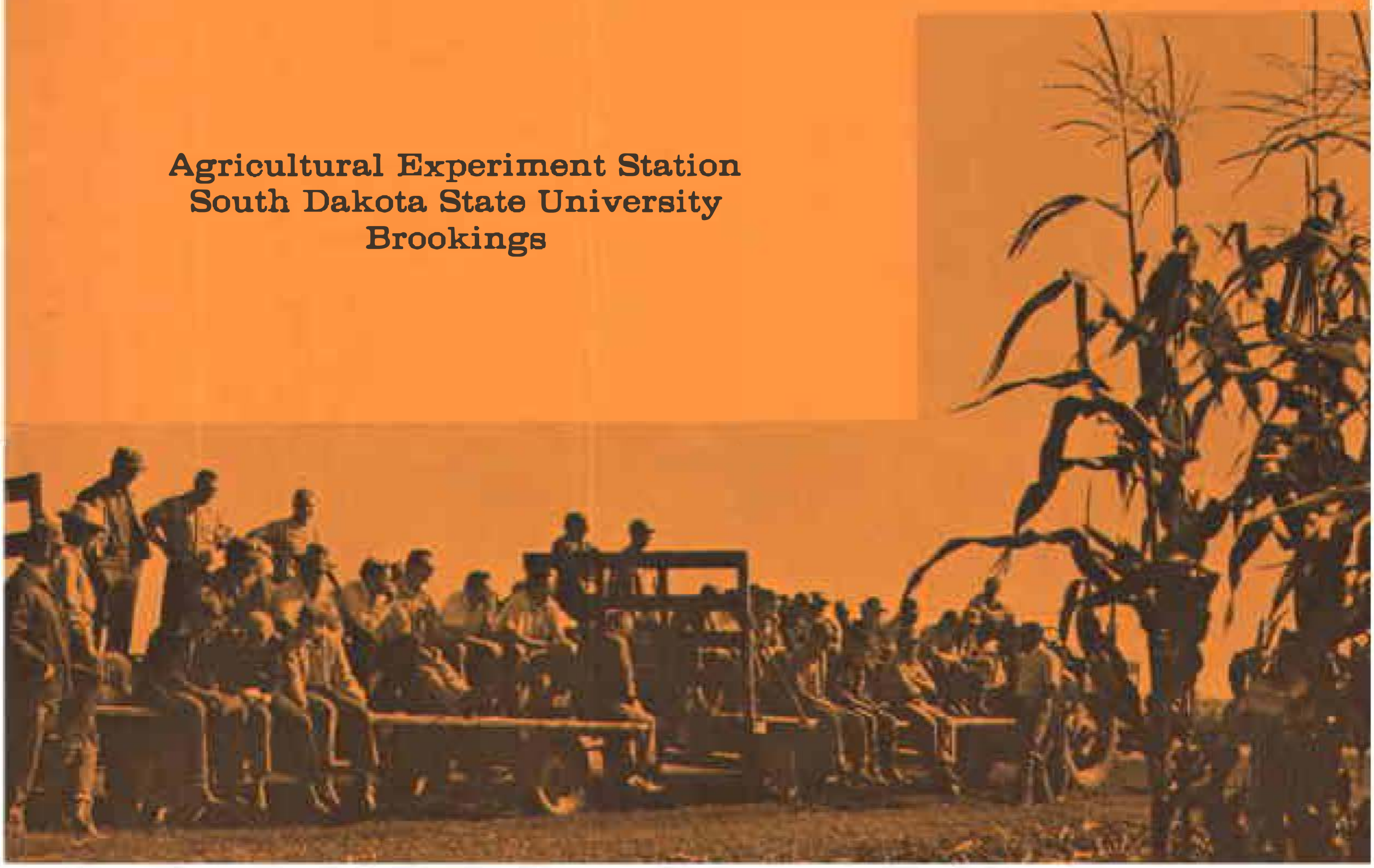
Southeast South Dakota Experiment Farm

12th Annual Progress Report 1972

Agricultural Experiment Station
South Dakota State University
Brookings



TWELFTH ANNUAL PROGRESS REPORT
SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM

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This twelfth 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 nine county area of southeast South Dakota. The results shown are not necessarily complete or conclusive. Interpretations given are tenative 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 57006

Duane Acker, Director A. L. Musson, Associate Director

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Marc Cox,
Sioux City Journal

RESEARCH MANAGER'S REPORT . . . . R. M. Luther

The 1972 year found the Experiment Farm and Research and Extension Center with the usual variety of programs and activities. Several personnel changes were made with Jake Fredrikson, Superintendent moving to Brookings to take a position in the Veterinary Science Department. Burton Lawrensen was made Agronomist and continues to work with crops research. Vacancies filled in classified personnel staff have added new talents to the farm work crew.

A number of research studies were initiated this year. New projects in Plant Science included the following titles: Potash on Grain Sorghum, Chisel Plow Experiment, No-till Planting of Corn and Soybeans, Soil Testing Experiment, Variety and Date of Planting Soybeans and Adjuvants to Herbicides for Corn. A study conducted by personnel of the Horticulture-Forestry Department dealt with varieties of pea beans for production in this area. Studies involving chemical application of insecticides by air for corn borer control were conducted by researchers in the Entomology-Zoology Department. These new studies and continuing research projects search for newer, better ways and answers to current problems of Southeastern South Dakota.

Field day visitors heard a variety of subjects discussed on September 14. Approximately 350 were in attendance for the event which started at 10 a.m. with five wagon tours about the Farm. A noon luncheon served by the Centerville Rotary Club provided adequate nourishment for the afternoon tours.

The United States Weather Bureau volunteer weather observers station was moved to the new site south of the Office-Laboratory building. This site was equipped with additional weather instruments during the summer and will be in full operation for the 1973 crop season. Weather records from the Centerville area date back some 20 years.

Livestock research was highlighted by beef cattle and swine nutrition studies. The beef cattle project continues to be a growing-fattening program which this year involved the value of "backgrounding" calves for varying growth rates. These cattle were fattened at the Farm and the results will be related to the back-grounding growth rates. Early in the year 30 first-calf heifers were transferred from Brookings to the Farm. These were carried on an experiment to evaluate two kinds of roughage during gestation. Future plans include the fencing of fields in which different types of pastures including corn stalks and corn residues can be available for study with the cow herd. Swine research studies involved a trial with levels of vitamins including a "super" level and a study with anti-bacterial compounds for growing-finishing swine.

During 1972 about twenty meetings with over 375 people (excluding Field Day) attending were held at the Research and Extension Center. A twilight tour held in June found 120 people learning about oat varieties, insect populations and herbicides for corn and soybeans. A beef feeder cattle workshop was held at the Farm in October with over 100 guests in attendance. The event, sponsored by the Clay County Livestock Feeders Association, offered a wide variety of practical subjects and demonstrations.

The project leaders, all dedicated staff members in various departments at South Dakota State University, have been most helpful in planning research programs. The staff at the Center execute these plans with continuing enthusiasm. The usual interest and support of the Southeast Experiment Farm Corporation continued this year.

Table 1. Temperatures at the Southeast Experiment Farm

Month	1972 Av. Temperature (F)[1] Maximum	Minimum	20 Year Average Maximum	Minimum	Departure from 20 Year Av. Maximum	Minimum
January	21.8	-3.0	26.5	5.5	-4.7	-8.5
February	25.7	3.5	33.3	11.5	-7.6	-8.0
March	43.1	22.6	43.6	22.3	-0.5	+0.3
April	55.0	33.7	62.0	35.5	-7.0	-1.8
May	69.9	49.4	74.2	48.2	-4.3	+1.2
June	80.3	53.9	83.4	58.1	-3.1	-4.2
July	84.0	55.4	87.8	62.6	-3.8	-7.2
August	84.7	58.4	86.9	60.5	-2.2	-2.1
September	74.2	45.9	76.1	50.1	-1.9	-4.2
October	61.5	32.5	66.5	43.0	-5.0	-10.5
November	39.1	25.7	47.2	25.3	-8.1	+0.4
December	24.1	5.3	44.7	12.7	-20.6	-7.4

[1]Computed from daily observations.
Days free of killing frost, April 24 to October 18, = 178 days.

Table 2. Precipitation at the Southeast Experiment Farm

Month	Precipitation 1972 (inches)	20-Year Average (inches)	Departure From 20-Yr. Av. (inches)
January	0.22	0.45	-0.23
February	0.41	1.36	-0.95
March	0.89	1.26	-0.37
April	1.63	2.50	-0.87
May	7.54	3.38	+4.16
June	2.46	4.42	-1.96
July	5.35	3.23	+2.12
August	2.06	2.80	-0.74
September	2.19	2.79	-0.60
October	1.58	1.72	-0.14
November	1.29	1.00	+0.29
December	1.68	0.81	+0.87
Total	27.30	25.71	+1.59

RATES OF NITROGEN AND DATE OF PLANTING CORN 1972

F. Shubeck and B. Lawrensen

Objectives of Experiment

1. Will planting dates influence response to fertilizer?
2. How high should rates of nitrogen be with a soil containing a medium amount of organic matter?
3. Will exceptionally high rates of nitrogen influence disease or insect damage?
4. Will soil temperatures serve as a dependable guide as to the optimum time to plant corn?

Methods and Procedures Used in Rates of Nitrogen Study

Nov. 9, 1972 - Double tandem disked corn stalks and plowed. No fertility applied at this time.
April 24, 1972 - Sprayed Experimental area with Aatrex 4L at the rate of 3.75# active material per acre and tandem disked to incorporate immediately.
May 8, 1972 - Tandem disked and spike-tooth harrowed first planting date plots. Fertilizer applied at this time.
May 15, 1972 - Fertilized, disked, harrowed and planted second planting date.
May 31, 1972 - Fertilized, tandem disked, spike-tooth harrowed and planted plots in third planting date.
June 2, 1972 - Rotary hoed first and second planting dates.
July 11, 1972 - Cultivated third and fourth planting dates.
October 11, 1972 - Harvested.
Insecticide - Bux Ten
Herbicide - Ramrod 20G in 14-inch band at planting time.
Variety - PIO 3571
Plant population - 16,000

Table 3. Effect of Fertilizer and Planting Dates on Yield of #2 Corn

Broadcast Treatment N+P+K	Planting Dates				Average
	May 8	May 15	May 31	June 9	
0-0-0	67	69	68	76	70.0
0-11-58*	66	82	71	83	75.5
80-11-58*	106	108	97	102	103.3
160-11-58*	108	118	96	89	102.8
240-11-58*	97	101	93	91	95.5
Average	88.8	95.6	85.0	88.2	89.4

*Received 4 lbs. N. 7 lbs. P and 7 lbs. K starter per acre placed approximately 2 inches to the side and 2 inches below the seed in addition to the broadcast treatment.

Discussion and Interpretation of Table 3

The planting season was delayed by early cool, moist conditions. May 8 was the earliest date that corn could be planted on this nearly level, moderately well drained site. With a slowly developing growing season the mid-May planting date yielded the most corn.

Eighty pounds of supplemented nitrogen was sufficient this year.

Table 4. Effect of Planting Dates and Fertilizer Treatments on Percent of Silks Showing on the Following Dates

Planting Date	Treatment N+P+K	% of ears with silks showing							
		July 21	July 25	July 31	Aug. 3	Aug. 7	Aug. 10	Aug. 15	Aug. 17
May 8	0+0+0	0	16	89	91	96	--	--	--
	0+11+58*	0	66	92	95	97	--	--	--
	80+11+58*	77	82	86	74	92	--	--	--
	160+11+58*	53	81	92	75	76	--	--	--
	240+11+58*	19	76	94	85	94	--	--	--
May 15	0+0+0	0	0	81	80	88	--	--	--
	0+11+58*	0	17	67	74	84	--	--	--
	80+11+58*	0	74	84	74	81	--	--	--
	160+11+58*	0	54	86	89	91	--	--	--
	240+11+58*	20	58	79	78	83	--	--	--
May 31	0+0+0	--	--	0	5	46	82	83	92
	0+11+58*	--	--	0	0	29	67	91	98
	80+11+58*	--	--	0	14	69	82	89	90
	160+11+58*	--	--	0	2	52	72	78	85
	240+11+58*	--	--	0	13	48	72	82	90
June 9	0+0+0	--	--	--	--	0	0	47	87
	0+11+58*	--	--	--	--	0	2	74	97
	80+11+58*	--	--	--	--	0	63	68	75
	160+11+58*	--	--	--	--	0	6	79	86
	240+11+58*	--	--	--	--	0	4	81	86

*Received 4 lbs. N, 7 lbs. P and 7 lbs. K as a starter placed 2 x 2 in addition to broadcast treatment.

Discussion and Interpretation of Table 4

When supplemental nitrogen was applied, the May 8 planting date had more silks showing by July 21 than plots where no nitrogen was applied.

The silking period of the first planting date extended over a longer period of days than the late (June 9) planting date.

There was about a 30 day difference between extremes in planting dates (May 8 – June 9) but there was only about 10 days difference between dates when plants were nearly all silked (August 7 – August 17).

Table 5. Effect of Planting Date on Plant Height

Planting date	Plant height in feet	
	July 21	Aug. 15
May 8	6.6	7.3
May 15	6.1	7.3
May 31	4.7	7.9
June 9	3.4	8.1

Discussion and Interpretation of Table 5

The delayed plantings had the tallest corn on August 15.

Table 6. Effect of Planting Dates and Fertilizer Treatments on Percent Ear Moisture at Harvest

Fertilizer Broadcast Treatment N+P+K	Planting Dates				Average
	May 8	May 15	May 31	June 9	
0+0+0	21.5	27.3	38.2	41.8	32.2
0+11+58*	26.5	25.2	36.5	40.8	32.2
80+11+58*	20.2	24.1	37.2	41.8	30.8
160+11+58*	18.9	23.0	38.7	42.2	30.7
240+11+58*	21.4	22.5	38.5	42.3	31.2
Average	21.7	24.4	37.8	41.8	31.4

*Received 4 lbs. N., 7 lbs. P., and 7 lbs. K starter per acre placed 2 x 2 in addition to broadcast treatment.

Discussion and Intrepretation of Table 6

A lack of nitrogen delayed maturity measured by percent ear moisture at harvest. Ear moisture at harvest was directly proportional to the delay in planting date. This occurred in a year of good rainfall distribution but limited growing degree days.

EFFECTS OF RATES OF NITROGEN ADDITION ON THE CONCENTRATION OF NITRATE-NITROGEN IN THE SOIL PROFILE

Paul Carson, Ray Ward, Fred Shubeck, Bernie Byrnes and Burt Lawrenson

The "Date of Planting and Rates of Nitrogen for Corn" study being carried on by Fred Shubeck and Burt Lawrensen reported elsewhere in this publication provided an opportunity to study the accumulation and movement of NO_3-N in the soil profile.

Objectives

1. To study and record the effects of rates of nitrogen addition on the accumulation and movement of NO_3-N in the soil profile.

Methods and Materials

1. Soil samples were taken to a depth of 4 feet. Samples have been taken to a depth of 4 feet for the past 3 years from these plots at the end of the growing season.
2. Samples were taken at 3 different dates during the 1971 growing season. Variations in the concentrations found at the 3 different times led to a more intensive sampling program during 1972.
3. During 1972 sampling started on July 5 and was continued at approximately 2-week intervals until the corn was physiologically mature. A final sampling was taken during November.
4. The 1972 sampling was to a depth of 4 feet until the final sampling which was to a depth of 8 feet. Each sample was a composite of 3 holes and represented one treatment.
5. The check plot (0 + 0 + 0) and the 160 pound per acre nitrogen addition (160 + 0 + 0) were sampled each time.
6. The samples were dried as soon as possible in a forced air oven at a temperature not to exceed 115° F.
7. Nitrate-nitrogen was determined by the n-phenol-disulphonic acid method.
8. Forage samples were taken at intervals in an attempt to determine the nitrogen present in the plants. The analytical work has not been completed on these samples.
9. The second planting was sampled throughout the entire season. This planting was made on May 15 using Pioneer 3571. The plant poplation established was 16,000 plants per acre.
10. This experiment is in its 5th year. This means that the 160 pound per acre rate of nitrogen addition has received a total of 800 pounds per acre of nitrogen during this time.

Results and Discussion

The sampling program resulted in 8 samplings. The nitrate-nitrogen determinations have been made on only 7 of these samplings at this time. The average nitrate-nitrogen contents from the 4 replications for the two treatments (0 + 0 + 0 and 160 + 0 + 0) for each of the sampling dates are found in Table 7.

It is interesting to note the changes in the total nitrate-nitrogen in the 4 foot profile throughout the summer. The same trends appear to hold for both treatments inspite of the difference in the amount of nitrates present in the profile of the 2 treatments. The NO_3-N levels decreased during the last part of July and during August, then increased during the last part of the growing season. This is consistant with results obtained in 1971. No explanation is offered for these changes in concentration at this time.

Table 7. The Effect of Added Fertilizer Nitrogen on the Concentration and Position of Nitrate-Nitrogen* in the Soil Profile

Depth of Sample	Treatment (0 + 0 + 0) Date Sampled						
	July 5	July 11	July 26	Aug. 8	Aug. 21	Sept. 11	Sept. 28
Inches	lbs. NO_3-N/A	lbs. NO_3-N/A	lbs. NO_3-N/A	lbs. NO_3-N/A	lbs. NO_3-N/A	lbs. NO_3-N/A	lbs. NO_3N/A
0-6	11.7	11.3	5.4	2.0	1.4	4.7	8.1
6-12	13.0	11.1	5.2	1.8	1.1	1.8	3.4
12-18	8.8	11.1	4.1	.7	1.0	1.4	4.0
18-24	12.0	7.7	2.7	.5	.7	1.1	3.6
24-30	8.3	5.0	2.9	.9	.9	1.3	4.3
30-36	6.7	3.4	2.9	1.4	1.4	1.6	6.1
36-42	4.7	2.9	7.6	2.7	2.3	2.0	6.7
42-48	3.2	6.1	4.1	2.2	4.1	3.1	8.3
Total	69.5	58.7	34.7	12.2	13.0	16.9	45.7
	Treatment (160 + 0 + 0)						
0-6	85.5	107.1	30.4	29.9	45.4	36.9	58.5
6-12	50.9	87.7	57.6	54.0	69.3	69.3	95.2
12-18	42.7	56.3	58.7	58.1	57.1	74.7	78.1
12-24	46.4	58.0	58.0	46.6	62.3	61.2	60.1
24-30	53.5	60.5	43.6	35.3	40.1	24.3	33.1
30-36	48.2	46.8	32.0	25.2	27.0	19.3	24.5
36-42	41.2	32.8	20.5	16.2	22.9	74.3	17.6
42-48	27.0	22.0	18.9	12.6	21.6	16.9	14.8
Total	395.4	448.4	320.6	277.7	345.6	376.7	381.6

*Lbs. per acre of NO_3-N calculated by multiplying ppm in a 6" layer by 1.8.

CORN POPULATIONS AND ROW SPACING

F. Shubeck and B. Lawrensen

Objectives of Experiment

1. Should we keep corn planters that can plant 35 or 36 inch rows or trade them in for machinery that can plant narrower rows?
2. Are the optimum row spacings and plant populations different for a short season hybrid and a full season hybrid?
3. Is there a greater need for narrow rows with high plant populations?
4. Can moisture loss by evaporation from the soil surface be reduced by narrow rows?
5. Will subsoil moisture at the beginning of the season, when added to expected rainfall in July and August, serve as a reliable guide to determine optimum number of plants per acre?

