Plant Science Pamphlet 11 December 1972

ANNUAL PROGRESS REPORT

NORTHEAST RESEARCH FARMS

Westprairie Coteau, Garden City, North Sioux Valley, Watertown and Whetstone Valley, Twin Brooks, South Dakota

NORTHEAST EXPERIMENTAL FARM COMMITTEE

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Quentin Kingsley, Project Leader	Northeast Farms	Brookings
Donald W. Nelson, S.D.S.U.	Clark	Garden City

BRIEF HISTORY

During the 1972 crop year, rainfall was above normal for the year on all the Northeast Research Farms. The rainfall varied from one unit to another, also in the intensity and duration. Subsoil moisture reserves were high in the spring and at freeze-up time.

The three research farm experiments and observation trials were observed by many small groups and individuals this year. Field days were conducted on the Whetstone Valley Farm, and the Garden City unit. The Watertown unit is not scheduled for field days, but tours may be conducted on it.

Various observations were set up this year on all three farms. A flax fertility study was started at Garden City and Watertown where fertilizer is applied with the seed and in another area the same amounts are plowed in. Also at Garden City, a fertilizer study was started with potatoes. On the Whetstone Valley Farm, a sunflower observation was started using 36 inch row with various fertility rates and a corn catch crop using 70, 95 and 105 day corn.

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

1972 CROP SEASON

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

Garden City, Watertown, and Whetstone Valley Units

	Garden City		Watertown		Whetstone	
Rainfall	Inches	Depart	Inches	Depart	Inches	Depart
April	3.33	+1.14	1.90	-0.16	2.21	+0.04
May	6.99	+4.14	7.73	+4.76	6.28	+3.40
June	1.16	-2.84	2.92	-0.78	1.21	-2.56
July	5.08	+2.21	6.35	+3.68	6.06	+3.34
August	1.56	-1.40	2.57	-0.21	1.46	-1.41
September	0.32	-1.95	0.11	-1.74	0.24	-2.02
October	1.63	+0.21	1.37	+0.21	0.93	-0.57

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FERTILITY AND CULTURAL PRACTICE EXPERIMENTS
WEST PRAIRIE COTEAU
Garden City, S. D.

Q. S. Kingsley

TITLE: Mulch Tillage and Fall Application of Fertilizer for Corn and Wheat

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: June 1
Variety: Pioneer, 85 Day
Row Spacing: 36 inches

Harvested: Oct. 20
Plant Population: 14,000/A
Soil Moisture Sampling Dates: June 5 and Oct. 19

RESULTS:

TABLE 2. MULCH TILLAGE AND FERTILIZER RATES FOR CORN

Treatment** N-P-K Lbs/A	Yield Bu/A 72	Yield Bu/A 70-72	Water Loss Inches	Precip. During Season Inches	Loss From Profiles and Precip.* Inch Used	Bushels per Inch of Water Used
(1) 0-0-0	58.4	41.6	5.34	9.18	14.52	4.02
(2) 100-0-0	85.5	55.9	6.25		15.43	5.54
(3) 50-30-0	76.1	54.8	6.21		15.39	4.94
(4) 100-30-0	99.2	65.4	6.77		15.95	6.22
(5) 100-60-100	90.7	62.1	6.69		15.87	5.72
(6) 100-30-100	91.0	61.2	7.29		16.47	5.53

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

** The numbers preceding the fertilizer treatment for corn correspond to the numbers used for wheat to show the difference in fertility levels.

DISCUSSION AND INTERPRETATION OF RESULTS:

This is the third year for this experiment and it is a mulch program where no plowing is performed. The corn yields show an appreciable difference between fertility treatments, when compared to the 0-0-0 or no fertility, yields were increased from 17.7 for 50-30-0 to 40.8 bushels per acre for 100-30-0. The fertilized areas also produced more bushels per inch of water used.

CROP YEAR HISTORY: WHEAT

Planted: May 10
Variety: Chris
Soil Moisture Sampling Dates:
June 5 and Sept. 12

Harvested: August 30
Row Spacing: 7 inches

RESULTS:

TABLE 3. MULCH TILLAGE AND FERTILIZER RATES FOR WHEAT

Treatment ** N-P-K Lbs/A	Yield Bu/A 72	Yield Bu/A 70-72	Water Loss Inches	Precip. During Season Inches	Loss from Profiles and Precip. * Inch Used	Bushels per Inch of Water Used
(1) 0-0-0	15.5	15.7	2.82	7.91	10.73	1.44
(5) 0-0-0	21.1	20.1	2.89		10.80	1.95
(4) 0-30-0	18.5	18.4	2.96		10.87	1.70
(2) 50-0-0	21.7	21.5	2.97		10.88	1.99
(6) 50-7-0	26.3	25.3	3.34		11.25	2.34
(3) 50-30-0	22.7	23.6	3.74		11.65	1.95

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

** The numbers preceding the fertilizer treatment for wheat correspond to the numbers used for corn to show the difference in fertility levels.

DISCUSSION AND INTERPRETATION OF RESULTS:

The fertilizer was fall broadcast and a stubble mulching tool, with 32 inch sweeps, was used to prepare the soil. Residual fertility from corn treatment 5, Table 2, increased wheat yields 5.5 bushels per acre over the 0-0-0 treatment 1. The nitrogen residual from treatment 4 increased yields 3.0 bushels per acre. Treatment 6, produced 10.8 bushels more wheat than treatment 1, but only 3.0+ bushels more than the other two treatments. Soil moisture was utilized better when the crop was fertilized.

TITLE: Depth Placement of Fertilizer for Wheat

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?

CROP YEAR HISTORY:

Planted: May 10
Variety: Chris
Soil Moisture Sampling Dates:
June 5 and Sept. 12

Harvested: Sept. 7
Row Spacing: 7 inches

RESULTS:

TABLE 4. DEPTH PLACEMENT OF FERTILIZER FOR WHEAT. FALL APPLIED IN 1971.

Treatment N-P	lbs/A(4)	Yield Bu/A 72	Yield Bu/A 68-72	Water Loss Inches	Precip. During Season	Loss from Profile and Precip.* Inches Used	Bushels per Inch of Water Used
0-0-0	No Rip	12.6	26.3	3.59	7.91	11.50	1.10
0-0-0	Rip	15.1	26.0	1.68		9.59	1.57
60-0-0	Broadcast(1)	19.0	34.0	3.01		10.92	1.74
60-0-0	Plow Sole(2)	18.7	31.1	2.39		10.30	1.82
60-0-0	Deep (3)	19.8	30.8	1.68		9.59	2.06
120-0-0	Broadcast	18.4	31.4	2.54		10.45	1.76
120-0-0	Plow Sole	20.6	32.1	3.52		11.43	1.80
120-0-0	Deep	19.0	30.8	1.25		9.16	2.07

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

(1) Fertilizer broadcast on surface and plowed in.
(2) Fertilizer applied at 21 inch spacing 6-7 inches 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 OF RESULTS:

Differences in yield between fertilized treatments are small. Due to the heavy rain fall during the spring season, much leaching occurred and the yields may have been reduced from the effect. The 120-0-0 placed at plow sole produced 8.0 bushels more wheat per acre than the No Rip 0-0-0 treatment and 5.5 more than Rip 0-0-0. The deep placement of fertilizer produced more wheat per inch of water used.

TITLE: Winter Wheat Management

OBJECTIVES OF EXPERIMENT:

1. The effect of various fertilizer rates to winter wheat yields.
2. Comparison of various equipment to prepare soil for planting winter wheat.

CROP YEAR HISTORY:

Planted: Sept. 24, 1971 Harvested: Aug. 28, 1972
Variety: Lancer at 1 1/4 Bu/A Row Spacing: 7 inches
Weed Control: Avadex, 12#/A fall broadcast for Wild Oats Control

RESULTS:

TABLE 5. WINTER WHEAT MANAGEMENT

Treatment N-P Lbs/A	Yield in Bushels per Acre					
	Plow	Fallow	No Till	Duckfoot +Disk	Chisel Plow	Stubble Mulch
0-0-0	17.6	24.2	26.3	21.8	25.8	26.5
30-0-0	22.5	31.1	33.9	36.2	34.0	30.8
30-15-0	27.5	30.3	34.7	38.6	37.7	37.6
45-0-0	21.9	31.9	33.2	33.8	36.5	31.2
45-15-0	27.4	31.5	34.5	38.6	39.9	39.6
60-0-0	25.1	28.9	32.8	35.9	36.8	31.5
60-15-0	31.2	33.1	33.6	38.0	39.6	43.5

DISCUSSION AND INTERPRETATION OF RESULTS:

The winter wheat was planted in barley stubble and the tillage was performed about 1 1/2 to 2 weeks after harvest. All equipment used for tillage were farm tools except the stubble mulcher. This piece of equipment has 32 inch sweeps on it, and is run at about 4 inches below the soil surface where possible. The 4 inch depth is suggested but soil moisture at tillage time dictates the depth the tillage tool can be kept in the ground. September of 1972 was dry and the soil was hard necessitating deeper tillage.

