21st Annual

SDSU

SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM

PROGRESS REPORT 1981

Agricultural Experiment Station
South Dakota State University
Brookings

This twenty-first annual report of the research program at the Southeast South Dakota Experiment Farm has special significance for those engaged in agriculture and the agriculturally related businesses in the ten county area of southeast South Dakota. The results shown are not necessarily complete or conclusive. Interpretations given are tentative because additional data resulting from continuation of these experiments may result in conclusions different from those based on any one year. Trade names are used in this publication merely to provide specific information. A trade name quoted here does not constitute a guarantee or warranty and does not signify that the product is approved to the exclusion of other comparable products.

South Dakota Agricultural Experiment Station
Brookings, South Dakota 57007

Delwyn Dearborn, Dean R.A. Moore, Director

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Introduction . . . . .Fred E. Shubeck
Research Manager

1981 marks another year that Experiment Farm crops were injured by hail. The hail storm occurred August 3, but was not severe enough or early enough in the season to justify replanting. It will influence yields, however, especially in experiments with different planting dates or plant maturities. Corn appeared to recover from the hail damage better than soybeans.

Part of the new shelter belt was replanted in 1981. The two hail storms in 1980 destroyed most of the pine and hackberry seedlings, but the chinkota elm survived fairly well. It became apparent that the two previous hail storms had also destroyed a majority of the fruit trees in the orchard. Some of the trees were 5 to 6 feet tall, but the two 1980 hail storms managed to girdle most of the branches and the trees eventually died.

The growing season was preceded by a mild open winter. It was possible to begin tillage in February. A new experiment was quickly initiated to test advisability of such early planting of small grain. From a dry winter we moved into a dry spring. Surface moisture was deficient and many seedbeds were rough. Rains began to come in June and from then on, moisture was usually adequate. By the first of August, the crops looked wonderful and some spectacular yields were expected. Then came the hail storm on August 3, and yield expectations were scaled down.

Investigations with double cropping and late planting were continued. Results were promising but not spectacular.

Some of the usual crop tours and field days were canceled due to the hail, but seven different groups were given special tours.

The hog house remodeling was completed and feeder pigs were brought in November 23. The remodeling included a different manure handling and storage system, new pen dividers made from plastic planks, and slats over the scraper for manure removal.

The new north feedlot is now in full scale operation. It has proved to be a valuable addition to the livestock facilities. We expect to see a lot of good research coming from this unit.

A total of 37 meetings were held in the office and laboratory building. These include extension clubs, adult education meetings, judging schools and other local groups.

Table 1. Temperatures at Southeast Experiment Farm

Month	1981 Av. Temperature (F)[1] Maximum	Minimum	29 Year Average Maximum	Minimum	Departure from 29 Year Average Maximum	Minimum
January	35.5	8.6	25.5	4.1	+10.0	+4.5
February	38.4	12.6	32.1	10.4	+ 6.3	+2.2
March	53.9	21.6	43.5	22.0	+10.4	- .4
April	68.6	39.3	61.5	35.6	+ 7.1	+3.7
May	70.2	43.2	73.4	47.2	- 3.2	-4.0
June	82.4	55.1	82.8	57.2	- .4	-2.1
July	83.0	60.3	87.7	62.1	- 4.7	-1.8
August	80.0	55.3	85.7	59.5	- 5.7	-4.2
September	78.1	45.6	76.0	49.1	+ 2.1	-3.5
October	59.6	37.5	65.3	40.3	- 5.7	-2.8
November	50.1	28.9	46.4	24.3	- 3.7	+4.6
December	27.7	10.4	31.4	11.2	- 3.7	- .8

[1]Computed from daily observations

Table 2. Precipitation at the Southeast Experiment Farm

Month	Precipitation 1981 (inches)	29-year Average (inches)	Departure from 29-yr. Ave.(inches)
January	T	.47	- .47
February	.26	1.08	- .82
March	1.71	1.41	+ .30
April	.41	2.30	-1.89
May	1.66	3.17	-1.51
June	5.09	3.97	+1.21
July	5.76	3.28	+2.48
August	3.77	3.03	+ .74
September	1.26	2.59	-1.33
October	1.70	1.58	+ .12
November	.25	.98	- .73
December	1.39	.70	+ .69
Total	23.26	24.55	-1.29

RATES OF NITROGEN AND

DATES OF PLANTING CORN

F. Shubeck, B. Lawrensen and D. DuBois

SOUTHEAST FARM 81-1

Objectives of Experiment

1. Will planting dates influence response to fertilizer?
2. What is the optimum rate of nitrogen fertilizer for a soil with a medium amount of organic matter when the same amount of nitrogen is applied each year for several years?
3. Will optimum rates of nitrogen application be influenced by drought?
4. Will high nitrogen rates influence disease or insect damage?
5. Will soil temperatures serve as a dependable guide to determine an optimum date to plant corn?

Methods and Procedures

October 14-15, 1980	- All high and low rates of nitrogen plus the phosphorus and potassium were spread broadcast by hand on all plots. The total area was moldboard plowed immediately after fertilization.
April 22, 1981	- Eradicane plus Aatrex 4L was broadcast on all plots and was tandem disced once to incorporate.
April 27, 1981	- All plots field cultivated
April 28, 1981	- First planting date. Variety planted - O's Gold 1107 Herbicide - Eradicane and Aatrex PPI Insecticide - Furadan 10G
May 6, 1981	- Second planting date
May 21, 1981	- Third planting date
May 28, 1981	- Rotary hoed first plots planted
June 4, 1981	- Fourth planting date
June 8, 1981	- Cultivated first and second planting date plots
June 11, 1981	- Cultivated third planting date plots
June 26, 1981	- Cultivated fourth planting date plots
August 3, 1981	- Hail
October 19, 1981	- Combined all plots
October 28, 1981	- Plowed total plot area

Table 3. Effect of Fertilizer and Planting Dates on Yield of Corn (High Nitrogen Rates)

Broadcast Fertilizer Treatment	Planting Dates				
N + P + K	April 28	May 6	May 21	June 4	Average
0 + 0 + 0	75	77	67	45	66.0
0 + 11 + 58	82	77	69	48	69.0
80 + 11 + 58	102	105	98	43	87.0
160 + 11 + 58	95	100	84	49	82.0
240 + 11 + 58	97	95	83	45	80.0
Average	90.2	90.8	80.2	46.0	

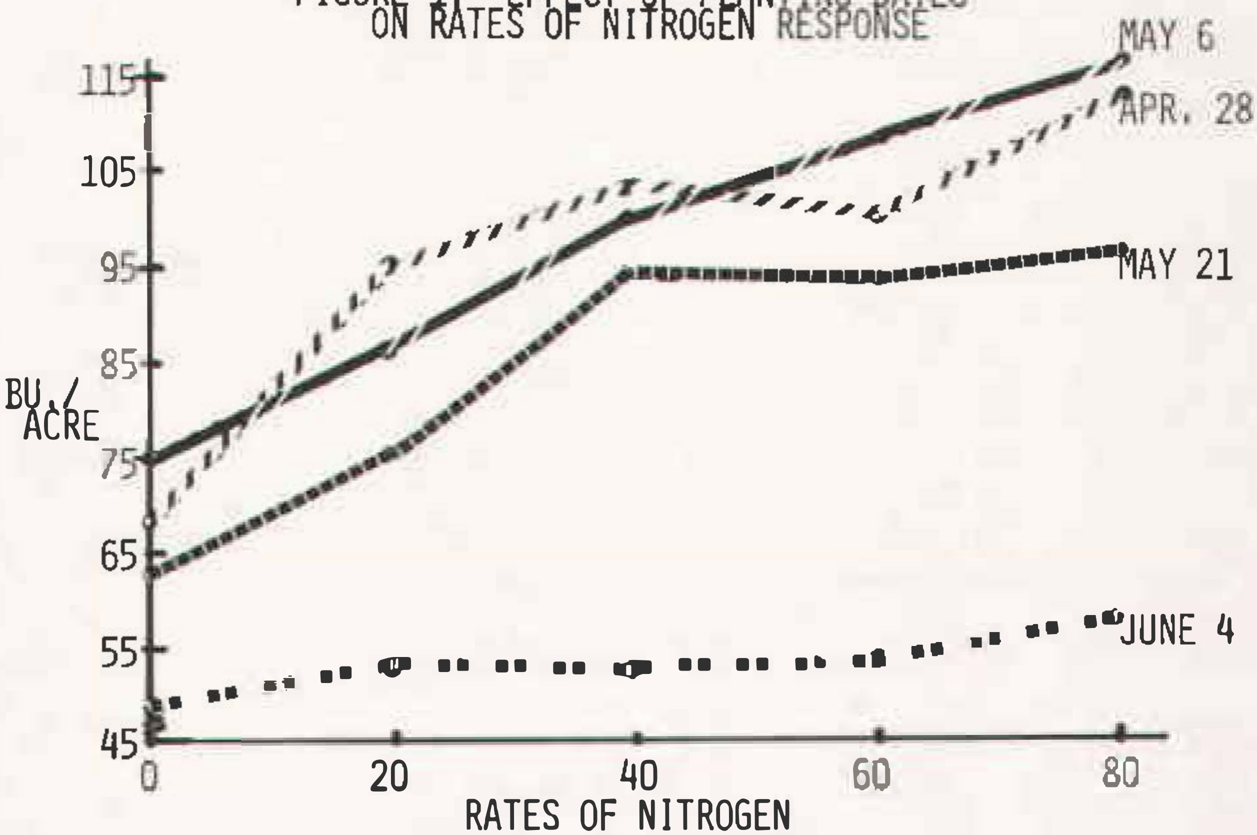
Discussion and Interpretation of Table 3.

80 pounds of nitrogen applied annually was sufficient to produce maximum yields in 1981. Rates of nitrogen higher than 80 pounds per acre appeared to decrease corn yields in some planting dates. It should be noted that these high nitrogen rates were applied every year for many years, including those years with severe hail storms when little or no fertility was removed by the crops. Have we finally reached a point where excessive nitrogen rates are detrimental to yield, or is this just a temporary imbalance caused by unusually dry conditions in the spring of 1981?

Yields from the late planting (June 4) fell off rather sharply this year.

May 6 looks like a pretty good date to have most of the corn planting done.

FIGURE 1. EFFECT OF PLANTING DATES ON RATES OF NITROGEN RESPONSE



Discussion and Interpretation of Figure 1.

This diagram shows more dramatically the effects of planting dates on nitrogen response. Note the low yield and virtually no response to fertilizer by the June 4 planting.

Table 4. Effect of Fertilizer and Planting Dates on Yield of Corn (Low Nitrogen Rates)

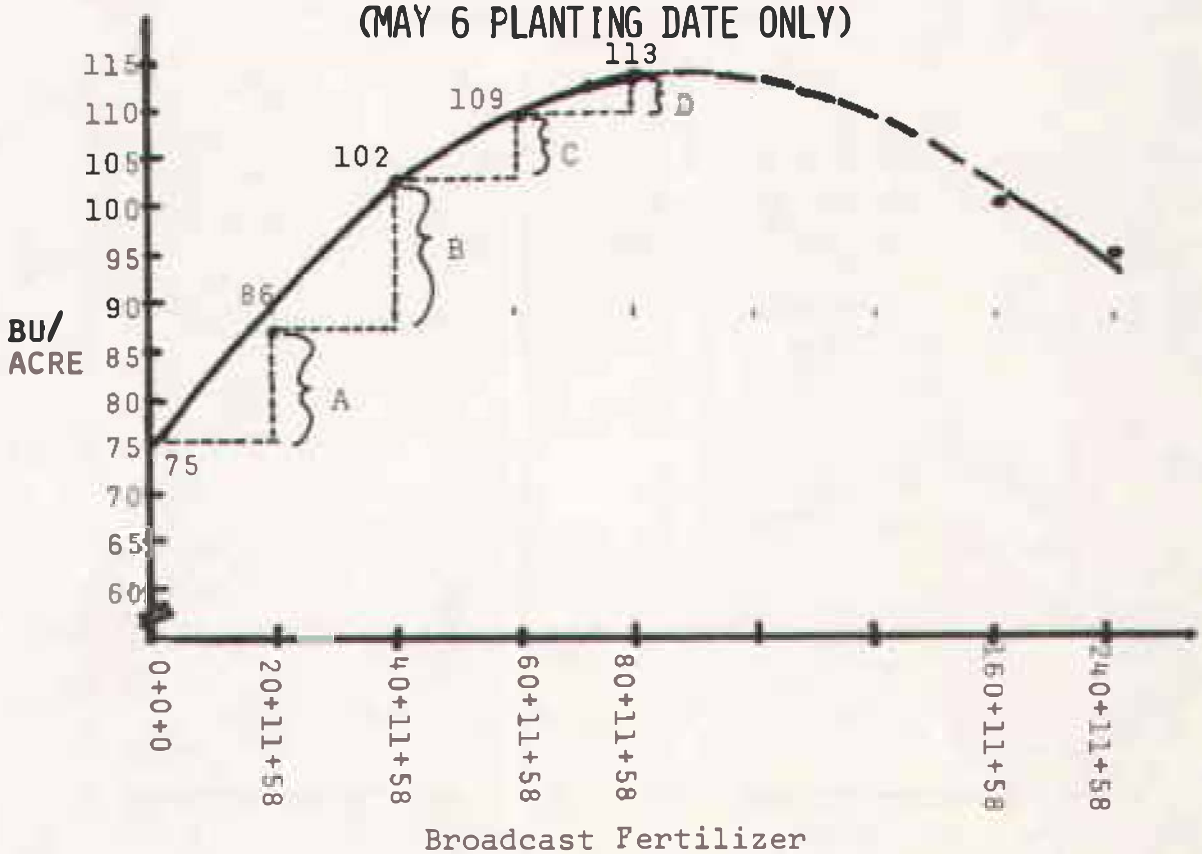
Broadcast Fertilizer Treatment N + P + K	Planting Dates April 28	May 6	May 21	June 4	Average
0 + 0 + 0	69	75	63	47	63.5
20 + 11 + 58	95	86	75	52	77.0
40 + 11 + 58	102	102	94	52	87.5
60 + 11 + 58	102	109	94	52	89.3
80 + 11 + 58	110	113	97	59	94.8
Average	95.6	97.0	84.6	52.4	

Discussion and Interpretation of Table 4.

Yields from the June 4 planting date were considerably less than from earlier planting dates.

Early and midseason plantings gave greater yield increases due to fertilizer than the late planting.

FIGURE 2. EFFECT OF FERTILIZER RATES ON YIELD OF CORN (MAY 6 PLANTING DATE ONLY)



Discussion and Interpretation of Figure 2.

Corn yields are illustrated graphically to emphasize effect of nitrogen fertilizer rates. The May 6 planting date was selected because it has been one of the more successful planting dates in the past. The yield line between 80 and 160 pounds of nitrogen is broken to show that it was estimated, because no data is available for this range.

Length of vertical dotted lines A, B, C, and D indicate amount of yield increase for each added increment of nitrogen. Notice that lines A and B are longer than C and D. This suggests that with the climatic conditions and past history of these plots, low rates of nitrogen gave the biggest return for each dollar spent for fertilizer, but rates in the 80 pounds per acre range gave the greatest total yield per acre.

Table 5. Effect of Fertilizer and Planting Dates on Ear Moisture Percent at Harvest.

Broadcast Fertilizer Treatment	Planting Dates				
N + P + K	April 28	May 6	May 21	June 4	Average
0 + 0 + 0	17	17	21	28	20.8
0 + 11 + 58	16	16	18	26	19.0
20 + 11 + 58	15	16	18	27	19.0
40 + 11 + 58	16	16	18	27	19.3
60 + 11 + 58	17	16	20	27	20.0
80 + 11 + 58	16	16	18	28	19.5
160 + 11 + 58	17	17	20	28	20.5
240 + 11 + 58	18	17	21	32	22.0
Average	16.5	16.4	19.3	27.9	

Discussion and Interpretation Table 5.

Except for the 240 pound rate, nitrogen had only small effects on ear moisture at harvest.

Ear moisture increased dramatically when planting dates were delayed after May 6.

S.E. FARM REPORT

PLANT POPULATIONS FOR CORN

F. Shubeck, B. Lawrensen, and D. DuBois

SOUTHEAST FARM 81-2

Objectives of Experiment

1. Will a drought tolerant hybrid help reduce the expected loss when the planting rate turns out to be too high for the rainfall?
2. Will a prolific hybrid planted at moderate populations be able to take full advantage of unexpected improved growing conditions?
3. "Shortie" wheats have done very well in limited rainfall areas. How about "shortie" corn?
4. Can the population problem be solved by using a single ear hybrid that has a strong ability to increase ear size if conditions are better than expected?
5. Or is it best to use the biggest, tallest, latest corn that can be matured in most seasons?

Methods and Procedures

September 25, 1980	- Broadcast 160 lbs. N, 26 lbs. of P, and 33 lbs. of K per acre; plowed the same day
April 22, 1981	- Over all sprayed with Eradicane plus Aatrex 4L at recommended rates. Tandem disked immediately.
May 5, 1981	- Field cultivated plot
May 6, 1981	- Planted all varieties and all plant populations Insecticide - Furadan 10G
June 4-11, 1981	- Finished thinning all plots to correct populations
June 12, 1981	- Cultivated all plots
August 3, 1981	- Hail
October 16, 1981	- Combined all plots
October 28, 1981	- Tandem disked all plots
October 29, 1981	- Plowed plot area. No fertilizer applied.

Table 6. Hybrids used with Important Features of Each

Hybrid	Special Characteristics	Days to Maturity
Curry's SC-150	Big tall full season	115
Frundt's 8500A	Multi-ear tendency	110
Pioneer 3709	Heat & drought tolerant	105
Pioneer 3932A	Ability to increase ear size	93
Yield Warranty 35A	"Shortie" about 5-1/2 to 6 ft.	95

Discussion and Interpretation of Table 6

Optimum plant populations have varied widely with changing environmental conditions. It is virtually impossible to accurately guess rainfall and temperature patterns three months in advance. The amount of subsoil moisture at planting will serve as a guide but this is not always known. This experiment is centered around hybrids with unique characteristics that hopefully will help reduce the necessity of trying to out-guess the weather when selecting the planting rates.

Table 7. Effect of Plant Populations and Hybrids on Corn Yield

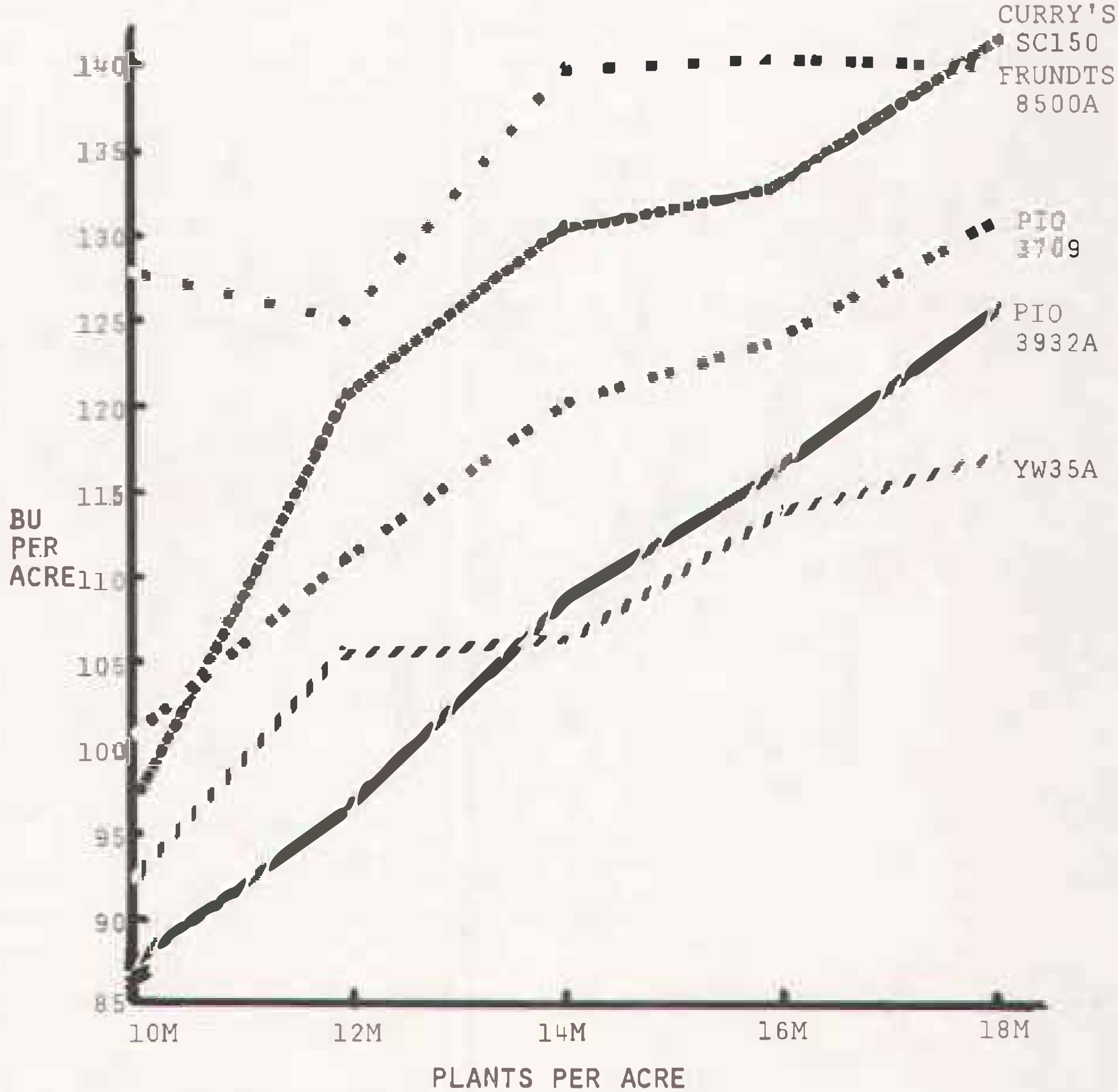
	Plants Per Acre (Final)					
Hybrid	10,000	12,000	14,000	16,000	18,000	Average
Pioneer 3709	102	111	120	123	131	117.4
Pioneer 3932 A	87	98	109	116	127	107.4
YW 35A	93	105	106	117	118	107.8
Curry SC150	98	120	131	132	141	124.4
Frundts 8500A	127	125	138	139	139	133.6
Average	101.4	111.8	120.8	125.4	131.2	

Discussion and Interpretation of Table 7

This is one of the few years that a final stand of 18,000 plants per acre may not have been sufficient for maximum yields. Yields were still advancing for each increase in population with all but one hybrid at the 18,000 plants per acre level.

The two earlier maturing hybrids yielded less than the full season numbers at each population density.

FIGURE 3. EFFECT OF PLANT POPULATIONS
AND HYBRIDS ON CORN YIELDS



Discussion and Interpretation of Figure 3.

Yields of all hybrids except the multi-eared number were continuing upward as populations reached 18,000. It looks like the multi-ear tendency can compensate fairly well for inadequate stands when growing conditions turn unexpectedly for the better.

In other years, with less desirable growing conditions, the drought tolerant corn and the hybrid with a big flex-range in ear size were more successful in widening the range for optimum plants per acre.

Table 8. Effect of Plant Populations and Hybrids on Shelled Corn Moisture at Harvest

Hybrid	Plants Per Acre					
	10,000	12,000	14,000	16,000	18,000	Average
Pioneer 3709	15.2	15.5	15.1	15.9	15.9	15.5
Pioneer 3932-A	13.9	13.8	14.8	14.0	13.8	14.1
YW 35-A	13.8	13.1	13.2	13.4	12.9	13.3
Curry SC 150	20.6	20.1	20.4	20.8	20.7	20.5
Frundt's 8500-A	20.3	20.2	19.4	19.6	21.0	20.1
Average	16.8	16.5	16.6	16.7	16.9	

Discussion and Interpretation of Table 8.

The two early hybrids had corn below 15.5% moisture at harvest. Corn from the two late hybrids averaged a little over 20% at harvest.

Populations had little or no affect on maturity measured by grain moisture when combined.

DATE OF PLANTING EARLY, MEDIUM AND LATE MATURING HYBRIDS (CORN)

F. Shubeck, B. Lawrensen and D. Dubois

S.E. FARM REPORT
SOUTHEAST FARM 81-3

Objectives of Experiment

1. How late can an early, medium, or late maturing hybrid be planted without decreasing yield?
2. If planting is delayed by weather, when should a short or mid-season hybrid be substituted for a full season number.
3. Is there a yield advantage for planting an early maturing hybrid early? or late?

Methods and Procedures

September 25, 1980	- Broadcast 80 lbs. of N; 13 lbs. of P, and 25 lbs. of K per acre on soybean stubble and plowed it down
April 24, 1981	- Sprayed area with five pints Eradicane per acre and tandem disked it
April 27, 1981	- Field cultivated plot (mulcher attached)
April 29, 1981	- First planting of all three varieties. No insecticide was used.
May 5, 1981	- Area spike-tooth harrowed except for first planting date
May 14, 1981	- Second planting date for all three varieties
May 20, 1981	- Third planting date
May 28, 1981	- Fourth planting date
June 11, 1981	- Cultivated first, second and third plantings
June 17, 1981	- Cultivated all four plantings for the second time
August 3, 1981	- Hail
August 13, 1981	- Sprayed all plots with 2,4D Ester at one pint per acre.
October 29, 1981	- Combined all plots
Final Stand	- 18,000 plants per acre

Table 9. Effect of Planting Dates and Varieties on Yield of Corn

Planting Dates	Hybrids Pioneer 3932A	Pioneer 3709	Pioneer 3388	Average
April 29	112	108	128	116.0
May 14	113	111	127	117.0
May 20	112	106	137	118.3
May 28	93	98	112	101.0
Average	107.6	105.8	126.0	

Discussion and Interpretation of Table 9.