Methods and Procedures Used in Corn Row Spacing Experiment

Nov. 12, 1971 - Fertilized plot area (154 lbs. N, 28 lbs. P, 33 lbs K. per acre).
Nov. 19, 1971 - Applied 16.7 tons of manure per acre to plot area.
Nov. 23, 1971 - Plowed plot.
April 26, 1972 - Sprayed plot area with atrazine 4L at the rate of 3.3 lbs. active material per acre and disked in immediately.
May 9, 1972 - Tandem disked entire plot and staked for planting.
May 10-15, 1972 - Planted all plots.
June 2, 1972 - Finished thinning all plots to desired populations.
June 13, 1972 - Cultivated 30" rows.
June 19, 1972 - Cultivated 35" and 40" rows.
Oct. 16-18, 1972 - Harvested.

Table 8. Effect of Corn Plant Populations on Ear Moisture and Yield of #2 Corn (Results From All 3 Row Spacings Were Averaged for Each Population)

Hybrid	Final Stand	% Ear Moisture	Bu/Acre
Pioneer 3715	12,000	25.8	103
Pioneer 3715	14,000	25.5	113
Pioneer 3715	16,000	26.8	103
Pioneer 3715	18,000	24.7	109
Pioneer 3715	20,000	24.0	113
Pioneer 3388	12,000	32.0	114
Pioneer 3388	14,000	32.5	128
Pioneer 3388	16,000	28.3	121
Pioneer 3388	18,000	28.2	124
Pioneer 3388	20,000	30.1	134

Discussion and Interpretation of Table 8

The larger, later maturing hybrid (P 3388) yielded more than the short season hybrid (P 3715). Yield from the early hybrid with 20,000 plants per acre was about the same as that from the full season hybrid with 12,000 plants per acre.

The best yielding combination in the experiment was obtained with the full season hybrid at 20,000 plants per acre.

Both hybrids appeared to yield quite favorably with a plant population of 14,000. In other years with climatic conditions favorable enough to bring yields over the 100 bushel mark, yields from 16,000 and 18,000 plants per acre were usually equal or better than those from 14,000.

Table 9. Effect of Row Spacings on Yield and Ear Moisture (Results From All 5 Populations Were Averaged for Each Row Spacing)

Hybrid	Row Spacing in Inches	% Ear Moisture at Harvest	Bu. per Acre
Pioneer 3715	30	24.8	108.0
Pioneer 3715	35	25.7	113.0
Pioneer 3715	40	25.6	104.0
Pioneer 3388	30	30.1	125.0
Pioneer 3388	35	29.9	125.0
Pioneer 3388	40	30.7	122.0

Discussion and Interpretation of Table 9

There were no consistent differences in ear moisture at harvest due to the different row spacings.

With both varieties, 30 and 35 inch rows spacings appeared to yield a little more than 40 inch rows.

Table 10. Effect of Row Spacing on Plant Height (Averaged From 5 Plant Populations)

Hybrid	Row Spacing in Inches	Plant Height in Feet	
		July 14	August 14
Pioneer 3715	30	6.6	7.3
Pioneer 3715	35	6.4	7.4
Pioneer 3715	40	6.3	7.4
Pioneer 3388	30	6.0	7.2
Pioneer 3388	35	6.1	7.5
Pioneer 3388	40	6.0	7.2

Discussion and Interpretation of Table 10

The purpose of these measurements was to see if narrow rows had any effect on early growth and plant height when plants were fully silked.

No consistent differences in early growth and height could be attributed to different row spacings.

CORN VARIETY--ROW SPACING--POPULATION STUDY

P. Carson, F. Shubeck, B. Lawrensen, B. Byrnes and B. Shank

Objectives of Experiment

1. Determine if grain yields are equal when leaf area/acre of "small" very early maturing corn is increased by increasing populations so the leaf area/acre is equal to the leaf area/acre of "big" late maturing corn.
2. Determine if the highest yields are produced by the biggest, late maturing varieties and if earlier varieties can be made to produce equal yields by increasing populations.
3. Determine the effect of widely varying populations and row widths on the growth and yield of corn varieties with a wide range of maturity.

Methods

Populations: 20,000, 40,000, and 80,000 plants per acre.
Row Spacing: 10, 20 and 40 inches.
Hybrids:

1. Pioneer 3505 - Late maturing.
2. Renks RN-1 - 75 day - Early maturing.
3. Agsco 3 x AAA - Very early maturing.

Experimental Design: Completely randomized factorial.
Fertilizer:
N = 162 pounds per acre
P = 39 pounds per acre
K = 106 pounds per acre

Fertilizer was broadcast and worked into the soil before planting.

Weed Control:

Ramrod 20G - Applied in a band.
Atrazine - Broadcast prior to planting (4.4 pounds per acre).

Date of Planting - May 18

Date of Harvest:
1. Grain - Agsco 3 x AAA - September 18, Renks NR-1 - September 21 Pioneer 3505 - October 4
2. Silage - Agsco 3 x AAA - August 24, Renks N R-1 - August 24 and Pioneer 3505 - September 19.

Insect Control: BUX-Ten at planting time.

The corn was planted with John Deere tool-bar planters. The corn was selectively thinned June 13 to desired populations and received no other treatments or attention until harvest.

The amount of moisture received during the growing season was above average. This resulted in growing conditions that differed greatly from those encountered during the past 2 years. The lower leaves on the higher population plots dried up during the last part of August. This indicates that moisture and/or nitrogen were limited for these plots.

During the past 2 years this site has been seriously affected by dry weather; as a result, forage samples were taken. This practice was continued in 1972. The leaf area index was taken during August. Soil samples were taken from the experimental area prior to planting. The test values are reported in Table 11.

Table 11. Soil Tests* Results From the Experimental Site

Depth of Sample (inches)	NO_3-N ppm	Organic Matter %	Phosphorus lbs/A of P	Potassium lbs/A K	pH 1:1	Soluble Salts mmhos per cm.
0-6	44.4	3.0	31	484	6.5	.60
6-12	3.5	2.9	6	443	6.8	.36
12-18	3.4	2.1	2	333	7.3	.34
18-24	6.9	1.3	2	281	7.8	.42
24-30	10.0	1.0	1	268	8.1	.62
30-36	10.6	.8	2	288	7.9	3.60
36-42	8.5	.6	2	261	8.1	4.00
42-48	2.5	.4	2	235	8.0	3.95

*The tests were made on a composite of four soil samples except for the 0-6 inch sample, which was a composite of many subsamples.

Discussion and Interpretation of Tables

The corn forage yields reported as tons of 70 percent moisture silage (Table 12) indicate that variety had the greatest effect on the yield. The more of the growing season used by the variety the greater the yield. Population had very little effect on the total tonage except for the very early variety where the tonage increased as the population increased. It should be kept in mind that this variety had lost some of its leaves when the silage yields were taken. Row spacing did not have a consistent effect on the yield.

The silage was harvested at different dates in an attempt to let each variety grow to approximately the same physiological stage of growth for harvest. If moisture content of the silage (Table 13) is an indication of the physiological

maturity, the very early variety was more mature than the other two varieties at the time the silage was harvested. Row spacing had an effect on the amount of water in the silage at harvest time. The wider the rows at the same plant population, the higher the moisture content. Population had very little effect on the moisture content of the harvested silage.

The effects of the row spacing, population and varieties on the yield of grain are shown in Table 14. Variety had a great effect on yield. At the lowest population the late variety produced the highest yield of grain. The early variety produced the highest yield at the two higher populations. The effect of row spacing varies with variety and population. At the lower population, the yield decreased as the rows became wider for the very early and the late variety. The 20 inch row produced the highest yield of the early variety. The early and late varieties showed a higher yield than the very early variety with 20 inch rows when the population was increased to 40,000 plants per acre.

The grain was harvested at different dates to give each variety an opportunity to make as much growth as the variety and season would allow. The moisture content of the ears at harvest time are reported in Table 15. The moisture content of the varieties at harvest time varied considerably but all were at the point of physiological maturity or lower. Row spacing had very little effect on the moisture content of the ears at harvest time. An increase in population did increase moisture content of the grain at harvest time.

The effects of the population, row spacing and variety on the number of stalks having ears are reported in Table 16. The effect of variety was not great at the 2 lower populations. It did have an effect at the highest population. Both the very early and the late varieties had a lower percentage of the plants having ears than did the early variety.

As the number of plants increased, the number of plants having ears decreased. Increasing the population had the greatest effect on the very early and the late varieties. Row spacing had very little effect on the number of plants having ears when the population was held constant.

The population of plants at harvest time approximates the population goal in each case. The actual populations counted at harvest time are reported in Table 17.

Table 12. The Effect of Variety, Row Spacing, and Population on the Yield of Silage, Southeast Experimental Farm, 1972

Variety[1]	Yield in Tons Per Acre[2]			
	10" Rows	20" Rows	40" Rows	Average
		20,000 plants per acre[3]		
Very early[4]	17.3	15.4	14.1	15.6
Early[4]	17.4	17.5	21.0	18.6
Late[4]	27.4	20.0	23.8	23.7
Average	20.7	17.6	19.6	
		40,000 plants per acre[3]		
Very early[4]	16.1	17.5	15.7	16.4
Early[4]	16.5	20.3	20.8	19.2
Late[4]	25.9	24.2	20.6	23.6
Average	19.5	20.7	19.0	
		80,000 plants per acre[3]		
Very early[4]	18.5	19.0	16.2	17.9
Early[4]	15.8	19.2	17.8	17.6
Late[4]	29.0	22.0	18.2	23.1
Average	21.1	20.1	17.4	

[1]The very early variety was Ageco 3 X AAA, the early variety was Renks NR-1, and the late variety was Pioneer 3505.
[2]Yields calculated at 70% moisture.
[3]Population goal.
[4]The 2 early varieties were harvested on August 24 and the late variety on September 19.

Table 13. The Effect of Variety, Population, and Row Spacing on the Moisture Content of Silage at Harvest Time, Southeast Experimental Farm, 1972

Variety[1]	Percent Moisture in Plants at Harvest Time[2]			
	10" Rows	20" Rows	40" Rows	Average
		20,000 plants per acre[3]		
Very early	50.0	59.2	59.5	56.2
Late	64.0	65.5	67.5	65.7
Late	57.8	63.5	69.2	63.5
Average	57.3	62.7	65.4	
		40,000 plants per acre[3]		
Very early	47.2	56.8	61.5	55.2
Early	61.0	63.5	68.0	64.2
Late	56.2	61.2	69.2	62.2
Average	54.8	60.5	66.2	
		80,000 plants per acre[3]		
Very early	50.0	56.0	58.0	54.7
Early	61.5	65.5	66.0	64.3
Late	56.8	61.8	71.8	63.5
Average	56.1	61.1	65.3	

[1]The very early variety was Agsco 3 X AAA, the early variety was Renks NR-1, and the late variety was Pioneer 3505.
[2]The two early varieties were harvested on August 24, and the late variety on September 19.
[3]Population goal.

Table 14. The Effect of Variety, Row Spacing, and Population on the Yield of Grain at the Southeast Experimental Farm, 1972

Variety[1]	Yield in Bushels of Corn Per Acre[2] 10" Rows	20" Rows	40" Rows	Average
		20,000 plants per acre[3]		
Very early[4]	111	97	84	97
Early[4]	109	121	111	114
Late[4]	184	145	137	155
Average	135	121	111	
		40,000 plants per acre[3]		
Very early[4]	74	71	78	74
Early[4]	126	144	112	127
Late[4]	120	125	118	121
Average	107	113	103	
		80,000 plants per acre[3]		
Very early[4]	62	61	61	61
Early[4]	115	107	92	105
Late[4]	61	55	53	56
Average	79	74	69	

[1]The early variety was Agsco 3 X AAA, the early variety was Renks NR-1 and the late variety was Pioneer 3505.
[2]Yield calculated at 15% moisture.
[3]Population goal.
[4]The very early variety was harveeted September 18, the early variety September 21, and the late variety on October 24.

Table 15. The Effect of Variety, Row Spacing, and Population on the Percent Moisture in the Ears at Harvest Time[1] at the Southeast Experimental Farm, 1972

Variety[2]	Percent Moisture in the Corn Ears at Harvest Time[3] 10" Rows	20" Rows	30" Rows	Average
		20,000 plants per acre[4]		
Very early	18.4	17.2	18.2	17.9
Early	25.5	23.6	23.3	24.1
Late		31.8	30.8	31.4
Average	25.2	24.2	24.1	
		40,000 plants per acre[4]		
Very early	21.9	19.2	20.3	20.5
Early	25.4	25.5	25.0	25.3
Late	32.3	33.0	33.4	32.9
Average	26.5	25.9	26.2	
		80,000 plants per acre[4]		
Very early	21.5	20.1	19.6	20.4
Early	26.0	26.9	27.0	26.6
Late	37.8	38.6	39.6	38.7
Average	28.4	28.5	28.7	

[1]The very early variety was harvested September 18, the early variety September 21, and the late variety on October 24.
[2]The very early variety was Agsco 3 X AAA, the early variety was Renks NR-1, and the late variety was Pioneer 3505.
[3]The moisture samples were obtained by taking a section from the center of eight ears of corn.
[4]Populations goal.

Table 16. The Effect of Variety, Row Spacing, and Population on the Percent of Plants Having Ears, Southeast Experimental Farm, 1972

Variety[1]	Percent of Plants Having Ears 10" Rows	20" Rows	30" Rows	Average
		20,000 plants per acre[2]		
Very early	96.7	100.0	99.0	98.6
Early	100.0	98.3	99.0	99.1
Late	100.0	100.0	103.0	101.0
Average	98.9	99.4	100.3	
		40,000 plants per acre[2]		
Very early	90.7	86.8	89.7	89.0
Early	98.0	94.2	93.9	95.3
Late	91.2	95.5	86.7	91.1
Average	93.3	92.1	90.1	
		80,000 plants per acre[3]		
Very early	68.0	64.6	57.9	63.5
Early	86.7	78.7	80.1	81.8
Late	52.3	48.9	55.6	52.2
Average	69.0	64.0	64.5	

[1]The very early variety was Agaco 3 X AAA, the early variety was Renke NR-1, and the late variety was Pioneer 3505.
[2]Population goal.

Table 17. Populations at Harvest Time in the Variety, Row Spacing, and Population Study Conducted at the Southeast Experimental Farm, 1972.

Variety[1]	10" Rows	20" Rows	40" Rows	Average
		20,000 plants per acre[2]		
Very early	23,517	20,896	20,243	21,552
Early	24,040	23,247	21,876	23,054
Late	23,517	16,717	20,570	20,268
Average	23,691	20,287	20,896	
		40,000 plants per acre[2]		
Very early	42,331	39,441	41,139	40,970
Early	41,285	45,057	40,813	42,384
Late	38,672	40,747	40,813	40,077
Average	40,763	41,748	40,922	
		80,000 plants per acre[2]		
Very early	76,300	74,181	78,360	76,280
Early	80,480	75,487	66,475	74,147
Late	78,390	79,666	70,198	76,085
Average	78,390	76,445	71,678	

[1]The very early variety was Agsco 3 X AAA, the early variety was Renke NR-1, and the late variety was Pioneer 3505.
[2]Population goal.

LIME EXPERIMENT

Raymond Ward, Burton Lawrensen, Bernie Byrnes and Paul Carson

A lime experiment was established in 1968. The purpose was to determine if lime is needed on some of our soils in Southeastern South Dakota. Lime applications are not recommended by the Soil Testing Lab at South Dakota State University because no profitable yield increases have been measured from research plots and because almost all our soils contain free lime within the root zone. However, many questions have been asked about the use of lime so experiments were established at four locations to determine if lime will produce yield increases. A four year cropping plan was set up so that residual lime could be measured. This program was finished in 1971. Due to the fact that lime appeared to give a small yield increase during the final two years of the trial it was decided to add P to certain plots to determine if the yield increase was due to more P being made available through the addition of lime.

Methods and Materials

1. Nitrogen at the rate of 100 pounds per acre was applied uniformly over the entire experimental area before seed bed preparation by broadcasting on the surface.
2. Ramrod was applied in a band over the row at planting time and atrazine was applied at the rate of 4.4 pounds of atrazine 80W over the entire area.
3. Pioneer 3388 was planted on 26 May.
4. Leaf samples were taken at silking time for analysis. This work has not been completed.
5. The corn was harvested in October.

Results and Discussion

The yield of ear corn for 1972, the average yield for the past 4 years and the moisture content of the ears at harvest time are shown in Table 18. The phosphorus was applied to the lime only and the lime plus phosphorus plots. The yields show that added phosphorus increased the yield 10 or more bushels per acre but it doesn't separate out the effect of lime on the yield. The effects of the 60 pounds of P_2O_5 applied in 1968 could no longer be detected.

Table 18. The Effect of Added Lime on Phosphorus on the Yield of Corn, Southeast Experimental Farm, 1972.

Treatments	1972 Yield bu/A[1]	1968-1971 Yield bu/A[1]	1972 Ear Moisture %
Check	104	66	32.9
Lime (4 T/A 1968) + 60# P_2O_5 1972	113	72	31.6
Lime + 60# P_2O_5 1958 + 60# P_2O_5 1972	120	68	32.4
Phosphorus 60# P_2O_5 1968	106	70	31.8

[1]Yield calculated at 15% moisture.

STARTER FERTILIZER EXPERIMENT WITH CORN

P. Carson, F. Shubeck, B. Lawrensen and B. Byrnes

Objectives of Experiment

1. To establish the value of starter fertilizers on the growth and yield of corn.

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

Methods

1. Experimental design - completely randomized factorial. Plot size was 10 feet x 60 feet. Each plot contained four rows of corn.
2. Nitrogen was applied before planting at the rate of approximately 100 pounds of N per acre.
3. Variety - Pioneer 3505.
4. Weeds were controlled with Ramrod and insects with Furadan by banding at planting time.
5. Corn was planted May 16, 1972.
6. Corn was planted with John Deere Uni-planters equipped with belt fertilizer applicators to apply fertilizer as a starter beside and below the seed. The rate of planting was 18,000 seeds per acre. The row width was 30 inches.
7. Weather conditions were average or better throughout the growing season. A firing of the lower leaves was noted early in September and some of the ears did not fill out on the tips. This may have been due to disease, a lack of available moisture, a lack of available nitrogen or possibly other causes.
8. Corn was harvested by hand October 3, 1972. Sixty feet of row was harvested from each plot.
9. Fertilizer treatments:

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

10. Soil samples were taken before planting. Soil test results are reported in Table 19. Parts of the experiment were less well drained than the major portion of the area. Because of this, samples from each area

are reported in Table 19. The area used in this experiment was adjacent to the area used for an identical experiment in 1971. Soil tests from the better drained soil were comparable for the 2 years. The soil from the less well drained area had more nitrates, higher test value for phosphorus and lower pH than the well drained area. The soil with restricted drainage made up less than 10% of the experimental area.

