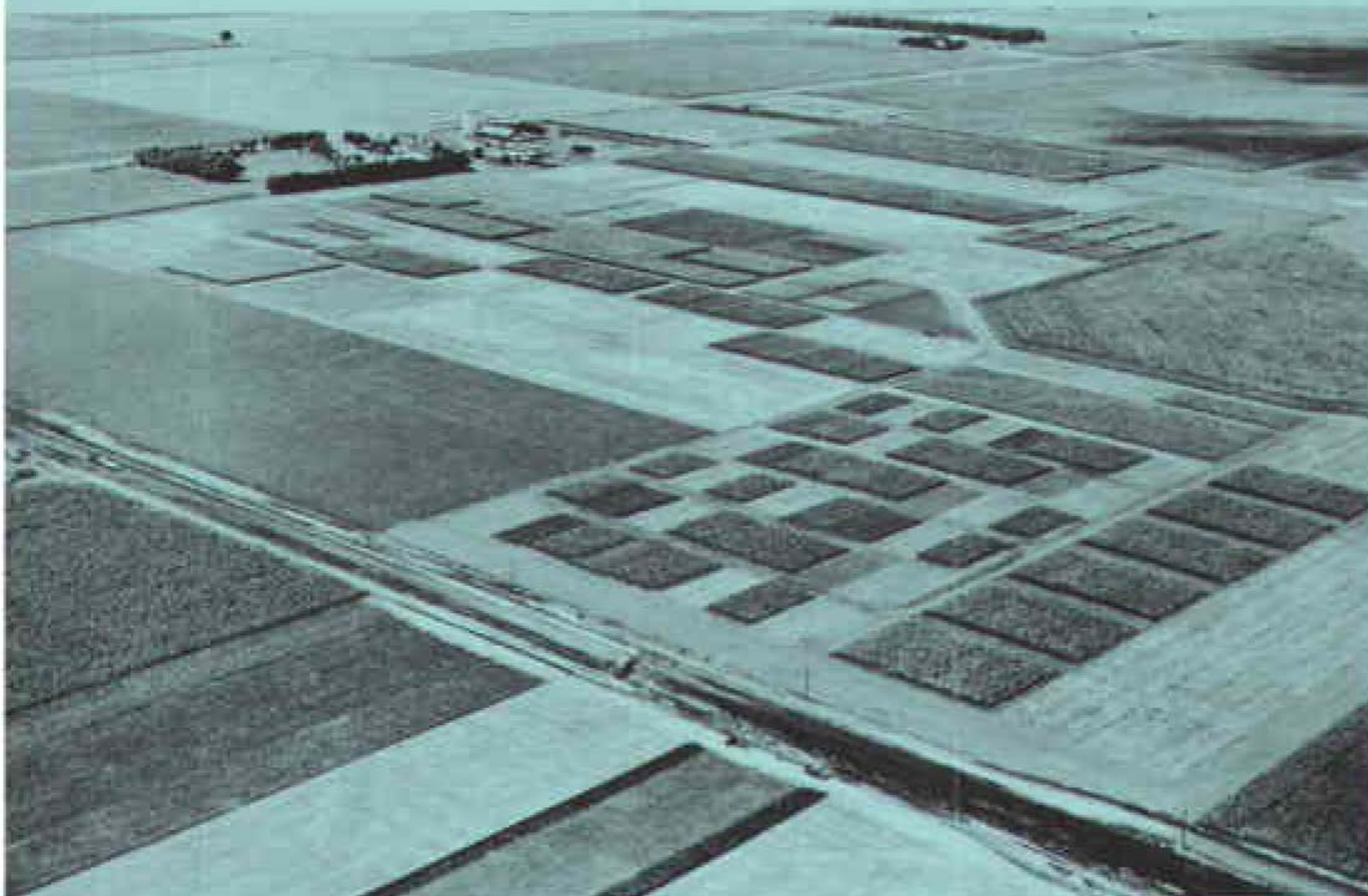
FIFTH ANNUAL PROGRESS REPORT

DECEMBER 1965

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

FIFTH ANNUAL PROGRESS REPORT
SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM

Table of Contents

		Page
Introduction	J. F. Fredrikson	1
Corn Populations and Row Spacing	F. Shubeck and L. Nelson	2
Sorghum Populations and Row Spacing	L. Nelson and F. Shubeck	11
Soybean Populations and Row Spacing	L. Nelson and F. Shubeck	13
Minimum Tillage for Corn	F. Shubeck and L. Nelson	16
Minimum Tillage Demonstration	F. Shubeck and L. Nelson	18
Starter Fertilizer for Corn	F. Shubeck and L. Nelson	19
Fertilizer Rates and Ratios	L. Nelson and F. Shubeck	20
Most Profitable Rotation Experiment	L. Nelson and F. Shubeck	21
Starter Fertilizer and Corn Tillers	F. Shubeck and L. Nelson	23
Oriented Planting of Corn	F. Shubeck and L. Nelson	24
Maximum Forage Experiment	L. Nelson and F. Shubeck	25
Soil Potassium of the Southeast South Dakota Experiment Farm	Dwight Hovland	26
High Phosphorus Experiment	Raymond C. Ward	28
Western Corn Rootworm Control	B.H. Kantack, W.L. Berndt, J.F. Fredrikson, Raymond Venard	30
Soybean & Sorghum Breeding & Testing	A.O. Lunden	31
Oats Breeding	R.S. Albrechtsen	32
Standard Variety Small Grain Trials	J.J. Bonnemann	35
Corn Performance Trials, Area E	J.J. Bonnemann	37
Grain Sorghum Performance Trials	J.J. Bonnemann	40
Foundation Seed Stock Div. Increases	G. W. Erion	40
Grass Variety Evaluation	J.G. Ross and S.S. Bullis	41
Corn Rootworm Studies	P.J. Fitzgerald, Eldon E. Ortman, Boyd Shank, Durwood Beatty	42
Weed Control in Corn	W.G. Wright	43
Weed Control in Soybeans	W.G. Wright	45
Weed Control in Sorghum	W.G. Wright	46
Corn Breeding	D.W. Beatty and D.B. Shank	48
Plant Disease Control- Corn Diseases	C.M. Nagel	49
Performance of Growing-Finishing Swine	R.C. Wahlstrom, R.W. Seerley, H.G. Young and J.F. Fredrikson	51
Comparison of Corn Silage and High-Moisture Ear Corn Rations	F. Whetzal and J. Fredrikson	53
Control of Cattle Grubs	Paul H. Kohler	58

This fifth annual report of the research program at the Southeast South Dakota Experiment Farm is presented herewith. The report has special significance for those engaged in agriculture and the agriculturally related businesses in the nine county area of southeast South Dakota, but it will be useful to many outside the area. 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.

The report was prepared by staff members of South Dakota State University as indicated in each section, and assembled by Lenis Nelson and the Experiment Station Director's office staff.

South Dakota Agricultural Experiment Station
Brookings, South Dakota

Oscar E. Olson, Acting Director A. L. Musson, Ass't Director

INTRODUCTION

-- J. F. Fredrikson

This annual progress report points to a continued growth in many areas of research at the Southeast South Dakota Experiment Farm. Agronomy plot work has utilized all suitable land area on the south quarter and is expanding to sites on the north quarter. However, this trend is not expected to continue as rapidly in the immediate future as it has in the past because of limitations in the areas of available funds, labor and supervisory personnel.

The north quarter will continue to be used largely for the production of feed and forage to support livestock experiments. Surplus grain from agronomy plots will continue to supplement the feed needs.

The crops grown on the north quarter this year were: 35 acres of alfalfa, 15 acres of oats, 3 acres of grain sorghum, and 102 acres of corn. The 15 acres of oats and 3 acres of grain sorghum were used by Foundation Seed Stock Division for seed increase and the yields from these acres are not reported as feed produced.

Production from the 1965 crop year yielded the following feed and forage (determined by sampling and field measurements):

Corn silage	242 tons	Oats	1,200 bushels
Ground ear corn silage.	6,000 bushels	Alfalfa hay.	127 tons
Ear corn	4,100 bushels	Brome hay.	25 tons

All corn ground, with the exception of alfalfa sod, was fertilized with 67 pounds of nitrogen and 20 pounds of phosphorus applied in the fall of 1964 and plowed down. Manure from the livestock barns and pens was spread on the corn ground throughout the year.

Many new practices, that are subjects of investigation in the agronomy plots, are used on the north quarter fields as a demonstration of their potential value. The application of atrazine for weed control has been used quite extensively. This includes various band widths and overall application. The use of chemicals for the control of corn root worm, as recommended by the Extension Service, was demonstrated and yield measurements taken. Minimum tillage in the form of "till-planting" was used on corn ground and on alfalfa ground, with chemical weed control incorporated into the demonstration.

The alfalfa produced on the north quarter was utilized in the wintering phase of a pasture feeding study. This involved 127 calves, half of which were given a full feed of chopped hay; the other half received 4 pounds of oats in addition to the full feed of chopped hay. These calves are wintered in open, outdoor dirt lots without shelter and transferred to Brookings in the spring. This study is being repeated for another year.

Table 1 is a summary of weather information as recorded by the official weather observer for this area. This year's precipitation and temperature averages are compared with the averages of the current 13 year period. As the precipitation total indicates, this was a favorable year for the production of most crops, the exception being those crops that needed a warm, dry fall in order to mature before the occurrence of a killing frost. Stress from moisture shortage and extreme heat was absent throughout the growing season. Rainfall during August and September provides adequate subsoil moisture reserves for the coming year.

Table 1. Precipitation and Temperature -- 1965

Month	Rainfall in Inches	1953-1965 13 Year Average	1953-1965 Departure	Average Temperature (F)	1953-1965 13 year Average	1953-1965 Departure
Jan	.13	.39	- .26	14.6	17.8	- 3.2
Feb	1.20	1.40	- .20	16.3	25.9	- 9.6
March	.64	1.49	- .85	23.4	28.8	- 5.4
April	2.92	2.83	+ .02	49.6	49.5	+ .1
May	6.02	3.65	+2.37	63.7	62.0	+ 1.7
June	6.87	4.31	+2.56	69.8	70.1	- .3
July	2.99	2.66	+ .33	72.9	69.2	+ 3.7
Aug	3.06	2.81	+ .25	71.3	69.9	+ 1.4
Sept	6.75	2.90	+3.85	54.8	63.7	- 8.9
Oct	.94	1.09	- .15	53.8	55.9	- 2.1
Nov	.32	1.09	- .77	35.9	37.0	- 1.1
Dec	.38	.62	- .24	28.4	23.6	+ 4.8
Total	32.22	25.24	+6.98	46.2	48.9	- 2.7

Frost free days: April 28 to September 24 -- 150 days.

\- - - - - - - - - - -

CORN POPULATIONS AND ROW SPACING

-- F. Shubeck and L. Nelson

Objectives of Experiment:

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

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

3. With narrow rows, can moisture loss from evaporation be reduced?

4. Will narrow rows help to control weeds?

5. Will subsoil moisture at the beginning of the season, when added to expected rainfall in July and August, serve as a reliable guide to tell us how many plants to plant per acre?

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

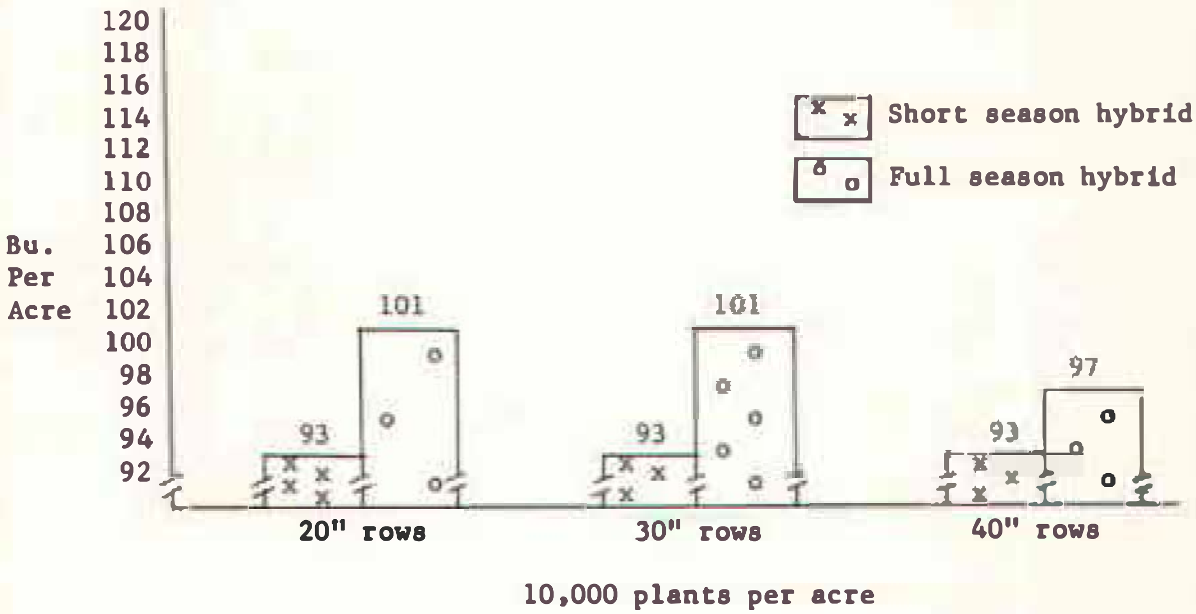


Figure 2. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 12,000 plants per acre.

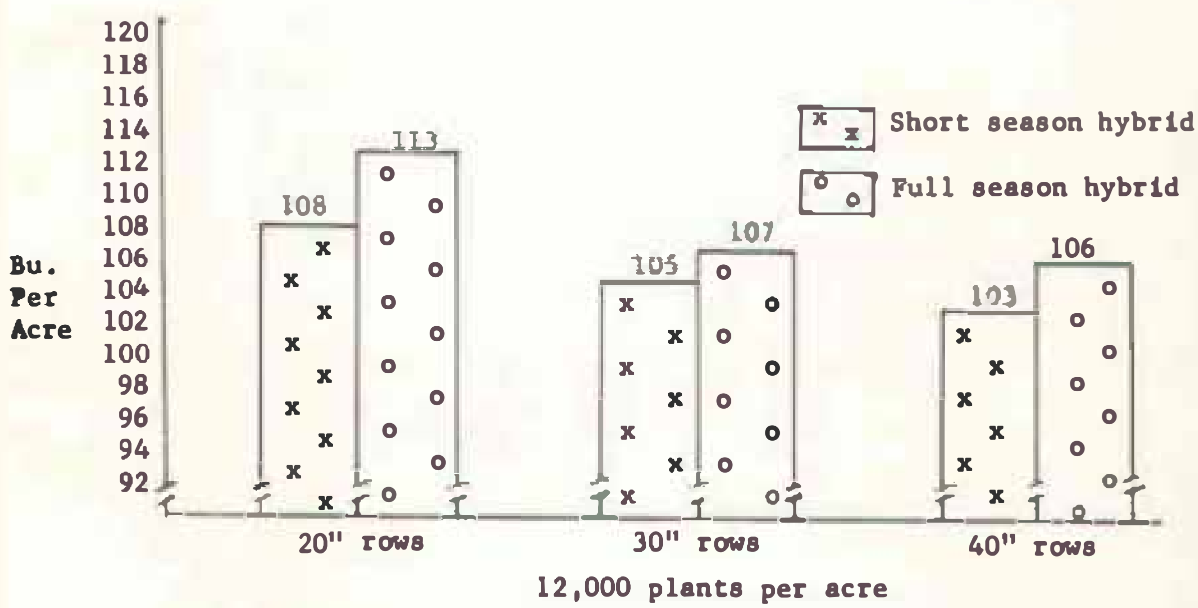


Figure 3. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 14,000 plants per acre.