Pioneer 3932-A is an early hybrid (93 day) with a reported large potential flex-range in ear size. Pioneer 3709 may be considered a mid-season number (104 day) that has some degree of drought tolerance. Pioneer 3388 is a full season (115-117 day) hybrid.

When yields of the three hybrids were averaged, there was no inclination of a yield decrease until planting dates were delayed beyond May 20.

The full season corn yielded more than the early and mid-season numbers on every one of the planting dates.

There was no yield advantage this year for planting an early corn early nor for delaying planting to May 20 or later.

Caution should be used in applying this data because the hail storm August 3, may have damaged some hybrids more than those of another maturity or planting date.

Table 10. Effect of Planting Dates and Hybrids on Kernel Moisture at Harvest

Planting Dates	Pioneer 3932A	Pioneer 3709	Pioneer 3388	Average
April 29	14.2	15.5	20.5	16.7
May 14	13.6	16.1	21.6	17.1
May 20	13.7	16.9	22.3	17.6
May 28	15.3	18.1	25.0	19.5
Average	14.2	16.7	22.4	

Discussion and Interpretation of Table 10.

All three hybrids reached physiological maturity before harvest.

Kernel moisture for each respective hybrid was quite similar for the first three planting dates. The latest planting date resulted in more kernel moisture and a lower yield.

DEPTH OF PLOWING

FOR CORN

F. Shubeck, B. Lawrensen and D. DuBois

SOUTHEAST FARM 81-4

Objectives of Experiment

1. With the current high price of diesel fuel, will it pay to plow any deeper than 5 inches?
2. Will nitrogen fertilizer be an adequate substitute for the additional nitrogen expected from greater mineralization of soil organic matter in the deeper plowing?
3. Which will give the least expensive yield increase, shallow plowing with fertilizer or deep plowing with more diesel fuel requirements?

Methods and Procedures

May 14, 1981	- Plowed all plots at specified depths. Tandem disked, harrowed, and planted Pioneer 3732 Herbicide - Lasso 2 banded in row Final stand - 17,000 plants per acre
May 15, 1981	- Sprayed Bladex 4L overall, pre-emergence
June 11, 1981	- Cultivated all plots
June 20, 1981	- Sidedressed specified plots with 100 lbs. of N per acre. Cultivated all plots.
August 3, 1981	- Hail
October 8, 1981	- Combined all plots

Table 11. Effect of Depth of Plowing on Corn Yield

Depth of Plowing(in.)	Bu. per acre
5	126
8	123
12	125

Discussion and Intergretation of Table 11.

There were no yield increases for plowing deeper than 5 inches this year.

Differences due to fertilizer were erratic and are not shown. There appeared to be some residual carry over from the previous year. Corn in some of the plots exhibited phosphorus deficiency symptoms early in the season, but these symptoms largely disappeared when the corn was 2-3 feet tall.

SILAGE REMOVAL
AND SOIL DEPLETION

F. Shubeck, B. Lawrensen and D. DuBois

S.E. FARM REPORT
SDSU
SOUTHEAST FARM 81-5

Objectives of Experiment

1. By removing all crop residues from the field, but fertilizing adequately, how long can we continue raising corn without a yield decrease?
2. Can we maintain yields where residues were removed by adding manure equal to that generated by the feed produced?

Methods and Procedures

October 9-10, 1980	- The total plot area was fertilized with specified amounts of manure and commercial N, P and K.
April 22, 1981	- Sprayed Eradicane + Aatrex at recommended rates. Immediately tandem disked area once.
April 27, 1981	- Field cultivated the plot area in readiness for planting
April 29, 1981	- Planted all plots Variety - Pioneer 3388 Herbicide - Eradicane + Aatrex 4L Insecticide - Furadan 10G Final Stand - 15,800 plants/acre
May 29, 1981	- Rotary hoed all plots
June 8, 1981	- Cultivated all plots
June 26, 1981	- Cultivated all plots (lay-by)
August 3, 1981	- Hail
October 20, 1981	- Combined all plots
October 23, 1981	- Removed corn stalks from specified plots
October 29, 1981	- Rotary chopped stalks
November 9, 1981	- Spread commercial fertilizer and manure on specified plots, then plowed down for the 1982 study.

Table 12. Effect of Commercial Fertilizer and Manure Applications on Corn Yields With Intensive Soil Depletion Management

Removed From Plot	Fertilizer Treatment N + P + K	Tons of Silage/acre	Bu of corn per acre
Corn grain only	0 + 0 + 0	---	93
Corn grain only	10 tons manure/acre	---	122
Corn grain only	0 + 0 + 0	---	92
Corn grain only	100 + 17.6 + 33.2	---	126
Grain and Stover	0 + 0 + 0	10.1	96
Grain and Stover	10 tons manure/acre	10.2	123
Grain and Stover	0 + 0 + 0	10.1	96
Grain and Stover	100 + 17.6 + 33.2	9.9	128

Discussion and Interpretation of Table 12.

Plots where both grain and stover were removed since 1975, yielded about the same as those where grain only was removed. Not much fertility was taken away in crops in 1980 because of the two hail storms.

In 1981, both commercial fertilizer and manure increased grain yields, but had little affect on yield of silage.

S.E. FARM REPORT

CHISEL PLOW FOR CORN AND SOYBEANS

F. Shubeck, B. Lawrensen and D. DuBois

SOUTHEAST FARM 81-6

Objectives of Experiment

1. How much tillage is necessary for optimum yields?
2. Will fall tillage increase soil moisture storage?
3. Can yields with chisel plowing be maintained equal to that from moldboard plowing?
4. Which is the best type of chisel point to use - sweeps or twists?

Methods and Procedure (corn after soybeans)

October 2, 1980	- Fall tillage treatments began
October 7, 1980	- Fall tillage completed
March 23, 1981	- Spring tillage performed
May 19, 1981	- Planted all plots Variety - Pioneer 3732 Insecticide - None (corn in rotation with soybeans) Herbicide - Lasso II banded Final stand - 16,000 plants/acre
May 20, 1981	- Sprayed Bladex pre-emergence at 1.5 quarts per acre
June 11, 1981	- Cultivated all plots
June 25, 1981	- Sidedressed plots with 100 lbs. of N/acre
June 26, 1981	- Cultivated
August 3, 1981	- Hail
October 9, 1981	- Combined all plots

Table 13. Effect of Tillage Treatments on Yield of Corn (Corn after Soybeans)

Tillage Treatments In Fall	In Spring	Bu corn/ acre
1. - - - - - - - - - - -	Disk-drag	120
2. - - - - - - - - - - -	Sweeps-drag	113
3. - - - - - - - - - - -	Plow-disk-drag	107
4. Plow (moldboard)	Disk-drag	115
5. Chisel plow with twists	Disk-drag	117
6. Chisel plow with twists	Disk-drag	123
7. Chisel plow with twists	Sweeps-drag	114
8. Chisel plow with sweeps	Sweeps-drag	109
9. - - - - - - - - - - - -	Disk-drag	121
10. Chisel plow with sweeps*	Sweeps-drag	103

* Treatment 10 was unfertilized. All other corn plots received 100 lbs. per acre of 8-32-16 (oxide) as a sideband starter. In addition, 100 lbs. of nitrogen per acre was applied as a sidedressing when corn was about 12 inches high.

Discussion and Interpretation of Table 13.

Plots receiving no fall tillage and only a disk-drag treatment in the spring (number 1 and 9) yielded very well. In comparable years that have a dry fall followed by a dry spring, this tillage treatment on soybean ground may turn out to be one of the better reduced tillage practices.

Under these conditions, most of the late fall tillage treatments in soybean stubble were ineffective for increasing the following corn yields.

More intensive tillage with a moldboard plow did not increase yields over the spring disk treatment.

Methods and Procedures (Soybeans after corn)

October 2-7, 1980	- All fall treatments in cornstalks were performed
March 23, 1981	- Spring tillage performed
May 19, 1981	- Seedbed preparation with chisel plow sweeps and twists performed, then spike-tooth harrowed
May 21, 1981	- Planted all plots Variety - Wells II Herbicide - Lasso II banded
June 12, 1981	- Cultivated all plots (1st)
June 30, 1981	- Cultivated all plots (2nd)
July 16, 1981	- Cultivated all plots (3rd)
July 17, 1981	- Rogued plots for broad leaved weeds
August 3, 1981	- Hail
September 18, 1981	- Combined all plots

Table 14. Effect of Tillage Treatments on Yield of Soybeans (Soybeans after Corn)

Tillage Treatments In Fall	In Spring	Bu. of Soybeans/Acre
1. - - - - - - - - - - - -	Disk-disk-drag	33
2. - - - - - - - - - - - -	Chop-sweeps-disk-drag	31
3. - - - - - - - - - - - -	Disk-moldboard plow-disk-drag	33
4. Disk-moldboard plow	Disk-drag	33
5. Disk-twists	Disk-drag	31
6. Chop-twists	Disk-drag	32
7. Chop-twists	Sweeps-drag	30
8. Chop-sweeps	Sweeps-drag	31
9. Disk	Disk-drag	31
10. Chop-twists*	Sweeps-drag	29

*Treatment 10 was unfertilized. All other plots received 100 lbs. per acre of 8-32-16 (oxide) as a sideband starter.

Discussion and Interpretation of Table 14.

Yield differences due to tillage treatments were very small or none at all.

There appeared to be a small, but consistent increase in soybean yield due to the fertilizer treatment.

Methods and Procedures (Corn after oats)

August 5-6, 1980	- Chisel sweeps, chisel twists and moldboard plow tillage performed
April 23, 1981	- Spring tillage done
May 19, 1981	- Disk and drag treatments completed and plots planted Variety - Pioneer 3732 Insecticide - None Herbicide - Lasso II banded in row
May 20, 1981	- Sprayed Bladex 4L pre-emergence at 1.5 quarts per acre
June 11, 1981	- Cultivated
June 25, 1981	- Sidedressed 100 lbs. of N per acre
June 26, 1981	- Cultivated (lay-by)
August 3, 1981	- Hail
October 10, 1981	- Combined all plots

Table 15. Effect of Tillage Treatment on Yield of Corn (Corn after Oats)

	Tillage Treatments		Corn
	In Summer	In Spring	Bu/Acre
1.	Chisel plow-sweeps	Disk-drag	120
2.	Chisel plow-twists	Disk-drag	122
3.	Moldboard plow	Disk-drag	117
4.	- - - - - - - - -	Moldboard plow-disk-drag	117
5.	- - - - - - - - -	Chisel plow-sweeps-disk-drag	117
6.	- - - - - - - - -	Chisel plow-twists-disk-drag	121
7.	- - - - - - - - -	Disk-disk-drag	113
8.	- - - - - - - - -	Chisel plow-sweeps-disk-drag*	87

* Received no fertilizer. All other plots were fertilized with 100 lbs. of 8-32-16 (oxide) as sideband starter and 100 lbs. of nitrogen sidedressed.

Discussion and Interpretation of Table 15

A new crop sequence was initiated that would permit tillage in mid-summer rather than late fall. Oats was substituted for soybeans, making it an oats-corn sequence. Tillage on the oats stubble was performed in early August. If tillage will increase rate of infiltration, then oats in the rotation will provide a greater interval of time between tillage and freeze-up to increase soil water accumulation.

The two chisel plow treatments in summer plots appeared to yield a little more than most of the spring only tillage plots.

Moldboard plowing in summer was not the highest yielding plot.

A substantial yield increase was obtained for the use of fertilizer.

TILLAGE TREATMENTS WITH DRYLAND CORN-SOYBEAN ROTATION

T. Chisholm, F. Shubeck and B. Lawrensen

AGRICULTURE ENGINEERING DEPARTMENT 81-7

S.E. FARM REPORT

Experimental Plan

Shallow Tillage Treatments
- Plow - Spring moldboard plow, disk twice and drag
- Chisel - Spring chisel plow, spring disk twice and drag
- Disk - Spring disk twice and drag
- Roto - Shallow spring roto-till

Deep tillage treatment
- S treatment - spring subsoil
- N treatment - not subsoiled

Soil: Well drained loam

Cropping Sequence: Corn - Soybeans

Methods and Procedures

1. Subsoiling was performed in the spring before any of the other tillage operations.
2. 109.6 lbs/acre of 8-32-16 (oxide) was applied broadcast for both corn and soybeans.
3. Nitrogen was broadcast at 100 lbs. of N per acre for corn.
4. A tank mix of Eradicane and Bladex 4L was applied on corn ground. Rate of application was 4 lb. Eradicane and 1.5 lbs. of Bladex per acre.
5. Treflan was applied to soybean stubble. Herbicides were incorporated by disking or rototilling immediately after application.
6. Corn was planted May 22, 1981.
   Variety - Pioneer 3732
   Rate - 18,000 plants/acre
7. Soybeans were planted May 22, 1981, at 60 lbs. per acre.
   Variety - Corsoy
8. Soybeans were combined October 6, 1981, and corn October 27, 1981.

Table 16. Effect of Different Tillage Treatments on Yield of Corn

	Plow		Chisel		Disk		Roto	
	S	N	S	N	S	N	S	N
Rep I	98.2	94.5	103.7	100.6	135.9	124.9	125.0	112.0
Rep II	108.0	112.6	91.1	115.0	107.1	108.0	116.3	108.8
Rep III	93.6	94.2	107.7	97.3	106.2	126.7	118.1	129.2
Rep IV	123.1	108.0	68.1	106.2	111.4	129.8	125.8	139.0
Average	105.7	102.3	100.3	104.8	115.2	122.4	121.3	122.1
Tillage Ave.	104.0		102.8		118.8		121.7	

Subsoiling Averages:

Subsoiled - 110.8
Not subsoiled - 112.9

Discussion and Interpretation of Table 16

Shallow tillage treatments (disking and rototilling) appeared to yield more than the deeper tillage methods of moldboard and chisel plowing in 1981. There may be a trend in favor of shallow tillage in soybean stubble in a dry spring, but more data will be necessary before this can be confirmed.

No increase in yield was obtained from the deep subsoiling treatment.

Table 17. Effect of Different Tillage Treatments on Yield of Soybeans

	Plow		Chisel		Disk		Roto	
	S	N	S	N	S	N	S	N
Rep I	32.1	41.3	35.9	39.2	32.8	35.9	30.5	35.9
Rep II	30.5	37.6	28.6	28.6	30.2	35.7	34.8	26.9
Rep III	28.8	28.8	28.6	26.9	25.0	32.1	25.0	30.5
Rep IV	25.0	21.3	26.9	27.1	30.5	23.4	28.8	28.8
Average	29.1	32.3	30.0	30.5	29.6	31.8	29.8	30.5
Tillage Ave.	30.7		30.3		30.7		30.2	

Subsoiling Averages:

Subsoiled - 29.6
Not subsoiled - 31.3

Discussion and Interpretation of Table 17

Yields from plowing, chiseling, disking and roto-tilling were almost exactly the same. The August 3 hail storm may have influenced these results. Soybeans appeared to be injured more than the corn by the hail.

Table 18. Effect of Tillage Methods on Stand Count Corn and Soybeans

Tillage Method	Plants per acre (Average of subsoiled and nonsubsoiled plots) Corn	Soybeans
Moldboard plow	15,800	64,500
Roto-till	17,700	114,000
Disk	17,050	66,500
Chisel Plow	14,200	83,000

Discussion and Interpretation of Table 18

Both beans and corn were planted with a 6 row John Deere tool bar planter. Sprocket settings in planting units were constant for all of the tillage methods.

It is interesting to see that roto-tilling resulted in higher stand counts with both corn and soybeans for this year. Dry cloddy surface soil characterized the seedbed with some tillage treatments in this year, with below average early season moisture supplies. Roto-tilling gave a more mellow seedbed with better seed-soil contact, which resulted in better germination and faster early growth.

Table 19. Effect of Tillage Methods on Growth Rate of Corn and Soybeans

Tillage Method	Height of Corn in cm. June 23	July 29	Height of soybeans in cm. July 1	July 29
Moldboard plow	54	254	21	92
Roto-tilled	64	264	21	91
Disk	62	250	20	85
Chisel Plow	48	242	20	88

Discussion and Interpretation of Table 19

Subsoiled and non-subsoiled measurements were averaged for each of the primary tillage methods. Height measurements were made on two different dates to record any differences that may be due to tillage treatments. Heights from subsoiled and non-subsoiled plots were averaged for each tillage treatment.

With corn, the roto-tilling and disking tillage methods appeared to get the corn off to a little faster start. By the end of July, roto-tilled plots still maintained a small height advantage.

With soybeans, there were practically no height differences due to tillage methods on July 1. By the end of July, beans in plots that were moldboard plowed and rotary tilled were slightly taller.

Table 20. Effect of Tillage Methods on Tasseling Dates of Corn

Tillage Method	% Of Stalks With Tassles July 29	August 5
Moldboard plow	--	96
Roto-till	100	--
Disk	95	--
Chisel Plow	--	76

Discussion and Interpretation of Table 20

Subsoiled and non-subsoiled measurements were averaged for each of the primary tillage treatments. The two tillage treatments (roto-till and disk) that had the fastest early growth, also tasseled earlier and yielded the most corn at harvest.

Getting corn off to a fast start in some years may be important from a standpoint of both yield and maturity at harvest.

Table 21. Effect of Tillage on Kernel Moisture at Harvest

Tillage Method	% Kernel Moisture
Moldboard Plow	16.4
Roto-till	14.9
Disk	15.3
Chisel Plow	17.0

Discussion and Interpretation of Table 21

Results for subsoiled and non-subsoiled plots were averaged for each of the above four tillage treatments.

The two tillage treatments where corn tasseled first (roto-till and disking) had corn with slightly less grain moisture at harvest.

Table 22. Effect of Tillage Treatments on Pounds of Residue Per Acre

Tillage Treatment	On Corn Ground After Beans July 1	On Corn Ground After Beans August 12	On Bean Ground After Corn July 1	On Bean Ground After Corn August 12
Moldboard Plow	315	579	1066	553
Roto-tiller	739	594	1451	1317
Disk	1076	507	1685	891
Chisel Plow	1062	493	1887	993

Discussion and Interpretation of Table 22

Subsoiled and non-subsoiled measurements were averaged for each of the primary tillage treatments. There was a surprising amount of soybean residue on the surface of corn ground in the disk and chisel plow plots on July 1. Residue gradually disappeared as the season progressed.

Corn residue on soybean ground also varied with type of tillage, with chisel plow and disking accounting for the greatest amount when measured on July 1.

Table 23. Effect of Tillage Treatments on Percent of Ground Cover by Organic Matter (On Bean Ground After Corn)

Tillage Method	% Of Ground Covered After Planting
Moldboard Plow	4.8
Roto-till	19.0
Disk	18.5
Chisel Plow	18.5

Discussion and Interpretation of Table 23

Moldboard plowing had a lower percent of ground surface cover than the other tillage treatments.

Subsoiled and non-subsoiled measurements were averaged for each of the primary tillage treatments.

Table 24. Effect of Tillage Methods on Soil Compaction
July 2, 1981

Tillage Treatment	On Bean Ground After Corn 0-20 cm.	20-40 cm.	On Corn Ground After Beans 0-20 cm.	20-40 cm.
Moldboard Plow	0.94	1.1	1.2	1.4
Roto-till	0.86	1.1	1.1	0.9
Disk	0.87	0.92	1.3	1.5
Chisel Plow	1.04	0.81	1.3	1.1

Discussion and Interpretation of Table 24

Soil density is determined by comparing the weight of a given volume of dry soil to the weight of an equal volume of water. A soil density of 1.2 means that the dry soil weights 1.2 times more than an equal volume of water. Soil densities greater than 1.4 will slow down root growth and rate of water infiltration.

Soil density would be affected most at the 0-20 cm. depth (about 8 inches), by the different tillage methods.

On bean ground at the 0-20 cm. depth, three of the tillage treatments had a soil density below one.

It was surprising to see soil densities at the 0-20 cm. depth on corn ground after beans as high as 1.2 and 1.3. Perhaps this was influenced by tractor and cultivator.

Table [illegible]. Effect of Tillage Methods on % Soil Water by Volume

Tillage Method	Soil Depth	7/3	7/15	7/22	7/30	8/5	8/14	8/22	8/29	9/5	9/12	9/26
					On Corn Ground After Soybeans							
Chisel	15-30	28	27	29	29	30	27	25	25	24	25	22
plow	30-45	26	25	26	25	26	23	22	22	22	22	20
Moldboard	15-30	27	27	29	28	30	28	26	26	25	26	22
plow	30-45	26	25	27	26	27	25	24	24	23	24	20
Disk	15-30	22	28	28	27	30	25	24	23	23	23	21
"	30-45	24	28	26	25	28	24	22	22	21	22	19
Roto-Till	15-30	29	28	31	31	32	31	28	29	28	30	25
"	30-45	29	28	30	29	31	29	28	28	27	28	25
					On Soybean Ground After Corn							
Chisel	15-30	28	26	30	29	32	29	27	26	25	25	25
Plow	30-45	27	26	28	26	30	26	25	24	24	24	23
Moldboard	15-30	31	32	32	31	33	30	27	27	25	27	25
Plow	30-45	30	29	30	28	30	26	24	24	24	24	23
Disk	15-30	31	30	31	29	33	29	28	28	27	28	26
"	30-45	32	32	32	31	33	30	29	29	28	29	28
Roto-till	15-30	34	33	33	33	34	31	30	29	28	29	29
"	30-45	32	32	32	32	32	31	30	30	30	31	31

Discussion and Interpretation of Table 25

Soil moisture determinations were made at several different dates and soil depths with a neutron probe. The 0-15 cm. depth was not measured with the probe because it is not accurate at this shallow depth. Eight depths were measured, but only the 15-30 and 30-45 cm. depths are reported because these are the depths where the greatest differences in soil moisture due to tillage would be expected (15-30 cm depth - 6 to 12 inches).

Soil moisture measurements were made both on corn ground and soybean ground in a corn-bean rotation.

After August 5, soil water was gradually reduced as the plants need for moisture exceeded the rainfall.

On corn ground following soybeans, roto-tilled plots had more soil moisture through the entire growing season at both depths than the other plots that we disked, chisel plowed or moldboard plowed. Roto-tilled plots also had some of the highest corn yields.

On soybean ground, roto-tilled plots also had more soil moisture during most of the growing season at both depths, but there were practically no differences in yield due to tillage methods. The August 3 hail storm may have been a limiting factor on soybean yields.

Even though this trend appears to be consistent with all four roto-tilled measurements, no explanation will be attempted until more years' data are available.

CONTINUOUS SOYBEANS

B. Lawrensen, F. Shubeck and D. DuBois

SOUTHEAST FARM 81-8

S.E. FARM REPORT

Objectives of Experiment

1. What are the possibilities of growing continuous soybeans for increasing soil nitrogen and at the same time produce an excellent cash crop? Approximately one pound of nitrogen is returned to the soil for each bushel of soybeans raised.
2. Will disease and insects gradually build up in the soil and reduce yields?
3. Is it possible to build up nitrogen reserves from symbiotic soybean nitrogen?

Methods and Procedures

September 29, 1980	- Total plot area plowed No fertility added at this time.
April 14, 1981	- Broadcast fertilizer on specified plots and spike tooth harrowed.
May 7, 1981	- Planted all rotation corn plots after field cultivating. Variety - Pioneer 3388 Herbicide - Lasso II banded over row
May 20, 1981	- Planted all soybeans after field cultivating Variety - Wells Herbicide - Lasso II banded over row
June 8, 1981	- Cultivated all corn plots
July 1, 1981	- Cultivated all corn and bean plots
August 3, 1981	- Hail
September 21, 1981	- Combined all soybean plots
October 26, 1981	- Combined all corn plots
October 30, 1981	- Plowed all bean and corn plots

Table 26. Effect of Cropping Sequence on Yields of Soybeans and Corn

Cropping Sequence	Fertilizer	Bushels of corn per acre	Bushels of beans per acre
Continuous beans	Check	---	31
Continuous beans	Fertilized*	---	33
Rotation corn and beans	Check	108	33
Rotation corn and beans	Fertilized**	118	33

* Soybeans were fertilized with 75 lbs. of 8-32-16 (oxide) per acre, broadcast.
**Corn was fertilized with 80+30+20 (oxide), broadcast.

Discussion and Interpretation of Table 26.

None of these plots were harvested in 1980 because of the two hail storms that year. The term continuous beans may be somewhat misleading because the continuity was broken by the hailstorms.

Rotation beans and continuous beans yielded about the same this year. The hail storm in 1981 seemed to minimize any potential yield differences that we could expect due to the treatments.

S.E. FARM REPORT

MOST PROFITABLE ROTATION

B. Lawrensen, F. Shubeck and D. DuBois

SOUTHEAST FARM 81-9

Objectives of Experiment

1. How much will commercial fertilizer increase net profits?
2. Is it more profitable to add nitrogen from a commercial fertilizer source or grow a legume in a rotation?
3. Which cropping sequence will bring the greatest net return?
4. Will previous crops have much effect on available moisture at spring planting time?