Table 19. Soil Tests* Results From the Experimental Site

Depth of Sample (inches)	Nitrate Nitrogen ppm	Organic Matter %	Phosphorus lbs/A of P	Potassium lbs/A of K	pH 1:1	Salts mmohs/cm
			Highland area**			
0-6	10.9	3.2	29	621	6.8	.53
6-12	8.2	2.9	14	359	6.6	.48
12-18	7.4	1.9	4	254	7.2	.37
18-24	8.8	1.1	2	268	7.7	.38
24-30	14.9	1.0	1	248	8.0	.43
30-36	13.9	.7	1	235	8.1	.45
36-42	14.9	.4	1	268	8.2	.43
42-48	13.6	.4	2	228	8.3	.42
			Lowland area**			
0-6	14.6	3.1	51	562	6.6	.38
6-1	10.0	2.9	26	471	6.3	.32
12-18	22.3	2.4	10	397	6.4	.36
18-24	21.3	1.6	12	327	6.5	.38
24-30	17.4	1.3	19	327	6.4	.34
30-36	15.6	.9	42	397	6.6	.32
36-42	14.0	.8	81	314	6.6	.32
42-48	5.3	.7	74	397	6.8	.28

*The tests were made on a composit of four soil samples except for the 0-6 inch sample which was a composite of many subsamples.

**The north end and the southwest corner of this experiment were less well drained than the rest of the site.

Results

The yield in bushels per acre of 15% moisture corn, percent moisture in ear corn at harvest time and the number of ears per stalk at harvest time are reported in Table 20. Some treatments have been listed in this table more than once to make comparisons easier.

Table 20. Effect of Rates of Phosphorus and Potassium in a Starter Fertilizer on Yield, Ear Moisture at Harvest, and the Number of Ears Per Stalk of Corn Grown at the Southeast Experimental Farm, 1972.

Treatment Number	Treatment N + P + K lbs/A	Yield[1] Bu/A	Moisture[2] %	No. of Ears Per Stalk
1	12 + 0 + 0	129	32.2	.99
2	12 + 0 + 9	135	31.6	1.01
3	12 + 0 + 17	132	32.1	.99
4	12 + 6 + 0	125	31.7	1.01
5	12 + 6 + 9	129	30.3	.99
6	12 + 6 + 17	132	31.1	1.04
7	12 + 12 + 0	128	29.9	1.00
8	12 + 12 + 9	132	30.9	1.00
9	12 + 12 + 17	126	31.8	.99
10	12 + 23 + 0	133	31.5	1.01
11	12 + 23 + 9	129	30.9	1.03
12	12 + 23 + 17	137	30.8	1.04
13	12 + 0 + 0	129	32.2	.98
14	12 + 6 + 0	126	31.7	1.01
15	12 + 12 + 0	128	29.9	1.00
16	12 + 23 + 0	133	31.5	1.01
17	12 + 0 + 9	135	31.6	1.01
18	12 + 6 + 9	129	30.3	.99
19	12 + 12 + 9	132	30.9	1.00
20	12 + 23 + 9	129	30.9	1.03
21	12 + 0 + 17	132	32.1	.99
22	12 + 6 + 17	132	31.1	1.04
23	12 + 12 + 17	126	31.8	.99
24	12 + 23 + 17	137	30.8	1.04

[1] Calculated at 15% moisture.
[2] The moisture sample was taken by cutting a section out of the center of eight ears of corn. This includes a section of the cob.

The addition of phosphorus with and without added potassium (treatments 13 through 24) shows no consistent effect on the yield of grain. The addition of potassium when no phosphorus was applied or when the rate of phosphorus addition was low (6# of P per acre) caused a small yield increase as the rate of potassium was increased (see treatments 1, 2, and 3 and 4, 5, and 6). These yield increases are not large and may not be statistically significant. The addition of potassium when the rates of P addition (12 and 23# per acre) were higher had no consistent effect on yield (see treatments 7, 8, 9, 10, 11, and 12).

The yields from these treatments applied to an adjacent area in 1971 when the yield level was less than 1/2 that of 1972 show quite similar effects from added phosphorus and potassium. The exception being that in 1972 the effects of added potassium caused what appears to be a small yield increase when no phosphorus was added or when only small amounts of phosphorus (6# per acre) was applied.

Phosphorus appears to have hastened maturity as can be observed in treatments 13 through 16, 17 through 20 and 21 through 24. As the rate of phosphorus added increases the moisture content of the ears at harvest time decreases. The decrease in moisture content is not large but appears to be consistent.

The fertilizer treatments had no consistent effect on the number of ears per stalk.

INFLUENCE OF SOIL TEMPERATURE ON STARTER FERTILIZER RESPONSE

P. D. Evenson, F. Shubeck and B. Lawrensen

Starter fertilizer response was evaluated under three soil temperature conditions. The cool temperatures were created by applying straw or polystyrene mulches to the soil. Warm soil temperatures were achieved by burying heat tapes 5 inches below the soil surface under the corn rows. The tapes were thermostatically controlled to turn on when the soil temperatures dropped below 80^{o} F. Medium soil temperature conditions were those which normally occurred during the season.

Starter fertilizer was applied in a 2" x 2" band at the rate of 45 and 90 lbs. per acre of 8-32-16 (7-13-12 elemental) and an overall application of 80 lbs. of nitrogen per acre was made on the whole experiment. The experiment was planted on May 8 and harvested on October 13.

Corn yields, ear moisture percentages and test weights are shown in Table 21. Those treatments which had the greatest early season growth also matured first and produced the greatest yields. The mulched plots had the lowest yields, the highest ear moisture percentages and the lowest test weights at harvest. In contrast, the heated plots had the highest yields, the lowest ear moisture percentage and the highest test weight. The standard plots were between the mulched and heated plots with respect to these factors. The relatively low yields may be the result of very little tillage for the past three years.

Table 21. Corn Yields, Ear Moisture Percentage and Test Weights as Influenced By Starter Fertilizer and Various Soil Temperature Treatments

	Treatment						
Heat	-	-	-	-	+	+	+
Starter	-	+	-	+	-	+	++
Mulch	+	+	-	-	-	-	-
	Yield (Bushels per Acre)						
	79	83	71	96	93	113	108
	Ear Moisture (%)						
	33	29	28	24	21	22	21
	Teat Weight (Pounds per Bushel)						
	52	53	53	54	55	56	55

ZERO TILLAGE FOR CORN AND SOYBEANS

E. Arnold and F. Shubeck

Objectives

1. To improve yield stability, soil conservation, and moisture conservation of a corn-soybean rotation system.
2. To determine the most economical system of corn-soybean production.
3. To determine if adequate weed control can be obtained using herbicide without mechanical means.
4. To determine if phosphorus placement, surface residues, insects, diseases, and adequate stands will become serious problems with the no-tillage system.

Procedure

Pioneer 3388 seed corn was planted into 3 different types of seedbed May 19, 1972. The first seedbed was a conventional "plow-disk-drag" system. The second seedbed was minimum tilled and the plots received only a disking prior to planting. The third seedbed received no tillage prior to planting. Fluted or waffle coulters cut through the corn stalks and prepared a narrow seedbed band immediately ahead of the double disk furrow openers of the corn planter.

Starter fertilizer consisting of 8 lbs. N, 14 lbs. P, and 13 lbs. K per acre was placed in a band to the side and below the seed with a corn planter attachment. Supplemental nitrogen at 100 lbs. N per acre was sidedressed before corn was knee high.

All herbicides were applied May 20 in a 20 gallon per acre (gpa) spray solution at 40 pounds pressure per square inch (psi). Mon-2139 was not applied to plots receiving conventional or minimum tillage.

Corn was harvested October 30. The results are presented in Table 22.

All soybean plots were disked June 1 because of furrow ridges remaining from the previous cropping system. Two seedbed types were used, a conventional and minimum tillage system. Corsoy soybeans were planted June 6. Starter fertilizer was the same as that applied for corn. Sidedress nitrogen was applied at 30 lbs. per acre July 12.

All herbicides were applied June 6 in a 20 gpa spray solution at 40 psi. All plots were cultivated July 28 because of poor weed control. The plots were combined with a small plot combine October 10. The results are presented in Table 23.

Discussion

The no tillage system of corn planting worked quite well and good stands were obtained in every plot. There were no differences in corn yield due to type of seedbed used. However, corn yields were reduced in plots which received no fertilizer. Based on visual observations during the corn growing season, nitrogen and possibly phosphorus fertilizer needs may be increased with a zero tillage system.

Soybean yields for conventional methods were quite similar to those with reduced tillage methods. Fertilizer appeared to cause a small increase in soybean yields.

Table 22. Effect of Tillage Practices, Fertilizer and Herbicides on Corn Yield

Treatment	Bu/Acre
Lasso + AAtrex + Mon-2139 Fluted coulter, starter and supplemental N	122
Lasso + AAtrex Disk, fluted coulter, starter and supplemental N.	117
Lasso + AAtrex + Mon-2139 Fluted coulter, starter + supplemental N	124
Lasso + AAtrex Conventional (plow-disk-drag) Starter and supplemental N	126
Lasso + AAtrex + Mon-2139 Fluted coulter, No fertilizer	85

Table 23. Effect of Tillage Practices, Fertilizer and Herbicides on Yield of Soybeans

Treatment	Bu/Acre
Lasso + Lorox Disk, fluted coulter, starter and aidedress N	34
Lasso + Lorox Disk, fluted coulter, starter and sidedress N	35
Lasso + MC-4379 Disk, fluted coulter, starter and sidedress N	35
Lasso + Lorox Disk, plow, disk, drag Starter and sidedress N	35
Lasso + Lorox Disk, fluted coulter No fertilizer	33

SOIL TEST EXPERIMENT

P. Carson, R. C. Ward, B. Byrnes and F. Shubeck

Objectives

1. Compare yield results from fertilizer applied as recommended by four soil testing laboratories.
2. Determine which recommendation produced the most profitable yield.
3. Determine the effect of the recommendations over a prolonged period of time on the nutrient levels of the soil.

Methods and Materials

1. A soil sample was taken from the experimental site. The sample was divided in four equal portions and sent to four soil testing laboratories. The laboratories were chosen from those serving the agriculture of South Dakota. Three of those chosen were commercial laboratories and one was the laboratory operated by South Dakota State University. A recommendation for 100 bushels of corn per acre was requested.
2. The treatments used in this experiment were those recommended by the laboratories and one receiving no fertilizer, making five treatments in all. The recommendations made by the laboratories are as follows:

Laboratory Number	N	+	P_2O_5	+	K_2O	Zn lbs/A	Cu lbs/A
			lbs/A				
1	95	+	45	+	0	--	--
2	130	+	75	+	0	6	1
3	140	+	80	+	30	10	--
4	170	+	35	+	30	--	--

3. The treatments were replicated 4 times and they were randomized within each replication.
4. Pioneer 3505 was planted at a rate of approximately 18,000 seeds per acre in 30 inch rows on May 16.
5. Ramrod was applied at planting time in a band over the row and Atrazine was broadcast over the entire area.
6. Furadan was applied to help control insects.
7. The experiment was located on a somewhat poorly drained site. Soil samples were taken in six inch increments to a depth of 4 feet from the check plot areas after the first crop was removed. The soil was so wet early in the spring that the samples could not be taken at that time. The test results are reported in Table 24. The nitrogen fertility level of soil is so high that nitrogen would not have been recommended by the SDSU laboratory had a NO_3-N test been made when the experiment was established. The sample sent to the 4 laboratories was from the surface only and the nitrate test was not involved in establishing the experiment. The soluble salts are higher than considered desirable in the 24-48 inch zone. This is an indication of the relatively poor drainage of this site.

Table 24. Soil Tests on Samples Taken From the Soil Test Experiment, Southeast Farm, 1972

Depth of Samples (Inches)	ppm NO_3-N	Organic Matter %	Phosphorus Lbs P/A	Potassium Lbs K/A	pH 1:1	Soluble Salts mmhos/cm
0-6	11.9	3.6	33.0	587	7.5	1.47
6-12	7.7	3.0	16.3	469	7.5	1.05
12-18	15.5	2.0	3.3	346	7.7	1.18
18-24	45.6	1.3	1.5	313	7.8	1.73
24-30	83.7	.9	2.8	309	7.9	2.65
30-36	69.8	.6	2.0	282	8.0	3.81
36-42	26.1	.4	3.3	245	8.0	3.85
42-48	17.3	.4	1.8	265	8.0	3.79

8. Leaf samples were taken for analysis at silking time and yield samples, ear moisture samples and stalk breakage notes were taken at harvest time.
9. It is planned that this experiment will be continued for 5 years on the same site. Soil samples will be taken at the end of that time from each plot to determine the effect of added fertilizer on the soil test levels.

Results

The yield of grain, the moisture content of the ears at harvest time and the percent stalk breakage are shown in Table 25. Very little difference is noted in the moisture of the ears sampled at harvest time. The differences in yield caused by the fertilizers recommended by the four laboratories are not large. It remains to be determined if any of these yields are statistically different from the others. Considerable variation does exist in the amount of stalk breakage noted. This breakage was largely in the internodal area between the first three nodes. It is questionable whether these stalk breakage trends can be repeated next year.

One of the objectives was to determine the most profitable treatment. To do this it is necessary to utilize standard costs and prices. These are shown in Table 26 along with the calculated costs and values. The differences in value of the corn above fertilizer costs are greater than the differences noted in yield. This is because of the differences in the cost of the fertilizer applied. In only one case did the fertilized corn show a greater income for the crop than did the check yield. This yield increase was not great. Laboratory #1 is South Dakota State University's recommendation.

Table 25. The Effect of Recommendations Made on the Same Sample by Four Soil Testing Laboratories on the Yield, Moisture Content of the Ears at Harvest and the Percentage of Broken Stalks of Corn Grown at the Southeast Experimental Farm, 1972.

Lab Designation	Treatments Fertilizer Recommended N	+	P_2O_5	+	K_2O	Yield[1]	Moisture At Harvest[2]	Stalk Breakage[5]
			lbs/A			bu/A	%	%
1	95	+	45	+	0	124	19.6	13
2	130	+	75	+	0[3]	105	22.1	39
3	140	+	80	+	30[4]	115	20.5	28
4	170	+	35	+	30	117	21.3	19
check	0	+	0	+	0	113	22.3	12

[1]Yields calculated on a 15% moisture basis.
[2]The moisture sample was taken by cutting a section out of the center of eight ears of corn. This includes a section of the cob.
[3]Minor elements added were 6 pounds of zinc and 1 pound of copper per acre.
[4]Minor elements added were 10 pounds of zinc per acre.
[5]Breakage was counted only if below the ear.

Table 26. The Effect of the Recommended Fertilizer on the Return From the Growth of Corn, Southeast Experimental Farm, 1972.

Laboratory Number	N	+	Treatment P_2O_5	+	K_2O	Cost of Fertilizer	Yield[2]	Value of Corn	Value of Corn Minus Cost of Fertilizer
			lbs/A			$	bu/A	$	$
1	95	+	45	+	0	9.75	124	124	144.25
2	130	+	75	+	0[4]	18.95	105	104	86.05
3	140	+	80	+	30[5]	21.10	115	115	93.90
4	170	+	35	+	30	14.85	117	117	102.15
	0	+	0	+	0	--	113	113	113.00

[1]The cost of the fertilizer was calculated as follows: Nitrogen at .06, P_2O_5 at .09, K_2O at .05, zinc at .40, and Cu at $2.00 per lb.
[2]Yield calculated at 15% moisture basis.
[3]A value of $1/bu. for the corn was used.
[4]6# of zinc and 1 lb. of Cu/acre.
[5]10# of zinc/acre.

PERFORMANCE OF HERBICIDES IN CORN AND SOYBEANS

W. E. Arnold, W. B. O'Neal, and L. J. Wrage

Herbicide screening experiments are conducted at the Southeast Experiment Farm to give area farmers a chance to compare the performance of several herbicides which may be used in their area. The performance of herbicides used on corn and soybeans this year as compared to previous years is presented in Tables 27 and 28.

Corsoy soybeans were planted in 30-inch rows May 19. Preplant incorporated treatments were applied on May 19 and incorporated with a tandem disking at a 4-inch depth followed by two flextinings. Preemergence applications were made May 20. Postemergence applications were made June 6 when the soybeans were in the first trifolicate stage and the weeds, foxtail sp., lambsquarter, and redroot pigweed, were 1 to 2-inches tall.

Pioneer 3505 seed corn was planted in 30-inch rows May 16. Preplant incorporated treatments were applied May 16 and incorporated with a tandem disking at the 4-inch depth followed by two flextinings. Preemergence treatments were applied May 16. Postemergence treatments were applied June 6 when the corn was 6 to 8-inches tall and the weeds, pigweed sp., lambsquarter, and foxtail sp., were 1 to 3-inches tall.

All herbicide treatments were applied in a 2 gpa water spray at 40 psi. The planting and spraying information for previous years are reported in the Southeast South Dakota Experiment Farm Progress Report for the year in question.

Postemergence applications of AAtrex and Outfox gave unsatisfactory grass control in 1972; however, these plots were not cultivated. Two cultivations would improve the weed control substantially. Lasso and Ramrod gave better broadleaf weed control in 1972 than in 1971. These differences were probably because of the difference in amount of rainfall within 10 days of application. Soybean herbicides performed well except for Solo. Tenoran gave good broadleaf weed control. The

herbicide 2,4-DB is recommended in emergency situations when cocklebur is a severe problem.

Table 27. Corn Herbicide Screening Trials

Treatment	Rate Lb/A	% Grass Control 1970	1971	1972	Ave.	% Broadleaf Control 1970	1971	1972	Ave.
Preplant Incorporated									
AAtrex	2.5	88	92	90	90	(No	97	100	98
AAtrex + Sutan	1 + 3	86	85	85	89	Data)	93	100	96
Sutan	4	73	80	93	82		50	88	69
Preemergence									
AAtrex	2.5	92	85	90	89		97	100	98
Lasso	2.5	88	60	98	82		10	95	52
Lasso + AAtrex	2 + 1	92	65	100	86		60	100	80
Lasso + AAtrex	2 + 1	87	-	100	94		-	98	98
Bladex	2.5	92	50	93	78		50	85	68
Ramrod	5	89	82	93	88		10	85	48
Ramrod + AAtrex	3 + 1	90	90	95	92		97	80	88
Ramrod + Lorox	3 + 1	87	88	90	88		88	80	84
Postemergence									
AAtrex + oil	1 + 1g	85	80	50	72		85	90	88
Outfox	.75	-	83	60	72		65	80	72
Check		0	0	0	0		0	0	0

Table 28. Soybean Herbicide Screening Trials

Treatment	Rate Lb/A	% Grass Control 1970	1971	1972	Ave.	% Broadleaf Control 1972
Preplant Inc. (PPI)			(No			
Treflan	.75	75	Data)	90	82	85
Vernam	2.5	83		90	86	90
Split Applications						
Treflan (PPI + Lorox (Pre)	.75 + 1	-	-	95	-	100
Treflan (PPI) + CIPC (Pre)	.75 + 2	-	-	95	-	85
Preemergence						
Amiben	2.5	83		95	89	93
Lasso	2.5	90		100	95	90
Lasso + Lorox	2 + 1	95		100	98	95
Lasso + Amiben	2 + 1	93		100	96	95
Preforan	4	83		95	89	90
Solo	3 + 3	67		50	58	60
Postemergence						
Tenoran	1.5	34		70	52	95
2,4-DB	.175	-		0	0	40
No Herbicide	-	0		0	0	0

PHYTOTOXICITY TO CORN OF DICAMBA IN COMBINATION WITH ADDITIVES

B. A. Brinkman and W. E. Arnold

This experiment was conducted to determine the effect on corn of dicamba (Banvel) when applied in combination with additives. The experiment was sprayed with lasso preemergence at 1.5 lb/A to control grassy weeds. Dicamba was applied June 6, when the corn was 6-8 inches tall. All herbicides were applied in a 20 gpa water spray at 40 psi with a tractor mounted sprayer. The treatments consisted of three rates of dicamba 1/16 lb/A, 1/8 lb/A, and 1/4 lb/A. Nine additives were added individually to each of the three rates of dicamba. The nine additives were X-77, Texaco + Tronic, Amoco Concentrate, Accutrol, Dacagin, Agri-oil plus, Bio-Veg, Surfol-plus, and Wex. Visual estimates of percent corn injury were based on amount of leaf rolling of treated plots compared to the untreated plot. Notes on corn injury were taken on July 3. Crop yield was determined from 75 feet harvested on September 28.