All the fertilizer was run down the spout, with the seed, at planting time. In all treatments, except the fallow method, when phosphorus was added to the nitrogen the yield increased. The effect of fertility above 30-0-0 for summer fallow and no till is rather small. In the other tillage treatments, except plowing, the yield differences between 30, 45 and 60-0-0 are within 2-3 bushels of each other in each tillage method.

POTATO FERTILITY

Q. S. Kingsley and E. P. Adams

TITLE: Potato Fertility Study

OBJECTIVES OF EXPERIMENT:

1. The effect of various fertilizer rates to potato yields.
2. What effect does the amount of fertilizer have on stand and weed growth?

CROP YEAR HISTORY:

Planted: June 2
Variety: Kennebec
Rate: 1200 Lbs/A

Harvested: Oct. 12
Row Space: 40 inch
Insecticide: 25 Lbs. of 10% thimet/A Banded

RESULTS:

TABLE 6. POTATO FERTILITY STUDY, GARDEN CITY, 1972

Treatment N-P-K Lbs/A	Yield in Bushels and Hundred Weight Per Acre Bu/A	Cwt/A
0-0-0	118.7	71.2
0-60-0	173.3	104.0
40-60-0	249.1	149.5
40-60-40	163.5	98.1
40-0-40	195.5	117.3
80-60-0	209.6	125.8
80-60-40	197.3	118.4
80-0-40	120.3	72.2
120-60-0	229.5	137.7
120-60-40	173.0	103.8

DISCUSSION AND INTERPRETATION:

The potatoes were planted late this year due to the wet soil. About 65 per cent of the seed pieces survived the wet weather and the yields in Table 6 are the results of this potato crop. Weeds were a problem this year.

The use of 60 pounds of phosphorus by itself produced higher yields than other applications that had nitrogen and potassium in combination. Where potassium was added to N and P the yields were reduced in every case. All fertility treatments exceeded the 0-0-0 treatment, and this year the 40-60-0 treatment produced 130.4 bushels more than 0-0-0.

Winter Wheat On The Johnny Arndt Farm 1972
Q. S. Kingsley, D. W. Nelson

In the fall of 1971, Mr. Arndt agreed to let us use 28 acres of land north and west of Garden City that was fairly irregular in topography. The slope on this land varied from level to a 10% slope. It had been planted to flax. Mr. Arndt chisel plowed the area NE by SW and to an operational depth where the tool stayed in the ground. On September 23, 1971, the field was planted using Winoka at 1 1/4 bushels per acre. Ten acres were planted using 54-36-0, another 10 acres using 27-18-0 and 8 acres with no fertility. The plantings were made side by side east and west across the field, with the fertilizer applied down the spout with the seed.

Mr. Arndt harvested the field using a 14 foot windrower and his own combine for threshing the grain. Windrows were selected from each test for sampling and the results are:

54-36-0 produced 35.4 Bu/A and 12-18 tillers/plant
27-18-0 produced 24.9 Bu/A and 8-14 tillers/plant
0-0-0 produced 17.1 Bu/A and 2-8 tillers/plant

GARDEN CITY RESEARCH FARM
SMALL GRAIN YIELDS 1972

Planting date: May 19
Harvested: August 8
Fertility: 30-20-0
Varieties listed in order of yield produced, not maturity

TABLE 7.

Barley	Test Wt. lb/bu	Yield Bu/A 1972	Yield Bu/A 67-72
Firlbecks III	48.0	61.5	66.3
Primus II	44.0	57.1	58.7
Nordic	46.0	50.3	58.2/2
Larker	44.0	50.1	59.7
Cree	42.0	48.8	60.0/2
Prilar	44.0	46.8	54.9/2
Dickson	44.0	46.2	60.3
Conquest	42.0	44.1	52.2
Burk	45.0	39.1	39.1/1
Flax			
Nored	51.0	19.0	22.8/4
Norstar	51.0	15.9	18.6/3
B-5128	50.0	15.9	21.1
Windom	50.0	15.3	20.6
Summit	50.0	14.6	20.8
Foster	51.0	14.2	18.2/3
Linott	52.0	10.9	20.5
Oats			
Dal	36.0	81.7	81.7/1
Random	24.0	74.6	74.6/1
Trio	32.0	73.1	73.1/1
Lodi	26.0	70.1	92.6
Chief	34.0	67.6	87.0/2
Kelsey	28.0	62.3	91.0
Portal	33.0	61.7	88.2
Otter	28.0	57.7	71.9/3
Cayuse	24.0	54.5	90.8/2
Diana	33.0	53.1	57.7/2
Froker	35.0	52.2	72.7/3
Burnett	29.0	50.4	78.9
Holden	30.0	48.4	75.5
Nodaway 70	31.0	47.0	56.7/3
Garland	31.0	43.1	76.8
Kota	29.0	41.8	86.6

Spring Wheat	Test Wt. lb/bu	Yield Bu/A 1972	Yield Bu/A 67-72
HARD RED SPRING			
Polk	59.0	37.1	38.7/5
Waldron	56.0	36.3	40.2/3
Chris	58.0	33.5	41.5
Sheridan	58.0	28.6	41.4
Nordak	58.0	28.3	28.3/1
Fortuna	55.0	27.2	34.2
Manitou	58.0	26.0	38.9
SEMI-DWARF			
Bonanza	58.0	42.9	43.3
Lark	57.0	39.3	39.3/1
Bounty 208	58.0	39.1	42.5/2
World Seeds 1809	57.0	38.7	43.4/3
Era	56.0	37.5	45.1/3
Fletcher	57.0	27.6	37.8/3
DURUM			
Hercules	60.0	42.9	37.7/3
Wells	59.0	38.6	42.7
Rolette	61.0	37.1	37.1/1
Leeds	60.0	32.4	39.8

NOTE:
/1, /2, /3, /4, /5 are the number of years averaged.

Data furnished by Q. Kingsley

TABLE 8. 1972 GRAIN SORGHUM PERFORMANCE TRIAL, AREA D2, WEST PRAIRIE COTEAU RESEARCH FARM, GARDEN CITY

Brand and Variety	Yield lb/A	68-72*	Test wt. lb/B	Height, inches	Percent Moisture 9/25/72	Date headed
RS 506	5105	3795/3	55	54	35.+	8/12
Pioneer 894	4175	3680/5	54	37	35.+	8/13
Coop SG-10	4095		54	49	35.+	8/15
Western WS 102	4085		55	44	35.+	8/9
SD 70106	3970		54	42	35.+	8/3
SD 104	3950	3650/2	56	39	35.+	8/1
SD 690156	3725		56	40	35.+	7/31
SD 503	3710	3405/5	54	48	35.+	8/14
SD 451	3340	3350/5	54	58	35.+	8/11
DeKalb X-1355	3125		49	39	35.+	8/12
DeKalb A-26	2645		50	40	35.+	8/13
DeKalb B-36	2555	2005/2	54	42	35.+	8/15
Coop SG-21	2155		47	44	35.+	8/17
Mean	3585					

C.V. = 13.2%

\+ sign indicates moisture was above 35%; beyond upper limits of meter.
* average of years 2, 3 etc. /2, /3

TABLE 9. Standard Variety Winter Grains Trials, Garden City

Winter Wheat Trials

Variety	Garden City Yield	T.W.
Nebred	36.4	57.5
Minter	41.0	62.8
Hume	40.1	61.8
Gage	46.5	61.0
Lancer	44.6	62.5
Froid	41.1	61.0
Scout 66	40.0	61.0
Trader	35.6	61.0
Trapper	35.8	59.5
Winoka	37.6	62.5
Scoutland	39.5	61.5
Caprock	22.2	56.8
Eagle	37.1	60.8
Centurk	46.2	60.8
W'master 106	41.9	61.8
Bronze	39.5	61.0
SD 7117	41.6	61.2
Tritical	LB/A	
Fas-Gro 131	2151	48.0

Standard Variety Rye Trials

Variety	Garden City Yield	T. W.
Caribou	28.6	54.0
Cougar	40.0	54.0
Frontier	32.9	55.5
Pearl	39.9	55.0
VonLochow	27.0	53.5
Zelder	34.9	54.0
Coloma	42.7	54.5
Sel. 1	30.0	55.5
	34.5	
	N. S.	

