex + Lasso	1½ + 1½	88	83	XX			XX	XX	X	12.5
Bladex + Lasso	3 + 1	89	85	XX				X	XX	26.8
Lasso	2½	76	78	X	XXX			XX	X	4.5
Lasso + Lorox	2 + 1	85	82	XX			XXX	X	X	20.8
Lasso + AAtrex	2 + 1	94	86	XX		XX				40.2
Ramrod	5	81	78	XX	X		X	XX	X	11.6
Ramrod + Atrazine	3 + 1½	86	76	XX	X		XX		XXX	34.3
S-6115	3/4	30	44	XXX	X		X	X	X	4.6
Ramrod + Lorox	3 + 1½	64	79	XXX			XXXX	X	XXXX	28.8
Post emergence										
AAtrex + oil	1 + 1	49	40	XX					X	18.6
AAtrex 4L	1	42	45	XX			X		XX	10.0
Dowpon + oil	3/8 + 1	18	32	XX	X		XX	XX	XXX	3.0
AAtrex + Dowpon + oil	1 + 3/8 + 1	52	49	XX	X	X	X		XX	10.8
Downpon + Preemerge	½ + 4	65	35	XX	XX		X	XX	XXXX	11.8
Banvel + 2,4-D	¼ + ½	52	36	XXX	XX		X	X		4.6
S-6115	3/4	65	60	XX	X				XX	14.2
Control										
Weedy check (no cult.)		0	0	XXX	XX	XXX	XX	X	XXX	0
Cultivated check (2 cult.)				XXX	X	XX	XX	XX	XX	26.9

X* = Indicates weed was present in 1 of a possible 4 replications.

1 Broadleaf weed control ratings were taken on July 10. Representations of the column headings are: M = wild mustard, K = Kochia, RT = Russian Thistle, LQ = lambsquarter, WO = wild oats and PW = pigweed.

2 Corn was harvested on September 3. Yields were calculated on the basis of 15.5% moisture.

DICAMBA RESIDUE STUDY

W. E. Arnold, C. E. Stymiest and W. B. O'Neal

OBJECTIVE:

To determine the residual effect of high rates of Banvel (Dicamba) to succeeding crops.

SPRAYING INFORMATION:

Banvel was applied onSeptember 10, 1969 when the soil was dry and the small grain stubble was 6-8 inches tall.

PLANTING INFORMATION:

Strips seven feet wide of Primus barley, Chris wheat, Kelsey oats, Bolley flax, Vernal alfalfa and Lincoln brome, were drilled on May 5, 1970. Pioneer corn was planted on May 9, 1970.

FERTILITY:

During fall of 1969, 60-40-30 elemental fertilizer was applied and then plowed under.

RESULTS:

The oats and wild oats yields were reduced by a large amount from the 0 to 2 lbs/A rate of dicamba. Barley, wheat and wild oats all had a much larger relative yield reduction in going from 0-16 lbs/A of dicamba than did the combined yield of oats and wild oats. Therefore, under the conditions of this experiment the oats had more tolerance to the high rates of dicamba than either barley or wheat.

TABLE 27. DICAMBA RESIDUE STUDY

Treatment	Rate #/A	Barley and Wild Oats[1] Barley Yields (Bu/A)	Barley and Wild Oats[1] Wild Oat Yields (Lbs/A)	Wheat and Wild Oats[2] Wheat Yields (Bu/A)	Wheat and Wild Oats[2] Wild Oat Yields (Lbs/A)	Oats and Wild Oats[3] Oats and Wild Oats Yields (Bu/A)
Dicamba	0	40.4	299.2	15.0	92.5	54.8
Dicamba	2	23.4	329.0	7.3	98.2	41.3
Dicamba	4	20.1	316.4	13.2	80.0	43.1
Dicamba	6	11.8	308.4	10.6	64.0	38.4
Dicamba	8	5.9	376.0	6.1	50.2	40.4
Dicamba	16	6.6	38.8	4.6	11.4	29.2

[1] Barley was harvested on July 27, 1970 and the wild oats were separated from the yield samples and yields were calculated for both barley and wild oats.

[2] Wheat was harvested on August 12, and as in 1/, yields were calculated for both wheat and wild oats.

[3] Oats was harvested on August 12, and the yield samples were not separated so the yield is given as a combination of oats and wild oats.

VCS-438 ON SMALL GRAINS

W. E. Arnold, C. E. Stymiest and W. B. O'Neal

OBJECTIVE:

To evaluate the performance of VCS-438 for weed control in wheat, oats, and barley.

PLANTING INFORMATION:

Primus barley, Kelsey oats, and Chris wheat were planted in drill strips across the plots on May 6.

SPRAYING INFORMATION:

Preemergence treatments were applied on May 9. Postemergence treatments were applied on June 17 when the oats and wheat were in the 6 leaf to boot stage and the barley was in the boot stage.

RESULTS:

Heavy wild oats infestations caused a variability in yield data, but a large reduction in yield by postemergence treatments as compared to preemergence treatments and the control plot did result. Barley was the only crop that did not show yield reductions for the 3 lb/A preemergence treatments. All crops decreased in yield when treated postemergence with barley and wheat having the greatest relative decrease.

TABLE 28. VCS-438 ON SMALL GRAIN - GARDEN CITY

Treatments	Rate Lbs/A	Barley Yield[1] (Bu/A)	Oat Yield (Bu/A)	Wheat Yield (Bu/A)
Preemergence				
VCS-438	1	22.5	33.8	11.5
VCS-438	2	25.6	35.4	17.0
VCS-438	3	25.6	20.6	10.2
Post Emergence				
VCS-438	1/4	7.8	25.6	6.9
VCS-438	3/8	8.0	25.4	7.8
VCS-438 + Banvel	1/4 + 1/8	12.3	22.3	7.4
VCS-438 + Banvel	3/8 + 1/8	11.0	21.2	6.6
No Herbicide	--	23.7	28.6	12.5

[1] Crops were harvested for determining yields on the following days; barley - July 27, wheat and oats - August 3.

EFFECTS OF ROTATIONS AND HERBICIDES ON WILD OATS

W. E. Arnold, C. E. Stymiest, and Q. S. Kingsley

OBJECTIVE:

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

FERTILITY:

Ammonium nitrate (66 lbs. of actual Nitrogen) was applied to the corn plots and plowed down. A pop-up application of 6-15-0 was made when the corn was planted. The barley plots were fertilized with 50-7-0 lbs/A actual at the time of planting.

PLANTING INFORMATION:

1969: Larker barley was drilled on April 28, and corn was planted on May 20.

1970: Primus barley was drilled on May 7 and Pioneer corn was planted on May 8.

DATA TAKEN:

1969: The number of wild oats and barley heads in six 6 by 36 inch quadrads were counted in each subplot on July 22. Barley yields were taken on August 7, 1969 and the number of wild oat seeds in an 80 gram sample of barley. Corn yields were taken on October 5.

1970: The number of wild oat plants in four 6 by 36 inch quadrads was counted on July 10. Barley yields were taken August 3, and the number of wild oat seeds in a 100 gram sample of barley were counted. Corn yields were taken on September 3. Corn yields were calculated on the basis of moisture content in individual subplots.

RESULTS:

Preliminary results showed that plowing was much more effective than leaving the stubble in controlling the wild oats. Also the corn-barley rotation was much more effective for controlling wild oats than the barley-barley rotation. Therefore the best cultural practice shown thus far under the conditions of this experiment is the corn-barley rotation with plowing each year. Rotational plans 1, 2, and 3 showed triallate to be the more effective herbicide for the control of wild oats. Whereas for rotational plan number 4 barban appeared to be the more effective chemical. Wild oat counts were not made on rotation 5. In rotation 5 atrazine + oil did not effectively control the annual grasses and a corn yield deficit resulted, as compared to the cultivated check. The experiment will be continued for three more years.