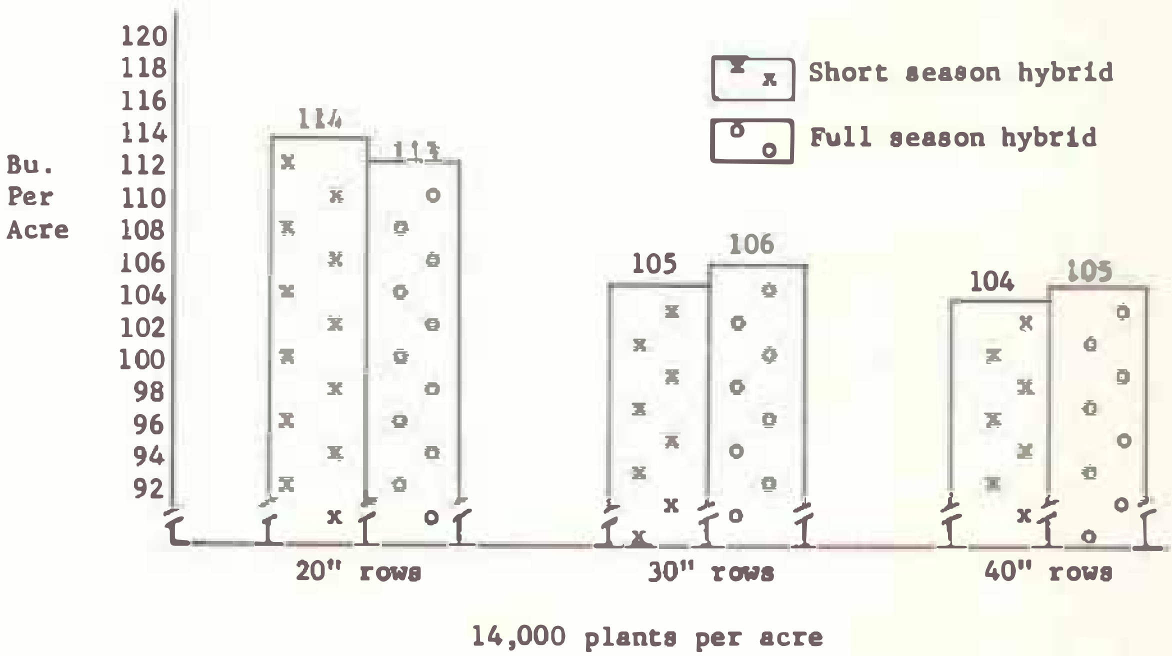


Figure 4. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 16,000 plants per acre.

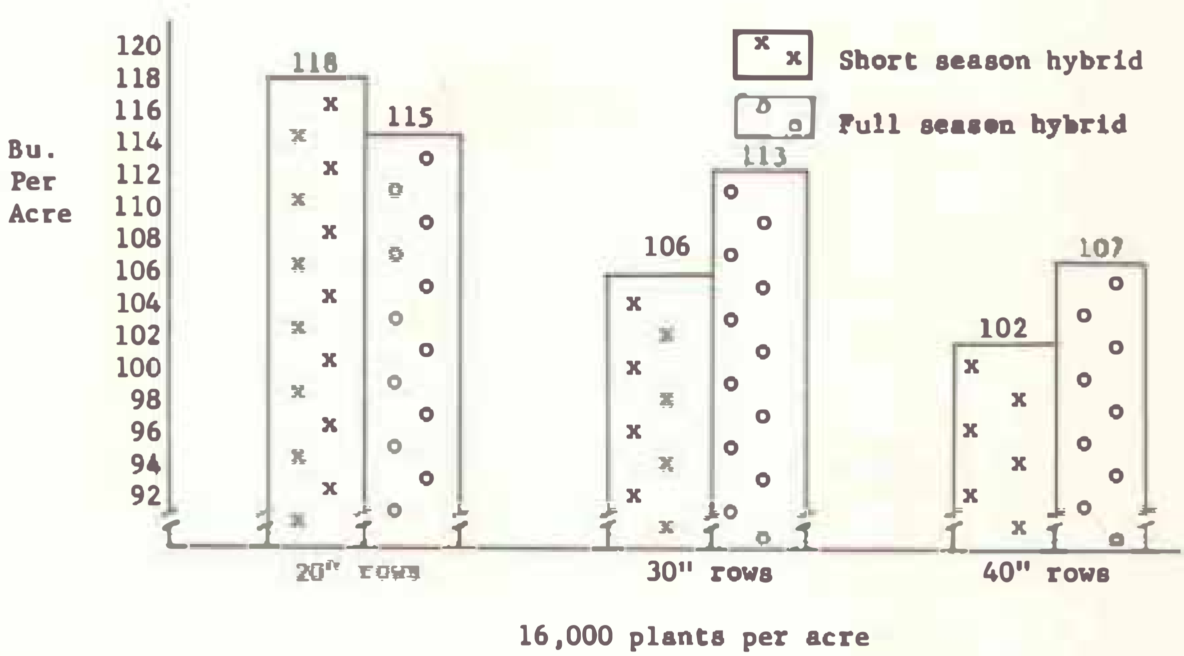


Figure 5. Effect of Row Spacing on Yield of Short Season and Full Season Hybrid at 18,000 plants per acre.

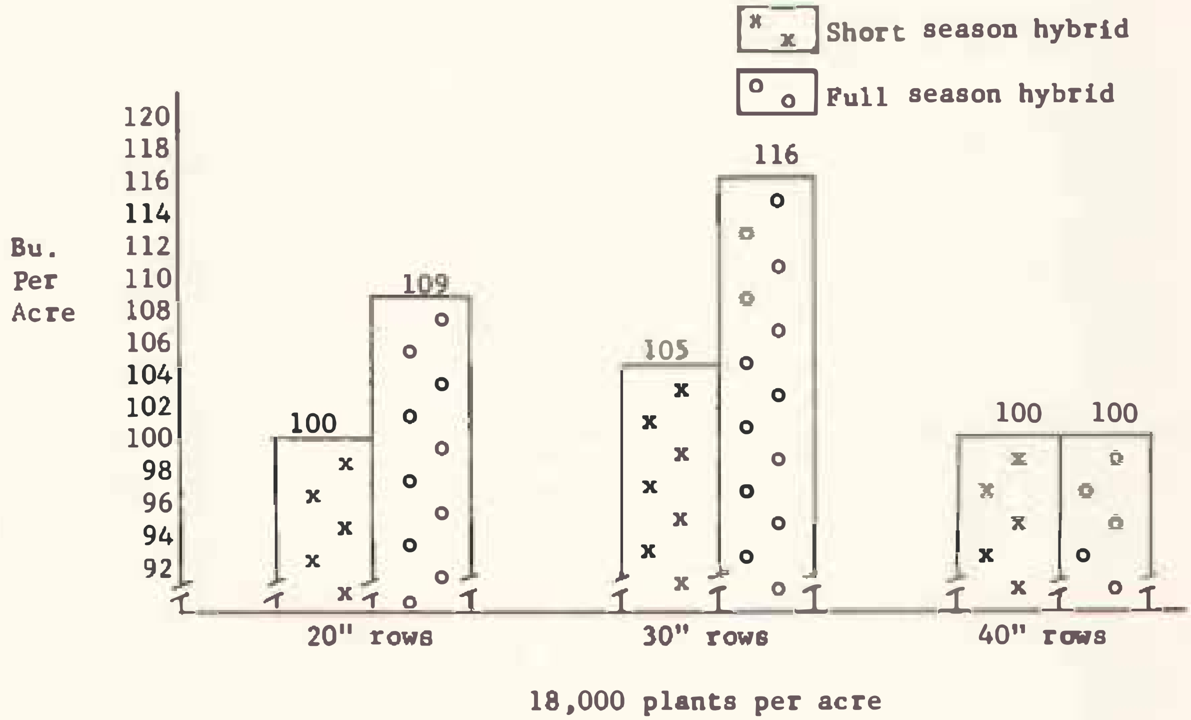
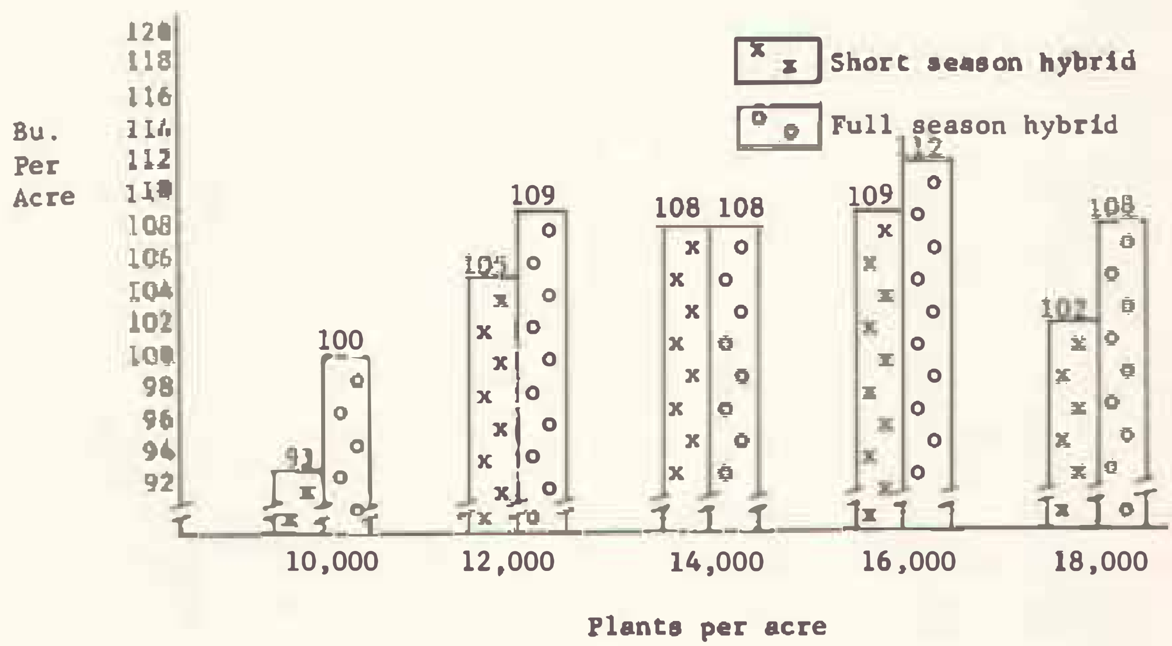


Figure 6. Effect of Plant Populations on Yield of Corn (Average of 3 Row Spacings).



Discussion and Interpretation of Figures 1 Through 5:

The following procedures were used in this experiment:

1. Sixty lbs of N and 18 lbs of P per acre were broadcast in the fall
2. Plowed in the fall
3. Thirty-five lbs of K were broadcast in the spring and disced in
4. Planted May 6
5. Organic phosphate insecticide applied in band at planting
6. Atrazine applied over all at 3 lbs per acre
7. Cultivated once with AC G-tractor
8. Side-dressed with 80 lbs of N per acre when corn was 18 inches tall
9. Carbaryl (Sevin) used for corn borer control

At 10,000 plants per acre, there was little difference in yield due to row spacing. At all other populations there was an increase in yield due to narrow rows with both short and full season hybrids.

The highest yield in this experiment was obtained with the short season hybrid in 20-inch rows at 16,000 plants per acre.

The results will not be the same in years of insufficient rainfall.

Discussion and Interpretation of Figure 6:

In this figure the effect of row spacings was obscured and emphasis was placed on plant populations and hybrids. It was interesting to note that yield of the short season hybrid was affected more by different plant populations than the full season hybrid. With 10,000 and 12,000 plants per acre, the larger full season hybrid could compensate for insufficient populations to a greater extent than the short season corn by increasing ear size to utilize the available fertility and moisture.

Figure 7. Effect of Plant Populations on Ear Size at Time of Picking (Average of 3 Row Spacings)

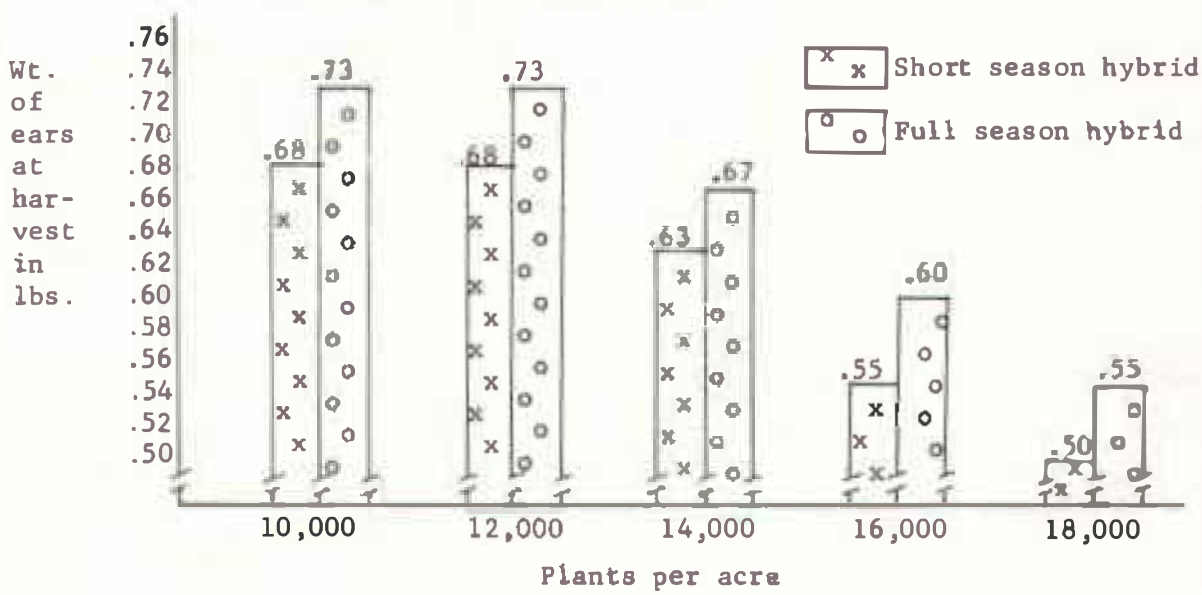
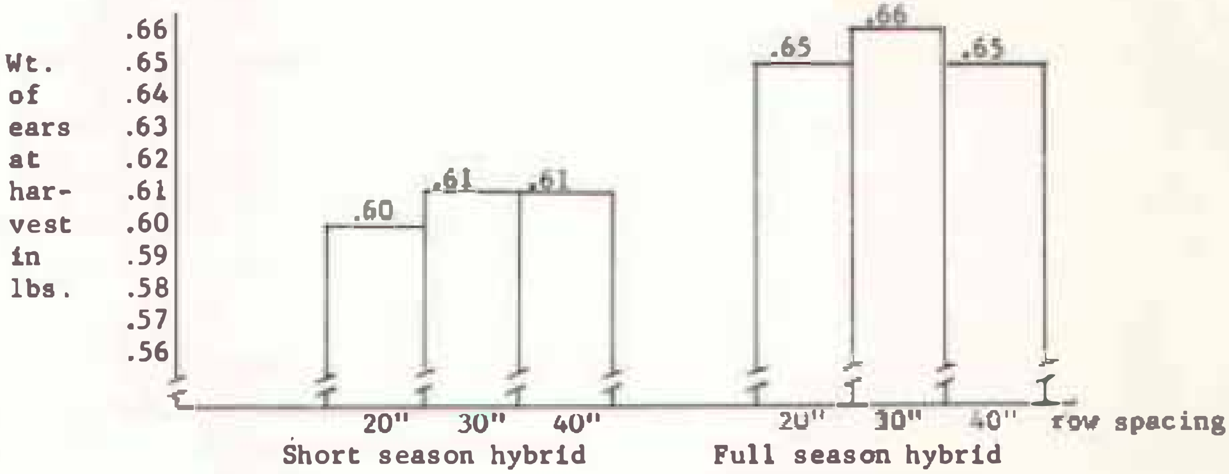


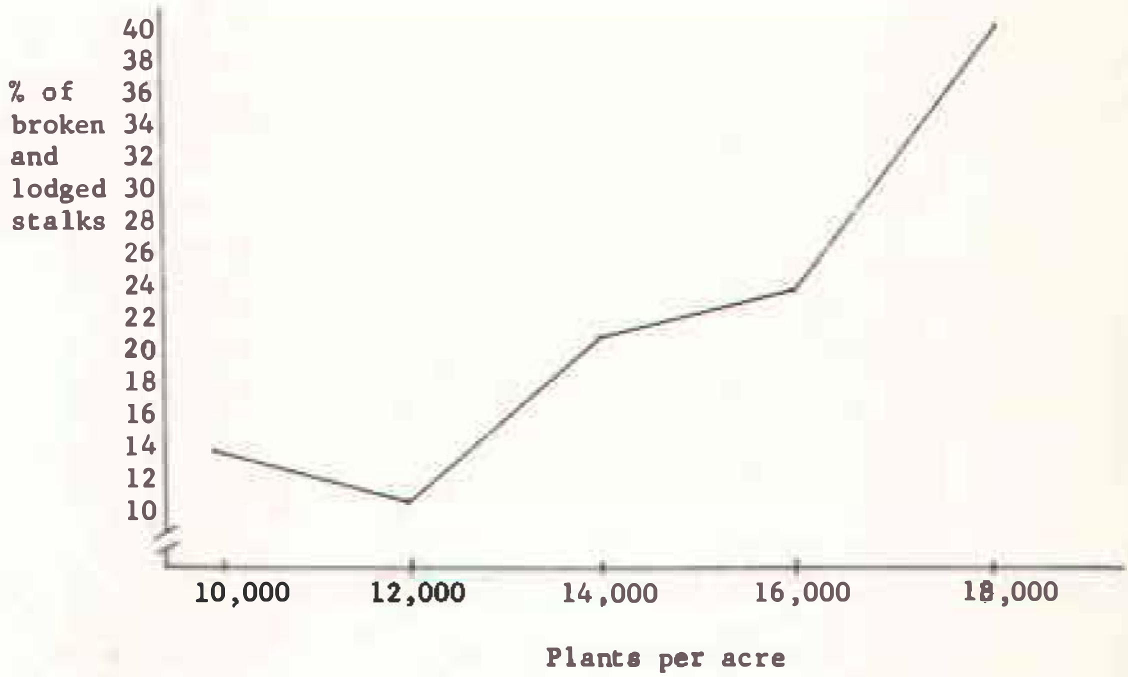
Figure 8. Effect of Row spacings and Hybrids on Ear Size at Time of Picking (average of 5 populations).



