SEVENTH ANNUAL PROGRESS REPORT

DECEMBER 1967

SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM

NEAR CENTERVILLE, SOUTH DAKOTA

Aerial view of Southeast South Dakota Experiment Farm

Agricultural Experiment Station
South Dakota State University
Brookings

SEVENTH ANNUAL PROGRESS REPORT
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This seventh 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 nor conclusive. Interpretations given are tentative because additional data resulting from continuation of these experiments may result in conclusions different from those based on any one year. Trade names are used in this publication merely to provide specific information. A trade name quoted here does not constitute a guarantee or warranty and does not signify that the product is approved to the exclusion of other comparable products.

SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION
BROOKINGS, SOUTH DAKOTA 57006

Duane Acker, Director

A. L. Musson, Assoc. Director

INTRODUCTION

-- J. F. Fredrikson

It is customary to refer to the acreage of land on this research farm as having two parts: the south quarter and the north quarter. When research was started, the south quarter was platted to contain all the agronomic research plots, with the north quarter used for the production of grain and forage for use in livestock feeding trials. In the past few years, the broadening of many research areas has brought about a need for larger plots, and some agronomy studies have been moved to the north quarter. This trend is not expected to continue because of limitations on available funds, labor and supervisory personnel. However, the north quarter is still, for the most part, farmed on a full scale field basis for the production of feed. Surplus grain from all agronomy plots, as well as filler areas on the south quarter, is also used for livestock feed.

The crops grown on the north quarter in 1967 were: 30 acres of alfalfa, 112 acres of corn and 10 acres of oats. The 10 acre field of oats was planted as an alfalfa nurse crop and was cut for hay.

Production from the 1967 crop year yielded the following feed and forage: (determined by sampling and field measurements)

Corn silage:	2¤0 tons	Ear corn:	8200 bu.
Alfalfa hay:	90 tons	Oats	800 bu.
Mixed hay :	10 tons		

All corn acreage on the north quarter was fertilized with 100 lbs. of nitrogen per acre. On approximately half of the acreage, the nitrogen was applied as ammonium nitrate plowed down the previous fall; the remaining half was side dressed with anhydrous ammonia. Atrazine with oil was banded on all areas in which annual grassy weeds were expected to be a problem.

A field demonstration involving the use of eight different chemicals for the control of corn root worm was applied in cooperation with the Extension Service. A report on corn root worm control is included in this publication.

Cattle feeding trials have started a new pattern of investigation for the coming year. The problems involved will be:

1. Management, feeding and treatment of feeder cattle following stress of shipping or weaning and shipping in preventing disease, recovering shrink and in improving early feedlot performance.

2. Production potentials and costs from alfalfa and corn fed in various ways to growing and finishing beef cattle.

3. Housing and shelter needs for growing and finishing beef cattle at various seasons of the year.

The objectives of these trials will be:

1. Compare early feedlot performance of calves fed rations with various levels of energy.

2. Determine the comparative value of rations composed of alfalfa with corn grain, and corn silage with protein supplement, when fed in growing type rations.

3. Compare alfalfa and corn silage as roughage sources in high concentrate rations for finishing beef cattle.

4. Determine the value of housing for beef cattle at various seasons of the year.

The swine feeding program now in process continues a comparison of performance of market hogs in inside and outside environment. The segregation of sexes is incorporated into this feeding trial.

Table I is a summary of the weather information recorded during 1967. This information is compiled by this station in its function as the official weather observer for this area. The precipitation pattern for south eastern South Dakota was varied and irregular during the growing season. The research farm is located in a geographic zone which became a transition area between adequate rainfall to the south and inadequate rainfall to the north. Table I shows that the rainfall was about 5 inches below the 15 year average. Some crop yields recorded in this publication are in a higher range than would normally be expected in a year of below average precipitation. Such yields reflect the utilization of a high reserve of moisture carryover in the subsoil from the previous year. By the same token, this production leaves the subsoil short of moisture reserve for the coming year.

Precipitation and Temperature - 1967

	Rainfall In Inches	1953-1967 15 Year Average	1953-1967 Departure	Average Temperature (F)	1953-1967 15 Year Average	1953-1967 Departure
Dec. [illegible]	[illegible]	.6?	[illegible]	[illegible]	[illegible]	-2.9
Jan. 1967	.47	.39	+.08	19.3	[illegible]	+2.0
Feb.	.14	1.29	-1.15	20.7	25.2	-4.5
Mar.	.07	1.37	-1.30	39.8	30.2	+9.6
April	2.10	2.70	-.60	50.2	49.2	+1.0
May	1.68	3.36	-1.68	56.1	61.3	-5.2
June	7.56	4.42	+3.14	67.9	69.9	-2.1
July	2.47	2.92	-.45	72.1	75.4	-3.3
Aug.	3.37	2.94	+.43	69.4	69.8	-0.4
Sept.	1.02	2.89	-1.87	62.2	63.4	-1.2
Oct.	.62	1.15	-.53	50.1	55.1	-5.0
Nov.	.00	.95	-.95	34.6	36.6	-2.0
Total	20.07	24.99	-4.92	47.6	48.1	-1.5

Frost free days: May 9 to Sept. 27 - 141 days

AGRONOMY SECTION

CORN POPULATIONS AND ROW SPACING

- F. Shubeck and B. Lawrensen

Objectives of experiment:

1. What is the optimum spacing of corn rows for different plant populations with a short season hybrid and a full season hybrid?

2. Is there a greater need for narrow rows with higher plant populations?

3. Can moisture loss from evaporation be reduced by narrow rows?

4. 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?

[illegible]: (on following page)

The following procedures were used in this experiment:

1. [illegible]

2. [illegible]

3. Disked again May 8.

4. Broadcasted 6.1 pounds of atrazine 80 W/acre on May 9 and harrowed with a spike tooth drag.

5. Planted May 9 and 10.

6. Bux Ten insecticide was applied in band at planting.

7. Cultivated once, on June 21.

8. Sprayed for corn borer July 13 with 2 pounds per acre of 80% Sevin.

9. Finished hand picking October 2.

In the lower range of plant populations used in this experiment, the full season hybrid usually yielded more than the earlier maturing, short season hybrid.

In the higher range of plant populations, there were no consistent yield advantages for either hybrid this year.

Yields from narrow rows did not increase when populations were increased which is different from results in 1965 and 1966. Yields from 40 inch rows did not increase with increasing populations either. Yields from 40 inch rows decreased as population densities approached the maximum used in this experiment.

When yields from all populations and hybrids were averaged for each row spacing (Fig. 7) narrow rows produced more corn than 40 inch rows.

Figure 1. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 10,000 plants per acre

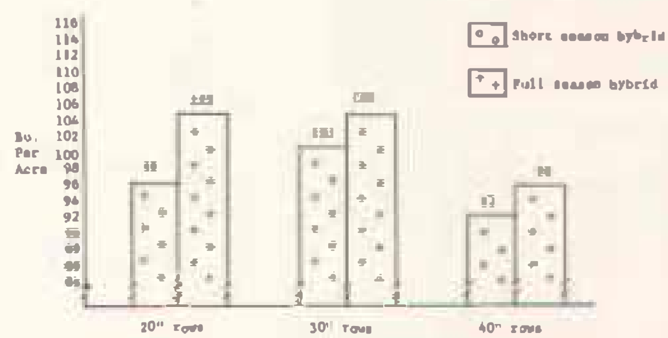


Figure 2. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 12,000 plants per acre.

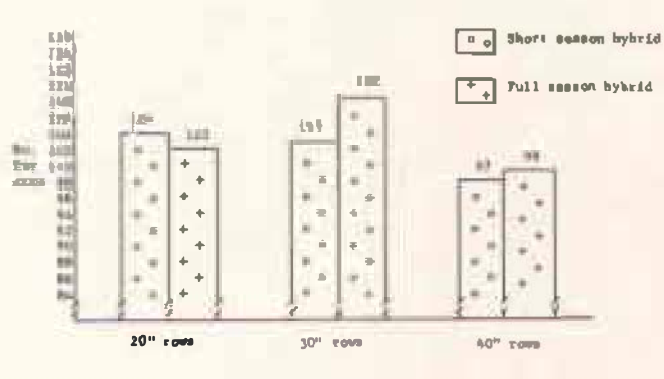


Figure 3. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 14,000 plants per acre

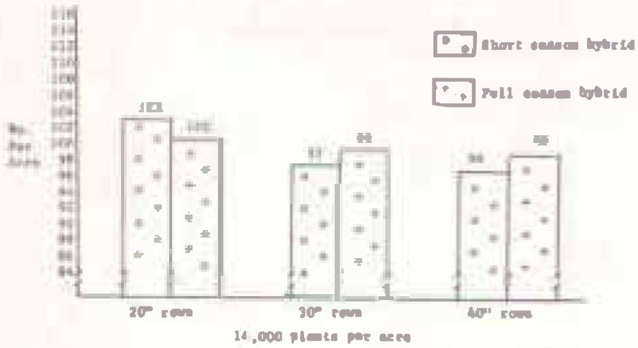


Figure 4. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 16,000 plants per acre.

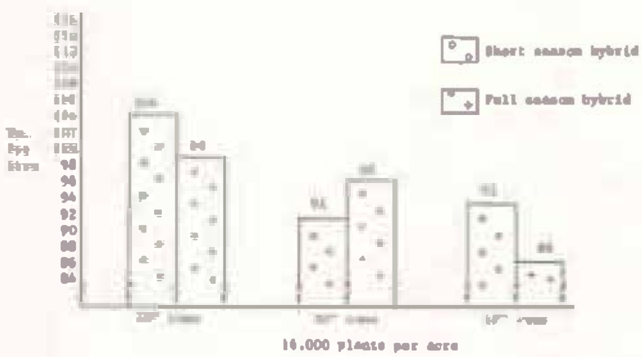


Figure 5. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 18,000 Plants per Acre.

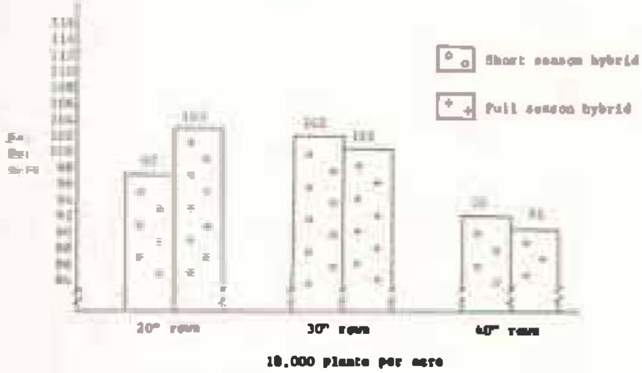


Figure 6. Effect of Plant Populations on Yield of Corn (Average of 3 Row Spacings).

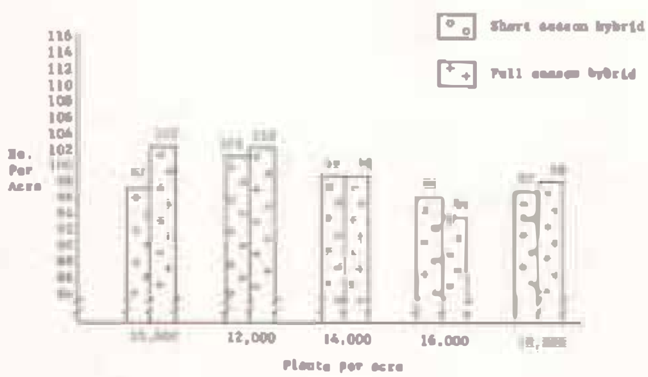


Figure 7. Effect of Row Spacings on Yield of Corn (Average from 5 Populations and 2 Hybrids for each Row Spacing).

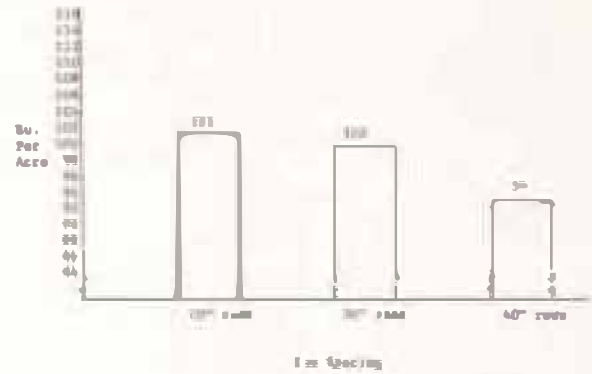
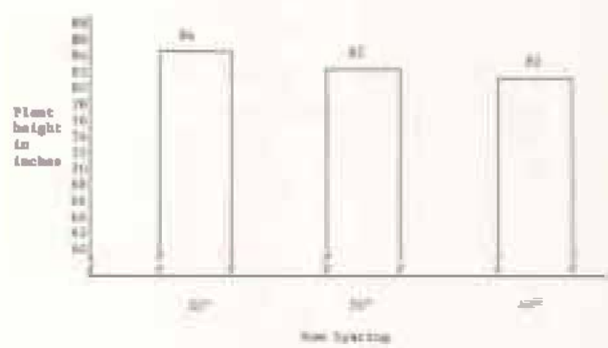


Figure 8. Effect of Row Spacing on Corn Height July 18 (average of 3 populations and 2 hybrids for each row spacing).

Figure 9. Effect of Row Spacing on Corn Height July 26 (average of 3 populations and 2 hybrids for each row spacing).



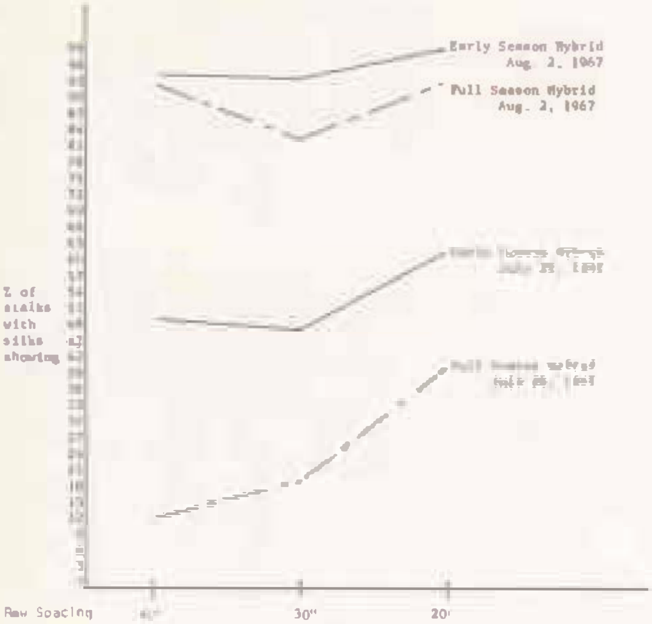
Discussion and Interpretation of Figures 8 and 9

Corn height was determined by measuring height in inches to the highest point on the uppermost mature leaf.

When average plant height was taken of 3 populations and 2 hybrids for each row spacing, the 20 inch row spacing had the tallest corn. There appeared to be a relationship between plant height and yield (see Figure 7).

With the fast growing short season hybrid at 18,000 plants per acre, the increase in height in favor of narrow rows amounted to 10 inches on July 18. This height difference was not so apparent by July 26.