TABLE 29. WILD OATS ROTATION - EFFECT OF ROTATIONS AND HERBICIDES ON WILD OATS

Treatment	1969 Wild Oat Stand Count	1969 Wild Oat Seeds/80 gm Barley	1969 Yield (Bu/A) Barley	1969 Yield (Bu/A) Corn	Treatment	1970 Wild Oat Stand Count	1970 Wild Oat Seeds/100 gm Barley	1970 Yield (Bu/A) Barley	1970 Yield (Bu/A) Corn
Rotation 1					Rotation 1				
Barban[1]	2.8	82	56		Barban	22.2	128	9.5	
Triallate[2]	3.2	53	48		Triallate	2.2	135	13.2	
No Herbicide	20.0	174	46		No Herbicide	79.5	254	8.1	
Rotation 2					Rotation 2				
Barban	0.0	40	44		Barban	19.2	254	3.9	
Triallate	1.6	64	40		Triallate	5.2	175	5.4	
No Herbicide	22.0	220	36		No Herbicide	106.8	291	4.7	
Rotation 3					Rotation 3				
Atr. + oil[3]				39	Barban	4.0	74	17.1	
Cult. Check				34	Triallate	1.2	85	18.4	
					No Herbicide	18.0	141	17.0	
Rotation 4					Rotation 4				
Atr. + oil				37	Barban	1.2	85	15.6	
Cult. Check				33	Triallate	35.5	137	14.8	
					No Herbicide	24.0	168	15.4	
Rotation 5					Rotation 5				
Atr. + oil				37	Atr. + oil				5.6
Cult. Check				33	Cult. Check				18.2

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 rotation with plowing.

[1] The rate of barban (Carbyne) used in all the rotations with barley was 3/8 lb. active ingredient per acre.

[2] The rate of triallate (Fargo) used in all the rotations with barley was 1 1/4 lb. active ingredient per acre. Triallate was incorporated with a tandem disk.

[3] The rate of atrazine plus oil used in all rotations with corn was 1 lb/A plus 1 gal/A.

WHEAT IMPROVEMENT

D. Wells

Two yield tests of winter wheat seeded on fallow land showed so much winter killing that they were abandoned.

Watertown, 1970:

Winterhardiness test - while too much winter killing occurred in the breeding nursery, enough plants survived to tell us something about relative hardiness. The wheat-wheatgrass nursery showed more survival than would seem to characterize wheat, suggesting that the wheatgrass parent had an effect. More testing will be needed to determine whether any lines are present that look like wheat but have hardiness from wheatgrass.

Durum test - Wells durum with 18 bushels per acre was the highest commercial variety. Semi-dwarfs yielded up to 24 bushels an acre. We do not yet know the semolina quality of the semi-dwarfs.

Bread wheat test - Chris with 18 bushels an acre was the best yielding tall variety. World Seeds 1812 yielded 19 bushels. Bonanza yielded 17 bushels and Fletcher 15 bushels. Experimental semi-dwarfs and medium height varieties yielded up to 22 bushels. Some of the experimental semi-dwarfs lodged badly.

There are promising new strains in these cooperative regional durum and bread wheat tests.

OAT AND FLAX BREEDING

D. L. Reeves

The Watertown Unit of the Northeast Research Farm serves as a testing site for both oat and flax breeding work. The location of the farm and the uniform soil make this location a very good place for testing breeding material. About 400 different selections and lines were tested this year. Only the best are saved for retesting the following year. Most of the material tested is from our own breeding program. Uniform Regional nurseries are also planted each year. Entries in these nurseries are the most promising lines from state experiment stations. These regional nurseries provide a means of testing a potential new variety for yield, adaptation and disease reaction over a large area. Only a few of the lines tested in the regional nurseries are good enough to be released as a variety.

Yields at the Watertown Unit were considerably below last years due to the extended dry weather. Diseases, on the other hand, were at a minimum. Testing over a period of years at a location is necessary in order to adequately check for yielding ability, disease resistance, and to determine how the line will perform under different conditions.

BARLEY TESTING AT THE NORTHEAST STATION

P. Price

The Mississippi Valley Barley regional nursery and breeding material from the SDSU barley project were seeded at the Watertown Station in 1970.

The Mississippi Valley nursery is a replicated rod-row plot nursery in which entries from several states in the North Central region are tested for yielding ability, and grain quality. Grain samples from the nursery are sent to the Barley and Malt Laboratory at Madison, Wisconsin, for chemical analyses. This nursery was damaged by hail and wind shortly before harvest in 1970.

Large plots of several barley crosses were also seeded for the purpose of selecting good plant types to be used in further testing and analyses.

CORN BREEDING

D. B. Shank

As part of the South Dakota State University Experiment Station, corn breeding project, five corn yield tests were conducted on the Watertown plots of the Northeast Research Farms in 1970. Included were two trials on advanced experimental three and four-way hybrids, one single cross test for the purpose of predicting new hybrids, one regional three-way test in cooperation with other experiment stations, and one experiment of six hybrids grown under two-row widths and two populations.

In general, yields were slightly lower than in 1969. This prehaps was caused by below average rainfall for all months of the growing season coupled with above average monthly temperatures in August. The plots were harvested by October 16, but the plants had been mature long enough so that both stalk lodging and ear droppage were rather high for some entries.

Some of the advanced experimental hybrids which have performed well in previous years again were near the top of the tests in performance in 1970. As an example, South Dakota Experimental 48A ranked 4th in one of the three- and four-tests and 15th in the other. Some of the new, early inbreds coming out of the corn breeding plots performed very well in the single cross test and may contribute to future hybrids for this area which requires early maturing corn.

The results of the test on hybrids in two row widths and two populations supported the results obtained in 1969. This was that there were no differences over six hybrids between 12 and 14 thousand plants per acre but between 30 and 40-inch row spacing, yields from 30-inch rows were superior to those from 40-inch rows.

WINTER WHEAT MANAGEMENT, WATERTOWN UNIT

Q. Kingsley

TITLE: Winter Wheat Management

OBJECTIVES OF EXPERIMENT:

1. The effect of various fertilizer rates and ratios 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.

CROP YEAR HISTORY:

Planted: September 19, 1969 Harvested: August 11, 1970
Variety: Lancer Seeding Rate: 1¼ bushels/acre

RESULTS:

TABLE 30. FERTILIZER RATES AND RATIOS AND PLANTING METHODS FOR WINTER WHEAT, YIELD IN BUSHELS PER ACRE, WATERTOWN

	Bushels per Acre					
Actual N and P	Duckfoot Press Drill	Disk Deep Furrow	Disk Press Drill	Fallow Deep Furrow	Stubble Press Drill	Fallow Press Drill
0-0-0	15.0	12.4	17.0	8.8	12.8	13.9
0-15-0	16.3	12.8	19.7	12.3	17.1	14.4
30-15-0	20.1	19.8	20.7	15.1	19.5	17.4
60-0-0	21.4	18.0	18.9	14.6	21.5	14.1
60-15-0	24.0	19.4	23.0	15.9	22.2	19.1
120-15-0	24.6	16.0	21.9	17.5	26.0	15.6

DISCUSSION AND INTERPRETATION OF RESULTS:

The yields of this experiment are lower than in previous years. Much of this may be attributed to lack of rainfall and quack grass.

The use of a fallow system in this area eliminates the mulch and is subjected to more winter kill. The yields are lower, for both planting methods, than where a mulch is present on the soil surface.

Management of the mulch was changed in 1969 to include the duckfoot and disk along with the regular stubble mulching blade. Duckfooted mulch produced yields which were comparable to the regular mulching tool. Yield differences are small between the two methods for this year. When the stubble is disked, larger yields were produced where a press drill was used.