Discussion and Interpretation of Figures 7 and 8:

Plant populations and size of hybrid had more influence on ear size at harvest than row spacings.

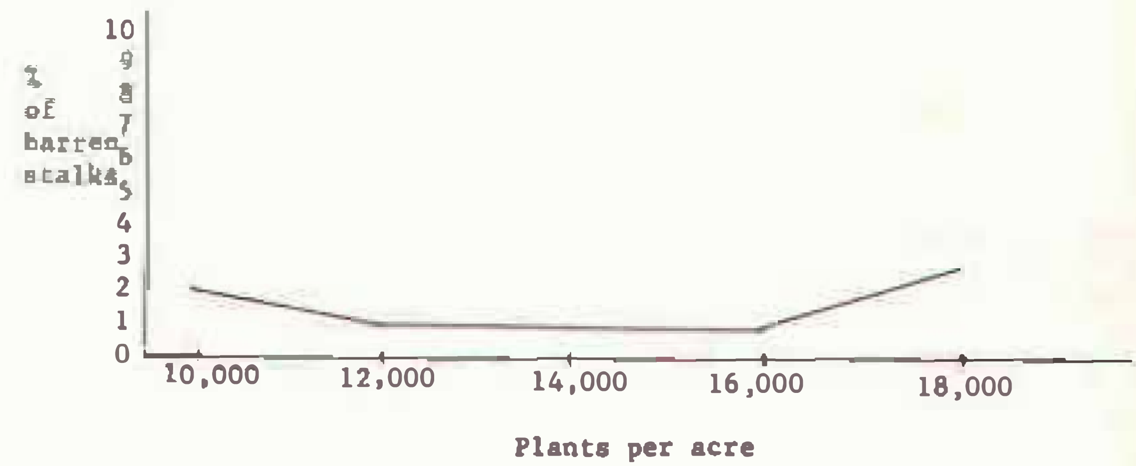
Figure 9. Effect of Plant Populations on % of Broken and Lodged Stalks (average of 3 row spacings and 2 hybrids).



Discussion and Interpretation of Figure 9:

The percentage of broken and lodged stalks at harvest went up sharply with increasing populations over 12,000. The delayed harvesting date and high winds were partially responsible for the overall high percentage of lodged stalks. If stalks were leaning 45° or more from vertical, they were counted as broken and lodged. Much of the corn on the leaning stalks could be recovered with mechanical pickers but harvesting was done by hand for yield determinations.

Figure 10. Effect of Plant Populations on % of Barren Stalks (average of 3-row spacings and 2 hybrids)



Discussion and Interpretation of Figure 10:

Populations had little effect on percentage of barren stalks. This is different from results obtained in years with insufficient moisture.

Figure 11. Effect of Plant Populations on % of Ear Moisture at Harvest (average of 3-row spacings and 2 hybrids)

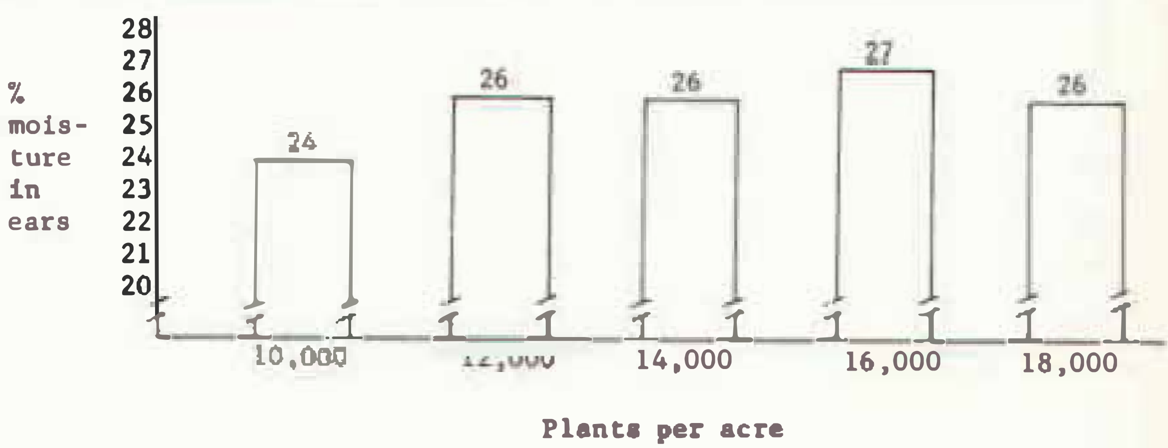
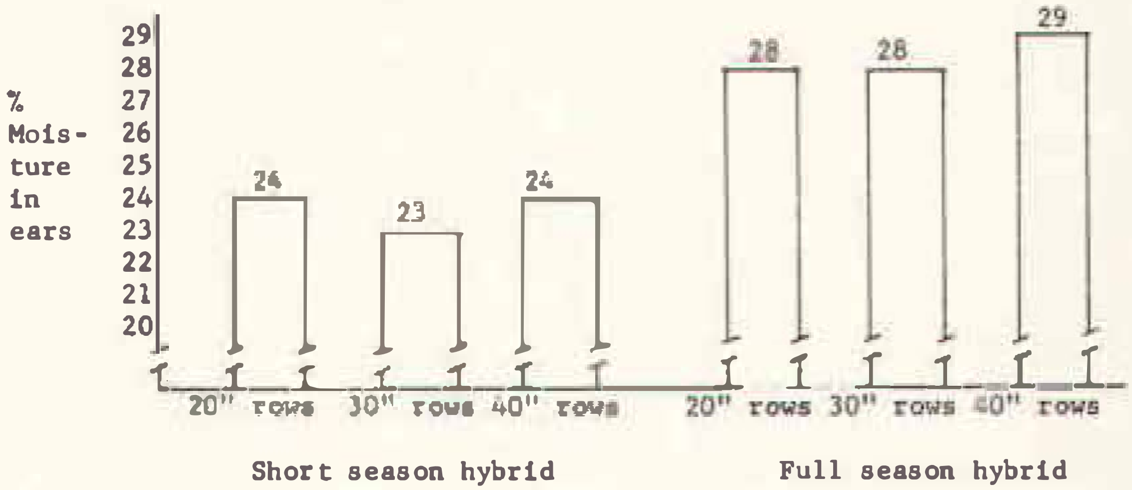


Figure 12. Effect of Row Spacing and Hybrids on % Ear Moisture at Harvest (average of 5 populations).



Discussion and Interpretation of Figures 11 and 12:

Populations and row spacings had very little effect on percent moisture in ears at harvest. Percent ear moisture of the 2 hybrids in figure 12 indicates their relative maturities.

Figure 13. Effect of Row Spacing on Soil Temperature with 18,000 Plants per acre and Full Season Hybrid.

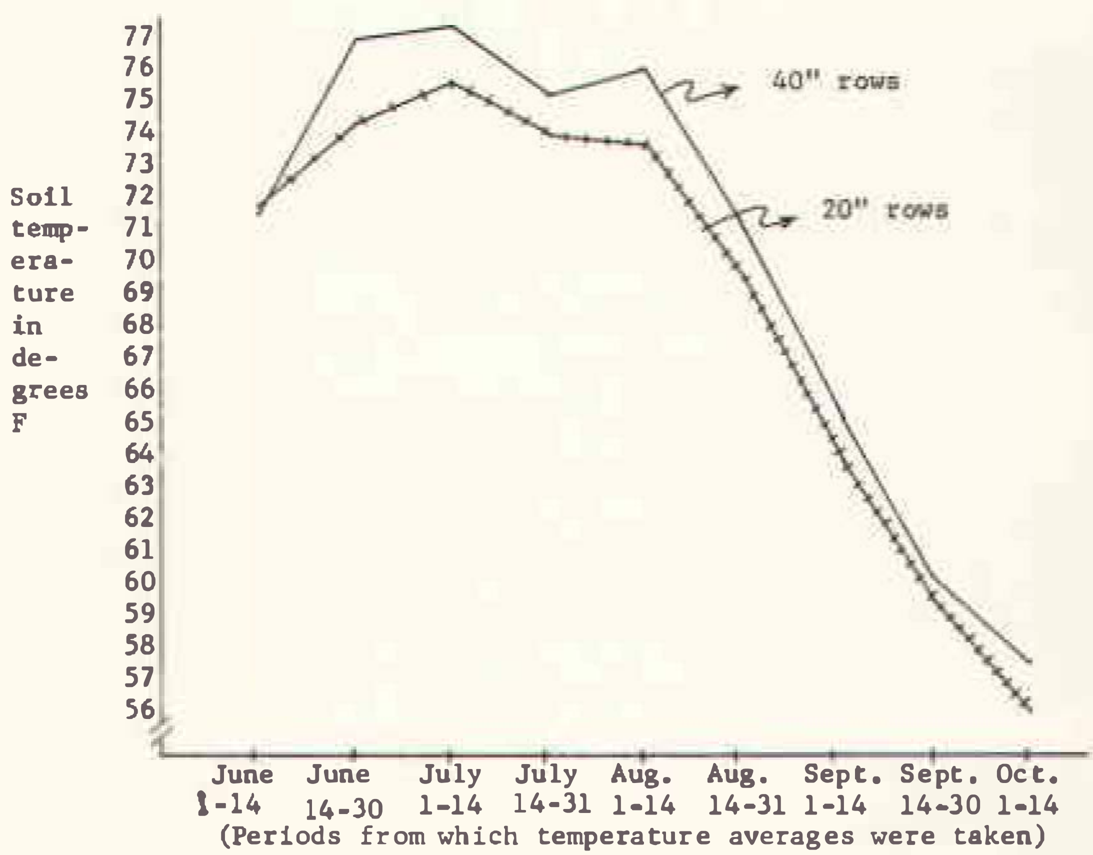
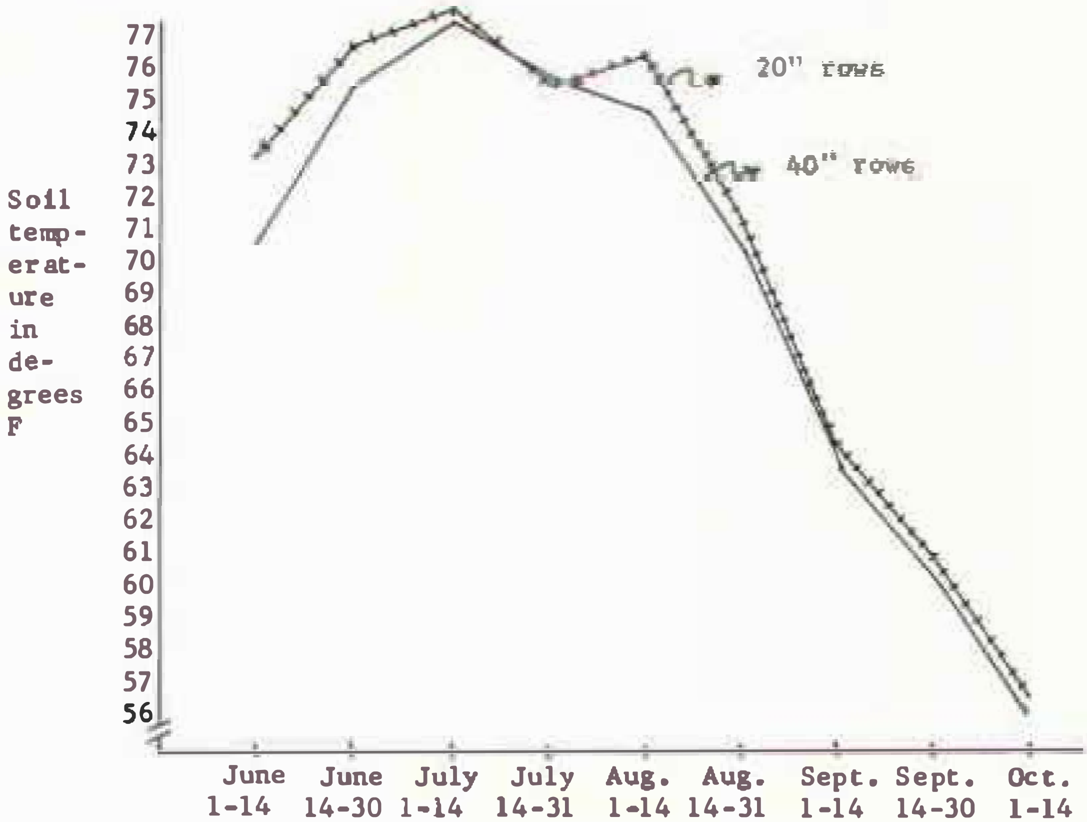


Figure 14. Effect of Row Spacing on Soil Temperature with 10,000 Plants per acre and Full Season Hybrid.



(Periods from which temperature averages were taken)

Discussion and Interpretation of Figures 13 and 14:

Soil temperatures were measured 3 inches below the soil surface. Soil temperature is important because it is related to potential evaporation of soil moisture.

With 18,000 plants per acre, narrow rows lowered soil temperatures in June, July and early August. Narrow rows provided a more complete leaf cover over the soil.

With 10,000 plants per acre, narrow row spacings did not lower soil temperatures.

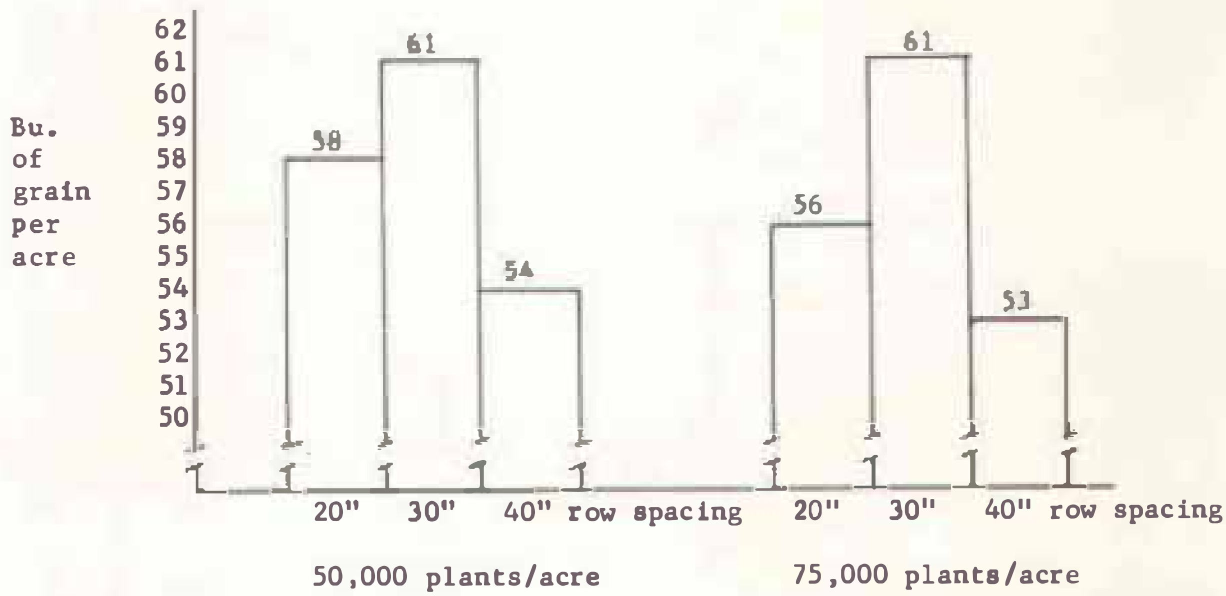
SORGHUM POPULATIONS AND ROW SPACING

-- L. Nelson and F. Shubeck

Objectives:

1. Will grain sorghum produce more grain in narrow spaced rows if plant populations remain constant?
2. Will different plant populations have much effect on yield?
3. Will row spacings affect weed control?