Figure 10. Effect of Row Spacings on Silking Dates



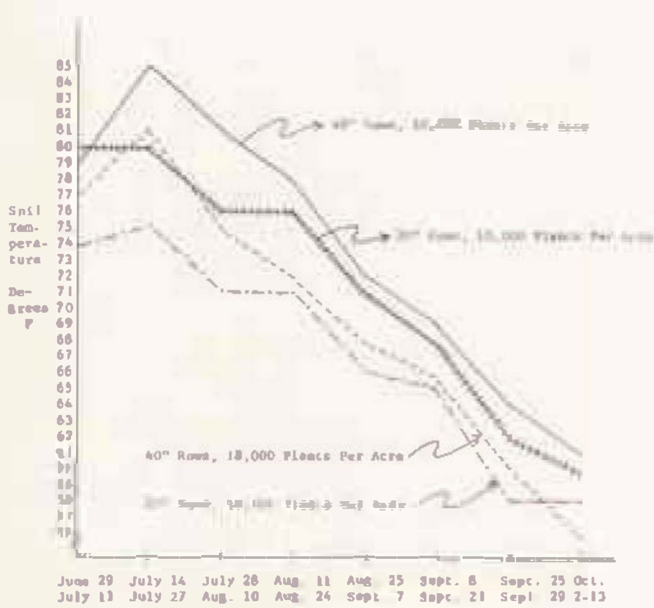
Row Spacing

Discussion and Interpretation of Figure 10

Figure 10 shows relative maturity of the 2 hybrids used in this experiment by comparing the percentage of stalks with silks showing, on two different dates. On July 26 the early hybrid planted in 40 inch rows had about 50% of silks out and the full season hybrid had a little over 10% of the silks showing.

From the data in Figure 10, it looks like row spacings may have had a small effect on silking dates on July 26. Corn in narrow rows formed silks a little sooner than the corn in 40 inch rows. This difference was not apparent by August 2. By harvest time there was little or no difference in maturity due to row spacing, measured by per cent of moisture in ears (see Table 3).

Figure 11. Effect of Row Spacing and Plant Populations on Soil Temperatures (Full Season Hybrid)



(Periods in which soil temperatures were taken)

Discussion and Interpretation of Figure 11

Thermocouples were used to measure soil temperatures. They were buried [illegible] inches from the soil surface in the corn row, close to the seed. [illegible] thermocouples were located at 4 different points in [illegible] of one row in each plot and united to a common lead. In this way an average temperature for these four points was obtained. The common lead in each plot was connected to a potentiometer once each day at [illegible] and soil temperatures were then read and recorded.

Soil temperatures at a given plant population were [illegible] with 20 inch row spacing than with 40 inch row spacing. This was true with both 10,000 plants per acre and 18,000 plants per acre. The greatest temperature differentials occurred in the high temperature periods of late July and early August.

[illegible] are narrow and plant populations are high.

Table 2. Effect of Corn Plant Populations* on Barren Stalks, Ear Moisture, Ear Weight and Lodged Stalks.

Plants Per Acre	% Barren Stalks	% Ear Moisture at Harvest	Ear Weight at Harvest [illegible]	% Broken and Lodged Stalks
10,000	4.1	33.3	.72	2.8
12,000	4.8	33.9	.69	2.8
14,000	3.6	32.4	.65	2.6
16,000	7.9	34.7	.53	2.5
18,000	9.7	34.2	.51	3.4

*Average from 3 row spacings and 2 hybrids for [illegible]

Table 3. Effect of Row Spacings* on Barren Stalks, Ear Moisture, Ear Weight, and Lodged Stalks.

Row Spacing	% Barren Stalks	% Ear Moisture at Harvest	Ear Weight at Harvest [illegible]	% Broken and Lodged Stalks
20 Inch	6.9	33.0	.61	3.1
30 Inch	6.1	33.9	.62	2.5
40 Inch	4.9	34.2	.63	2.5

*Average from 5 populations [illegible] for each row spacing.

Discussion and Interpretation of Tables 2 and 3

Results this year show a small increase in per cent of barren stalks as populations were increased. [illegible]

In 1966, ear weights [illegible] 1967. [illegible]

[illegible]

STARTER AND POP-UP FERTILIZER FOR CORN

- F. Shubeck and B. Lawrensen

Objectives of Experiment

1. Will a starter fertilizer high in phosphorus increase corn yield in a soil with medium phosphorus supplying ability?

2. Is the practice of including a small amount of potassium in the starter fertilizer worth while "insurance" against possible potassium deficiencies in borderline response areas?

3. Is it best to forget about starter fertilizer and to broadcast all fertilizer before planting, either disking it in or plowing it under?

4. What can we expect from "pop-up" fertilizer? Pop-up refers to small amount of fertilizer placed with the seed at planting.

Table 4. Effect of Starter Fertilizer, Pop-up Fertilizer, Supplemental Nitrogen and Method of Application on Corn Yield

Starter and Pop-up Fertilizer Treatments Lbs. Per Acre N	P	K	Lbs. of Supplemental N/Acre	% Water in Ears at Harvest	Tons of Stover at Harvest (70% moisture)	Bu. of #2 Corn Per Acre
0	0	0	None	40.2	3.9	76
12	23	0 in band 2x2	None	37.6	5.0	89
12	23	17 in band 2x2	None	39.9	4.6	87
0	0	0	80# sidedressed	40.2	4.7	102
12	23	0 in band 2x2	80# sidedressed	38.1	5.0	111
12	23	17 in band 2x2	80# sidedressed	39.5	5.0	105
12	23	17 + zinc in band 2x2	80# sidedressed	38.6	4.8	100
12	23	17 broadcast	80# all broadcast and disked in	37.3	5.3	100
12	23	17 broadcast	80# all broadcast and plowed under	39.1	5.3	107
3	6	5 pop up with seed	80# broadcast and plowed under	37.1	4.7	102
3 9	6 17	5 pop up with seed plus 12 broadcast and plowed under	80# broadcast and plowed under	37.0	5.6	113
L.S.D. at 5% level					.77	[illegible]

Discussion and Interpretation of Table 4

Two new treatments were introduced this year, the pop up treatments. Pop-up refers to a small amount of fertilizer placed with the seed. In starter 2 x 2 treatments, fertilizer was banded approximately 2 inches to the side of the seed and 2 inches below it. The basic unit of starter fertilizer was 110 lbs of 11 - 48 - 0 and 33 lbs of 0 - 0 - 60 per acre. In one pop-up treatment ¼ of the basic quantity was applied with the seed and the other 3/4 was broadcast with the supplemental nitrogen and plowed under. In the other pop-up treatment, only ¼ of the basic unit of starter was applied in addition to the supplemental nitrogen. In the first pop-up treatment the same quantity was applied as in some of the banded starter 2 x 2 treatments. Amounts of fertilizer applied were expressed in elemental form in table 4.

Fertilizer was broadcast May 4 and 5. Plots were plowed and disked May 5. Atrazine was broadcast May 9 at 5.41 lbs. of 80 W per acre, and on May 11 plots were double dragged with spike tooth harrow. Pioneer 3414 was planted May 16. Selection of variety was made from commercial yield trial data of previous years. First cultivation was June 20. Corn was sidedressed July 5 and the last cultivation made July 6. On July 14 plots were sprayed with 2 lbs. per acre of 80% Sevin for corn borer control. All plots were hand picked September 28.

There was a little more ear moisture at harvest in the check plot and the plot that received 80 lbs of nitrogen per acre without starter, than in most of the other treatments.

There was a substantial increase in stover yield of fertilized plots compared to that of the check plots. It is interesting that one of the pop-up plus plow under treatments had a high stover yield (table 4). Emergence was not any faster for the pop-up plus plow under treatment but there was an increased rate of plant growth for this method of application (see figure 12)

Fertilizer gave a big increase in bushels of number 2 corn again this year. Several treatments increased yield 25 to 30 bushels per acre. Starter fertilizer alone without supplemental nitrogen increased yield about 13 bushels per acre. Starter alone did not increase yields last year or in several other years on this medium phosphorus supplying soil. Note that the starter had 12 pounds of nitrogen applied with the phosphorus. Last year the heavy rainfall months were in July and August. This year the heavy rainfall month was in June. Starter fertilizer has been more effective when the early part of the corn growing season was cold and wet as it was in 1967.

Supplemental nitrogen alone gave larger yield increases than starter alone. No yields over 100 bushels per acre were obtained in this experiment unless supplemental nitrogen was applied. Combinations of starter and supplemental nitrogen gave the greatest total yield.

Seventeen pounds of potassium (20 lbs. K_2O) did not increase corn yields this year when applied with starter alone or when applied with starter plus sidedressed nitrogen.

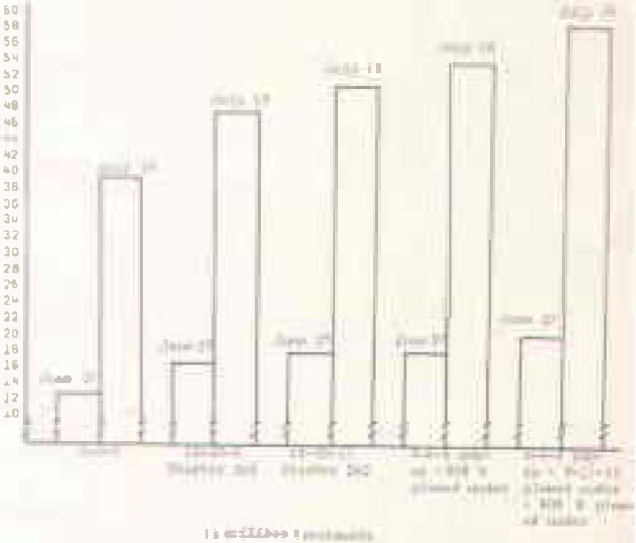
The next important consideration is method of fertilizer application. The following 4 treatments are arranged in order of increasing yield: 1. starter in band + nitrogen disked in; 2. starter in band + nitrogen sidedressed; 3. starter in band + nitrogen plowed under; 4. part of starter applied as pop-up and part of it plowed under + nitrogen plowed under. Some of these differences were not statistically significant at the 5% confidence level and more research data is needed before any conclusions can be made.

Soil test values for this location were:

Soil test values for this location were:

Organic matter %	2.7	(medium)
Phosphorus, lbs. per acre	15	(at junction between low and medium)
Potassium, lbs. per acre	314	(high)
pH	6.4	
Soluble salts, mmho/cm	0.59	(low)

Figure 12 - Effect of Pop-up, Plow Under and Starter Fertilizer on Plant Height.



Discussion and Interpretation of Figure 12

On June 27, when corn was about a foot high there were only small differences in plant height due to fertilizer treatments.

By July 19, corn height in all fertilized plots was well above that of the check plot. [illegible] the large height increase due to the pop-up plus nitrogen plowed under treatments. This height advantage carried over to greater yields [illegible]

SOYBEAN POPULATIONS AND ROW SPACING

F. Shubeck and B. Lawrensen

Objectives [illegible]

1. Study effect of row spacings and plant populations on yield.
2. Study relationship of row spacings and weed control.

Table 5. Relation of Distances Between Plants in the Row and Row Spacings to Plants per Acre

Soybean Plants/Acre	Row Spacing	Plants/ft. of row	Linear inches between plants
75,000	20"	2.87	4.2
75,000	30"	4.30	2.8
75,000	40"	5.74	2.1
100,000	20"	3.83	3.1
100,000	30"	5.74	2.[illegible]
100,000	40"	7.65	1.6
150,000	20"	5.74	2.1
150,000	30"	8.61	1.4
150,000	40"	11.48	1.0

Figure 13. Effect of Soybean Populations and Row Spacings on Yield

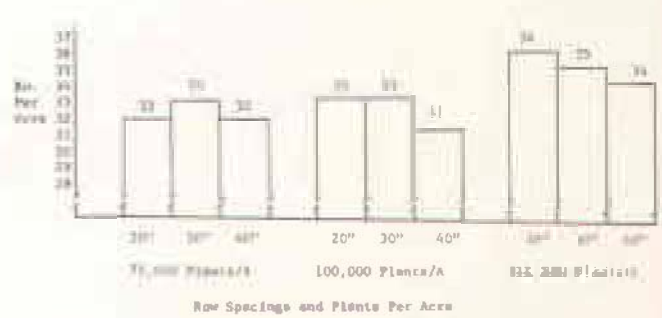
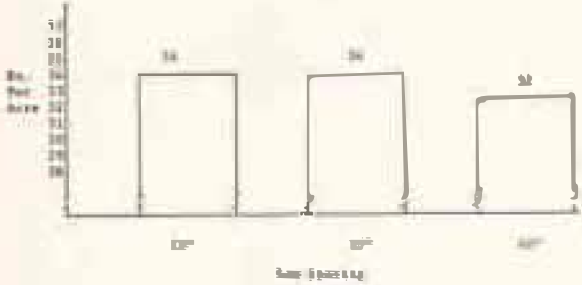


Figure 14. Effect of Row Spacings on Soybean Yields



Discussion and Interpretation of Table 5, Figures 13 and 14

The cropping sequence followed in this experiment was corn and soybeans. No fertilizer or treatment variations were used for corn in order that the test crop, soybeans, would follow a uniformly treated crop. Land preparation consisted of fall plowing and three diskings (May 13, May 16, and June 1). Eight lbs. of N, 14 lbs. of P and 13 lbs. of K per acre were broadcast before fall plowing. Treflan at 1 1/2 pints per acre was broadcast June 2 then disked in and dragged immediately. Variety used was Lindarin 63. It was planted June 5 and 6 with a tool-bar planter. All plots were cultivated once, on June 29. Harvest date was Oct 11.

Weed control in this experiment was exceptionally good and it was uniform in all plots. Therefore no weed counts or related measurements were made.

The heaviest rate of planting was increased from 125,000 to 150,000 plants per acre this year. Data in Figure 13 indicated that in the 20-inch rows, higher population densities might have been beneficial.

Figure 14 shows yields from all three populations averaged for each row spacing. Yields from 20-inch rows and 30-inch rows were the same but yields from 40-inch rows were slightly less.

Table 5 was included to relate plant population figures to distances between plants in the row. This is more meaningful than pounds of seed planted per acre because of variations in seed size, germination % and seedling mortality. A final stand count of one inch per plant in 40-inch rows amounts to 150,000 plants per acre.

Lindarin 63 seed, used in 1967, averaged 544 seeds per 100 grams. This would be 544/100 = 5.44 seeds per gram. 5.44 seeds per gram x 454 grams per pound = 2470 seeds per pound. Pounds per acre at 150,000 population = 150,000/2470 = 61 pounds. Therefore, if 61 lbs./acre were planted and every seed grew, there would be one plant per inch in 40-inch rows and 150,000 plants per acre. To get 150,000 plants per acre with average germination, emergence and cultivator damage a more realistic figure would be closer to 75 lbs. of seed per acre.