SOUTHERN CORN LEAF BLIGHT

C. M. Nagel

In 1970, southern corn blight hit all major news headlines nationwide and began a scare that corn, and therefore, beef and pork might be in short supply this winter. In spite of the losses estimated now at 15 percent nationwide, there should be no severe shortage because this year's harvest, estimated at 4.1 billion bushels, will be the third largest in our history because of the favorable growing conditions in the corn belt. However, if blight continues to be a major disease on corn, shortages could occur rapidly, and the economy could be severely jolted.

Southern corn leaf blight (SCLB) was present in light amounts on corn in South Dakota from the Nebraska to the North Dakota borders envolving the two tiers of counties along the eastern border of South Dakota. The yield loss for the state would amount to less than 1 percent.

The symptoms of this disease consist of tan colored spots on the leaves, leaf sheaths, and one inch circular black spots on husks; rotted ear shanks and ears. If the disease becomes severe and defoliation occurs, other diseases affecting the plants, namely, stalk and root rot, may become more destructive.

What was the cause and what steps are being taken to guard against similar damage in the future?

The cause was the southern leaf corn blight fungus, a new strain of an old fungus which has been present in the southern states for 25 years, scientifically called Helminthosporium maydis. Blighted corn looks spotted and scorched as though killed by an early frost. The diseased lesions produce spores or "seed" abundantly on the surface and are spread by wind, rain, and seed. It cannot be stated with accuracy at this time whether or not the SCLB fungus will survive the winter conditions in South Dakota or in much of the rest of the corn belt. The reason, the current new strain of the fungus which was created recently in nature and only recently isolated by plant pathologists in the laboratories of the corn belt Agricultural Experiment Stations during the past year, has not afforded enough time to obtain all the necessary information concerning the new strain of this serious plant disease organism to answer many of the questions pertinent to its effective control. Experiments are under way in many state Agricultural Experiment Stations to this end.

Present knowledge regarding the control of this disease may be listed as follows:

1. Growers should try to obtain seed produced from seed fields which have been detasseled by hand. Hybrid seed produced with male sterile or with T. cytoplasm is highly susceptible. Normal cytoplasm produced seed is highly resistant although not immune to the T strain of the southern corn blight fungus.

2. Carefully chop and plow down harvested corn fields so as to cover up as much of the leaves, stalks, and other refuse from the crop as possible. This will help to reduce the source of fungus inoculum in the spring which, if the organism survives the winter, can spread to the new corn crop.

3. Barley, oats and wheat as eroneously reported in the news media is not susceptible to southern corn leaf blight.

4. Hybrid seed corn blends are on the market, consist of mechanical mixtures of male sterile and male fertile produced seed. Blends will have limited value in controlling the disease and may create problems at harvest especially if blight becomes serious in 1971. Most hybrid seed corn producers will have "Blend" information printed on the seed corn bags.

5. Conditions of minimum tillage would tend to increase the amount of damage from southern corn leaf blight.

6. Seed treatment with the fungicide Captan will benefit by reducing the amount of inoculum produced.

7. For the future, hybrids based on S and other resistant but male sterile cytoplasms are being prepared and tested.

Two other fungi also cause leaf blight and, may be confused with southern corn leaf blight in the field. Northern corn leaf blight is caused by Helminthosporium turcicum, a major problem readily controlled with resistant hybrids, and yellow leaf blight (a new disease threat in 1968) caused by still a different fungus, Phyllosticta spp, which first began to damage corn in the northern states in 1968. The symptoms of the three diseases are very similar and therefore difficult to tell apart in the field. Laboratory diagnosis is necessary.

Weather conditions for spread and development of leaf blight in 1970 were at times favorable. However, we do know that the genetic make-up of the corn itself grown in the corn belt including South Dakota was a major factor. It was largely T cytoplasm or male sterile, which is highly susceptible. This arises from current practice in hybrid seed production, in using male sterile cytoplasm to avoid the expense of hand detasseling.

Until the last 15-20 years virtually all hybrid seed corn was produced by hand detasselling--removing the male elements or tassel, in a seed field, i.e., the pollen, so that the seed parent was not self-pollinated. At the peak of the detasseling season the job occupied an estimated 135,000 people nationwide. It was the most expensive part in the production of raising hybrid seed corn. A search for the genetic substitute for detasselling began. The late Donald F. Jones of the Connecticut Experiment Station and Dr. Paul Mangelsdorf, formerly of the Texas Experiment Station, were the first to show how to use a corn strain with naturally sterile pollen. This is called cytoplasmic male sterility. A cytoplasmic character is transmitted by the mother plant to all its progeny. The cytoplasmic male sterility character was introduced by crossing an inbred to the sterile source, crossing the hybrid back to the inbred and repeating the backcross in each successive generation. A hybrid, made up with "sterile cytoplasm", was fertile because of the action of the restorer genes from the male parent.

About 15 years ago, this system was introduced into the hybrid seed corn production program and has become widely adopted. In recent years, including 1970, about 80% of commercial hybrids were made up with the T cytoplasmic male sterility. The wide use of T rather than other sources of sterile cytoplasm came about because it worked better under varying environmental conditions in the field.

The first indications that a problem was in the offing, resulted from research published in 1961 at the Central Experiment Station in the Philippines. It was found that T cytoplasmic male sterile corn inbreds and hybrids were much more susceptible to the southern corn leaf blight disease than those with normal cytoplasm. In fact, the Philippine publication and another confirming it published in 1965, are the first descriptions of the cytoplasmic inheritance of disease susceptibility in a crop plant.

A check in 1963 showed no difference in disease reaction between the male sterile and normal corn lines used in the Philippines which had been made by inoculating with strains of Helminthosporium maydis from Illinois. The same was true of similar tests made later in Pennsylvania. However, in 1969 heavy infection was observed on corn with T cytoplasm in southern Iowa, Indiana, Ohio, Illinois and other states. In 1970, corn grown in Florida became infected with H. maydis and rapidly spread north into the Corn Belt, and Ontario, Canada. A new race of the fungus had developed specifically adapted to corn carrying the T cytoplasm. In 1969 it was reported that high susceptibility to yellow leaf spot was also associated with T male sterile cytoplasm. Although plant scientists had produced a wide spectrum of different corn hybrids with considerable genetic diversity they had overlooked the fact that these hybrids were nearly uniform with respect to their cytoplasms. Thus, with favorable weather conditions there was rapid spread of a new strain of a virulent pathogen readily adapted to its host, the corn plant.

The short term cure may be considered simple--not to use hybrids made up with T cytoplasm. Normal cytoplasm is highly resistant to the T race. Available for the 1971 corn planting season is about 3 million bushels of hybrid seed produced by the fertile male method made by hand detasselling. This amount will plant only about 15-20% of the total national requirement. Much of this will go to major corn states where the risks are considered greater. Most farmers will have to grow T cytoplasm corn next year because only this is available in large quantities. Also, some hybrids are being put out as blends with up to 50% seed with normal cytoplasm for pollination. Most seed producers have labeled their hybrid seed blends on the bags stating its percentage of T cytoplasm (the susceptible type).

Foliage fungicides for the control of blight on fields used for seed production will perhaps be available for 1971. However, the effectiveness is not as good as desired, hence the control may not be economically feasible. Applications will need to be made several times during the growing season.

CORN DISEASE CONTROL

C. M. Nagel

In addition to the information the Southern Corn Leaf Blight disease the experimental results which follow involve experimental hybrids with resistance to two other diseases, namely, stalk and root rot.