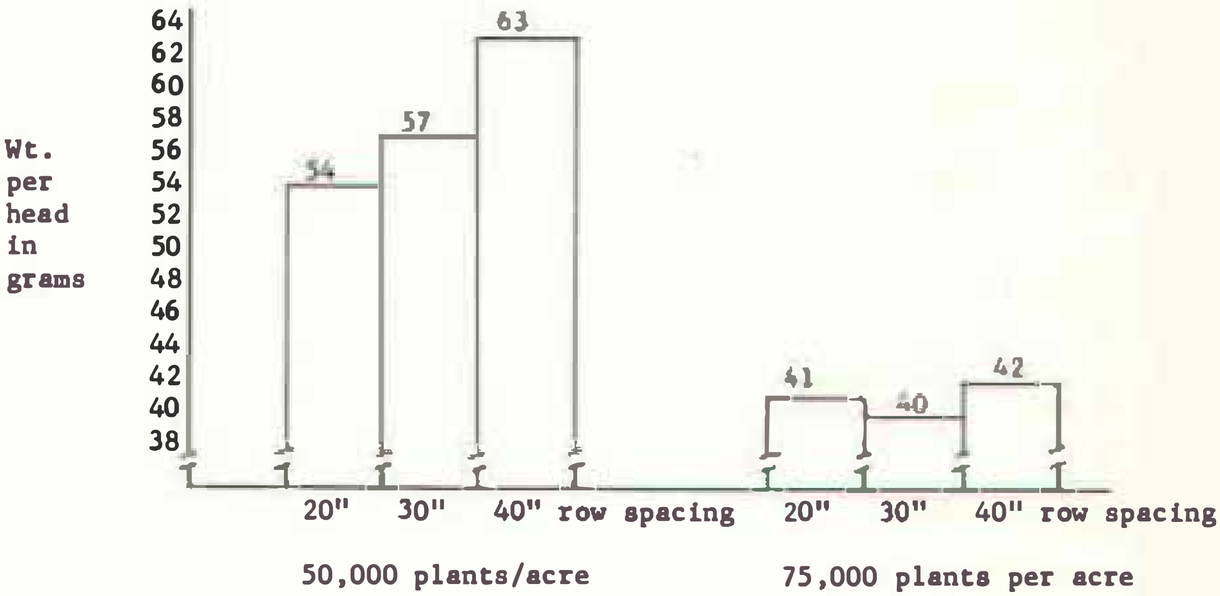
Figure 15. Effect of Sorghum Populations and Row Spacings on Grain Yield.



Discussion and Interpretation of Figure 15:

Variety used was Northrup King 227. Sorghum was planted June 11, 1965, with 4 John Deere tool bar planters. Seedbed preparation consisted of spring plowing, 2 discings, once over with a field cultivator and 2 flextine harrowings. The entire area was sprayed with atrazine at 3 pounds per acre on June 15. It was cultivated once with an Allis Chalmers G-tractor. Eighty pounds of N and 18 pounds of P were broadcast on May 5 and disced in. There were 3,073 seeds per 100 grams, or 13,951 seeds per pound.

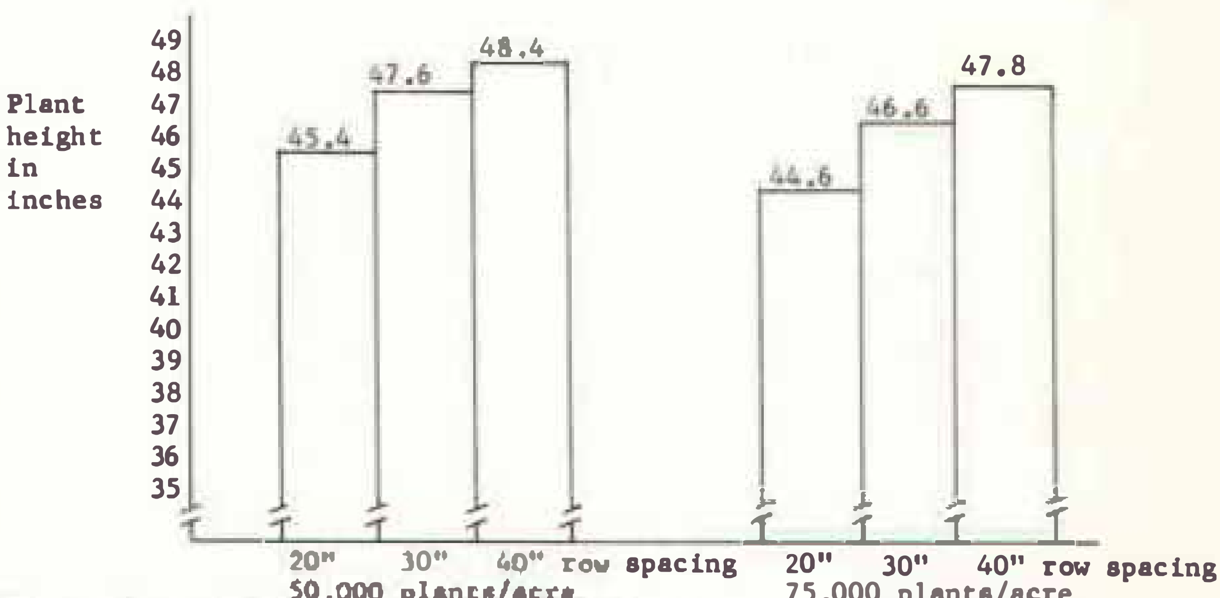
Figure 16. Effect of Sorghum Populations and Row Spacings on Weights per Head at Harvest.



Discussion and interpretation of Figure 16:

Sorghum heads were smaller when plant populations were increased.

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



Discussion and interpretation of Figure 17:

Sorghum plants in narrow rows were a little shorter than plants in wide rows. There was little difference in height due to different populations.

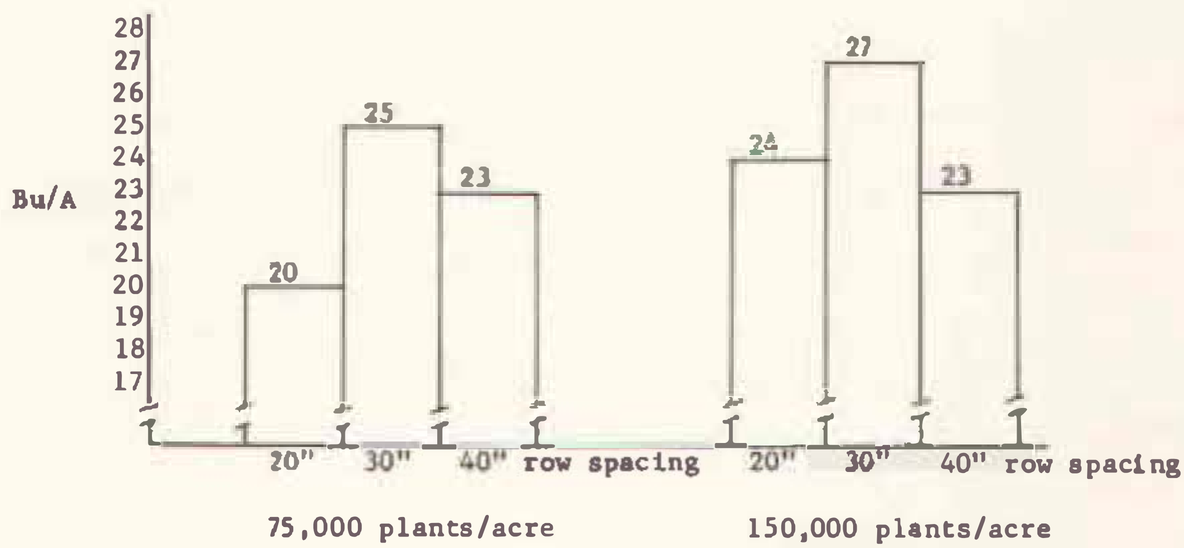
SOYBEAN POPULATIONS AND ROW SPACING

-- L. Nelson and F. Shubeck

Objectives:

1. Study effect of row spacing and plant populations on yield.
2. If populations remain the same, will different row spacings influence yield?
3. Study effects of row spacing on weed control and water utilization.

Figure 18. Effect of Soybean Populations and Row Spacings on Yield.

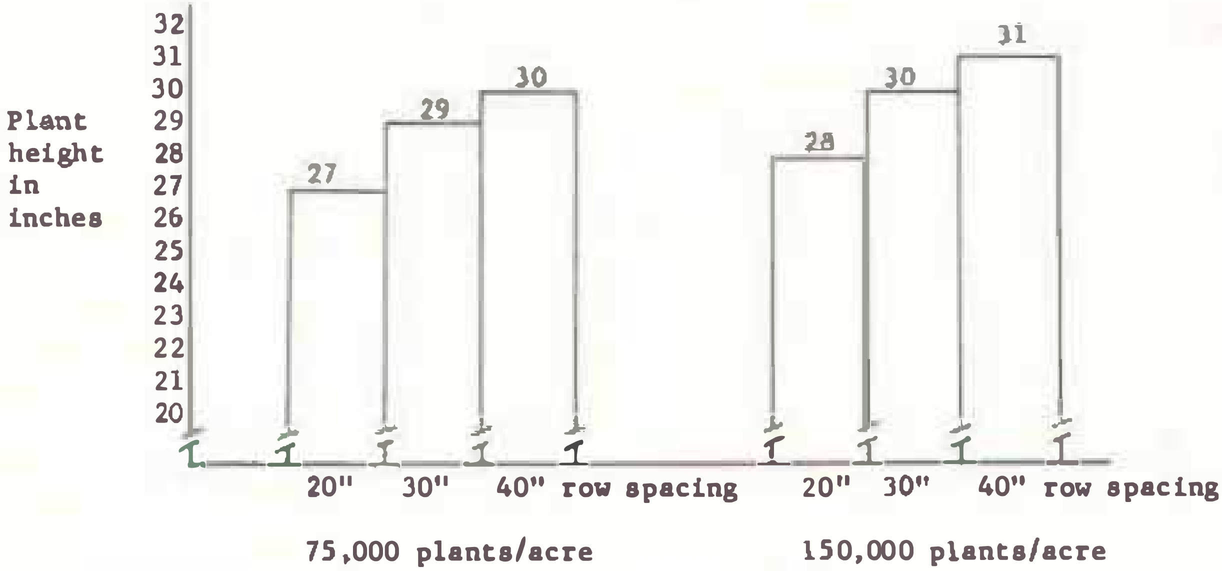


Discussion and Interpretation of Figure 18:

Variety used was Lindarin 63. It was planted June 11, 1965, with tool bar planters. Fifty pounds of 18-46-0 (18-20.2-0 elemental basis) were applied broadcast and disced in. Seedbed preparation consisted of spring plowing, 2 discings, twice over with a field cultivator and once with a floating harrow. It was cultivated once with an Allis Chalmers G-tractor. There were 705 seeds per 100 grams or 3200 seeds per pound.

Thirty-inch row spacing for soybeans gave the highest yield with both populations.

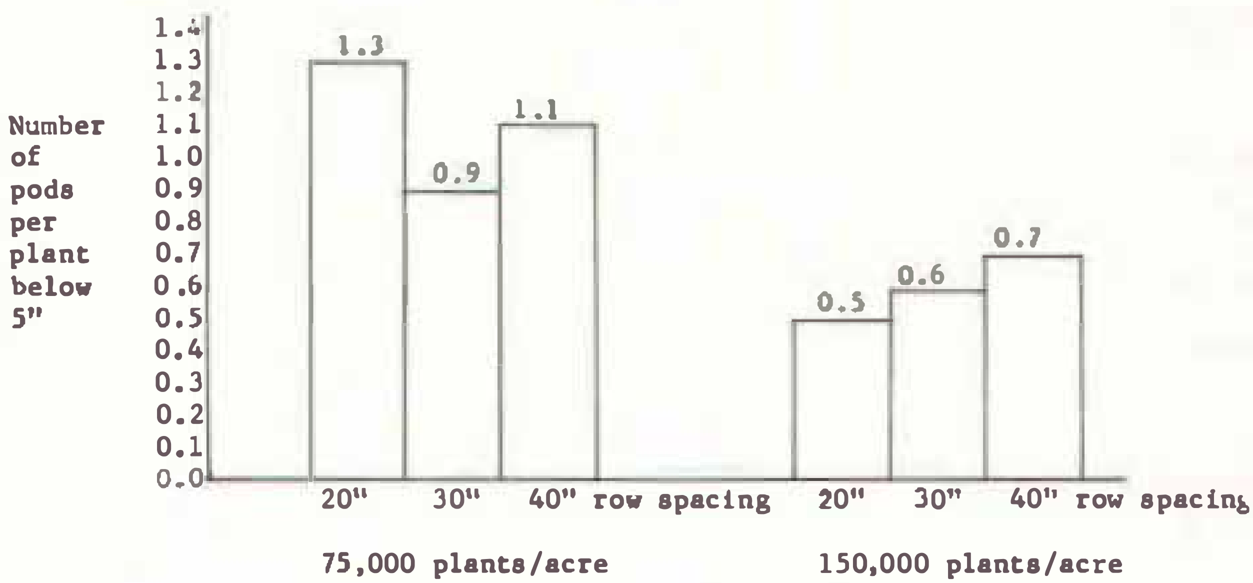
Figure 19. Effect of Soybean Populations and Row Spacings on Plant Height



Discussion and interpretation of Figure 19:

Narrow rows had shorter plants. Populations had little effect on plant height.

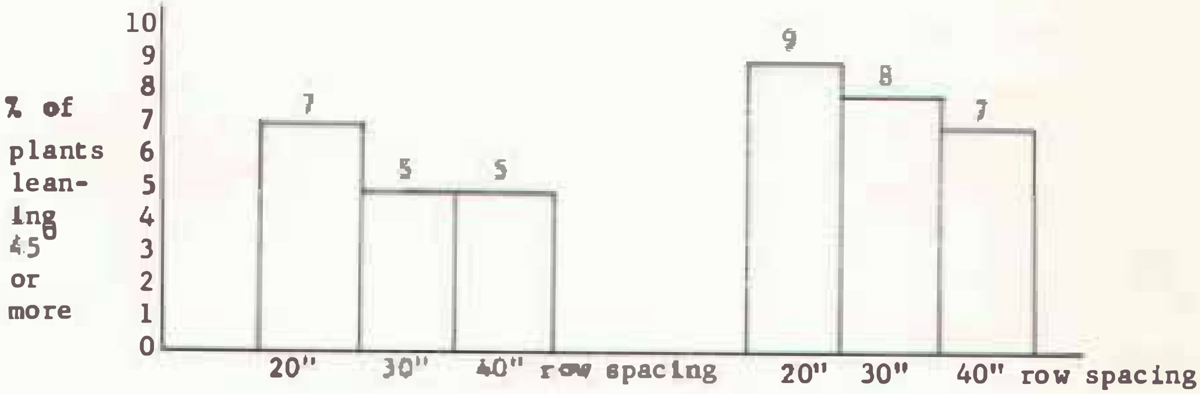
Figure 20. Effect of Soybean Populations and Row Spacings on Number of Pods per plant below 5 inches.



Discussion and interpretation of Figure 20:

There was a relatively large difference in the number of pods less than 5 inches above the ground due to different populations. This is in contrast to the small differences in plant height due to seeding rates (see Figure 19).

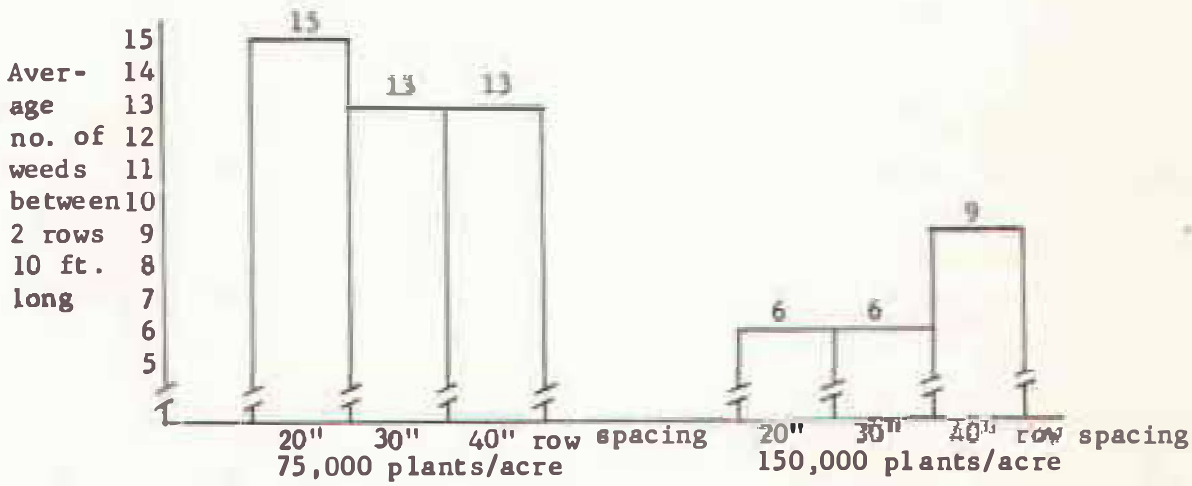
Figure 21. Effect of Soybean Populations and Row Spacings on % of Lodged Stalks



Discussion and Interpretation of Figure 21:

Row spacings and plant populations had only minor effects on percent of lodged stalks in 1965.