Methods and Procedures

October 2-3, 1980	-	Rotary chopped all corn and grain sorghum plots and plowed all six ranges
April 6, 1981	-	Single tandem disked and spike-tooth harrowed all plot areas
April 9, 1981	-	All oats plots spike tooth harrowed and planted. Variety - Moore Oats Sweet clover and Mammoth red clover mixture was planted in catch crop legume plots. Alfalfa - N. K. Thor
April 10, 1981	-	Land rolled all alfalfa and sweet clover plus red clover plots. Then, spike-tooth harrowed to incorporate legume seed.
May 14, 1981	-	All corn, grain sorghum and soybean plots spike-tooth harrowed.
May 14-15, 1981	-	Planted all corn plots Variety - Pioneer 3732 Herbicide - Lasso II banded over row Bladex 4L at 1.5 qts. per acre sprayed pre-emergence Insecticide - Furadan 10G
May 19, 1981	-	Sprayed all oats plots, except those underseeded with legumes, with Bronate at one pint per acre.
May 20, 1981	-	Planted all soybean plots Variety - Wells II Herbicide - Lasso II banded over row
May 28, 1981	-	Field cultivated all grain sorghum plots before planting
May 29, 1981	-	Planted grain sorghum plots Variety - Cenex 310 T

Herbicide - Bexton 4L
Insecticide - Furadan 10 - for green bug suppression

June 1, 1981	-	Rotary hoed all corn plots
June 8, 1981	-	Cultivated all corn plots (1st)
June 12, 1981	-	Cultivated all bean plots (1st)
June 23, 1981	-	Field chopped all alfalfa plots to remove forage from plots. Reason: Damaging frost
June 25, 1981	-	Sidedressed all corn and grain sorghum plots with specified amounts of ammonium nitrate.
June 26, 1981	-	Cultivated all corn, bean and grain sorghum plots. Corn - second and lay-by; Beans - second time; Grain Sorghum - first time
July 14, 1981	-	Sprayed all corn plots with 2, 4D amine at rate of 0.6 pints per acre.
July 16, 1981	-	Cultivated all bean and grain sorghum plots
July 20, 1981	-	Rogued soybean plots for volunteer corn and broadleaf weeds
August 3, 1981	-	Combined all oat plots
August 3, 1981	-	Hail in P.M.
September 21, 1981	-	Combined beans
October 8, 1981	-	Combined grain sorghum
October 10, 1981	-	Combined corn plots
October 23, 1981	-	Rotary chopped all corn and grain sorghum plots
October 27, 1981	-	Plowed all plots except alfalfa that was established in spring of 1981.

Table 27. Effect of Cropping Sequence and Fertilizer on Crop Yield, 1981

	Cropping Sequence	Crop Receiving Fertilizer	Fertilizer lbs/A N + P + K	N Side Dress lbs/A	Oats Bu/A	1st Year Corn Bu/A	2nd Year Corn Bu/A	Soy-beans Bu/A	Sor-ghum Bu/A	Hay Tons/A
1	Continuous corn	----	0 + 0 + 0			82.0				
1	Continuous corn	Corn	6 +11 +10	70		113.0				
2	Corn-oats	---	0 + 0 + 0		52.0	99.0				
2	Corn-oats	Corn	6 +11 +10	70		119.0				
		Oats	30 + 7 + 0		63.0					
3	Corn-corn-Oats+alf hay	----	0 + 0 + 0		54.0	110.0	108.0			1.0
3	Corn-corn-oats+alf hay	Corn	6 +11 +10			118.0				
		Corn	6 +11 +10	70			120.0			
		Oats	15 +26 + 0		63.0					
		Alf resid.	0 + 0 + 0							1.19
4	Oats+sweet clover-corn	----	0 + 0 + 0		59.0	99.0				
4	Oats+sweet clover-corn	Oats	30 + 7 + 0		66.0					
		Corn	6 +11 +10			102.0				
5	Corn-soybeans-oats	----	0 + 0 + 0		58.0	91.0		33.0		
5	Corn-soybeans-oats	Corn	6 +11 +10	70		125.0				
		Soybeans	6 +11 +10					36.0		
		Oats	30 + 7 + 0		75.0					
6	Corn-oats-soybeans	----	0 + 0 + 0		50.0	114.0		33.0		
6	Corn-oats-soybeans	Corn	6 +11 +10	55		123.0				
		Oats	20 + 7 + 0		70.0					
		Soybeans	6 +11 +10					36.0		
7	Continuous grain sorghum	----	0 + 0 + 0						68.0	
7	Continuous grain sorghum	Sorghum	6 +11 +10	70					98.0	

Discussion and Interpretation of Table 27

There were substantial increases in corn yield due to fertilizer, even though serious damage was inflicted by the August 3 hail storm.

Where no fertilizer was applied, corn yields in a corn-oats sequence were higher than continuous corn. When corn followed soybeans, and no fertilizer added, corn yield was increased by 32 bushels per acre over continuous corn.

Alfalfa hay increased the following corn yield almost as much as soybeans when no fertilizer was used.

Soybeans showed a small but consistent increase due to fertilizer.

There was a large increase in grain sorghum yield from fertilizer, but that over-all sorghum yields were less than that of corn.

Oats yields were rather mediocre in 1981, due largely to insufficient rainfall early in the season. There were some increases from fertilizer, but not as large as in more favorable years. The highest oat yields occurred in the soybean rotations.

SOYBEAN VARIETY AND

ROW SPACING STUDY

F. Shubeck, B. Lawrensen and D. DuBois

SOUTHEAST FARM 81-10

Objectives of Experiment

1. Will it pay to narrow rows from 30 inches down to 7 inches?
2. What can we expect from intermediate row spacings between 30" and 7", like 20" or skip row allowing room for tractor wheels and a cultivator?
3. Is planting soybeans with a small grain press drill a good practice?
4. Will soybeans with a different type of growth habit respond differently - like branching type (Corsoy); a thin line (Wells; or a semi-dwarf (Gnome)?

Methods and Procedures

October 22, 1980	- Area was fall plowed. No fertility added at this time.
April 24, 1981	- Sprayed area with Treflan at 1.5 pints per acre and tandem disked immediately.
May 14, 1981	- Field cultivated diagonally to disking
May 22, 1981	- Planted all row spacing and varieties Varieties, Corsoy, Wells and Gnome Row Spacings - 30", 20", 7" and skip row
July 1, 1981	- Cultivated first time in all spacings except 7 inch.
August 3, 1981	- Hail storm
October 15, 1981	- Combined all plots

Table 28. Comparison of Row Spacings and Varieties on Yield of Soybeans

Variety	Row Spacing in inches	Plants Per Acre	Bu. of Soybeans/acre
Wells	7	112,000	26
Wells	20	102,000	31
Wells	30	65,000	24
Wells	15" Skip Row	71,000	25
Corsoy	7	130,000	32
Corsoy	20	96,000	37
Corsoy	30	61,000	33
Corsoy	15" Skip Row	73,000	35
Gnome	7	106,000	33
Gnome	20	76,000	44
Gnome	30	58,000	33
Gnome	15" Skip Row	53,000	38

Discussion and Interpretation of Table 28

There was a wide variation in stand counts after the hail storm. From appearances, the Gnome variety had the most hail damage. The low stand counts in the Gnome plots are due in part to the hail storm.

The surprising thing was the high yield with relatively low stand counts for the Gnome variety. Gnome is a semi-dwarf and was selected to do best with high soil fertility, dense stands and narrow rows.

Both Gnome and Corsoy yielded more than the branching thin line Wells.

From the yield data, 20 inch rows appeared to do the best, but caution should be used here because some of this apparent yield increase could be due to variations in plant populations.

It will be interesting to see if a semi-dwarf variety can compete with established tall varieties in this ear, and to determine the conditions where it will give its best performance.

BROADCAST VS DRILLING

SEED FOR OATS

B. Lawrensen, F. Shubeck and D. DuBois

SOUTHEAST FARM 81-11

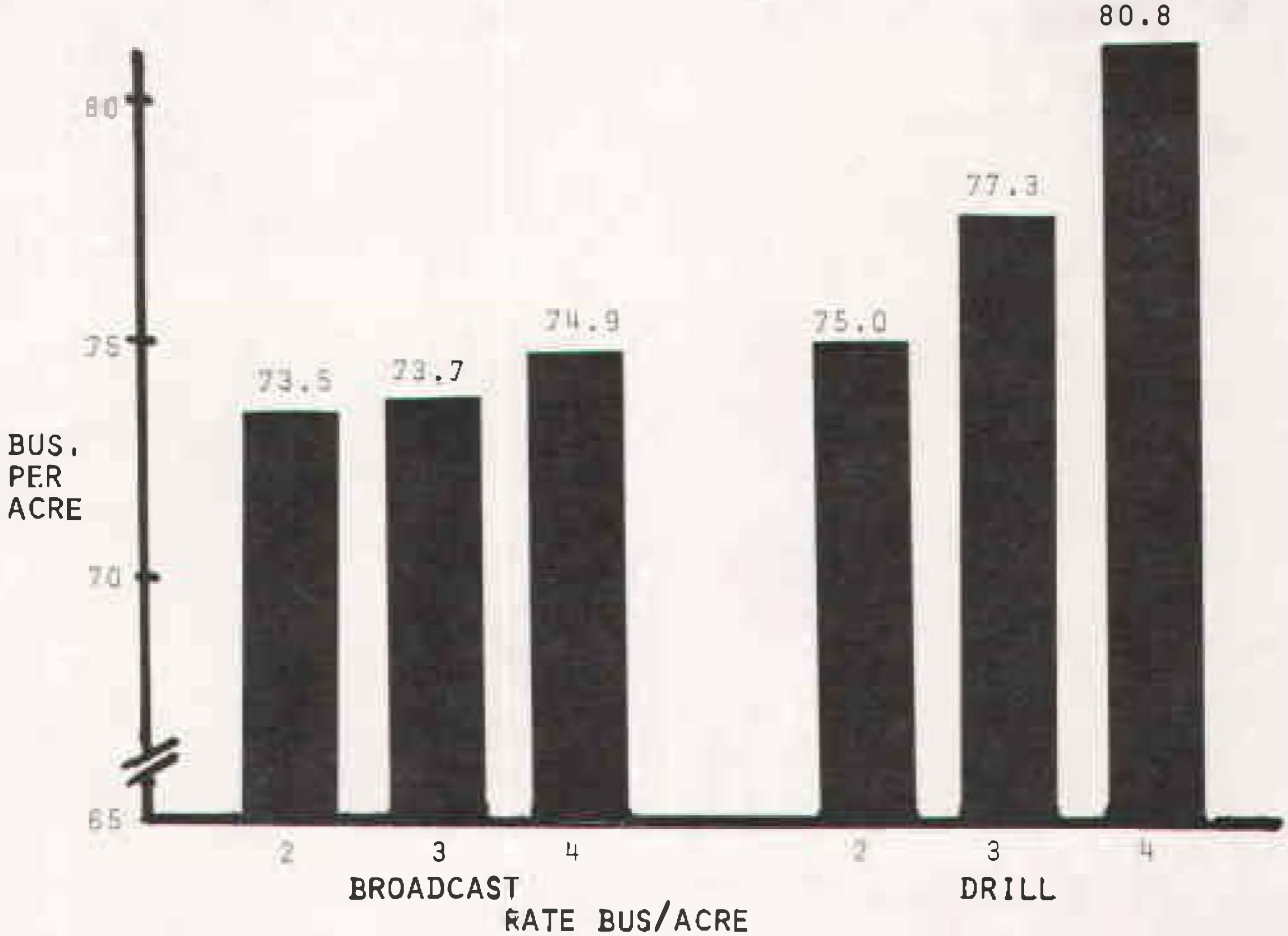
Objectives of Experiment

1. Will seeding oats with a press drill be better than broadcasting seed at a little higher rate than the drill method?
2. Will there be much difference in stands and tilling between the two methods if seeding rates are similar?

Methods and Procedures

March 20, 1981	- Tandem disked cornstalks
April 3, 1981	- Applied 30 + 15 + 0 (oxide) on both drill and broadcast plots. Seed was broadcast on designated plots then entire area was disked and spike-tooth harrowed. Then drilled plots were seeded.
May 19, 1981	- Sprayed plots with Brominal + at one pint per acre.
July 7, 1981	- Combined all plots

FIGURE 4. EFFECT OF SEEDING METHODS AND RATES ON OATS YIELD



Discussion and Interpretation of Figure 4

Oats yields in this experiment were very good even though the early growing season was dry.

Where seed was broadcast, there was little or no difference in yield due to planting rates.

Where seed was drilled, there was a consistent increase in yield with each increase in planting rate. This is surprising because the broadcast method was expected to be more responsive to planting rates than drilling. With broadcasting, the seed-soil contact may not be as positive or uniform as with the press drill, and higher seeding rates are sometimes used to make up this expected stand deficiency. At any rate, there were some excellent oats yields with use of the grain drill for conditions that prevailed in 1981.

DATE OF PLANTING SMALL GRAIN

F. Shubeck, B. Lawrensen, D. DuBois
G. Williamson, B. Jurgensen and R. Hanson

SOUTHEAST FARM 81-12

Objectives of Experiment

1. In a year with winter temperatures so mild that tillage can be performed in the last week of February, should oats, wheat or barley be planted the first week in March?
2. Would it be better to plant the wheat at this early date, but delay seeding of oats and barley?
3. Would it be better to wait with the seeding of all the small grain until normal seeding time, regardless of the unseasonable warm early temperatures?

Methods and Procedures

Corn silage taken off in fall, then chisel plowed.

Dates of seeding - March 6, March 12, March 19, March 26, April 2, April 10 and April 16
Before each drilling date, area was double tandem disked and spike tooth harrowed.
Varieties and seeding rates:
Noble and Nodway oats - 3.0 bu. per acre
Eureka Spring Wheat - 1.4 bu. per acre
Larker Barley - 1.7 bu. per acre

May 6, 1981 - Sprayed all plantings with Brominal + at 1 pint per acre.
July 10, 1981 - Windrowed all wheat, oats and barley, except the last planting of wheat and barley
July 13, 1981 - Windrowed remaining plots
July 14, 1981 - Combined all oats plots
July 16, 1981 - Combined all barley plots
July 23, 1981 - Combined all wheat plots

Table 29. Date of Planting Small Grain

Planting Dates	Small Grain Crops - Bu/Acre Spring Wheat	Oats	Barley
March 5	13	68	22
March 12	17	70	26
March 19	21	68	21
March 25	21	69	21
April 2	25	67	25
April 10	33	67	40
April 16	33	69	43

Discussion and Interpretation of Table 29

The latter part of February was so warm and dry that the surface soil was not frozen. Several inquiries were received regarding the planting of small grain this early. No information was available for such early planting in this area. It was decided to initiate an experiment with several dates of planting, so that if these very unusual conditions ever developed again, we would have some data on which to base recommendations.

Noble oats was planted on the first four planting dates. For the last three planting dates an earlier oat, Nodway 70 was planted. Varieties were constant for all planting dates with both wheat and barley.

The usual recommendation for date of planting spring wheat, is to plant it as soon in the spring as you can prepare the seedbed. Under normal conditions, this may be good advice, but with the abnormal warm and dry spring of 1981, it would have been planted too early for maximum production. Results from this one abnormal year indicate that it's better to plant wheat closer to the normal planting date.

Barley results were similar to those with wheat. Very early planting dates with 1981 conditions were not as successful as normal planting dates.

With oats, where the first four planting dates a mid-season oat (Noble) was used and the last three dates and early oat (Nodway 70) was used, results were somewhat different. Yields were practically the same for all planting dates. Yields of oats were not depressed quite as much as wheat and barley when planted very early. Remember that these results are only for one year. If temperatures had been more severe in the

latter part of March and the first of April, wheat may have survived better than the oats.

To sum it up - very early planting increases risks, but it may not always increase the yields.

Table 30A. Effect of Planting Date on Kernel Grade of Larker Barley

Information Compiled by: Phil Price

Date of Planting	Kernel Distribution % 7/64	6/64	5/64	PAN
March 6	27.1	46.0	22.7	4.3
March 12	28.2	50.0	19.3	2.5
March 19	25.1	51.9	19.2	3.8
March 25	36.6	43.7	16.6	3.1
April 2	35.3	44.1	17.0	3.6
April 10	19.6	45.8	27.2	7.4
April 16	18.9	47.9	27.6	5.6

Discussion and Interpretation of Table 30A

With every planting date, the percent of kernels grading 7/64" plus the percent grading 6/64" gave 66% or over plump, which is one of the malting industry's requirements for top premium.

The planting dates that gave the highest percent plump were March 25 with 80.3% and April 2 with 79.4% plump.

Percent of kernels grading 7/64" dropped off sharply when planting was delayed to April 10.

Table 30B. Effect of Small Grain Planting Date on Test Weight and Protein*

Date of Seeding	Test Weight Barley	Test Weight Oats	Test Weight Sp. Wheat	% Protein Spring Wheat
March 6	47	35	55	17.5
March 12	47	34	56	16.1
March 19	47	35	55	16.4
March 25	47	33	55	15.2
April 2	48	35	55	16.4
April 10	46	34	50	16.2
April 16	45	30	48	16.9

*Data collected by Crop Performance Testing Group, SDSU

Discussion and Interpretation of Table 30B

Test weights for barley, oats and spring wheat were neither lowered nor increased by very early planting. When planting was delayed until April 16, some decrease in test weights were observed.

Percent protein in spring wheat planted very early was as high or higher than spring wheat planted at normal dates.

OTHER CULTURAL PRACTICE EXPERIMENTS

Fred E. Shubeck

SOUTHEAST FARM 81-13

There were some additional experiments performed, but not reported because of their vulnerability to hail damage. For example, in the experiment with simulated hail damage on sunflowers, the simulated mechanical damage was performed on buds, leaves and stems, then the real hail storm came. This left the simulated damage plus the real hail damage without any undamaged plots to compare to. Some of the unreported experiments are listed below:

1. Simulated hail damage on sunflowers - In cooperation with the South Dakota Research and Development Committee under the auspices of the National Crop Insurance Association.

2. Effect on corn yield by clipping leaves of corn plants at 5 leaf stage.

3. Interseeding of soybeans in oats.

4. Saving hybrid corn seed for replanting from a two parent cross, a three parent cross and a four parent cross.

A COMPARISON OF SEVERAL
SOIL TESTING LABORATORY FERTILIZER RECOMMENDATIONS

R. Gelderman, P. Carson, P. Fixen and B. Lawrensen

PLANT SCIENCE 81-14

SDSU
S.E. FARM REPORT

Many soil test laboratory services are available to South Dakota. Although accurate figures are not available, it is estimated 20-30 percent of the soil samples taken in South Dakota are tested by commercial laboratories. Most of the remainder of the samples are tested by the state's land grant college laboratory located at South Dakota State University at Brookings. Some samples are tested by bordering state universities.

The purpose of a soil testing laboratory is to evaluate the nutrient status of a soil and provide a fertilizer reommendation to meet the nutrient needs of the crop. This recommendation must also be economical. It must be profitable to fertilize the crop.

Variations in fertilizer recommendations between laboratories have been known for some time. These variations are a concern to many. These differences may be due to at least two factors: (1) a difference in analysis results, or (2) a difference in philosophy of recommendation. In either case, the final evaluation is to be made by the plant yields and profit per acre.

The objectives of this experiment were to make comparisons of soil test recommendations from several laboratories. The effect of the recommendations on yield and fertilizer costs per acre are also to be evaluated.

Methods and Procedures

The experiment was conducted at the Southeast Experiment farm just to the east of the office building. The soil at this site was an Egan silty clay loam. Egan soils are well drained silty clay loams that formed in silty drift over glacial till. The area was in corn the year before and was spring plowed. A yield goal of 110 bushel/acre corn was set for the experiment.

A composite soil sample was taken from the area, carefully mixed, dried, divided and sent to the various labs. None of the labs, including the SDSU lab, were aware that these samples were to be used as the basis for a comparative study. The samples were divided into 0-6" and 6-24" samples to evaluate nitrate-nitrogen. All fertilizer recommended by each lab was assumed to be needed and applied. The fertilizer was broadcast and worked into the soil before planting.

Laboratories were simply labeled A, B, C, etc. Fertilizer costs were estimated averages paid by farmers in the spring of 1981. They were set on a per pound basis as follows:

Nitrogen = \$.22 per lb N

Phosphorus = \$.27 per pound P_2O_5

Potassium = \$.12 per lb K_2O

Sulfur = \$.33 per lb S

Zinc = \$.97 per lb Zn

These values were used to calculate fertilizer costs per acre, although these values did not include application costs per acre.

The treatments were arranged in a randomized complete block design with four replications. The plots were harvested by hand with ear mid-section samples taken for moisture. Ear leaf samples were taken at silking, but analyses are not complete at this time.
The variety used was Pioneer 3388. It was planted May 11, 1981.

Results

In general, the analysis results from the various labs were similar (Table 31). Recommendations varied considerably between labs (Table 32). Fertilizer cost varied from a low of \$15.30/acre to a high of \$48.46/acre.

Yields were excellent and surpassed the 110 yield goal. No significant yield differences were found between treatments. The yield for the check treatment was approximately midway between the yield range of 137-146 bu/A.

Because no significant differences in yield were found, laboratory comparisons should be made on the basis of cost of the suggested fertilizer programs. It is apparent that none of the fertilizer nutrients recommended here increased grain yield or profits. However, fertilizer additions and their effect on yields need to be evaluated for many years. With this in mind, these plots will be continued. Individual plots will be sampled and sent to the respective laboratory for continued evaluation of fertility programs.

Table 31. Soil Tests From Experiment Site.

S. E. FARM LABORATORY COMPARISON STUDY
1981 CORN

Measurement	LABORATORY SDSU	A	B	C	D
Nitrate-N #A-2'	96	60	107	55	----
O.M.%	3.1	3.4	3.4	3.5	----
Phosphorus #/A	35	30	26	24*	32
Potassium #/A	810	580	2000	764	768
pH	7.2	6.6	6.8	6.8	6.9
Salts mmho. cm	0.8	0.35	----	0.17	----
Zinc ppm	1.53	1.3	1.3	1.60	2.0
Iron ppm	43.5	57.3	37	76.2	----
Manganese ppm	45.4	26.3	20	38.2	----
Copper ppm	2.5	1.7	1.5	2.00	----
Sulfur (So_4) ppm	88+	12	10	8.2	9
Boron ppm	----	15	1.6	0.88	----
Magnesium ppm	879	880	574	638	----
Calcium ppm	3384	3200	2240	2645	----
Sodium ppm	----	30	----	68	----
CEC meq/100g	----	24.1	18.5	20	----

*Mechlich test

Table 32. Suggested Fertilizer Recommendations for 110 bu/A Corn

Fertilizer	Pounds of Fertilizer Recommended by Laboratory SDSU	A	B	C	D
Nitrogen lb/A	45	90	100	102	110
Phosphorus lb/A P_2O_5	20	60	75	43	45
Potassium lb/A K_2O	0	30	0	0	0
Sulfur lb/A	0	10	10	0	0
Zinc lb/A	0	0	3	0	0
Fert. Cost/A	$15.30	$48.30	$48.46	$34.05	$36.35

Table 33. Yields in Bushels of Corn Produced Per Acre.

Laboratory	SDSU	A	B	C	D	CHECK (no fert. appl.)
Yield bu/A*	137	146	145	139	141	141

*Yields were not significantly different at the .05 level.

EFFECT OF DEGREE OF TILLAGE

ON NEED FOR ADDED PHOSPHORUS

P. Fixen, R. Gelderman, F. Shubeck, B. Lawrensen,
P. Carson, R. Nettleton, R. Narem and R. Assmus

PLANT SCIENCE 81-15

Early growth of corn on fallow land has often been observed to be slow. Corn plants frequently exhibit purple color associated with phosphorus deficiency. It has been known for many years that application of phosphorus fertilizer at planting time with a planter equipped with a fertilizer attachment will greatly improve the early growth of corn and will sometimes increase yield. The cause or causes of this poor early growth after fallow are not clearly understood. Observations made at the Southeast Experiment Farm in 1977 indicated that degree of tillage may influence the need for added phosphorus. These plots were established in 1978 with hail destroying them in July of that year, which resulted in a partial fallow for the entire area.

The objectives of this experiment are to determine what effect the degree of tillage has on the need for added phosphorus and to determine if high yields can be obtained and maintained with limited tillage under South Dakota growing conditions.

Methods and Procedures

1. The experiment is located on an Egan silty clay loam (Udic haplustoll) northeast of the office building at the Southeast Experiment Farm. Egan soils are deep, friable, well-drained silty clay loams developed in a silty cap over glacial till. Soil samples were taken in the spring of 1981 to a depth of 4 feet, but the analyses are not yet completed. The tests on the soil samples taken from the experimental area in the spring of 1980 are reported in Table 34.

   These tests are averages of samples taken from the 0+0+0 treatment plots in each tillage treatment area. The supply of available phosphorus is at such a level that yield increases from added phosphorus are not likely when corn is grown under a normal tillage program. The potassium supply is high. A comparison of the tests made for each of the tillage treatments show that the treatments for one year did not greatly effect the soil test values.

Table 34. Soil Tests on Samples* Taken in the Spring of 1980 From the Tillage Plots.

Tillage Treatment	Depth** (inches)	NO_3-N lb/A	O.M. %	P lb/A	K lb/A	pH	Sol. Salts mmho/cm	Texture
Fallow	0-24	185	2.7	31	673	6.5	.9	Silty Clay Loam
	0-48	256						
Continuous	0-24	143	2.8	20	638	6.8	1.1	Silty Clay Loam
	0-48	238						
Corn-Oats	0-24	155	2.8	29	693	6.6	.75	Silty Clay Loam
	0-48	223						
No-Till	0-24	201	2.7	35	727	6.9	1.5	Silty Clay Loam
	0-48	289						

* The 0+0+0 treatments were the only plots sampled.
** The designation "depth" applied to the NO_3-N test only. All other tests were made on the 0-6" depth sample.