Seeded 9/15/71
4 replications

Data furnished by J. J. Bonnemann

Soil and Water Loss (Runoff) Demonstration

Edward J. Williamson, 1972
and Donald W. Nelson

This year provides the fourth year of data collection for the soil and water runoff demonstration study. The comparisons of yield and moisture use efficiency for both a two and four year cropping sequence on up-and-down slopes and contour farming systems are presented in Table 10. A sixteen bushel per acre corn yield increase was obtained by the contour farming system over that of conventional up-and-down slope. Both received similar fertility treatment of a 60+35+0. The contour system further shows a soil moisture efficiency advantage of almost 3 more bushels of corn produced for each inch of soil moisture used. While little difference in oat yield was shown between the contour and the up-and-down slope system, it is interesting to note the slight advantage for contouring based on soil moisture use efficiency.

Runoff was quite low for the season even though the growing season precipitation (April-October) of 20.07 inches was 1.51 inches above normal. The total loss of runoff and soil for the two cropping sequences and continuous fallow are shown in Table 11. Similar to 1971, the greatest loss occurred with continuous fallow.

There were five rain storms in 1972 of magnitude for runoff to occur on the continuous fallow plot. Only two of these storms caused runoff to some degree with the cropping sequence systems, as shown in Table 12.

TABLE 10. CROP YIELD AND WATER USE EFFICIENCY--RUNOFF DEMONSTRATION
WEST PRAIRIE COTEAU RESEARCH FARM--GARDEN CITY--1972

		Up and Down Slope		Across Slope (Contour)	
Cropping System	Crop	Yield Bu/A or T/A	Water Use Efficiency Bu/Inch Water Used	Yield Bu/A	Water Use Efficiency Bu/Inch Water Used
Two-Year Sequence:					
Row Crop	Corn	96.4	5.23	110.0	8.12
Small Grain	Oats	69.5	5.63	68.3	5.77
Four-Year Sequence:					
Row Crop-	Corn	93.4	6.18	--	--
Small Grain-	Oats	1/	--	--	--
Alf-alf	Alf-2 yrs.	5.3	--	--	--
	Alf-1 yr.	2/	--	--	--

1/ Oats companion crop clipped to cause good stand of alfalfa
2/ First year alfalfa crop not harvested, very thin stand

TABLE 11. RAINFALL, RUNOFF AND SOIL LOSS FROM RUNOFF DEMONSTRATIONS
WEST PRAIRIE COTEAU RESEARCH FARM, GARDEN CITY--1972

Year	Rainfall Apr.-Oct. Inches	Cropping Sequence	Crop	Runoff % Rainfall	Runoff Inches	Soil Loss lbs/A
		2 yr. sequence C-O	Corn	0.00	0.00	0.00
		Up/Down Slope	Oats	<0.01	0.08	160
		2 yr. sequence C-O	Corn	0.00	0.00	0.00
		Across Slope	Oats	0.00	0.00	0.00
1972	20.07	(contour)				
		4 yr. sequence	Corn	1.79	0.36	479
		C-O-alf-alf.	Oats	0.94	0.19	230
		Up/Down Slope	Alf.-1 yr.	0.00	0.00	0.00
			Alf.-2 yrs.	0.00	0.00	0.00
		Fallow	---	4.58	0.92	1038

TABLE 12. EFFECT OF STORM INTENSITY ON RUNOFF AND SOIL LOSS FROM CORN IN 4 YEAR SEQUENCE AND CONTINUOUS FALLOW
West Prairie Coteau Research Farm--Garden City--1972

No.	Storm Date	Duration	Slope Direction	Rainfall Amt Inches	Rainfall % Total	Runoff Amt Inches	Runoff % Total	Soil Loss Amt lbs/A	Soil Loss % Total
1.	May 28	0.9"in 30 minutes	Up/Down Slope	1.61	53	0.23	24	453	35
			Fallow			0.45	46	678	52
2.	July 25	0.5" in 15 minutes	Up/Down Slope	1.45	47	0.13	13	26	2
		0.45" in 30 minutes and 0.5" in 15 minutes							
			Fallow			0.16	17	139	11

Wild Oats Control in Wheat, Barley, and Flax

W. E. Arnold and W. B. O'Neal

Several experimental herbicides were evaluated for their control of wild oats (Avena fatua) in small grains. Chris wheat, Prilar barley and Nored flax were seeded in a silty clay loam soil of 4% organic matter on May 18. Plot size was 10 by 22 feet, replicated four times in a randomized complete block design. Herbicide applications were made with a tractor sprayer applying 20 gpa at 40 psi. Preemergence applications were applied on May 18. The first post emergence applications were made on June 3 when the wild oats were in the two leaf stage of growth and the crops were in the following stages of growth; wheat - 2 leaf, barley- 2 to 3 leaf, and flax - 2 to 3 inches. On June 12 herbicide treatments were applied to wild oats in the four leaf stage of growth while the crops were in the following stages of growth; wheat - 4-leaf, barley - 4 to 5 leaf, and flax 4-5 inches. The entire experiment was sprayed with MCPA amine (1/2 lb/a) on June 22 for broadleaf weed control Visual estimations of percent wild oats control were made on July 25. Harvest samples from a 3 by 6 feet area were taken for determination of crop yield.

An unusually wet spring resulted in a late planting that may account for the low yields obtained. Triallate (Fargo) gave better wild oats control and higher barley yields than barban (Carbyne). AC-84777+Surfel gave good wild oats control when applied at the four leaf stage but did result in some crop injury to wheat and barley. Asulam+X-77 gave excellent wild oats control with only slight injury to flax. The average of four replications of percent wild oats control and crop yield are shown in the table below.

TABLE 13. WILD OATS CONTROL IN WHEAT, BARLEY AND FLAX

Treatment	Rate (Lb/A)	Percent Wild Oats Control	Yields Bu/A Wheat	Barley	Flax
Preemergence					
Triallate a/	1	93	13	31	5
Two Leaf Stage					
Barban b/	3/8	55	13	17	2
AC-84777+Surfel	1/4+1/2%	38	9	26	4
AC-84777+Surfel	1/2+1/2%	83	10	28	6
AC-84777+Surfel	3/4+1/2%	80	6	36	3
AC-84777+Surfel	1+1/2%	78	6	27	4
AC-50191+Surfel	1/2+1/2%	70	12	32	4
AC-50191+Surfel	1+1/2%	84	8	38	5
Four Leaf Stage					
AC-84777+Surfel	1/4+1/2%	49	11	20	2
AC-84777+Surfel	1/2+1/2%	84	8	25	4
AC-84777+Surfel	3/4+1/2%	88	10	33	4
AC-84777+Surfel	1+1/2%	92	9	23	4
AC-84777+2,4D amine+Surfel	1/2+1/2+1/2%	81	14	28	1
AC-84777+2,4-D amine+Surfel	1+1/2+1/2%	89	10	20	2
AC-50191+Surfel	1/2+1/2%	80	14	26	3
AC-50191+Surfel	1+1/2%	93	8	39	5
Asulam+X-77	3/4+1/2%	96	---	---	4
Asulam+X-77	1+1/2%	99	---	---	4
Asulam+X-77	2+1/2%	100	---	---	7
No Herbicide	---	0	10	24	3

a/ Incorporated with two flextine harrowings at right angles

b/ Applied at 6.7 gpa and 40 psi

Corn Breeding Work - Watertown Station

D. B. Shank

Five yield trials were conducted in 1972 as follows: A test of new experimental 3-and 4-way crosses, three tests of single cross hybrids to be used for prediction purposes, and one investigating row widths and population levels.

Over 5 inches of rainfall in May and 3 1/2 inches in July resulted in yields far above long time averages. The lowest yielding test, composed of 56 very early single crosses had a mean yield of 68.6 bushels per acre while the highest yielding trial was a single cross test of later inbreds having 81 entries which produced a mean yield of 85.0 bushels per acre. The highest yield in this test was 113.5 bushels per acre. The large amount of rain in May caused poor stands in one low area of the field because of standing water.

Several of the new 3-and 4-way hybrids which have performed well in previous years when rain fall was less adequate did not do as well on a relative basis compared to some of the later maturing hybrids which responded to the good moisture conditions and warm temperatures in August.

As indicated above, results from the three single cross tests will be used to predict as yet untried 3-and 4-way combinations for possible future hybrids. Because of above average yields in 1972, such predictions may be of limited value in a search for new pedigrees of hybrids adapted to more nearly average growing conditions.

Some of the results from the study on row widths and populations are given in Table 14.