NET RADIATION MEASUREMENTS WITH SOYBEANS

- P. Evenson and F. Shubeck

A study was initiated to determine the effectiveness of crop canopies to intercept radiant energy. Net radiation is the difference between the amount of radiant energy received at the earth's surface and that which leaves the earth's surface. Net radiation measurements were made above the crop and between crop rows 4 to 6 inches above the soil surface. Net radiation at the soil surface was expressed as a percent of the net radiation above the crop. The effectiveness of the crop to intercept radiant energy increases as the percentage at the soil surface decreases. The net radiation received at the soil surface is used to heat the soil, to evaporate soil water (if present) and to heat air above the soil.

Net radiation measurements were made in all row spacing and population combinations except one (time did not allow measurements on the 30 inch row at the 75,000 population density). These measurements were taken in one replication when the crop was near maximum growth. The relationship between these measurements and row spacings at the various population levels is in Figure 15. In general, the percent net radiation reaching the soil decreased as row spacing decreased and as population increased. One exception to these trends is the 40 inch row spacing at 150,000 plants per acre. In this case soybean growth was particularly lush where the radiation measurements were taken. This accounts for the low value.

Ten foot strips of soybeans were harvested in the areas that the measurements were taken. The relationship between soybean yields and net radiation values is shown in Figure 16. The slope of the line and the correlation coefficient are not significant at the .05 level, but they are significant at the .10 level. The coefficient of determination (r^2 = .40) indicates that 40% of the variation in yields of beans can be explained with the net radiation measurements. There are many other environmental factors other than net radiation which are known to affect plant responses. An attempt will be made in the future to measure these environmental factors as well as net radiation.

Whenever a crop is planted in different arrangements, the plants are placed in different environments since the plants alter each others environment. Therefore, the key to finding the best planting arrangement must lie in finding the optimum environment for plant growth. This calls for an integrated study of plant environment as related to all phases of plant growth.

Figure 15. Relationship between % net radiation reaching soil and row spacings at various population levels.

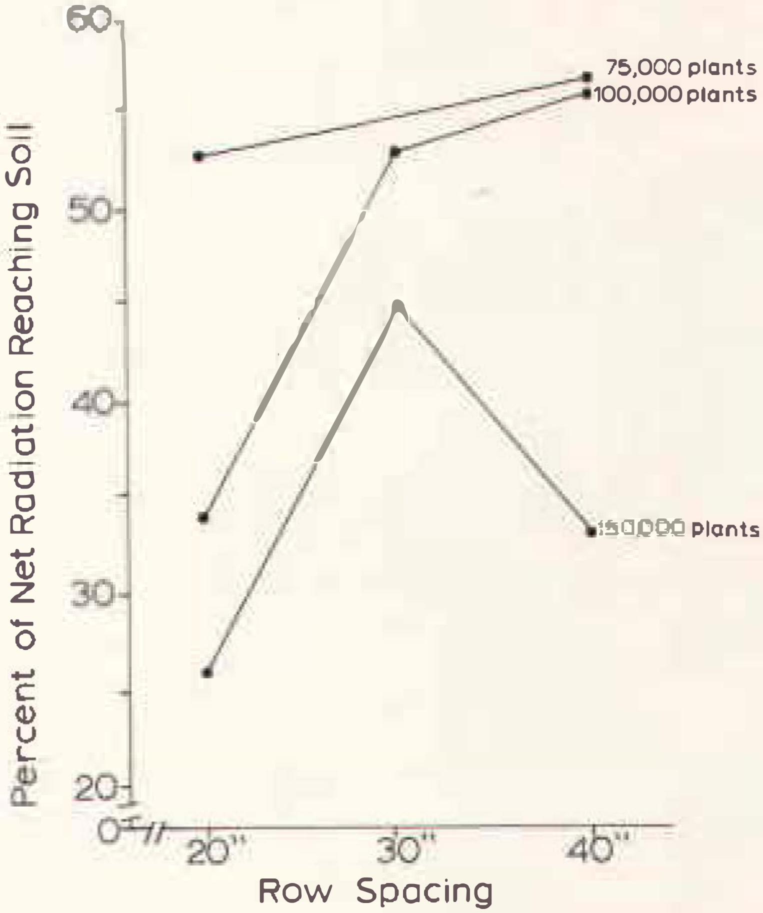
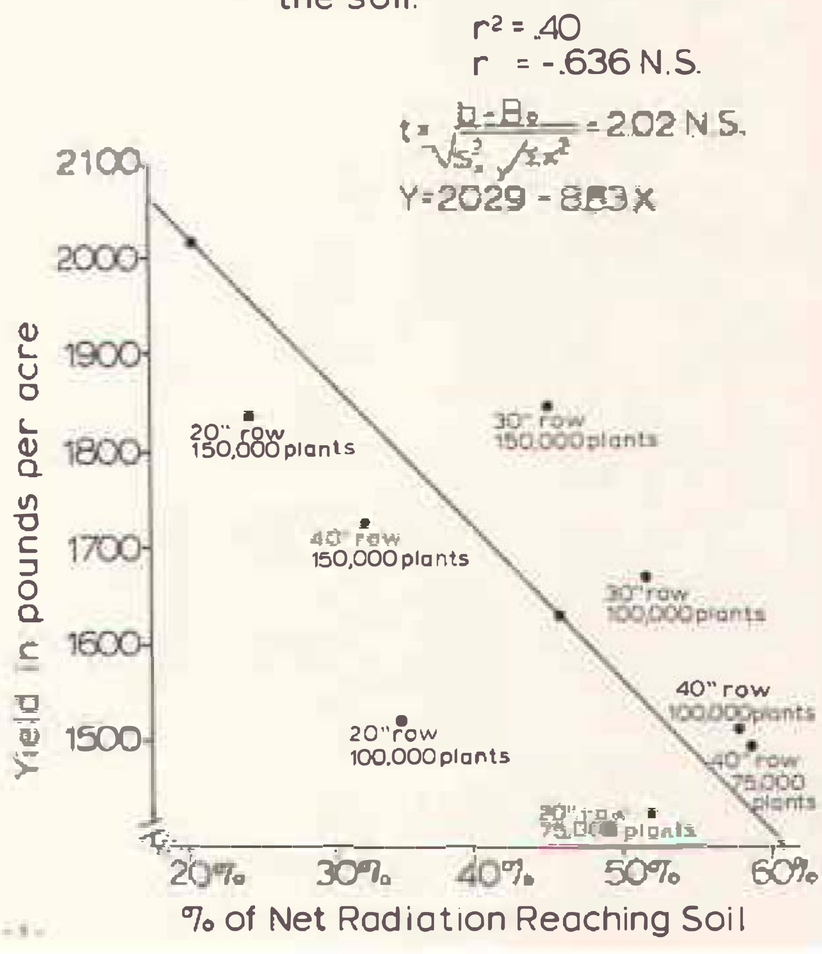


Figure 16. Relationship between yield of soybeans and % net radiation reaching the soil.



SORGHUM POPULATIONS AND ROW SPACINGS

- F. Shubeck and B. Lawrensen

Objectives of Experiment

1. Study effect of row spacings and plant populations on yield.
2. Study relationship of row spacings and weed control.

Figure 17. Effect of Row Spacings and Plant Populations on Sorghum Yield

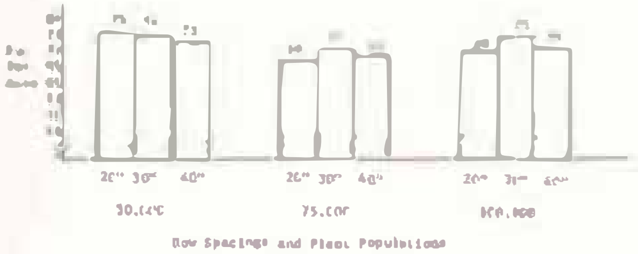
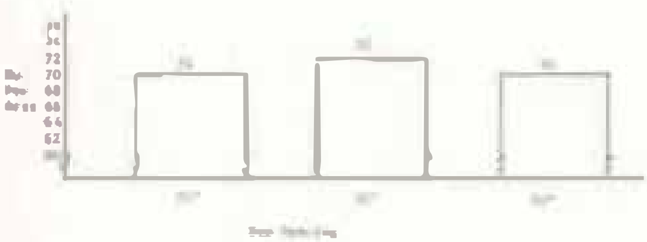


Figure 18. Effect of Row Spacings on Sorghum Yield



Discussion and Interpretation of Figures 17 and 18

[illegible] used in 1966 had 14,165 seeds per pound.

[illegible] yield due to row spacings or population [illegible] rather low compared to corn. Cool [illegible] for these results (Table 1). Most of [illegible] below average. Some months averaged [illegible] Sorghum is a tropical plant and it needs [illegible]

[illegible] predictions [illegible] for [illegible]. However, over the past [illegible] years, yields with [illegible] usually averaged higher than [illegible] inch spacings with most of the populations used. [illegible] to [illegible] adverse temperature, moisture, radiation or [illegible] environmental condition [illegible] the potential yield advantages of narrow rows.

MINIMUM TILLAGE FOR CORN

- F. Shubeck and B. Lawrensen

Objectives of Experiment

1. How much tillage is really necessary for corn production?
2. Can yields from minimum tillage methods be maintained or improved over yields from conventional methods?
3. Evaluate various methods of seedbed preparation, planting and cultivation.

Figure 19. Effect of Corn Tillage and Planting Methods on Soil Temperature

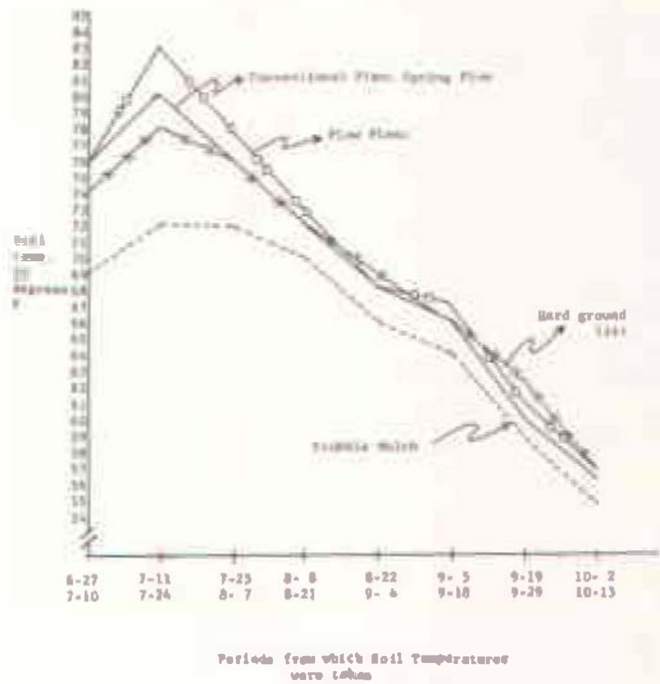


Table 6. Effect of Minimum Tillage Methods on Yield of Corn and Ear Moisture at Harvest.

Treatment No.	Treatment	Fertility* N P K	Bu. of 83 Corn/Acre	% Water in Ears at Harvest
1	Spring List, Fall Subsoil	90.8 + 12 + 0	84	40.0
2	Stubble Mulch, Noble Blade	90.8 + 12 + 0	97	38.0
3	Loose-Ground List, Fall Plow	90.8 + 12 + 0	89	40.0
4	Roto-Tiller, Conventional Plant	90.8 + 12 + 0	98	37.0
5	Hard-Ground List	90.8 + 12 + 0	85	38.0
6	Conventional Plant, Fall Plow	90.8 + 12 + 0	109	38.0
7	Conventional Plant, Spring Plow	90.8 + 12 + 0	101	38.0
8	Plow Plant	90.8 + 12 + 0	92	39.0
9	Conventional Plant, Spring Plow	0-0-0	80	38.0
10	Wheel Track	90.8 + 12 + 0	104	35.0

* Fertility included 60# of 18-46-0 starter. This amounts to 10.8 pounds of N and 12 pounds of P (elemental) per acre. In addition, 80 pounds of N per acre were sidedressed when the corn was 18 inches high.

Discussion and Interpretation of Table 6 and Fig. 19

[illegible] the listed treatments.

Stubble mulching has the lowest soil temperatures of all treatments. This has not been very desirable in early spring because it gets corn off to a slow start. However, in years with high temperatures, mulching had an advantage due to its moisture conserving properties (See Farm and Home Research Bul. XXII Summer, 1962, pp 9-11). Yields for stubble mulching in 1967 were in between those from listing and conventional planting.

Treatment 9 was planted with conventional methods and received no fertilizer. Treatment 7 was planted with conventional methods but was fertilized (Note the large yield increase from commercial fertilizer).

Table 7. Effects of Tillage Methods on Plant Nutrient Uptake 5 Days prior to Silking*

Method of Tillage & Planting	N %	P %	K %	Ca %	Mg %	Mn PPM	Fe PPM	B PPM	Cu PPM	Zn PPM
Plow Plant	3.50	.52	2.32	.24	.21	73	171	15	14	68
Stubble Mulch	3.75	.48	2.22	.22	.19	75	158	14	13	61
Loose Ground List	3.05	.47	2.46	.17	.17	63	133	12	14	51
Wheel Track	3.35	.44	2.43	.26	.19	72	135	15	13	54
Conventional Plant Spring Plow No Fertilizer	2.75	.44	2.37	.23	.25	77	137	12	12	52
Roto Till Conventional Plant	3.20	.42	2.63	.22	.18	70	163	15	16	58
Conventional Plant Spring Plow	3.60	.39	2.54	.20	.16	63	121	11	14	69
Spring List After Fall Subsoil	3.05	.44	2.66	.20	.21	65	133	[illegible]	[illegible]	[illegible]
Hard Ground List	3.50	.47	2.30	.20	.21	70	186	16	14	66
Conventional Plant Fall Plow	3.10	.46	2.70	.21	.17	61	131	12	13	50

* Leaf analysis made by Plant Analysis Laboratory at Ohio Agricultural Research and Development Center, Wooster, Ohio.

Table 8. Sufficiency levels to evaluate plant analysis for corn as determined by Ohio Research and Development Center Standards

Element	% of element in Corn Min.	Max.
N %	2.76	3.50
P %	.25	.40
K %	1.71	2.25
Ca %	.21	.50
Mg %	.21	.40
Mn. ppm	20.	150.
Fe ppm	21.	250.
B ppm	6.	25.
Co. ppm	6.	20.
Zn ppm	20.	70.

Based on analysis of ear leaf sampled at initial silk

Discussion and Interpretations of Tables 7 and 8

A new feature was added to the minimum tillage experiment this year. It involved leaf analysis for 10 nutrient elements by the emission [illegible] machine located at the Agricultural Research and Development Center, Wooster, Ohio. Table 7 gives composition of corn leaves taken from the minimum tillage experiment at Southeast Experiment Farm. Table 8 lists sufficiency levels for each element for Ohio conditions.

Note the nitrogen content in leaves taken from the unfertilized plot. It falls below the minimum sufficiency levels for nitrogen given in table 8. Yield increases from a fertilizer high in nitrogen (Table 6) are in accordance with leaf tissue analyses.