The 1970 growing season at the station was lacking in moisture, particularly the later half of the season. Yields were markedly reduced (about 50 percent) in comparison to the previous two years. However, over a period of years in South Dakota just such seasons with low rainfall can be expected. Therefore, it is especially important to know how various hybrids perform not only under favorable but adverse growing conditions as well.

Most of the experimental hybrids developed and included in these five experiments are resistant to Southern Corn Leaf Blight. The commercial hybrids included as checks are susceptible, they contain the Texas male sterile cytoplasm and therefore, are susceptible to Southern Corn Leaf Blight, Helminthosporium maydis, race T. The experimental hybrids contain normal cytoplasm and are therefore resistant to this serious disease.

Southern Corn Leaf Blight infection in 1970 was present in light amounts in the southeastern part of the state. The overall loss in yield was about one percent. Dought was the principle cause of the low yields and not blight.

To save space only the top 3/4 of the hybrids are listed in each of the tables. The significant difference (sign. diff.) shown at the bottom of each table, indicates the number of bushels required in yield between any two hybrids for the difference to be significant. For example, in table 1, the difference required is 8.7 bushels.

TABLE 31. DISEASE PERFORMANCE RATING OF 43 EXPERIMENTAL HYBRIDS VARYING IN RESISTANCE TO ROOT AND STALK ROT DISEASES, COMPARED TO 4 ADAPTED COMMERCIAL HYBRIDS USED AS CHECKS. NORTHEAST RESEARCH FARM. 1970 PLANTED MAY 18, HARVESTED OCTOBER 20.

Exp'l Hybrid or Commercial Check	Performance Score Ranking	Yield Bu/A	Ear Moisture at Harvest %
	Experiment #1		
Expt'l. #1	2	43.9	20.9
" 2	1	43.3	15.9
" 3	6	43.0	21.2
" 4	4	41.9	17.0
" 5	3	41.5	14.3
" 6	7	41.4	16.5
" 7	9	41.3	17.4
" 8	10	41.3	19.2
" 9	5	41.0	14.3
" 10	8	40.5	14.8
" 11	12	40.4	17.5
" 12	13	40.4	19.0
" 13	15	40.1	19.5
" 14	11	40.0	14.6
" 15	28	39.9	23.8
" 16	14	39.6	16.8
" 17	18	39.3	18.0
" 18	22	39.1	20.4
" 19	29	39.1	21.3
" 20	16	39.0	16.2
" 21	26	38.6	19.5
" 22	31	38.6	20.8
" 23	21	38.3	17.5
" 24	17	38.1	13.5
" 25	19	38.1	16.0
" 26	25	38.1	17.8
" 27	34	38.0	22.3
" 28	33	37.9	19.9
" 29	23	37.5	15.2
" 30	20	37.3	14.1
Pioneer 3862 (check)	27	37.2	15.2
Sokota SD 220 (ck)	24	37.1	14.2
Northrup King Px442 (ck)	30	37.0	15.5
Sign. diff. (Tukey'a)		2.1 bu/A	

TABLE 32. Experiment #2

Expt'l Hybrid or Commercial Check	Performance Score Ranking	Yield Bu/A	Ear Moisture at Harvest %
Expt'l. #1	2	51.1	14.0
" 2	1	51.0	13.2
" 3	3	50.9	14.8
" 4	4	49.8	15.0
" 5	5	49.5	15.8
" 6	6	48.5	15.2
" 7	10	47.6	15.3
" 8	9	47.4	13.6
" 9	8	47.2	12.8
" 10	17	47.1	19.4
" 11	13	46.7	17.7
" 12	14	46.7	17.7
" 13	7	46.5	10.8
" 14	11	46.2	12.3
" 15	20	45.9	16.5
" 16	19	45.8	16.3
" 17	15	45.7	15.0
" 18	21	45.6	17.4
" 19	27	45.6	21.8
" 20	18	45.2	14.1
Northrup King Px442 (check)	12	45.2	11.5
Expt'l. #21	16	44.7	12.4
" 22	25	44.0	16.9
" 23	23	43.8	15.6
" 24	22	43.5	13.9
" 25	26	42.9	13.9
" 26	28	42.5	13.4
" 27	31	42.3	17.4
Pioneer 3956 (ck)	35	42.3	24.2
Expt'l. #28	24	42.1	12.1
" 29	30	41.6	14.8
Sokota SD220 (ck)	29	41.6	13.6
Sign. diff. (Tukey's)		2.1 bu/A	

TABLE 33. Experiment #3

Expt'l Hybrid or Commercial Check	Performance Score Ranking	Yield Bu/A	Ear Moisture at Harvest %
Expt'l. #1	1	49.0	15.4
" 2	3	48.3	16.6
" 3	2	47.5	13.5
" 4	5	47.2	18.9
" 5	4	46.0	14.9
" 6	9	46.0	17.0
" 7	6	45.8	15.2
" 8	8	45.7	15.0
" 9	12	45.5	17.4
" 10	7	45.4	14.4
" 11	10	45.3	16.0
" 12	17	44.7	18.8
" 13	19	44.6	20.1
" 14	15	44.6	17.0
" 15	11	44.5	14.7
" 16	20	44.3	20.0
" 17	21	44.2	19.7
" 18	13	44.0	13.6
" 19	14	43.4	12.9
" 20	23	43.4	18.8
" 21	18	43.0	14.9
" 22	16	42.9	12.9
" 23	22	42.6	15.2
" 24	24	42.5	17.5
" 25	26	42.5	18.1
" 26	25	41.7	16.1
" 27	32	41.3	20.5
Northrup King Px442 (check)	27	41.0	13.6
Expt'l. #28	31	40.5	17.6
Pioneer 3956 (ck)	37	40.5	25.6
Expt'l. #29	28	40.3	15.7
Sokota SD220 (ck)	29	39.6	14.2
Sign. diff. (Tukey's)		1.9 bu/A	

TABLE 34. Experiment #4

Expt'l Hybrid or Commercial Check	Performance Score Ranking	Yield Bu/A	Ear Moisture at Harvest %
Expt'l. #1	1	49.1	16.0
" 2	3	48.8	18.5
" 3	6	48.7	22.6
" 4	2	47.1	12.7
" 5	10	46.9	18.8
" 6	4	46.5	14.8
" 7	7	46.5	16.2
" 8	14	46.5	19.7
" 9	5	46.4	15.0
" 10	8	46.3	15.8
" 11	15	46.1	18.5
" 12	11	45.6	15.4
" 13	13	45.6	16.0
" 14	12	45.3	14.4
" 15	9	45.2	13.9
" 16	17	45.1	17.4
" 17	19	45.1	18.4
" 18	16	44.0	13.7
" 19	18	43.9	14.2
" 20	21	43.6	16.9
" 21	20	43.5	14.1
" 22	28	43.3	24.0
" 23	22	43.2	16.4
" 24	26	43.2	18.8
" 25	25	42.8	17.5
" 26	24	42.6	16.5
" 27	27	42.3	16.4
Pioneer 3956 (check)	32	42.2	24.8
Expt'l. #28	23	42.1	13.6
" 29	29	40.7	17.2
" 30	30	39.9	15.5
" 31	33	39.3	17.4
Sign. diff. (Tukey's)		2.0 bu/A	