Results

Dicamba in combination with additives increased corn injury compared to dicamba without additives. Dicamba at 1/4 lb/A did not reduce corn yields compared to dicamba at 1/16 lb/A; however, corn yields tended to be lower when dicamba was applied in combination with additives.

Table 29. Effect of Three Rates of Dicamba With and Without Additives on Corn Injury and Corn Yields.

		Corn Injury, Percent		Corn Yields, Bu/A	
Treatment	Rate Lb/A	Without Additives	With Additives	Without Additives	With Additives
Dicamba	1/16	10.6	11.9	147.3	143.0
Dicamba	1/8	10.6	14.5	148.4	145.4
Dicamba	1/4	11.9	22.6	149.5	143.4

INCIDENCE OF EUROPEAN CORN BORER IN RELATION TO VARIOUS RATES OF NITROGEN ON CORN

P. A. Jones

Five years data have now been accumulated regarding the relationship between high rates of nitrogen (N) for corn production and the establishment of European corn borer, Ostrinia nubilalis Hubner. Preliminary reports on this project were carried in the 1968 and 1970 Annual Reports of the Southeast South Dakota Experiment Farm.

Methods used from 1698 through 1970 were similar, and were outlined in the 1968 Annual Report. In 1971 and 1972 natural infestations were higher so that artificial infestations of the corn plants was not employed as had been done in the previous years. The change in method was accompanied by a decrease in the establishment of corn borer. Another factor which partially curtailed results was due to very wet field conditions in the Spring of 1972; replicates 1 and 4 were planted late and were not suitable for a source of data in corn borer establishment. The project will be continued in 1973 with artificial infestation of the corn again being utilized.

In 1968 there was no increase or decrease on corn borer establisment relative to the various rates of N. It is apparent from the next four years data that corn borer incidence increased as the rates of N increased, until the optimum rate of N, 160-11-58, was reached. (Tables 30, 31 and 32).

Shubeck and Lawrenson data on yields in this plot indicate that the highest rate of N, applied as 240-11-58, may have had a deleterious effect on the corn. The incidence of corn borer would tend to corroborate this if it is assumed that the better the corn the higher the incidence of corn borer.

The 1972 results were not entirely consistant with the previous years, in that the untreated plot (0-0-0) had a higher than normal establishment of corn borer. The effect can probably be attributed to the excellent growth of corn in all treatments, which tended to average-out the effect of the various treamtents (see Shubeck and Lawrenson report).

The least-squares analysis of variance was carried out on all the data from 1968-1972 by Dr. W. Lee Tucker, Experiment Station Statistician. The analysis indicated that even though the overall levels of infestation were not significant from year to year, infestation levels and larval count differences between treatments, or various rates of N, were highly significant.

It can be assumed that the following statement will hold true, as the optimum rates of N are attained, and corn reaches its maximum production, the incidence and establishment of corn borers is likely to follow a parallel course. Appropriate steps should be taken by the grower to protect his investiment from possible increased losses due to corn borer.

Table 30. Establishment of European Corn Borer on Corn Treated with Various Rates of Nitrogen at the Southeast Experiment Farm, Beresford, South Dakota. 1968-1972

Broadcast Fertilizer N + P + K	Average Number Larvae/Rep/Yr.				
	1968	1969	1970	1971	1972
0-0-0	34.25	14.75	23	7.0	12.5
0-11-58*	34	19	18	9.75	7.0
80-11-58*	37.75	26.5	34	15.25	13.5
160-11-58*	34.25	24	63	17.0	13.5
240-11-58*	35	30.75	59.25	12.5	13.0

Table 31. Establishment of European Corn Borer on Corn Treated With Various Rates of Nitrogen at the Southeast Experiment Farm, Beresford, South Dakota. 1968-1972.

Broadcast Fertilizer N + P + K	Average % Plants Infested/Rep/Yr.				
	1968	1969	1970	1971	1972
0-0-0	80	45	25	52.5	62.5
0-11-58*	71.25	46.25	50	66.25	35.0
80-11-58*	75	65	72.5	75.0	67.5
160-11-58*	76.25	61.25	85	88.75	67.5
240-11-58*	76.25	70	86.25	76.25	65.0

*Received 4 lbs. N, 7 lbs. P and 7 lbs. K per acre as sideband starter in addition to broadcast treatment.
20 plants per replicate artificially infested 7-28-68, 7-28-69, 7-31-70 with 1 egg mass per plant. In 1971, 1972 natural infestations were depended upon for the populations of European corn borer.

Table 32. Date of Larval Counts - 1968-1972

Replicate	1968	1969	1970	1971	1972
1	8-22, 25	8-22	8-17	8-20	--
2	8-22, 25	8-22	8-17	8-20, 21	9-10
3	8-22, 25	8-23	8-18	8-21	9-23, 24
4	8-26	8-24	8-20	8-21	--

FURADAN AS A SYSTEMIC INSECTICIDE FOR EUROPEAN CORN BORER CONTROL

P. A. Jones and B. Lawrensen

Objectives

1. Evaluate Furadan for corn borer control when applied as a planting time treatment vs a cultivation treatment.
2. Compare effectiveness of 7" band of Furadan with in-furrow treatments.
3. Compare effectiveness of granular insecticide vs flowable.
4. Determine if planting date will be economically important variable to consider when Furadan is used in manner outlined above.
5. Evaluate 2 rates of Furadan as planting time treatments for corn borer control when applied at normal, and higher than normal, rates for corn rootworm control.

Methods, Materials, Procedures

A 4 replicate, randomized, complete block design was used for the experiment. Plots were planted May 22 and 26 with Pioneer 3571 in 30" rows at approximately 16,000 - 18,000 plants per acre. Atrazine 4L, at the rate of 3.5 lbs/acre, was disced in preplant. Ramrod 20G, at 3-4 lbs. actual per acre was applied at planting in a 14" band over-the-row. The Furadan was applied either as a granular 10G material or as a liquid, 4F. All Furadan band applications were in a 7" band over-the-row. Furrow applications of Furadan were made into the seed furrow directly ahead of the covering blades. The cultivation treatments were applied in a 3"-4" band on either side of the row, then incorporated by cultivation. Evaluation of treatments were made by larval counts and cavity counts taken July 31, followed by yields at harvest. All data were treated by normal statistical tests.

Results and Discussion

Low corn borer larval counts in the untreated controls were unexpected, but may have resulted from a number of factors, such as lateness of planting, leading to non-synchronization of optimum plant size and presence of adult corn borers. (Table 33).

Another factor was lateness in sampling for the larvae, as evidenced by the small number of larvae compared with larger number of cavities. (Table 34).

When the yields were examined in relation to cavity counts (= damage) there were no clear cut differences between treatments. (Table 35).

The least-squares analysis of variance, and a correlation, was carried out on all the data by Dr. W. Lee Tucker, Experiment Station Statistician. Differences between treatments were statistically significant when larval counts were used for evaluation, and were highly significant when cavity counts were compared. When the data comparing dates were analyzed, larval counts were non-significant, whereas the differences in cavity counts were highly significant. Because of the lateness in the season of the field evaluation, the cavity counts were a more reliable indicator of the differences between treatments.

Even with low populations the larval counts, and particularly the cavity counts, do indicate that little corn borer mortality results from use of the normal .75 lbs ai/A treatment of Furadan, as used for corn rootworm control; and there is no advantage in use of a cultivation treatment. More beneficial were the Furadan 10G treatments using the 2 lbs ai/A rates. Of these, the Furadan granules applied into the furrow were better than band application. When Furadan flowable (= liquid) was compared to the granular Furadan, the better treatment was the band application of Furadan liquid.

At the present time Furadan in either the granule or liquid formulation is labelled for use at a maximum rate of 1 lb ai/A for rootworm or for European Corn borer. The use of Furadan granules at the higher rates of 1.5 - 3.0 lbs ai/A has recently been registered as a planting time treatment for southwestern corn borer. This insect does not occur in South Dakota at the present time.

Table 33. Incidence of First Brood European Corn Borer Larvae in Corn Treated at Planting Time With the Systemic Insecticide Furadan. (Data Taken July 31, 1972)

Treatment		Planting (Treatment) Dates			
		May 22, 1972		May 26, 1972	
Compound and Formulation	Rate (lbs. A.I./A.) and type of application	No. of larvae* Ave./Rep. (range)	% Reduction from Check	No. of larvae* Ave./Rep. (range)	% Reduction from Check
Furadan 10G	.75# Band	3.25 (1-6)	+85.7	1.5(0.3)	45.5
Furadan 10G	2# Furrow	.75(0-1)	57.1	.25(0-1)	90.9
Furadan 10G	2# Band	0 (0)	100	1.25(0-2)	54.6
Furadan 4F	2# Band	0 (0)	100	.25(0-1)	90.9
Furadan 10G + Furadan 10G	.75# Band 1# Cultivation	1 (0-2)	42.9	1.5 (0-3)	45.6
Dyfonate 20G +Furadan 10G	1# Band 1# Cultivation	1 (0-2)	42.9	2.25(1-3)	18.2
Untreated		1.75(0-3)	--	2.75(0-6)	--

*Larval counts from dissection of 5 plants from 2 locations in each treatment for a total of 10 plants per replicate in each of 4 replicates.

Table 34. Incidence of Cavities From First Brood European Corn Borer Larvae in Corn Treated at Planting Time With the Systemic Insecticide Furadan. (Data Taken July 31, 1972)

Treatment		Planting (Treatment) Dates			
		May 22, 1972		May 26, 1972	
Compound and Formulation	Rate (lbs. A.I./A) and type of application	No. of cavities* Ave./Rep. (range)	% Reduction from check	No. of cavities* Ave./Rep. (range)	% Reduction from check
Furadan 10G	.75# Band	5.5 (3-8)	12.0	3.75 (2-6)	37.5
Furadan 10G	2# Furrow	2.25(1-5)	64.0	.75 (0-2)	87.5
Furadan 10G	2# Band	3.75(2-5)	40.0	2.75 (1-5)	54.2
Furadan 4F	2# Band	.25 (0-1)	96.0	.25 (0-1)	95.8
Furadan 10G + Furadan 10G	.75# Band 1# Cultivation	4.75(1-10)	24.0	1.75 (1-3)	70.8
Dyfonate 20G +Furadan 10G	1# Band 1# Cultivation	3.5 (2-5)	44.0	2.75 (1-5)	54.2
Untreated		6.25(5-8)	—	6.0 (3-10)	—

*Cavity counts from dissection of 5 plants from 2 locations in each treatment for a total of 10 plants per replicate in each of 4 replicates.

Table 35. Yields - European Corn Borer Plot. (Yields Calculated as Bu/A. of No. 2 Ear Corn 15.5% Moisture)

Treatment		Planting (Treatment) Dates			
		May 22, 1972		May 26, 1972	
Compound and Formulation	Rate (lbs. A.I./A.) and Type of Application	Yield Bu/A Average (range)	% Increase in Yield Over Check	Yield Bu/A Average (range)	% Increase in Yield Over Check
Furadan 10G	.75# Band	118 (112-132)	4.2	114.5 (104-127)	-0.9
Furadan 10G	2# Furrow	122.75 (118-127)	8.4	117.75 (109-132)	1.9
Furadan 10G	2# Band	113.75 (99-125)	.4	124 (119-129)	7.4
Furadan 4F	2# Band	117 (104-130)	3.3	116.25 (96-132)	.6
Furadan 10G + Furadan 10G	.75# Band 1# Cultivation	116.5 (113-118)	2.9	114 (105-121)	-1.3
Dyfonate 20G +Furadan 10G	1# Band 1# Cultivation	125.5 (121-130)	10.8	111.25(96-133)	-3.7
Untreated		113.25(93-126)	--	115.5(104-124)	--

WESTERN CORN ROOTWORM CONTROL

B. H. Kantack, J. Fredrikson, B. Lawrensen and W. L. Berndt

Incidence of infestations and severity of infestations of Western Corn Rootworm remained at high economic levels in South Dakota again in 1972. Rootworm populations have remained at economic levels since the resistant Western Corn Rootworm became well established in 1963. A number of problem fields were observed in 1972 where the insecticides used failed to give adequate control. A small number of fields treated with Bux developed problems in 1971, however during the 1972 season the field developing problems increased. The results of a survey of South Dakota dealers on corn rootworm performance is shown below:

CORN ROOTWORM INSECTICIDE PERFORMANCE IN SOUTH DAKOTA
(Results of dealer and county agent survey conducted during October, 1972)

Insecticide	Complaints
Bux	87
Thimet	9
Furadan	3
Mocap	1
Dyfonate	1
Dasanit	0

The corn rootworm infestation on the demonstration plot located on the Southeast Experiment Farm was very spotty and too light for evaluation of the different insecticides formulations. Thus no results are shown for this plot in 1972.

Field observations on a number of fields during the last two growing seasons (1971-72) have shown a lack of consistent corn rootworm control on some fields where Bux was used at planting time. In view of these facts and observations we felt it is much to risky for South Dakota farmers to continue using Bux as a planting time application for control of corn rootworm in South Dakota. Thus we are withdrawing our recommendation for Bux in the 1973 recommendations.

Caution

Insecticides are poisonous - handle and store them with care. Be sure to read the label and follow directions to the letter. Keep children and pets out of the area where chemicals are stored, mixed, or used. Do not contaminate feed, feed containers, or water troughs. Clean all contaminated planting equipment carefully. Destroy all emptied containers so they cannot be reused for any purpose.

CORN ROOTWORM RECOMMENDATIONS FOR USE AT PLANTING TIME FOR 1973
(Listed in reverse alphabetical order)

Insecticide and Formulations	Ounces of formulation per 1000 ft. row	Amount actual per 13,080 ft. of row
Thimet 15G	8.0	1 pound
Mocap 10G	11.5	1 pound
Furadan 10G	9.2	3/4 pound
Dyfonate 20G	6.0	1 pound
Dyfonate 10G	11.5	1 pound
Dasanit 15G	8.0	1 pound

NOTE: Landrin, a newcomer, will be recommended and available in limited supply during 1973. A major change in our 1973 recommendations is the removal of Bux from the recommended list. Diazinon which has been recommended in northern areas on late planted corn is also being removed from the recommended list for rootworm control.

CORN PERFORMANCE TRIALS

J. J. Bonnemann

The 1972 corn performance trials included the most entries under trial since the program was begun in 1961. Eighty hybrids, commercial and Experiment Station entries, were in the 1972 test.

The corn was drilled in single rows, 30 inches apart, 31 feet long on May 10. Harvest was by picker-sheller on October 25. Two populations were intended at 16,- and 20,000 plants per acre but actual counts in late August averaged 15,300 and 18,500 for the two populations. Yields reported are the mean of the two populations for each entry as differences between populations were not statistically significant.

The 1972 yields are excellent for most hybrids. The mean yield for the entire trial was about 133 bushels per acre. The moisture at harvest averaged 21% for all entries.

The results are presented in Table 36. Additional information will be found in an upcoming circular, 1972 Corn Performance Trials.

Table 36. Corn Performance Trial, Area E, Southeast Experiment Farm, Beresford, 1972

Brand and Variety	Type	Cross	Performance Score	Percent Moisture	Percent Stalks Broken	Yield B/A
Cargill 930	N	M2X	3	23.2	8.8	171.3
Curry's SC-159	N	2X	3	23.3	9.6	169.8
McCurdy's 69-111	N	2X	1	20.7	0.6	167.1
Trojan TXS 111	N	2X	2	21.3	0.5	166.2
Curry's SC-160A	N	2X	5	24.1	0.0	161.7

Table 36 continued on next page.

Table 36. Continued

Brand and Variety	Type	Cross	Perfor-mance Score	Percent Moisture	Percent Stalks Broken	Yield B/A
Trojan TXS 113	N	M2X	6	23.1	2.7	160.4
Sokota TS-75	N	2X	11	24.1	13.7	156.2
McCurdy's MSX 66	N	2X	7	21.1	5.0	156.1
P-A-G 344	N	3X	8	22.8	0.6	154.1
Sokota TS-85	N	2X	10	25.2	3.8	154.0
Pride R-771	N	3X	9	22.0	4.5	151.7
Pioneer 3387	N	2X	12	24.5	2.2	150.6
Payco SX1093	N	2X	14	20.3	13.3	150.3
Wilson's 1017	N	2X	24	21.0	22.2	148.0
Curry's TC-358B	N	3X	21	22.8	13.6	147.5
Pioneer 3517	N	M2X	15	22.0	3.2	147.2
Embro X2	N	2X	13	19.6	5.0	145.8
O's Gold SX 2102	N	2X	16	19.7	5.3	145.3
McCurdy's 71-5	N	2X	23	21.7	11.5	145.0
Trojan TXS 115	N	2X	33	25.5	12.0	145.0
Earl May F25	N	2X	29	21.8	11.1	142.5
Pioneer 3390	N	M2X	17	21.9	1.8	142.4
Pride R-728	N	3X	31	21.9	14.1	142.0
Pioneer 3388	N	M2X	25	23.6	1.7	141.7
Curtis A201	N	2X	20	19.4	6.5	140.8
Disco SX 17	T	2X	19	19.4	5.4	140.4
Fontanelle F 440	N	2X	34	19.1	21.7	140.1
Cargill 456	N	3X	35	21.5	15.8	140.0
Sokota MS-84	N	M2X	47	22.9	24.0	139.5
Pride R-450	N	3X	22	19.4	4.5	139.3
P-A-G SX 56	N	M2X	32	23.8	2.7	139.0
Trojan TXS 102	N	2X	27	19.0	9.4	139.0
ACCO UC 4601	N	2X	39	22.9	12.6	138.8
Renk RK 44	N	2X	18	18.9	2.2	138.8
Disco SP 170	T	3X	42	21.1	24.6	138.6
Curry's SC-146	N	2X	44	21.6	23.1	138.0
Payco SX 986	N	2X	28	19.5	6.2	137.7
ACCO U 378	N	3X	41	23.5	8.9	137.4
Pioneer 3520	N	3X	30	21.4	1.6	137.3
McCurdy's 2X4	N	2X	26	19.1	4.4	137.2
McCurdy's MSP 3X3	N	2X	40	20.7	13.8	136.6
Earl May F23	N	2X	38	19.3	11.3	134.0
Curry's TC-344A	N	3X	37	22.8	1.6	133.9
ACCO TGG 678	T	4X	53	23.4	18.0	133.9
McCurdy's MSX 55A	N	2X	36	21.1	2.8	133.2
ACCO TGG 10	T	4X	54	23.3	15.2	131.9
Earl May 2095	N	3X	43	19.7	9.3	129.7
SDAES PP167	N	3X	46	22.4	2.3	129.2
Wilson's 1016	N	2X	45	19.5	7.8	128.6
Pioneer 3715	N	3X	51	19.7	8.1	127.5
Trojan TXS 104	N	2X	55	21.4	12.0	127.3
McCurdy's 71-313	T	2X	59	20.3	18.3	126.9
Western KX 55	T	2X	48	19.5	4.9	126.8

Table 36 continued on next page.