Phosphorus and potassium levels in leaves from all plots were above minimum sufficiency levels by Ohio standards. However, stubble mulch plots which had the lowest average temperatures (Figure 19) also had the lowest % of K in leaves. When soil potassium levels are low enough to be considered marginal, then lower soil temperatures due to some of the cultivation and planting methods may have a critical effect on uptake of potassium. Uptake of potassium is more sensitive to temperature variations than most other elements.

Calcium content in leaves of some treatments appeared to be close to minimum levels established at Ohio. With magnesium, several values were below the minimum levels established under Ohio conditions. This should be looked into more carefully.

All other elements analyzed were in sufficient quantities.

CORN TILLERING

- F. Shubeck and B. Lorenzen

Objectives of Experiment

1. Does fertilizer cause or stimulate formation of tillers?
2. Do tillers depress yields?
3. Is tillering a function of total nitrogen and phosphorus applied or of methods by which they were applied?
4. Do number of plants per acre or method of planting corn influence tiller formation?

Table 9. Effect of Fertilizer and Method of Application on Number of Tillers and Yield of Ear Corn

Treat-ment no.	Treatment N-P-K	Plants Per Acre	Planting Method	Tillers	Method of Application	% stalk with Tillers	Bu/A
1	0-0-0	13,275	drilled	left		4	89
2	6-11-11	13,275	drilled	left	banded 2x2	8	101
3	6-11-11	13,275	checked	left	banded 2x2	7	98
4	100-18-0	13,275	drilled	left	broadcast and plowed under	6	120
5	100-18-0	13,275	checked	left	broadcast and plowed under	4	107
6	100-18-0	19,000	drilled	left	broadcast and plowed under	3	125
7	100-18-0	13,275	drilled	removed	broadcast and plowed under	-	121
8	(6-11-11 (starter + (100-18-0 (broadcast	13,275	drilled	left	starter in a band broadcast and N + P plowed under	9	118

Discussion and Interpretation of Table 9

Very few stalks had tillers this year. With the same variety of corn in 1966, over 50% of the stalks in some treatments had tillers. Climatic conditions are probably responsible for this difference in rate of tillering. With so few tillers, it was difficult to determine accurately the influence of each treatment on the incidence of tillering. However, most fertilized treatments had more tillers than the unfertilized plot and there appeared to be a few less tillers with high populations (treatment 6) than with low populations (treatment 4). Checked corn reduced tillering slightly compared to drilled corn when a starter fertilizer was used in addition to a plow-under fertilizer treatment (compare treatment 3 to treatment 2).

The small number of tillers formed this year limits the application of the following data [illegible] was plowed under.

Is it worth while to take the extra time to check corn or just go ahead and drill it in? (Compare treatment 5 to 4). With 13,275 plants per acre, with fertilizer plowed under and nearly perfect weed control, drilled corn yielded more. These results are for one year only, but other work has shown that corn plants usually yield better as planting patterns approach an equal distance arrangement.

To get maximum yields, wouldn't plant populations have to be raised? (Compare treatment 6 to 4). Populations were raised to 19,000 but yield was increased only about 5 bushels per acre. Raising populations this high presents quite a risk to take for a 5-bushel increase. All corn in this experiment was planted in 40-inch rows. In previous years, corn yields in 40-inch rows was not as responsive to increased populations as narrow row corn. If these plots had been planted in 30-inch or 20-inch rows, perhaps yields would have increased more than 5 bushels per acre by increasing populations up to 19,000.

MAXIMUM FORAGE

- B. Lawrensen, F. Shubeck of the Agronomy Dept, and George Gastler of Station Biochemistry

Objectives of Experiment

1. Compare 5 types of forage (Hybrid sorghum-Sudan, True Sudan Hybrid, Hybrid Sorghum, Open-pollinated Sorghum and Hybrid Corn).
2. Compare multiple cutting with full season growth using two types of forage (Hybrid Sorghum-Sudan, and True Sudan Hybrid).
3. Compare nutritive values of forages of different types and cuttings.
4. Compare results from 20" and 40" rows.

Table 10. Effect of Forage Types, Row Spacings and Number of Cuttings on Forage Yield and Plant Composition

Type	Variety	**No. of cuttings	Row Sp	Tons/A @ 70% H_2O	Crude Fat*	% Crude Fiber % *	Crude Protein % *	% net Free Extract*	% ash *
Hybrid sorghum sudan	Frontier	1	20"	19.3	2.20	31.14	7.65	47.11	6.99
	Hyd 38	1	40"	18.4	2.44	26.56	8.65	50.72	7.27
		2	20"	6.7	2.71	28.13	9.97	46.14	7.63
		2	40"	6.5	2.63	31.54	8.85	45.52	6.14
	DeKalb	1	20"	17.7	2.65	28.97	6.90	49.25	7.32
	SX-11	1	40"	18.1	2.93	25.45	6.53	54.02	6.98
		2	20"	17.7	2.44	28.26	9.54	47.03	6.90
		2	40"	7.0	2.38	27.53	11.16	46.55	7.66
True sudan hybrid	[illegible]	1	20"	14.8	2.41	31.14	6.19	49.41	6.21
	[illegible]	1	40"	13.2	2.66	31.20	6.75	49.33	6.77
	[illegible]	2	20"	7.2	2.99	31.27	10.09	43.75	7.12
	[illegible]	2	40"	6.2	2.50	30.11	10.22	45.52	6.86
Hybrid forage sorghum	Frontier	1	20"	14.8	2.25	29.07	8.28	51.04	5.60
	[illegible]	1	40"	14.6	2.16	27.68	7.43	52.36	5.60
	Pio	1	20"	21.4	1.93	32.57	6.63	49.07	6.43
	931	1	40"	22.4	2.06	31.11	7.78	49.04	5.43
Open polli-nated sorghum	[illegible]	1	20"	16.2	2.07	25.28	6.19	57.51	4.93
	[illegible]	1	40"	17.3	2.85	23.76	6.68	56.62	5.44
Corn	Pio	1	20"	15.1	2.52	23.04	9.16	53.47	5.47
	[illegible]	1	40"	12.6	2.15	24.39	9.51	53.88	6.08

* Percentage analysis reported on basis of moisture free material.
** One cutting - plants were allowed to grow until frost
Two cutting - plants were cut each time they reached approximately forty inches in height.

Discussion and Interpretation of Table 10

For this experiment, 100 lbs of N and 13 lbs of P per acre were broadcast in the fall and plowed under. On June 3, plots were disked and 7 days later were [illegible] twice diagonally. A heavy rain ([illegible] inches) delayed planting. On June 12 plots were again disked and dragged and then planted. Planting rates for sorghum were [illegible] lbs/acre in 40 inch rows and double that for 20 inch rows. Corn plant populations were 12,000 in 40 inch rows and 24,000 in 20 inch rows. Plots were cultivated twice during the summer.

Forage yields (70% moisture) were lower this year than in [illegible]. This was probably due to delayed planting and climatic conditions. [illegible], DeKalb SX 11 and N. K. Trudan yielded more forage from 1 cutting in the fall than from 2 cuttings during the growing season. The multiple cuttings however, resulted in forage with a higher percent of crude protein.

There was no yield advantage this year for double planting forages in 20 inch rows.

Pioneer hybrid forage sorghum 931 yielded the most tons of forage per acre and was a little higher in crude fiber than most of the other varieties.

MOST PROFITABLE ROTATION

- B. Lawrensen and F. Shubeck

Data from Most Profitable Rotation experiment was not presented this year. Excessive rainfall in June delayed planting of some crops on this somewhat poorly drained soil. Small differences in soil and drainage that ordinarily had only minor effects on yields were magnified to such an extent this year that validity of experimental treatment comparisons was questionable.

HIGH PHOSPHORUS EXPERIMENT

- Raymond C. Ward

An experiment was established in 1964 to study the effects of various rates of phosphorus (P) fertilizer on the yield of corn. The various rates of P were also used to determine the influence of P fertilizer on the zinc (Zn) uptake by corn plants. Four rates of P (10, 20, 40 and 80 lbs. P/Acre) have been broadcast and plowed down annually. Each broadcast P rate has been divided into thirds with one third receiving about 10 pounds of P per acre as a starter fertilizer, one third receiving Zn fertilizer, and one third receiving no extra P or Zn. The fertilizer applications have been applied on the same site for 4 years, except the zinc fertilizer which was not applied in 1966 or 1967.

The entire experimental area received 80 pounds of nitrogen (N) per acre and 33 pounds of potassium (K) per acre before planting each year. An insecticide was applied to control western corn rootworms, and Atrazine was applied to control weeds. Pioneer 3291 was planted May 15, 1967. In 1967 the corn was planted in 30" rows. Plant population averaged about 15,000 plants per acre.

Soil tests at the beginning of the experiment rated the P test as medium and the Zn test as very high.

[illegible]

[illegible] Ten pounds of starter P per acre, on the other hand, increased the yield about 10 bushels per acre. Broadcast P was much more effective than starter P in increasing the corn yield. This was contrary to the results obtained in 1966 and similar to the results obtained in 1965. Apparently the yield increases obtained from methods of P applications are influenced by climatic conditions.

Larger rates of broadcast P tended to lower the corn yield except where zinc had also been applied. Where Zn had been applied with larger rates of broadcast P, the yields remained at a higher level. It appears that high rates of P may be causing a zinc deficiency as shown in Table 13.

Forage yields were taken from two replications on October 2, 1967. The forage yields are shown in Table 12. Ear corn moisture and per cent barren stalks are also shown in Table 12. Since there was essentially no difference among the subplots the average of the three subplots are shown for each rate of broadcast P. Forage yields were increased approximately four tons per acre when 10 pounds of broadcast P or more were applied. The large yield increase in forage corresponds to the large yield increase in ear corn. Broadcast P definitely decreased the moisture content of the ear corn (10 pounds of P decreased the moisture content 4%). The % barren stalks increased as the rate of broadcast P increased. This may partially explain why the yields decreased as more P was applied.

The number of tillers per 100 corn plants was not taken this year because very few tillers were formed even at the high rates of P. This again points out that climatic factors influence the response of P fertilizer. The same hybrid was grown at the same plant population as in 1965 and 1966 when many tillers were found at the high rates of P.

Table 11. [illegible] fertilizer on the yield of ear corn.

Pounds of P Broadcast/A	No additional P or Zn	10 lbs. of P/A as starter	20 lbs. of Residual Zn/A	Average
	Ear Corn Yield in Bushels per acre[1]			
0	75	84	78	79
10	96	97	89	94
20	93	87	91	91
40	91	87	95	91
80	85	86	91	87
Average	88	88	89	

[1] Yields corrected to 15% moisture in the ear corn.

Table 12. [illegible] of corn.[1]

Pounds of P Broadcast/A	Forage Yield[2]	Ear Corn Moisture[3]	Barren Stalks
	Tons/A	%	%
0	15	35.6	3.0
10	19	31.4	5.1
20	18	30.2	10.0
40	19	30.0	11.1
80	19	29.3	16.3

[1] Values reported are averages of the three subplots.

[2] [illegible]

[3] Ear corn was harvested on October 18, 1967.

Table 13. The concentration of several nutrient elements found in corn leaves at silking time[1] as influenced by various fertilizer treatments.

Lbs. of P Broadcast/A	Additional Treatment	N	P	K	Ca	Mg	Mn	Fe	B	Cu	Zn
0	None	2.77	.27	3.22	.62	.38	82	182	12	12	32
10		2.54	.36	2.84	.66	.30	90	258	12	12	26
20		2.60	.35	3.14	.67	.31	88	224	12	12	24
40		2.69	.34	2.83	.66	.34	90	232	12	11	20
80		2.51	.42	2.99	.91	.48	126	345	14	12	20
0	Starter P	2.69	.26	3.10	.67	.41	88	238	14	13	38
10		2.75	.33	2.90	.68	.36	97	303	13	12	34
20		2.61	.34	2.62	.79	.38	107	236	12	12	24
40		2.84	.32	2.86	.70	.36	95	218	13	10	18
80		2.60	.33	2.76	.62	.29	88	197	10	10	14
0	Residual Zinc	2.79	.23	2.85	.52	.33	71	199	14	12	48
10		2.96	.28	2.97	.56	.28	75	203	12	12	36
20		2.61	.28	3.06	.55	.27	72	191	11	10	28
40		2.72	.36	2.91	.69	.34	92	242	12	12	33
80		2.69	.31	2.83	.64	.28	91	200	11	9	20

[1] The leaf opposite and below the ear was sampled.

[2] Average of 2 replications.

Table 13 reports the plant analysis data obtained in 1967. In general, the nitrogen content of the corn leaves was low, compared to 1966. Potassium levels were higher this year and are in [illegible] Broadcast P did not appear to influence the concentration of other nutrients reported.

SOIL POTASSIUM OF THE SOUTHEAST FARM

– Dwight Hovland

To help evaluate availability of soil potassium, field plots have been used on some moderately well-drained soils of this farm each season since 1962. Results from 1962 through 1966 were reported earlier (1965 Fifth Annual Progress Report, and 1966 Sixth Annual Progress Report, Southeast S. Dak. Exp. Farm, S. Dak. Agr. Exp. Sta.) The 1967 study was a continuation of the same plots used in 1965 and 1966. These plots compared three potassium fertilizer treatments; the same fertilizer treatments were used on the same plots each spring 1965, 1966, and 1967. Treatments were: (a) no potassium, (b) 500 pounds of potassium per acre broadcast and disked into surface soil, and (c) 12 to 17 pounds potassium per acre banded alongside and just below the seed. Nitrogen and phosphorus fertilizers were broadcast and banded uniformly over all plots. Pioneer 3414 corn was planted in 40-inch rows on May 19. Three weeks later corn plants were thinned to a uniform density of 14 thousand per acre. Good insect and weed control was maintained throughout the season. Moisture content to the five foot depth in the soils between corn rows at each corner of the plot area was determined both about ten days before corn pollination and again after harvest of the corn grain. Temperatures in the corn row at the three-inch depth of soils bordering the plots were measured at 1 P.M. on work days from late June through mid October. Corn grain yield on the individual plots was sampled October 23.

Soil moisture, soil temperature and corn grain yield data are in tables 14, 15, and 16. Analysis of variance showed no significant differences among corn yield data. Again, banding a small amount of potassium fertilizer adjacent to the seed or repeatedly broadcasting and disking in large quantities of potassium fertilizer has not markedly influenced corn yields on these soils.

Table 14. Average moisture content of soils bordering 1967 potassium plots.

Sample depth (inches)	Moisture content (g. water/g. dry material)* July 24	November 2
0-6	0.26	0.18
6-12	0.20	0.18
12-24	0.21	0.17
24-36	0.19	0.19
36-48	0.23	0.24
48-60	0.25	0.26

* Each value is an average of four samples (one from each corner of the plot area).

Table 15. Average 1 P.M. temperature in corn row at three-inch depth in soils bordering 1967 potassium plots.

Period	Temperature (°F.)
June 27-30	77
July 1-15	75
July 16-31	80
August 1-15	73
August 16-31	70
September 1-15	66
September 16-30	61
October 1-15	56

Table 16. Influence of potassium fertilizer on 1967 corn grain yields on some mederately well-drained soils of the Southeast Farm.