TABLE 14. AVERAGE YIELDS IN BUSHELS PER ACRE FOR FOUR HYBRIDS GROWN AT THREE POPULATION LEVELS AND THREE ROW WIDTHS AT THE WATERTOWN STATION - 1972

Hybrid	Plants/A	Row Width
1 = 88.0	12M=76.2	30"=87.5
2 = 83.3	14M=83.0	35"=83.0
3 = 64.7	16M=87.3	40"=76.1
4 = 92.7		

The hybrids all yielded differently which was expected. Yields for population levels also increased directly as stands were raised from 12 to 16 thousand plants per acre. In tests conducted from 1969-71, inclusive, 16M plants per acre usually produced slightly more than 12M plants per acre but not by very much. The generally high yields of 1972 probably account for the 11.1 bushel per acre superiority of 16 over 12 thousand plants per acre.

Row width data shows a distinct advantage as rows were narrowed from 40 to 30 inches. In previous tests, wherein 35 inch rows were not included, 30 inch plot yields were always higher than those from 40 inch widths.

STARTER FERTILIZER EXPERIMENT WITH CORN
NORTH SIOUX VALLEY RESEARCH FARM, WATERTOWN, S. D.

P. Carson, F. Shubeck, B. Byrnes and Q. Kingsley

OBJECTIVES OF THE EXPERIMENT:

1. To establish the value of starter fertilizers on the growth and yield of corn.
2. To determine what effects, rates of P and/or K applied as starter, have on the yield of corn.

METHODS:

1. Experimental design - completely randomized factorial. Plot size was 10 feet x 60 feet. Each plot contained four rows of corn.
2. Nitrogen was applied before planting at the rate of approximately 100 pounds per acre.
3. Variety - Pioneer 3862.
4. Weeds were controlled with Ramrod and insects with Furadan by banding at corn time.
5. Corn was planted June 2, 1972.
6. The corn was planted with a John Deere Unit-planter equipped with belt fertilizer applicators to apply fertilizer as a starter beside and below the seed. The rate of planting was 16,000 seeds per acre. The row width was 30 inches.
7. Rains in May made it impossible to plant this plot until June 2. The seed bed at planting time was cloddy on the surface and wet underneath. The soil would have to be considered in a poor state of tilth at that time. These conditions were quite comparable to those being encountered by farmers at that time. June rainfall was also high. In general, the season would have to be considered wet and cloudy. However, it should be pointed out that the growing degree days as of Sept. 5 were only slightly under normal.
8. Corn was harvested by hand October 3, 1972. Sixty feet of row were harvested.
9. Fertilizer treatments.

N + P + K (lbs. per acre)		
12+0+0	12+0+9	12+0+17
12+6+0	12+6+9	12+6+17
12+12+0	12+12+9	12+12+17
12+23+0	12+23+9	12+23+17

10. A soil sample was taken at planting time, but it was impossible to take profile samples until the end of the season because of the wet condition of the soil during most of the growing season. The tests on the surface soil taken at planting time are as follows.

O.M. %	3.8
lbs. of P/A	57.0
lbs. of K/A	333.0
pH	6.9
sol. salts mmhos/cm	.45

TABLE 15. THE EFFECT OF RATES OF PHOSPHORUS AND POTASSIUM IN A STARTER FERTILIZER ON YIELD, EAR MOISTURE, NUMBER OF EARS PER STALK, AND AN ESTIMATION OF SUCKERING ON CORN, NORTH SIOUX VALLEY RESEARCH FARM, WATERTOWN, S. D. 1972.

Treatment No.	Treatment N + P + K	Yield 1/ bu/A	Moisture 2/ %	Stalks Having Ears	Estimation of Suckering 3/
1	12 + 0 + 0	66	31.1	1.10	VL
2	12 + 6 + 0	70	29.7	1.22	M
3	12 + 12 + 0	66	30.3	1.13	L
4	12 + 23 + 0	77	32.1	1.20	L
5	12 + 0 + 9	72	32.1	1.25	M
6	12 + 6 + 9	76	31.6	1.28	L
7	12 + 12 + 9	78	33.2	1.27	H
8	12 + 23 + 9	67	33.8	1.22	L
9	12 + 0 + 17	68	32.9	1.19	M
10	12 + 6 + 17	73	32.4	1.22	M
11	12 + 12 + 17	67	31.2	1.16	VL
12	12 + 23 + 17	77	31.3	1.21	M

1/ Calculated at 15 % moisture.
2/ The moisture sample was taken by cutting a section out of the center of eight ears of corn. This includes a section of the cob.
3/ Estimation of suckering was based on visual observations of each treatment. VL = very low, L = low, M = medium, and H = high.

RESULTS AND DISCUSSION:

The effects of the fertilizer treatments on the yield, moisture content of the ears at harvest, the number of ears per stalk and an estimate on the amount of suckering are shown in table 15. The treatments did not greatly affect the yield. The high test values for both phosphorus and potassium caused us to not expect large yield increases. The moisture content of the ears at harvest time do not show any trends due to added phosphorus and potassium. It should be noted that the ears showed considerable damage due to mold etc. The corn apparently did not reach physiological maturity before frost.

The number of ears per stalk is an indication of multiple earing or suckering. Some stalks with more than one ear were noted. Lots of suckering was noted on some plots. An attempt was made to average the incidence of suckering. This is shown in the table. Averaging removes the extremes within treatments. Even with averages no trends in suckering due to treatments can be detected. This leads to the conclusion that suckering was due to some factor not measured in this experiment.

HIGH NITROGEN TRIALS
GARDEN CITY AND WHETSTONE VALLEY

P. Carson, R. Ward, B. Byrnes, and Q. Kingsley

This is a continuation of the experiments that were established in 1969.

OBJECTIVES:

1. Determine the effect of very high rates of nitrogen on the yield, nitrogen content, stand and maturity (moisture content of the ears at harvest time).

2. Determine if large additions of nitrogen, part of which will not be used in growth of the crop, will become a serious pollution problem under South Dakota weather conditions.
3. Determine if large amounts of nitrogen are of value in moving excess sodium from the profile.

METHODS AND MATERIALS:

Location:

The trials were located at two experimental farms.

(a.) West Prairie Coteau Experimental farm near Garden City.
(b.) Whetstone Valley Experimental farm near Twin Brooks.

Fertilizer added:

(a.) West Prairie Coteau--potassium at the rate of 100 pounds per acre of 0-0-60 was broadcast over the entire plot. This was because plant analyses in 1971 showed a level of potassium in the leaves at silking time that was below the sufficiency level considered desirable for corn.

(b.) Whetstone Valley--phosphorus at the rate of 100 pounds per acre of 0-46-0 was applied by broadcasting over the entire experiment before planting. This was because the analyses of plant leaves taken in 1971 were below the sufficiency level considered desirable for phosphorus in corn leaves.

Experimental design:

The treatments consisted of five rates of nitrogen which are as follows:

Treatment No.	N + P + K lbs/A
1	0 + 0 + 0
2	32 + 0 + 0
3	100 + 0 + 0
4	320 + 0 + 0
5	1000 + 0 + 0

Cultural practices:

(a.) Date of planting
  1. West Prairie Coteau--June 1
  2. Whetstone Valley--June 8
(b.) Harvesting dates
  1. West Prairie Coteau--Pioneer 3981
  2. Whetstone Valley--Not harvested

MEASUREMENTS:

Yield in bu/acre and moisture content of the ears at harvest will be reported at this time. The nitrate-nitrogen content of the soil, leaf analyses etc. will be reported at a later date.

Variety:

(a.) West Prairie Coteau--Pioneer 3981
(b.) Whetstone Valley--Sokota T549.

RESULTS AND DISCUSSION:

The effects of the residual nitrogen on the yield, moisture content of the ears at harvest time and the number of stalks having ears form the West Prairie Coteau experiment are reported in Table 16. The corn was not harvested at the Whetstone Valley site in 1972 because the wet weather in May and June drastically reduced the stand on some plots or parts of some plots at this site. The areas most seriously affected were the solonetz areas.

The yield increased as the rate of nitrogen applied in 1969 increased. This indicates that the residual effect of the nitrogen added was still affecting yields in 1972. During the growing season the corn did not appear to have an abundant supply of available nitrogen. It should be noted that the residual nitrogen in the soil profile was found to be located in the 3-4 foot layer in the fall of 1971. These plots were sampled in the fall of 1972 to 8 feet to see where the nitrate-nitrogen is now located. The analysis on these samples has not been completed.

TABLE 16. THE RESIDUAL EFFECT OF NITROGEN RATES ADDED IN 1969 ON THE YIELD, MOISTURE CONTENT OF THE EARS AT HARVEST AND THE NUMBER OF EARS PER STALK ON CORN GROWN AT THE WEST PRAIRIE COTEAU EXPERIMENTAL FARM, 1972.