TABLE 35. Experiment #5

Expt'l. Hybrid or Commercial Check	Performance Score Ranking	Yield Bu/A	Ear Moisture at Harvest
Expt'l. #1	1	49.2	13.6
" 2	2	45.3	15.6
" 3	5	45.3	18.5
" 4	4	44.7	16.3
" 5	3	44.3	14.2
" 6	7	44.1	16.9
Northrup King Px442 (check)	6	44.0	14.4
Expt'l. #7	8	43.8	17.4
" 8	10	43.5	19.0
" 9	14	43.3	20.8
" 10	9	43.1	17.7
" 11	17	42.9	20.9
" 12	12	42.6	17.1
" 13	19	42.4	19.6
" 14	11	42.0	14.8
" 15	13	42.0	16.6
" 16	16	41.8	16.9
" 17	23	41.5	19.1
" 18	18	41.3	16.1
" 19	15	41.2	14.9
" 20	24	41.0	18.1
" 21	25	41.0	18.7
" 22	26	40.6	17.7
" 23	22	40.4	15.6
" 24	29	40.2	20.9
Sokota SD220 (ck)	20	39.8	13.0
Expt'l. #25	28	39.8	17.8
" 26	21	39.6	13.0
" 27	27	39.3	15.1
" 28	30	38.7	17.9
" 29	31	38.0	16.9
" 30	35	38.0	25.8
Pioneer 3956 (ck)	38	37.8	32.4
Sign. diff. (Tukey's)		3.0 bu/A	

WHETSTONE VALLEY RESEARCH FARM
TWIN BROOKS, SOUTH DAKOTA

BRIEF HISTORY

During the 1970 season, rainfall was below normal for the months of June through August and temperatures were above normal for the same period. The frost free period extended from May 2 to October 8 for a total of 159 days. The influence of the low rainfall and the high temperatures can be noticed in the yields produced in the various experiments on this farm.

A small grain crop tour and field day were conducted on this farm during the year. Attendance was very good at both occasions with active participation and interest shown in the various projects.

The various corn varieties used in the experiments are provided by local dealers. Variety selection is a function of the "farm directors" of the Whetstone Valley Research Farm.

Three new experiments were started in 1970 namely; Fertilizer Rates of Phosphorus; Tillage Methods for Corn and Methods of Fertilizer Application.

WHETSTONE VALLEY RESEARCH FARM ADVISORS

Member	Address
Harlyn Bartz	Browns Valley
Gordon Bracht	Milbank
Winston Christensen	Wilmot
Clayton Palmquist	Wilmot
Robert Quade	Wilmot
Ted Arnold	Twin Brooks
Harold Barlund	Milbank
Bob Osborne	Milbank
Jim Rabe	Big Stone City
Gordon Ziemer	Browns Valley
John Anderson	Wilmot
Wilford Anderson	LaBolt
Roy Carlson	Milbank
Ray Mueller	Big Stone City
Gerald Oehler	Milbank
Arvid Stengel	Milbank

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

Quentin Kingsley

TITLE: FERTILIZER RATES - NITROGEN

OBJECTIVES OF EXPERIMENT:

1. What is the most profitable rate of nitrogen application for corn?
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?
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?

CROP YEAR HISTORY: CORN

Planted: May 15
Variety: DeKalb XL 45
Row Spacing: 30 inches
Harvested: October 15
Plant Population: 14,000
Soil Moisture Sampling Dates: May 26 and October 28
Insecticide: Thimet 1# Active per acre
Weed Control: 2 pounds atrazine + 1 gallon crop oil per acre
Cultivations: one

RESULTS:

TABLE 1. NITROGEN FERTILIZER RATES FOR CORN. MOISTURE USE AND BUSHELS PER INCH OF WATER UTILIZED

Broadcast Treatment N+P+K lbs/A	Yield Bu/A	Percent Protein	Water Loss Inches	Precip. During Season	Loss from Profile and Precip.* Inches Used	Bushels per Inch of Water Used
0-0-0	47.2	9.2	3.9	10.8	14.7	3.21
0-25-0	50.8	9.8				
100-0-0	53.0	10.5				
50-25-0	50.8	11.0				
100-25-0	55.5	9.9	3.5		14.3	3.88
200-25-0	59.3	11.1	2.9		13.7	4.33
150-25-0	50.0	10.9				
150-25-50	47.9	10.1				

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

DISCUSSION AND INTERPRETATION OF RESULTS:

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

In this year, the 200 pound rate of nitrogen increased corn yields 12.1 bushels per acre more than 0-0-0, and produced 1.12 bushels more corn per inch of soil moisture used. No appreciable lodging, insect or disease damage was noted in the field. Where 100-0-0 was applied, the percent moisture in the corn grain was 2% higher when compared to 100-25-0. The addition of 50 pounds of potassium to the 150-25-0 treatment did not help increase corn yields.

TITLE: Tillage Methods

OBJECTIVES:

1. Which method conserves the most soil moisture and produces the most corn?

2. Will there be a difference in soil compaction due to these different methods?

CROP YEAR HISTORY: CORN

Planted: May 16
Variety: Sokota TS49
Row Spacing: 36 inches
Harvested: October 16
Plant Population: 14,000
Soil Moisture Sampling Dates: May 26 and October 28.
Insecticide: Thimet, 1# Active per acre
Cultivations: one
Weed Control: 2# Atrazine + 1 gallon crop oil per acre

RESULTS:

TABLE 2. TILLAGE METHODS FOR CORN. MOISTURE USE AND BUSHELS PER INCH OF WATER UTILIZED

Treatment Lbs/A N-P-K	Yield Bu/A	Water Loss Inches	Precip. During Season	Loss from Profile & Precip.* Inches Used	Bushels Per Inch of Water
Plow					
0-0-0	68.6	2.0	10.8	12.8	5.36
150-25-30	68.0	1.2		12.0	5.67
Till Plant					
0-0-0	68.2	2.8		13.6	5.01
150-25-30	67.5	0.5		11.3	5.97
Chisel Plow					
0-0-0	71.2	2.2		13.0	5.48
150-25-30	65.9	0.4		11.2	5.88

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

DISCUSSION AND INTERPRETATION OF RESULTS:

Due to a summer fallow practice in 1969 to control perennial weeds, the difference in yield are not significant for any of the planting methods. The moisture utilization for bushels per inch of water used was more efficient where fertilizer was applied for the corn.

The fertilizer was broadcast for plowing and chisel plow, and side dressed for the till plant method of soil preparation.

In 1971, yield difference may be larger due to the previous corn crop, debris and soil moisture use differences.

TITLE: FERTILIZER RATE - PHOSPHORUS

OBJECTIVE OF EXPERIMENT:

1. What is the most profitable rate of phosphorus application for corn?

2. How much will a broadcast treatment of phosphorus influence maturity?

CROP YEAR HISTORY: CORN

Planted: May 15
Variety: NK 446
Row Spacing: 30 inch
Harvested: October 16
Plant Population: 14,000
Soil Moisture Sampling Dates: May 26 and October 28
Insecticide: Thimet, 1# active per acre
Weed Control: 2 pounds atrazine + 1 gallon crop oil per acre.
Cultivations: one

RESULTS:

TABLE 3. PHOSPHORUS FERTILIZER RATES FOR CORN. MOISTURE USE AND BUSHELS PER INCH OF WATER UTILIZED

Broadcast Treatment N-P-K Lbs/A	Yield Bu/A	Percent Protein	Water Loss Inches	Precip. During Season	Loss from Profile and Precip.* Inches Used	Bushels per Inch of Water Used
0-0-0	50.3	10.7	2.1	10.8	12.9	3.90
100-0-0	56.7	11.1				
100-15-0	54.6	11.0				
100-20-0	51.7	10.7				
100-25-0	50.1	10.9	1.1		11.9	4.21
100-30-0	58.5	9.7				
100-35-0	54.2	11.0	2.0		12.8	4.23
100-35-30	48.5	10.9				

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

DISCUSSION AND INTERPRETATION OF RESULTS:

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

The 30 pound rate of phosphorus increased yields 8.2 bushels per acre more than the 0-0-0 treatment, but had the lowest percent protein. Soil moisture utilization was better at the 100-35-0 rate when compared to the 100-25-0 and the 0-0-0 treatments. The addition of 30 pounds of potassium to the 100-35-0 treatment did not increase yields.