Potassium Fertilizer Treatment* (lbs. K/ac./yr. 1965,1966 & 1967)	Corn Grain Yield (bu./ac.)**
None	119
500 broadcast	111
12 to 17 banded	112

* All plots received nitrogen and phosphorus fertilizers.

** Each value is the average of eight replications.

WATER STORAGE CAPACITIES OF VARIOUS SURFACE CONDITIONS AND GEOMETRIC SHAPES

- C. W. Doty and P. E. Stegenga

Objectives of Experiment

1. To determine the geometric shapes of bedding, conventional tillage, listing and listing superimposed on bedding.
2. To determine the surface water storage capacities for these types of tillage operations.
3. To determine the effects of these tillage operations on soil moisture, crop yield and terrace spacing.

Table 17. Effect of Different Geometric Shapes on Corn Yield

Treatment	Grain Bu/Acre
Conventional Contouring	103
Contour Listing	96
Contoured 4-row bedding with conventional planting	95
Contoured 4-row bedding with lister planting	81
Contoured 8-row bedding with conventional planting	90
Contoured 8-row bedding with lister planting	81

Discussion and Interpretations of Results

Fertilizer was applied to all treatments at the same rate and time, 44 pounds of N and 44 pounds of P_2O_5 per acre at planting. The plots were sidedressed with 66 pounds of N per acre on July 12. Plants were thinned to 14,000 plants per acre.

Too much rain in the month of June caused some of the rows on the listing and bedding plots to drown out. At least a portion of one row was lost on the listing and bedding plots, and in several plots two rows were lost in the sample area. The surface water storage capacity of the listing and bedding treetments was 1½ to 3 times greater than the conventional contouring. The potential surface water storage capacities of the six treatments are shown in figure 20 for the 1966 crop year. The 1967 storage capacities have not been calculated at this date. The corn drowning out caused the variation in corn yields shown in table 17.

Figure 21 shows the soil moisture in the top four feet of the soil profile throughout the year. Listing and bedding treatments had more moisture in the soil profile than conventional contouring throughout the year.

In Eastern South Dakota there is a need for moisture during most years and the listing and bedding treatments when placed on the contour provide the surface water storage capacity to reduce runoff and this in turn would reduce erosion.

* This study was conducted by Soil and Water Conservation Research Division, Agricultural Research Service. Project No. SWC 8-C4 for 1967.

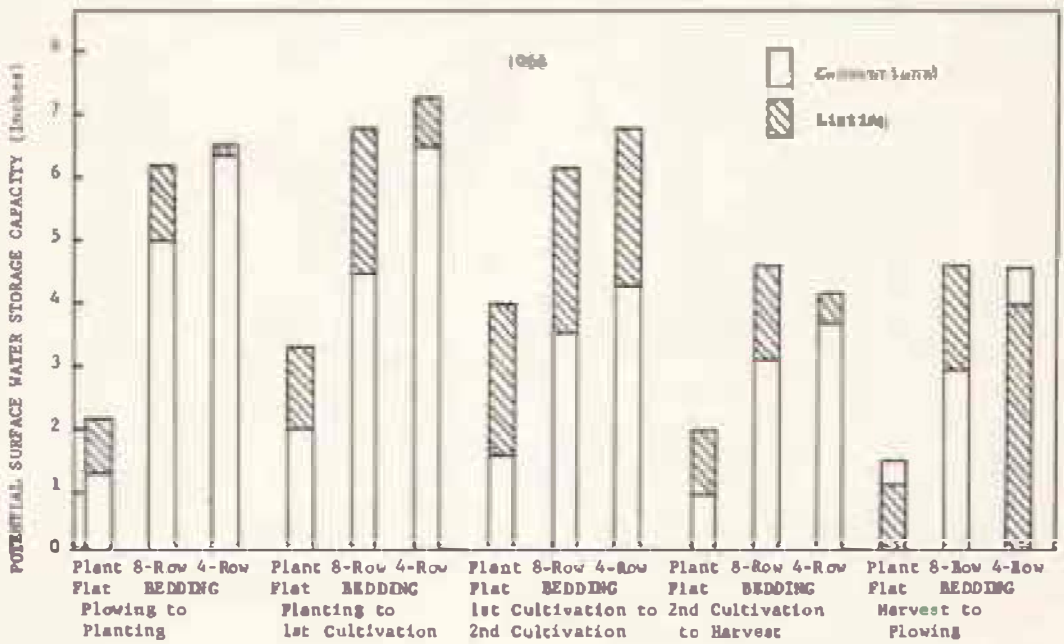
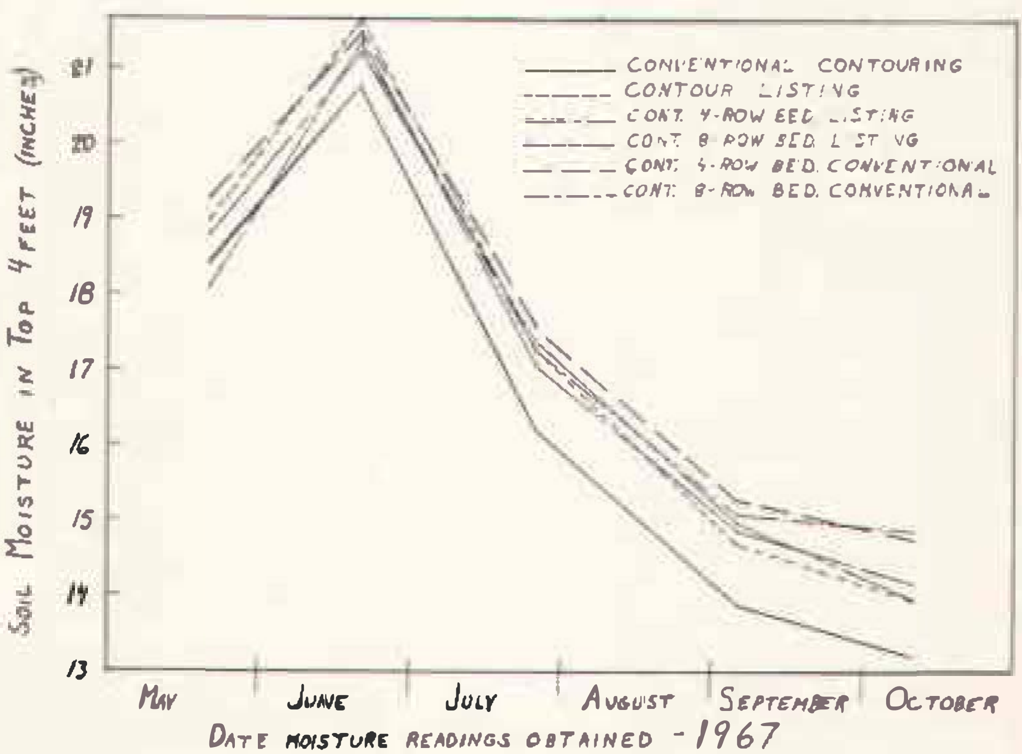


Figure 20. Potential Surface Water Storage Capacity in Inches of Six Geometric Shapes at the Centerville Location for Each Cropping Period During the Year.

FIGURE 21. TOTAL INCHES MOISTURE, TOP 4 FEET SOIL GEOMETRIC SHAPE PLOTS

CENTERVILLE, SOUTH DAKOTA



WESTERN CORN ROOTWORM CONTROL - 1967

B. H. Kantack, Wayne L. Berndt and J. F. Fredrikson

Four demonstration plots were initiated in southeastern South Dakota in 1967 to demonstrate the efficacy of various insecticides for control of western corn rootworm. Results are reported for one of these plots in this report. The infestation on the Howard Kennedy farm was extremely heavy and severe lodging resulted (see Table 18).

TABLE 18. Results Obtained from Plots on Corn Rootworm on Howard Kennedy Farm, Lincoln County, South Dakota*

Insecticides	Percent Lodging 30° From Center Replicate No. 1	No. 2	Av.
Dux Ten 19G	[illegible]	[illegible]	[illegible]
Thimet 15G	[illegible]	[illegible]	[illegible]
Diazinon 14G	[illegible]	[illegible]	[illegible]
Niran 10G	[illegible]	[illegible]	[illegible]
Parahep 10-10G	[illegible]	[illegible]	[illegible]
Sevin 20G	[illegible]	[illegible]	[illegible]
Check	[illegible]	[illegible]	[illegible]

* Degree of infestation (heavy) with counts ranging from 40 to 60 worms per plant, with an average of 50 worms per plant. Planting date, May 23, 1967.

Representative root systems found during examination on July 24, 1967, are shown in Figure 22.

Figure 22. Typical corn roots examined July 24, 1967, from a demonstration plot on Howard Kennedy farm (Lincoln County) Beresford, South Dakota. Note planting time treatments of Dux Ten, Thimet, and Diazinon gave good control. (Planting date: May 23, 1967)

The picture in Figure 22 illustrates that parathion products or formulations and Sevin 20G failed to provide adequate control on this plot when applied at planting time. Lodging counts taken later substantiated this. These results apparently were caused by later rootworm hatch and unfavorable weather conditions. Thus, we are not recommending any Parathion formulations nor are we recommending Sevin 20G for corn rootworm control in South Dakota for 1968. Recommendations for 1968 are: (1) Planting time treatments with either Dux Ten, Thimet, or Diazinon. Apply at recommended rates in a 4- to 7-inch band and incorporate in the top half inch of soil above the seed. (2) Rotate corn with other crops wherever possible to break the corn-on-corn sequence.

At present S.D.S.U. is experimenting with cultivation time treatments of corn rootworm insecticides. However, we feel additional research data is needed under South Dakota climatic conditions before such treatments can be recommended for general use in South Dakota.

STANDARD VARIETY SMALL GRAIN TRIALS

- J. J. Bonnemann

Standard variety trials of spring and winter wheat, oats, barley and rye were harvested at the SE Farm in 1967. Data included in this report are bushel yields and test weights for 1967 and five-year averages where available.

The winter wheat and rye was seeded on September 10, 1966 and produced a good cover before fall growth stopped. Winterkill was light and survival 90 per cent or better in the winter wheat. The rye trials were expanded in 1967 and several of the new entries suffered heavy losses from winterkilling.

Spring grains were seeded on April 6, 1967. Germination was quite uniform but cool weather slowed growth. A heavy rain accompanied by high wind on July 9 caused severe lodging and reduced grain weight.

Further discussion on the small grain trials will be found in Circular 182, 1967 Small Grain Variety Trials, South Dakota Agricultural Experiment Station.

CORN PERFORMANCE TRIALS

- J. J. Bonnemann

The entries in the trial were those selected by participating commercial seed producers and varieties developed by Experiment Stations in the area. Forty-six entries were included in the 1967 performance trial.

The corn was seeded on May 18 and harvested on October 26. It was hand planted as checked corn, 4 kernels per hill, in 40-inch rows. The plots were 2 x 8 hills in size. The seeding rate was 15,750 kernels per acre. Recommended chemicals were used for grassy weed and corn rootworm control.

Production was very good, even though cooler temperatures were prevalent throughout much of the season. Yields in the performance trial ranged from 148.1 to 95.2 bushels per acre. Moisture in the shelled corn at harvest time varied from 17.4 to 31.8 percent. Results are reported in Table 19.

Additional agronomic data and several year averages will be found in Circular 183, 1967 Corn Performance Trials, South Dakota Agricultural Experiment Station.

GRAIN SORGHUM PERFORMANCE TRIALS

- J. J. Bonnemann

The performance trials have been conducted at the SE Farm since 1962. Entering seed producers selected the entries included in the trial. Check entries are included by the Agricultural Experiment Station.

The 1967 trial included thirty-two entries. Seeding was done on May 23 and harvesting on October 9. Growth was slow in June as excessive precipitation and cool temperatures prevailed for much of the month. Precipitation was adequate for steady growth during July and August but temperatures were below normal. September temperatures were slightly above normal and precipitation was limited. This permitted varieties to mature more rapidly and produce some excellent yields by harvest; this in view of the fact that over half of the entries had above 35 percent moisture in the grain on September 20.

Yields are reported in terms of 100 pounds per acre and range from 74.5 to 24.6. Some grain was of excellent quality but others were light as test weights ranged from 60 to 45 pounds per bushel.

Results of the Grain Sorghum Performance Trial appear in Table 19. Complete results and further discussion will appear in Circular 184, 1976 Grain Sorghum Performance Trials, South Dakota Agricultural Experiment Station.

TABLE 19. 1967 Corn Performance Trial, Area E, Southeast Research Farm

Variety	Performance rating	Percent SL	Percent EO	Percent moisture	Yield, Bu/A
SC Exp 68 (3x)	[illegible]	[illegible]	[illegible]	[illegible]	148.1
SC Exp 67 (3x)	[illegible]	50	[illegible]	[illegible]	142.7
SD Exp 69 (4x)	[illegible]	37	[illegible]	[illegible]	156.9
Curry SC-165 (2x)	[illegible]	10	[illegible]	[illegible]	138.8
T-E Cashmaker (2x)	[illegible]	45	[illegible]	[illegible]	136.2
Pioneer 3715 (4x)	[illegible]	2	[illegible]	[illegible]	134.0
Sokota SX 70 (2x)	[illegible]	[illegible]	[illegible]	[illegible]	133.0
Pioneer 3510 (2x)	[illegible]	[illegible]	[illegible]	[illegible]	132.4
Pioneer 3414 (4x)	[illegible]	[illegible]	[illegible]	[illegible]	131.7
Northrup-King PX 50 (2x)	[illegible]	[illegible]	[illegible]	20.2	130.8
Pioneer 3567 (2x)	9	[illegible]	[illegible]	21.2	130.5
Green Acres 401 (4x)	14	4	[illegible]	24.0	130.2
Northrup-King PX 610 (5x)	13	1	[illegible]	22.[illegible]	129.8
Pioneer 3291 (4x)	15	3	[illegible]	24.5	129.7
McCurdy 3 x 6 (2x)	16	1	[illegible]	24.5	129.4
T-E Horusmaker (2x)	11	5	[illegible]	20.1	128.0
Pioneer 3558	12	5	[illegible]	20.9	128.0
Nebr. 501G (4x)	10	13	[illegible]	23.7	127.4
Cisco SX 29 (2x)	19	[illegible]	[illegible]	23.9	127.5
Haapala SX [illegible] (2x)	22	[illegible]	[illegible]	26.3	126.4
Pioneer 3561 (2x)	17	[illegible]	[illegible]	20.3	124.7
Haapala SX 725 (2x)	21	[illegible]	[illegible]	22.7	123.8
United-Hagie 5551C (2x)	26	[illegible]	[illegible]	24.9	122.6
Northrup King KT 623A (4x)	27	[illegible]	[illegible]	25.0	122.4
McCurdy [illegible] (3x)	29	[illegible]	[illegible]	23.1	119.8
Curry C-660 (4x)	32	[illegible]	[illegible]	24.3	119.5
Sokota 623 (4x)	28	[illegible]	[illegible]	22.7	119.4
Green Acres 636 (4x)	31	[illegible]	[illegible]	23.6	119.4
Minn. 4301 (3x)	24	[illegible]	[illegible]	21.0	119.3
McCurdy 112P (4x)	30	[illegible]	[illegible]	23.1	119.2
Minn. 6302 (3x)	23	[illegible]	[illegible]	18.1	117.6
Sokota 625A (4x)	37	[illegible]	[illegible]	24.5	117.4
Northrup King PX 52 (2x)	25	[illegible]	[illegible]	19.5	117.3
Sokota 625 (4x)	33	[illegible]	[illegible]	22.1	116.7
T-E Cropmaster (4x)	35	[illegible]	[illegible]	21.9	115.9
Curry TC-342 (3x)	34	[illegible]	[illegible]	19.4	113.4
Cisco SX 20 (2x)	36	2	[illegible]	20.1	113.0
Curry C-627 (4x)	41	11	[illegible]	25.8	112.9
McCurdy [illegible] X 5 (2x)	38	[illegible]	[illegible]	21.[illegible]	112.1
Iowa 5053	39	[illegible]	[illegible]	20.9	111.2
Minn. 417 (4x)	40	[illegible]	[illegible]	20.1	109.4
United-Hagie C5560 (2x)	46	[illegible]	[illegible]	31.8	109.4
United-Hagie IXL 6 (2x)	42	[illegible]	[illegible]	23.[illegible]	107.2
SC 627 (4x)	43	[illegible]	[illegible]	23.7	106.1
T-E Harvestmaker (4x)	44	[illegible]	[illegible]	24.6	106.0
T-E Hastymaker (4x)	45	[illegible]	[illegible]	17.4	95.2
				Mean	122.[illegible]
CV = 6.45				LSD (.05)	11.0