Table 36. Continued

Brand and Variety	Type	Cross	Perfor-mance Score	Percent Moisture	Percent Stalks Broken	Yield B/A
ACCO DC 3600	T	2X	52	20.6	4.9	126.5
Fontanelle F 400	N	2X	49	18.7	6.3	126.2
Trojan TXS 109	N	2X	50	21.2	0.6	125.9
O's Gold SX 2145	N	2X	58	21.4	11.8	125.9
Pioneer 3571	N	M2X	57	19.7	13.7	125.7
McCurdy's MSP 777	N	3X	56	20.6	10.6	125.4
SDAES PP162	N	4X	62	18.3	19.3	122.4
ACCO UC 3300	T	2X	64	19.1	18.4	121.9
ACCO DC 441	N	4X	67	20.4	9.3	120.7
Embro R-110	T	4X	65	20.1	9.3	118.7
ACCO U 348	N	3X	71	20.1	20.3	118.7
Trojan TXS 94	N	2X	61	18.7	8.7	118.5
SDAES PP157	N	2X	66	22.9	1.7	117.9
Earl May X 33	N	3X	73	18.7	26.8	117.7
Earl May X 32	N	2X	63	18.1	9.1	116.7
Coop S-102	N	2X	60	18.7	4.5	116.6
SDAES EX 93	N	4X	77	23.2	39.3	115.1
Pride R-501	N	3X	68	18.3	10.1	113.5
Earl May 988	N	4X	74	18.9	17.9	113.1
Pioneer 3727	N	3X	69	20.5	2.3	112.3
Embro 3 W-105	N	3X	75	18.9	17.2	112.3
Curtis 457	N	2X	70	18.7	8.1	111.8
Trojan TXS 99	N	2X	72	18.0	5.8	107.6
SDAES PP155	N	2X	76	21.8	7.8	104.4
SDAES EX 70	N	3X	79	21.6	43.1	95.1
SDAES SD 605	N	4X	80	22.1	45.8	90.6
Pride R-601	N	3X	78	19.8	20.7	90.4
			Means	21.1	10.9	133.4

C.V. = 10.7%

CORN BREEDING

D. B. Shank

Corn breeding work consisted of two yield trials of experimental hybrids, one being a test of single crosses made up of 10 inbred lines in all possible combinations, the other a regional test of three way hybrids. The regional material consisted of two tester singles combined with each of 24 new inbreds developed by various experimental stations of the North Central Region. Data from the single cross test will be used to predict performances of new 3- and 4-way hybrids for future use in southeastern South Dakota. Information from the regional test will be added to that collected by other experimental stations conducting tests on the same entries, in order to find which new inbred lines have regional adaptation.

In 1972 yields were excellent and in general lodging was not excessive. The single cross test averaged 129 bushels per acre with a average of 22.5 percent moisture while the regional test averaged 125 bushels per acre and 20.5 percent moisture. Results of the single cross test are presented in Table 37. A wide range in yields and in stalk breakage may be noted. With regard to stalk breakage, inbred line 7207 is almost impossible to stand up until harvest time because of stalk rots. It was placed in the trial to see if any of the other inbreds could keep it standing. Some were much better than others in this respect.

Results from the regional test are not available for publication.

Table 37. Corn Single Cross Test, Southeast Experimental Farm, 1972

Hybrid	Mean Yield B/A	Percent Moisture	Percent Broken Stalks
7204 x 7209*	180.9	21.0	1.8
7201 x 7209	178.9	26.2	1.9
7202 x 7209	172.1	21.3	3.6
7204 x 7210	161.3	22.9	2.8
7205 x 7208	160.9	22.1	1.8
Check A	159.6	25.0	1.9
7201 x 7210	157.9	24.5	4.6
Check B	155.2	24.9	0.0
7207 x 7209	153.7	25.8	83.6
7204 x 7208	152.7	20.3	12.5
7202 x 7210	152.3	21.1	0.9
7203 x 7209	151.3	19.3	16.5
7206 x 7208	145.3	23.4	0.0
7207 x 7210	141.8	25.5	13.5
7205 x 7207	141.2	25.0	65.1
7203 x 7204	140.7	19.1	8.1
7207 x 7208	140.1	24.2	59.8
7202 x 7208	139.9	19.0	3.1
7201 x 7204	139.6	21.6	33.0
7202 x 7204	139.5	18.5	3.9
7201 x 7203	139.2	21.5	21.8
7205 x 7210	136.5	23.6	0.0
Check C	136.1	19.9	6.3
7201 x 7205	134.7	23.8	0.0
7203 x 7208	133.4	18.2	6.4
7204 x 7207	129.2	23.6	77.6
7202 x 7203	128.2	17.3	1.8
7206 x 7209	126.9	24.4	1.1
7203 x 7205	126.6	21.1	17.0
7205 x 7209	125.2	25.1	3.7
7205 x 7206	124.7	23.5	0.0
7201 x 7206	124.6	24.5	0.0
7204 x 7206	122.6	19.8	5.9
7206 x 7207	122.0	23.6	48.6
7201 x 7207	117.6	28.5	94.6
Check D	116.9	19.6	4.7

Continued on the next page.

Table 37. Continued

Hybrid	Mean Yield B/A	Percent Moisture	Percent Broken Stalks
7202 x 7207	113.7	23.3	16.4
7203 x 7207	112.8	23.5	87.5
7201 x 7202	112.3	21.3	10.4
7206 x 7210	112.1	23.3	4.9
7204 x 7205	110.9	21.9	1.2
7208 x 7210	109.5	21.4	0.0
7203 x 7206	93.0	20.0	2.2
7202 x 7206	89.3	19.9	0.0
7202 x 7205	87.1	21.8	0.0
7203 x 7210	85.6	22.3	3.9
7201 x 7208	80.1	25.0	0.0
7209 x 7210	67.1	24.6	0.0
7208 x 7209	45.5	25.6	0.0
Mean	129.1	22.5	15.0

*7201-10 are inbred lines. Checks are commercial hybrids which have performed well in standard variety trials in previous years.

CORN DISEASES AND THEIR CONTROL

Preliminary Evidence Indicates Another Newer Strain of Southern Corn Leaf Blight in South Dakota

C. M. Nagel

What appears to be a different strain of SCLB was isolated from diseased corn leaves in 1972 in laboratory studies by a number of corn Pathologists at State Agricultural Experiment Stations. The states in which these new disease specimens have been found are South Dakota, Nebraska, Indiana, Illinois and Pennsylvania.

Although experimental evidence in some of these states is still inconclusive, information available at this time indicates the new fungus strain of *H. maydis* which can cause infection on N-type hybrids, (heretofore, resistant) may be equally destructive when compared to the current strain race T, on susceptible corns. Some widely used inbred lines appear to be susceptible.

Southern Corn Leaf Blight Still A Problem For South Dakota Corn Growers

C. M. Nagel

South Dakota corn growers are urged not to take the unnecessary risk of planting corn susceptible to Southern Corn Leaf Blight.

The disease is still in South Dakota, in fact, disease surveys made during August 1972 show the disease at its highest level in the state since its first appearance in 1969. It was at least 10 times more severe than ever before in the southeastern 1/4 of the state.

Recommendations to growers, plant N-type seed (normal type), which is resistant to the blight. This is about the only practical way in which yield losses can be controlled once the disease strikes. The principal reason why the disease was much more destructive than in the eastern corn belt, was due to the fact that an estimated 30% of the corn planted in South Dakota in 1972 was the T-type, or Texas male sterile seed, which is highly susceptible to Southern Corn Leaf Blight. N-type seed is being used by about 98% of the growers in other main corn producing states. This has drastically reduced the amount of disease and yield losses from blight in those states in 1972 which the United States Department of Agriculture estimated in 1970 caused a 700-million bushel yield loss in the Corn Belt.

Following the first season, when blight invaded South Dakota; long range over-wintering or survival experiments were established under field conditions at Brookings to determine if this new fungus disease could successfully survive South Dakota winter weather. Corn pathologists in other State Agricultural Experiment Stations in the Corn Belt were of the opinion this fungus disease, Helmenthosporium maydis, the fungus which causes the blight on corn would not survive. The reason being that the old strain of this fungus is typically a warm climate disease. It has been present on corn in Florida, Georgia and alabama for many years and, although spores (seed) of the fungus have undoubtedly been carried north by the wind to the North Central states, it apparently could not survive here over the winter, until the new strain (race T) evolved in 1969.

To determine whether the strain (race T) of the fungus could survive our winters, a long term survival experiment was established at Brookings under field conditions. Thus far the fungus has lived over winter for 2 years in dried or rotted blight infected corn leaves buried in the soil under outdoor experiments simulating plowed corn field conditions. Since the blight organism remained alive in the absence of living corn plants for 2 years at temperatures as much as 38 degress below zero, suggests that the fungus can survive in the soil more or less indefinitely and thereby remain as a constant threat for at least 2 years, following its last appearance on corn in the field. In some fields, leaf infection which developed on leaves below the ear level, was so severe that leaves were killed in about 10 days, by August 10th. The disease also causes ear infection on the husks that appear as light to dark brownish circular spots up to 2 inches in diameter. The husk or ear phase of the disease rapidly penetrates the husks and infects and rots the kernels. The blight damage in 1972 in southeast South Dakota caused an estimated 10% loss in yield in some fields.

The blight resistance in N-type seed (resistant) prevents the fungus from causing the serious leaf killing and ear rot damage that T-type or susceptible corn permits. N-type corn hybrids are not imune to blight infection. SCLB infection spots on N-type corn ears and leaves is similar in color and shape compared to those on T-type corn but, the spots remain very much smaller and therefore, very much less damaging. Most important, however, the destructive toxin is not produced by the fungus in resistant or N-type plants as compared to the susceptible hybrids. The toxin factor of the fungus on T-type plants is the cause of the greater damage to susceptible hybrids.

Yield Performances of Experimental Hybrids

C. M. Nagel and J. R. Jenison

Growing conditions during the 1972 season were especially favorable for corn. Research on the control of the major corn diseases, includes root and stalk rot and southern corn leaf blight. Control of these serious diseases is based on the development of disease resistant inbred lines of corn usually derived from open-pollinated corn varieties, commonly grown prior to 1930. Through a program of selection for healthy plants under natural field infection and inoculation experiments and then inbreeding for 6-8 generations using large plant populations, disease resistant lines may result. However, the success ratio is considerably less than 1 percent. This information will indicate how difficult it is to discover new sources of disease resistance in plants. Foliage diseases on corn usually are easily recognized however, in the case of root rot and stalk rot, the disease organisms destroy the pith and roots and therefore damage is usually not noticeable during the growing season. Even though the damage from stalk and root rot may be severely affecting the plant as reflected in poor filling of the ear tips, kernels and shortened and light-weight ears. Lodging usually results because of disease damage on the inside of the stalk and rotted roots. In 1972, in the southeastern part of the state, stalk rot became very destructive at the base of the stalks and prematurely killed 40-60 percent of the plants in many fields about mid-August. It appeared that frequently the same hybrid was involved. Yield losses in such fields was estimated at 30-40 percent. This disease problem was root and basal stalk rot, but the corn plants developed symptoms largely of root rot and the main difference being that the stalk rot phase of the disease infected only the lower six inches of the stalk and roots, virtually rotting off the stalk just above the ground line.

Table 37 a, b and c present the performance data of 85 experimental hybrids resulting from inbred lines produced from research under this project. Data are included for 1971 and 1972 in Experiment 1. Rainfall was much less in 1971 than 1972, accounting for the lower yields. However, the yields are nevertheless valid, as the results are comparable between identical experimental hybrids and the commercial checks in a given experiment in a given season.

Table 37a. Performance Rating of New Experimental Hybrids Varying in Root and Stalk Rot Resistance Compared With 4 Different Commercial Hybrids Commonly Grown in the Area. Centerville Research Farm. Experiments Were Check Planted in 38-Inch Rows, 4 Kernels Per Hill. Planted May 20, Harvested October 28, 1972. Plants/Acre, Average 15,400.

	1972				1971	
Expt'l Hybrid or Commerical Check	Yield Bu/A	Ear Moisture %	% Lodging	Perfor. Score Ranking	Yield Bu/A	Ear Moisture %
Experiment #1						
Expt'l #1	148.2	34.3	0.0	105.2		
Pioneer 3387 (ck)	143.4	31.4	0.0	104.7	82.8	31.0
Expt'l #2	142.9	29.4	0.5	105.4		
3	139.3	29.5	0.4	103.9		
4	138.8	26.6	0.5	105.0	80.9	28.5
5	137.3	27.3	0.0	104.2		
DeKalb XL 361(ck)	136.8	31.3	0.4	102.0	97.7	32.7
Pioneer 3390 (ck)	136.4	28.6	0.0	105.6	81.2	29.5
Expt'l #6	134.5	27.7	0.0	102.9		
7	131.7	19.8	2.2	105.0	76.8	17.3
8	131.3	26.1	4.1	101.7	77.4	30.1
9	131.2	27.6	3.7	101.0		
10	131.1	24.9	4.8	102.1	68.6	25.1
11	129.9	27.0	0.0	101.1	65.9	25.0
12	127.7	26.4	5.4	100.0	72.3	27.5
Funks G 4444 (ck)	126.9	23.6	0.0	101.8	86.4	21.8
Expt'l #13	123.9	25.3	4.9	99.0	74.6	24.2
14	123.8	24.0	0.0	100.4	96.4	21.2
15	122.1	21.0	1.3	100.9	91.7	18.2
16	120.9	18.7	0.9	101.6		
17	119.9	20.4	3.1	100.0		
18	116.7	24.8	2.5	96.8		
19	115.7	24.8	0.0	96.8	82.7	22.5
20	115.4	23.3	1.3	97.1	78.8	22.8
21	113.4	30.6	3.3	92.6		
22	112.9	24.6	1.8	95.5	79.0	23.0
23	107.2	27.3	0.0	92.2		
24	103.4	24.7	7.5	90.8		
25	102.1	21.2	4.5	92.4		
26	100.7	22.6	4.9	91.1		
Average Yield	124.4					

C.V. = 6.5%
F = 7.44**
L.S.D. = 13.2 bushels

Table 37b. Continued

Expt'l Hybrid or Commercial Check	Yield Bu/A	Ear Moisture at Harvest, %	% Lodging	Performance Score Ranking
Experiment #2				
Pioneer 3387 (ck)	144.4	30.0	0.5	106.2
DeKalb XL 361 (ck)	143.6	30.9	0.5	105.4
Pioneer 3390 (ck)	142.6	28.3	0.0	106.3
Expt'l #27	137.8	21.8	0.5	107.4
28	136.7	25.3	1.3	105.3
29	131.5	28.9	0.0	101.6
30	129.8	28.1	9.5	99.9
31	129.6	21.9	0.5	104.1
32	129.6	31.9	0.0	99.4
Funks G 4444 (ck)	129.3	22.8	0.9	103.5
Expt'l #33	129.2	31.7	0.5	99.3
34	128.7	30.1	0.0	99.9
35	126.4	31.2	0.0	98.5
36	125.0	24.5	1.0	100.9
37	125.0	29.6	0.0	98.7
38	124.6	25.7	0.5	100.3
39	124.2	25.3	1.0	100.3
40	122.7	25.7	1.5	99.4
41	122.0	19.5	0.0	102.3
42	121.2	25.1	1.3	99.1
43	121.1	24.0	4.0	99.1
44	119.3	28.1	0.0	97.1
45	118.9	23.9	1.5	98.7
46	118.7	24.9	7.8	97.2
47	117.3	25.8	0.0	97.4
48	116.8	19.3	0.0	100.3
49	116.5	30.7	0.0	94.7
50	114.8	26.6	0.0	96.0
51	114.4	19.6	9.8	97.7
52	114.0	26.1	1.8	95.7
53	109.7	23.8	10.2	93.8
54	106.5	25.4	1.8	93.0
Average Yield	124.7			

C.V. = 7.4%
F = 3.1**
L.S.D. = 14.9 bushels

Table 37c. Continued

Expt'l Hybrid or Commercial Check	Yield Bu/A	Ear Moisture at Harvest %	% Lodging	Performance Score Ranking
Experiment #3				
Expt'l #55	150.3	21.9	0.0	113.1
56	146.7	27.7	0.0	108.9
Pioneer 3390 (ck)	144.3	26.4	0.0	108.6
Pioneer 3387 (ck)	144.2	31.4	0.0	106.1
Expt'l #57	136.4	31.4	0.5	102.9
DeKalb XL 361 (ck)	136.3	30.2	0.5	103.4
Expt'l #58	135.4	22.3	0.0	107.0
59	133.8	33.5	0.0	100.9
60	133.4	27.7	0.0	103.6
61	132.3	26.0	0.5	103.9
62	131.7	27.5	0.0	103.0
63	126.6	24.4	8.2	101.2
64	126.6	26.5	1.4	101.2
65	126.4	28.6	4.8	99.6
66	124.2	27.6	0.9	99.8
67	124.0	30.7	0.0	98.3
68	123.8	26.1	0.0	100.4
Funks G 4444 (ck)	123.7	22.5	0.9	102.0
Expt'l #69	121.5	26.2	0.0	99.5
70	121.1	31.6	0.0	96.7
71	120.3	30.4	0.0	97.0
72	119.9	26.6	0.0	98.7
73	118.3	28.2	0.0	97.2
74	117.6	25.9	3.3	97.6
75	117.1	28.1	0.5	96.7
76	116.2	25.9	0.0	97.5
77	115.8	25.7	0.0	97.4
78	115.5	23.4	1.4	98.2
79	110.3	25.1	6.3	94.6
80	108.7	28.1	0.5	93.3
81	106.0	26.6	11.5	91.3
82	104.6	28.3	0.0	91.7
83	92.8	27.4	0.0	87.4
Average Yield	124.3			

C.V. = 6.8%
F = 6.8**
L.S.D. = 13.7 bushels

DATE OF PLANTING SOYBEANS

F. Shubeck and B. Lawrensen

Objectives of Experiment

1. Will early planting dates decrease yields of early maturing soybean varieties?
2. Does day length and time of planting seriously affect soybean yield?
3. Can a planting date be selected for early maturing varieties that will prevent improper day length from triggering premature flowering?

Methods and Procedures Used in Soybean Study

Nov. 10, 1971 - Plowed plot area.
May 16, 1972 - Sprayed 1½ pint of treflan per acre and incorporated immediately.
May 18, 1972 - First planting date.
May 26, 1972 - Second planting date.
June 6, 1972 - Third planting date.
June 21, 1972 - Cultivated all planting dates and all varieties.
October 10, 1972 - Harvested.

Table 38. Effect of Soybean Variety and Date of Planting on Yield in Bushels Per Acre

	Planting Dates		
Variety	May 18	May 26	June 6
Anoka	37	35	36
Chippewa	36	33	35
Hark	38	37	38
Corsoy	42	41	40

Discussion and Interpretation of Table 38

Growth and development of soybeans are influenced by length of day and night. A definite number of hours of darkness is necessary for each variety before flowering will begin. Under continuous light, some varieties will never produce flowers. The very early varieties adapted to northern areas will flower with relatively long days and short nights.

Length of day for soybean growth is controlled by the planting date. Therefore, growth and development of soybeans can be influenced by planting dates.

The object of this experiment was to select a planting date giving optimum environmental conditions including day length.