Figure 22. Effect of Soybean Populations and Row Spacings on Weed Control (Average of 3 replications).



Discussion and Interpretation of Figure 22:

There were fewer weeds with 150,000 soybean plants per acre than with 75,000 plants per acre.

With 150,000 plants per acre there appeared to be fewer weeds with narrow rows than with wide rows. With 75,000 plants per acre weed counts indicated no advantage in weed control for narrow rows. The intensive preplant cultivations and spray treatment should be considered when interpreting these data. (See discussion for Figure 18.)

MINIMUM TILLAGE FOR CORN

-- F. Shubeck and L. Nelson

Objectives of Experiment:

1. How much tillage is actually 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.

Table 2. Effect of Minimum Tillage on Yield of Corn.

Treatment	Fertility * N P K	Bu/Acre
1 Hard ground listing	80+12 +0	97
2 Wheel track planting	80+12 +0	101
3 Conventional plant spring plow	0- 0 -0	80
4 Stubble mulch Noble blade	80+12 +0	96
5 Spring list after fall subsoiling	80+12 +0	99
6 Plow plant	80+12 +0	97
7 Loose ground list, fall plow	80+12 +0	100
8 Conventional plant, fall plow	80+12 +0	105
9 Rototeller, conventional plant	80+12 +0	97
10 Conventional plant, spring plow	80+12 +0	105

* Fertility included 60# of 18-46-0 starter (18-20.2-0 elemental basis) + 70# nitrogen/acre sidedressed.

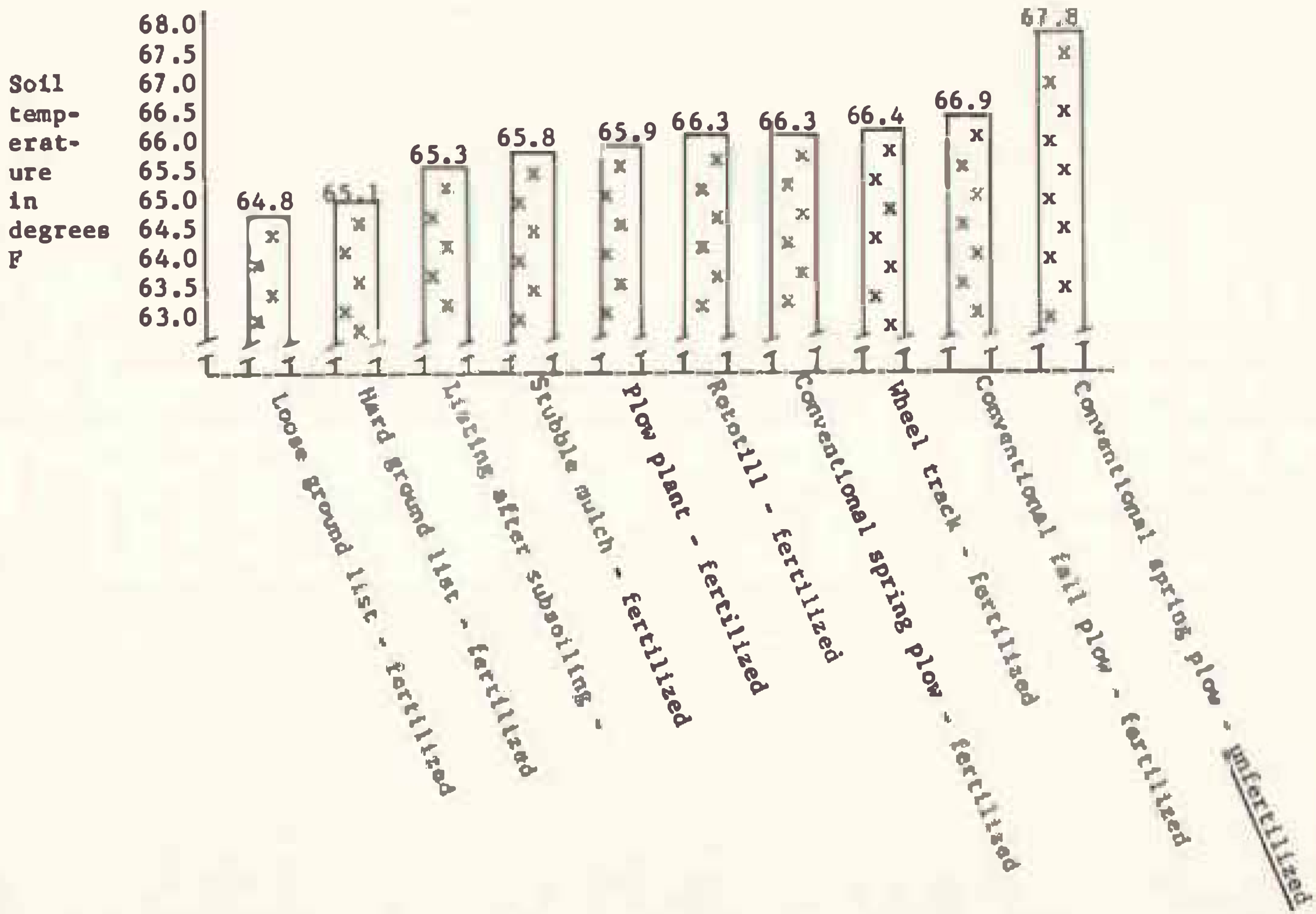
Discussion and Interpretation for Table 2:

Corn yields with conventional methods appeared to be slightly above those obtained with some of the minimum tillage methods. Wheel track planting was one of the higher yielding minimum tillage methods.

There were no yield differences between fall and spring plowing when corn was fertilized and planted with conventional equipment in 1965.

Note the substantial increase in yield due to fertilizer. (Compare treatment 3 to treatment 10.)

Figure 23. Effect of Corn Planting Method on Soil Temperature (averaged from June 1 through Oct. 8)



Discussion and Interpretation for Figure 23:

Soil temperatures were taken daily from June 1 through October 8 and averaged for each planting method in Figure 23. Temperature measuring devices were buried 3 inches below surface of soil at time of planting and left in this position for the entire growing season. Depth of soil covering thermocouples was altered somewhat due to cultivations. This was more noticeable with listed plots. In the future, thermocouples will be reset after each cultivation.

Treatments were arranged in order of increasing average soil temperature. The treatment on the right in Figure 23 had the highest average soil temperature and, therefore, had the highest potential for evaporation of soil moisture.

Minimum tillage methods usually resulted in cooler soil temperatures. The lower soil temperatures recorded for listed plots may be due partially to burying thermocouples a little deeper when cultivating.

Cooler soil temperatures in minimum tillage plots could account for the sluggish start and slow early growth of corn which frequently occurs with some minimum tillage methods.

Another interesting observation in this experiment was that fertilizer indirectly influenced soil temperature. Soil under fertilized corn was cooler than soil under unfertilized corn. (Compare conventional spring plow unfertilized to conventional spring plow fertilized, Figure 23.) This was evident in the high temperature months of July and August. Fertilized corn had a greater leaf area and a denser canopy of vegetation which intercepted more of the sun's rays than unfertilized corn. This leads to the speculation that perhaps a greater percentage of the water lost would be through transpiring leaf tissue and less wasted by evaporation from the soil. More work on the subject is planned for the future.

\- - - - -

MINIMUM TILLAGE DEMONSTRATION

-- F. Shubeck and L. Nelson

Objectives of Demonstration:

1. Familiarization of problems and equipment associated with 2 additional minimum tillage methods -- Buffalo Till Planter and Bush Hog Planter.
2. Estimate yield potential of these two methods.

Discussion and Interpretation of Results:

This additional minimum tillage work was not set up as a randomized replicated experiment but as a demonstration. The Buffalo Till Planter was obtained through the courtesy of Fleisher Manufacturing Company, Columbus, Nebraska. The Bush Hog Planter was obtained through the courtesy of Gerald Mettler Implement Company, Menno, South Dakota.

Planting dates, fertilizer rates and planting rates differed somewhat for each machine.

The check plot planted with conventional methods yielded approximately 90 bushels per acre, and the two minimum tillage methods gave equivalent yields. The important point of this demonstration was that corn can be grown successfully with these machines without plowing.

The biggest problem involved was cultivating when all the trash was left on the soil surface. The solution to this may be an improvised cultivator which will operate more satisfactorily than conventional cultivators in heavy trash. More investigation in this regard is planned for 1966.

- - - - - - - - - - - - - - -

STARTER FERTILIZER FOR CORN

-- F. Shubeck and L. Nelson

Objectives of Experiment:

1. Evaluate use of starter fertilizer and side-dressed nitrogen for corn.
2. Is the practice of including a small amount of potassium in the starter fertilizer "for insurance" against possible potassium deficiencies in borderline response areas worthwhile?
3. Is it best to forget about the starter fertilizer and broadcast all the fertilizer before planting and disc it in or plow it under?

Table 3. Effect of Starter Fertilizer and Side-dressed Nitrogen on Yield of Corn.

Starter fertilizer treatments N	P	K		Lbs. of N/Acre	% Broken & lodged stalks	% Water in ears harvest	Bu. of #2 Corn/Acre
0	0	0		None	24	30	85
11	21	0	In band	None	29	30	93
11	21	17	In band	None	29	31	94
0	0	0		70# side-dressed	23	31	95
11	21	0	In band	70# side-dressed	31	31	98
11	21	17	In band	70# side-dressed	31	29	99
11	21	17 + zinc	In band	70# side-dressed	33	32	91
11	21	17	Broadcast	70# banded on surface and disced in	30	31	97
11	21	17	Broadcast	70# banded on surface and plowed under	29	32	99

Discussion and Interpretation of Table 3:

Fertilizer increased yield from 8 to 14 bushels per acre. A combination of starter plus supplemental nitrogen increased yields more than starter alone or supplemental nitrogen alone. Potash had little effect on yield.

Method of fertilizer application had only minor effects on yield.

Fertilized corn appeared to have a few more broken and lodged stalks than the check plot but this was not statistically significant.

In 1965, starter fertilizer did not hasten corn maturity, measured by percent moisture in ears at harvest.

* * * * * * * * * * * *

FERTILIZER RATES AND RATIOS

-- L. Nelson and F. Shubeck

Objectives of Experiment:

1. What are the optimum nitrogen rates for corn?
2. What are the optimum nitrogen and phosphorus rates for oats?
3. What is the most efficient method of applying fertilizer to oats?
4. Is it more economical to fertilize corn and recover the unused portion (residual effect) with oats, or to fertilize the oats and recover the unused portion with corn?

Table 4. Residual Effects of Different Fertilizer Rates and Ratios on Yields of Grain Harvested in 1965.

Treatment N P K	Crop Treated	Treated in 1961 Corn	Treated in 1961 Oats	Treated in 1962 Corn	Treated in 1962 Oats	Treated in 1963 Corn	Treated in 1963 Oats	Treated in 1964 Corn	Treated in 1964 Oats
0- 0 -0	Corn-Oats	45.5	41.6	52.0	44.7	57.4	44.7	53.5	41.6
20- 0 -0	Oats	-	39.7	55.8	-	-	39.1	49.3	-
20- 9 -0	Oats	-	42.8	-	-	-	-	-	-
40- 0 -0	Oats-Corn	47.3	-	55.8	50.4	55.5	42.8	58.2	56.1
40- 9 -0	Oats	-	43.5	53.7	-	-	46.0	52.2	-
40-18 -0	Oats	-	36.5	55.4	-	-	44.7	58.3	-
40-26 -0	Corn	52.0	-	-	41.6	63.3	-	-	51.7
60-18 -0	Oats	-	40.3	59.2	-	-	50.4	55.2	-
80- 0 -0	Corn	57.6	-	-	44.7	80.5	-	-	53.6
80-26 -0	Corn	48.7	-	-	44.7	88.4	-	-	60.1
120-26 -0	Corn	53.8	-	-	47.9	86.6	-	-	57.3

Discussion and Interpretation of Table 4:

Nineteen sixty-five was the final year of the 5 years that this experiment was originally scheduled. The purpose for harvesting this year's crop was to measure, by yield response, the residual fertilizer remaining after one, two, three and four crop years. Soil tests were taken to determine how many years phosphorus can be detected when applied at 26 pounds per acre and cropped with a corn-oats rotation.

Nineteen sixty-one was the only year shown in Table 4 that oats received 20-9-0 fertilizer. From 1962 on, the 20-9-0 treatment was changed to 40-0-0.

The heavy rates of nitrogen and phosphorus applied in 1962, 1963 and 1964 appeared to have a residual effect on corn and oats yields in 1965.

* * * * * * * * * * *

MOST PROFITABLE ROTATION EXPERIMENT

-- L. Nelson and F. Shubeck

Objectives:

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

Interpretation of Results:

Fertilized plots were more profitable than unfertilized plots. The most profitable cropping sequence was continuous corn with commercial fertilizer added. The inclusion of oats in a rotation tended to reduce the net profit of that rotation.

A sweet clover catch crop did not increase yield of the following corn in 1965. The alfalfa hay made a good return but the first year corn following alfalfa did not yield as much as the second year of corn following alfalfa. This may be due to depletion of subsoil moisture reserves by the alfalfa.

Sorghum was a disappointing crop this year. It was caught by frost and rain before it was mature, causing light grain and considerable lodging. Normally it could be expected to compare favorably with corn.

Table 5. Crop Yields from Rotation Experiment

Cropping Sequence		Fertilizer N P K	N Side-dress	Oats Bu/A	1st Yr Corn Bu/A	2nd Yr Corn Bu/A	Soy-Beans Bu/A	Sorg-hum Bu/A	Hay Ton /A
1 Cont. Corn		0 + 0 + 0		-	81.8	-	-	-	-
1 Cont. Corn		50 + 9 + 0		-	105.0	-	-	-	-
2 Corn-Oats		0 + 0 + 0		47.2	69.0	-	-	-	-
2 Corn-Oats	(Corn	50 + 9 + 0		-	91.8	-	-	-	-
	(Oats	30 + 7 + 0		66.8	-	-	-	-	-
3 Corn-Corn-Oats + Alfalfa-Alfalfa Hay		0 + 0 + 0		56.2	78.2	81.7	-	-	2.8
3 Corn-Corn-Oats +	(Corn 75#	18 - 20 - 0		-	93.3	-	-	-	3.4
Alfalfa-Alfalfa Hay	(Corn 75#	18 - 20 - 0	40	-	-	103.2	-	-	-
	(Oats	15 + 26 + 0		67.8	-	-	-	-	-
4 Oats + Sw. Clover-Corn		0 + 0 + 0		46.0	66.9	-	-	-	-
4 Oats + Sw. Clover-Corn	(Oats	30 + 7 + 0		69.6	-	-	-	-	-
	(Corn 75#	18 - 20 - 0		-	75.8	-	-	-	-
5 Corn-Oats-Beans		0 + 0 + 0		50.5	86.7	-	20.1	-	-
5 Corn-Oats-Beans	(Corn	50 + 9 + 0		-	104.3	-	-	-	-
	(Oats	20 + 9 + 0		67.8	-	-	-	-	-
	(Beans75#	18 - 20 - 0		-	-	-	24.3	-	-
6 Corn-Beans-Oats		0 + 0 + 0		58.4	70.7	-	16.9	-	-
6 Corn-Beans-Oats	(Corn 75#	18 - 20 - 0	40	-	92.9	-	-	-	-
	(Beans75#	18 - 20 - 0		-	-	-	22.1	-	-
	(Oats	30 + 7 + 0		73.5	-	-	-	-	-
7 Cont. Sorghum		0 + 0 + 0		-	-	-	-	15.9	-
7 Cont. Sorghum		50 + 9 + 0		-	-	-	-	30.0	-

Table 6. Net Returns from Most Profitable Rotation Experiment

Rotation	Returns above cash costs per acre* Fertilized	Unfertilized
1. Continuous Corn	$ 85.55	$ 67.40
2. Corn-Oats	47.73	35.21
3. Corn-Corn-Oats + Alfalfa-Alfalfa Hay	56.58	47.81
4. Oats + Sweet Clover-Corn	44.15	33.15
5. Corn-Oats-Soybeans	48.99	40.76
6. Corn-Soybeans-Oats	43.32	33.88
7. Continuous Sorghum	-1.58	-5.29

* Does not include cost of land use.