N + P + K	Yield 1/	Moisture 2/	Stalks Having Ears
lbs/A	bu/A	%	
0 + 0 + 0	65	23.5	.99
32 + 0 + 0	68	26.0	1.01
100 + 0 + 0	77	23.3	.99
320 + 0 + 0	89	24.5	.99
1000 + 0 + 0	94	26.2	1.00

1/ Yield calculated at 15% moisture.

2/ The moisture sample was taken by cutting a section out of the center of eight ears of corn. This includes a section of the cob.

TABLE 17. STANDARD VARIETY SMALL GRAIN TRIALS, WATERTOWN

Planted May 8
Spring-Seeded Wheat

Variety	1972	3 Yr. Av.
HARD RED SPRING		
Thatcher	10.1	16.8
Sheridan	21.6	25.0
Fortuna	16.5	23.4
Chris	21.6	25.6
Polk	25.1	27.2
Manitou	16.0	22.6
Waldron	25.7	29.4
ND 491	24.9	
Nordak	20.5	
DURUMS		
Wells	32.7	29.9
Leeds	33.9	29.2
Hercules	30.0	29.6
Rolette	39.6	
Wascana	18.5	
SEMI-DWARF		
WS 1812	34.6	28.1
WS 1809	40.9	35.1
Lark	26.9	
Bounty 208	31.7	
Bonanza	34.9	33.5
Fletcher	17.2	24.6
Era	27.1	33.2
ND 497	29.8	
Bluebird 4	32.1	
Colano	30.5	

Flax Trials

Variety	Early-May 8 Yield Bu/A	Early-May 8 Test Wt.	Late-June 5 Yield Bu/A	Late-June 5 Test Wt.
Bison	12.6	50.0	6.1	50.0
B5128	12.0	49.0	4.5	49.0
Bolley	18.6	50.5	8.8	50.5
Windom	16.7	51.0	6.8	51.0
Summit	17.5	51.0	8.6	51.0
Norstar	20.3	52.0	12.0	52.0
Nored	18.8	52.5	3.6	52.5
Noralta	14.0	51	5.8	51.0
Linott	19.3	51.0	5.5	51.0
Foster	15.3	49.0	10.9	49.0

Data Furnished By J. J. Bonnemann

Oat Trials Variety	1972	3 Yr. Av.	1972 T. W.
Dupree	26.9	53.6	23.7
Burnett	21.3	55.9	22.5
Garland	64.7	69.1	29.0
Lodi	36.1	60.3	21.7
Clintland 64	67.1	63.5	31.0
Brave	40.0	58.6	24.5
Trio	58.7		29.7
Pettis	44.7	61.0	31.5
Diana	65.5		30.0
Jaycee	63.4	69.2	30.0
Holden	60.2	70.9	29.7
Portal	80.4	76.9	33.3
Kelsey	41.1	58.6	23.7
Kota	45.4	58.3	22.5
Cayuse	38.9		19.2
Otter	41.5	63.8	22.7
Nodaway 70	53.2	65.0	28.0
Froker	60.6	69.4	29.0
Grundy	70.0		31.7
Chief	79.1	82.1	33.2
Dal	63.1		32.0
Randon	55.2		25.7
M-72	67.0		31.2
McCurdy 3306	41.4		27.0
SD 955	71.0		26.5
Ill. 66-2287A	45.5		27.2
Barley			
Liberty	21.8	29.3	34.5
Firlbecks III	36.0	35.8	43.0
Larker	39.0	38.9	39.0
Dickson	37.3	34.5	36.0
Conquest	43.1	39.8	39.0
Paragon	36.2	39.6	35.0
Primus II	45.2	41.8	42.0
Bonanza	39.8	40.3	36.0
Nordic	45.8		37.8
Burk	37.4		40.5
Prilar	40.9		37.3
Cree	41.5		36.2
Steptoe	41.2		34.0

Standard Variety Tritical Trials

Variety	1970	1971	1972	3 Yr. Av.	1972 T. W.*
	Pounds Per Acre				
Rosner	494	2659	1515	1536	36.0
Graze-Grain 70			958		37.5
Fas-Gro 203			1371		38.0
Fas-Gro 204			1900		38.7
Fas-Gro 419			1199		42.0
CL-71			1379		39.7

TITLE: Flax Fertility and Time of Fertilizer Application - Watertown

OBJECTIVES OF EXPERIMENT:

1. What is the best method and time for applying fertilizer for flax production? Broadcast and plow down or with the seed?
2. What effect does the amount and time of fertilizer application have on stand and weed growth?

CROP YEAR HISTORY:

Planted: May 31 Harvested: Sept. 22
Variety: Linott at 1 Bu/A Row Space: 7 inches

RESULTS:

TABLE 18. PERCENT DOCHAGE AND YIELD IN BUSHELS PER ACRE

	Method of Fertilizer Application			
	Plow Down		With The Seed	
Treatment	%Dockage	Bu/A	%Dockage	Bu/A
0-0-0	8.9	17.4	10.2	18.8
15-0-0	9.7	17.8	11.5	18.2
15-15-0	12.8	18.8	10.4	15.4
30-0-0	10.4	14.3	16.4	11.1
30-15-0	13.5	15.8	13.6	10.6
45-0-0	15.7	14.9	17.2	12.5
45-15-0	12.3	9.9	14.3	11.9
60-0-0	14.2	12.3	19.4	12.9
60-15-0	14.1	15.2	21.4	6.3

DISCUSSION AND INTERPRETATION:

Plow Down

The highest yield 18.8 bu/A was produced using 15-15-0 which was 1.4 bu/A higher than 0-0-0 and 3.6 bu/A more than 60-15-0. The dockage increased from 8.9 for 0-0-0 to 14.1 for 60-15-0.

With the Seed

The 15-0-0 treatment produced 18.2 bu/A and the 60-15-0 treatment 6.3 bu/A. The dockage increased form 10.2 for 0-0-0 to 21.4 for 60-15-0.

CORN DISEASES AND THEIR CONTROL

C. M. Nagel and John R. Jenison

Yield Performance

Plant Science Pamphlet 11. December 1972

NOTE: CORRECTIONS TO TABLES 19, 20 AND 21.
pages 21, 22 and 23

TABLE 19. C.V. 6.5 LSD 7.0 Bu

TABLE 20. C.V. 6.2 LSD 6.5 Bu

TABLE 21. C.V. 5.6 LSD 5.5 Bu

ions during the 1972 season were especially favorable for the control of the major corn diseases, includes root and ern corn leaf blight. Control of these serious diseases is pment of disease inbred lines of corn usually derived from n varieties, commonly grown prior to 1930. Through a n for healthy plants and then inbreeding for 6-8 generations opulations, disease resistant lines may result. However, is considerably less than 1 percent. This information will ult it is to discover new sources of disease resistance in seases on corn usually are easily recognized however, in the d stalk rot, the disease organisms destroy the pith and damage is usually not noticeable during the growing season, age from stalk and root rot may be severely affecting the In poor filling of the ear tips, kernels and shortened :s. Fall lodging usually results because of the disease e of the stalk and rotted roots. In 1972, in the south- state, stalk rot became very destructive at the base of aturely killed 40-60 percent of the plants in many fields It appeared that frequently the same hybrid was involved. ch fields was estimated at 30-40 percent.) This disease d stalk rot, but the corn plants developed symptoms largely main difference being that the stalk rot phase of the ly the lower six inches of the stalk and roots, virtually lk just above the ground line.

presents the performance data of 74 experimental hybrids ed lines produced from research under this project. Data 71 and 1972 in experiment #1. Rainfall was much less in 1972, accounting for the lower yields. However, the yields valid, as the results are comparable between identical s and the commercial checks in a given experiment in a

TABLE 19. PERFORMANCE RATING OF NEW HYBRIDS VARYING IN RESISTANCE TO ROOT AND STALK ROT COMPARED WITH 3 DIFFERENT COMMERCIAL HYBRIDS. NORTHEAST RESEARCH FARM, WATERTOWN.