Two early varieties and two full season varieties were selected for the test. Each of the four varieties was planted on three different dates spaced a little over a week apart.

Results for 1972 show that the full season Corsoy yielded more than the other varieties on all three dates of planting. The yield of Corsoy decreased gradually as planting dates were delayed.

The two early varieties, Anoka and Chippewa, yielded almost as much on the late planting (June 6) as they did on the early planting date (May 18).

Yield response to planting date by Hark (a full season bean) resembled that of Anoka and Chippewa.

Perhaps the most interesting result of this first year is the good yields produced when planting date was delayed as late as June 6.

Table 39. Relation of Planting Dates and Soybean Varieties to Plant Height in Feet

	Measured at 1st Flowering			Measured at Maturing		
Variety	Planted May 18	Planted May 26	Planted June 6	Planted May 18	Planted May 26	Planted June 6
Anoka	1.4	1.0	1.2	2.4	2.4	2.4
Chippewa	1.4	1.4	1.1	2.8	2.8	2.6
Hark	1.3	1.0	1.1	3.2	3.1	2.9
Corsoy	1.5	1.2	1.3	3.1	3.1	3.1

Discussion and Interpretation of Table 39

The earliest planting date had the tallest beans at first flowering. Note also that this planting date yielded the most soybeans (see preceding table).

When the vegetative period between emergence and flowering is shortened due to daylight period, the effect on the soybean plant is usually a reduction in both yield and height*.

Beans planted the last week in May and the first week in June were shorter when they began to flower and yielded less than the early planting.

Height differences at maturity due to planting dates were small.

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*Modern Soybean Production by W. O. Scott and S. R. Aldrich.

SOYBEAN ROW SPACING (30" vs 7")

F. Shubeck and B. Lawrensen

Objectives of Experiment

1. What are the possibilities of planting soybeans with the grain drill and not cultivating weeds?

2. Is there any yield advantage in narrowing rows down to 7 inches?

Methods and Procedures Used for Soybeans

Nov. 1971 - Fall plowed.
May 31, 1972 - Sprayed treflan at the rate of 1½ pints per acre and incorporated immediately by tandem disking.
June 1, 1972 - Spike-tooth harrowed plot and planted 30" rows and seeded 7" rows with John Deere press drill.
June 27, 1972 - Cultivated 30" rows.
October 17, 1972 - Combined all plots.

Table 40. Comparison of 7 Inch and 30 Inch Row Spacings for Soybeans

Row Spacing	Bu. per Acre
7 inch (planted with grain drill)	43
30 inch (planted with tool bar planter)	43

Discussion and Interpretation of Table 40

Yields from the two planting methods and row spacings were identical this year. In 1971, yields from the two planting methods were also about the same. In 1970, the grain drill planted beans (7 inch rows) averaged 5 bushels per acre more than the toolbar planted beans in 30 inch rows.

SOYBEAN RESEARCH AND TESTING

A. O. Lunden and G. W. Erion

Plantings at Beresford and Elk Point included Regional Uniform Tests, Standard Variety Tests, Commercial Yield Trials and a Herbicide Response test area. 1972 yields were near normal in spite of mid-summer drought near Elk Point and frost before maturity at Beresford. Commercial entries were included for the first time this year because they are being merchandised in most of the South Dakota soybean area. Yield information is needed to determine the relative yield potential of standard varieties and commercial entries in different parts of the state. Some strains have been planted out of their areas of prime adaptation and this information should assist both buyers and sellers in variety selection for 1973. These tests were performed without financial support of the companies involved but each company was contacted to suggest entries and to supply seed. Yield results and agronomic data from replicated plots at the Southeast Farm and from the Forrest Fennel farm east of Elk Point are shown in Table 41.

New soybean releases include Wells from Indiana and Steele from Minnesota. Wells is similar to Corsoy in maturity and lower in yield potential but it is more resistant to lodging and resistant to phytophthora root rot. Wells should be a good mid-season to full season variety in areas to the east where this disease is important but will be of only moderate interest in South Dakota. Steele is

slightly later than Chippewa in maturity, about three bushels above Chippewa in yield potential and is resistant to Phytophthora. Steele should be a good early to mid-season variety in most of South Dakota and will probably be recommended in the northern half of the state. Three and four year yield results of the most important standard varieties are recorded in Tables 42 and 43.

Table 41. Soybean Yields and Agronomic Data - 1972

	Southeast Research Farm			Elk Point			
Entry[1]	Yield Bu/A	Plant Height	Lodging[2]	Yield Bu/A	Plant Height	Lodging	Days to Maturity[3]
Amsoy	40.0	45	1.5	46.0	40	1.4	+4
Beeson	36.9	41	1.3	39.5	36	1.3	+5
Calland	--	--	--	38.1	38	2.2	+15
Corsoy	42.1	41	1.6	45.4	35	1.9	0
Hark	34.9	36	1.5	41.5	35	1.6	+1
Provar	38.1	38	1.6	42.1	33	1.5	+3
Rampage	37.5	37	1.4	38.4	34	1.4	+1
Steele	36.5	38	1.5	--	--	--	--
Wayne	41.3	40	1.8	44.9	37	2.1	+10
Wells	40.0	41	1.2	43.7	36	1.2	+2
Wirth	37.8	36	1.4	--	--	--	--
FFR 950168	25.0	41	1.6	--	--	--	--
FFR 950169	25.5	41	1.4	39.2	34	1.8	+4
FFR 955053	--	--	--	35.4	36	1.8	+5
FFR 955088	--	--	--	35.4	36	1.8	+5
IVR Marshall	--	--	--	37.7	35	1.5	+2
IVR Osage	34.4	37	1.3	35.6	31	1.5	0
IVR 1120	41.6	34	1.4	--	--	--	--
LOL Go42	42.5	46	1.3	43.1	41	1.4	+4
LOL Go45	33.4	37	1.3	--	--	--	--
MCC 2A	35.5	40	1.4	41.3	36	1.3	0
MCC 90+	38.7	41	1.5	45.8	34	1.5	0
PET 2090	38.1	39	1.5	--	--	--	--
PET 2100	33.1	45	1.6	44.1	37	1.6	+3
PET 2105	--	--	--	39.6	36	1.5	+7
PET 2120	--	--	--	40.2	35	2.0	+8
SRF 150	33.8	39	1.3	40.4	36	1.4	+1
SRF X 7065	38.4	46	1.4	43.3	38	1.3	+2
TAMA S-20	39.6	42	1.5	38.0	36	1.6	+1
TEW XK 505	39.5	44	1.5	44.1	41	1.7	+4
TEW XK 585	41.9	43	1.5	43.3	39	1.7	+6
TEW XR 70	--	--	--	34.3	41	2.0	+18
LSD	8.2			7.4			

[1]Entries include standard varieties from the SD AES, Farmers Forage Research Cooperative (FFR), Improved Varieties Research Inc. (IVR), Felco Land-O-Lakes Inc. (LOL), McCurdy Seed Co. (MCC), Peterson Seeds (PET), Soybean Research Foundation (SRF), Security Seed Co. (TAMA) and L. Tewles Seed Co. (TEW).

[2]Lodging is rated on the scale of 1 to 5 with the higher numbers more severely lodged.

[3]Maturity estimates based on days needed to mature relative to the earliest varieties. Zero represents the earliest variety at Elk Point in 1972. (early frost prevented maturity readings at the Southeast Research Farm.)

Table 42. Soybean Yields at Southeast Research Farm - 1968 to 1972

	1968	1969	1970	1971	1972	Average
Corsoy	43.0	plot	28.2	32.8	42.1	36.5
Wayne	40.2	lost	25.9	34.4	41.3	35.5
Provar	34.2	to hail	29.6	35.5	38.1	34.4
Rampage	38.0	in	26.7	29.0	37.5	32.8
Amsoy	34.8	1969	37.4	30.3	40.0	33.1
Hark	38.8	no	24.3	28.4	34.9	31.6
		yield data				
Wells	35.0		26.2	28.5	40.0	32.4
Wirth	34.9		26.8	26.9	37.8	31.6
Beeson	32.7		23.8	28.8	36.9	30.6
Steele	--		--	30.8	36.5	--
LSD	NS	7.8	5.2	8.2		

Table 43. Soybean Yields at Elk Point, South Dakota - 1969 to 1972

	1969	1970	1971	1972	Average
Wayne	45.7	plot	33.3	44.9	41.3
Corsoy	38.2	lost	38.3	45.4	40.7
Hark	37.0	to	38.0	41.5	38.8
Amsoy	38.1	drought	36.7	46.0	40.3
		in			
Beeson	37.4	1970	31.0	39.5	36.0
Rampage	34.2	no	33.6	38.4	35.4
Provar	30.2	yield	37.4	42.1	36.6
		data			
Calland	36.7		30.7	38.1	35.2
Wells	--		--	43.7	
LSD	NS		NS	7.4	

EVALUATION OF PEA BEAN VARIETIES

P. Prashar

Fifteen pea bean varieties were planted at Centerville on June 2, 1972. Rows were 20 feet long and spaced 20 inches apart. Seeds were planted 2 and 1/2 inches apart within rows. Early varieties of beans were harvested on September 12, and late varieties were harvested October 18. Yield data and bacterial blight infection readings were taken. Yield data of pea beans from Centerville was compared to yield data obtained in eastern states, where pea beans are commercially grown. This year's results indicate that the southeastern part of the state has potential to produce a profitable pea bean crop commercially. Two standard varieties yielded 20% higher at Centerville than at locations in the east. Further experiments at Centerville will be conducted to obtain more yield data on pea beans.

RESIDUAL PHOSPHORUS - OAT AND BARLEY RESPONSE

Ray Ward, Burton Lawrensen, Bernie Byrnes and Paul Carson

An experiment was established in 1964 to study the effects of various rates of phosphorus (P) fertilizer on the yield of corn. From 1964 to 1967 four rates of P (10, 20, 40, and 80 lbs. P/acre) were broadcast and plowed down annually. No phosphorus has been broadcast during the past 5 years. Each of the P treatments was divided into thirds with one-third receiving about 10 pounds of P as a starter fertilizer from 1964 through 1968, one-third receiving 10 pounds of zinc per acre in 1964 and 1965, and one-third remaining only as the broadcast phosphorus treatment.

Grain sorghum was grown in 1969 and residual phosphorus increased yields about one-third by the broadcast application rate of 10 pounds of P/A (23 lbs. of P_2O_5/A) for four years (1964-1967). In 1968 and previous years, corn yields were increased about 10 bushels per acre for the first increment of applied phosphorus. Additional broadcast P did not increase corn yields and at a high rate of addition, yields tended to decrease. Grain sorghum yields did not decrease where higher rates of P had been applied.

The 1970 and 1971 crop was soybeans. A visual response to the carry-over phosphorus fertilizer was observed during most of the growing season. Soybean growth was less on low phosphorus soil test plots than on medium to high or to very high phosphorus soil test plots. The yield on the medium to high soil test or higher was 3 to 5 bushels more per acre than on the low phosphorus plot.

Many times the question is asked does available P have a greater effect on the growth and yield of barley than oats. These plots offered an opportunity to study this question. Differences in the test values for available phosphorus were to have been checked at the end of the growing season. However, due to unfavorable weather and insufficient time only one replication was sampled. The results of these tests are reported in Table 44.

Table 44. Influence of Residual Broadcast P, Additional Starter P, and Residual Zinc on the Phosphorus Soil Test of Samples Taken in the Fall of 1973, Southeast Experimental Farm.

Total pounds of P Broadcast per Acre 1964-1967	No Residual Zn or P A	10 lbs. of P/A Per Year (4 years) as a Starter	20# of Residual Zn/A
0	11	11	8
40	30	26	23
80	21	35	23
160	54	62	50
320	108	117	112

Because it was possible to sample only 1 replication this fall the tests from samples taken in 1968 are also reported. These tests are reported in Table 45 The levels of available phosphorus as measured by the Bray 1 test are shown to have dropped a little during the past 5 years and some irregularity in the test values is noted. Inclusion of the other 3 replications would probably have ironed out these irregularities. However, the levels that were in effect at that time are for the most part still present as can be seen when the two tables are compared.

Table 45. Influence of Residual Broadcast P, Additional Starter P and Residual Zinc on the Phosphorus Soil Tests of Samples Taken in 1968, Southeast Experimental Farm.

Total Pounds of P Broadcast per Acre 1964-1967	No Additional Zn or P	10# of P/A As a Starter	20# of Residual Zn/A
	Bray No. 1 P Soil Test, Lbs. P/A		
0	13	20	11
40	37	55	34
80	57	84	62
160	95	108	88
320	140+	140+	140+

Each range was divided in half with Prilar barley being seeded on 1/2 and Kota oats on the other. The seeding was made on April 14. Thirty pounds of nitrogen was applied at planting time. Plant samples were taken for analysis at the early heading stage. The barley was straight combined with a small plot combine. The oats was windrowed and combined with a Case 9-foot combine. The plant analysis has not been completed. The 30 pounds of nitrogen caused some lodging of the oats.

Results and Discussion

May proved to be relatively dry especially in the early part of the month at this site. As a result the amount of stooling was limited. The amount of rainfall received during June was above average. This resulted in some lodging. Growth

differences could be noted throughout the growing season. The yields are reported in Table 46. The residual phosphorus had a greater effect on the barley yields than on the oat yields. This is most easily observed if the yields due to the residual phosphorus are comared with those not receiving residual phosphorus. When the barley yields of A and B are compared to those of C it appears that residual zinc depressed the yield a small amount. These differences have not been tested statistically. The same observation does not hold for oats.

Table 46. The Effect of Residual Phosphorus on the Yield of Barley and Oats, Southeast Experimental Farm, 1972

Residual Phosphorus Total Pounds of P Broadcast per Acre 1964-1967	No Additional P or Zn A		Residual Starter B		Residual Zinc C	
	Oats	Barley	Oats	Barley	Oats	Barley
	bu/A		bu/A		bu/A	
0	68.0	19	65	28	73	21
40	69.0	31	73	37	77	34
80	70.0	41	72	34	75	35
160	73.0	36	72	37	71	34
320	72.0	40	72	36	71	36

STANDARD VARIETY OAT TRIALS

J. J. Bonnemann

Small grain rod-row trials were limited to oats at the Southeast Farm in 1972. Farm personnel seeded drill strips of other small grains for observational use and crop tours.

The data included in this report (Table 47) are bushel yield, test weight, and available three-year averages.

The trial was seeded on April 19. Moisture and seedbed conditions were good. Four replications were harvested. Yields were good though test weights were rather low for some varieties.

Table 47. 1972 Standard Variety Oat Trials, Southeast Farm, Beresford

Variety	1970	1971	1972	3 Yr. Av.	1972 T.W.
Dupree	69.3	79.4	76.5	75.1	30.7
Burnett	79.2	93.2	68.4	80.3	32.7
Lodi	72.2	70.7	69.2	70.7	31.0
Clintland 64	72.9	78.3	70.6	73.9	35.7
Brave	58.3	93.0	66.6	72.6	31.7
Trio		88.5	88.9		34.5
Pettis	82.5	84.1	83.4	83.3	35.7
Diana			84.2		33.5
Jaycee	71.1	80.8	81.1	77.7	32.2
Holden	72.2	95.0	60.6	75.9	30.0
Portal	76.5	89.2	72.2	79.3	34.5
Kelsey	65.6	92.8	75.9	78.1	30.0
Kota	74.9	89.2	66.6	76.9	32.2
Cayuse		81.0	66.4		24.5
Otter	65.1	74.5	60.9	66.8	30.5
Nodaway 70	79.2	94.6	83.1	85.6	34.0
Froker	70.3	73.9	86.8	77.0	35.8
Grundy			83.9		35.0
Chief	78.1	96.0	81.9	85.3	35.8
Dal			79.6		36.5
Randon		70.2	60.1		25.0
M-72			74.3		37.0
McCurdy 3306			77.8		37.5
SD 955		82.7	90.9		34.5
Ill. 66-2287A		88.2	80.3		33.0
		Mean	75.6		
		LSD-.05	8.6		
		CV-%	8.1		

SORGHUM - POTASH - LODGING EXPERIMENT

Paul Carson, Fred Shubeck and Burt Lawrensen

It has been reported that the addition of potash when applied as a starter fertilizer reduced lodging of sorghum when soil tests for available potassium were in the medium range. The supply of exchangeable potassium in South Dakota soils is frequently higher than that reported in the work referred to above but lodging of sorghum is a serious problem. Because of the seriousness of the lodging problem and the fact that an experimental site was available where levels of potassium had already been established previously, this experiment was undertaken.

Objectives

1. Will an annual application of potassium, concentrated in a band, influence stalk breakage and lodging in grain sorghum?

2. Will potassium absorbed on the exchange complex and the potassium trapped by micaceous clays from previous high level potassium treatments be an important factor in stalk breakage?

Methods and Materials

1. A site where earlier studies involving large amounts of added potassium was used. The past treatments resulted in variations in the level of exchangeable potassium. These levels vary from high to higher. The soil tests on the samples taken in April 1972 are shown in Table 48. The sample tested for each treatment was a composite of samples taken from the four replications.

Table 48. Soil Test Values Found in Samples From Plots in Experiment 1972

Treatment*	O.M.	P	K	pH	Salts mmohs/cm	Texture
	%	lbs/A	lbs/A	1:1	1:1	
12-17# K	3.7	26	567	6.4	.39	silc
500# K	3.8	26	682	6.3	.39	silc
no K	3.4	25	477	6.3	.35	silc

*The amount of K applied in the previous experiment.

2. The original experiment had 8 replications. This made it possible to apply 30 pounds of K_2O per acre beside and below the seed at planting time on 1/2 of the plots. This gave 4 replications of the past treatments with 30 pounds of starter K and 4 replications without starter K.
3. All plots received 100 lbs. of nitrogen per acre and 46 lbs. of P_2O_5 per acre. These were applied as a broadcast application prior to planting.
4. Pioneer 866 was planted June 1 in 30-inch rows at the rate of 70,000 seeds per acre. A final plant population of 60,000 plants per acre was the objective.
5. Ramrod was applied in a band at planting time.
6. Leaf samples were taken at heading time. The analysis have not been completed.
7. Yield samples were taken by cutting and weighing the heads from 30 feet of row from each treatment on October 26.

Results and Discussion

Yield results are reported in Table 49. Starter potash applied in 1972 appeared to increase sorghum yield slightly in plots where no K was applied previously and also where 1,500 lbs. of K had been applied. Where only a small amount of K had been applied earlier (36-42 lbs./Acre) the 1972 applications did not increase yield. These small differences do not appear to be statistically significant.

Lodging did not occur until the first week in December when an ice storm was encountered. As a result of the ice all of the sorghum lodged at one time.

Table 49. Potash and Grain Sorghum Yields, 1972

Residual Treatments	Starter K Added in 1972 none	lbs. K_2O/A 30
lbs. of K/A	Yield of Grain lbs/A	
0	5643	5937
1500	5892	5928
36-44	5900	5767

GRAIN SORGHUM PERFORMANCE TRIALS

J. J. Bonnemann

Twenty-six grain sorghum hybrids were entered in the 1972 Grain Sorghum Performance Trials at the Southeast Farm. Of these, seven were included by the Agricultural Experiment Station.

The trial was seeded on May 22 and harvested on October 4. Row spacing was 30 inches. Ramrod and Diazanon were banded over the row at time of seeding. Excellent yields of good quality grain were obtained from most entries.