2. The methods of tillage used in the experiment are:
   (a). No tillage (Waffle Coulter).
   (b). Corn grown in a corn-oat rotation (Conventional tillage).
   (c). Continuous corn (plow, disk, plant).
   (d). Fallow-corn rotation (stubble plowed, kept black, and disked before planting).

3. Fertilizer application was the same on all plots. The total amounts of applied fertilizer are as follows:

Pounds per acre of $N+P_2O_5+K_2O$
100+ 0+20
100+10+20
100+20+20
100+30+20
100+40+20
100+60+20

   These treatments provide six rates of phosphorus application plus a constant amount of added nitrogen and potassium. Ten pounds of the nitrogen, all of the phosphorus and the potassium were applied with the fertilizer attachment on the planter at planting time. The remainder of the nitrogen fertilizer was applied as a broadcast application before planting. The oat and fallow plots were not fertilized.

4. All plots were planted on May 7, 1981, at a rate of 18,000 seeds per acre. The variety used was Pioneer 3388. Lasso II granules and Furadan were applied with the planter at recommended rates.

5. Conventional tillage is considered to be a sequence of chopping stalks and plowing in the fall (if possible) and disking and dragging before planting in the spring.

6. No till involved the use of a Waffle Coulter just ahead of the planter and no other tillage except for one cultivation for weed control.

7. Ear leaf plant samples were taken on July 23, but have not yet been analyzed.

Results and Discussion

The quantity of surface residue and the amount of the soil surface covered by residue is shown in Table 35 for each system. The corn-fallow and corn-oats systems resulted in about 200-250 lbs/A of surface residue which covered 4-5% of the surface. As expected, the no-till system resulted in much greater surface residue, about 2,500 lbs/A, and covered 24% of the surface.

One of the influences of greater surface residue is a decrease in soil temperature. The data in Table 36 show that the soil temperature in the no-till system averaged about 2°F below the conventionally tilled system. This has the potential to decrease nutrient uptake since root respiration is directly influenced by soil temperature.

Bulk density in each of the systems is reported in Table 37. In the 0-8" increment, bulk density appeared greater with no-till than with the other systems. This has been noted by many other investigators and is due to the absence of the loosening action from moldboard plowing. Compaction is removed in the plow layer each year by the other systems, but is not with no-till. The degree of compaction beneath the plow layer appeared less with no-till than in the conventional tillage systems. Less machinery traffic with the no-till system may be the cause of the reduced subsoil compaction.

Table 35. Surface Residue in Four Tillage/Cropping Systems, S.E. Farm, 1981.

	Tillage/Cropping System			
	Corn after Fallow	Corn after Oats	Cont. Corn conv.	no-till
% of soil surface covered soon after planting*	4.0	5.0	7.0	24.0
Surface residue, lbs/A 6/26/81	275	232	553	2491
Surface residue lbs/A 8/12/81	286	1247	455	2672

*Based on photographic technique.

Table 36. Soil Temperature in No-Till and Conventionally Tilled Corn at the S. E. Farm 1981

Date	Tillage* Conv.	No-Till	Date	Tillage* Conv.	No-Till
	- - - F° - - -			- - - F° - - -	
6/29	75.5	74.5	7/27	63.0	64.0
6/30	79.5	75.0	7/28	63.5	63.5
7/1	79.0	75.0	7/29	65.0	65.0
7/2	77.0	73.5	7/30	66.5	66.0
7/6	76.5	76.0	7/31	70.5	69.0
7/7	77.5	73.0	8/3	76.0	73.0
7/8	78.0	76.0	8/5	wet	74.0
7/9	77.0	74.0	8/6	76.5	74.5
7/10	80.0	77.0	8/7	71.0	72.5
7/13	84.0	79.0	8/10	70.5	69.0
7/14	84.5	81.5	8/11	73.0	71.0
7/15	77.5	77.5	8/12	76.0	73.0
7/16	75.0	75.0	8/13	rain	rain
7/17	80.5	78.5	8/14	77.5	74.0
7/20	----	75.0	8/17	67.0	67.0
7/21	74.0	71.5	8/19	72.5	69.0
7/22	74.0	73.0	8/20	73.0	70.0
7/23	74.0	72.5	8/21	76.0	74.0
7/24	72.0	72.0	8/28	68.0	67.5
			Avg.	74.3	72.6

* Temperature at 4" depth in the row at 3-4:00 p.m. in Rep 4, 100-20-20 treatment (Thermocouples 4 and 8).

Table 37. Bulk Density* in Four Tillage/Cropping Systems, S. E. Farm, 1981.

Depth inches	Tillage/Cropping System: Corn after Fallow	Corn after Oats	Cont. Corn Conv.	Cont. Corn No-Till
0-8	1.16	1.06	1.16	1.33
8-16	1.37	1.52	1.49	1.31

* Average of traffic and non-traffic rows on 7/2/81.

Soil water through the season is reported in Table 38. Generally, water contents were similar through the season, however, the conventionally tilled continuous corn tended to have slightly more water than the other three systems. This may be due to soil differences between tillage sites.

Corn growth and development is summarized in Table 39. Corn in the no-till system was slightly shorter early in the season than corn in the other systems. No major differences in tasseling dates were noted.

Grain yields and moisture are reported in Table 40 and 41. Row applied phosphorus did not influence yield or grain moisture in 1981 and only minor yield differences were noted between systems.

Table 42 summarizes grain yields over a three year period, from 1979-1981. No yield differences were found between phosphorus treatments or tillage systems during this three-year period. Lack of P response is not surprising since the soil test P level averaged 29 lbs/A which is in the high category.

Table 38. Soil Water in Four Tillage/Cropping Systems, S. E. Farm, 1981

Date	Corn after Fallow	Corn after Oats	Cont. Corn Conv.	Cont. Corn No-Till
	Inches*			
7/9	18.5	17.5	16.8	19.3
7/16	14.8	13.7	15.9	14.3
7/22	15.0	14.8	17.0	14.8
7/30	14.9	14.6	16.9	14.7
8/6	15.6	15.4	15.3	15.1
8/14	15.2	14.9	16.9	14.8
8/22	14.5	14.4	16.5	14.4
8/29	14.5	14.4	16.4	14.4
9/5	14.4	14.2	16.1	14.3
9/12	14.6	14.3	16.3	14.5
9/26	13.7	13.9	15.4	13.9
Avg.	15.1	14.7	16.3	15.0

* Total water in 6"-53" profile based on neutron probe readings. Average volumetric water contents can be calculated by dividing given numbers by 47 (Example: 15.1 ÷ 47 = 32.1%).

Table 39. Corn Growth and Development in Four Tillage/Cropping Systems, S.E. Farm, 1981.

	Corn after Fallow	Corn after Oats	Cont. Corn Conv.	Cont. Corn No-Till
Plant height, 6/16/81 inches	26	26	27	22
Plant height, 7/22/81 inches	108	94	95	90
% tasseled, 7/16/81	66	*	54	*
% tasseled, 7/22/81	89	84	81	88

* Measurements not taken.

Table 40. Influence of Row Applied P on Grain Yield in Four Tillage/Cropping Systems, S.E. Farm, 1981.

Phosphorus Applied*	Tillage/Cropping System: Corn after Fallow	Corn after Oats	Continuous Corn: Conv.	Continuous Corn: No-Till	Average
P_2O_5, lbs/A	- - - - - - - - - bu/A	- - - - - - - - -			
0	136	122	120	136	129
10	129	124	126	133	128
20	122	120	131	125	125
30	127	119	123	140	127
40	129	121	129	134	127
60	129	118	125	134	125
Average	129	121	126	134	
Avg. Pop.	17,200	16,100	16,400	17,500	
P Soil Test (lbs/A)	31	29	20	35	

* All phosphorus and 20 lbs/A of K_2O applied in 2x2 placement.

Table 41. Influence of Row Applied P on Grain Moisture in Four Tillage/Cropping Systems, S.E. Farm, 1981.

Phosphorus Applied	Tillage/Cropping System: Corn after Fallow	Corn after Oats	Continuous Corn: Conv.	Continuous Corn: No-Till	Average
P_2O_5, lbs/A	- - - - - - - - - - %	- - - - - - - - - -			
0	27	30	26	28	28
10	27	29	26	28	28
20	27	28	29	27	28
30	27	29	27	28	28
40	27	30	28	27	28
60	27	28	27	27	27
Avg.	27	29	27	28	

Table 42. Influence of Row Applied P on Grain Yield in Four Tillage/Cropping Systems, S.E. Farm, 1979-1981.

Phosphorus Applied	Tillage/Cropping System: Corn after Fallow	Corn after Oats	Continuous Corn: Conv.	Continuous Corn: No-Till	Average
P, lbs/A			-bu/A*-		
0	121	113	115	121	118
10	120	122	116	118	119
20	117	117	120	116	118
30	126	115	114	123	120
40	122	120	123	119	121
60	121	114	120	119	119
Avg.	121	117	118	119	

* Average of 1979, 1980, and 1981.

RESIDUAL POTASSIUM STUDY

R. Gelderman, P. Fixen, P. Carson and B. Lawrensen

PLANT SCIENCE 81-16

This study was initiated in 1965. No yield data has been taken since 1969. Yields were taken in 1981.

Objectives

1. To determine potassium soil test levels after ten years of continuous cropping.
2. To determine residual potassium effect on yields.

Methods and Materials

The experiment is located east of the office building on an Egan silty clay loam. Egan soils are relatively well drained silty clay loams that developed from a silty cap over glacial till.

The experimental design consisted of three separate treatments: (a) no potash (K_2O) applied, (b) 2000 lb/A K_2O applied, and (c) 60 lb/A K_2O applied. These rates were applied over a four year period starting in 1965. Treatment (b) was broadcast and treatment (c) was band applied. Each treatment was repeated eight times.

Pioneer 3364 was planted on May 7, 1981. Lasso was banded at planting time and no insecticide was applied. Corn rootworm caused a serious lodging problem at this site. Forty feet of row was harvested from each plot. Ear mid-section samples were taken for moisture determination.

Results

Average yield of corn for 1981 is shown in Table 43. In addition, the mean potassium soil test levels are shown in Table 43. The yield difference due to potassium treatments were not significant. Soil test levels increased with addition of added potash as would be expected.

In summary, it appears added potassium after ten years of cropping had no effect on corn yields. This would be expected since the potassium level (606) is considered high.

Table 43. Corn Yields and Soil Test Levels of the Residual Potassium Experiment, S. E. Farm, 1981.

Treatment lb K_2O/A	Yield*** 1981 bu/A	Soil Test 1979 lb/A K	Yield 1965-1969(Ave) bu/A
0	115	606	105
2000*	117	860	98
60**	114	725	106

* Broadcast 500#/A for 4 years.
** Band applied 15#/A for 4 years.
***Yields were not significantly different due to treatment. Plots were begun in 1965.

EFFECTS OF APPLIED NITROGEN ON NITRATE ACCUMULATION IN THE SOIL PROFILE

P. Fixen, R. Gelderman, F. Shubeck, B. Lawrensen,
P. Carson, R. Nettleton, R. Narem and R. Assmus

PLANT SCIENCE 81-17

Objectives

1. Study and record the effects of rates of nitrogen addition on the accumulation and movement of NO_3-N in the soil profile.
2. Determine the effect of large amounts of nitrogen fertilizer on the pH of the soil.
3. Measure the effects of the treatments on the nitrogen concentration in the leaves.
4. Determine effects of the treatments on nitrogen concentration in the entire plant at maturity.

Materials and Methods

1. This experiment is located on a Viborg silty clay loam on the southeast corner of the Southeast Experiment Farm. Viborg soils are deep, friable, moderately well-drained, silty clay loam soils developed in a silty cap over glacial till. The water table fluctuates from 3-7 feet in this area.
2. Two experiments are involved in this study, one involving a number of low rate N applications and the other a sequence of high N applications. The experiments are adjacent and related. The high rate experiment began in 1969. The low rate experiment began in 1975.
3. Soil samples in the heavy rates of application were taken to a depth of 6 feet each year since 1969, except in 1979 when they were taken to a depth of 4 feet because of wet soil conditions. The NO_3-N is reported to a depth of 4 feet in 1980. The samples are only being taken to a depth of 4 feet in the low rate experiment.
4. The samples were dried as soon as possible after taking, in a forced air oven at a temperature not to exceed 115° f.
5. Nitrate-nitrogen was determined by the n-phenol-di-sulphonic acid method until 1973. Since then the nitrate electrode method has been used.

6. The longer duration experiment with high rates of nitrogen is in its thirteenth year. The nitrogen fertilizer used has been ammonium nitrate. The additions of P_2O_5 (25 lbs/A) and K_2O (70 lbs/A) have remained constant on both experiments. All plots except the 0+0+0 treatment have received the same amounts of P and K.
7. Leaf samples were taken for analysis when the corn was in the early silk stage of growth. The leaf opposite and below the ear was taken for the samples. Leaves were dried in a forced air oven, ground, and nitrogen content determined by the Kjeldahl method.
8. Grain and silage yields were not determined in 1980 due to a late hail storm. In 1981, silage and grain yields were measured and a sample of silage was taken from each plot for moisture and nitrogen determinations.

Results and Discussion

The influence of applied nitrogen on soil nitrate levels in the spring of 1980 after fertilization and in the fall of 1980 after the growing season is reported in Tables 44 and 45. The treatments shown in Table 44 have been applied for 12 years, while those in Table 45 have been applied for only 5 years. Therefore, the 80 lb/A treatment in Table 45 has resulted in much lower soil nitrates than the 80 lb/A treatment in Table 44.

Figure 5 shows the change in total nitrate in the 0-4 ft. profile over the cropping season (S80-F80). This change may reflect differences in nitrogen uptake by the corn crop between treatments. Although the experiment was hailed out, the nitrogen taken up by the crop prior to the storm would not yet have been completely returned to the soil nitrate reservoir.

Apparently, uptake increased until the 300-500 lbs/A range was reached, after which a decrease is indicated. This may have been caused by nutrient imbalance in the plant that resulted in less growth. Of course, this is speculation since no yield determinations were made. It will be pointed out later, however, that a yield depression did occur at high nitrate levels in 1981.

Figure 6 depicts the nitrate distribution for the high rates study in the fall of 1980. The highest nitrate levels are found between 24 and 30"; however, the 240 lb. rate has significantly increased nitrate levels to a depth of at least six feet. The relative decrease in nitrate levels in the 12-18" zone likely reflect crop uptake since greatest removal probably occurred in this zone.

Grain yield and silage yield response is shown in Table 46. The grain yield response is also depicted in Figure 7. This graph shows that approximately 150 lbs/A of total nitrogen (NO_3-N + fertilizer N) was adequate at this location in 1981 and resulted in about 110 bu/A. This agrees with our current recommendations for corn which also indicate 149 lbs of N for a yield goal of 110 bu/A.

There also appeared to be a yield depression at the highest nitrogen rates. Plant analysis may clarify this effect, but they are not completed at this time.

Table 44. The Influence of Applied Nitrogen Over a 12 Year Period on the Amount of Nitrate Present in the Soil Profile in the Spring and Fall of 1980 (High Rates).

	N Applied Annually, lbs/A**									
	0		80		160		240		Average	
Increment	S	F*	S	F	S	F	S	F	S	F
Inches	NO_3-N, lbs/A									
0-6	21	19	104	38	166	87	157	114	112	65
6-12	11	8	23	31	70	75	77	75	45	47
12-18	4	5	22	19	74	70	55	68	39	41
18-24	4	5	31	16	96	96	91	104	56	55
24-30	4	5	44	28	102	107	96	157	62	74
30-36	5	6	44	30	105	91	105	124	65	63
36-42	8	6	36	29	97	74	150	103	73	53
42-48	9	7	34	26	90	65	139	94	68	48
48-54	19	8	28	24	72	47	79	86	50	41
54-60	22	9	28	21	57	32	66	66	43	32
60-66	22	10	23	18	40	24	46	53	33	26
66-72	15	8	20	14	30	17	36	38	25	19
0-24	40	37	180	104	406	328	380	361	252	208
0-48	66	61	338	217	800	665	870	839	519	446
0-72	144	96	437	294	999	785	1097	1082	669	564

*S = Sampled in Spring (May); F = Sampled in Fall (November).

** Treatments have been applied for the past 12 years (1968-1980).

Table 45. The Influence of Applied Nitrogen over a 5 Year Period on the amount of Nitrate Present in the Soil Profile in the Spring and Fall of 1980 (Low Rates).

Depth Increment	N Applied Annually, lbs/A** 0		20		40		60		80		Average	
	S	F*	S	F	S	F	S	F	S	F	S	F
inches	NO_3-N, lbs/A											
0-6	13	16	32	14	59	20	72	23	86	34	52	27
6-12	9	9	15	8	20	12	21	17	26	28	18	19
12-18	5	5	6	5	7	7	9	9	9	16	7	11
18-24	4	4	4	4	5	5	7	6	9	9	6	7
24-30	4	4	4	4	5	4	8	6	11	6	6	5
30-36	4	3	4	3	4	4	8	8	12	6	6	5
36-42	4	3	44	4	5	4	12	9	11	7	7	7
42-48	4	4	4	5	6	5	15	8	10	7	8	7
0-24	31	34	57	31	91	44	109	55	130	87	83	63
0-48	47	48	73	47	111	61	152	86	174	113	110	89

* S = Sampled in Spring (May); F = Sampled in Fall (November)
** Treatments have been applied for the past 5 years (1975-1980).

Table 46. The Influence of Applied Nitrogen and Residual Nitrate on Yield of Corn Grain and Silage, Southeast Experiment Farm, 1981.

Nitrogen Treatment[1/]		Soil NO_3-N[2/] 0-2 ft.	0-4 ft.	Grain[3/]	Silage[4/]
		- - - - - - - - - -lbs/A - - - --- -		bu/A	T/A
1	0	34	48	76.9	14.9
2	20	31	47	86.3	15.2
3	40	44	61	102	17.8
4	60	55	86	109	16.1
5	80	87	113	113	16.3
6	80	104	217	105	18.2
7	160	328	665	100	17.1
8	240	361	839	95	16.3

1/ Treatments 1-5 were applied from 1975-1981. Treatments 6-8 were applied from 1968-1981.
2/ Samples taken November, 1980.
3/ At 15.5% moisture, May 6 planting date.
4/ At 60% moisture, May 6 planting date.

FIGURE 5. NET CHANGE IN SOIL NITRATE TO FOUR FEET BETWEEN SPRING OF 1980 AND FALL OF 1980.

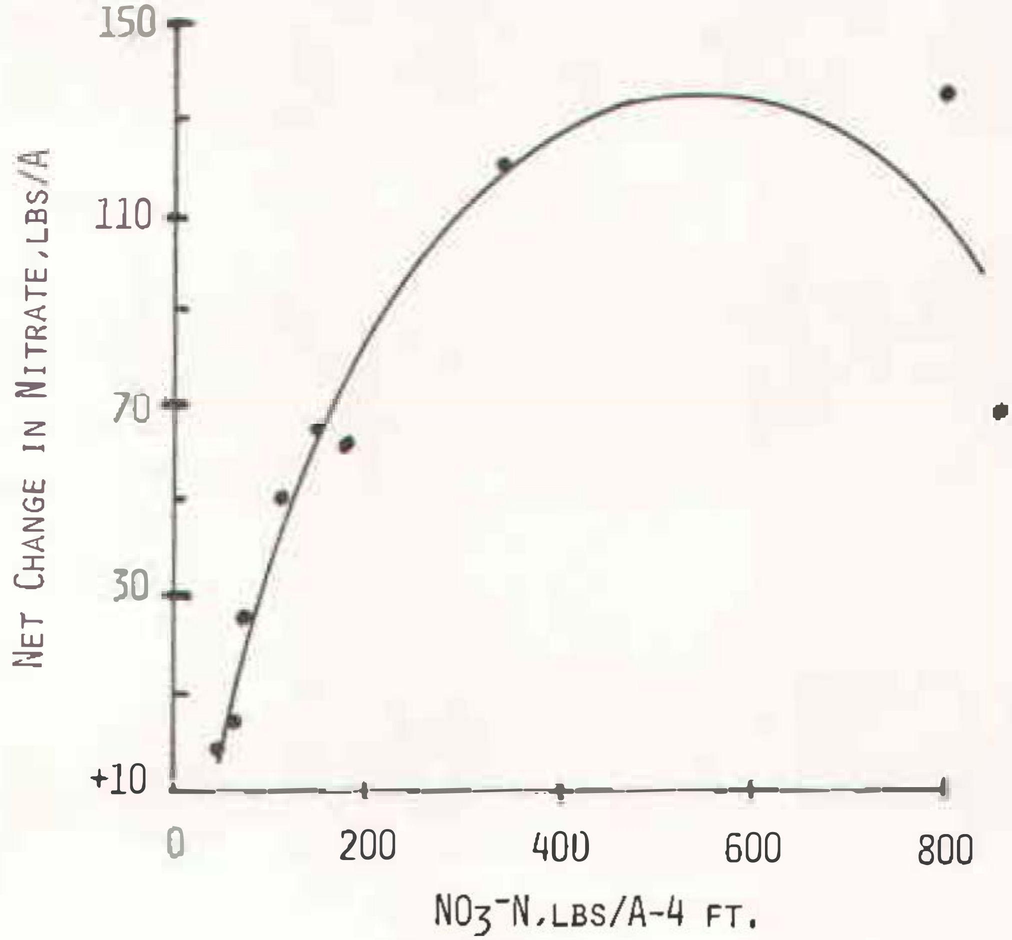


FIGURE 6. INFLUENCE OF APPLIED N ON NITRATE DISTRIBUTION IN THE SOIL PROFILE AFTER 12 YEARS, SOUTHEAST EXPERIMENT FARM, 1980.