Table 7. Custom Rates, Seed and Chemical Costs, Grain and Hay Prices Used to Calculate Net Returns from Rotation Study - 1965.

Custom Rates*

Operation	Average Rate per acre
plowing	$ 4.00
Discing	1.50
Cultivating	1.20
Swathing (incl. Hay)	1.25
Baling - .12¢/bale @ 50#	4.80/ton
Corn picking	3.50
Combining-Oats, Soybeans, Sorghum	4.00
Corn planter w/fertilizer	1.25
w/o fertilizer	1.00
Grain Drill w/fertilizer	1.25
w/o fertilizer	1.00
Sidedress Nitrogen	.35
Harrowing	.50

Seed and Chemical Costs

Corn	$ 2.20/A
Oats	2.50/A
Soybeans	3.00/A
Sorghum	1.20/A
Alfalfa	3.30/A
Sweet Clover	1.00/A
Organic phosphate	2.00/A
Herbicide	3.50/A

Grain & Hay Prices**

#2 Corn	$ 1.10/bu.
Soybeans	2.48
Oats	.62/bu.
Sorghum	1.40/CWT
Alfalfa Hay	20.00/ton

Fertilizer Costs

N	11¢ per lb.
P_2O_5	8-1/3¢ per lb.
18-46-0 (18-20-0 elemental)	5-1/2¢ per lb.

* Established using Ag. Economics Fact Sheet No. 188 as a guide.
** Prices taken at Farmers Coop Elevator, Brookings, S. Dak. on Dec. 23, 1965.

STARTER FERTILIZER AND CORN TILLERS

-- F. Shubeck and L. Nelson

Objectives of Experiment:

1. Does starter fertilizer cause or stimulate formation of tillers?
2. Do tillers affect yield?
3. Does side-dressed nitrogen cause tillering?

Table 8. Effect of Fertilizer and Tillers on Yield of Corn

Type of Corn	Fertilizer*	Method of Handling Tillers	Bu. of Corn/Acre
Light tillering	none	tillers undisturbed	76
Light tillering	starter	tillers undisturbed	76
Light tillering	starter + 80#N	tillers undisturbed	81
Light tillering	starter + 80#N	tillers removed	83
Heavy tillering	none	tillers undisturbed	73
Heavy tillering	starter	tillers undisturbed	80
Heavy tillering	starter + 80#N	tillers undisturbed	86
Heavy tillering	starter + 80#N	tillers removed	95

* Starter fertilizer was 80 lbs per acre of 18-46-0 (18-20-0 elemental). Supplemental nitrogen was side-dressed when corn was 18 inches high.

Discussion and Interpretation of Table 8:

Fewer tillers developed than were expected in all fertilized plots. In plots designated as tillers removed, the tillers were pulled by hand on two different dates.

From the data in Table 8, it appears that removal of tillers may increase yield. This trend occurred for both light and heavy tillering corn types. This raises a question regarding the causes and value of tillers.

* * * * * * * * * * *

ORIENTED PLANTING OF CORN

-- F. Shubeck and L. Nelson

Objectives of Study:

1. How effective is orientation of kernels at planting for controlling direction of leaf growth?
2. Will this make a more complete leaf canopy and influence soil moisture loss?

Discussion and Interpretation of Results:

Kernels were planted and oriented by hand in a small plot in 1965. No yields or other measurements were taken because of the small plot size. Before starting a large experiment, it was necessary to first determine the possibility of controlling direction of leaf growth.

In one row, approximately 80% of the plants were oriented in the desired direction. In other rows, plant orientation was less predictable.

Results were promising enough to continue next year on the same scale. Emphasis will be placed on depth of planting and more accurate orientation of kernels.

MAXIMUM FORAGE EXPERIMENT

-- L. Nelson and F. Shubeck

Objectives:

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

Table 9. Maximum Forage Experiment

Type	Variety	** No. of Cuttings	Row Sp.	Ton/acre @ 70% H_2O	% Crude Fat*	% Crude Fiber*	% Crude Protein*	% Nitrogen Free Extract*	% Ash*
Hybrid Sorghum Sudan	Frontier	1	20"	18.0	1.17	31.76	7.40	52.52	7.15
	Hydan	1	40"	15.8	1.16	30.17	7.74	53.87	7.06
	38	2	20"	6.7	1.55	31.19	16.22	37.04	13.97
		2	40"	5.2	1.72	31.53	16.75	34.92	15.05
		1	20"	16.0	1.60	27.45	7.90	56.27	6.77
	DeKalb	1	40"	16.3	1.56	28.78	7.50	55.82	6.34
	SX-11	2	20"	6.4	3.19	28.61	16.16	37.93	14.07
		2	40"	5.2	3.01	28.93	17.34	35.72	14.98
True Sudan Hybrid	Northrup	1	20"	15.5	1.84	33.49	6.63	51.33	6.70
	King	1	40"	12.4	1.50	35.01	7.25	49.29	6.94
	Trudan	2	20"	6.6	2.61	32.89	15.65	35.20	13.62
		2	40"	6.2	2.93	29.50	18.51	36.15	12.88
Hybrid Sorghum	Frontier	1	20"	16.8	1.51	27.32	7.56	56.95	6.65
	FS 210	1	40"	15.9	1.35	27.62	7.56	56.92	6.53
	Sokota	1	20"	17.5	2.25	26.84	8.18	55.51	7.21
	SD252F	1	40"	14.5	2.13	21.54	9.16	60.95	6.21
Open Polli-nated Sorghum	Rox	1	20"	15.6	1.58	28.63	7.81	55.38	6.59
	Orange	1	40"	12.5	1.51	26.95	7.26	58.14	6.12
Corn	Pioneer	1	20"	15.0	1.39	28.34	7.62	57.77	4.88
	3291	1	40"	14.0	1.31	26.17	8.90	58.03	5.57

* Percentage analysis reported on basis of moisture free material

** One cutting - plants were allowed to grow until frost
Two cuttings - plants were cut each time they reached approximately 40 inches in height

Discussion and Interpretation of Results of Table 9:

Land was spring plowed and received a broadcast application of 60 pounds of N, 18 pounds of P, and 12 ton of manure per acre. Six replications were used. Sorghum was planted at a rate of 6 pounds per acre and corn at 14,000 plants per acre in 40-inch rows. The population was doubled in 20-inch rows. All plots received two cultivations for weed control.

In this experiment, the Hybrid Sorghum Sudans and Hybrid Sorghums appeared to outyield the other types of forage. In nearly all cases the 20-inch rows yielded more forage than the 40-inch rows.

The plots which were cut more than once during the season had a low yield. This was due to the high moisture content of the early cut forage and to the frost and rains which interfered with the harvesting of the third cutting. Note the high protein content which partly compensates for the low yield.

A complete analysis was made on each type of forage by George F. Gastler of Station Biochemistry. The constituents are reported in percent content of moisture free material.

* * * * * * * *

SOIL POTASSIUM OF THE SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM

-- Dwight Hovland

In 1962 field plots were established to help evaluate the availability of soil potassium to corn. Some of the plots were treated with fertilizer containing potassium and other plots were treated with fertilizer containing no potassium. Ten replications of three treatments were used on each of two sites, one site on poorly-drained soils and the other on well-drained soils. Corn was grown on these plots in 1962, 1963, and 1964. Average annual yields for these plots are shown in Table 10. These data indicate that the small amount of potassium included with the starter fertilizer (treatment c) did not influence the average corn yields for this three year period on either the poorly-drained or the well-drained soils. It was not clear if there was accumulating damage to the corn yields from the annual heavy broadcasting of potassium fertilizer (treatment b). This needed more study; however, the original plots were too small to be used longer.

New plots were started in 1965. These plots were put on moderately well-drained soils. Individual plots were 20 feet wide and 60 feet long. There were three sets of plots comparing as many fertilizer treatments: (a) no potassium, (b) 500 pounds potassium broadcasted per acre, and (c) 12 to 17 pounds potassium banded per acre. Each treatment was repeated eight times. Nitrogen and phosphorus ferfilizers were broadcasted and banded uniformly over all plots. Pioneer 3291 corn was planted in 40-inch rows on May 13. A month later corn plants were thinned to a uniform density of 12 thousand per acre. Good insect and weed control was maintained throughout the season. Late season winds resulted in some stalk breakage.

Table 10. Influence of Potassium Fertilizer on 1962-4 Average Annual Corn grain Yields of Some Poorly-drained Soils and Some Well-drained Soils of the Southeast South Dakota Experiment Farm

Soils	Treatments *		
	a	b	c
		bu./ac.**	
Poorly-drained	57	51	58
Well-drained	62	60	63

*Treatment Key (All plots received nitrogen and phosphorus fertilizers)
- a - No potassium fertilizer
- b - 125 lbs. K/ac. in 1962 and 400 lbs. K/ac. in 1963 and 1964, all broadcasted
- c - 12.5 lbs. K/ac. hilldropped in 1962 and 1963, and 12.5 lbs. K/ac. banded in 1964.

** Each value is the average of 30 observations (ten replications each of three years.)

Corn yield, stalk breakage, soil moisture, and soil temperature data for 1965 are in Tables 11, 12, and 13. Analysis of variance showed no significant differences among corn yield and stalk breakage data.

Table 11. Influence of Potassium Fertilizer on 1965 Corn Grain Yields and Stalk Breakage on Some Moderately Well-drained Soils of the Southeast South Dakota Experiment Farm

	Treatments *		
	a	b	c
Grain yield (bu./ac.)	101**	101	100
Stalk breakage (%)	17	19	21

*Treatment Key (All plots received nitrogen and phosphorus fertilizers)
- a - No potassium fertilizer
- b - 500 lbs. K/ac. broadcasted
- c - 12 to 17 lbs. K/ac. banded

** Each value is the average of eight replications

Table 12. Average Moisture Content of Soils Bordering 1965 Potassium Plots

Sample depth (ft.)	Moisture content (g.water/g.dry material)* June 3	August 18
0-1	0.292	0.133
1-2	0.252	0.148
2-3	0.224	0.174
3-4	0.243	0.222
4-5	0.245	0.219

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

Table 13. Average Temperature at Three-inch Depth in Soils Bordering 1965 Potassium Plots

Period	Temperature (°F.)*
June 1 -15	75
June 16-30	76
July 1 -15	73
July 16-31	72
August 1 -15	72
August 16-31	68
September 1 -15	60

*Each value is average of about 96 (Eight points each of 12 days usually) and observations were made about 1 P.M.

HIGH PHOSPHORUS EXPERIMENT

-- Raymond C. Ward

An experiment was established in 1964 to study the effects of large applications of phosphorus (P) fertilizer on the yield of corn. Since research work has shown that P fertilizer can "tie up" enough available zinc (Zn) to limit corn yields, the various P fertilizer rates are also being used to study Zn availability to corn.

The entire experimental area received 80 pounds of nitrogen (N) per acre and 33 pounds of potassium (K) per acre. An insecticide and an herbicide were used to control insects and weeds. Pioneer 3291 was planted on May 27, 1965.

Experimental Results:

Soil tests on the experimental site rate the soil as medium in available P and very high in available Zn. Soil tests from the experimental area in April 1965, showed that P ranged from medium to very high, depending upon the rate of P fertilizer applied in 1964.

Table 14. Influence of Various Rates of Broadcast P, Starter P, and Zn Fertilizer on the Yield of Ear Corn

Pounds of P Broadcast per Acre 1/	No Additional Fertilizer	15 Lbs. of P Starter/A	10 Lbs. of Zn Broadcast/A	Average
	Bushels of Ear Corn per Acre			
0	70.9	75.4	78.1	74.8
10	94.8	85.5	83.2	87.8
20	86.0	84.3	87.8	86.0
40	89.1	85.8	86.5	87.1
80	81.6	82.2	85.5	83.1
Average	84.5	82.6	84.2	

1/ To convert to P_2O_5, multiply by 2.3.

Table 15. Influence of Various Rates of Broadcast P, Starter P, and Zn Fertilizer on the Moisture Content of Ear Corn Picked October 26, 1965.

Lbs. of P Broadcast/A	No Additional Fertilizer	15 Lbs. of P Starter/A	10 Lbs. of Zn Broadcast/A	Average
		Percent Moisture in the Ear Corn		
0	39.7	37.3	37.6	38.2
10	33.0	33.7	35.4	34.0
20	35.3	34.7	34.3	34.0
40	33.4	33.5	35.1	35.1
80	37.1	35.5	33.8	35.5
AVERAGE	35.7	34.9	35.2	

Table 16. Influence of Various Rates of Broadcast P, Starter P, and Zn Fertilizer on the Number of Tillers per 100 Corn Plants. Tillers or Suckers were Counted on September 27, 1965.

Lbs. of P Broadcast/A	No Additional Fertilizer	15 Lbs. of P Starter/A	10 Lbs. of Zn Broadcast/A	Average
		Number of Suckers per 100 Plants		
0	8	26	8	14
10	20	40	12	24
20	39	46	31	39
40	33	36	36	35
80	32	56	53	47
AVERAGE	26	41	28	

The corn yields are presented in Table 14. Broadcast P increased the yield about 10 to 12 bushels per acre when comparing the average yields in the right-hand column of the table. Ten pounds of broadcast P was enough to bring about this yield increase. Additional P did not increase or decrease the yield significantly. Starter P fertilizer and Zn did not affect the yield materially.

Although starter P fertilizer did not increase the yield of the corn, a growth response was observed early in the season. Corn plants receiving starter fertilizer with 0 or 10 pounds of broadcast P were 4 to 6 inches taller 32 days after planting.

The yield of corn was related almost directly to ear size since plant stand and percent barren stalks were not affected by the fertilizer treatments.

Percent moisture in the ear corn at harvest is represented in Table 15. Percent moisture was 3 to 4 percent lower when P fertilizer was broadcast. Starter P fertilizer and Zn fertilizer had no effect.

In 1964 numerous suckers were observed on plots receiving starter P fertilizer and/or high rates of broadcast P. This year sucker counts were made on September 27 and are shown in Table 16. Broadcast P and starter P increased the number of suckers per 100 plants. The larger the broadcast P application, the more suckers the plants produced. The suckers may have adverse effects in years when moisture is lacking in July and August.

* * * * * * * * *

WESTERN CORN ROOTWORM CONTROL - 1965

-- B. H. Kantack, W. L. Berndt,
J. F. Fredrikson, Raymond Venard

In cooperation with the Cooperative Extension Service, demonstration plots were planted at the SESD Experiment Farm using the currently recommended insecticides for the control of western corn rootworm. The results of this trial are shown in Table 17.

Table 17. Corn Yields Obtained With Insecticides for Control of Western Corn Rootworm on SESD Experiment Farm

Insecticide Treatment	% Moisture in ears	Yields in Bu. per acre
Thimet 10 G	29	81.7
Niran 10 G	27	80.1
Diazinon 14 G	30	78.5
Aldrex 10-10-G	29	74.8
Parahep 10-10 G	31	73.8
Untreated Check	29	70.0

Yields taken from weights obtained from 4 rows 80 rods long in each plot. All yields corrected to 15.0% moisture. All treatments applied at the rate of 1.0 lb/acre for each material involved. Corn variety was Pioneer 3291. Rootworm infestation very light.

All the treatments increased yields over the untreated check plots. Very little lodging was indicated in all the plots since the rootworm population was very light in these plots. The differences in yield obtained from the different insecticide applications are not significantly different as performance of the recommended insecticides will vary from field to field where different climatic conditions, soil moisture, soil pH, fertility, and other factors may be encountered.

The results of this test demonstrate the fallacy of measuring corn rootworm population or damage by the degree of lodging in a field. Many fields that are infested with a low number of corn rootworms do not show visual evidence of damage such as lodging, but suffer yield reductions of five to ten bushels per acre.

Results obtained in this test plot substantiate earlier observations that absence of stalk lodging does not necessarily imply that there has not been enough rootworm damage to cause yield reduction. These results clearly indicate that corn rootworm control pays even where light infestations are encountered.

For example -- Averaging all treatments, the yield increase over the untreated check is 7.8 bushels per acre.

$2.44 = estimated cost of treatment (obtained by averaging the suggested 1965 retail prices of the five test formulations)
$5.36 = net return (using $1.00 per bushel as the price for corn)

Although there was a lower concentration of rootworm adults and less evidence of damage in corn fields in 1965, there were still sufficient adults available to deposit eggs in the soil so that a damaging population of corn rootworms can be expected in the corn growing areas of South Dakota in 1966.