Expt'l Hybrid or Commercial Check	1972 Yield Bu/A	1972 % Ear Moisture	1972 % Lodging	1972 Performance Score	1971 Yield Bu/A	1971 % Ear Moisture	1970 Yield Bu/A	1970 % Ear Moisture
Experiment #1								
Expt'l #1	71.6	28.8	0.7	101.2			48.8	18.5
2	70.7	18.3	0.6	105.3				
3	70.7	25.6	2.9	101.7	59.0	31.4		
4	70.0	25.6	3.4	101.1	58.6	30.3		
5	69.9	22.0	4.9	102.4	56.8	26.0		
6	69.9	23.3	1.3	102.3	52.2	28.1	47.2	12.8
7	69.9	23.7	0.6	102.3	49.2	27.6	45.2	14.1
8	69.7	23.6	1.1	102.0	52.0	31.0	48.3	16.6
9	69.7	21.9	1.3	102.8	55.1	26.9		
10	69.7	22.9	0.6	102.5	57.2	27.3		
11	69.6	26.5	1.2	100.7	59.5	30.0	43.0	21.2
12	68.9	21.3	1.2	102.5	57.0	29.7		
13	68.4	25.4	1.2	100.3	50.5	31.2	41.3	17.4
14	68.3	22.2	1.9	101.5	58.8	25.5		
15	67.6	24.0	1.3	100.3	55.3	28.7	42.3	16.4
16	67.5	22.7	3.0	100.5	52.5	26.5		
17	66.8	21.6	3.8	100.4	54.8	29.8	49.2	13.6
18	66.8	25.0	1.8	99.2	49.9	27.9	38.1	13.5
19	66.5	26.2	0.6	98.5	46.9	32.0	38.1	16.0
20	65.9	23.9	0.6	99.1	55.9	30.6	45.5	17.4
21	65.4	23.5	4.4	98.4	51.8	29.9		
22	63.8	19.7	1.5	99.4				
Pioneer 3956(ck)	63.3	22.5	2.4	97.6	45.8	30.2	39.7	26.4
Expt'l #23	61.9	25.5	2.7	95.1	57.2	27.8		
Pioneer 3872(ck)	61.2	19.0	4.9	97.2	45.9	21.4	36.2	20.1
Expt'l #24	57.8	19.2	0.0	95.4	53.1	26.7		
NK Px417(ck)	56.1	17.0	4.3	94.4	45.3	19.9	35.1	19.2
Average Yield	66.7				52.8		42.7	

C. V. = ~~10.5%~~ 6.5 F. = 2.65** L.S.D. = ~~9.11~~ 2.0 Bu

TABLE 20. PERFORMANCE RATING OF NEW EXPERIMENTAL HYBRIDS VARYING IN RESISTANCE TO ROOT AND STALK ROT COMPARED WITH 3 DIFFERENT COMMERCIAL HYBRIDS COMMONLY GROWN IN THE AREA. NORTHEAST RESEARCH FARM. 40 INCH ROWS, CHECK PLANTED MAY 20, HARVESTED OCT. 28, 1972. PLANTS/ACRE, AVERAGE 10,600. WATERTOWN STATION.

Expt'l Hybrid or Commerical Check	Yield Bu/A	Ear Moisture at Harvest %	Lodging	Performance Score Ranking
Experiment #2				
Expt'l #25	74.2	25.3	1.8	107.1
26	73.4	26.2	1.2	106.1
27	73.3	29.8	0.0	104.6
28	72.5	23.1	3.0	106.5
29	68.6	25.0	0.0	103.1
30	67.9	26.4	0.6	101.8
31	67.8	27.6	1.2	101.1
32	67.6	23.4	1.2	102.9
33	66.6	24.5	0.0	101.7
34	66.0	22.4	2.5	101.9
35	66.0	26.6	0.7	100.2
36	65.7	24.7	3.1	100.5
37	65.7	28.5	0.6	99.2
Pioneer 3956	64.6	22.0	1.8	101.0
Expt'l #38	64.4	24.3	7.2	99.0
39	62.2	17.2	0.6	101.6
40	64.2	29.0	0.6	97.7
41	64.0	23.2	1.2	100.1
42	62.6	21.6	1.7	99.7
43	62.1	23.3	1.9	98.5
44	60.9	19.3	0.0	99.7
45	60.2	19.8	1.8	98.6
46	60.2	28.6	0.6	94.8
Pioneer 3872(ck)	59.4	15.9	4.1	99.4
NK Px417(ck)	58.9	16.9	4.3	98.5
Expt'l #47	58.0	23.1	3.6	95.2
48	56.7	20.2	0.6	95.9
49	53.0	19.7	1.9	93.0
50	52.6	21.6	3.8	91.6
Average Yield 64.1				

C. V.=14.9% F. = 5.66** L.S.D.=10.5 Bu

TABLE 21. PERFORMANCE RATING OF NEW EXPERIMENTAL HYBRIDS VARYING IN RESISTANCE TO ROOT AND STALK ROT COMPARED WITH 3 DIFFERENT COMMERCIAL HYBRIDS COMMONLY GROWN IN THE AREA. NORTHEAST RESEARCH FARM. 40-INCH ROWS, CHECK PLANTED MAY 20, HARVESTED OCT. 28, 1972. PLANTS/ACRE, AVERAGE 10,600. WATERTOWN STATION.

Expt'l Hybrid or Commercial Check	Yield Bu/A	Ear Moisture at Harvest %	Lodging	Performance Score Ranking
Experiment #3				
Expt'l #51	71.3	26.2	2.4	106.6
52	71.1	24.9	0.0	107.5
53	65.2	22.3	0.0	103.8
54	64.3	21.7	1.8	103.0
55	64.3	26.3	3.5	100.7
56	64.1	20.3	1.1	103.6
57	63.7	22.7	0.0	102.4
58	63.7	24.2	0.0	101.5
59	63.6	18.3	0.0	104.3
60	63.0	21.4	0.0	102.3
61	63.0	22.8	0.0	101.1
62	62.8	22.2	0.0	101.9
63	62.7	25.4	0.0	100.3
64	62.1	22.7	2.5	100.6
Pioneer 3956(ck)	60.9	22.3	0.0	100.2
Expt'l #65	60.6	21.3	0.0	100.4
66	60.2	25.7	2.5	97.7
67	57.8	23.4	0.0	97.2
68	58.7	23.7	4.0	97.2
69	58.5	20.1	0.0	99.3
70	58.2	22.6	2.4	97.5
71	55.5	19.4	1.3	96.9
72	55.3	19.4	0.0	96.9
NK Px417(ck)	54.9	15.7	0.6	98.2
Expt'l #73	54.5	22.8	4.1	94.1
74	51.6	22.4	1.2	92.4
Pioneer 3872(ck)	50.2	17.8	0.0	93.4
Average Yield	60.8			

C. V.= 14.2% F. = 6.48** L.S.D. = 9.2 Bu

WHETSTONE VALLEY RESEARCH FARM
TWIN BROOKS, SOUTH DAKOTA

BRIEF HISTORY

The rainfall for the crop season was above normal and the soil moisture reserves were high in the spring and fall.

A field day was scheduled for the Whetstone Valley farm in July, but rains during that period necessitated postponement till October 16th. A tour was then conducted through the various experiments to point out points of interest to the group. The field day date for 1973 is tentatively set for September 6th.

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.

WHETSTONE VALLEY RESEARCH FARM ADVISORS

Member	County	Address
Harlyn Bartz	Roberts	Browns Valley
Gordon Bracht	Grant	Milbank
Winston Christensen	Roberts	Wilmot
Clayton Palmquist	Roberts	Wilmot
Robert Quade	Roberts	Wilmot
Elwood Konstant	Grant	Milbank
Don Grimsrud	Roberts	Sisseton
LeRoy Larson	Grant	Milbank
Frank Roberts	Grant	LaBolt
Jim Voeltz	Grant	Big Stone City
John Anderson	Roberts	Wilmot
Wilford Anderson	Grant	LaBolt
Roy Carlson	Grant	Milbank
Ray Mueller	Grant	Big Stone City
Gerald Oehler	Grant	Milbank
Arvid Stengel	Grant	Milbank
Quentin Kingsley, Project Leader	Northeast Research Farms	Brookings

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

WHETSTONE VALLEY RESEARCH FARM
Rainfall 1972

Rainfall	Inches per Month	Departure
April	2.21	+0.04
May	6.28	+3.40
June	1.21	-2.56
July	6.06	+3.34
August	1.46	-1.41
September	0.24	-2.02
October	0.93	-0.57

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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: June 8
Variety: DeKalb XL12
Soil Moisture Sampling Dates:
June 6 and Nov. 10
Insecticide: Thimet 1# Active per acre
Weed Control: Residual Atrazine from 1971
Cultivations: Two

Harvested: Nov. 13
Plant Population: 14,000
Row Spacing: 30 inches
Fertilizer: Actual N-P-K #/A
Broadcast and plowed in
Variable: Nitrogen

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	27.3	9.5	2.34	12.21	14.55	1.88
0-25-0	39.7	8.8				
100-0-0	46.4	10.3				
50-25-0	46.9	9.2				
100-25-0	50.3	9.8	2.25		14.46	3.48
200-25-0	57.1	10.2	2.15		14.36	3.98
150-25-0	53.3	10.5				
150-25-50	52.8	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 200-25-0 treatment produced 30 bushels per acre more corn than 0-0-0 and 7 bushels more than 100-25-0, but on the overall average 69-72, 100-25-0 yielded 2 bushels more corn per acre than 200-25-0.