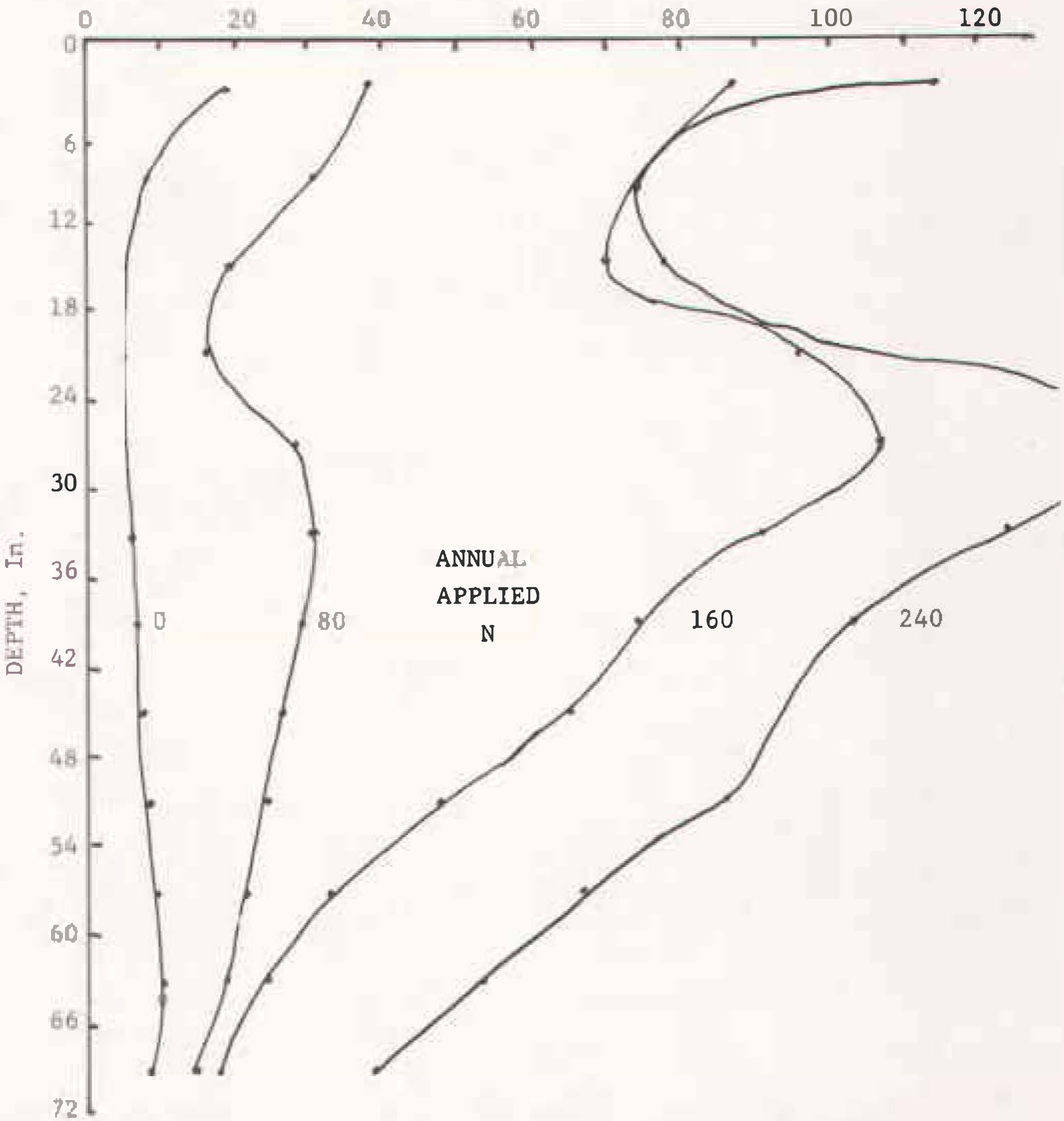
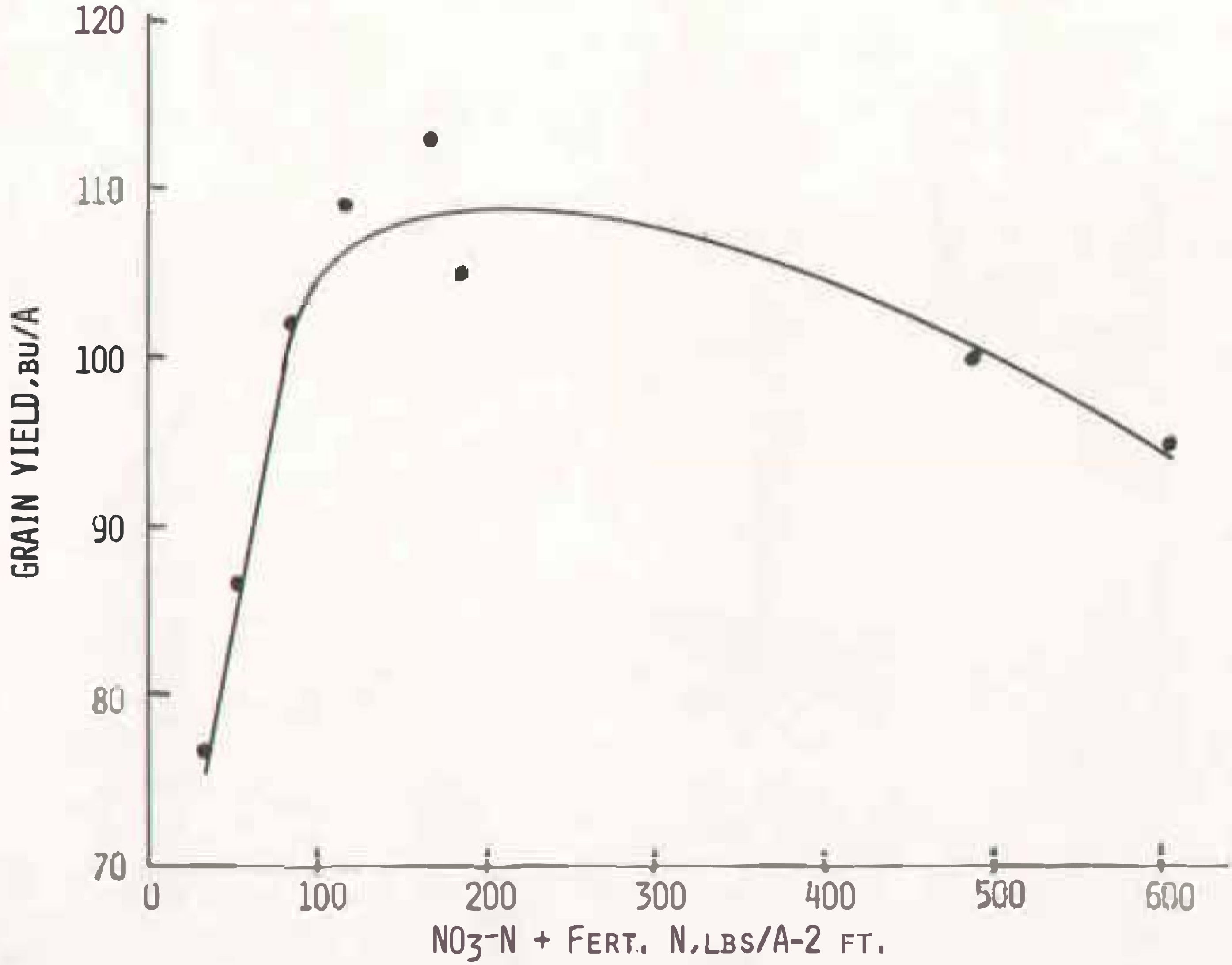


FIGURE 7. YIELD RESPONSE TO NITROGEN AT S. E. EXPERIMENT FARM, 1981 (0-24 FT.)



RESIDUAL PHOSPHORUS - GRAIN SORGHUM YIELD RESPONSE

S.E. FARM REPORT

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PLANT SCIENCE 81-18

Objectives

1. Determine the effect of residual fertilizer phosphorus on sorghum yields.
2. To monitor changes in the P soil test as phosphorus is removed through crop yields.

Materials and Methods

1. The experiment is located on an Egan silty clay loam (Udic haplustoll) south of the office building at the Southeast Experiment Farm. Egan soils are deep, friable, well drained silty clay loams developed in a silty cap over glacial till.
2. This experiment was established in 1964 to study the effect of various rates of phosphorus (P) fertilizer on the yield of corn. From 1964-1967 five rates of P (0, 10, 20, 40, and 160 lbs per acre) were broadcast and plowed down annually. Each of the phosphorus treatments was divided into thirds, with one-third receiving about 10 lbs of P as a starter fertilizer from 1964 through 1967, one-third receiving 10 lbs of 2N per acre in 1964 and 1965 plus 10 lbs of P as a starter, and one-third receiving no additional fertilizer. In the spring of 1978 an additional 13 lbs of P was applied to the plots which received zinc in the 1960's.
3. This land has been in various crops since 1967, such as soybeans, sorghum, oats, and alfalfa. The soil on the experimental area was sampled in the spring of 1973, after the first cutting of alfalfa in 1977, and in the spring of 1980. The results of these tests for available phosphorus are listed in the accompanying Table 47.
4. After having been planted to alfalfa since 1973, the plots were plowed in the spring of 1978, and were planted to corn in 1979 and 1980. Multiple hail storms in 1980 prevented yield determinations that year.
5. The study was planted to grain sorghum on May 29, 1981, variety Cenex 310T. Bexton 20G and Furadan 10G were banded at planting for weed and greenbug suppression, respectively. Nitrogen was applied at 100 lbs/A.

Results and Discussion

Soil test P levels from 1973 to 1980 are reported in Table 46. Where no P was applied from 1964-1967 virtually no soil test draw-down of phosphorus occurred between 1973 and 1980. This demonstrates the tremendous buffering ability soils have for available phosphorus at low soil test levels. As soil test level increases in Table 46 (increasing rates of added P 1964-1967), the amount of draw-down that occurred between 1973 and 1980 increases. At the 320 lb rate, soil P decreased 28 lbs in the surface 4 inches from 1973 to 1977 and an additional 25 lbs/A from 1977 to 1980.

Excellent sorghum yields were harvested in 1981 (Table 47). Good response to soil test P also occurred for both grain and silage yields up to a soil test level of 39 lbs/A based on the 1980 soil analysis. No additional response occurred as soil P increased from 39 to 73 lbs/A. This is very interesting since no yield response occurred in 1979 for corn when 130 bu/A was produced. This study will likely be planted back to corn in 1982 to re-evaluate the P response.

Table 47. Effect of Past Phosphorus Fertilizer Additions on Sorghum Grain and Silage Yields at the Southeast Farm, 1981.

Treatment[1/]	Test P[2/]	Silage Yield				Grain Yield[4/]			
P,lbs/A		A[3/]	B	C	Avg.	A[3/]	B	C	Avg.
0	13	4.2	4.0	4.1	4.1	95	97	97	96
40	20	4.4	4.7	4.8	4.7	106	108	96	103
80	22	5.0	4.8	5.4	5.1	103	110	114	109
160	39	5.2	5.3	5.7	5.4	118	122	121	120
320	73	5.4	5.6	5.7	5.5	112	125	127	121
Avg.		4.8	4.9	5.1		107	112	111	

1/ Total amount added over a four year period (1964-1967).

2/ Bray 1 extractable P averaged over subplots (0-4") in Spring of 1980.

3/ Subplot treatments: A = no additional P or Zn.
B = 10 lbs of starter P (1964-1967).
C = 10 lbs/A Zn plus 10 lbs/A P in 1964 and 1965; 13 lbs A of broadcast P in 1978.

4/ 7.5% water.

Table 48. The Effect of Past Phosphorus Fertilizer Additions on Available Soil Phosphorus at the Southeast Experimental Farm, 1973-1980.

Plot[1]	Total Fertilizer Applied, lbs P/A[2] 0			40			80			160			320		
	1973	1977	1980	1973	1977	1980	1973	1977	1980	1973	1977	1980	1973	1977	1980
	lbs/A[3]														
	0-4"														
A	12	9	14	27	22	20	40	32	21	60	46	35	121	102	82
B	15	12	12	36	31	22	45	34	22	71	52	44	131	97	66
C	10	10	12	35	22	17	38	27	24	59	49	39	125	95	72
Ave.	12	10	13	29	25	20	41	31	22	63	49	39	126	98	73
	4-8"														
A	9	7	12	22	14	18	35	19	16	57	36	33	122	84	76
B	12	7	11	36	13	19	42	20	20	77	42	40	134	88	59
C	9	5	10	22	13	16	37	16	22	57	32	38	127	85	65
Ave.	10	6	11	27	13	18	38	18	19	64	37	37	128	86	67
	8-12"														
A	4	4	5	13	8	9	13	7	14	32	9	14	39	13	22
B	7	5	6	18	9	9	14	8	8	26	11	15	44	14	16
C	5	4	6	13	7	8	16	6	9	23	10	13	37	13	14
Ave.	5	4	5	15	8	8	14	7	10	27	10	14	40	13	17

1/ A = No additional P or Zn
B = 10 lbs/A of starter P (1964-1967)
C - 10 lbs/A Zn plus 10 lbs/A of P in 1964 and 1965; 13 lbs/A of broadcast P in 1978

2/ Total amount added over a four year period (1964-1967)

3/ Bray 1 extractable P (1:7 in 73 and 77 and 1:10 in 80)

EFFECT OF RATE OF NITROGEN ON YIELD OF FORAGE SORGHUM

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S.E. FARM REPORT

PLANT SCIENCE 81-19

Objectives

1. Determine effect of added nitrogen on forage sorghum yield and nitrogen uptake.
2. Determine if yield of forage sorghum can be related to soil nitrate level.

Methods and Materials

1. The experiment was established on the east edge of the south quarter of the Southeast Experiment Farm on an Egan silty loam. Egan soils are moderately well drained silty clay loams developed in a silty cap over glacial till. The soil tests on the site before the experiment was established are as follows:

NO_3-N lb/A-2'	O.M. %	P lb/A	K lb/A
51(lo-med)	3.0 (med)	14(lo)	950(hi)

2. The site had been in switchgrass for the past ten years and was plowed in early spring of 1981. Thirty pounds per acre of phosphorus (P_2O_5) was broadcast and worked into the soil with the nitrogen treatments to eliminate phosphorus as a limiting factor.
3. The experiment consisted of 6 rates of nitrogen: 0, 30, 60, 90, 120, and 150 lb N/A. These treatments were repeated four times in a randomized complete block design. Ammonium nitrate was used as the nitrogen source.
4. Planting date was June 17, 1981. The variety used was Pioneer 956. Lasso was applied two weeks before planting for weed control.
5. Yield samples were taken September 15, 1981. The harvested material was weighed in the field and a subsample taken for moisture and protein determination. Whole plant samples were taken on July 24, when plants were approximately 30" tall. These will be analyzed for nitrogen content.

Results

Yields of 60% moisture silage are shown in Table 49. Yields were excellent; although, no significant yield difference due to nitrogen is seen. No nitrogen deficiency was noted during the growing season. It appears that soil nitrogen was adequate to meet the crops nitrogen demand. The low initial soil nitrate-nitrogen level would have led us to believe otherwise. It should be kept in mind that this site was in grass production for 10 years prior. Often after grass is plowed, an inordinate amount of organic nitrogen is converted to available nitrogen during the first few years. This may be the reason why there was no nitrogen response here. The plots will be established in the same location next year to continue to monitor nitrogen release by this soil.

Table 49. Forage Sorghum Silage Yields, 1981.

Rate lb/A N	Yield* lb/A (60% moisture)
0	24,360
30	26,008
60	24,222
90	24,287
120	27,249
150	24,548

* Yields due to treatment were not significantly different at the 0.05 level.

1981 PERFORMANCE TRIALS OF CORN, GRAIN SORGHUM, SOYBEANS AND SMALL GRAINS AT THE SOUTHEAST EXPERIMENT FARM

J. J. BONNEMANN AND G. W. ERION

PLANT SCIENCE 81-20

S.E. FARM REPORT

Performance trials with corn, grain sorghum, soybeans and small grains (oats, barley, spring wheat and durum) were seeded at the Southeast Experiment Farm for 1981 harvest.

The small grain trials were seeded on April 7, 1981. Conditions were favorable for good spring wheat yields as the average for all 1981 yields was 44.3 B/A. Oat yields were not exceptional in 1981, the average being 76.6 B/A. Barley yields were good in 1981, the average of all entries being 60.7 B/A. Durum wheat was seeded for the first time in recent years and the yields averaged 40.2 B/A. No durum varieties yielded significantly better than another. Test weights were average or better for the barley and oats but down for spring wheat and durum. The data included in this report are bushels per acre, test weight and available several-year averages. Results are found in Tables 50, 51, 52 and 53.

The corn trials included 82 proprietary hybrids at the Southeast Farm. The corn was seeded in paired rows 18 feet long, 36 inches apart on May 14, 1981. Two seeding rates were used with final counts being 15,685 and 19,525 plants per acre at final stand count in late August. No statistical differences were found for either population being better than the other. The yield reported is the average of all 4 replications harvested. Harvest was with an Almac small-plot combine on November 5 and 6.

The corn trial mean yield was 127.3 B/A of No. 2 shelled corn. The dry, warm September permitted all plants to fully develop. A killing frost did not occur until late October and moisture at harvest averaged 19.4 percent. Stalk breakage averaged only about 5%, which was rather good considering the strong winds that blew for several days at a time in mid-October.

Additional information will be found in the upcoming circular, 1981 Corn Performance Trials. The trial results are presented in Table 54.

Two soybean trial sites were located in Southeastern South Dakota that included entries from USDA and State breeders. These determine potential for new public releases. The trials included are the Group II and Group III Northern Uniform and Northern Uniform Preliminary Tests at Centerville and Elk Point. Standard public varieties and proprietary entries are grown at three

locations in the area; Ellis, Centerville and Elk Point. The proprietary entries, varieties or blends, are the choice of the participating companies and a nominal fee is charged to partially offset trial costs.

The soybean trials were seeded on May 21 at Ellis and Centerville and May 22 at Elk Point. Harvest was with an Almac small-plot combine on October 8 at Centerville, October 9 at Elk Point and because of wet conditions harvest was delayed until October 28 at Ellis. Two rows, 16 feet long in 30-inch spacings were harvested from four replications.

Yields were good to excellent for adapted entries at all sites. The absence of a hard killing frost until late October permitted the later maturity group varieties in all trials to produce good yields of fair quality. Lack of moisture and a trace of hail did affect seed size at Centerville.

The trial at Ellis averaged 55.6 B/A with the range going from 61.7 to 44.5 B/A. The mean yield at Centerville was 40.5 B/A; the range going from 35.0 up to 47.2 B/A. The mid-summer touch of hail may have caused some yield loss. Yields at Elk Point were also good, ranging from 42.7 to 59.8 B/A.

Many public and proprietary varieties yield very well. The trial at Ellis is a newly established site and an average over a period of years is not available. Group II soybeans are generally most adapted to the SE Farm and several varieties have 2-year yields of 45 B/A or better. Some late maturing II's and III's have higher yields but these results must be tempered with the fact the fall weather has been mild the last few years and plant-killing temperatures did not occur in mid-September. The warm fall weather favored the full season varieties at Elk Point. However, over the period of years, the Group II varieties have a comparable yield record, and the advantage of usually maturing before killing frost in most years. Several semi-dwarf lines were included at Elk Point, and they produced satisfactory yields. Semi-dwarf lines were developed for use in narrow rows, 7-9 inch spacings, in areas where yields usually exceed 40 B/A.

The yields and other agronomic data from the trials are shown in Table 55, 56, and 57, for Ellis, Centerville and Elk Point, respectively. Results of all soybean performance trials are available in Plant Science Pamphlet #63, 1981 Soybean Performance Trials.

The 1981 grain sorghum trial at the Southeast Farm included 28 entries. The trial was seeded on May 22 and harvested on October 8, 1981. The row spacing was 36 inches. Recommended herbicides and insecticides were used at seeding time for weed and insect control.

Yields were excellent, ranging from 6900 down to 4685 lbs/A. The trial mean yield was 5555 lbs/A. Light frost nipped the trials twice before harvest. The cool, wet summer delayed heading, flowering and maturity so kernel moisture was still quite high when the trial was harvested. Much of the material headed 10-14 days later than usual. The dry, warmer September aided full development of most lines.

Additional information will be found in the upcoming circular, 1981 Grain Sorghum Performance Trials. The results of the 1981 Southeast Farm trial are found in Table 5[illegible].

Table 50. 1981 Standard Variety Spring Wheat Trials

Variety	Beresford* 1977	Beresford* 1979	Beresford* 1981	Beresford* 3-yr	1981 Test Weight	3-yr Test Weight
	Bushels Per Acre					
Standard/mid-tall						
Fortuna	23.3	33.6	36.3	31.1	54	57
Chris	20.0	31.1	44.4	31.8	55	57
Waldron	26.6	33.3	45.1	35.0	55	56
Alex (ND 550)			48.7		56	
Lew			37.1		54	
Butte	10.8	39.3	47.9	32.7	58	58
Eureka	24.1	34.0	40.6	32.9	53	55
Coteau	21.7	30.2	45.5	32.5	55	58
James	14.9	35.1	47.2	32.4	56	56
Pondera			43.8		55	
MPV-2			48.1		56	
MPV-3			46-7		57	
Semi-dwarfs						
Era	23.0	30.2	45.9	33.0	54	57
Olaf	26.4	32.3	44.2	34.3	55	57
Prodax	35.9	26.0	34.6	32.2	50	53
Protor	26.2	36.0	40.8	34.3	55	57
Angus	26.5	33.5	51.1	37.0	57	58
715			40.5		51	
Walera			44.4		52	
Solar		32.2	44.3		53	
711			43.3		55	
Oslo			46.6		54	
Aim		36.9	49.5		54	
906R		24.0	35.4		55	
Means			44.3		55	
LSD (.05)			3.1			
CV - %			5.0			

* 1978 and 1980 hailed out.

Table 51. 1981 Standard Variety Oat Trials

	Beresford* 1976	1979	1981	3-yr	1981	3-yr
	Bushels Per Acre				Test Weight	
Burnett	51.6	87.5	73.4	70.8	37	36
Nodaway	64.6	107.0	64.4	78.7	39	39
Chief	55.6	104.3	73.1	77.6	37	36
Otee	64.7	95.8	75.9	78.8	38	36
Dal	42.4	87.2	70.6	66.7	37	37
Noble	73.4	101.8	76.0	83.7	36	36
Lyon	40.5	98.3	85.7	74.8	35	36
Bates	62.3	103.6	86.3	84.1	36	35
Wright	51.2	93.4	72.2	72.3	38	38
Otana		94.0	89.1			
Lancer		105.6	77.8		36	
Lang	69.1	94.6	80.5	81.4	37	35
Benson		95.8	78.0		35	
Moore		104.3	86.2		37	
Marathon		90.9	76.9		32	
Larry		102.5	72.7		37	
Ogle		111.1	90.9		36	
Stout		102.6	65.0		38	
Means			76.6		37	
LSD (.05)			6.3			
CV - %			5.9			

* 1977, 1978 and 1980 lost to herbicide residual damage and hail storms

Table 52. 1981 Standard Variety Durum Wheat Trials

Variety	Beresford Bu/Acre	Test wt.
Rolette	37.1	56
Ward	38.2	57
Crosby	40.3	56
Rugby	36.4	55
Botno	41.4	55
Edmore	42.4	55
Vic	43.9	556
Cando*	42.1	53
Calvin*	40.0	54
Means	40.2	55
LSD (.05)	N.S.	
CV - %		

Table 53. 1981 Standard Variety Barley Trials

Variety	Beresford* 1977	1979	1981	3-yr	1981	3-yr
	Bushels Per Acre				Test Weight	
Firlbeck III	37.9	44.3	34.5	38.9	46	49
Larker	27.4	47.4	54.7	43.2	49	45
Primus II	26.9	35.5	48.9	37.1	50	47
Klages			26.8		45	
Glenn		41.7	52.2		46	
Morex	26.8	41.8	64.4	44.3	49	44
Clark			45.3		47	
Bumper			62.7		46	
Onda			58.2		45	
Means			50.7		47	
LSD (.05)			5.8			
CV - %			8.1			

* 1978 and 1980 hailed out.

Table 54. 1981 Corn Performance Trials, Area E, Beresford, SD

Brand and Variety	Type and Cross	Yield B/A	Pct Stalk Lodged	Percent Moisture	Performance Score Rating
PAG SX351	L 2X	151.5	1.2	21.1	1
MIGRO HP-470	L 2X	145.1	2.3	18.4	2
SOKOTA TS-75	L 2X	144.6	1.1	18.9	3
CARGILL 967	L 2X	142.7	1.2	21.1	77
WILSON 1600	M 2X	142.6	7.3	17.7	4
MC CURDY 6555	m 2X	142.1	3.4	19.3	6
MIGRO HP-44	L 2X	141.5	3.4	19.7	8
CURRY SC 1455	M 2X	141.2	2.4	18.7	5
O'S GOLD 5500A	L 2X	140.4	1.2	20.8	10
PAG SX333	L 2X	140.4	0.6	20.5	9
O'S GOLD 6882	L 2X	138.4	1.1	19.2	11
KELTGEN KS112	L 2X	138.2	4.0	18.7	12
ASGROW RX777	L 2X	138.2	8.0	19.6	16
TALL CORN SX113	M 2X	137.3	1.7	19.0	13
DE KALB XL-55A	M 2X	137.1	7.4	18.9	17
CURTIS 601	L 2X	136.5	1.8	20.7	19
NORTHRUP KING PX74	L 2X	136.1	3.4	20.0	20
CARGILL 921	M 2X	135.9	5.2	19.5	21
TROJAN T1100	L 2X	135.5	3.0	18.9	15
SOKOTA 660	M 2X	135.1	6.4	17.5	18
MC CURDY 6262	L 2X	134.7	11.2	20.4	35
DE KALB XL-67	L 2X	134.4	5.2	20.2	27
KALTENBURG KX 61	M 2X	133.9	4.0	16.6	14
WESTERN KX-70	L 2X	133.7	6.8	21.1	34
KALTENBURG KX 73	L 2X	132.7	0.0	19.3	22
FUNKS G-4435	L M2X	131.6	4.5	19.6	32
CURRY SC 1424	M 2X	131.4	3.2	17.3	23
WILSON 1600A	M 2X	131.4	6.3	18.7	30
MIGRO HP-401	M 2X	130.9	1.7	17.6	24
ACCO PAYMSTR UC2990	M 2X	130.5	4.6	16.7	25
DE KALB XL-72A	L 2X	130.4	0.0	22.4	41

Table 54. Continued

Brand and Variety	Type and Cross	Yield B/A	Pct Stalk Lodged	Percent Moisture	Performance Score Rating
MIGRO M-2022X	E 2X	129.5	3.0	18.5	28
KELTGEN KS114	L 2X	129.9	4.0	19.5	39
MC CURDY 6475	M 2X	129.8	2.9	19.7	37
MC CURDY 84	L 2X	129.7	7.5	20.3	46
KELTGEN KS115	L 2X	129.6	1.8	21.1	42
KE KALB XL-32A	M 2X	129.5	2.3	16.8	26
CENEX 2114	L 2X	129.0	0.0	18.9	31
FUNKS G-4522	L M2X	129.0	3.6	22.2	52
CURRY SC-1462	M 2X	128.8	17.0	18.1	56
CURRY SC-150	L 2X	128.8	1.2	21.1	44
ACCO PAYMSTR X94790	M 2X	128.7	22.5	17.6	29
SDAES CHECK 1	L 2X	128.4	0.0	21.0	45
CURRY SC-1422	M 2X	128.0	15.8	17.3	54
LYNKS LX4210	M 2X	127.7	2.[illegible]	17.4	33
KELTGEN KS106	L 2X	127.7	9.5	16.7	43
TROJAN T1058	M 2X	126.8	1.2	17.3	36
CURTIS 530	M 2X	126.4	5.0	18.6	48
FUNKS G-4323	M M2X	126.3	6.3	15.9	40
KALTENBURG KS 67	M 2X	126.3	0.7	17.4	38
MC CURDY 5596	M 2X	126.3	22.9	17.5	67
MC CURDY 60	L 2X	125.6	3.5	18.7	49
PAG SX249	M 2X	125.6	6.4	17.0	47
CENEX 2157	L 2X	125.3	19.0	16.9	64
CARGILL 872	M 2X	124.9	8.1	16.6	50
NORTHRUP KING PX59	M 2X	124.9	7.9	17.7	55
CARGILL 924	M 2X	124.2	5.7	20.3	62
PRIDE 4488	M 2X	124.0	6.1	16.3	51
NORTHRUP KING X6169	L 2X	123.6	5.2	16.8	53
NORTHRUP KING PX9573	L 2X	123.0	1.7	22.3	66
WILSON 1500	M 2X	122.9	11.2	16.9	60