Table 19. 1967 Grain Sorghum Performance Trial, Area E, SESD Research Farm, 1967

Variety	Height, Inches	Harvest Moisture [illegible]	Test wt. lb/bu	Yield, Bu/A 1967	[illegible]
T-E 44	50	26.9	54	74.5	70.2
Nebr. 504	54	27.4	59	64.7	61.3
SD 451	56	26.2	57	64.4	62.5
DeKalb DD-50	52	35.1+	53	61.1	65.1
RS 610	53	35.1+	56	60.8	65.4
SD 503	60	31.3	58	60.0	54.7
NK 210	51	35.1+	55	59.8	
T-E #4C	48	35.1+	60	58.1	54.5
Frontier 370	49	27.8	53	57.7	
Pioneer 883	47	30.2	57	57.5	
NK 222	44	35.1+	53	57.3	60.6
Frontier 401	45	35.1+	56	57.1	61.2
Pioneer 885	48	32.6	58	57.0	59.7
Rudy-Patrick RP 212	49	33.3	56	56.9	
Paymaster R102	50	32.0	56	56.8	
Pioneer 866	54	35.1+	58	55.4	
SD 441	60	17.9	57	55.3	
AMAK-R10	49	35.1+	54	53.0	
T-E Grainmaster A	50	35.1+	54	52.4	60.6
Advance 14	52	35.1+	47	52.2	
T-E Mucho	48	33.9	54	52.1	
NK X4018	45	35.1+	55	51.7	
Pioneer 872A	48	35.1+	53	51.0	
Rudy-Patrick RP 180	49	33.3	56	48.5	
Frontier Super 400	47	35.1+	50	48.2	57.6
Ute	44	35.1+	58	47.2	56.0
Frontier 375	44	26.6	48	46.2	54.1
Frontier 409	47	35.1+	45	42.1	
DeKalb E-57	50	35.1+	47	34.7	
Pioneer 846	46	35.1+	45	32.5	50.9
NK 222A	45	35.1+	45	29.6	
Haapala BL-229	49	35.1+	52	24.6	
			Mean	52.5	
			LSD (.05)	[illegible]	

Table 20. Standard Variety Winter Wheat Trial, SESD Research Farm, 1967

Variety	Test wt. lb/bu	Average yields, Bu/A 1967	1963-67
Gage	59.6	39.7	
Omaha	59.1	35.8	[illegible]
Ottawa	58.0	33.6	[illegible]
Winalta	59.1	33.5	
Neb. 64323	56.2	32.6	
Hume	59.8	32.3	30.8
CI 13994	57.5	31.1	
Scout	58.8	30.9	
Winalta 66	58.9	30.9	
Neb. 64322	57.2	29.8	
Lancer	58.0	28.5	[illegible]
Warrior	54.5	28.1	[illegible]
Bison	56.7	24.7	[illegible]
Winter	54.9	24.2	[illegible]
Nebred	53.7	23.4	[illegible]
Shoshoni	51.7	23.1	
	Mean	30.1	
	LSD (.05)	[illegible]	

Table 21. Standard Variety Rye Trials, SESD Research Farm, 1967

Variety	Test wt. lb/bu	Average yields, Bu/A 1967	1963-67
Gustbover	53.0	55.7	
Antelope	53.7	54.2	45.1
Von Lochow	54.5	54.1	
Petkus	52.1	53.9	
Sangaste	53.0	52.1	
Elk	52.9	52.0	35.2
Dominant	53.3	50.7	
Zeider	53.2	50.7	
Toive	51.8	47.4	
Frontier	53.4	45.8	
Caribou	53.3	41.1	43.4
Oakold	53.4	38.4	
Pierre	54.1	34.3	40.2
7276	54.4	32.8	
Adams	51.5	31.5	
N. F. No. 1	54.7	31.3	
Bonel	52.2	30.7	
Elbon	54.5	28.4	
	Mean	43.6	
	LSD (.05)	8.5	

Table 22. Standard Variety Spring Wheat and Durum Trial, SESD Research Farm, 1967

Variety	Test wt. lb/bu	Average yields, Bu/A 1967	1963-67
DT 191*	58.0	43.5	
Lakota*	56.5	42.4	
Wells*	59.0	41.7	
Stewart 63*	60.0	39.9	
Manitou	58.0	37.1	
CI 13937	56.5	33.7	
Chris	59.5	33.6	29.0
CI 13773	60.5	33.0	
Leeds*	61.0	29.1	
Justin	58.5	28.6	21.0
Sheridan	60.0	28.2	26.8
Rushmore	59.5	27.7	23.3
II-55-16	59.5	26.8	
Pembina	53.5	26.8	23.9
Crim	57.5	24.5	24.3
Selkirk	53.5	24.5	21.1
Thatcher	55.0	24.3	20.4
Fortuna	54.5	22.8	
	Mean	31.5	
	LSD (.05)	[illegible]	

* Durum

Table 23. Standard Variety Barley Trials, SESD Research Farm, 1967

Variety	Test wt. lb/bu	Average yields, Bu/A 1967	1963-67
CI 11863	43.5	61.1	
Trophy	43.5	58.7	49.3
CI 13110	45.0	58.2	
CI 11864	44.5	56.5	
Galt	42.5	53.8	
Liberty	43.5	52.9	48.9
Primus	43.0	52.7	
Conquest	43.5	51.3	
Dickson	43.5	50.8	
Firlbecks III	47.0	44.3	
Traill	44.5	43.3	46.8
Larker	45.5	41.8	44.9
Plains	42.5	38.9	42.2
Spartan	45.5	38.3	36.7
	Mean	50.2	
	LSD (.05)	[illegible]	

Table 24. Standard Variety Oat Trial, SESD Research Farm, 1967

Variety	Test wt. lb/bu	Average yields, Bu/A 1967	1963-67
Clintland 64	37.0	82.6	
Portage	34.0	76.3	63.7
Holden	34.0	74.4	
Multiline E68	37.0	74.0	
Minhafer	36.0	69.5	63.3
Clintford	36.0	68.8	
Multiline M68	38.0	68.6	
Tippecanoe	35.0	64.1	
Kelsey	31.0	63.5	
Jaycee	35.0	61.3	
Orbit	32.0	60.5	
Lodi	30.0	60.3	60.8
Wyndmere	34.0	59.6	
Dupree	34.0	58.8	66.9
Ortley	35.0	58.6	60.1
Rodney	27.0	58.6	56.3
Garland	34.0	58.5	62.8
Sioux	34.0	56.4	
Dodge	36.0	55.8	63.2
CI 8273	34.0	55.7	
CI 8178	37.0	55.7	
Portal	36.0	55.5	
Andrew	33.0	54.1	63.1
Dawn	33.0	52.7	
Stormont	32.0	52.3	
Brave	33.0	51.5	
O'Brien	37.0	48.9	
Santee	32.0	48.7	
Garry	30.0	46.7	57.8
Tyler	32.0	46.1	
Coachman	32.0	44.8	59.4
Burnett	33.0	42.7	60.8
	Mean	58.9	
	LSD (.05)	[illegible]	

OAT BREEDING

– R. S. Albrechtsen

[illegible] from state experiment stations primarily throughout the North Central Region of the U.S. and in Canada. Strains in these nurseries are in the final [illegible]

[illegible] this nursery are primarily of the early maturity class, being equal to or earlier than the Clintland type oats. Most of these strains should be in a maturity range suitable for growing in Southeastern South Dakota.

Table 26 shows data on selected experimental strains that yielded well in 1967, with recently released varieties and long-time checks in the Uniform Midseason Oat Performance Nursery. Entries in this Nursery are primarily of the Midseason to late maturity class. Some strains in this nursery are not well adapted for Southeastern South Dakota because of their late maturity.

The data in both Tables 25 and 26 show that varietal performance [illegible]

Table 25. Performance of Selected Experimental Oat Strains and Check Varieties in the Centerville Uniform Early Oat Performance Nursery

C.I. Number	Variety or Selection	[illegible]	[illegible]	1967	[illegible]
		lbs/bushel		bushels/acre	
7639	Clintland 64	37.0	34.9	89.3	80.8
	E-68	36.2	*	82.5	*
7463	Clintford	38.2	36.2	77.2	78.5
8166	62-1453	36.8	35.8	75.6	73.8
8167	62-1456	36.0	35.6	72.4	73.3
8063	61-1632	35.2	34.6	72.0	73.2
7805	04935	38.2	37.0	70.9	80.4
7970	C237-89	36.8	*	69.8	*
7698	Ab-60-1079	34.2	33.3	69.0	78.6
4978	04978	36.0	35.3	66.8	73.1
5291	05291	35.0	*	66.1	*
4170	Andrew	33.8	32.4	65.9	65.8

* 1967 was first year of testing in the Uniform Early Oat Performance Nursery.

Table 26. Performance of Selected Experimental Oat Strains and Check Varieties in the Centerville Uniform Midseason Oat Performance Nursery

C.I. Number	Variety or Selection	[illegible]	[illegible]	1967	[illegible]
		lbs/bushel		bushels/acre	
8187	U-60-2-149	39.0	35.6	90.7	81.6
8040	Portal (New)	37.5	34.5	89.8	81.5
7639	Clintland 64	38.8	35.4	84.8	78.1
8304	2-94-109	33.0	*	83.4	*
	M-68	37.8	*	78.9	*
8192	5842A 4-14-3	37.5	33.5	77.8	65.4
	6316A2-4	34.0	*	76.0	*
	6316A2-3	34.0	*	73.6	*
4988	Mo. O-205	35.8	33.6	70.7	75.2
7463	Clintford	38.8	36.3	70.6	71.3
7971	Joycae	34.8	33.4	69.2	73.7
7811	Orbit	33.2	30.8	67.8	67.2
4170	Andrew	35.2	33.4	53.8	66.2

* 1967 was first year of testing in the Uniform Midseason Oat Performance Nursery.

WEED CONTROL IN CORN

– J. F. Stritzke and C. E. Stymiest

[illegible]

1. The evaluation of early weedy grass (yellow and green foxtail) control of various preemergent and early postemergent herbicides which are, or will be available to the farmer.

2. The comparison of yield from plots receiving a specific treatment and that of the check plot.

3. To compare effectiveness of new herbicides with some of the recommended herbicide treatments.

Materials and Methods:

[illegible]

Method of Application Herbicide treatments were applied by a tractor type sprayer applying 20 gal. spray solution per acre.

[illegible] to 4 inches tall.

[illegible] All herbicide treated plots received one cultivation and the non-treated plots received three cultivations when corn was grown in 40-inch rows and two cultivations when corn was grown in 30-inch rows. The 1967 corn experiment was flex-tine harrowed on June 6, 1967.

[illegible] 1965 SD-619
1966-67 SD-625

[illegible]

A number of preemerge herbicides were evaluated in 1967. Evaluation of results before the first cultivation indicated that good weed control was obtained with atrazine and CP-50144 (table 27). A new type of atrazine granule gave only fair control as did propachlor (Ramrod). Only poor control of foxtail was obtained with 2 and 4 pounds/A of R-11914 (a new experimental herbicide from Stauffer).

Post emergence applications were delayed until the grasses were four inches tall. This was done to determine what atrazine and oil rates should [illegible] oil applied postemergence did not give satisfactory weed control. Only fair weed control was obtained with the two herbicide mixtures used in 1967.

Corn yields from herbicide treated plots were no better than corn yields from cultivated plots in 1967. This indicated that moisture and fertility were sufficient in our plots to produce good yields of corn even with a slight infestation of foxtail.

Three Year Results:

Atrazine preemergence, atrazine plus oil postemergence, and Ramrod have been evaluated for three years at the southeast experiment farm. Atrazine plus oil has given the most consistent weed control (table 28). Weed control from atrazine preemergence was only fair due to limited rain after application in [illegible] plots (Table 27).

Several mixtures have been evaluated in the past three years. The weed control and corn yields were usually no better with a mixture than for the individual herbicides. However, the main weed problems in the weed control plots have been green and yellow foxtail. Where some other weeds are a problem, then a mixture may give better control.

[illegible]

Atrazine and oil (1 pound plus 1 gallon) continued to be the most effective weed control treatment at the Southeast South Dakota Experiment Farm. Two [illegible]

Under the conditions of fertility and moisture present in these experiments the corn yields from the non-sprayed plots which were cultivated equalled the yields from the sprayed plots which were cultivated once. On the average the better herbicide treatments have taken the place of one cultivation and have resulted in yield increases of 3 to 6 bushels per acre (table 28).

Table 27. Early and Late % Weed Control and Corn Yield from Herbicide Plots at S.E.S.D. Experiment Farm 1967

Treatment	Rate/A	% Foxtail Control 7-13-67	% Foxtail Control 10-30-67	Ave. Yield bu/A
Check			[illegible]	141
[illegible]				
Atrazine	2.5 lb.	89	95	141
Atrazine (glomule)	2.5 lb.	65	77	139
Ramrod	4.0 lb.	65	82	140
CP-50144	2.0 lb.	81	83	137
	2.5 lb.	84	93	134
	3.0 lb.	86	92	138
R 11914	2.0 lb.	41	65	130
	4.0 lb.	38	58	119
Fenaben (glomule)	3.0 lb.	75	65	109
Fenaben (granular)	3.0 lb.	75	62	126
[illegible]				
Atrazine	1.0 lb.	86	80	144
Atrazine + oil	[illegible] lb. + 1 gal.	98	99	130
	[illegible] lb. + 2 gal.	96	93	143
	[illegible] lb. + 1 gal.	99	97	138
	[illegible] lb. + 2 gal.	98	92	138
Ramrod	[illegible] lb.	35	65	136
Ramrod + oil	[illegible] lb. + 1 gal.	46	82	128
Mixtures Pre.				
Ramrod + Atrazine	2 lb. + 1 lb.	79	83	142
Ramrod + Linuron	2 lb. + 1 lb.	66	83	[illegible]

Table 28. Weed Control and Corn Yield from Herbicide Plots at SESD Experiment Farm from 1965 through 1967.