* * * * * * * * * * * *

SOYBEAN AND SORGHUM BREEDING AND TESTING - 1965

-- A. O. Lunden

Breeder testing of soybeans at Centerville included both Group II and Group III soybeans as well as a variety test and a group of experimental lines. The growing season was unusually cool with many entries not reaching maturity. Yields were slightly above average with Amsoy, Harosoy, Lindarin and Hawkeye producing about 40 bushels per acre. Wayne, a new Group III soybean, yielded about 5 bushels less because the short, cold season did not allow maturity of this late variety.

Amsoy, a new Group II variety between Hawkeye and Harosoy in maturity, has averaged about 4 bushels above Harosoy and Hawkeye for the last three years. It will be released to the County Crop Improvement Associations for seed production in 1966 and should be a very good variety for the southern counties. Wayne will be too late for most areas of the state as it is about 4 days later than Ford. Several South Dakota selections and Regional entries also yielded very well in preliminary tests and will be repeated in 1966.

Breeder testing of sorghum at Centerville included only the Regional Sorghum entries as no South Dakota Hybrids were produced in 1964 for yield tests in 1965. Regional entries ranged from very poor to about 85 bushels per acre with only a few entries reaching full maturity before frost.

The 1966 yield test planting will include several South Dakota experimental lines of earlier maturity.

Table 18. Soybean Yields at the Southeast South Dakota Experiment Farm

	1963	1964	1965	1963-65 Ave.
Hawkeye	38.6	31.3	38	35.8
Harosoy	36.9	28.4	42	35.8
Lindarin	36.5	29.3	42	35.9
Amsoy	48.1	32.6	42	40.9
Ford	-	-	34	-
Wayne	-	-	36	-

OATS BREEDING

-- R. S. Albrechtsen

Five nurseries of experimental oats were grown at the Southeast South Dakota Experiment Farm during 1965. Strains included in these nurseries represent various stages of the oat breeding program at the South Dakota Agricultural Experiment Station and other cooperating agencies, primarily in the North Central Region of the United States and in Canada.

Work on the earliest stage of this breeding program in 1965 consisted of growing approximately 150 lines in single rows in an effort to find strains possessing a higher degree of resistance to the barley yellow dwarf virus (red leaf) disease than those presently available. The Southeast area is normally the most heavily infected with barley yellow dwarf of any area in the state. However, the occurrence of the disease varies widely from year to year. The low level of infection in 1965 hindered selection for resistance since strains did not show a good differential reaction to the disease.

Closely associated with the Plant Row Nursery described above was the growing of a Barley Yellow Dwarf Yield Test Nursery. This nursery was comprised of more advanced strains which have previously shown some resistance to the virus and are now being evaluated for yield and other agronomic and pathologic characteristics. This nursery was grown in 4-row plots and replicated three times. Evaluation of these strains for yellow dwarf resistance was hampered by the lack of sufficient infection to provide a good differential response. No data are reported here for either of the Barley Yellow Dwarf Nurseries since response to the virus was the primary objective of these nurseries.

Fourteen new strains developed at the South Dakota Agricultural Experiment Station were grown in a yield nursery (Rod Row Oats I) with four standard varieties as checks. These 14 strains are those which were left after selective elimination of a much larger number grown previously in individual plant rows and preliminary yield tests. Entries in this nursery which show possible potential of being suitable for release as a new variety will be advanced to the next stage of testing. Table 19 shows data on the two highest yielding experimental strains and the check varieties included in this nursery in 1965.

Table 19. Performance of Selected Experimental Oat Strains and Check Varieties in Rod Row Oat Nursery

Variety or selection	Height	1964 Crown rust	1964 Stem rust	Bush. wt. 64-65	Yield 1965	Yield 64-65
	in.	*	*	lbs.	bushels per acre	
65 RROI-9	29	5-MS	tr-MS	32.5	83.5	71.3
65 RROI-14	31	5-MS	tr-MS	33.5	75.9	72.5
Andrew	27	10-MS	10-S	31.4	63.5	65.4
Clintland 64 1/	29	10-S	2-S	33.1	78.2	68.0
Dodge	30	tr-MS	0	33.6	80.1	70.8
Garry	33	20-S	0	30.8	68.4	69.9

1/ Clintland 60 grown in 1964, Clintland 64 in 1965.
* Letter indicate type of reaction shown by plants, 0 = no observable infection, tr = trace of infection, R = resistant, MR = moderate resistant, MS = moderately susceptible, S = susceptible, x = heterogeneous reaction ; numbers indicate percentage of leaf or stem surface covered by rust pustules.

Uniform Midseason Oat Performance Nursery Test:

The next step in the oat breeding program at South Dakota (after testing in the Rod Row Nursery) is the testing of new strains and standard check varieties in one of two Uniform Regional Oat Nurseries. The growing of these nurseries is coordinated by the Crops Research Division of the United States Department of Agriculture. The best new strains available from all states in the North Central Region of the United States and from Canada are normally grown in this nursery for a period of 2 to 4 years prior to release as a new variety. The nurseries are grown at approximately 20 locations throughout the North Central Region and Canada. This extensive testing program serves as a basis for decision on the releaseof new varieties and for the determination of areas of adaptation for these varieties. Through such a cooperative testing program varieties developed in one state or region may be found suitable for production in other states or areas as well.

Data on the four highest yielding experimental strains and standard check varieties in the Uniform Midseason Oat Performance Nursery are shown in Table 20. Entries in this nursery are primarily of the midseason to late maturity class, being as late as or later than the Clintland type oats.

Table 20. Performance of Selected Experimental Oat Strains and Check Varieties in the Uniform Midseason Oat Performance Nursery

Variety or selection	Height 1965	1964 Crown rust	1964 Stem rust	Bush.wt. 64-65	Yield 1965	Yield 64-65
	in.	*	*	lbs.	bushels per acre	
C.I. 7978	42	5-X	5-S	34.8	108.4	85.1
C.I. 8072	44	2-MR	2-MS	34.3	99.0	84.7
C.I. 8048	47	10-MS	5-MS	32.2	98.5	85.0
C.I. 8040	44	2-X	tr-MR	34.8	96.1	79.8
Andrew	42	20-MS	30-S	32.8	98.8	79.4
Clintford	40	2-X	10-S	35.9	85.7	67.7
Clintland 64	42	5-X	10-S	34.8	87.3	73.0
Garry	45	20-X	10-MS	30.1	67.1	68.6
Mo.0-205	44	10-MS	20-S	33.4	82.0	69.4
Tippecanoe	41	10-MS	5-S	33.6	78.6	68.4
Tyler	40	20-X	10-S	32.8	90.3	72.7

* See footnote under Table 19 for explanation of rust readings.

Uniform Early Oat Performance Nursery Test:

Data on the four highest yielding experimental strains and standard check varieties in the Uniform Early Oat Performance Nursery are shown in Table 21. Most of the entries in this nursery are of the early maturity class being equal to or earlier than the Clintland types.

Table 21. Performance of Selected Experimental Oat Strains and Check Varieties in the Uniform Early Oat Performance Nursery

Variety or selection	Height 1965	1964 Crown rust	1964 Stem rust	Bush.wt. 64-65	Yield 1965	Yield 64-65
	in.	*	*	lbs.	bushels per acre	
C.I. 8038	47	10-S	2-S	34.0	93.1	75.0
C.I. 7698	42	10-MS	5-S	33.0	92.3	76.2
C.I. 7971	36	5-S	5-S	34.0	91.6	75.8
C.I. 7970	42	2-MS	0	34.4	90.7	75.4
Andrew	42	10-MS	20-S	32.9	78.6	68.1
Clintford	39	5-X	20-S	36.1	86.2	68.6
Clintland 64	43	2-X	5-S	34.4	97.5	77.8
Mo.0-205	45	10-MS	20-S	33.8	96.5	80.1
Nodaway	43	10-S	5-S	33.8	79.0	66.3
Tippecanoe	41	10-X	5-S	33.6	77.6	68.8
Tyler	40	10-X	10-S	33.4	91.9	77.4

* See footnote under Table 19 for explanation of rust readings.

STANDARD VARIETY SMALL GRAIN TRIALS - 1965

-- J. J. Bonnemann

Standard variety trials of spring wheat, barley, oats and rye were harvested at the SESD Experiment Farm in 1965. The winter wheat trials were lost due to adverse weather. Data included in this report are bushel yields and test weights for 1965 and four-year averages where available.

Soil moisture was favorable for rapid germination of the fall planted trials. Plant growth in 1964 was at least six inches. Adverse winter conditions killed out most of the winter wheat entries entirely and only 30 to 40 percent stand remained in the surviving varieties.

The spring grain trials were seeded on April 16. Germination was uniform but growth was slow due to high rainfall and cool temperatures which prevailed through May and early June. Lodging was serious in parts of the trial because of heavy rainfall accompanied by high velocity winds.

Further discussion on the small grain trials will be found in Circular 173, 1965 Small Grain Performance Trials, South Dakota Agricultural Experiment Station.

Table 22. Standard Variety Spring Wheat Trial, SESD Experiment Farm 1965

Variety	Test Wt. Lb / Bu	1965 Average Yield, Bu/A	1962-65 Average Yield, Bu/A
CI 13949	58.0	45.2	
CI 13655	60.5	42.0	
CI 13779	56.0	40.6	
CI 13773	59.0	38.2	
Manitou	56.5	36.9	
Chris	59.0	34.7	
CI 13586	57.5	34.3	
Pembina	54.0	33.8	17.5
CI 13947	57.5	32.3	
Crim	54.0	30.9	18.2
Rushmore	57.0	27.3	16.7
Lee	52.0	24.6	14.4
Selkirk	52.0	23.7	14.5
Canthatch	56.0	23.5	14.7
Thatcher	54.0	21.8	14.4
Justin	52.5	20.7	12.7
	Mean Yield ...	31.9	

LSD .05 4.3

Table 23. Standard Variety Barley Trial, SESD Experiment Farm, 1965

Variety	Test Wt. Lb / Bu	1965 Average Yield, Bu/A	1962-65 Average Yield, Bu/A
Dickson	51.5	70.8	
Larker	49.0	68.5	41.5
Traill	51.0	67.1	41.8
Plains	48.0	64.6	35.6
Trophy	49.0	63.0	36.6
Otis	49.0	62.2	33.3
Liberty	48.5	61.9	45.1
Betzes	51.5	60.3	33.1
Parkland	50.5	58.6	32.0
Custer	43.0	56.6	30.4
Feebar	46.5	56.5	31.2
Spartan	51.0	52.8	29.1
	Mean Yield...	61.9	

LSD .05 8.7

Table 24. Standard Variety Oat Trial, SESD Experiment Farm, 1965

Variety	Test Wt. Lb / Bu	1965 Average Yield, Bu/A	1962-65 Average Yield, Bu/A
Garland	36.0	101.3	57.9
Dodge	36.5	95.5	60.4
Clintford	38.0	92.8	
CI 7978	36.0	92.0	
Clintland 64	35.0	90.8	
Minhafer	33.5	90.0	60.3
Burnett	35.0	87.8	56.8
Neal	33.5	87.3	
Tyler	33.0	87.2	
Garry	33.5	87.0	57.2
Santee	33.5	85.7	
Brave	32.5	85.6	
Coachman	34.5	85.4	
Nodaway	34.5	84.7	53.6
Putnam 61	34.0	84.1	
Mo. 0-205	33.5	83.6	57.9
CI 8178	33.0	83.6	
Andrew	33.5	82.7	56.8
Dupree	32.0	82.6	63.6
Goodfield	35.5	82.4	56.5
Lodi	33.0	81.9	
Tippecanoe	36.5	80.2	
Peterson 100	35.0	79.4	
Bonkee	36.0	74.9	
Portage	32.0	74.4	57.7
Ortley	34.0	73.3	58.5
Rodney	31.5	71.2	52.5
	Mean Yield ...	84.7	

LSD .05 10.1

Table 25. Standard Variety Rye Trial, SESD Experiment Farm, 1965

Variety	Test Wt. Lb / Bu.	Percent Stand	1965 Average Yield, Bu/A	1962-65 Average Yield, Bu/A
Pierre	56.0	85	53.6	31.4
Antelope	56.0	75	49.6	33.8
Caribou	56.5	80	49.4	33.0
Von Lochow	52.5	15	21.1	
Elk	52.0	20	17.5	17.4
			Mean Yield...38.2	

LSD .05 11.6

CORN PERFORMANCE TRIALS, AREA E, 1965

-- J. J. Bonnemann

Corn performance trials have been conducted at the SESD Experiment Farm for five years. Entries under trial were those selected by commercial seed producers and control varieties developed by experiment stations of the area. Fifty-three entries were included in the 1965 trials.

The corn was planted on May 14 and harvested October 21. It was hand planted as checked corn, 4 kernels per hill, in 40-inch rows. The plots were 2 by 8 hills in size. Atrazine was used for grassy weed control and Niran was used for corn rootworm control.

Yields ranged from 132.5 down to 103.3 bushels per acre. Moisture in the shelled corn at harvest time ranged from 21.9 to 32.1 percent. The results for 1965 are presented in Table 26.

Additional agronomic data and several year averages will appear in Circular 174, 1965 Corn Performance Trial, South Dakota Agricultural Experiment Station.

Table 26. Area E 1965 Corn Performance Trial, Southeast South Dakota Experiment Farm

Variety	Performance Score	% H_2O shelled corn	Yield B/A	Variety	Performance Score	% H_2O shelled corn	Yield B/A
Pioneer 3414 (4x)	1	23.8	132.5	Nebr. 202 (4x)	15	22.7	113.7
United-Hagie UH X147 (2x)	2	25.6	132.1	DeKalb XL-361 (3x)	27	25.6	113.6
Pioneer 3510 (2x)	3	27.0	131.0	Nebr. 501D (4x)	36	27.7	113.6
DeKalb XL-362 (3x)	4	27.2	126.0	Pioneer 3306 (2x)	46	32.0	113.3
Northrup-King PX 66 (2x)	6	25.6	123.0	Sokota 625 (4x)	26	24.5	112.7
SD Exp. 45 (4x)	7	25.1	122.1	Green Acres 462 (4x)	35	26.2	112.4
Pioneer 3206 (4x)	8	28.0	122.0	Northrup-King KM 589 (4x)	29	24.6	111.5
Pioneer 3558 (2x)	5	23.2	121.4	Minn. 417 (4x)	24	22.7	111.4
Pioneer 3291 (4x)	9	27.8	121.1	SD 604 (4x)	34	24.9	111.1
Pfister PAG SX29 (2x)	20	28.8	118.5	Northrup-King KT 623A (4x)	38	26.5	110.8
DeKalb 441A (4x)	14	25.6	117.1	Disco 115-A (4x)	39	25.8	110.1
United-Hagie UH X142 (2x)	23	28.1	117.0	Green Acres X1000 (4x)	50	30.5	110.0
DeKalb XL-65 (2x)	12	25.2	116.8	Master F-109 (4x)	32	23.4	109.7
Northrup-King KT623 (4x)	17	25.4	116.1	United-Hagie UH 158 (2x)	41	26.3	109.7
United-Hagie UH X152A (2x)	37	31.0	116.1	Pfister PAG 272 (3x)	33	23.4	109.6
Pioneer 328 (4x)	28	28.5	115.6	Pfister PAG 70 (4x)	31	22.8	109.1
DeKalb XL-45 (2x)	11	23.8	115.5	Disco 1090 (4x)	42	25.6	108.9
United-Hagie UH 1580 (2x)	43	32.1	115.5	Pfister PAG 393 (3x)	45	26.2	108.7
Sokota MS 75 (2x)	16	23.9	114.6	Green Acres X1001 (4x)	49	28.1	107.8
Pioneer 3418 (4x)	22	25.4	114.5	Sokota 675 (4x)	53	29.2	107.5
DeKalb 441 (4x)	25	26.1	114.5	Pfister PAG 348 (4x)	47	26.0	107.1
Sokota 623 (4x)	21	24.8	114.3	Master FX-500 (3x)	40	22.0	105.8
Pfister PAG SX66 (2x)	10	22.5	114.2	Minn. 301 (3x)	44	21.9	105.0
SD Exp. 46 (4x)	13	22.7	114.2	Master F-110 (4x)	52	26.3	105.0
United-Hagie UH 1500 (3x)	30	27.4	114.2	SD 622 (4x)	48	25.1	104.8
Disco 111-AA (4x)	19	24.4	114.1	Iowa 5063 (4x)	51	24.0	103.3
Disco 112-A (4x)	18	24.1	113.9				

Mean yield 14.2 LSD (.05) 8.7

Table 27. Area E 1965 Grain Sorghum Performance Trials, SESD Experiment Farm

Variety	Height, inches	Date headed	Test wt. lb/bu	Yield, 100Lb/A 1965	Yield, 100Lb/A 1963-65
DeKalb C-44b	51	8/1	51.0	47.6	40.5
Excel 202	56	7/25	54.0	46.6	
Taylor-Evans 44	54	7/30	53.0	46.4	
NK 212	52	8/1	51.0	46.1	
Nebr. 504	53	7/26	55.0	45.7	
NK 227	51	7/31	53.5	45.6	39.2
NK 133	47	7/25	55.0	45.0	
RS 610	51	8/2	50.5	44.9	39.7
SD 451	56	7/26	54.0	44.2	35.7
PAG 430	49	7/30	52.0	43.6	
Frontier 400B	53	8/1	50.5	42.8	
Kiowa	52	8/2	50.5	42.8	
RS 608	52	8/2	51.0	41.6	36.1
Pioneer 846	50	8/4	48.0	41.6	
NK 222	46	8/2	52.5	41.5	38.6
Comanche	51	8/4	48.5	41.1	
NK 255	46	8/2	50.0	41.1	
SD 503	53	7/28	54.0	40.8	38.5
SD 502	54	7/28	54.0	40.3	
Pioneer 865	50	8/3	50.0	40.2	
Lindsey 744	52	8/2	49.0	39.2	
Frontier 400C	55	8/3	49.0	38.9	35.4
DeKalb E-57	50	8/2	48.5	38.7	
Pioneer 848	48	8/7	47.0	38.7	
Colo. 604	59	7/30	54.5	37.7	
Pawnee	55	7/25	55.5	36.3	
PAG 304	40	7/28	54.0	35.7	
Lindsey 555	51	8/4	47.0	35.0	
Colo. 606	50	8/2	51.1	34.1	
Tasco	53	8/4	45.5	33.5	
Rico	51	8/4	44.0	33.0	
Colo. 585	56	7/24	55.0	32.4	
Ute	48	8/3	48.0	32.0	
PAG 275	49	7/24	55.0	29.9	
Frontier 400D	51	8/5	45.0	28.3	
RS 501	60	7/28	54.0	24.8	33.6
Frontier 413	54	8/11	32.5	9.5	
		Mean yield	38.6		
	LSD (.05)		9.4		

GRAIN SORGHUM PERFORMANCE TRIALS, AREA E, 1965

-- J. J. Bonnemann

This is the fourth year grain sorghum performance trials have been conducted at the Southeast South Dakota Experiment Farm under supervision of the Crop Performance Testing Activity. Entering seed producers, who pay a small fee, select the entries to be included in the trial. Check entries are included by the Agricultural Experiment Station.