The results of the 1972 trial appear in Table 50. Additional information will be found in the upcoming circular, 1972 Grain Sorghum Performance Trials.

Table 50. 1972 Grain Sorghum Performance Trial, Area E, Southeast Experiment Farm, Beresford

Brand and Variety	Yield lb/A	Test Wt. lb/B	Height, inches	Percent moisture 9/26/72
Northrup-King 265	8335	59	60	22.6
Pioneer 866	8280	58	57	24.2
Frontier 400C	8075	58	59	27.6
NB 635	7975	60	52	34.6
NB 634	7740	60	56	34.1
RS 506	7505	57	61	21.1
Northrup-King 233	7480	59	55	22.2
ACCO R 1019	7415	58	51	30.5
ACCO R 1029	7375	58	52	25.0
Frontier Super 400A	7375	57	53	23.6
Northrup-King 180	7370	58	51	25.9
RS 610	7355	58	57	25.4

Table 50. Continued

Brand and Variety	Yield lb/A	Test Wt. lb/B	Height, inches	Percent moisture 9/26/72
Northrup-King 222	7300	58	46	24.7
DeKalb C-42Y	7290	60	61	35.+
SD 25702	7150	57	49	23.8
SD 503	7030	57	64	23.1
DeKalb C-42C	7010	59	58	34.0
DeKalb C-42A	7000	58	52	32.3
ACCO R 1010	6975	60	65	19.0
Frontier 389	6810	59	53	22.8
Western WS 206	6720	58	52	24.0
SD 451	6675	56	62	20.6
Pride P-800Y	6590	58	45	25.6
Curry's 530	6540	59	50	22.6
Pioneer 883	6425	54	48	21.2
Pride P-550BR	6115	57	55	19.3
Mean	7225			

C.V. = 6.3%

GREENBUG CONTROL EXPERIMENTS WITH SYSTEMIC INSECTICIDES ON GRAIN SORGHUM

B. H. Kantack, P. A. Jones, F. Shubeck, B. Tyler and B. Lawrensen

Greenbug Schizaphis graminum Rondani continues as a major pest on sorghum in South Dakota. This greenbug control study is on a continuing basis to:

1. Evaluate systemic insecticides for Greenbug control.
2. To determine effective rates of insecticides at the lowest cost to the growers.
3. To obtain efficacy and residue data for newer systemic insecticides which are presently unregistered by the Environmental Protection Agency.

The insecticides reported on in this experiment for 1972 as indicated in the table were subjected to a different infestation pattern as in previous years. The greenbug infestation developed on the seedling stage in mid-June and then greenbug populations dropped to non-economic levels for the remainder of the growing season. Aphid numbers did not present a severe economic stress on these plants at anytime. Unfortunately this lack of sufficient population pressure made it impossible to differentiate the degree of control between the insecticide treatments. Yields results for the experimental plots are shown in Table 51.

Table 51. Greenbug Control on Sorghum at the Southeast Farm, 1972

Insecticide	Dosage lbs. A.I./acre	Yield Bu/acre
Temik	1.0	93
AC 92,100	0.5	93
Furadan	1.0	92
Orthene	0.5	92
CGA 12,658	1.0	91
Orthene	1.0	90
Furadan (In furrow)	1.0	90
Orthene (seed treat)	5 oz./100 lbs. (seed)	88
Di-Syston	1.0	88
AC 92,100	1.0	88
Check	--	86
Furadan	0.5	82

Averages based on 4 replicates. All treatments applied in 4-inch band above seed unless otherwise indicated. Statistical analysis indicated no significant differences between treatment means.

Recommendation for Greenbug Control on Sorghum

Economic thresholds depend on plant size and growing conditions. Suggested guidelines before control measures should be applied are shown below.

Plant Size	When to Treat
Emergence to 6 inches	Visible damage with colonies of aphids on most plants and 10 to 20 greenbugs per plant, 10 on smaller plants.
Six inches to pre-boot	When aphids are present on plants and evidence indicates that entire leaves will be killed.
Pre-boot and larger	When numbers are sufficient to kill the lower two to four leaves.

Economic damage can vary from complete loss of a field where seedlings are infested to severe yield reduction in fields where larger plants are attached. Plants growing under moisture stress are more susceptible to greenbug injury than plants growing in adequate soil moisture. Under low moisture stress benefits from insecticide treatment for greenbugs are greatly increased.

Planting-Time Treatments

Research in South Dakota over the last four years has shown that the systemic insecticide Di-Syston in granules is very effective in controlling greenbug infestations. This systemic insecticide should be applied at planting time in a 4-inch band above the seed and incorporated one-half inch into the soil. The incorporation can be accomplished by dropping the granules ahead of the packer wheels. Granules can be dispensed either through a granular attachment on planters or grass seeder attachments where grain drills are utilized for planting operations. Where recommended granules have been used at planting-time, season long greenbug control has been obtained. Although a few aphids persist on treated plants economic populations do not build up. The advantage of these planting time treatments is the elimination of the necessity for foliar sprays. Liquid systemic insecticides used as planting time treatments have not given greenbug control through the season.

Foliar Sprays

Where infestations develop in fields not treated at planting time foliar sprays maybe necessary to bring about control. As shown in Table 52 several insecticides are registered and recommended for use.

Table 52. Insecticides Recommended for Foliar Application for Greenbug Control On Sorghum

Insecticides*	A.I./Acre	Intervals and Precautions
Cygon	4 oz.	Do not feed or graze for 28 days. Do not apply more than 3 times per season.
Di-Syston	8 oz.	Do not apply within 7 days for grain or 28 days for forage or fodder. Do not apply more than twice per season.
Ethyl Parathion	8 oz.	Do not apply within 12 days of harvest. Post treated field to prevent entry for 3 days. Do not spray methyl or mixtures of methyl and ethyl parathion on sorghum as plant injury may occur.

*Di-Syston and Parathion are recommended for Commercial Aerial applicators only. The only insecticide recommended for ground sprayers is Cygon.

Precautions

Insecticides are poisonous, handle and store them with care. Be sure to read the label and follow the directions. Keep children and pets out of the area where chemicals are stored, mixed, or used.

Do not contaminate feed, feed containers, or water troughs. Carefully clean all contaminated planting equipment. Destroy all emptied containers so they cannot be used for any purpose.

SOUTH DAKOTA POISON CONTROL CENTERS

Sioux Falls: (Treatment and Information)
Poison Control Center
McKennan Hospital
800 East 21st Street
Sioux Falls, South Dakota 57101
Phone: 605-336-3894, G. F. Touhy, M.D.

Vermillion: (Information)
Poison Control Center
Department of Pharmacology
University of South Dakota
Vermillion, South Dakota 57069
Phone: 605-624-3432, J. N. Spencer, Ph.D.

SUNFLOWER RESEARCH

Harry A. Geise

Objectives of Research

To compare varieties of the various types of sunflowers for adaptation to the corn belt area of South Dakota. Evaluation of varieties will be based on characters such as seed yield, seed quality, plant height, and damage by birds, diseases and insects.

To evaluate herbicides by studying their effects on yield, seed quality, and weed control in Southeast South Dakota.

Sunflower Variety Trial

The variety trial in 1972 consisted of both confectionary and oilseed types. It was planted on May 10 with all plots receiving both an insecticide and a herbicide treatment.

Harvesting was completed on September 11 in order to prevent yield errors from shattering and bird depredation. The harvested heads were immediately placed in a dryer and left until dry enough for threshing.

Field observations prior to harvest indicated very little insect damage, and excellent weed control.

Sunflower Herbicide Study

An experiment including several herbicides was initiated on May 11, 1972. The treatments were composed of an experimental preplant incorporated granular pesticide (CGA-10832) at 2 rates, a preplant incorporated liquid (Treflan), and a post plant liquid (Preforan) at one rate. All plots received cultivation during the growing season.

Table 53. Sunflower Variety Trial - Southeast Research Farm, Beresford, South Dakota, 1972.

Variety	Plant Height inches	Test Weight lbs/bushel	Seed Yield lbs/acre
Oil Type-Hybrids			
S19 x R5	79	32.1	1869
S9 x R6	71	30.8	1584
Sputnik-C1	74	30.3	1370
Luch	75	29.8	1259
Oil Type-Open Pollinated			
Peredovik-66	76	29.8	1495
Record	83	30.1	1474
VNIIMK 8931-66	74	29.5	1200
Confectionary			
Commander	71	23.9	1559
Mingren	70	24.6	1291
Arrowhead	74	28.0	1334
		Mean	1444

Table 54. Effects of Weed Control Chemicals on Yield and Test Weight of Oilseed Sunflowers, var. Peredovik 66 - Southeast Research Farm, Beresford, South Dakota, 1972.

Herbicide	Rate of Application	Test Weight lbs/bushel	Seed Yield lbs/acre
CGA-10832 (5G)	1.0#/a	27.2	1227
CGA-10832 (5G)	2.0#/a	28.5	1283
Treflan 4#a.c./gal	0.5#/a	27.5	1372
Treflan 4#a.c./gal	1.0#/a	26.5	1616
Preforan 3.0#a.c./gal	4.5#/a	26.2	1466
Check		28.2	1564

The plots were harvested on September 11. There was excellent weed control and all plots were uniform in stand. The differences between yields as shown in Table 54 are not statistically significant.

ALFALFA MANAGEMENT RESEARCH

P. D. Evenson, M. D. Rumbaugh, Dwight Hovland
and B. Lawrensen

Experiment I

The objective of this experiment is to determine the influence of soil fertility management in maintaining alfalfa stands and forage yields and in increasing economic return from this crop.

The 1970, 1971 and 1972 results from this experiment are in Table 55. It would appear from the three year average that 15 lbs. of phosphorus top-dressed gave maximum increases in yield. The potassium treatments also appear to produce slight yield increases. It should be noted that there are no significant differences between treatments at the .05 level in Table 55.

Table 55. Alfalfa Forage Yields in the Southeast Research Center Fertilizer Experiments

	Yield (Oven dry t/a)			
Treatment	1970	1971	1972	Mean
No fertilizer	3.10	3.73	6.51	4.45
15 lb. P/Acre/Year	3.50	4.16	7.58	5.08
30 lbs. P/Acre/Year	3.55	4.18	7.32	5.02
60 lb. P/Acre/Year	3.55	4.40	7.15	5.03
120 lb. P + 15 lb. P/Acre/Yr.	3.28	4.40	6.78	4.82
300 lb. P	3.54	4.24	7.02	4.93
200 lb. K/Acre/Year	3.42	4.13	6.65	4.73
300 lb. P + 200 lb. K/Acre/Yr.	3.61	4.46	7.22	5.10
Mean	3.44	4.21	7.03	4.90

Experiment II

The objective of this experiment is to develop methods of altering temperatures of alfalfa crowns, shoots and foliage during critical periods of plant growth in order to enhance plant dry matter production.

Table 56 contains the 1970, 1971 and 1972 results of this experiment. Most of the treatments appear to decrease yields when averaged over the three year period of this experiment. The high average yields recorded for 1972 indicate that near optimal growing conditions existed during the growing season. Alfalfa plants which are not under moisture stress require a higher soil temperature for optimal growth than plants which are under stress. The high yields recorded in 1972 are indicative of low moisture stress. Therefore, cooling the plant under these conditions was not beneficial.

Table 56. Alfalfa Forage Yield in the Southeast Research Center Mulch Experiment

Treatment	Yield (Oven dry T/A) 1970	1971	1972	Mean
Control	3.57	4.28	7.25	5.03
15 lb. N/A	3.74	4.33	7.27	5.11
Louver and straw mulch	3.76	3.42	5.97	4.38
Cloth and straw mulch	3.89	3.87	7.03	4.93
Styrofoam mulch	3.77	3.88	6.97	4.87
Straw mulch	3.56	3.96	6.63	4.72
Minor elements	3.53	4.25	7.20	4.99
Mean	3.68	4.03	6.96	4.89

MOST PROFITABLE ROTATION

F. Shubeck and B. Lawrensen

Objectives of Experiment

1. Which rotation or cropping sequence will bring the greatest net cash return?
2. Will the previous crop affect the available moisture during the growing season?
3. Is it more profitable to add nitrogen from a commercial source or grow a legume in the rotation?
4. How much will commercial fertilizer increase net profits?

Methods and Procedures

All crops were planted at normal planting dates except corn. Wet weather delayed corn planting until the last week in May.

Soil tests were used as a basis for fertilizer recommendations.

Varieties Used:

Corn - Curry's SC-142 (N cytoplasm)
Oats - Kota
Alfalfa - Vernal
Soybeans - Corsoy
Grain sorghum - NK 222
Sweet clover - Madrid

Table 57. Effect of Cropping Sequence and Fertilizer on Crop Yield

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	--		76.0				
1 Continuous corn	Corn	6 + 11 + 10	70		122.0				
2 Corn-oats	--	0 + 0 + 0	--	51.0	82.0				
2 Corn-oats	Corn	6 + 11 + 10	70		107.0				
	Oats	30 + 7 + 0	--	85.0					
3 Corn-corn-oats+alf-alf hay	--	0 + 0 + 0	--	72.0	91.0	102.0			3.5
3 Corn-corn-oats+alf-alf hay	Corn	6 + 11 + 10	--		104.0				
	Corn	6 + 11 + 10	70			116.0			
	Oats	15 + 26 + 0	--	76.0					
	Alf residual	0 + 0 + 0							4.2
4 Oats+sweet clover-corn	--	0 + 0 + 0	--	61.0	101.0				
4 Oats+sweet clover-corn	Oats	30 + 7 + 0	--	84.0					
	Corn	6 + 11 + 10	--		101.0				
5 Corn-soybean oats	--	0 + 0 + 0	--	77.0	72.0		37.0		
5 Corn-soybeans-oats	Corn	6 + 11 + 10	70		122.0				
	Soybeans	6 + 11 + 10	--				41.0		
	Oats	30 + 7 + 0	--	82.0					
6 Corn-oats-soybeans	--	0 + 0 + 0	--	60.0	93.0		39.0		
6 Corn-oats-soybeans	Corn	6 + 11 + 10	55		126.0				
	Oats	20 + 7 + 0	--	83.0					
	Soybeans	6 + 11 + 10	--				43.0		
7 Continuous Grain Sorghum	--	0 + 0 + 0	--					31.0	
7 Continuous Grain Sorghum	Sorghum	6 + 11 + 10	70					59.0	

Discussion and Interpretation of Table 57

Moisture distribution in 1972 was very good for corn. Yields were high and response to fertilizer was outstanding. In cropping sequence number 1 (continuous corn for 12 years) fertilizer increased corn yields 46 bushels per acre.

In cropping sequence 5 and 6, fertilizer increased yields of soybeans by 4 bushels per acre.

In sequence number 3, fertilizer increased yield of alfalfa hay by 0.7 of a ton.

In sequence number 7, yields of sorghum were nearly doubled by fertilizer.

Yields of oats in sequence 2 were increased by 34 bushels per acre.

This was certainly a year of great response to fertilizer in this experiment.

Where nitrogen needs were met by including alfalfa or sweet clover in the rotation (No. 3 and 4) responses to commercial nitrogen applications by the following grain crops were not so large.

EFFECT OF COOKED CORN IN DIETS OF GROWING-FINISHING SWINE

Richard C. Wahlstrom, George W. Libal and Richard M. Luther

A considerable amount of research has been conducted during the past few years on the effects of various methods of processing grain on performance of finishing cattle. One of the methods that has been reported to improve performance of finishing cattle is cooking corn. This method of processing grains is now possible by use of the "on-the-farm cookers" that have been developed for cooking soybeans.

Little information is known concerning the effects of cooking corn on the growth performance of growing-finishing pigs. Therefore, the objective of the present study was to evaluate the performance of pigs fed cooked or regular corn in free-choice and complete mixed ration feeding systems.

Experimental Procedure

Forty-eight crossbred pigs averaging about 60 lb. were allotted to three replications of four treatments on the basis of litter, weight and sex. The pigs were housed in a confinement type house with slotted floors.

The four treatments were as follows:

1. Cooked corn, complete mixed diet
2. Regular corn, complete mixed diet
3. Cooked corn, free-choice diet
4. Regular corn, free-choice diet

The composition of the protein-mineral-vitamin-antibiotic supplement used in this experiment is shown in Table 58. The complete mixed diets were formulated

by mixing 77.5 lb. of the respective type of corn and 22.5 lb. of supplement and fed until the pigs averaged 115 lb. From 115 lb. to market weight the proportion of corn and supplement in the diets was 87 and 13 lb. The diets formulated in this way contained 15.9% protein when fed to 115 lb. and 12.1% protein after pigs weighed 115 lb. Pigs fed free-choice were allowed corn and supplement in separate compartments of the self-feeder.

The corn was cooked in a "on-the-farm cooker" to a temperature of about 250° F. Moisture content was 9.14 and 11.29% for the cooked and regular corn, respectively.

Twenty-six pigs were slaughtered at the termination of the experiment and carcass data were obtained for length, backfat, loin eye area and ham-loin percent.

Results

A summary of the results of this experiment is presented in Table 59. The data have been combined by type of corn and method of feeding. Cooking the corn did not affect rate of gain during either the growing or finishing periods. However, pigs fed cooked corn consumed less total feed and were more efficient in that they required less feed per unit of gain. Although these differences existed during both growing and finishing periods, they were significant only during the growing period from 60 to 115 lb. in weight. For the entire trial, pigs fed cooked corn required 6% less feed per lb. of gain than pigs fed regular corn. The improvement in feed efficiency due to cooked corn is slightly over 4% when adjusted for the difference in moisture content of the corn.

Faster gains were obtained when pigs were fed complete mixed diets than when they were self-fed free-choice. These differences were statistically significant during the finishing (115 to 205 lb.) period and for the entire experiment. Pigs fed free-choice gained at a similar rate during both growing and finishing periods. The feed consumption of the free-choice fed pigs was considerably less than those fed complete diets during the finishing period. However, feed efficiency was similar with the two feeding systems. These results are not in agreement with other research where we have noted no significant differences due to method of feeding.

There were no significant differences in any of the carcass data obtained for either type of corn or feeding method.

Summary

Forty-eight crossbred pigs were used to study the effect of cooking corn and complete mixed or free-choice feeding systems. In this experiment, cooking corn did not affect rate of gain but did decrease feed consumption and improve feed efficiency. Pigs fed complete mixed diets gained about 11% faster than those fed free-choice. There was no difference in feed efficiency between the two feeding systems. Quality of carcasses was not affected by either corn or feeding method.

Table 58. Composition of Supplement

Ingredients	Percent
Soybean meal (44%)	63.1
Meat meal (50%)	20.0
Dehydrated alfalfa meal (17%)	10.0
Dicalcium phosphate	3.0
Ground limestone	1.0
Trace mineral salt (1% zinc)	2.5
Vitamin-antibiotic premix[a]	0.4

[a] Provided per lb. of supplement: 6,800 I.U. vitamin A; 1,000 I.U. vitamin D; 6 mg. riboflavin; 24 mg. calcium pantothenate; 48 mg. niacin; 240 mg. choline; 36 mcg. vitamin B_{12} and 45 mg. oxytetracycline.