Table 54. Continued

Brand and Variety	Type and Cross		Yield B/A	Pct Stalk Lodged	Percent Moisture	Performance Score Rating
CENEX	L	2X	121.5	6.2	17.4	59
LYNKS LX4305	L	2X	121.4	1.9	18.1	57
KELTGEN KS107	L	2X	121.2	6.8	16.6	58
PRIDE 5592	M	2X	120.8	4.1	17.6	61
GREEN ACRES 824	L	4X	119.9	11.6	22.5	75
ACCO PAYMSTR UC4660	M	2X	119.3	5.4	15.9	63
LYNKS LX4100	E	2X	119.0	4.2	16.9	65
SOKOTA TS-62A	M	2X	117.8	9.1	16.2	68
PRIDE 6678	L	2X	117.1	7.0	18.2	72
MIGRO HP-360	E	2X	116.9	4.6	17.2	69
FUNKS G-4315	M	M2X	115.6	6.4	16.0	70
SDAES CHECK 9	M	2X	115.1	7.4	16.9	73
LYNKS LX4075	E	2X	114.9	5.5	15.7	71
PAG SX397	M	2X	114.7	11.0	17.8	74
GREEN ACRES 831	L	4X	113.8	4.6	22.9	76
GREEN ACRES 835	L	4X	106.4	10.7	21.8	79
WESTERN KX-66	M	2X	105.8	3.2	20.0	78
MIGRO-HP 277	E	2X	104.2	6.0	16.3	77
WESTERN KX-52	M	2X	97.9	6.5	18.2	81
TALL CORN SX110	M	2X	97.1	3.7	18.1	80
SDAES CHECK 2	M	2X	94.7	12.1	15.4	82
Means			127.3	5.3	18.6	

LSD (.05) 18.5 C.V. - % = 10.5

Table 55. 1981 Soybean Performance Trial, Southeast Experiment Farm, Centerville, SD

Identification of Entries[1]			1981 Field Data: Maturity Date	Plant Height	100 seed wgt.	Lodging[4]	Average Yield in Bu/acre#: 1976	1977	1979	1981	1976-81	1979-81
Standard Varieties			(mo-day)	(inches)	(grams)	(1-5)						
Entry	Days to Mature[2]	Maturity Group[3]										
Hodgson 78	+ 6	I	9-8	37	14.2	1.25			49.3	37.7		43.5
Weber	+ 7	I	9-9	37	11.7	2.00			53.9	41.3		47.6
Hardin	+ 8	I	9-9	39	12.5	2.00				40.7		
Vickery	+10	II	9-14	40	11.2	2.75			46.0	39.7		42.8
Corsoy 79	+12	II	9-14	39	11.3	2.25			53.1	38.9		46.0
Harcor	+13	II	9-15	38	13.5	2.25	13.1	54.7	52.6	41.1	40.4	46.8
Wells II	+13	II	9-15	36	13.8	1.25			54.3	38.2		46.2
Nebsoy	+14	II	9-16	36	15.5	2.00			56.2	38.6		47.4
Beeson 80	+18	II	9-20	37	16.5	2.25			59.1	34.7		46.9
Amcor	+19	II	9-21	43	14.0	2.75			62.2	41.3		51.7
Sloan	+20	II	9-22	38	14.3	3.00		58.8	52.3	35.0		43.6
Century	+20	II	9-22	38	15.8	2.25			56.1	42.2		49.1
Gnome (S-D)	+21	II	9-23	27	15.0	1.00				39.9		
Pella	+24	III	9-26	41	16.9	2.50				44.7		
Will	+24	III	9-26	37	13.9	2.00			54.7	36.0		45.3
Sprite (S-D)	+25	III	9-27	30	15.8	1.00				42.7		
Hobbit (S-D)	+25	III	9-27	28	13.8	1.00				38.7		
Mead	+25	III	9-27	38	14.0	2.00				43.4		
Wayne	+26	III	9-28	42	15.5	3.00	21.1	47.9	51.1	43.2	40.8	47.1
Proprietary Entries:												
Brand	Entry	b										
Land O'Lakes	GO-44(B)	I	9-11	38	13.5	1.75				40.4		
Land O'Lakes	LL 4404	I	9-11	37	16.3	1.75				36.3		
Latham	150	I	9-11	37	14.7	1.75				41.0		
Mustang	Exp I	I	9-12	38	16.4	2.00				41.0		
McCurdy	101+ (B)	I	9-13	39	14.1	2.25				37.7		

Table 55. Continued 1981 Soybeans, Centerville, SD.

			Date	Height	wgt.	Lodging	1976	1977	1979	1981	1976-81	1979-81
Fontanelle	42X	II	9-13	41	14.8	2.50				40.7		
Mustang	M-1120	II	9-13	41	14.8	1.50				36.9		
Land O'Lakes	GO-43 (B)	I	9-14	41	13.6	2.50				38.3		
NAPB-Agripro	AP200	II	9-14	39	15.1	2.00			52.7	39.5		46.1
Fontanelle	4141	II	9-14	38	15.5	2.25				40.9		
Hy-Vigor	Butler	I	9-14	35	15.6	1.25				38.2		
Hy-Vigor	Exp 133	II	9-14	39	13.1	2.00				41.8		
Latham	300 (B)	I+	9-14	37	15.8	2.00				40.4		
Land O'Lakes	LL 4302	II	9-15	36	14.5	2.25				34.6		
McCurdy	94+ (B)	I	9-15	37	14.4	1.75				34.4		
McCurdy	102+ (B)	II	9-15	40	13.5	2.00				40.1		
Dairyland	DSR-171	I+	9-15	39	15.1	2.50				43.1		
NAPB-Agripro	18 (B)	II	9-16	40	12.5	2.00			49.9	40.6		45.2
Hy-Vigor	903 (B)	II	9-16	40	13.8	2.25			55.1	39.7		47.4
Cenex	8017	II	9-16	39	14.4	2.00				36.0		
Mustang	M-1220	II	9-16	40	15.6	1.50				36.8		
SRF	150P	I	9-17	41	14.1	2.00				37.3		
Land O'Lakes	LL 4303	II	9-17	39	17.1	1.50				42.9		
Hy-Vigor	Rowtunda	II	9-17	39	14.0	2.50			55.5	38.4		46.9
Cenex	7480	II	9-17	41	13.8	2.25				38.8		
Hy-Vigor	905 (B)	II	9-18	40	13.3	2.50			53.0	42.9		47.9
Cenex	7461 (B)	II	9-18	39	12.8	3.00				41.0		
Pride	B216	II	9-21	40	15.0	2.25	9.5	54.9	57.3	47.2	42.2	52.3
Curry	CBS-300B(B)	II	9-22	41	15.8	2.50			59.2	43.1		51.1
SRF	250	II	9-23	42	14.3	2.00				43.7		
Curry	CBS-220B(B)	II	9-23	41	15.0	2.50				45.3		
Curry	CBS-210B(B)	II	9-23	42	14.4	2.25				46.7		
Dairyland	DSR-232	II+	9-23	40	14.4	3.00				43.2		
Pfizer Genetics	CX 290	II	9-24	41	13.9	2.75				41.7		
Dairyland	DSR-207	II	9-24	39	15.4	2.25				38.4		
Fontanelle	4747	II+	9-25	41	15.6	3.00			59.8	41.6		50.7
Pride	PK 352	III	9-28	43	13.6	3.00				44.9		
Means				38	14.4	2.2				40.5		

Table 55. Continued, 1981 Soybeans, Centerville, SD.

LSD (.05) 4.9
C.V.-% 8.7

1 - Listed in order of Maturity 1981
2 - Expected relative maturity at this site compared to Swift when not exposed to a killing frost
3a- Maturity Group from USDA classification: I = early, II = mid-season III = late at Centerville
3b- Information supplied by company
4 - See footnote 4 following Elk Point data
B - blend   S-D - semi-dwarf

- 1978 and 1980 hailed out

Table 56. 1981 Soybean Performance Trial, Ed Curry, Cooperator, Elk Point, SD

Identification of Entries[1]			1981 Field Data: Maturity Date (mo-day)	Plant Height (inches)	100 Seed Wgt. (grams)	Lodging[4] (1-5)	Average Yield in Bu/acre: 1978	1979	1980	1981	1978-81	1980-81
Standard Varieties												
Entry	Days to Mature[2]	Maturity Group[3]										
Weber	+ 6	I	9-18	36	13.1	1.25				45.1		
Hodgson 78	+ 7	I	9-19	37	15.1	1.00				49.7		
Corsoy 79	+10	II	9-23	42	15.2	1.75		36.3	36.0	55.4		45.7
Vickery	+10	II	9-23	43	15.6	2.00				54.9		
Harcor	+11	II	9-24	45	15.3	2.00		44.4	37.0	54.7		45.8
Wells II	+12	II	9-25	43	17.1	1.25	51.0	39.5	34.7	53.3	44.6	44.0
Beeson 80	+13	II	9-27	42	20.3	2.00		45.1	38.8	52.3		45.5
Century	+14	II	9-27	45	17.9	1.50		42.3	37.7	53.2		45.4
Nebsoy	+14	II	9-27	39	18.7	1.00	47.3	38.5	36.8	52.0	43.6	44.4
Sloan	+14	II	9-27	37	17.9	2.25	40.5	41.9	44.0	42.7	42.3	43.3
Amcor	+14	II	9-28	44	17.5	2.00			33.8	54.4		44.1
Gnome (S-D)	+16	II	9-29	26	15.7	1.00			25.4	44.6		35.0
Will	+19	III	10-2	41	16.8	1.50		50.3	33.7	50.0		41.8
Sprite (S-D)	+21	III	10-2	32	17.3	1.00			30.7	53.3		42.0
Hobbit (S-D)	+20	III	10-2	30	16.0	1.00			36.1	51.9		44.0
Mead	+19	III	10-3	40	16.6	1.50			33.7	56.6		45.1
Wayne	+20	III	10-3	44	16.5	2.25	47.0	35.7	36.5	48.9	42.0	42.7
Pella	+20	III	10-4	44	20.4	2.00		55.6	36.9	57.0		46.9
Williams 79	+22	III	10-4	45	16.9	2.00			34.8	52.2		43.5
Cumberland	+23	III	10-4	44	17.5	2.00	46.2	45.2	32.3	50.3	43.2	41.3
Elk (S-D)	+24	III	10-4	30	15.7	1.00	46.1	46.4	31.8	42.4	41.7	37.1
Union	+27	IV	10-8	49	18.2	2.00	40.2	42.3	32.7	46.4	40.4	39.5
Proprietary Entries:												
Brand	Entry	b										
Midland	HC800 (B)	0	9-12	32	15.5	1.00				42.6		

Table 56. Continued; Soybean Trials, Elk Point

							1978	1979	1980	1981	1978-81	1980-81
Midland	HC895	I	9-17	34	15.5	1.00				39.2		
Asgrow	AI937	I	9-20	41	16.1	1.00				54.3		
NAPB-Migrwo	HP 20-20	II	9-21	39	17.1	1.00			35.8	50.8		43.3
Dairyland	DSR-171	I+	9-22	43	16.6	1.25				49.8		
Midland	HC900A (B)	II	9-22	42	15.8	1.00				49.4		
NAPB-Agripro	18 (B)	II	9-23	39	15.9	1.25			38.0	45.0		41.5
NAPB-Agripro	AP200	II	9-23	44	17.1	1.25			37.6	55.7		46.6
Hy-Vigor	Rowtunda	II	9-23	41	17.5	1.75		40.2	37.3	47.0		42.1
Kruger	K-2005	II	9-23	40	15.4	1.75				46.5		
Land O'Lakes	GO-44 (B)	I	9-24	43	15.9	1.50	48.5	41.4	34.8	50.8	43.9	42.8
Pfizer Genetics	2ER-75 (B)	II	9-24	44	17.2	1.50		41.1	35.0	51.7		43.3
Asgrow	A2575	II	9-25	43	17.6	1.25	50.6	42.0	37.7	54.0	46.1	45.8
Land O'Lakes	LL 4303	II	9-25	43	18.6	1.00				53.4		
Land O'Lakes	GO-43 (B)	I	9-25	43	17.3	1.75				55.8		
NAPB-Agripro	AP 230	II	9-25	36	18.6	1.00				52.0		
De Soy	555E (B)	II	9-25	44	15.9	1.75				53.2		
Dairyland	DSR-207	II	9-25	38	18.5	1.25				49.6		
Asgrow	A2680	II	9-26	38	16.1	2.25				52.0		
SRF	200	II	9-26	46	15.3	2.00	41.4	48.9	35.4	46.6	43.1	41.0
Pride	B220	II	9-26	44	17.1	1.25				54.3		
Land O'Lakes	LL 4302	II	9-26	45	18.6	1.50				52.3		
McCurdy	102+ (B)	II	9-26	43	16.8	1.50			37.7	55.0	46.3	
Hy-Vigor	909 (B)	III	9-26	43	18.9	1.75				52.0		
Hy-Vigor	Exp 110	II	9-26	38	16.4	1.00				43.9		
Curry	CBS-220B(B)	II	9-26	45	17.6	1.50			37.0	53.8		45.4
Kruger	K-2000	II	9-26	45	18.3	1.25				58.6		
Kruger	K-2010A	II	9-26	39	18.5	1.00				54.8		
Kruger	K-2030	II	9-26	42	17.4	1.75				49.9		
NAPB-Migro	HP2530	II	9-27	43	18.1	2.00			38.0	54.8		46.4
Curry	CBS-210B(B)	II	9-27	42	16.7	1.75				54.8		
Curry	CBS-300B(B)	II	9-27	43	18.6	1.25				55.1		
Asgrow	A2853	II	9-28	40	20.8	1.50			37.9	55.6		46.7
Kruger	KB-250(B)	II	9-28	42	17.5	1.25				55.6		
Dairyland	3617A	II	9-28	47	20.8	1.50				46.4		

Table 56. Continued; Soybean Trials, Elk Point

							1978	1979	1980	1981	1979-81	1980-81
Dairyland	DSR-227	II+	9-28	44	15.7	2.00				45.0		
SRF	250	II	9-29	42	14.5	1.00		42.3	38.3	47.1		42.7
De Soy	750 (B)	III	9-29	40	17.3	1.50				54.8		
Dairyland	DSR-232	II+	9-29	43	15.7	2.00				45.2		
NAPB-Agripro	AP250	II	9-30	47	17.3	1.75			40.0	48.3		44.1
De Soy	800 (B)	II	9-30	46	19.8	1.75				59.8		
De Soy	850 A	II	9-30	41	18.0	1.75				54.4		
Pride	PK 352 (B)	III	10-2	46	15.4	2.00				54.3		
Asgrow	A3127	III	10-3	42	15.0	1.25	43.9	51.0	42.8	54.9	48.1	48.8
De Soy	875 (B)	III	10-3	44	15.3	1.75				59.1		
McCurdy	109+	III	10-4	45	17.0	1.00			40.2	50.4		45.3
Fontanelle	5656	II+	10-4	47	18.4	2.00				54.5		
Means				41	17.0	1.55				51.4		

1 - Listed in order of 1981 maturity
2 - Expected relative maturity at this site compared to Swift when not exposed to a killing frost
3a- Maturity Group from USDA classification: I & II, early to mid-season; III - full season to late; IV late at Elk Point
3b- Information supplied by the company
4 - Lodging rating as follows:
1 = almost all plants erect
2 = all plants leaning slightly or a few plants down
3 = all plants leaning moderately (45°), or 25 to 50% of the plants down
4 = all plants leaning considerably, or 50-80% of the plants down
5 = almost all plants down

LSD (.05) 5.9
C.V. - % 8.2

(B) = Blend (S-D) = semi-dwarf

Table 57. 1981 Soybean Performance Trial, Les Winterstein, Cooperator, Ellis, SD

Identification of Entries[1]			Maturity Date	Plant Height	100 Seed wgt.	Lodging[4]	1981 Yield, B/A
Standard Varieties			(mo-day)	(inches)	(grams)	(1-5)	
Entry	Days to Mature[2]	Maturity Group[3]					
Evans	- 4	0	9-12	40	16.2	1.25	44.8
Swift	0	0	9-17	38	16.9	2.00	49.6
Hodgson 78	+ 5	I	9-22	40	17.0	2.00	53.4
Lakota	+ 6	I	9-23	45	17.0	2.75	57.8
Weber	+ 6	I	9-25	40	14.2	2.00	58.0
Hardin	+ 7	I	9-28	43	15.6	2.00	61.7
Corsoy 79	+ 9	II	9-30	47	16.0	2.25	57.1
Vickery	+ 9	II	9-30	44	15.6	2.25	56.9
Harcor	+10	II	9-30	48	15.5	2.25	56.6
Nebsoy	+10	II	9-30	40	18.0	2.00	56.5
Wells II	+10	II	10-1	43	16.5	1.75	52.9
Gnome (S-D)	+12	II	10-2	30	16.0	1.00	52.9
Sloan	+15	II	10-2	44	17.4	2.00	51.2
Amcor	+18	II	10-3	51	15.4	2.00	55.3
Century	+17	II	10-3	45	18.6	2.00	58.2
Beeson 80	+18	II	10-4	50	18.1	2.50	46.0
Will	+20	III	10-5	43	15.5	2.00	47.2

Proprietary Entries

Brand	Entry	b	Maturity Date	Plant Height	100 Seed wgt.	Lodging	1981 Yield, B/A
Hy-Vigor	Hardy	I	9-20	36	17.9	2.00	55.5
Mustang	Exp. I	I	9-21	42	17.0	1.75	56.2
Mustang	M-1120	I	9-23	41	17.4	2.00	58.4
Land O'Lakes	LL 4404	I	9-24	42	18.8	2.00	57.2
Hy-Vigor	Butler	I	9-24	39	18.7	2.00	56.4

Table 57 Continued. 1981 Soybean Performance, Ellis, SD

Dairyland	DSR-141	I	9-25	44	19.1	2.00	57.2
Dairyland	DSR-171	I	9-26	45	17.2	2.00	58.9
Hy-Vigor	E-90 (B)	II	9-27	43	17.7	2.00	54.7
Cenex	9017	II	9-28	41	17.7	2.00	59.6
Hy-Vigor	900 (B)	II	9-29	47	17.7	2.25	55.9
Land O'Lakes	GO-44 (B)	I	9-30	49	17.1	2.00	55.1
Land O'Lakes	LL 4303	II	9-30	43	18.5	2.00	58.8
Pfizer Genetics	CX 155	II	9-30	46	15.8	2.00	55.8
Hy-Vigor	Rowtunda	II	9-30	43	17.8	2.25	56.5
Cenex	7461 (B)	II	9-30	45	15.8	2.00	55.2
Northrup King	S1492	II	10-1	46	15.0	2.00	55.8
Northrup King	MV 24-59	II	10-1	42	15.6	2.00	58.9
Northrup King	S2596	II	10-1	42	18.2	2.00	59.6
Mustang	M-1220	II	10-1	45	18.2	2.00	58.8
Land O'Lakes	GO-43 (B)	I	10-2	47	17.1	2.00	58.2
Dairyland	DSR-207	II	10-2	42	18.7	2.00	55.4
Northrup King	S1474	II	10-3	45	15.1	2.00	54.9
Dairyland	DSR 232	II	10-3	49	16.7	2.00	56.4
Means				43	16.9	2.00	55.6
					LSD (.05)		4.2
					C.V. - %		5.4

1 - Listed in order of maturity in 1981
2 - Expected relative maturity at this site compared to Swift when not exposed to a killing frost
3a- Maturity Group from USDA classification:
- 0-& I = early
- II = mid-season
- III = late for Ellis

3b- Information supplied by the company
4 - See footnote following Elk Point data

(B) - blend (S-D) - semi-dwarf

Table 58. 1981 Grain Sorghum Performance Trial, Area E, Southeast Experiment Farm, Centerville, Clay County, South Dakota

Brand and Hybrid	Yield lb/A	Test Weight lb/B	Height inches	Date Headed	9/17/81 Percent Moisture
DeKalb DX-38	6900	61	51	8/1	35.0+
Warner W-655T	6620	61	51	8/4	35.0+
Migro TEX 14R	6100	62	57	8/6	35.0+
Migro TEK 1021R	6085	61	52	8/6	35.0+
Asgrow Dorado E	6035	62	49	8/1	35.0+
Northrup King Brand 2030	5945	61	43	7/28	30.7
Migro TEK 1011R	5835	61	45	8/5	35.0+
Warner W-564T	5785	61	48	8/3	35.0+
PAG Ex 91008	5765	61	47	8/6	35.0+
Western WS-212	5745	62	53	8/1	34.4
Asgrow Corral	5715	61	51	8/1	35.0+
Golden Acres T-E Y44R	5625	62	43	7/24	31.7
Warner W-545T	5540	61	39	8/2	35.0+
Cenex 224T	5535	61	38	8/4	33.7
Northrup King Brand 2222	5530	60	45	8/5	35.0+
Cenex 228T	5500	60	47	8/5	35.0+
Cenex 310T	5490	61	52	8/5	35.0+
DeKalb DK-42	5470	59	45	8/4	35.0+
Sigco 254YG	5390	60	48	8/5	35.0+
Stauffer Seeds PV535	5210	61	53	8/5	35.0+
Cargill Ex 91002	5175	61	45	8/1	28.9
Pioneer Brand 8515	5155	61	52	8/7	35.0+
PAG 354	5150	60	48	7/26	29.6
Cargill 30	4910	60	52	8/5	35.0+
Pfizer Genetics M548G	4875	62	47	8/4	29.4
Barzan Rancher 30Y	4875	62	51	8/3	35.0+
PAG 4433	4865	58	50	8/4	35.0+
Stauffer Seeds PV515GR	4685	60	36	8/3	35.0+
Means	5555	61	48	8/3	

LSD (.05) 965 C.V. - % = 10.6

SOYBEAN TILLAGE SYSTEM

EFFECTS ON WEED CONTROL

M. A. Wrucke and W. E. Arnold

S.E. FARM REPORT

PLANT SCIENCE 81-21

An experiment was established in 1972 at the Southeast South Dakota Research and Extension Center at Beresford to compare the effect of various tillage systems on weed control. A corn-soybean rotation was practiced while maintaining the same tillage practices on each plot. Plot size was 20' x 140' in a randomized complete block design with four replications. The experiment was located on a well drained silty clay loam (22.8% sand, 49.28% silt, 27.9% clay) with pH 6.5 and 3.5% organic matter. To prepare these plots for the tenth year, corn stalks were chopped on September 20, 1980 and fall tillage treatments were done. Fall herbicide treatments were also applied at this time with a one-wheel bicycle sprayer at 20 GPA and 35 PSI. Weather conditions at time of spraying were 68° F air temperature, 66° F soil temperature 50% relative humidity and moist soil conditions.

Spring tillage was done on the appropriate plots on May 29, 1981. "Hodgson 78" soybeans were planted with a fluted coulter plant at 60 lb/A in 30-inchrrows on the same day. One-hundred pounds per acre of 16-37-0 was sidedressed with the planter. All spring herbicide treatments were also applied on May 29 with a tractor mounted plot sprayer at 20 GPA and 40 PSI. Weather conditions at time of spraying were 52° F air temperature, 54° F soil temperature, 38% relative humidity, and moist soil conditions.

Weed evaluations were taken on August 6 and weed yields were determined on August 17 by taking fifteen 625 cm^2 quadrants and separating by species. Soybean yield was determined on October 23 by combining 2100 ft^2/plot and expressing yield as bu/A.

Weed yield was lowest and soybean yield highest in the plots with tillage. Control of grassy weeds was especially low in plots without tillage with smaller differences seen for control of broadleaf weeds between the tillage treatments. Also, perennial weeds such as field bindweed and common milkweed were observed in the no-till plots, but not in the tilled plots.

Table 59. Tillage Effects on Weed Control at Beresford, South Dakota.

Tillage	Herbicide	% Weed Control					Weed Yield		Soybeans	
		*Grft	Colq	Rrpw	Pesw	Cocb	Grass lb/A	Bdlf lb/A	Yield lb/A	Test lb/bu
No-Till	paraquat (0.5) + X-77 (0.5) (preplant) alachlor (2.5) + metribuzin (0.5) (pre)	26	99	97	88	94	3134	894	17.7	52.9
1 disk (fall)- 1 disk (spring)	trifluralin 5G (1.0)(fall) + metribuzin (0.50) (pre)	96	99	99	97	85	248	634	19.2	52.4
No-Till	pendimethalin (2.50) + metribuzin (0.50)(fall)	3	77	79	15	87	3053	4237	9.6	51.8
Plow-Disk-Drag	alachlor (2.50) + metribuzin (0.50) (pre)	97	98	98	92	66	86	842	17.5	51.8
Plow(fall) Plant rye- No-Till-in spring	paraquat (0.5) + X-77 (0.5%) (preplant) alachlor (2.5) (pre)	71	65	87	70	99	616	849	21.5	51.7
	LSD (0.05) =	30	17	16	20	28	1683	1453	2.8	0.8

* Grft = Green foxtail
Colq = Common lambsquarter
Rrpw = Red root pig weed
Pesw = Pennsylvania smart weed
Cocb = Cocklebur

COMMON COCKLEBUR CONTROL IN SOYBEANS

R. L. Smith and W. E. Arnold

S.E. FARM REPORT

PLANT SCIENCE 81-22

An experiment was conducted at the Southeast South Dakota Research and Extension Center at Beresford to determine the effectiveness of bentazon and acifluorfen - Na on common cocklebur. The herbicides were applied alone nd in various tank-mix combinations as post-emergence treatments.