Soil moisture samples from 3 treatments are taken to a depth of 5 feet. The 200-25-0 produced 0.5 bushels per inch of water used than 100-25-0 and 2.1 bushels more than the 0-0-0 treatment.

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: June 9
Variety: Sokota TS49
Row Spacing: 36 inches
Insecticide: Thimet, 1# Active per acre
Cultivations: Two
Weed Control: Residual Atrazine from 1971

Harvested: Nov. 13
Plant Population 14,000
Soil Moisture Sampling Dates: June 6 and Nov. 10
Fertilizer: Actual N-P-K #/A 50-25-30 Starter, 100-0-0 Side-dress

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 or Gain Inches	Precip. During Season	Loss from Profile & Precip. * Inches Used	Bushels Per Inch of Water
Plow					
0-0-0	40.4	+1.07	12.21	11.14	3.63
150-25-30	71.2	+0.67		11.54	6.17
Till Plant					
0-0-0	33.3	+0.53		11.68	2.85
150-25-30	45.5	-0.11		12.32	3.69
Chisel Plow					
0-0-0	34.7	+0.48		11.73	2.96
150-25-30	60.8	+2.51		9.70	6.27

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

DISCUSSION AND INTERPRETATION OF RESULTS:

Due to high rainfall, the chisel plow and till plant seed beds were over saturated with moisture at planting time. The chisel plow method, at the highest fertility, produced 60.8 bu/A, till plant 45.5 bu/A and fall plow 71.2. The 0-0-0 for all treatments averaged about 36.0 bu/A.

The subsoil moisture was high in the spring and lack of good drainage created a poor seedbed condition for chisel plow and till plant methods. There was an increase in soil moisture at fall sampling time. The corn on the fertilized areas produced more corn per inch of water used than those not fertilized.

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: June 8
Variety: NK PX20
Row Spacing: 30 inch
Insecticide: Thimet, 1# active per acre
Weed Control: Residual Atrazine from 1971
Cultivations: Two

Harvested: Nov. 13
Plant Population: 14,000
Soil Moisture Sampling Dates: June 13 and Nov. 10
Fertilizer: Actual N-P-K #/A
Broadcast and plowed in
Variable: Phosphorus

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 or Gain Inches	Precip. During Season	Loss from Profile and Precip. * Inches Used	Bushels Per Inch Of Water Used
0-0-0	42.9	9.6	+0.25	12.21	11.96	3.59
100-0-0	59.2	10.1				
100-15-0	58.0	9.4				
100-20-0	52.0	10.2				
100-25-0	63.7	9.8	+0.50		11.71	5.44
100-30-0	62.5	9.8				
100-35-0	59.2	9.9	-0.75		12.96	4.57
100-35-30	60.8	9.4				

* 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:

In this year, 100-25-0 produced 63.7 bu/A, 100-30-0 produced 62.5 bu/A and the untreated 42.9 bu/A. On the long time average, 100-25-0 produced 61.5 bu/A, 100-30-0 produced 62.4 bu/A and 0-0-0 yielded 46.2 bu/A of corn.

The use of potassium did not help increase yields for treatments receiving 25 pounds or more of phosphorus, and the percent protein was less than the 0-0-0 treatment. Moisture utilization was better at 100-25-0 than for the 100-35-0 and 0-0-0 levels of fertilizer application.

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: June 8
Variety: Pioneer 3932
Weed Control: Residual from Atrazine 1971
Insecticide: Thimet, 1# active per acre
Cultivations: Two

Harvested: Nov. 13
Fertility: 150-25-50 actual N-P-K #/A Broadcast and plowed in
Variable: Plant population, row space

RESULTS:

TABLE 4. CORN ROW SPACING AND PLANT POPULATIONS

Plant Population	Yield, Bushels per Acre of #2 Corn								
	Row Spacing in Inches								
	30"	%		35"	%		40"	%	
Thousands		Moisture	Protein		Moisture	Protein		Moisture	Protein
9	37.9	26.9	11.5	40.9	26.5	12.1	41.9	27.2	12.1
12	46.7	23.9	11.7	49.7	24.8	11.8	50.2	25.0	11.9
15	53.3	26.4	11.5	52.8	25.8	11.0	58.0	20.7	11.3
18	60.7	26.4	11.3	62.5	25.8	11.7	65.2	25.4	11.6
21	63.9	26.6	11.3	65.0	23.8	11.1	65.7	25.8	11.8

DISCUSSION AND INTERPRETATION OF RESULTS:

The best yields were at 18-20,000 plants per acre in all 3 row spacings. Yields were in the 62-65 bu/A range this year. The long term highest yield averages are:
for 40" row, 15,000 plants/A, 67.0 bu/A; 35" row, 15-18,000 plant/A, 67.3 bu/A and 30" row, 18,000 plants/A 68.6 bu/A.

Moisture in the corn at harvest time was fairly consistant, also the protein.

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: June 9
Variety: Trojan TXS 99
Row Spacing 36 inches
Insecticide: Thimet, 1# active per acre
Cultivations: Two

Harvested: Oct. 12
Plant Population: 14,000
Weed Control: Residual Atrazine from 1971
Fertilizer: Totals 100-25-0 actual N-P-K #/A
Variable: Fertilizer placement and time

TABLE 5. METHODS OF FERTILIZER APPLICATION FOR CORN

N-P* Lbs/A	Yield Bu/A	% Moisture
0-0-0 Plow down	32.4	24.4
100-25-0 Pop up	53.4	23.9
4-4-0 Plow down 96-21-0 Starter 10-25-0 Side dress	59.1	24.1
90-0-0 Starter 10-25-0+Zn** Side dress	66.1	21.0
90-0-0 Starter 10-25-0 Plow down	58.5	24.6
90-0-0	66.1	21.8

* 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 starter plus side-dress and the starter plus plow down treatments produced 66.1 bu/A this year and for the long time average their yields are 66.6 bu/A. The yield average for 0-0-0 from 70-72 is 48.9 bu/A

Moisture in the corn was lower for the starter plus sidedress and the starter plus plow down treatments. The addition of zinc with the other starter treatment did not increase corn yields.

TITLE: Corn, Sorghum and Alfalfa Forage 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: June 8
Variety: Funks G4465
Weed Control: Residual Atrazine from 1971
Insecticide: Thimet, 1# active per acre
Cultivation: Two

Harvested: Oct. 12
Fertility: 150-25-0 actual N-P #/A Broadcast and plowed in
Variable: Plant population, row space

RESULTS:

TABLE 6. CORN FORAGE, TONS PER ACRE WET

Row Space Inches	Population Thousands	Wet Tons/A	% Moisture	Wet Tons/A 69-72	% TDN
30	12	11.8	61.1	10.6	62.4
40		13.1	66.1	11.5	61.6
30	16	14.3	63.0	12.0	62.0
40		14.1	63.9	11.9	62.0
30	20	14.2	66.1	12.2	62.5
40		14.7	63.6	12.7	61.2
30	24	15.0	65.7	13.0	61.7
40		14.8	65.0	12.4	61.2

DISCUSSION AND INTERPRETATION OF RESULTS:

The highest tonnage of corn silage was produced at 24,000 plants per acre in both row spacings, with moisture ranging from 65 to 65.7 percent per ton. Yields did not vary much within each population and row space, except at 12,000 plants per acre in 30 inch rows. In this case, the corn in the 40 inch row yielded 1.5 tons per acre more than in the 30 inch rows. Total Digestable Nutrients (TDN) for all populations exceeded 60% and the overall average was 61.8%.

CROP YEAR HISTORY: Forage Sorghum

Planted: June 8
Variety: Waconia
Weed Control: Residual Atrazine from 1971

Harvested: Oct. 12
Fertility: 150-25-0 actual N-P #/A Broadcast and plowed
Variable: Plant population, row space

RESULTS:

TABLE 7. FORAGE SORGHUM TONS PER ACRE WET

Row Space Inches	Population Thousands	Wet Tons/A	% Moisture	Wet Tons/A 69-72	% TDN
30	25	16.9	75.2	15.4	53.0
40		18.3	74.5	13.8	53.2
30	50	17.8	74.7	17.4	53.3
40		16.5	74.8	15.8	55.5
30	75	19.2	75.1	18.8	56.1
40		15.4	75.2	16.4	53.9
30	100	18.9	75.0	19.3	55.9
40		17.1	72.8	17.3	53.9

DISCUSSION AND INTERPRETATION OF RESULTS:

Sorghum silage tonnage was highest in 30 inch rows and for all populations, when compared to the 40 inch rows. In the 40 inch rows, the tonnage, this year, increased with each higher population change. Moisture in the sorghum at harvest time was over 70% for all treatments. The total digestible nutrients (TDN) range from 6-10 % less than for corn.