TITLE: ROW SPACING AND PLANT POPULATIONS

OBJECTIVES:

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?

CROP YEAR HISTORY: CORN

Planted: May 16 Harvested: October 16
Variety: Pioneer 3582 Fertility: 150-25-50 plow down
Weed Control: 2 pounds atrazine + 1 gallon crop oil per acre
Insecticide: Thimet, 1# active per acre
Cultivations: one

RESULTS:

TABLE 4. 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	49.2	22.4	58.7	22.0	63.0	24.1
10	55.9	23.5	64.4	21.9	64.5	22.6
15	56.8	23.7	69.8	23.5	72.2	23.3
18	63.6	23.9	58.0	22.3	55.9	20.8
21	52.0	22.5	58.3	22.6	39.5	24.5

DISCUSSION AND INTERPRETATION OF RESULTS:

In the row spacing - plant population study, the plant population in this year of stress seemed to be the most important factor. Top yields in the 30 inch rows were produced at 18,000 plants per acre. In the 35 and 40 inch rows, the highest yields were in the 15,000 plants per acre area. The moisture in the corn varied somewhat with the yields from these different plant populations and row spacings.

TITLE: METHODS OF FERTILIZER APPLICATION

OBJECTIVES:

1. What is the best method or system of fertilizer application?

2. Will 25 pounds of phosphorus in a band influence zinc uptake?

CROP YEAR HISTORY: CORN

Planted: May 15
Variety: Trojan TXS 102
Row Spacing: 36 inches
Insecticide: Thimet, 1# active per acre
Cultivations: one

Harvested: October 16
Plant Population: 14,000
Weed Control: 2# atrazine + 1 gallon crop oil per acre

TABLE 5. METHODS OF FERTILIZER APPLICATION FOR CORN AND LEAF SAMPLE ANALYSIS

		Leaf Analysis at Tasseling Time							
N-P Lbs/A	Yield Bu/A	% N*	% P*	% K*	% Ca*	% Mg*	ppm Fe*	ppm Mn*	ppm Zn*
0-0-0 Plow down	64.1	3.37	0.278	1.70	0.84	0.47	84	55.3	62.5
100-25-0 Pop up	58.1	3.27	0.274	1.83	0.84	0.45	88	63.5	56.6
4-4-0 Plow down 96-21-0 Starter 10-25-0 Side dress	66.5	3.31	0.277	1.94	0.85	0.46	89	63.9	55.5
90-0-0 Starter 10-25-0+Zn** Side dress	60.7	3.17	0.273	1.90	0.85	0.42	88	52.3	55.8
90-0-0 Starter 10-25-0 Plow down	64.8	3.17	0.272	1.96	0.94	0.51	93	53.5	51.5
90-0-0	64.5	3.21	0.269	1.70	0.92	0.46	91	63.2	56.4

* N - Nitrogen, P - phosphorus, K - potassium, Ca - Calcium, Mg - magnesium, Fe - Iron, Mn - manganese, Zn - zinc.
**38# of zinc in the form of $ZnSO_4$ to get 10.8# of zinc.

DISCUSSION AND INTERPRETATION OF RESULTS:

The total amount of fertilizer used for each method or combinations of application methods is 100-25-0, except where 10.8 pounds of zinc is added to one of the starter ratios. All fertilizers rates are expressed in actual pounds of N, P and zinc per acre.

A summer fallow - weed control program preceded this experiment in 1969. The effects of the fertilizer placements does not reflect the anticipated differences in yield, which may be due to the summer fallowing. When zinc is included with the starter application, the yield increases 4.1 bushels per acre, but the uptake of zinc into the plant leaves at tassaling time decreased.

The percent of calcium and magnesium are above the optimum element levels for the corn plant at tasseling time. The range for calcium is 0.21-0.50 percent and for magnesium 0.21-0.40 percent. Percent calcium is about three times as high as phosphorus and this should be near a 1 to 1 ratio to be safe from ill effects in livestock feeding.

TITLE: CORN, SORHGUM AND ALFALFA STUDY

OBJECTIVES:

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?

CROP YEAR HISTORY: CORN

Planted: May 16 Harvested: September 24
Variety: Funks G4384 Fertility: 150-25-0 Plow down
Weed Control: 2 pounds atrazine + 1 gallon crop oil per acre
Insecticide: Thimet, 1# active per acre
Cultivation: one

RESULTS:

TABLE 6. CORN FORAGE, TONS PER ACRE WET AND DRY

Row Space Inchea	Population Thousands	Wet Tons/A	% Moisture	Dry Tons/A 12% Moisture	Wet Tons/A 69-70
30	12	6.3	48.2	3.8	10.0
40		7.0	56.8	3.5	10.7
30	16	6.9	49.9	4.0	10.9
40		7.7	52.1	4.3	10.9
30	20	7.9	54.2	4.2	11.2
40		8.5	53.6	4.6	11.7
30	24	8.4	54.8	4.4	12.1
40		7.8	56.6	4.0	11.2

DISCUSSION AND INTERPRETATION OF RESULTS:

Yields of corn for silage are down about 45% from the tonnage produced in 1969. At populations of 12 to 20,000 plants per acre, more wet corn silage was produced in the 40 inch rows. The silage yields are higher in the 30 inch rows at 24,000 plants per acre than the 40 inch row, but does not exceed that of 20,000 plants in the 40 inch rows. There were 2.1 more tons of silage produced at 24,000 plants in the 30 inch rows than 12,000 at the same row spacing. In the 40 inch row spacing, 20,000 plants produced 1.5 tons more than the 12,000 plants per acre.

CROP YEAR HISTORY: FORAGE SORGHUM

Planted: June 16 Harvested: September 22
Variety: Waconia Fertility: 150-25-0 Plow down

RESULTS:

TABLE 7. FORAGE SORGHUM, TONS PER ACRE WET AND DRY

Row Space Inches	Population Thousands	Wet Tons/A	% Moisture	Dry Tons/A 12% Moisture	Wet Tons/A 69-70
30	25	11.9	77.2	3.1	14.7
40		11.1	70.3	3.9	14.1
30	50	15.5	72.3	5.0	17.2
40		13.9	76.1	3.9	15.5
30	75	16.1	63.8	6.7	18.6
40		15.0	74.6	4.4	16.9
30	100	16.9	70.9	5.7	19.5
30		16.7	70.7	5.7	17.5

DISCUSSION AND INTERPRETATION OF RESULTS:

This phase of the forage study was planted the first time on May 16 but had to be replanted because the stands of the higher population were below the proper count. The high percent moisture at harvest time is due partly to the later planting date.

Yields of wet silage, in the 30 inch rows, at all populations were higher than for the same populations in 40 inch rows. More dry tons were produced in the 30 inch rows at 50, 75, and 100,000 plants per acre than for corn, Table 6, at the three highest populations. The yield averages of 1969-70 increase with each increase in population and for each row spacing. The highest yields were produced in the 30 inch rows.

CROP YEAR HISTORY: ALFALFA HAY

Planted: 1969 Harvested: 1st cut June 22; 2nd Cut: July 23;
Fertility: 18-46-0 Broadcast 3rd cut September 23

RESULTS:

TABLE 8. ALFALFA HAY, TONS PER ACRE AT 12% MOISTURE

Variety	Tons per Acre			
	1st Cut	2nd Cut	3rd Cut	Total
Team	1.99	1.34	1.39	4.72
Dawson	1.96	1.39	1.09	4.44
Glacier*	1.99	1.11	1.31	4.41
Warrior*	1.97	1.02	1.31	4.30
Vernal	2.22	0.83	1.20	4.25
Blackburns Ranger	2.03	0.79	1.18	4.00
Saranac*	1.72	0.87	1.16	3.75
Extt. AR 1	1.50	0.63	0.90	3.03

*Flemish varieties

DISCUSSION AND INTERPRETATION OF RESULTS:

Differences in yield are not large between varieties this year. Team produced 1.69 tons more per acre than Experimental AR1 and 0.47 tons more hay than vernal. The two Flemish varieties, Glacier and Warrior, produced about equal yields.