Treatment	Rate lbs./A	1965 % early Foxtail Control	1965 Yield bu/A	1966 % early Foxtail Control	1966 Yield bu/A	1967 % early Foxtail Control	1967 Yield bu/A	Three yr. ave. % early Foxtail Control	Three yr. ave. Yield bu/A
Preemergent									
Atrazine	2.5	99	96	58	100	89	141	82	112
CP-50144	2.0					81	137		
CP-50144	3.0			72	97	86	138		
Ramrod	4.0	98	97	95	103	65	140	86	112
Randox T	3.0	93	98	95	77				
Postemergent									
Atrazine	2.5			90	122				
Atrazine	1.0			32	116	86	144		
Atrazine + oil	1 + 1	95	102	90	118	98	130	94	115
Combinations (Pre.)									
Ramrod + Atrazine	2 + 1			85	120	83	142		
Ramrod + Linuron	2 + 1					83	134		
Atrazine + Linuron	1 + 1	96	100	27	91				
Atrazine + Prometryne	1 + 1	97	106	33	91				
Check			106		95		141		109

WEED CONTROL IN SORGHUM

- J. F. Stritzke and C. E. Stymiest

[illegible]

1. To evaluate new herbicides for weed control and injury to sorghum.

2. To compare effectiveness of new herbicides with some of the recommended herbicide treatments.

[illegible]

[illegible] [illegible] were 10 feet by 30 feet and were replicated [illegible] design. Sorghum was grown in 40 [illegible] in 30 inch rows in 1967.

[illegible]

[illegible] grasses were 4 inches tall before treatment.

[illegible] All herbicide treated plots received one cultivation and [illegible] received three cultivations when sorghum was grown in 40 [illegible] and two cultivations when sorghum was grown in 30 inch rows.

[illegible] 1964 SD - 441
1965-66 SD - 451
1967 TE - 44

Results

[illegible]

[illegible] some stand reduction in the atrazine treated plots due to leaching of the atrazine into the sorghum rooting zone. However the stand reduction was not serious enough to lower yields below the yield of the cultivated check plot.

Propazine preemerge was evaluated in 1964 and 1965 and results were similar to results with atrazine. Randox was evaluated in 1964 and [illegible] irritating to handle. Propachlor (Ramrod) has been evaluated since 1965 and has given consistent foxtail control and good sorghum yields. CP-50144 (Lasso) has been tested for 2 years. Weed control with this herbicide were good but severe stand reduction of sorghum resulted this year.

Another preemergence herbicide which looked promising is norea (Herban). The weed control was not satisfactory in 1966 but Hercules had some formulations problems and this may have been due to a bad formulation. R-11914 (an experimental herbicide from Stauffer) was tried in 1967. Weed control results looked unfavorable but yields of sorghum were surprisingly high and this may merit further evaluation.

[illegible]

[illegible] atrazine and oil treatment, corn had to be cultivated before the weedy grasses [illegible] highest yields were obtained from the atrazine plus oil treated plots.

Herbicide Mixtures

Several mixtures have been evaluated and some performed quite satisfactory. However, foxtail control was usually no better with the mixtures than with the individual herbicides.

Summary:

Yields from herbicide treated plots were usually better than from the untreated plots. A number of these herbicides (atrazine, propazine, Randox and Herban) are cleared for use. Tentative tolerance has been established for Ramrod.

Table 29. Summary of Foxtail Control[1] and Sorghum Yields for 4 Y Years at the Southeast South Dakota Experiment Farm

Treatment		1964		1965		1966		1967	
	[illegible] lbs/A	[illegible] Control	[illegible] lbs/A	[illegible] Control	[illegible] lbs/A	[illegible] Control	[illegible] lbs/A	[illegible] Control	[illegible] lbs/A
No herbicide		[illegible]	[illegible]		2890		2743		[illegible]
[illegible]									
Atrazine	2.5	99	3180	98	3809	88	5153	[illegible]	5716
Propazine	2.5	99	2777	77	3472				
Randox	4	83	2546			92	4787		
Ramrod	4			98	3662	98	5160	86	5635
CP-50144	2					86	5315	94	5981
Herban	2			92	3646				
"	2.5					57	4010	89	5894
R-11914	2							45	6327
"	4							43	6728
Postemergence									
Atrazine	2.5	99	2597	90	3900				
Atrazine + Oil	1+1 gal			20	3511	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]									
Ramrod + Herban	2+1					92	4860		
Herban + Linuron	1+1					95	4217		
Ramrod + Atrazine	2+1					92	4823	93	5873
Herban + Atrazine	1+1					71	4720	95	5891

[1] Estimates of weed control were taken prior to first cultivation in 1965, 1966, and 1967 and after layby in 1964.

WEED CONTROL IN SOYBEANS

- J. F. Stritzke and C. E. Stymiest

Objectives:

1. The evaluation of early weedy grass (yellow and green foxtail) control of various herbicides which are or will be available to the farmer.

2. The comparison of yield of plots receiving a specific treatment and that of the check plot.

[illegible] Materials:

[illegible] Plots were 10 ft. by 30 ft. and were replicated 3 times in a [illegible] complete block design. Soybeans were planted in 40 inch rows in 1965 and 1966 and in 30 inch rows in 1967.

[illegible]

Cultivation: Check plots were cultivated 3 times in 1965 and 1966 but due [illegible] field in 1967, the check plots were cultivated only once. All herbicide treated plots were cultivated once.

Results:

Amiben and trifluralin (Treflan) continued to perform satisfactory and [illegible] but soybean yields were still good.

Metobromuron (Patoran) was used in 1965 and 1966 but weed control was not always consistent and often soybean yields were no better than cultivated check. A similar compound C-6889 (Beteran) was evaluated in 1967 and results from this compound were more favorable.

CDAA (Randox) was evaluated in 1965 and 1966. Weed control results were fair to good and soybean yields were better than check. Propachlor (Ramrod), a compound similar to Randox, appeared to give weed control results similar to [illegible]

Four other herbicides (Dacthal, norea (Herban), nitralin (Planavin) and UC 22463 (Sirmate) were evaluated in 1967. The first three gave good foxtail [illegible] herbicides and both have label clearance for use. Herban caused soybean damage. Herban is not cleared for use.

A [illegible] at the Southeast Station do not have a heavy infestation of broadleaf weeds, this compound was not tested in 1966 and 1967.

A mixture of Ramrod and linuron was tested in 1967 and weed control and soybean yields were favorable.

Summary:

Plots treated with amiben and trifluralin have consistently given good [illegible]

Table 30. The Performance of Herbicides for Foxtail Control and the Soybean Yields from the Various Herbicide Treatments

Treatment	Rate lbs/A	[illegible] % [illegible] Control	[illegible] Yield Bu/A	[illegible] % [illegible]	[illegible] Yield Bu/A	1967 % Foxtail Control	1967 Yield Bu/A
No herbicide			18		20		30
Amiben (pre)	3	91	21	89	30	70	38
Trifluralin*	3/4	94	19	91	28		
Trifluralin*	[illegible]	98	21			93	39
Metabromuron (Patoran)	[illegible]	40	21				
Metabromuron (Patoran)	[illegible]	57	19	84	21		
Metabromuron (Patoran)	[illegible]			86	19		
C-6889 (Beteran)	[illegible]					82	41
CDAA (Randox)	[illegible]	[illegible]	[illegible]	91	23		
Propachlor (Ramrod)	[illegible]			96	26	92	40
CP-50144 (Lasso)	[illegible]			97	31	99	41
CP-52665	[illegible]					99	44
CP-52665	[illegible]					99	41
Dacthal*	10					88	37
Norea (Herban)	2.5					96	37
Nitralin (Planavin)*	1.5					88	40
UC-22463	1					63	38
Chloroxuron (Tenoran)	4	20	[illegible]				
Ramrod + linuron	2+1			96	[illegible]	78	38

* Incorporated in soil before planting

SOYBEAN BREEDING AND TESTING

- A. D. Lunden

[illegible]

[illegible]

Acreage shift to the newer varieties should continue in the next few years and choice of variety will be determined by local conditions and personal preference as to the relative maturity range desired.

Table 31. Performance of Soybean Varieties in 1967

Variety	Days to Maturity*	Yields (Bu/A) 1965-67 1965	1966	1967	Ave.	1963-67 Ave.
[illegible]						
Chippewa	[illegible]	41.0	39.9	33.6	38.2	
Hark	[illegible]	42.8	43.0	34.8	40.2	
Blackhawk	[illegible]	34.7	33.9	36.0	34.9	
[illegible]						
[illegible]	[illegible]	36.9	38.5	33.6	36.3	35.1
Harosoy	[illegible]	39.2	37.6	35.4	37.4	39.5
Corsoy	[illegible]	45.5	46.0	37.2	42.9	38.1
Amsoy	[illegible]	37.1	39.9	36.0	37.7	38.7
Hawkeye	1[illegible]	38.4	36.8	34.8	36.7	35.9
[illegible]						
Ford	15	37.0	40.8	32.4	35.1	
Wayne	19	36.4	40.8	36.0	37.7	
Experimental						
[illegible]	[illegible]	43.0	43.9	32.2	39.7	

* Days to maturity relative to Chippewa

SORGHUM BREEDING AND TESTING 1967 SOUTHEAST FARM

- A. O. Lunden

[illegible]

[illegible]

CORN BREEDING

- D. B. Shank

Corn [illegible] consisted of four tests of experimental hybrids. One test was [illegible] single crosses and results of this test will be [illegible]

[illegible]

In the test of 3- and 4-way crosses, seven hybrids yielded above the best performing [illegible] hybrid (table 32) while 24 entries performed less well.

[illegible]

In the regional 3-way test some new inbred lines from other states were [illegible]

[illegible]

[illegible] use.

Table 32. Performance of One Check and Seven Experimental Corn Hybrids, SDSD Experiment F Farm, 1967*

Hybrid	Yield, Bu./A	% H_2O In Shelled Corn	% Stalk Lodging
1	152.6	24.9	63.4
2	148.3	23.3	35.1
3	144.8	24.7	47.1
4	144.6	25.1	13.0
5	139.5	23.1	44.3
6	141.9	25.9	56.0
7	141.1	25.6	20.8
Check	139.0	20.8	4.4

* There were 24 more entries in this test, all with a lower performance rating than the check, based on yield and moisture in shelled corn at harvest.

GRASS VARIETY EVALUATION

- S. Bullis

[illegible]

[illegible] rumen technique to determine what percentage of the forage would actually be used by a ruminant animal.

[illegible]

Table 33. Digestibility of Different Warm Season Grasses Measured by Artificial Rumen

Forages	Tons Per Acre Dry Matter	% Dry Matter Digestible	Tons Per Acre Dry Matter Digestible
Indian Grass			
Neb. Black	5.85	46.0	2.69
Neb. Brown	6.01	46.0	2.76
Big Blue Stem			
Pawnee	5.17	47.8	2.47
Champ	3.89	47.8	1.86
Switch Grass			
Neb. 28	4.52	44.0	1.99
Summer	4.44	44.0	1.95
Side Oats Grama			
Pierre	1.32	49.5	0.65
Butte	2.50	49.5	1.24
Alfalfa			
Vernal		64.0	

CROP DISEASE CONTROL

STALK ROT AND ROOT ROT OF HYBRID CORN

- C. M. Nagel

Corn stalk rot and related stalk breakage and lodging were extensive and highly damaging to hybrid corn crop yields in 1967. (see Figures 23, 24, and 25). Laboratory isolations from diseased stalks showed the cause to be Fursalum rot, a common fungus disease of major importance throughout the corn belt in most years.

Experiments were conducted at the S. E. Research Farm to determine influence of 2 commercial hybrids, 3 row spacings of 20", 30", and 40" and 5 plant populations of 10,000, 12,000, 14,000, 16,000, and 18,000 plants/acre on stalk rot and root rot development in corn.

Figure 23. Stalk breakage and lodging due to stalk and root rot disease in commercial hybrids grown in experimental plots at S. E. Research Farm, 1967.

Figure 24. Stalk rot and root rot resistant (no stalk breakage) experimental 3-way hybrids developed by the Plant Pathology Department, S.D.S.U.

Hybrids in Figure 24 were grown on the S.E. Research Farm a short distance from corn in Figure 23. The two photographs were taken on the same day.

Stalk and root rot records were obtained by splitting over 8,000 corn plants in the experimental plots prior to harvest and by digging plants and scoring the amount of basial stalk rot and root rot present.

Note severe shredding of pith and disintegration of nodes in 2 stalks on the left in Figure 24. This greatly reduces stalk strength, and causes lodging and stalk breakage. The split stalks on right possess disease resistance to stalk rot. Pith was intact in these disease resistant stalks and nodes were more or less normal and healthy giving strength to the stalk.

To determine yield losses caused by stalk and root rot, ears were harvested in 130 plots from "healthy" and diseased plants and weighed separately. The stalks were longitudinally split to the base to permit determination of the disease damage. The results are summarized in Tables 34 and 35.

Figure 25. Comparison of lower 1 foot sections of 2 stalks damaged by stalk rot disease (on left) and 2 healthy stalks (on right).

Table 34. Effect of Stalk and Root Rot Disease on Corn Yield, S.E. Experiment Farm, 1967.

Number of Plots	"Healthy" Plants Bu/Acre	Diseased Plants (Stalk and Root Rot) Bu/Acre
130	128.6**	111.[illegible]

** Difference between 2 means was significant at 1% level.

Table 35. Effect of Stalk and Root Rot on Corn Yields at Different Plant Populations, S.E. Experiment Farm, 1967.

Plant Population	Yield from "Healthy plants"	Yield from Plants with Stalk and root rot	% Loss Due to Stalk and Root Rot
10,000 per/A	98.29 bu/A	89.67 bu/A	8.8%
12,000 "	110.71 "	100.88 "	8.9%
14,000 "	123.88 "	106.71 "	13.9%
16,000 "	129.38 "	108.35 "	16.3%
18,000 "	137.79 "	117.33 "	14.8%

The yield loss due to stalk rot and root rot diseased plants was actually somewhat larger than that presented in table 35 since even the checks or "healthy" plants, were not entirely disease-free. A very conservative estimate of the additional loss to stalk rot and root rot would be 6%, for a total loss from these two diseases of 71.4 bushels per acre.

Therefore, the loss on a 100 acre field of corn, yielding 100 bushels per acre, (such as occurred in this general area in 1966 and 67) would mean a loss of 2,142 bushels. With corn selling at $1.03 per bushel this would mean a loss of $2,206.00 on 100 acres of corn.

DEVELOPMENT OF DISEASE RESISTANCE IN HYBRID CORN

- C. M. Nagel

The process of developing inbred lines of corn from open pollinated varieties has been underway for a number of years. More recently these newly created disease resistant inbreds have been incorporated into 3-way crosses. These experimental hybrids are now being tested at the S.E. Experiment Farm for their resistance to stalk rot and root rot and their yielding ability. (see figure 24)

Table 36 presents the results of this work for 1967.