The soil was a well-drained silty clay loam (sand 9.0%, silt 59.0%, clay 32.0%) with 2.70% organic matter and a pH of 6.2. 'Hodgson 78' soybeans were planted in 30-inch rows on May 30, 1981. Plot size was 7.5 by 25 feet with four replications. A five by five factorial arrangement of treatments was utilized in a randomized complete block design. The treatments were applied June 23 when the soybeans were in the 1- to 2-trifloiate leaf stage. Common cocklebur was in the 3- to 4- leaf stage (2- to 3-inches). Air temperature was 65° F and the relative humidity was 70% at application. Spray volume was 20 GPA at 35 PSI. Injury evaluations were made June 25. Cocklebur control evaluations were made June 25 and July 11. Cocklebur dry weight values and stand counts were obtained July 17. Soybeans were harvested October 7 from a 165 ft^2 area/plot.

The effects of bentazon were less readily apparent than the effects of acifluorfen. Acifluorfen provided the greatest amount of control in the time period shortly after application. However, these effects did not hold throughout the season and the bentazon treatments produced a higher level of control for a longer period of time. Both early, short-season control and late, long-season control enhanced yields significantly.

Table 60. Common Cocklebur Control in Soybeans

Dosage Lb/A		Cocklebur Response				Soybean Response		
acifluorfen-Na	bentazon	% Control 6-25	% Control 7-11	Dry Weight 7-17 (grams) per 1[illegible]5 cm^2	Plant Count 7-17	Yield Bu/A	Test Weight lb/Bu	% Injury 6-25
0.00	0.00	0	0	22.4	7.3	17	54.7	0
0.00	0.25	16	43	17.3	6.5	24	54.9	0
0.00	0.50	20	63	12.6	7.3	27	55.3	0
0.00	0.75	30	84	0.4	0.3	28	54.6	3
0.00	1.00	31	96	0.2	0.3	27	54.5	0
0.25	0.00	40	22	34.2	9.3	20	54.6	0
0.25	0.25	61	54	13.2	7.5	24	54.8	5
0.25	0.50	70	76	3.0	3.0	28	54.3	5
0.25	0.75	73	85	1.9	2.8	28	54.5	8
0.25	1.00	71	93	1.8	0.8	29	54.2	9
0.50	0.00	56	46	17.8	6.0	24	54.7	3
0.50	0.25	80	63	7.8	4.5	26	54.4	11
0.50	0.50	89	81	3.3	3.0	27	54.7	14
0.50	0.75	90	91	0.8	0.8	27	54.4	14
0.50	1.00	94	95	2.2	0.5	27	54.7	19
0.75	0.00	81	56	18.8	9.0	23	54.3	9
0.75	0.25	89	75	3.7	2.8	27	54.3	11
0.75	0.50	94	89	1.3	0.5	29	54.3	20
0.75	0.75	90	94	3.0	1.0	27	54.5	21
0.75	1.00	91	96	1.7	1.3	27	54.6	20
1.00	0.00	83	66	5.6	4.3	28	54.4	13
1.00	0.25	86	81	2.4	2.3	25	54.8	14
1.00	0.50	93	90	2.5	1.0	27	53.7	21
1.00	0.75	94	95	0.5	0.0	29	54.5	23
1.00	1.00	95	99	0.7	0.0	29	54.2	25
LSD (a = 0.05) =		12	17	7	3	4	0.5	5

S.E. FARM REPORT

NITROGEN SOURCE AND PLACEMENT STUDY

R. Gelderman, P. Fixen, J. Gerwing and R. Nettleton

PLANT SCIENCE 81-23

Popularity of urea as a nitrogen fertilizer continues to grow. Information concerning amounts of nitrogen, urea in particular, to be applied with a planter attachment is not well documented for the soils and climatic conditions of South Dakota. Toxicity of urea as a nitrogen source involves its chemical form. Urea nitrogen after applied to the soil, goes through the following simplified changes. Urea → ammonia → ammonium → nitrate. The ammonia form, in high amounts, can be toxic to a germinating seed.

Objectives

1. To determine the amount of nitrogen that can be applied with corn using a planter attachment.

Methods and Materials

1. The experimental site was located on the S. E. Experiment Farm east of the office building. The soil series was primarily Egan silty clay loam. Egan soils are well drained silty clay loams that formed in silty drift over glacial till. However, a large part of the "seed applied" treatments were located on Tekonka soils that have a clayey subsoil. Permeability is very slow in these soils. The area was in corn the year before and spring plowed.
2. Two experiments were established side by side to meet the objectives. In one experiment, the nitrogen fertilizer was applied "2x2" (2 inches to the side and 2 inches below the seed). The other experiment had the nitrogen applied in close proximity with the seed. Both experiments used urea and ammonium nitrate (AN) as nitrogen forms. The rates of actual nitrogen used for each experiment are given in Table 61.
3. The experimental design for each experiment was a split plot randomized complete block. The main plots were rates split between nitrogen sources. Plot size was 10 x 50 feet. Each plot contained four rows of corn.
4. Soil samples for the entire study area were taken in the spring and were as follows:

NO_3-N lb/A-2'	O.M. %	P lb/A	K lb/A	pH
96	3.1	35	810	7.2

5. No additional nitrogen (besides treatment N) was added.
Weed Control - Lasso II, banded at planting; sprayed Bladex 4L pre-emergence (May 15).
Insecticide - Furadan 10G
Variety - Pioneer 3388
Planting Date - May 7, 1981
6. Corn was harvested by hand October 12. Forty feet of row was harvested from each plot. Ear mid-section samples were taken for moisture determination.
7. Rainfall was very limited during germination. However, soil moisture was fairly good in the germination zone. The remainder of the growing season was excellent in terms of moisture and heat units. Some hail occurred on August 3, causing some damage.

Results

The yields for both experiments are shown in Table 62. It is apparent that nitrogen was limiting and there was a yield response to the added nitrogen (Figure 8). This complicates the interpretation of the yield results. However, too much nitrogen with a planter attachment usually causes germination problems. If we observe the number of plants soon after emergence (Table 63) we can see a definite trend. The high rates of nitrogen, regardless of source, had no effect on number of plants per acre when the fertilizer was applied 2x2. Seed placed urea nitrogen did reduce stand when the rate exceeded 10 lb/A nitrogen (Figure 9).

This trend also shows up clearly in the yields for the seed placed study. Note the yield differences between ammonium nitrate and urea forms when over 10 lbs N/A was applied (Table 62).

The yield differences between the two experiments (seed vs 2x2) are also quite evident. This is primarily due to the two different soil types at the experimental site. The seed placement study was located on the Tetonka series which has very slow permeability and a subsoil which can be restrictive to root growth. The 2x2 placement study was located on the more permeable Egan silty clay loam.

In summary, urea fertilizer caused stand and yield reductions on corn when over 10 lbs of urea nitrogen was applied close to the seed. No yield or stand reductions were noted with the rates used for 2 x 2 placement.

FIGURE 8. EFFECT OF RATE AND SOURCE OF NITROGEN ON CORN YIELD. S. E. FARM 1981.

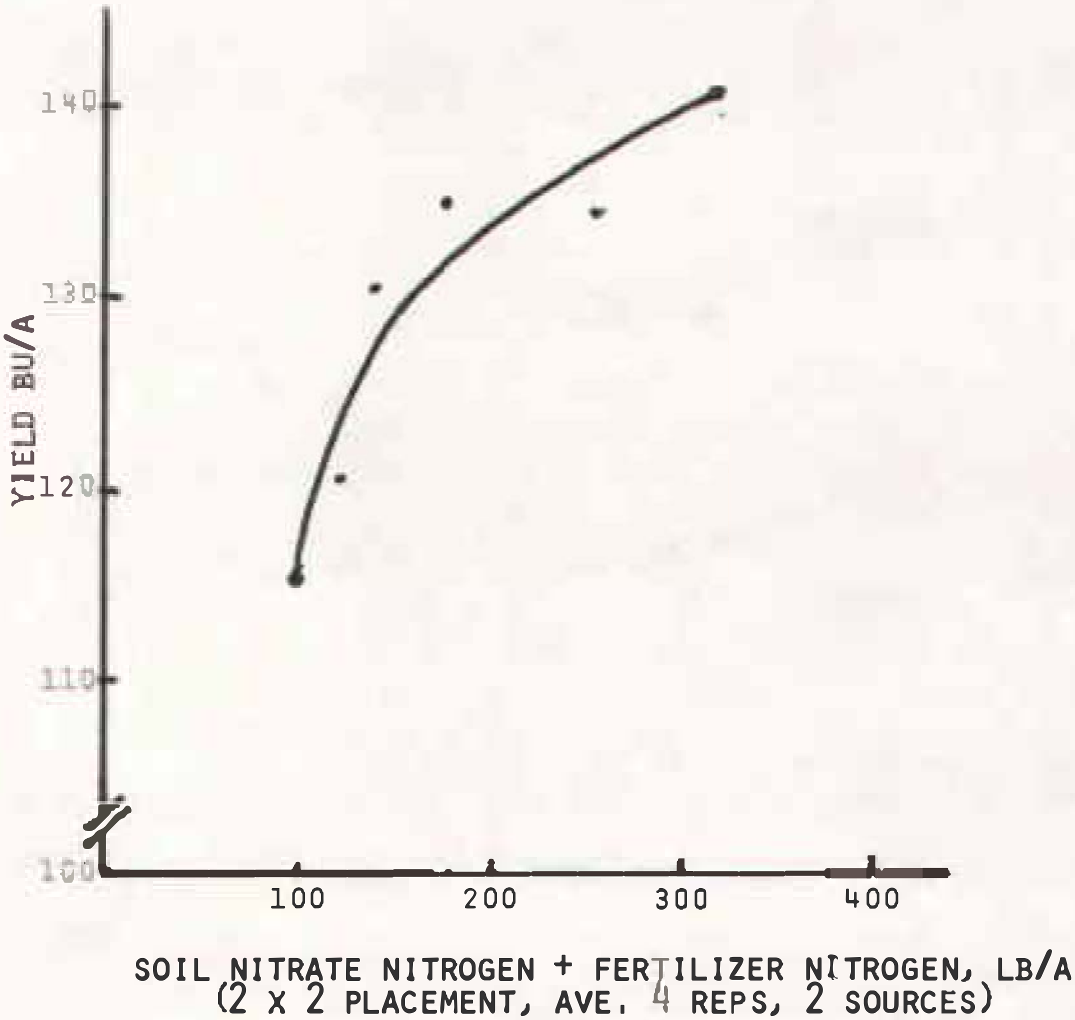

FIGURE 9. EFFECT OF ADDED UREA NITROGEN ON CORN PLANT STAND. S. E. FARM 1981

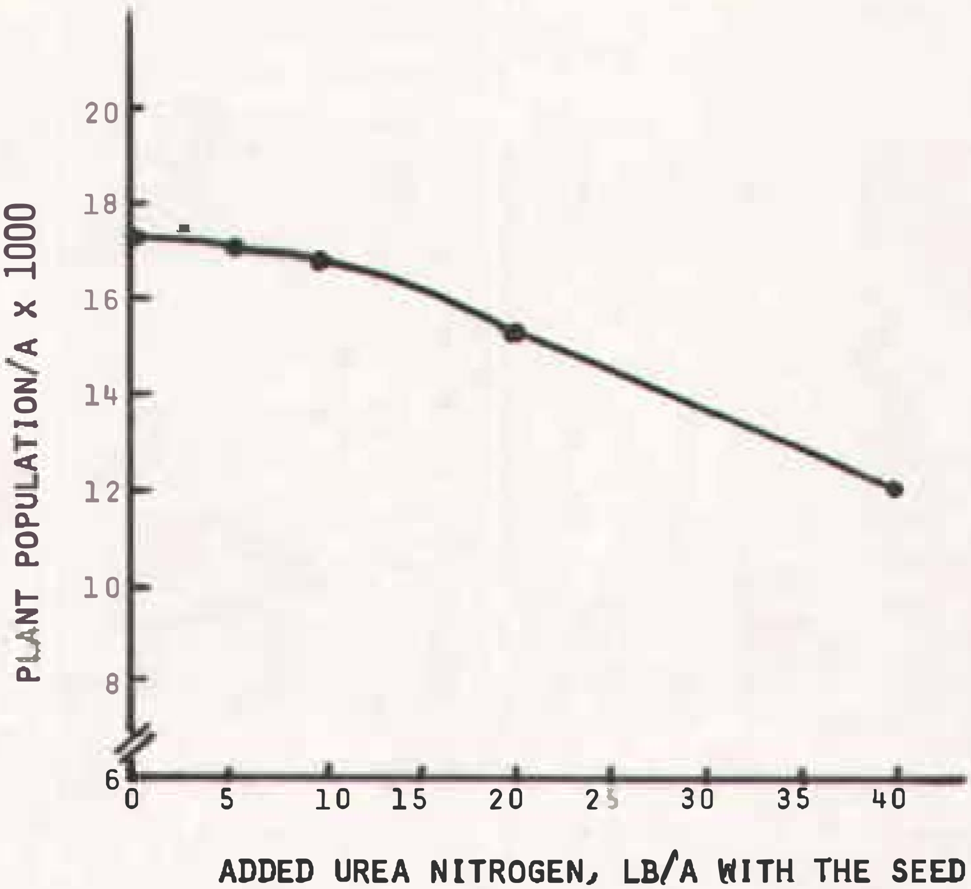

Table 61. Rates of Nitrogen Used for the Nitrogen Source and Placement Study.

Lbs. of Nitrogen Applied Per Acre	
2x2 Placement	Seed Placement
0	0
20	2.5
40	5
80	10
160	20
320	40

Table 62. Nitrogen Source and Nitrogen Placement Studies, S. E. Farm, 1981, Yield of 15% Corn.

Rate	2x2 Placement Study		Rate	Seed Placement Study	
lb/A N	AN	UREA	lb/A	AN	UREA
	bu/A 15% Corn			bu/A 15% Corn	
0	117	115	0	85	86
20	124	119	2.5	98	99
40	124	138	5	90	94
80	132	138	10	91	92
160	134	133	20	103	96
320	143	138	40	109	86
Average	129	130		96	92

Nitrate - N soil test = 98 lb/A-2'.

Table 63. Nitrogen Source and Placement Studies, S. E. Farm, 1981. Plants Per Acre Four Weeks After Emergence.

Rate	2x2 Placement Study		Rate	Seed Placement Study	
lb/A N	AN	UREA	lb/A	AN	UREA
0	17,206	16,661	0	17,097	17,424
20	16,443	16,880	2.5	17,859	17,532
40	17,750	17,532	5	16,770	17,206
80	17,532	17,206	10	17,097	16,988
160	16,988	16,879	20	16,770	15,572
320	17,206	16,988	40	17,750	11,107

DOUBLE CROPPING

R. Hanson, G. Williamson, B. Jurgensen
D. DuBois and F. Shubeck

SOUTHEAST FARM 81-24

S.E. FARM REPORT

Objectives

1. Is the growing season in S. E. South Dakota long enough to mature a second crop like edible beans or sunflowers?
2. What kind of yields can we expect from a second crop planted after harvesting a crop of small grain?
3. What are the problems associated with double cropping?

Methods and Procedures

The first crop was spring wheat. It was harvested for silage on July 7, 1981 and yielded four tons of silage per acre.

Wheat stubble was tandem disked twice in opposite directions and then spike tooth harrowed.

Edible beans were planted July 8, 1981, in 30 inch rows at the rate of seven seeds per foot of row. This amounted to approximately 120,000 plants per acre at harvest.

Variety of navy beans used was Seafare and variety of small reds was UI 36.

No herbicides were used for the beans. Fields were cultivated twice. Volunteer corn and velvet leaf were pulled. No fertilizer was applied for the beans.

Sunflowers were planted on the remaining wheat stubble July 9, 1981 at 20,000 plants per acre. Variety was Sigco 890. Cultural procedures for sunflowers were the same as those used for edible beans.

Sunflowers were combined on November 13, 1981.

Table 64. Yields of Second Crop of Edible Beans and Sunflowers

Crop and Variety	Yield/Acre	% Moisture
Edible Beans - Navy Seafare	14 bu (60 lb/bu)	14.1
Edible Beans - Small Reds UI 36	10.3 bu (60 lb/bu)	12.7
Sunflowers - Sigco 890	925 lbs (32 lb/bu)	11.0

Discussion and Interpretation of Table 64

Yields of second crop beans appear to be rather low, but at current prices, this amounts to well over $150 per acre. Remember that four tons per acre of wheat silage were taken off on July 7.

The economics of double cropping at this northern latitude have not been thoroughly studied, but it does appear promising. The question of moisture conservation for the next year's crop will take time to evaluate. For example: If all the late summer and fall moisture is used for the bean crop, will yield of the next year's crop be reduced proportionately? Several studies have shown that it is impossible to save much more than 1/4 to 1/3 of the moisture that falls in one complete year of summer fallow. If we can only save 1/3 of the moisture that falls after the wheat is removed for silage, then 2/3 must be wasted by evapotranspiration. Perhaps a second crop like edible beans or sunflowers can make better use of this moisture.

One of the major problems in double cropping is to get the second crop matured. To do this, the first crops must be removed early (by using it for silage, for example), or by interplanting. There must be sufficient moisture in the soil to get the second crop off to a fast start. If the second crop is planted in dry soil, the chances of success are considerably less because it may be one or two weeks before enough moisture falls to germinate the seed. With this delay it is very difficult to mature a second crop. A forage crop that can be used at an immature stage for feed, will help to reduce this risk.

In our double cropping experiment, leaves on the edible beans were killed by a frost on September 17, 1981. The pods that were physiologically mature dried down and made good quality beans. There were many other pods that were immature or had no beans in them. If the first killing frost occurred on October 10-14, as it usually does, the yield of edible beans would have been considerably more.

Another problem with edible beans is in the harvesting. Navys are more erect than pintos and can be combined without special equipment. Setting the combine to avoid cracked or broken beans is of the utmost importance. Cracked or broken seed will not be purchased for human consumption. This drastically reduces the value of the crop.

Sunflowers in our double cropping experiment survived the September 17 frost. Cool weather slowed maturity, but they were down to 11% moisture by November 13, 1981. Yields were fairly good for a second crop. It was interesting to note the small amount of insect and disease damage in these late planted sunflowers.

S.E. FARM REPORT

PERFORMANCE OF HERBICIDES IN CORN AND SOYBEANS

W. E. Arnold and L. J. Wrage

PLANT SCIENCE 81-25

Herbicide demonstration plots provide side-by-side comparison of herbicide treatments. Treatments include herbicides presently labeled and those which may be approved in the near future. Demonstration plots are the final step in the herbicide evaluation program. Rates and application methods for each are based on results obtained in previous years' screening tests.

METHODS

Preplant and pre-emergence treatments were applied May 14. A plot sprayer delivering 20 gpa water and 40 psi pressure was used. Preplant treatments were incorporated immediately with two tandem diskings set to cut 5-6 inches deep. Lasso, Dual and atrazine were incorporated with one shallow disking and harrowed.

Half of each plot was on a fall plowed seedbed and half was on a disked seedbed. The 1980 crop was corn.

Rainfall the first week after application totaled .29 inches and .09 inches the second week. Weed pressure was moderate. Annual grass species included green and yellow foxtail. Major broadleaves species were smooth and rough pigweed and lambsquarters.

RESULTS

The performance of treatments is presented in the following tables. Evaluations are based on two visual estimates of each weed on July 8. A 3-year average for early season weed control is included.

Table 65. 1981 Corn Herbicide Demonstration

Treatment	lb/A act.	Percent Weed Control 1981 Plowed Gr	Plowed Bdlf	Disked Gr	Disked Bdlf	3 year Ave. Gr	3 year Ave. Bdlf
PREPLANT INCORPORATED							
Check	---	0	0	0	0	--	--
Surpass	4	96	94	91	93	--	--
Eradicane	4	96	93	95	93	97	75
Eradicane+atrazine	3+1	94	97	91	94	97	97
Eradicane+Bladex	3+1-1/2	96	95	91	93	97	94
Eradicane+Bladex+atrazine	3+1-1/2+1/2	95	96	87	90	--	--
Sutan^{+}	4	89	69	80	73	94	60
Sutan^{+}+atrazine	4+1	88	93	83	91	94	94
Sutan^{+}+Bladex	4+1-1/2	88	90	94	91	93	92
Sutan^{+}+Bladex+atrazine	4+1-1/2+1/2	92	97	87	93	94	96
SHALLOW PREPLANT INCORPORATED							
atrazine	2-1/2	78	94	73	89	69	96
Lasso	3	83	83	64	69	84	80
Dual	2-1/2	80	79	69	67	84	69
PREEMERGENCE							
Check	--	0	0	0	0	--	--
atrazine	2-1/2	79	94	45	87	72	94
Bladex	3	87	76	45	40	80	76
Lasso	3	91	85	77	65	93	62
Lasso(harrow)	3	83	76	72	48	--	--
Dual	2-1/2	89	82	68	47	93	66
Prowl	2	85	85	69	68	63	87
propachlor	6	93	73	70	41	94	70
Mon-097	2-1/2	97	90	85	85	--	--
Lasso+atrazine	2+1	90	96	69	83	92	96
Lasso+Bladex	2+1-1/2	94	92	75	78	90	89
Dual+atrazine	2+1	89	96	69	77	91	97
Dual+Bladex	2+1-1/2	93	93	74	70	93	91
Prowl+atrazine	1-1/2+1	93	94	80	87	87	94
propachlor+atrazine	4+1	92	93	70	86	94	95
propachlor+Bladex	4+1-1/2	96	89	82	57	95	94
Lasso+Bladex+atrazine	2+1-1/2+1/2	91	95	78	85	--	--
Dual+Bladex+atrazine	2+1-1/2+1/2	91	94	73	83	--	--
Lasso+Bladex+Sencor	2+1-1/2+1/4	89	95	71	84	--	--
Lasso+atrazine+Sencor	2+1+1/4	87	97	66	85	--	--

Table 65 continued; Corn Herbicide Demonstration

PREEMERGENCE (cont.)	lb/A act.	Plowed Gr	Plowed Bdlf	Disked Gr	Disked Bdlf	3 year Ave. Gr	3 year Ave. Bdlf
Dual+Bladex+Sencor	2+1-1/2+1/4	85	96	66	84	--	--
Dual+atrazine+Sencor	2+1+1/4	92	97	67	92	--	--
Lasso+Bladex+atrazine+ Sencor	2+1+1/2+1/4	95	98	69	95	--	--
POST-EMERGENCE							
Prowl+atrazine (2 lf)	1-1/2+1	94	97	77	95	--	--
Prowl+Bladex (2 lf)	1-1/2+1-1/2	94	95	88	92	--	--
atrazine+oil	1-1/2+1 gal	86	97	59	91	64	98
Bladex wp+WA	1-1/2+1/2%	70	79	42	60	54	82
PREEMERGENCE & POST-EMERGENCE							
propachlor&Banvel (5 lf)	4&1/2	91	91	73	90	91	94
propachlor&Banvel	4&1/4	90	95	70	85	90	94
propachlor&2,4-D amine	4&1/2	89	90	60	88	89	89
propachlor&Basagran	4&1	88	78	60	72	--	--

Table 66. 1981 Soybean Herbicide Demonstration

Treatment	lb/A act.	Percent Weed Control 1981 Plowed Gr.	Bdlf	Disked Gr	Bdlf	3 year avg. Gr	Bdlf
PREPLANT INCORPORATED							
Check	---	0	0	0	0	0	0
Treflan	3/4	95	94	85	58	92	85
Tolban	1	93	90	83	53	89	85
Basalin	1	95	92	83	67	92	84
Prowl	1-1/4	94	89	89	74	89	81
Vernam	2-1/2	91	84	77	68	90	71
Treflan+Amiben	3/4+2	94	93	82	79	85	92
Treflan+Sencor/Lexone	3/4+3/8	94	95	79	79	95	93
Treflan+Amiben+ Sencor/Lexone	3/4+2+1/4	97	98	80	79	--	--
SHALLOW PREPLANT INCORPORATED							
Lasso	3	92	86	73	59	88	65
Dual	2-1/2	93	77	79	43	91	60
Treflan+Modown	3/4+1-1/2	95	85	85	80	95	89
PREPLANT INCORPORATED & PREEMERGENCE							
Treflan+Sencor/Lexone & Sencor/Lexone	3/4+1/4 &3/8	95	92	85	86	--	--
Treflan&Sencor/Lexone	3/4&1/2	97	96	89	90	97	97
Treflan&Modown	3/4&2	98	96	86	89	--	--
Treflan&Amiben	3/4&2	99	99	89	91	--	--
Treflan&Lorox	3/4&1	95	93	70	77	--	--
PREEMERGENCE							
Check	---	0	0	0	0	--	--
Treflan+Surflan	1/2+1/2	85	65	50	12	--	--
Amiben	3	89	79	58	45	85	83
Lasso	3	93	86	63	70	86	74
Dual	2-1/2	89	71	58	50	86	66
Lasso+Sencor/Lexone	2+1/2	89	92	70	83	82	86
Dual+Sencor/Lexone	2+1/2	89	91	71	85	85	88
Lasso+Amiben	2+2	91	91	55	69	86	87
Dual+Amiben	2+2	89	89	57	68	--	--
Lasso+Modown(harrow)	2+1-1/2	89	87	48	86	--	--
Dual+Modown(harrow)	2-1/2+1-1/2	90	85	54	84	--	--
Lasso+Lorox	2+1	86	80	45	62	80	75
Dual+Lorox	2+1	86	77	37	62	--	--
Lasso+Furloe	2+2	85	83	44	50	--	--
Lasso+Premerge	2+4-1/2	78	80	54	58	72	67

Table 66 Continued; Soybean Herbicide Demonstration

PREEMERGENCE (cont.)	LB/A act.	Plowed Gr	Plowed Bdlf	Disked Gr	Disked Bdlf	3 year avg. Gr	3 year avg. Bdlf
Lasso+Goal	2+3/8	94	96	82	92	--	--
Lasso+Lorox+Sencor/ Lexone	2+1+1/4	91	95	69	88	--	--
Dual+Lorox+Sencor/ Lexone	2+1+1/4	91	95	76	89	--	--
Lasso+Amiben+Sencor/ Lexone	2+2+1/4	97	97	85	90	--	--
Dual+Amiben+Sencor/ Lexone	2+2+1/4	96	97	84	89	--	--
Lasso+Modown	2+1-1/2	92	95	66	81	84	79
PREEMERGENCE & POST-EMERGENCE							
Lasso&Alanap+2,4-DB	2&1-1/4+1/16	83	85	45	68	--	--
Lasso&Blazer	2&1/2	84	88	53	84	--	--
Lasso & Dynap	2&2-1/2	88	90	60	78	79	82
Lasso&Tackle	2&1/2	90	93	66	89	--	--
Lasso&Tackle+Basagran	2&1/2+1/4	90	94	59	84	--	--
POST-EMERGENCE							
Hoelon+Basagran	1+1	27	43	8	55	--	--

S.E. FARM REPORT

THE EFFECT OF BREED AND IMPLANT ON GROWTH, CARCASS CHARACTERISTICS AND PALATABILITY OF BULLOCK BEEF

Roger Johnson, Dan Gee, Roland Hanson

ANIMAL SCIENCE 81-26

Introduction

Consumer demand has changed in recent years with an expressed preference for reasonably-priced beef with lean to fat ratio. In response to these needs, several revisions have been made in the U.S.D.A. standards for quality grades of carcass beef that have and will continue to encourage the production of lean beef.