Rainfall during August and early September helped to increase the tonnage of the third cutting.

SOYBEANS

A. O. Lunden

Soybean yields were moderate in spite of late planting followed by subnormal rainfall and ranged from 17 to 25 bushels per acre. Data presented in Table 9 include the very poor yields caused by severe drought in 1969. Corsoy averaged about 21 bushels per acre for the two years at this location and has averaged 37 bushels per acre for three years at the plot near Revillo. This is about two bushels more than the best competitors, Hark and Anoka, but excessive field variability prevents statistical comparison of observed yields. Other new varieties, Dunn, Wirth and Rampage, do not appear to be competitive.

TABLE 9. SOYBEAN YIELDS - NORTHEAST SOUTH DAKOTA

Variety	Days to Maturity	Whetstone Research Farm Bu/A 1969	1970	X	Revillo Test Area Bu/A 1967	1968	1970	X
Corsoy	+10	18.5	24.0	21.3	28.4	36.6	46.0	37.0
Anoka	+2	17.8	20.5	19.2	25.9	35.9	40.2	34.0
Grant	0	15.3	21.2	18.3	23.9	38.8	38.6	33.8
Hark	+11	16.3	20.2	18.3	27.8	38.0	40.9	35.6
Dunn	+2	16.1	20.2	18.2	27.2	34.4	42.1	34.5
Chippewa	+3	17.1	18.8	18.0	27.8	32.8	36.4	32.7
Traverse	+1	16.0	19.4	17.7	23.9	35.7	35.2	31.6
Amsoy	+13	15.3	19.7	17.5	26.6	34.6	44.8	35.3
Rampage	+9	16.0	18.7	17.4	28.3	37.6	37.5	34.5
Wirth	+4	14.4	18.7	16.6	26.8	34.1	36.1	32.9
LSD		NS	NS		2.5	4.9	5.0	

HERBICIDE SCREENING TESTS IN SOYBEANS

W. E. Arnold, C. E. Stymiest and W. B. O'Neal

OBJECTIVE:

To evaluate the effectiveness of new and currently recommended herbicides and herbicide combinations for their control of annual weeds in soybeans.

PLANTING INFORMATION:

Corsoy soybeans were planted in six inch drill rows on June 5.

SPRAYING INFORMATION:

Preplant incorporated and preemergence treatments were applied on June 5. The postemergence treatments were applied on June 25, when the soybeans were in the 2-3 trifoliate stage of growth and the foxtail was just emerging.

RESULTS:

Visual ratings for grassy weed control and soybean yields are presented in the following table. Broadleaf weed infestation was not heavy enough for evaluation. Preplant incorporated treatments of lasso, vernam and treflan satisfactorily controlled annual grasses. Sufficient rainfall was received within a 2 week period after application of the preemergence treatments to move them into the root zone of the weeds and many of these treatments gave excellent control of the annual grasses. Bladex and Bay gave good weed control but a high degree of soybean injury was also noted with these two herbicides. Postemergence herbicides did not perform as well as preplant incorporated or preemergence herbicides.

TABLE 10. HERBICIDE SCREENING TESTS IN SOYBEANS

Treatment	Rate #/A	% Grass Control	Soybean[1] Injury	Soybean Yield[2] (Bu/A)
Pre plant Inc.				
Lasso	2 1/2	90	0	15.3
Vernam	3	77	0	17.4
Treflan	3/4	73	0	17.6
Planivan	1 1/2	65	1.3	18.3
Preemergence				
Lasso	2 1/2	93	0	18.2
Lasso & Lorox	2 + 1	92	0	18.2
Lasso & Amiben	2 + 1 1/2	93	0	17.4
Ramrod	5	92	0	19.4
Ramrod & Lorox	3 + 1 1/2	96	0.7	17.2
Lorox	2 1/2	88	0.3	14.9
Amiben	3	72	1.3	18.1
Solo	3 + 3	67	0	14.3
Preforan	4	88	1.3	16.8
Dathal & Linuron	6 + 3/4	85	0	18.7
Ryzelan	1 1/2	60	0	16.6
Ryzelan	2	78	1.0	14.3
Ryzelan	3	80	1.0	18.2
Preemerge 21	8 q t/a	52	0.7	15.8
BASF-2903	4	93	0.7	18.5
Bladex	2	68	3.3	13.0
Bladex	3	85	8.0	11.9
AN-S6477	3	68	0	17.8
Bay	1	95	6.3	14.1
Post Emergence				
Lasso + oil	2 + 1	10	1.3	9.3
GS-16068	1 1/2	15	3.7	9.4
Tenoran + oil	1 + 1	17	2.0	5.8
Control				
Weedy Check	--	0	0	8.0
Cultivated Check	--	0*	0	11.7

[1] Ratings are based on a 0-10 scale, where 0 is no injury and 10 is severe injury.
[2] Soybeans were harvested on October 21.
* Cultivated check was hoed on June 25.

CORN PERFORMANCE TRIAL

J. Bonnemann

Thirty-six hybrids were included in the trial. The trial was seeded on May 21 and harvested by picker-sheller on October 19. The trial was seeded at two populations, 12,- and 16,000 plants per acre. The variability within the trial site was such that there was no significant yield difference for populations. The yields reported are the mean yield of eight replications. Fertilizer was applied at the rate of 60# N and 40# P_2O_5 per acre. Moisture was taken from shelled corn samples.

TABLE 11. CORN PERFORMANCE TRIAL, WHETSTONE VALLEY RESEARCH FARM, 1970

Brand and Variety	Cross	Performance Rating	Percent Moisture	Percent Root Lodged	Percent Stalks Broken	Yield, B/A
Northrup-King PX 476	3x	1	16.4	1.8	3.6	73.8
SDAES SD Ex 70	3x	4	20.0	6.1	15.9	70.7
Coop S-201	2x	3	22.2	1.4	10.1	70.7
SDAES PP103	4x	2	17.4	29.0	10.8	69.7
Sokota MS-59	M2x	5	18.7	0.4	14.4	69.5
Renk RK-44	2x	10	22.1	0.7	11.0	67.1
SDAES SD Ex 77	4x	8	19.4	14.0	13.2	66.9
SDAES SD Ex 72	M3x	11	17.9	35.3	22.3	66.4
SDAES PP127	4x	6	17.3	1.5	2.6	66.3
Pioneer 3784	2x	7	19.2	0.3	7.0	66.1
Pioneer 3579	M2x	13	21.0	1.8	10.8	65.2
Pioneer 3773	2x	12	20.0	0.4	8.5	64.3
SDAES SD Ex 59	2x	9	15.8	0.0	10.7	64.2
Northrup-King PX 525	3x	16	19.7	0.7	9.7	62.1
SDAES SD Ex 48	M3x	15	17.3	22.4	11.2	62.0
Pioneer 3715	3x	19	21.1	4.0	7.9	61.5
Sokota TS-67	2x	24	22.8	1.1	16.3	61.3
Western KX-45	2x	20	19.6	3.6	12.1	61.0
Northrup-King PX 20	2x	14	16.6	1.8	1.4	60.4
Coop T-106	3x	18	18.8	2.6	5.6	60.2
SDAES PP128	4x	17	17.9	7.1	4.6	59.9
SDAES SD 420	4x	27	22.3	8.5	14.9	59.1
Western KX-33	2x	21	18.5	0.7	5.7	58.2
Northrup-King PX 442	3x	22	16.0	1.4	6.8	56.9
SDAES PP129	4x	25	17.5	7.5	6.7	56.5
Pioneer 3956	2x	23	16.7	2.5	4.3	56.3
Sokota TS-55	2x	26	18.2	3.4	8.7	55.8
Northrup-King PX 446	3x	29	16.7	1.1	25.2	55.5
SDAES PP112	M3x	28	18.2	9.5	4.4	53.4
SDAES SD Ex 63	3x	30	20.0	4.1	12.4	53.0
SDAES SD 250	4x	32	18.2	14.3	18.1	51.4
Northrup-King PX 521	M3x	31	19.1	1.9	1.9	50.1
SDAES SD Ex 75	3x	33	18.1	1.1	14.4	49.2
SDAES SD Ex 52	3x	34	17.7	4.2	14.4	46.5
SDAES SD 270	4x	35	18.9	6.5	16.7	43.9
		Means	18.7	6.0	10.4	60.4

C.V. = 21.72

CORN DISEASES (CON'T.)