Table 36 Yield, moisture content and performance ratings of 69 3-way experimental hybrids possessing varying degrees of root and stalk rot resistance. Centerville, 1967.

Expt'l hybrid Or commercial Check	Yield Bu/A	Ear Moisture At harvest	Total* Performance Score	Yield Performance Score	Moisture Performance Score
DEK 410	144.4	25.0	115.24	124.69	101.05
1	140.0	24.6	111.81	118.39	101.93
2	139.8	25.0	109.99	116.90	99.62
3	137.2	22.9	111.33	116.07	104.23
4	135.3	26.8	108.22	114.39	98.95
5	135.1	25.4	107.42	112.97	99.09
6	133.6	22.3	109.82	113.00	105.04
7	133.2	24.0	107.19	111.34	100.95
8	132.8	26.0	105.94	111.02	98.29
9	132.3	23.4	108.55	111.88	103.55
10	131.9	22.4	108.90	111.56	104.90
SD622	131.9	28.9	106.72	113.98	95.83
11	131.3	22.2	107.19	109.75	103.34
12	130.8	27.4	111.00	119.09	98.86
P352	129.7	28.3	105.69	111.84	96.49
13	128.9	26.2	105.31	109.00	99.77
14	127.3	27.5	109.05	115.93	98.73
15	126.4	24.2	103.66	105.63	100.69
16	124.5	29.1	101.50	105.26	95.84
17	124.4	23.5	109.63	113.26	104.18
18	124.0	26.5	107.77	112.88	100.09
19	123.6	25.6	101.51	103.29	98.83
20	123.5	24.2	108.75	112.42	103.22
21	123.3	32.4	99.14	104.31	91.38
22	123.1	22.5	102.95	102.94	102.94
23	122.8	23.9	102.05	102.69	101.08
24	122.8	27.1	106.77	111.76	99.27
25	122.2	23.0	102.21	102.16	102.28
26	121.3	29.6	99.63	102.59	95.17
27	120.0	22.7	101.24	100.28	102.68
28	119.9	25.0	99.97	100.20	99.62
29	119.8	24.7	100.12	100.18	100.02
30	119.5	26.3	99.12	99.93	97.90
31	118.8	26.0	100.30	100.46	100.04
32	117.8	24.9	100.37	99.59	101.52
33	117.1	23.3	99.49	97.88	101.88
34	115.4	24.8	97.86	96.50	99.89
35	114.1	26.6	102.31	103.86	99.95
36	114.0	25.8	96.60	95.29	98.56
37	113.2	26.9	96.99	95.77	98.82
SD400	112.4	22.0	100.12	96.83	105.04
38	112.2	26.0	95.62	93.82	98.29
39	111.4	28.2	95.36	94.22	97.06
40	111.0	29.7	94.32	93.84	95.03
41	110.9	26.3	100.73	100.97	100.36
42	110.8	25.6	95.13	92.65	98.83
43	110.6	27.6	95.27	93.52	97.87
44	110.3	20.0	97.85	92.24	106.26
45	110.1	27.0	95.35	93.12	98.68
46	109.7	25.6	94.58	91.73	98.83
47	109.4	24.0	96.59	92.48	102.74
48	109.2	26.5	93.81	91.25	97.63
49	109.1	23.2	96.91	92.30	103.82
50	108.5	25.1	100.07	98.78	102.00
51	108.4	25.7	95.16	91.64	100.44
52	108.2	26.9	98.90	98.47	99.55
53	107.7	27.2	98.49	98.06	99.14
54	107.6	26.2	98.97	97.95	100.50
55	107.4	24.7	95.21	90.82	101.79
56	107.0	29.5	96.87	97.45	96.00
57	107.0	26.5	98.49	97.42	100.09
58	106.3	28.7	96.93	96.81	97.09
59	106.2	27.6	93.05	89.82	97.87
60	105.2	27.4	96.99	95.73	98.86
61	103.9	28.0	95.95	94.55	98.05
62	101.9	26.4	95.76	92.77	100.23
63	101.6	27.[illegible]	90.73	85.95	97.87
64	101.1	25.8	91.41	85.46	100.31
65	100.7	27.2	89.19	84.17	96.70
66	98.7	25.9	94.26	89.82	100.91
67	97.1	26.8	92.89	88.36	99.68
68	96.6	25.5	88.03	80.74	98.96
69	96.2	29.4	90.99	87.54	96.14
SD420	96.1	27.3	89.00	83.04	97.95

*Total performance score is a value based on percent of moisture and grain yield in the corn at harvest. A rating of 100 or more indicates a low-moisture, high-yield hybrid.

A difference of 13.6 Bu/A between any two hybrids shows that one is significantly better than the other.

From the table, it will be noted that out of the 11 highest yielding hybrids in Table 36, 10 are now new experimental 3-way hybrids. It should be noted also that these experimental hybrids are a little too early for this area, they would be best adapted for the general area centered north and south of Sioux Falls or between Centerville and Dell Rapids and west of this area. However, their performance, with considerably late commercial hybrids used as checks, indicates they could be used perhaps with advantage a little farther south of area referred to above.

Results obtained in other locations in the state indicate that many of these hybrids possess considerable drought resistance, and of course, resistance to stalk rot and root rot.

CORN SILAGE AND HIGH-MOISTURE EAR CORN RATIONS FOR GROWING AND FINISHING BEEF CATTLE

- L. B. Embry and J. F. Fredrickson

This experiment is one of a series to measure rate of gain, feed [illegible] combinations in feeding the corn crop.

[illegible]

One hundred steer calves were purchased for the experiment and allotted to 4 lots of 25 each. Ration treatments were as follows:

Lot 1 - Corn silage, 15 lbs.; high-moisture ear corn, full-fed

Lot 2 - Corn silage, full-fed 112 days then same as lot 1

Lot 3 - Corn silage, full-fed 224 days then same as lot 1

Lot 4 - Corn silage, full-fed without added grain entire trial

[illegible] of aureomycin and diethylstilbestrol premixes furnished 35 mg. of aureomycin and 5 mg. of diethylstilbestrol per pound of supplement. The supplement was also fortified with 10,000 I.U. of vitamin A per pound.

The silage and ground ear corn were stored in concrete stave silos. They were fed twice daily along with the protein supplement in amounts that would be nearly consumed by the next feeding.

Results

Results of the experiment are presented in table 1. It was planned to market each lot of steers when the average lot weight was about 1150 lb. Since rate of gain varied with length of feeding period for silage without added grain, the time fed varied for the various lots. However, those fed corn silage without added grain (lot 4) were marketed at the same time as those in lot 3 even though they were considerably lighter in weight.

The fastest rate of gain was obtained when corn silage was fed at [illegible] in comparison to feeding the limited silage ration during the entire growing and finishing period.

[illegible] ear corn per 100 lb. of gain (lot 3 vs lot 1). These steers had about the same grade and dressing percent as those fed the higher energy ration (lot 1) but they had a larger rib eye area and less back fat.

Steers fed corn silage and protein supplement for 341 days gained only 1.75 lb. daily and had a market weight of only 1047 lb. They had less finish that the other cattle. Previous experiments would indicate that the lower grade and yield was due primarily to the lighter weight. When cattle fed this type of ration have been fed to the same final weight as those fed less corn silage, they have graded about as well.

The gain obtained with the high silage ration (lot 4) is lower than has been obtained with this kind of ration in past experiments. In some experiments, gains of about 2 lb. daily have been obtained with corn silage and protein supplement for periods of 10-11 months.

While ear corn saved per 100 lb. of silage in comparison to lot 1 (100 lb. silage saved 28 lb. ear corn) differed only slightly from lot 3 (100 lb. corn silage saved 31 lb. ear corn), the period of limited silage and a full feed of ear corn was an economical practice in view of the faster rate of gain and lower amount of supplement required.

[illegible]

Past experiments have shown that corn silage with protein supplement produced more gain per acre of corn than rations with less silage and more gain. Rations with 15-20 lb. of corn silage produced about the same rate of gain with more gain per acre of corn than rations of ear corn and protein supplement but no silage.

In this experiment, full feeding corn silage with protein supplement for 224 days followed by finishing period with limited silage (15 lb.) and a full [illegible]

Table 1. Corn Silage and High-Moisture Ear Corn Rations for Growing and Finishing Beef Steers

	Corn Silage 15 lb. H.M.E.C.[a] Full-fed	Corn Silage Full-fed 112 da. then same as lot 1	Corn Silage Full-fed 224 da. then same as lot 1	Corn Silage Full-fed entire expt.
Lot	1	2	3	4
Number steers	24	25	25	25
Days fed	292	319	341	341
Init. wt., lb.	448	449	450	449
Final wt., lb.	1154	1145	1165	1047
Av. daily gain, lb.	2.42	2.18	2.10	1.75
Av. daily ration, lb.				
Corn silage	14.8	22.9	33.6	49.6
H.M. ear corn	15.0	12.2	6.7	
Protein suppl.	2.0	2.0	2.0	2.0
Feed per 100 lb. gain, lb.				
Corn silage	615	1048	1601	2829
H.M. ear corn	621	559	319	
Protein suppl.	82	91	95	114
Carcass grade[b]	19.2	20.1	19.0	17.5
Dressing percent	61.5	62.1	61.6	59.6
Marbling[c]	5.4	6.7	5.5	4.2
Rib eye area, sq. in.	11.5	11.6	12.5	12.1
Fat thickness, in.	.70	.69	.59	.57

[a] H.M.E.C. = [illegible]
[b] [illegible]
[c] [illegible]

PERFORMANCE OF GROWING-FINISHING SWINE UNDER DIFFERENT ENVIRONMENTAL AND NUTRITIONAL TREATMENTS

- R. C. Wahlstrom, R. W. Seerley, H. G. Young and J. F. Fredrickson

Two trials were conducted during the winter of 1966-67 with growing-finishing swine at the Southeast Experimental Farm. The rations used in both of these trials are shown in Table 1. The 16% protein ration was fed to approximately 100 lb. body weight, then the 14% protein ration was fed to about 150 lb. and then the 12% protein ration was fed to the end of the trials.

In the first trial, 108 pigs were allotted into six groups. Two groups were housed in each of the following types of houses: (1) a closed, insulated and ventilated house, (2) an open front insulated house and (3) an open front uninsulated house. Both of the open front houses were connected to concrete outside pens where pigs were fed and watered.

There was very little difference in rate of gain of the pigs under any of the housing conditions, as can be seen in Table 2. Rate of gain was lower in all lots by about 0.2 lbs. per day than measured in previous years. Pigs housed in the insulated and ventilated closed house consumed less feed daily and required approximately 15 to 20 lbs. less feed per hundred-weight of gain. A similar difference in feed efficiency has been noted in previous trials.

Trial two was conducted using five lots of 9 pigs each. Three lots averaged about 40 lbs. initially while two lots averaged about 86 lbs. The three treatments used in this trial were: (1) basal rations as shown in Table 1, (2) basal rations with the vitamin-antibiotic premix omitted and (3) basal rations with the vitamin-antibiotic levels doubled. One lot of lighter weight pigs was fed on each of these treatments and the two lots of heavier pigs received treatments 1 or 3.

The results of this trials are shown in Table 3. There appeared to be no real benefit from the vitamin-antibiotic supplement for the lighter weight pigs. For the heavier pigs there was no benefit in increasing the level of vitamins and antibiotics in the ration. Again as in trial 1 the rate of gain of all lots was lower than expected.

TABLE 1. Composition of Rations (Winter 1966-67)

	LB.	LB.	LB.
Ground shelled corn	766	820	872
Soybean meal (44%)	200	150	100
Dicalcium phosphate	15	10	10
Limestone	7	8	8
Trace mineral salt	5	5	5
Premix[a]	2.5	2.5	2.5
Calculated analysis:			
Crude protein, %	16	14	12
Calcium, %	0.72	0.61	0.58
Phosphorus, %	0.59	0.48	0.51

[a] Provided per lb. of ration: 1500 U.S.P. units of vitamin A, 150 U.S.P. units of vitamin D, 1 mg. riboflavin, 2.5 mg. pantothenic acid, 7.5 mg. niacin, 50 mg. choline, 7.5 mcg. vitamin B_{12}.

TABLE 2. Performance of Growing-Finishing Swine Under Different Environmental Conditions (Winter 1966-67)

Type of housing	Closed, insulated, ventilated		Open front insulated		Open front uninsulated	
No. of pigs[a]	17	18	16	18	15	16
Av. initial wt., lb.	68.4	90.0	66.9	49.9	67.9	90.0
Av. finish wt., lb.	220.2	229.3	223.1	232.1	230.5	236.6
Av. daily gain lb.	1.27	1.34	1.31	1.36	1.38	1.38
Av., lb.	1.31		1.34		1.37	
Av. daily feed, lb.	4.69	4.96	5.09	5.32	5.10	5.28
Feed per lb. gain, lb.	3.71	3.71	3.91	3.91	3.76	3.95
Av., lb.	3.71		3.91		3.86	

[a] Initially 18 pigs per lot. Two pigs removed for failure to gain and six pigs died. Data on these pigs are not included.

TABLE 3. Performance of Growing-Finishing Swine Fed Different Levels of Vitamins and Antibiotics (Winter 1966-67)

Vit-Ant. level	None	Recommended level		Twice recommended level	
No. of pigs	9	9	9	9	9
Av. initial wt., lb.	39.1	40.2	87.0	39.8	84.9
Av. final wt., lb.	208.4	210.8	224.1	208.0	226.1
Av. daily gain lb.	1.26	1.27	1.33	1.26	1.37
Av. daily feed, lb.	4.51	4.22	5.00	4.41	5.07
Feed per lb. gain, lb.	3.47	3.31	3.76	3.51	3.70

* * *

Table of Contents continued from inside front cover:

THE SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM CORPORATION

BOARD OF DIRECTORS

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Ervin Cleland	Clay	Vermillion
Eric Thormodsgaard	Lincoln	Hudson
Carl Wright	Clay	Volin
Leon Jorgenson	Hutchinson	Freeman
Earl Rames	Hutchinson	Menno
Wesley Larson	Union	Beresford
Lloyd Overgaard	Turner	Centerville
Lawrence Holzbauer	Charles Mix	Wagner
William DeJong	Yankton	Volin

THE COOPERATIVE EXTENSION SERVICE

John T. Stone, Director

COUNTY EXTENSION AGENTS OF THE SOUTHEAST AREA

County	Agent	Address
Bon Homme	Donald Boone	Tyndall
Charles Mix	Leonard Nelson	Lake Andes
Clay	Norbert Faulstich	Vermillion
Douglas	Norman Telkamp	Armour
Hutchinson	Denver Parks	Olivet
Lincoln	Bernard Uthe	Canton
Turner	Darrel Pahl	Parker
Union	Robert Osborne	Elk Point
Yankton	Vane Miller	Yankton

District III Supervisor

Cecil D. Sanderson, Cooperative Extension Service

Brookings, S. Dak.