Several alternatives are available for producers to increase the amount of beef produced and, at the same time, increase production efficiency. The most common method is the use of implants, which have been linked to increased growth and feed utilization in steers and heifers. Research data has also indicated that the production of beef by young bulls may be another possible solution to more efficient beef production.

The knowledge of the above information presents possible production method--the use of implants on bulls. However, limited work has been done with the use of implants on bulls.

Procedure

Two hundred young bulls consisting of 100 Angus and 100 Gelbvieh crossbred bulls were used to evaluate the effect of breed and implant on growth, carcass characteristics and palatability parameters of bullock beef. All of the bulls were purchased from three ranches in South Dakota and raised under typical climatic conditions for the area. Following an acclimation period, the bulls were weighed and divided into eight equal groups based upon breed and weight. One pen from each breed was randomly selected and implanted with either Ralgro, Synovex-H or Synovex-S. The fourth pen of each breed served as a control.

The bulls were fed in outside dirt mount lots with fence-line bunks and cable fences. A growing ration, of 67% corn silage and 33% high-moisture shelled corn (as fed) plus a commercial supplement, was fed for the first 92 days. For the remainder of the trial, the ration consisted of 67% high-moisture shelled corn and 33% corn silage (as fed) plus supplement. The bulls previously implanted were reimplanted with the same implant during the finishing phase.

At the conclusion of the feeding trial, the bulls were slaughtered at a commercial packing company and the quality and yield grade factors were evaluated by a U.S.D.A. grader. A four-rib section from one side of each carcass was transported to the SDSU meat lab and broken down into samples to be used for Warner-Bratzler shear, taste panel and proximate analysis.

Results

Statistical analysis has not been completed on the data. Therefore, the significance of the trends that are noted cannot be stated.

Mean values for the feedlot performance according to breed and implant type are reported in Table 67. The variation in the number of days on feed can be explained by the scheduling restrictions at the packing company and the endpoint selected for each pen. The use of implants on bulls appears to improve average daily gains during the growing phase, but the benefits of reimplanting during the finishing phase are somewhat questionable.

Table 68 presents the mean values for the carcass characteristics by breed and implant type. The Gelbvieh crossbred bulls were heavier muscled and later maturing as indicated by the larger rib eye areas and less external fat on heavier carcasses. Due to trimness and muscling advantages, the Gelbvieh bulls would be expected to yield a higher percentage of boneless trimmed retail cuts as shown by the more desirable yield grades. The earlier-maturing Angus bulls possessed higher marbling levels and, therefore, higher quality grades than the Gelbvieh crossbred bulls.

Sensory evaluation mean values and standard deviations by breed and implant are shown in Table 69. General trends cannot be drawn from this data without complete statistical analysis.

Further analysis being done in this project inclues (1) taste panel evaluation of juiciness, tenderness, connective tissue amount and flavor desirability, (2) proximate analysis, (3) Armour Tenderometer evaluation of fresh and aged bullock beef, and (4) relationship between chilling rate and tenderness.

Table 67. Mean Values of Feedlot Performance

	Angus Bulls				Gelbvieh Crossbred Bulls			
	Control	Ralgro	Syn-H	Syn-S	Control	Ralgro	Syn-H	Syn-S
Days on feed	205	195	198	202	223	230	233	226
Avg.daily gain, lb,day								
Growing	2.94	3.56	3.07	3.10	3.32	3.36	3.57	3.43
Finishing	2.64	2.56	3.08	3.03	2.94	2.70	2.65	3.05
Overall	2.79	3.08	3.08	3.07	3.12	3.01	2.96	3.23
Live wt, lb	1090	1121	1133	1145	1237	1233	1233	1289

Table 68. Mean Values for Carcass Characteristics

	Angus Bulls				Gelbvieh Crossbred Bulls			
	Control	Ralgro	Syn-H	Syn-S	Control	Ralgro	Syn-H	Syn-S
Carcass wt, lb	686	722	707	720	771	765	769	795
Rib eye area, sq inc	12.41	13.16	12.45	12.37	13.84	14.02	13.95	13.96
Fat thickness, in	.41	.49	.52	.54	.18	.17	.21	.24
Percent kidney, heart, pelvic fat	1.9	1.9	1.8	2.0	2.0	1.5	2.1	1.9
USDA yield grade	2.5	2.7	2.8	3.0	1.7	1.6	1.9	2.0
Maturity[a]	A	A	A	A	A	A	A	A
Marbling level[b]	Sl	Sl	Sl+	Sl+	Tr+	Tr	Tr+	Tr
Quality grade[c]	C	G	G+	G+	St+	St+	St+	St+

[a] A maturity = cattle 9-30 months of age.
[b] Tr = traces, Sl - slight.
[c] G = good, St = standard.

Table 69. Mean Values and Standard Deviations for Sensory Evaluation

	Angus Bulls				Gelbvieh Crossbred Bulls			
	Control	Ralgro	Syn-H	Syn-S	Control	Ralgro	Syn-H	Syn-S
Warner-Bratzler shear, lb[a]	19.66	18.27	18.88	21.74	20.82	22.89	21.97	21.26
Standard deviation	3.61	2.29	2.88	2.70	2.69	4.90	2.06	2.93
Overall desirability[b]	4.95	5.19	5.31	5.12	4.81	4.83	4.72	4.75
Standard deviation	.88	.38	.67	.77	.65	.69	.42	.49

[a]Pounds of shear force required to cut through a 1 inch core.
[b]Extremely undesirable = 1, slightly desirable = 5, extremely desirable = 8.

S.E. FARM REPORT

SDSU

SUNFLOWER PEST MANAGEMENT

D. D. Walgenbech, T. Heilman, J. Gednalske

PLANT SCIENCE 81-27

Sunflower hybrids have the genetic capability of producing seed yields approaching 4000 pounds per acre. Under normal production practices interaction with the environment reduces potential seed yield by about 50%. Management of the sunflower crop to maximize profits through reduction of insect damage from seed weevils, stem insects and sunflower moth has considerable potential for decreasing this loss in South Dakota. Most of these insects are native to this area and feed on several plant species in addition to cultivated and wild sunflowers. Expansion of cultivated sunflower acreage is expected to encourage these insects to become profit limiting on an annual basis. This situation has occurred in South Dakota and other areas where sunflowers have been a major crop the past 5 to 7 years. We believe certain management practices can increase seed yields and hence profits while at the same time reducing insect losses to sunflower producers.

The impact of insect pests upon yield can range from no damage to destruction of the crop. The major management practices that have potential for limiting insect pest populations and either increase or sustain yields are:

1. Early planting (May 1-10)

2. Plant population (18,000 emerged)

3. Fall or spring moldboard plowing of harvested sunflower land.

These practices are discussed within the parameters of current knowledge of the pests. Must of the research on which these recommendations are based was initiated in 1981. These recommendations are tentative as they are based on one year's work. However, the results are encouraging and the suggested practices have potential for enhancing yield in addition to reducing pest populations. Moldboard plowing of sunflower land entails some risks from either wind or water erosion. Each field must be evaluated by the grower on this basis. Strip plowing, pony press drills and plowing shortly before planting row crops must be taken into consideration. Importantly, some fields should not be plowed or planted to row crops.

The major insect pests of sunflowers will be discussed as affected by the suggested practices.

SEED WEEVILS

The red sunflower seed weevil Simicronyx fulvus is the most damaging insect pest on sunflowers in South Dakota and in certain areas is joined by the gray seed weevil, S. sordidus. Replicated experiments in 1981 showed that moldboard plowing in either the spring or fall reduced adult weevil emergence by 40 percent. The only other treatment showing a reduction in weevil emergence was the spring chisel tillage treatment. Plowing was compared to fall and spring disking, Noble blade, chisel plow operation and untilled soil.

Weevils began emerging from the soil on July 8 and continued to emerge until September. By August 1, only 50 percent of the seed weevil population had emerged. Sunflowers that blossomed prior to August 1 would escape seed weevil damage, since seed weevils have been reported to require a 2 week period before they begin laying eggs. Weevils only lay eggs in developing seeds and do not oviposit after the seed coats have hardened. Most sunflower hybrids require 65 to 70 days from planting to flowering and pollination lasts from 7 to 10 days.

The planting of late maturing hybrids between May 1 and 10 should reduce the amount of seed weevil damage and possibly eliminate the need for an insecticide application during flowering.

An emerged sunflower plant population of approximately 18,000 plants per acre has a head size and position that can increase insecticidal control when compared to plants with large, less erect heads. Observations are that seed weevil escapes in aerial insecticide applications occur on large heads (greater than 8") that are bowed during flowering.

STEM INSECTS

The stem insect complex contains 3 weevils and 2 beetles plus several associated stem rotting organisms. Further research is necessary to determine the level of yield reduction due to these insects and associated disease. Research in 1981 showed a positive correlation between insects and stem rot. Four of the insects, Cylindrocopturus adspersus, Baris strenua, Dectes texanus, and Mordellistena sp. overwinter as larvae in the stems and roots of sunflowers. Fall or spring moldboard plowing of sunflower land should have a suppressive effect on the populations of these insects. Since these insects migrate in spring, a reduction in their winter survival should reduce the potential for damage. Work in the mid-1970's in North Dakota showed a significant reduction of C. adspersus from plowing. Dectes texanus, a cerambycid is of particular concern as it was reported to be a serious pest of soybeans in

Missouri during the late 1960's. The infectation level of *Dectes* in South Dakota soybeans has not been established. *Apion occidentale* also infects sunflower stems, however, it overwinters as an adult and the effect of plowing on Apion survival is still unknown.

SUNFLOWER MOTH

The sunflower moth does not overwinter in South Dakota. Present information is that moths are carried into the state during June by weather systems. The moth can complete its lifecycle on a large number of weeds and plants in addition to sunflowers so it is difficult to predict the severity and timing of moth presence in South Dakota. The states to the south plant very low acreages of sunflowers and have indicated that early planted flowers are most subject to moth damage. Early planted sunflower fields can have high moth populations although this is not generally true because of the erratic nature of moth infestations. Moths are attracted to sex pheromone traps. Populations can be monitored fairly easily and adequately controlled with insecticides. Generally, the overall risk of infestation from the moth is less compared to seed weevils.

The recommended practices of early planting and populations of 20-22,000 seeds per acre should enhance yields under most situations. Newly emerged plants are resistant to frost until the six leaf stage. Early planting may justify the use of a fungicidal seed treatment to protect from the new race of downy mildew.

Desired plant populations are difficult to define because of compensation by the plant. For example, lower plant populations tend to produce larger heads. Generally, highest yields have been obtained in the 18-22,000 final stand range. Other factors which favor populations in the 20,000 final stand range include smaller head size and its association with faster dry down, and less stalk breakage and more erect heads during bloom. A more erect head provides a much better target for aerial insecticide application. A 15 to 30 percent reduction in seed weevil and sunflower moth control can be expected on larger (greater than 6" d) when compared to smaller more erect blossoms.

CUTWORMS

Three species of cutworms have sporadically occurred in sunflower production areas. Moths of the darksided and redbacked cutworms oviposit in cropland in late summer preferring low lying fields with crop stubble and/or debris. The eggs overwinter and larvae emerge during late May and June and begin feeding on any commonly planted row crop. The dingy cutworm overwinters as a partially grown larvae and begins to feed slightly earlier than the other species. The larvae of all species feed primarily

at night, cutting plants at the soil surface or slightly above ground level. We expect damage from cutworms can be reduced by:

A. Early planting . . .

1. Reduce cutworm damage to germinating plants prior to emergence because germination occurs prior to cutworm activity.

2. Allow initial damage to be more noticeable on larger plants for better treatment timing.

3. Improve insecticidal control in larger plants for oral and contact materials.

B. Plant population . . .

1. Adequate plant populations of 20,000 plants will provide greater latitude in economic threshold.

SUNFLOWER MIDGE

The sunflower midge has not caused economic losses to sunflower produces in South Dakota, however, the midge was found and identified in several widely separated areas in the eastern part of the state. Midge overwinters in the soil as larvae. The adults are small, fragile insects and would have difficulty emerging from sunflower fields that were fall or spring plowed. Since the sunflower midge is extremely difficult to control with insecticides, cultural control appears as the major method to prevent population buildup in South Dakota.

CHEMICAL CONTROL OF STALK-BORING INSECTS IN SUNFLOWERS

D. D. Walgenbach, T. Heilman and J. Gednalske

S.E. FARM REPORT

PLANT SCIENCE 81-28

Stalk-boring insects and associated stalk-rot diseases appear to be common in sunflowers and may reduce potential seed yields. During the 1980-1981 growing seasons, the larvae of four insect species were commonly found in sunflower stems in South Dakota. This complex of stalk boring insects includes two stem weevils, *Apion occidentale* and *Cylindrocopturus adspersus*; one long-horned beetle, *Dectes texanus*; and one tumbling flower beetle, *Mordellistena* sp.

Little research has been done on the effect of these insects on sunflower seed yields or the potential for chemical control of insect larvae in the stem. An investigation was initiated at Redfield and other locations in 1981.

Three granular, systemic insecticides were applied at planting time: Furadan 10G, Counter 15G, and Temik 15G. Each of these was applied at several rates and with different placements i.e., (a) band over the seed furrow, (b) seed furrow, (c) subseed. An application of Counter 15G at first cultivation was also made.

The effectiveness of each insecticide, rate, and placement was determined by hand splitting of twenty sunflower stems (5 from each of 4 replications) from each of the chemical treatments. The species of insects present and a subjective rating of the severity of stalk-rotting (fungal infection) were recorded for each stem. Ratings of stalk-rot were as follows: 0 for stems with no fungal growth (no infection), 1 for stems with a light fungal growth in the pith only (light infection), 2 for stems with a fungal growth throughout the pith in one area of the stem (moderate infection), and 3 for stems with a complete destruction of the pith and partial destruction of vascular tissue by fungus in one area of the stem (severe infection). All stems were split and the above information recorded during the full bloom stage of the sunflowers.

Table 70 summarizes the results from tests at Brookings, Watertown, Centerville, Redfield and Highmore.

THE CHEMICALS USED IN THIS STUDY ARE NOT REGISTERED FOR USE ON SUNFLOWERS IN SOUTH DAKOTA. REGISTRATION OF FURADAN AND COUNTER MAY OCCUR WITHIN THE NEXT TWO OR THREE YEARS.

Table 70. Effect of Insecticide Treatments on the Percent of Sunflower Stems Infested (By any Insect Species); On the Severity of Stalk Rots (Fungal Infection Rating); And on the Percent of Stalks Infested by Each of the Four Insect Species

Treatment	Rate &	Placement	% Stems Infested	Stalk Rot Rating	% of Stalks Infested by Species Apion	Cylindrocopturus	Dectes	Mordellistena
Untreated	--		97	2.28	45	65	33	50
Furadan 10G	1.0 lb.	Furrow	85	1.55*	40	23*	20	43
Furadan 10G	1.5 lb.	Furrow	70*	1.38*	38	13*	10*	23*
Furadan 10G	2.0 lb.	Furrow	67*	1.18*	45	8*	20	13*
Furadan 10G	2.0 lb.	Band	70*	1.28*	50	13*	15	20*
Furadan 10G	1.0 lb.	Subseed	85	1.65	45	8*	30	33
Counter 15G	1.0 lb.	Band	72*	1.60*	50	23*	18	23*
Counter 15G	1.0 lb.	Furrow	75	1.75*	58	23*	12*	23*
Counter 15G	1.0 lb.	Cultivation	83	1.30*	63	10*	13	30
Counter 15G	1.0 lb.	Subseed	65*	1.00*	45	5*	10*	28*
Counter 15G	2.0 lb.	Band	72*	1.65*	58	40*	5*	33
Counter 15G	2.0 lb.	Furrow	60*	1.63*	38	23*	5*	20*
Counter 15G	2.0 lb.	Cultivation	57*	1.30*	33	13*	3*	17*
Counter 15G	2.0 lb.	Subseed	30*	0.83*	15*	8*	8*	5*
Temik 15G	1.0 lb.	Furrow	97	1.95	52	30*	33	38
Temik 15G	0.5 lb.	Furrow	97	2.05	33	40*	45	33

Most stalks were infested by more than one insect species.

* Means followed by an asterisk were significantly different from the untreated mean in the same column of the table at the .05 probability level.

Few of the chemical treatments had a major effect on the percentage of stalks infested (by any insect) or on the percentage of stalks infested by the stem weevil, *Apio occidentale*. The only exception to this was Counter 2 lb. subseed, which gave excellent control of all insects. Several of the treatments significantly reduced the percentage of stalks infested by the other insect species, particularly the stem weevil, *Cylindrocopterus adspersus* and the long-horned beetle, *Dectes texanus*. The same treatments were also effective in reducing the severity of stalk rots in the stem. The placement of the chemical appeared to be more important than the rate. Generally, subseed placement of Counter and first cultivation application of Counter were the most effective treatments at the lower rates. At higher rates, Counter subseed, Counter cultivation, and Furadan in furrow produced equal or greater control of most insects and somewhat less stalk-rot. It should be noted that Furadan was not applied subseed at higher rates. Also, the difference in insect control or severity of stalk-rot between the lower and higher rates of the insecticides may not be economically important.

No significant differences in seed yield were found at Watertown, where there was a light infestation of stalk-boring insects. The test crops at other locations, including Redfield, were damaged by high winds, other insects and/or birds prior to harvest, so differences in seed yield could not be measured. Yield tests will be repeated in 1982.

Some recent research done by C. E. Rogers on sunflowers in Texas indicated that heavy infestations of the stem weevil, *Cylindrocopterus adspersus* can reduce seed yields by stunting plant growth and/or through lodging of the plants before harvest. Other research done by J. H. Hatchett, et. al. on the long-horned bettle, *Dextes texanus*, indicates that this insect uses both sunflowers and soybeans for host plants, and it has caused significant soybean yield losses in Missouri. Soybean yield losses have resulted from lodging of the plants before harvest or from harvesting losses when stalks break off too easily to properly feed into a combine. Crop losses have not yet been attributed to either the stem weevil, *Apion occidentale*, or the tumbling flower beetle, *Mordellistena* sp.

Since all four of these insects are natural pests of wild sunflowers and do overwinter in South Dakota, one or more of these species may increase in number with continued cultivation of domestic sunflowers. Future research on these insects in South Dakota will help determine their effect on sunflower seed yields and what control measures are the most effective. Despite the loss of yield information in 1981, two important discoveries were made toward those goals. First, it is now evident that these stalk-boring insects are associated closely with stalk-rot diseases. Second, granular insecticides can be used effectively to control these insects and to reduce the occurrence of stalk-rot diseases.

S.E. FARM REPORT

EUROPEAN CORN BORER CONTROL

D. Raemisch and D. D. Walgenbach

PLANT SCIENCE 81-29

FIELD INFORMATION

Location - Platte, South Dakota
Flood irrigated field
Row spacing - 40 inches
Corn Variety - DenBesten SX60
Date Planted - May 1, 1981
Herbicide - AAtrex 2.[illegible] lbs (post)
Insecticide - Dyfonate 20G 5 lbs.(root worm)
Plant population 28,000/A

Insecticide Trial: (Table 71)

Application Method - John Deere highboy Gandy applicators (chain driven)
Application Date - June 23, corn was 40-45" extended leaf height
Analysis - July 20 split stalks, corn in tassel stage.

Treatment Means (# cavities/plant)	Treatment	Grouping
2.41	Control	A
1.40	Dyfonate 0.25 lbs.	B
1.17	Lorsban 0.25	BC
1.07	Thimet 1.0	BC
1.05	Thimet 0.5	C
0.86	Furadan 0.25	CD
0.62	Dyfonate 0.5	DE
0.45	Lorsban 0.5	E
0.38	Furadan 0.5	E
0.38	Lorsban 1.0	E
0.36	Furadan 1.0	E
0.34	Dyfonate 1.0	E

Table 72. Corn Grain Yield as Influenced by European Corn Borer Cavity Counts

No. of Cavities Per Plant	Grain Yield-Bu/Acre
0	206
1	194
2	190
3	177

Two studies were conducted to assess the impact of the European corn borer (ECB) on corn yield in South Dakota. The first examines the affect of ECB on grain yield and the second looks at effects of ECB on total plant weight. In both cases treatments consisted of individual plants tagged as either damaged (showing leaf feeding by first brood) or non-damaged by first brood ECB. In south-central South Dakota the ECB exhibits two generations per year. Grain yield on irrigated land in this area of the state was reduced from 208 to 190 Bu/A by second brood damage while a combined attack by first and second brood showed no significant further decrease in yield. At the present time most corn producers in this area monitor first brood ECB but few give such attention to second brood borers. This study indicates that it may be worthwhile to monitor second brood populations. In east-central South Dakota total plant weight was studied on adjacent irrigated and dryland plots. A comparison of 100% first brood damage to no first brood damage showed an 8.8% yield loss under irrigation and an 18.1% loss in dryland corn. Within non-damaged corn, dryland yielded 17.2% lower than irrigated corn while plants that had 100% first brood damage sustained a 30.5% loss when comparing dryland to irrigated corn. This study supports the use of different threshold levels for making management decisions on either dryland or irrigated corn.

CORN ROOTWORM CONTROL - 1982

D. D. Walgenbach

PLANT SCIENCE 81-30

Results from eight years of corn rootworm research on insecticide efficacy are shown in Table 73.* Both the number of tests and the percent root protection afforded are indicated for each year. The average percent root protection is calculated for the eight-year period from 1974-1981, inclusive. These test averages involve both light and heavy corn rootworm larval infestations with very little Western corn rootworm pressure since 1977. The Northern corn rootworm species has predominated in South Dakota since the collapse of the Western corn rootworm populations in 1977.

The overall corn rootworm population pressure in the field has been low the past four years and indications are that the 1982 corn rootworm populations in South Dakota will not be any higher than the 1981 growing season, or possibly even lower. The Western corn rootworm species is building up in some southern South Dakota counties and the Belle Fourche area in western South Dakota. However, most corn growers in South Dakota will encounter predominately Northern corn rootworm in 1982.

Since the field situation indicate less Western corn rootworm pressure for the 1982 season, we are eliminating our category placings of corn rootworm insecticides for 1982. Performance of all rootworm insecticides the last four years has been satisfactory against the Northern corn rootworm species and lighter populations, in general, have been encountered in the field.

Table 73. Corn Rootworn Research 1974-1981
Insecticide Efficacy

Insecticide	1974 # Tests	1974 % R.P.[1]	1975 # Tests	1975 % R.P.[1]	1976 # Tests	1976 % R.P.[1]	1977 # Tests	1977 % R.P.[1]	1978 # Tests	1978 % R.P.[1]	1979 # Tests	1979 % R.P.[1]	1980 # Tests	1980 % R.P.[1]	1981 # Tests	1981 % R.P.[1]	1974-81 Avg. # Tests	1974-81 Avg. % R.P.[1]
Amaze	2	75	14	62	15	55	12	91	8	82	6	85	9	69	14	79	80	74.6
Counter	14	71	25	65	21	55	14	83	7	76	7	84	11	69	21	84	120	73.4
Furadan	32	76	20	73	18	60	12	75	9	68	9	67	12	56	12	71	124	68.0
Thimet	32	56	12	49	17	49	10	81	7	72	5	78	11	66	18	80	112	66.5
Dyfonate	14	60	13	60	10	51	10	76	8	69	6	65	11	60	16	74	88	64.5
Mocap	14	58	13	48	19	44	9	79	7	67	5	62	10	60	21	76	98	61.8
Lorsban	3	62	13	42	21	44	9	80	6	73	2	71	11	55	15	64	80	61.0

* Not Marketed

[1] % R.P. - Percent Root Protection = % R. P. = $100 \left(\frac{\text{root rating of treatment}}{\text{root rating of UTC}}\right) -1$

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