C. M. Nagel

Through the fine cooperation of Mr. Henry 1. Knudsen of New Effington, South Dakota, a corn experiment was grown on his farm. A total of 85 experimental hybrids were included in the tests, plus four commercial hybrids as checks.

TABLE 12. DISEASE PERFORMANCE RATING OF 41 EXPERIMENTAL HYBRIDS VARYING IN RESISTANCE TO ROOT AND STALK ROT DISEASES, COMPARED TO 4 ADAPTED COMMERCIAL HYBRIDS USED AS CHECKS. H. I. KNUDSEN FARM, NEW EFFINGTON, SOUTH DAKOTA. 1970. PLANTED MAY 22, HARVESTED OCTOBER 17.

Expt'l Hybrid or Commercial Check	Performance Score Ranking	Yield Bu/A	Ear Moisture at Harvest %
	Experiment 1		
Expt'l. #1	1	81.4	12.2
" 2	2	80.6	13.8
" 3	4	78.6	12.6
" 4	3	77.8	9.6
" 5	5	76.5	11.2
" 6	6	74.5	12.1
Dekalb XL 26 (check)	18	73.9	20.1
Expt'l. #7	9	73.5	12.9
" 8	7	73.4	11.8
" 9	11	73.4	13.9
" 10	8	73.3	12.3
" 11	13	73.1	14.5
" 12	12	72.3	12.0
" 13	10	72.2	11.2
" 14	15	71.9	14.0
" 15	14	71.7	11.3
Sokota MS 35 (ck)	19	70.8	14.9
Expt'l. #16	16	70.2	11.1
" 17	17	69.2	10.8
" 18	25	69.2	14.1
" 19	29	68.6	15.7
" 20	30	68.5	16.8
" 21	23	68.4	11.5
" 22	22	68.2	11.1
" 23	18	68.0	10.3
" 24	20	68.0	10.7
" 25	27	67.6	11.1
" 26	26	67.5	10.7
" 27	31	67.5	15.1
" 28	24	67.0	10.7
" 29	28	65.9	10.9
" 30	35	65.7	13.0
Pioneer 3980 (ck)	44	55.8	9.7
SD Exp'l 59 (ck)	45	53.5	10.1
Sig. Diff. (Tukey's)		6.04 Bu/A	

In addition to the Southern Corn Leaf Blight disease the experimental results which precedes and follows envolved experimental hybrids with resistance to two other diseases, namely, stalk and root rot.

Most of the experimental hybrids developed and included in these two experiments are resistant to Southern Corn Leaf Blight. The commercial hybrids included as checks are susceptible, they contain the Texas male sterile cytoplasm and therefore,

are susceptible to Southern Corn Leaf Blight, Helminthosporium maydis, race T. The experimental hybrids listed in the following tables contain normal cytoplasm and are therefore resistant to this serious disease, but not immune.

The Southern Corn Leaf Bligh disease in 1970 was present in light amounts in the northeastern part of the state. However, a dry period set in about mid-August and the disease caused little damage--less than 1 percent.

Due to the lack of soil uniformity (underground impervious formations) experienced at Corona Station, in 1969, it seemed advisable to locate the experiment where the soil problems were less and the yield results more reliable. Therefore, the Knudsen farm was selected for the 1970 tests.

TABLE 13. Experiment #2

Expt'l. Hybrid or Commercial Check	Performance Score Ranking	Yield Bu/A	Ear Moisture at Harvest %
Expt'l. #1	1	95.6	16.8
" 2	3	89.9	18.3
" 3	5	88.5	19.5
" 4	2	86.6	11.3
" 5	4	86.1	13.0
" 6	7	84.8	19.0
" 7	8	84.2	20.0
" 8	6	83.2	15.4
" 9	13	82.8	21.0
Sokota MS 35 (check)	10	81.1	14.8
Expt'l. #10	16	79.4	17.8
" 11	15	79.2	16.4
" 12	8	79.1	10.1
SD Expt'l. 59 (ck)	12	79.0	14.4
Expt'l. #13	11	78.6	13.9
" 14	18	78.0	17.7
" 15	14	77.6	12.5
Dekalb XL 26 (ck)	29	77.1	27.1
Expt'l. #16	20	77.1	17.1
" 17	22	76.2	20.1
" 18	28	74.7	22.6
Pioneer 3980 (ck)	17	74.5	11.5
Expt'l. #19	19	74.4	12.7
" 20	23	72.7	15.6
" 21	21	72.3	11.0
" 22	24	72.2	15.2
" 23	26	71.6	16.1
" 24	25	70.9	14.6
" 25	30	70.7	18.0
" 26	31	69.7	16.4
" 27	27	67.9	10.8
" 28	32	65.1	12.8
Sign. diff. (Tukey's)		2.26 Bu/A	

WHETSTONE VALLEY RESEARCH FARM
SMALL GRAIN YIELDS 1970

Planting Date: May 12, 1970
Harvested: August 13, 1970
Fertility: 150 pounds of 20-20-12 per acre
Varieties listed in order of yield produced, not maturity

Wheat, Spring:	Test Wt.	Yield Bu/A
Era	57.5	33.7
Polk	57.5	33.6
Fortuna	58.0	33.4
Bonanza	56.0	32.9
Neepawa	55.5	32.8
Manitou	55.5	30.7
Chris	58.0	30.3
Waldron	57.5	30.1
World Seeds 1812	57.0	29.1
Fletcher	56.5	27.4
Sheridan	59.5	26.5
6 WO 1809	58.9	17.8
Durum:		
Wells	58.0	32.5
Hercules	57.5	32.2
Leeds	59.0	32.1
Triticales:		
Triticales 204 (ICC)	44.5	23.8
Triticales 209 (DOT)	43.5	23.3
Rosner	43.0	21.0
Flax:		
Linott	52.0	18.4
Foster	52.5	17.1
Windom	52.5	16.9
Summit	53.0	16.7
Nored	53.0	16.6
Norstar	52.0	16.1
Bolley	51.0	16.1
B-5128	52.5	13.5
Berley:		
Firlbecks III	41.5	40.8
Larker	40.5	40.7
Conquest	39.5	39.0
Dickson	40.5	38.8
Liberty	43.0	37.9
Primus II	40.0	37.0

Oats:	Test Wt.	Yield Bu/A
Kota	33.5	62.6
Kelsey	32.0	61.1
Portal	33.5	60.9
Garland	32.5	58.2
Holden	31.5	58.0
Nodaway	34.0	57.6
Sioux	31.0	55.1
Lodi	29.0	54.9
Otter	30.5	54.0
Brave	32.0	53.3
Froker	32.0	51.6
Cayuse	27.5	50.9
Burnett	32.5	49.7
Clintland 64	33.5	45.1