Table 59. Effect of Cooking Corn on Performance of Pigs Fed Free-Choice or Complete Mixed Diets

	Corn		Feeding Method	
	Cooked	Regular	Complete	Regular
No. of pigs	24	24	24	24
Avg. initial wt., lb.	59.7	59.9	59.5	60.0
Avg. final wt., lb.	208.1	207.2	210.7	204.6
60 to 115 lb.	1.71	1.70	1.75	1.66
115 to 205 lb.	1.81	1.78	1.92[a]	1.67[a]
60 to 206 lb.	1.77	1.75	1.85[a]	1.67[a]
Avg. daily feed, lb.				
60 tp 115 lb.	3.93[b]	4.25[b]	4.11	4.07
115 to 205 lb.	5.63	5.80	6.06	5.37
Avg. feed per lb. gain, lb.				
60 to 115 lb.	2.31[b]	2.51[b]	2.35	2.47
115 to 205 lb.	3.12	3.30	3.19	3.23
60 to 205 lb.	2.81	3.00	2.88	2.93
Carcass data				
No. of pigs	13	13	17	9
Length, in.	30.25	30.30	30.25	30.30
Backfat, in.	1.16	1.09	1.15	1.10
Loin eye area, sq. in.	4.32	4.67	4.65	4.33
Ham-loin, %	42.96	42.56	42.99	42.53

[a] Significant difference due to feeding method ($P < .05$).
[b] Significant difference due to corn ($P < .05$).

RATIONS FOR STARTING BEEF CALVES ON FEED

Richard M. Luther

When newly weaned beef calves are shipped to the feedlot the kind of ration they are fed may influence how rapidly they start on feed. Calves weaned off grass and under additional stresses of shipping and handling may require a ration quite unlike that fed to calves previously on a creep and weaned prior to shipment. Some cattle feeders perfer a ration high in dry matter such as dry forage to start calves on feed. Others may wish to use a higher moisture feed such as corn silage. This experiment was designed to compare a ration composed of alfalfa hay and corn with one containing corn silage and protein supplement for starting calves on feed. Primary emphasis was on performance and daily feed consumption.

Procedure

Fifty-six Hereford steer calves purchased from a western South Dakota rancher were used in this study. The calves had been weaned in late October and were being fed 5 lb. of oats and 10 lb. prairie hay per head daily at the time of shipment. Upon arrival at the Experiment Farm, February 3, 1972, the calves were held overnight in drylot without feed and water and were weighed the following morning. These shrunk weights were used in allotting the calves to four outside pens without shelter with 14 calves per pen. Each pen had a concrete apron adjacent to the feed bunk. The calves were fed each day an amount of feed that was in excess of what they would consume. Feed remaining in the bunk was weighed back daily and discarded. A ration containing 73% chopped alfalfa hay and 27% ground corn grain was fed to two lots of steers. Another 2 lots were given a full feed of corn silage and one pound of a 40% protein supplement. The composition of the supplement was 88.7% soybean meal, 1% ground corn, 10% dicalcium phosphate with 0.3% vitamin A premix (40,000 I.U. vitamin A/lb. supplement). The experiment was terminated after 33 days. Performance was based on shrunk weights of the calves and feed consumption and efficiency comparisons on a dry basis.

Results

Results are shown in Table 60.

Table 60. Starting Calves on Feed (2-4 to 3-8, 1972 - 33 days)

14 steers/lot	Alfalfa Hay and Corn Grain			Corn Silage and Supplement		
Lot	5	8	Av.	6	7	Av.
Av. initial wt., lb.	450	450	450	450	450	450
Av. final wt., lb.	503	499	501	497	495	496
Av. daily gain, lb.	1.62	1.50	1.56	1.43	1.36	1.40
Av. daily feed, lb.						
Alfalfa hay	9.44	9.46	9.45	--	--	--
Ground corn	4.34	4.34	4.34	--	--	--
Corn silage (wet basis)	--	--	--	25.57	25.47	25.52
Protein supplement	--	--	--	0.96	0.96	0.96
Total	13.78	13.80	13.79	26.53	26.43	26.48
Total (dry basis)[1]	11.59	11.61	11.60	11.94	11.90	11.92
Feed/cwt. gain, lb.						
Alfalfa hay	583	631	607	--	--	--
Ground corn	268	289	278	--	--	--
Corn silage (wet basis)	--	--	--	1788	1873	1830
Protein supplement	--	--	--	67	71	69
Total	851	920	885	1855	1944	1899
Total (dry basis)[1]	716	774	744	835	875	855

[1]Feed samples were collected weekly and analyzed for moisture.

The calves fed alfalfa hay and corn gained 11% faster than those fed a corn silage-supplement ration. Dry matter consumption was essentially the same for the two groups (11.6 vs 11.9). Calves fed corn silage required about 15% more dry matter per cwt. gain than the calves fed the hay rations.

The weekly dry matter consumption was as follows:

Days on Feed	Hay and Corn, lb.	Corn Silage and Supplement, lb.
0 - 7	8.58	8.89
7 - 14	11.75	12.29
14 - 21	12.56	12.85
21 - 28	12.97	13.46
28 - 33	12.64	12.33

Total dry feed consumption was slightly higher for calves fed silage the first 4 weeks of the trial. Calves began refusing feed after 7 days with the silage ration and after 9 days with the hay ration. Feed refusals were common for both treatments thereafter. No sickness or digestive disturbances were encountered.

The rapidity with which both groups of cattle started on feed could be expected in view of the calves being weaned and fed some grain for over three months prior to the start of this trial. These results therefore may differ somewhat from those obtained with newly weaned calves shipped to a strange feedlot.

BACKGROUNDING BEEF STEER CALVES FOR VARYING RATES OF GROWTH

Richard M. Luther

"Backgrounding" is defined as a phase of beef production between weaning of the calf and the start of the finishing period. This period of growth falls between 300-500 lb. and 500-700 lb. An advantage in backgrounding is that gains are cheaper with lighter weight animals. A variety of forage materials including the grazing of corn stalks may be used in a backgrounding operation. The question arises as to what rate of growth a feeder should use in backgrounding for the most economical gains considering the period of growth and finishing. Experimental stations in the Midwest have conducted backgrounding trials (Colorado - backgrounding at 1.25, 1.75 and 2.25 lb. gain/day; Missouri - 1.0 or 1.5 lb./day; Ohio - all corn vs corn silage and corn). Relatively little information is available where cattle have been backgrounded at different levels of growth and followed through the finishing phase with carcass studies and economical evaluations. The purpose of this experiment was to study performance and economics of backgrounded calves followed by full feeding to a market weight of about 1,150 pounds.

Procedures - Backgrounding Phase

With the assistance of Dr. Dan Fox, Extension Feedlot Nutritionist (Animal Science, SDSU) computer projections were made to give expected backgrounding gains of 1.00, 1.60, 1.90 and 2.25 lb./steer/day. The gains were computed on the basis of estimated net energy values for feeds available and estimated net energy requirements of steers for maintenance and growth. Four experimental treatments were developed for this experiment:

	Treatment (Net Energy/lb. Ration)		
Treatment Number	Megacalories for Maintenance	Megacalories for Production	Expected daily gain lb.
1	51	24	1.00
2	63	35	1.60
3	69	40	1.90
4	75	45	2.25

The composition of backgrounding rations was as follows:

Ingredient[1], %	Treatment Number 1	2	3	4
Chopped alfalfa hay	99.0	70.0	56.0	40.0
Ground shelled corn	--	29.1	43.2	59.2
Dicalcium phosphate	0.5	0.4	0.3	0.3
Trace mineral salt	0.5	0.5	0.5	0.5
Vitamin A premix[2]	+	+	+	+

[1] 90% dry matter basis.
[2] 600,000 I.U. vitamin A/steer/month top-dressed to the ration.

Each ration was fed according to a computer estimate calculated to achieve the desired rate of gain. Quantities of feed were increased with each 50 pound increase in weight of animal.

The cattle in the experiment were the 56 steers used in a previous experiment dealing with starting calves on feed. The steers were reallotted on the basis of previous treatment and body weight to four lots of 14 steers each. The lots were outside with concrete aprons adjacent to the feed bunks and connecting to a central cattle waterer. The lots had dirt floors, were without shelter and were equipped with fence row feed bunks. The steers averaged about 497 pounds at the start of the experiment. Filled weights were taken every 28 days during the 112-day trial. Shrunk weights were taken initially and at the end of the trial with a 14-hour stand without feed and water. All steers were implanted with Snyovex S (200 mg. Progesterone and 20 mg. Estradiol Benzoate) at the start of the trial.

<u>Procedures - Finishing Phase</u>

At the completion of the backgrounding phase all cattle were started on a finishing ration. The composition of the ration was chopped alfalfa hay, 10%; ground shelled corn, 83.6%; soybean meal 5%; ground limestone, 0.6%; dicalcium phosphate, 0.3% and trace mineral salt, 0.5%. A vitamin A premix was top-dressed to the ration monthly to provide 600,000 I.U. vitamin per steer (20,000 I.U. per steer daily). The finishing ration as formulated was estimated to contain 85 megacalories net energy per lb. for maintenance and 55 megacalories per lb. for production. The digestible protein content of the ration was about 8.5%.

Several steers developed a "lumpy jaw-wooden tongue" condition during the trial. Organic iodine was administered via the feed periodically. Approximately 4.5 grams per steer of basic iodine mix (20.7 gm. ethylene diamine dihydro-iodide/lb.) in ground corn was top dressed to the ration twice a month.

All steers were reimplanted with Synovex (200 mg. Progesterone and 20 mg. Estradiol Benzoate) at the start of the finishing period.

As each lot of cattle averaged approximately 1,150 pounds it was marketed. Shrunk weights were recorded following a 14-hour stand without feed and water.

The cattle were trucked 40 miles to market, weighed as a lot and slaughtered. Carcass measurements were taken following a 24-hour cooler chill.

Results - Backgrounding Phase

Table 61 shows the results of the backgrounding experiment.

Table 61. Backgrounding Beef Steer Calves (March 8 to June 28, 1972 - 112 Days)

Expected daily gain, lb.	1.00	1.60	1.90	1.25
Megacalories net energy for maintenance/lb. ration	51	63	69	75
Megacalories net energy for production/lb. ration	24	35	40	45
Treatment No.	1	2	3	4
Number steers	13[1]	13[2]	14	14
Av. initial wt., lb.	496	496	498	498
Av. final wt., lb.	575	640	675	683
Total gain, lb.	79	144	177	185
Av. daily gain, lb.	0.71	1.29	1.58	1.65
Av. daily ration, lb.				
Chopped alfalfa hay	14.18	10.43	8.56	6.10
Ground corn	--	4.39	6.64	9.06
Dicalcium phosphate	0.07	0.06	0.04	0.04
Trace mineral salt	0.07	0.08	0.08	0.07
Total	14.32	14.96	15.32	15.25
Fee/cwt. gain, lb.				
Chopped alfalfa hay	1997	809	542	372
Ground corn	--	340	420	551
Dicalcium phosphate	10	5	3	3
Trace mineral salt	10	6	5	5
Total	2017	1160	970	931
Feed costs/cwt. gain, $[3]	21.55	16.35	15.33	16.61
Feed costs/steer, $	16.75	23.54	27.13	30.73

[1]Died of bloat.
[2]Chronic bloater removed.
[3]Based on alfalfa hay at $20.00/ton; shelled corn at $1.27/bu.; dicalcium phosphate at $5.90/cwt.; ground limestone at $4.10/cwt.

The growth response of steers fed rations varying in net energy content for maintenance and production was as expected. However, rates of gain at each growth level were considerably lower than the projected gain. Differences in feed

consumption resulted from the manner in which the feed was increased (at each increase of 50 lb. body weight). The lighter weight cattle were held at a given feed intake longer mainly because of the slower growth rate.

Cattle fed an all-hay ration (Treatment 1) gained only 0.71 lb. per day compared to an expected gain of 1 lb./day. Cattle fed the higher energy ration (Treatment 4) fell 0.35 lb./day short of the expected gain. Reasons for these differences are not apparent. Feed efficiency improved with increasing quantities of corn grain (energy) in the ration.

Costs of beef production vary with individual situations. Feed costs used in this trial were based upon current selling prices of feeds at the beginning of the trial. The most economical backgrounding ration based on cost/cwt. gain was composed of 56% hay and 43% corn (Treatment 3). The all-hay ration (Treatment 1) was the most costly with the other two rations being intermediate. On a per steer basis feed costs increased, as expected, with increasing levels of energy in the ration.

Results - Finishing Phase

This part of the experiment has not been completed. Because of the different backgrounding levels of growth the cattle completed the finishing phase at different times. Table 62 shows a progress report of the fattening phase to November 17, 1972 (142 days).

Results - Backgrounding and Finishing

Although the finishing period has not been completed combined results for the backgrounding phase (112 days) and finishing phase (142 days) are presented in Table 63.

Table 62. Results of Finishing Phase (June 28 to November 17, 1972 - 142 Days)

	Backgrounding Treatment			
	1	2	3	4
No. steers	13[1]	13[2]	14	14
Av. initial wt., lb.	575	640	675	683
Av. wt., 11-17-72, lb.	1033	1082	1077	1105
Av. total gain, lb.	458	442	402	422
Av. daily gain, lb.	3.23	3.11	2.83	2.97
Av. daily feed, lb.				
Chopped alfalfa hay	2.91	2.57	2.37	2.29
Ground corn	16.60	16.81	16.65	17.23
Protein supplement	1.62	1.58	1.66	1.70
Vitamin A and Iodine Premix	0.06	0.06	0.06	0.06
Total	21.19	21.02	20.74	21.28
Feed/cwt. gain, lb.				
Chopped alfalfa hay	90	83	84	77
Ground corn	514	541	588	580
Protein supplement	50	51	59	57
Vitamin A and Iodine Premix	2	2	2	2
Total	656	677	733	716

[1]Died of bloat during backgrounding phase.
[2]Chronic bloater removed during backgrounding phase.

Table 63. Backgrounding and Finishing (March 8 to November 17, 1972 - 254 Days)

	Backgrounding Treatment			
	1	2	3	4
No. steers	13[1]	13[2]	14	14
Av. initial wt., lb.	496	496	498	498
Av. wt., 11-17-72, lb.	1033	1082	1077	1105
Av. total gain, lb.	537	586	579	607
Av. daily gain, lb.	2.11	2.31	2.28	2.39
Av. daily feed, lb.				
Chopped alfalfa hay, lb.	7.88	6.04	5.10	3.97
Ground corn	9.28	11.33	12.24	13.62
Protein supplement	0.90	0.89	0.93	0.95
Vitamin A and Iodine Premix	0.03	0.03	0.03	0.03
Total	18.09	18.29	18.30	18.57
Feed/cwt. gain, lb.				
Chopped alfalfa hay	373	261	224	166
Ground corn	440	490	537	570
Protein supplement	43	39	41	40
Vitamin A and Iodine Premix	1	1	1	1
Total	857	791	803	777

[1]Died of bloat during backgrounding phase.
[2]Chronic bloater removed during backgrounding phase.

ALFALFA HAY-HAYLAGE AND CORN SILAGE FOR GESTATING FIRST-CALF BEEF HEIFERS

Richard M. Luther

During recent years there has been considerable interest in the expansion of beef cow enterprises in the cornbelt. Southeastern South Dakota farmers appear to have several possibilities for production of feeds used by the cow herd: (1) establishing permanent pastures on row crop acres for cow herd grazing (2) utilizing crop residues, forages with pasture grazing and (3) maintaining cows and calves in drylot using crop residues, dry forages and silages. Each has its advantages and disadvantages. An important consideration is that most of the costs of raising a cow and producing a calf are feed and pasture costs. Roughage materials such as corn stalks, corn glomerate (offal from the combining of corn), cereal straws and other low-quality forages can be utilized economically in a cow-calf production operation whether it be drylot, mainly pasture or a combination. Maximum use of these feeds appears to be a way of increasing returns on a cow herd program.

The present experiment was designed to study the utilization of alfalfa haylage or hay diluted with cereal straw and corn silage for gestating beef heifers in drylot. Primarly emphasis was placed on feed consumption, cow gains and reproductive performance.

Procedure

Thirty Hereford x Angus first-calf heifers used in a multiple ovulation experiment at the Brookings Experiment Station were transferred to the Southeast Experiment Farm. The heifers were bred A.I. to an Angus bull to calve from mid-June to mid-July. All animals were believed to be pregnant; some with twin fetuses.

Upon arrival at the Farm the cattle were weighed and allotted to pens with 7 or 8 heifers per pen. The pens were located in a remodeled cattle shed with part of pen under shelter and part open to the outside. The feed bunks were located inside.

Two ration treatments were used with two lots of cattle fed each ration. Ration 1 was composed of 62% alfalfa haylage, later changed to alfalfa hay and 18% chopped cereal straw. Ration 2 consisted of corn silage and 0.5 lb. of protein supplement. The supplement was composed of 92.6% soybean meal (44% protein); 5% dicalcium phosphate and 2.4% vitamin A premix (1 lb. of premix contained 840,000 I.U. vitamin A). Both rations were fed in amounts that would equalize energy and dry matter intake between treatments. The cattle were maintained in dry lot during the experiment.

The corn silage was from the 1971 crop with a yield of 29 bushels of No. 2 corn/acre. The alfalfa haylage was from the 1968 crop season. The haylage and silage were stored in concrete stave silos. The haylage proved to be of poor quality and was replaced by chopped alfalfa hay. Chopped oat straw from the 1971 crop season was used to dilute the hay-haylage rations. Feed samples were collected weekly and analyzed for dry matter and protein.

The cattle were weighed at 28-day intervals and on June 9, 1972 when the gestation treatments were terminated. The first cow calved on June 10. At parturition the calves were ear-tagged and weighed. All cows were weighed two days after calving. Measures of the effect of gestation rations include gain of cows during the trial and reproductive performance.

Results

The results of this experiment are presented in Table 64.

Table 64. Hay-Haylage and Corn Silage for Pregnant Heifers (January 21 to June 9, 1972 - 140 Days)

	Hay-Haylage	Corn Silage
No. cows	15	15
No. cows calving	13	14
Av. initial wt., lb. (1-21-72)	864	864
Av. final wt., lb. (6-9-72)	936	1024
Total gain, lb.	72	160
Av. daily gain, lb.	0.51	1.14
Av. daily feed consumption, lb. (as fed)		
Alfalfa haylage	9.12	--
Alfalfa hay[1]	3.64	--
Straw	7.96	--
Corn silage	--	35.78
Protein supplement	--	0.50
Total (as fed)	20.72	36.28
Total (dry basis)	14.73	14.36
Estimated TDN intake/head (dry basis)	8.50	8.86
Estimated digestible protein intake/head (dry basis)	0.89	0.75
Av. cow wt. 2 days post-partum	925	973
Calf data - (interval June 10 - July 23, 1972)		
No. calves born	14	16
No. calves live July 23, 1972	11	13
Bull calves	5	6
Heifer calves	6	7
Av. birth wt. of live calves	54.0	55.4
Bull calves	53.2	59.7
Heifer calves	54.8	51.1

[1]Alfalfa hay replaced haylage 4-10-72.

Gains of cows fed the haylage-hay-straw ration were markedly lower than those of cows fed corn silage. This appeared to be due to the poor quality haylage used in the early part of the trial. Feed consumption on a dry basis was about the same for the two groups. TDN intake was likewise similar but somewhat lower than would be recommended.

General appearance of cows at calving favored the cows fed corn silage. Cattle fed hay-haylage had dull haircoats which were slow to shed. Three calves on each treatment were born dead. None of the deaths could be related to a pathological condition.

Calves from both groups were healthy and vigorous at birth. Number of calves and birth weight of calves could not be related to treatment.

The herd will be maintained with emphasis on various aspects of nutrition of the beef cow.

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