CROP YEAR HISTORY: Alfalfa Hay

Planted 1969
Fertility: 18-46-0 Broadcast

Harvested: 1st cut 6/14/72; 2nd cut 7/18/72; 3rd cut 9/11/72

RESULTS:

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

Variety	Tons per Acre 1st Cut	2nd Cut	3rd Cut	Total	% TDN
Team	2.59	1.83	1.38	5.80	53.49
Dawson	2.43	1.99	1.31	5.73	52.91
Glacier*	2.08	1.79	1.26	5.13	53.14
Warrior*	2.56	1.82	1.25	5.63	50.21
Vernal	2.45	1.77	1.43	5.65	53.31
Blackburns Ranger	2.72	1.74	1.31	5.77	52.47
Saranac*	2.50	2.00	1.29	5.79	53.37
Expt. AR 1	2.30	1.46	1.02	4.78	53.08

* Flemish variation

DISCUSSION AND INTERPRETATION OF RESULTS:

Alfalfa tonnages for 3 cuttings averaged near 5.75 tons per acre for Team, Dawson, Blackburn's Ranger and Saranac. Problems with insects and foliar diseases were not too noticeable. The high humidity lengthened the drying period after the alfalfa was cut and some of the hay molded slightly.

CATCH CROP
WHETSTONE VALLEY RESEARCH FARM
P. Carson, F. Shubeck, B. Byrnes and Q. Kingsley

OBJECTIVES:

1. Determine if satisfactory corn yields and corn quality could be attained when the corn is planted in mid-June.
2. Determine if added fertilizer will have an influence on the yield of grain and the maturity of the crop when it is planted late.

METHODS AND MATERIALS:

1. The site used was one at the Whetstone Valley Experimental farm that was intended for a starter fertilizer experiment using corn as an indicator crop.
2. The seed bed was very cloddy and the soil was saturated under the surface of the clods at planting time. This was typical of the planting conditions in this area in 1972.
3. The corn was planted on June 14 with a John Deere Uni-planter in 30 inch rows.
4. The varieties used were:
   (a.) Pioneer 3784 at 15,000 plants/A--105 day corn.
   (b.) Weathermaster EP x 2A at 20,000 plants/A--95 day corn.
   (c.) Agsco 3 x AAA at 25,000 plants/A--70 day corn.
5. Fertilizer treatments used:

	$N + P_2O_5 + K_2O$
1.	0 + 0 + 0
2.	0 + 32 + 16
3.	80 + 0 + 0
4.	80 + 32 + 16

   The nitrogen was applied at planting time by broadcasting on the surface.
6. Bux 10 and Ramrod were applied in a band over the seed at planting time to help control insects and weeds.
7. The weather was wet through out most of the season. The crop was damaged to some extent by hail on July 7. The growing season had higher than average temperatures, but the late planting of the crop did not give it enough growing degree days to mature the varieties requiring the longer growing season.
8. The wet weather made it impossible to provide adequate weed control between the rows.
9. The corn was picked on November 22, 1972.

RESULTS AND DISCUSSION:

The effects of the fertilizer treatments on the yield, moisture content of the ears at harvest time and the number of ears per stalk of 3 varieties are reported in Table 9. The 70 day corn was the only variety having mature corn at harvest time. Mold and other organisms had badly damaged the other 2 varieties by harvest time. Fertilizer additions in general caused a slightly higher moisture content of the grain at harvest time.

The starter fertilizer (8 + 32 + 16) increased the yield of the earlier varieties but had no effect on the yield of the later variety.

The added nitrogen without the starter fertilizer did not increase the yield.

The combination of starter and added nitrogen produced the highest yield for the 2 earlier varieties but had no effect on the later variety.

This work indicates that mature corn can be obtained when the season is late if the variety planted is early enough and that starter of a starter plus added nitrogen will increase the yield under these conditions.

TABLE 9. THE EFFECT OF FERTILIZER TREATMENTS ON THE YIELD MOISTURE CONTENT OF THE EARS AT HARVEST AND THE NUMBER OF EARS PER STALK OF 3 VARIETIES OF CORN PLANTED LATE IN THE SEASON, WHETSTONE VALLEY EXPERIMENTAL FARM, 1972.

Variety[1]	Treatment N + P_2O_5 + K_2O lbs/A	Yield[2] bu/A	Moisture[3] %	Stalks Having Ears
A	0 + 0 + 0	57	24.9	.98
A	8 + 32 + 16	62	27.4	.98
A	80 + 0 + 0	61	26.1	1.02
A	80 + 32 + 16	74	25.5	1.03
B	0 + 0 + 0	56	36.2	1.08
B	8 + 32 + 16	61	36.2	.99
B	80 + 0 + 0	57	41.8	1.10
B	80 + 32 + 16	72	33.7	1.00
C	0 + 0 + 0	63	42.3	1.04
C	0 + 32 + 16	58	41.7	1.05
C	80 + 0 + 0	63	40.6	1.06
C	80 + 32 + 16	58	43.8	1.06

1/ A = Agsco 3 x AAA, B= Weather Master EP x 2A, C = Pioneer 3784.
2/ Yield was calculated at 15% moisture.
3/ The moisture sample was taken by cutting a section out of the center of eight ears of corn. This included a section of the cob.

TABLE 9. CORN PERFORMANCE TRIAL, WHETSTONE VALLEY RESEARCH UNIT, TWIN BROOKS

Seeded June 6, 1972 Harvested Oct. 19

Brand & Variety	Type	Cross	Performance Score	Percent Moisture	Percent Stalks Broken	Yield B/A
SDAES EX 82	N	3X	1	31.9	0.8	100.5
Pioneer 3780	N	2X	4	36.3	0.9	98.1
Trojan TX 90	N	3X	3	30.5	0.8	95.9
Pioneer 3956A	N	2X	2	29.8	0.8	95.8
Trojan TXS 94	N	2X	5	34.7	0.4	95.6
Trojan TXS 102	N	2X	9	38.1	4.0	94.0
ACCO UC 2700	T	2X	10	35.5	0.0	90.6
Payco SX 775	N	2X	13	36.8	0.4	89.2
Trojan TX 100	N	3X	12	34.1	1.2	88.8
ACCO U333	T	3X	17	36.3	1.4	87.4
SDAES PP146	N	4X	8	30.6	2.2	87.0
O'x Gold SX 900	N	2X	6	27.7	1.3	86.4
Trojan M95	N	M3X	15	33.9	0.9	86.3
ACCO UC2900	T	2X	14	33.0	0.9	85.7
Pioneer 3784	N	2X	18	35.1	0.4	85.7
ACCO UC 1900	T	2X	11	29.2	1.2	85.2
Pride R-290	N	2X	25	37.3	1.7	15.1
Payco 3X783	N	3X	27	38.3	0.0	85.1
ACCO U326	N	3X	16	31.6	1.6	84.5
ACCO UC3300	T	2X	30	37.9	0.9	84.3
Renk RK 2	T	2X	7	25.1	0.9	83.9
Western KX 55	T	2X	26	37.0	0.0	83.9
SDAES PP161	N	4X	20	33.3	4.8	83.8
Pioneer 3932	N	2X	21	34.4	0.0	83.6
Sokota TS-62	N	2X	28	35.8	0.0	82.8
SDAES PP 166	N	4X	19	32.2	3.0	82.7
Sokota MS-59	B	M2X	33	36.5	0.9	81.6
Pioneer 3579	N	M2X	32	36.0	0.4	81.2
Trojan TXS 99	N	3X	23	32.1	0.5	80.6
Sokota SK-54	N	3X	31	33.4	1.7	80.3
Western KX 46	N	M2X	37	38.1	0.4	80.1
ACCO UC3201	N	2X	41	39.8	0.8	79.5
SDAES PP112	N	4X	29	29.9	3.5	78.3
O's Gold SX 1010	N	2X	39	37.5	0.4	78.2
Pioneer 3778	N	3X	38	35.9	0.0	77.0
Pioneer 3662	N	4X	42	36.7	1.3	76.8
ACCO UC1301	N	2X	35	31.8	6.6	76.8
Pride R-369	N	3X	40	35.7	0.5	76.2
SDAES SD 200	N	2X	24	25.8	2.4	75.4
SDAES PP159	N	3X	36	31.7	0.5	74.9
Trojan M70	N	M3X	22	22.7	2.7	73.1
Trojan TXS 85	N	M2X	34	27.6	1.8	72.2
SDAES SD 250	T	4X	43	30.7	11.7	71.8
Pioneer 3773	N	2X	44	42.5	0.0	54.9
			Means	33.6	1.53	83.1

C. V. = 10.3% Means of 8 replications

Cytoplasm type N-Normal, T-Texas, B-Blend