The 1965 trial included 37 entries. Seeding was done on May 24 and harvesting on October 8. Conditions were less than favorable for sorghum during much of the season. Heavy rains caused some soil crusting and cooler soil temperatures further delayed rapid emergence. More than adequate rains throughout the growing season were accompanied by cooler temperatures and higher humidity. The month of September was one of the coolest on record and further delayed the progress of the sorghum toward maturity. The first frost was reported on September 24.

Yields are reported in terms of 100 pounds per acre. The yields ranged from 47.6 to 9.5 per acre. The retarded progress toward maturity reduced test weights of most entries.

Results of the Grain Sorghum Performance Trial are presented in Table 27. Complete results of all trials and further discussion will appear in Circular 175, 1965 Grain Sorghum Performance Trials. South Dakota Agricultural Experiment Station.

- - - - - - - - - -

FOUNDATION SEED STOCK DIVISION INCREASES

-- G. W. Erion

The Southeast South Dakota Experiment Farm has cooperated with the Foundation Seed Stock Division of South Dakota State University in the increase of Foundation seed. In 1965, these were as follows:

1. Summer Switchgrass (warm season) — One acre

Summer switchgrass is a warm season native grass; it produces forage during the summer months. It was developed at South Dakota Agricultural Experiment Station from a collection of Panicum Virgatum (P.I. 214759). Mass selection for earliness, leafiness, and rust resistance was made in each of two succeeding generations. Summer is tall, upright, with abundant and somewhat coarse leaves that start growth after June 1.

2. Clintford Oat — 15 acres

Clintford oat was developed at the Purdue Experiment Station in cooperation with the U. S. Department of Agriculture. Clintford oat is from a cross of a Purdue selection (a sixth backcross of Clinton 59 x Landhafer to Clinton 59) by Milford. Milford was introduced from Wales for its excellent straw strength, and this characteristic was transfered to Clintford.

The yield record of Clintford is similar to that of Tyler, being slightly better than Tippecanoe, but neither Clintford nor Tyler have yielded as well as Brave oat in South Dakota tests.

3. Ford Soybeans 10 acres

Ford soybean was developed by the Iowa Experiment Station. It is a selection from a cross of Lincoln x (Lincoln x Richland). Ford has high yielding potentials and produces high quality beans. It is about 4 to 5 days later than Hawkeye.

South Dakota Foundation Seed Stock Division released a limited supply in 1958. This 1965 Foundation Seed Stock increase will be available in 1966.

4. Martin ms Sorghum Isolation 3 acres

This sorghum isolation was an increase of the Martin ms (male sterile). This male sterile seed is used as the seed parent in SD 451, SD 502, and SD 252F hybrid sorghums.

Due to the cool temperatures in August and September along with above normal precipitation this crop did not mature well. The frost lowered the germination to the level where most of this increase was lost.

- - - - - - - - - -

GRASS VARIETY EVALUATION AT SESD EXPERIMENT FARM

-- J. G. Ross and S. S. Bullis

Tests of varieties of smooth bromegrass and intermediate wheatgrass were established in 1962. Forage yields from these varieties are shown in Tables 28 and 29.

Table 28. Smooth Bromegrass Variety Test

Variety Bromegrass	1965	1964	Average
Sac	3.18	2.12	2.65
Southland	3.17	2.13	2.65
Lincoln	3.10	2.05	2.58
Lyons	3.10	1.85	2.48
Lancaster	3.09	2.11	2.60
Saratoga	3.04	2.06	2.55
Wis 55	2.81	1.95	2.38
Homesteader	2.74	1.99	2.36
Manchar	2.65	1.77	2.21
Canadian Commercial	2.38	1.85	2.11
Least significant difference	0.47	0.23	

It will be noted that the southern varieties of bromegrass have yielded well at this location. The newer varieties, Sac released from Wisconsin and Saratoga from New York, have also had high yields. The two varieties, Homesteader and Manchar, which are closer to the northern type have not produced as much forage as the southern types. Canadian Commercial, which is representative of the Canadian seed commonly sold in South Dakota, was significantly lower in yield than the higher yielding varieties.

Table 29. Wheatgrass Variety Test

Variety	Species	1965	1964	1963	Average
		Tons per acre			
Amur	Intermediate	2.75	1.90	1.69	2.11
Greenar	Intermediate	2.73	1.80	1.76	2.10
Nebraska 50	Intermediate	2.72	1.65	-	-
Oahe	Intermediate	2.61	2.14	1.88	2.21
Mandan 759	Pubescent	2.44	1.82	1.54	1.93
Lopar	Pubescent	2.42	1.58	-	-
Least significant difference		NS	NS	NS	

No significant difference in yield between the intermediate wheatgrass varieties was found though Oahe had the highest average yield. The better bromegrass varieties yielded more than the intermediate wheatgrass varieties. These tests had been fertilized with 60 pounds of nitrogen (180 pounds of ammonium nitrate) in the early spring before the grasses started growth.

- - - - - - - - - -

CORN ROOTWORM STUDIES TO LOCATE AND EVALUATE RESISTANCE IN VARIETIES AND SELECTIONS OF CORN

-- Paul J. Fitzgerald, Eldon E. Ortman
Boyd Shank, Durwood Beatty

Cooperative rootworm studies between the Northern Grain Insects Research Laboratory and the Department of Agronomy were initiated on the SESD Experiment Farm in 1965. The three distinct investigations are summarized below.

Establishing and Maintaining a Rootworm Infestation:

A natural infestation of rootworms of a moderate level and a high degree of uniformity is essential for the effective evaluation of corn varieties and lines for resistance to damage by larvae. Seldom are these conditions fully met in selected fields on private farms. It would be of considerable advantage to the research workers to maintain an adequate infestation on the same site year after year and be assured of desirable plot area. With this need in mind, and with the knowledge that corn rootworm populations have been successfully manipulated at other locations by delayed plantings of selected varieties, an attempt was made in 1963 to localize in one 4-acre field on the SESD Experiment Farm the natural population of corn rootworm adult beetles.

Delayed plantings of late-maturing corn were made each year to provide succulent feed for the adult beetles during their egg-laying period beginning about the middle of August. It is necessary to retain the beetles in the plot during the critical egg-laying period to develop an infestation the following summer. We have been unsuccessful in increasing the infestation in this plot. This study was discontinued after the 1965 field season.

Evaluating Breeding Lines of Corn for Resistance to Damage by the Western Corn Rootworm Larvae:

A nursery plot was established in a field showing extensive damage and a moderate population of adult beetles the previous summer. Approximately 270 lines of corn from the Northern Grain Insects Research Laboratory and the Departments of Agronomy and Plant Pathology were planted in single row plots 25 feet long with plants spaced one foot apart in the row. The lines were to be evaluated at one or two

stages of growth for firmness of anchorage in the soil, stalk lodging (goose-necking), and general appearance of color and vigor.

As was true for much of the area in 1965, an infestation did not develop and no data could be collected from this trial.

Comparison of Experimental Single-Crosses in Rootworm-Infested and Insecticide-Treated Field Trials:

Fifty-seven entries from South Dakota and 49 from Missouri were seeded in single-row plots 38 feet long in 4 replications. Replications 1 and 2 were grown under rootworm-controlled conditions, provided by a broadcast application of three pounds of Niran on May 18. Replications 3 and 4 were grown in untreated, rootworm-infested soil. All plots were sprayed with Amiben on May 18 for weed control.

The entries from each location were experimental crosses of approximately 10 selected inbred lines in all combinations. Appropriate checks were included for comparison. Generally, the inbreds crossed in Missouri were later in maturity than those crossed in South Dakota. Some of the crosses were made in the field during the summer, but many of them had to be made in the greenhouse during the winter or in the Florida winter plots.

The experiment was designed to study the effect of the rootworm on the yield of individual hybrid combinations. More specifically, the objective was to study the individual inbred's contribution to the hybrid's performance in the presence of the western corn rootworm. Since no infestation developed these comparisons were not possible. Yield data was collected to provide information on favorable line combinations for yield and other agronomic characters.

* * * * * * * *

WEED CONTROL IN CORN

-- W. G. Wright

Objectives:

1. To screen new herbicides and determine their potential use in corn.
2. To maintain weed control but reduce or eliminate atrazine carry-over by using atrazine at lower rates in combination with other herbicides and non-plant toxic oils.
3. To determine the difference, if any, of several non-plant toxic oils in combination with atrazine.
4. To determine the number of cultivations needed with the various herbicides to give season long weed control.

Description:

SD619 corn was planted and treated pre-emergence May 14, 1965. Post-emergence atrazine and oil treatments were made May 27. The first cultivation was omitted in the treated plots. Check plots received the first and second and first, second and third cultivations, respectively.

Table 30. Weed Control in Corn

Treatment	Rate lb/A	Percent weed control 6 weeks and 3 months after treatment: 6 weeks	3 months			Yield bu/A		
			0X	1X	2X*	0X	1X	2X
Pre-emergence								
Atrazine	2.5	99	84	92	95	98.1	95.6	90.6
Ramrod	4	98	83	88	93	99.5	97.2	94.4
Randox T	3.1	93	62	85	92	90.4	98.2	95.4
Knoxweed 42	2+1	83	43	83	92	91.9	93.1	92.4
Atrazine + Prometryne	1+1	97	83	87	95	108.2	105.9	108.1
Atrazine + Linuron	1+1	96	70	88	94	106.9	99.7	101.7
Amiben	3	87	42	67	77	81.7	95.7	88.6
Fenaben	2+1	96	70	92	96	86.6	90.7	87.6
52504	2	37	33	77	88	86.2	90.5	92.4
52504	4	78	67	87	94	88.0	89.3	88.7
D263	2	68	50	87	94	93.3	102.2	91.4
D263	4	82	53	90	95	98.2	105.4	106.3
GS14260	2	89	73	85	91	98.2	103.1	103.3
GS14260	4	98	86	94	96	107.6	100.6	97.8
GS13528	2	93	79	94	97	95.1	96.8	98.0
GS13528	4	97	90	94	97	101.4	98.8	101.4
GS13529	2	98	87	93	98	107.1	100.1	97.3
GS13529	4	98	89	93	98	107.6	104.9	104.9
GS14253	2	78	77	88	93	92.3	89.8	90.1
GS14253	4	97	82	90	95	106.3	98.5	94.1
R 1910	4	36	40	78	88	82.5	93.9	98.8
R 1910 + 2,4-D	3+1	67	43	85	95	96.1	97.7	99.7
Ramrod + 2,4-D	3+1	98	83	92	96	101.2	106.7	105.6
Post emergence								
Atrazine + oil	2+2 gal	98	77	92	97	97.6	104.4	101.4
Atrazine + oil	1+2 gal	97	70	88	95	97.6	102.0	96.4
Atrazine + oil	1.5+1 gal	99	75	86	93	99.7	89.1	95.9
Atrazine + oil	1+1 gal**	95	66	88	95	94.1	102.1	99.5
Check	-	0	0	63	78	72.3	93.4	105.6
LSD .05 level						16.2	10.9	14.7

* 0X, 1X and 2X represents 0, 1 and 2 cultivations
** Average of 5 different oils at this rate

Results:

Moisture and fertility conditions for corn at the SESD Farm were excellent throughout the growing season in 1965. Three cultivations alone controlled 78 percent of the weeds and gave one of the better yields under these conditions. At the same time comparable yields were obtained with several herbicides with one cultivation. Atrazine showed excellent season-long control as it has in the past. Randox T with the more abundant moisture, performed somewhat better than it does in most years. Ramrod, a promising new chemical, gave excellent early annual grass control, but is weak where broadleaf weeds are a problem. Knoxweed 42, although it gave fair early control at this location, showed very little, if any, weed control and caused some damage to corn in other tests.

Amiben and Fenaben, both, caused severe early stunting and a slight stand reduction. The corn overcame the early stunting but there was a significant yield reduction with 2 cultivations. The combination of one pound of atrazine with one pound of prometryne or lorox to cut down carry-over gave good season-long control. These plots will be evaluated next year for carry-over damage in oats.

The 2-pound rate of the experimental compounds GS13529 shows season-long control equal to atrazine. Coupled with indications that there may not be as much of a carry-over problem with this compound as with atrazine, it is one that will warrant furher testing in 1966.

The combination of one pound of atrazine with one gallon of a dormant spray oil applied when the weeds are 1/2 to 1-1/2 inches tall looks very promising. This combination gave as good early control as 2.5 pounds of atrazine pre-emergence. Of the oils tested no particular oil was superior nor was the two gallon rate superior to the one gallon rate. This combination, if further testing proves satisfactory, could cut the initial investment in the product, reduce or eliminate carry-over and give better weed control in dry years when pre-emergence treatments are ineffective.

- - - - - - - -

WEED CONTROL IN SOYBEANS

-- W. G. Wright

Objectives:

To determine the effect of several pre-emergence herbicides on soybean injury, soybean yield and weed control both with and without cultivation.

Description:

Chippewa soybeans were planted in 40-inch rows and treated pre-emergence June 3, 1965. Each chemical was tested with 0, 1 and 2 cultivations. The first cultivation was omitted in the treated plots. Check plots received the first and second and first, second and third cultivations, respectively. The 20-inch row plots were not cultivated.

Results:

A heavy rain immediately following planting and treating caused extensive washing over the entire plot area. As a result, the stand was not uniform over the entire plot area and may account for some of the variation in yield and weed control readings. Treflan and Amiben gave excellent early-season weed control and season-long control with one cultivation. Ramrod gave excellent early-season control

but needed two cultivations for season-long control. Vernam, Dyanap and Randox gave fair early weed control but did not hold up through the entire growing season. Soybeans treated with Treflan and Amiben in 20-inch rows and not cultivated, looked very good, but there were some late germinating weeds that did develop. These treatments yielded 1.5 to 6.3 bushels better than the cultivated check area.

Table 31. Weed Control in Soybeans

Treatment	Rate lb/A	Percent weed control 6 weeks and 3 months after treatment: 6 weeks and 3 weeks	3 months 0X	3 months 1X	3 months 2X*	Yield bu/A 0X	Yield bu/A 1X	Yield bu/A 2X
Treflan	1/2	93	73	90	92	16.3	20.9	16.6
Treflan	3/4	94	77	88	89	17.2	18.9	13.7
Treflan	1	98	77	96	94	17.7	20.7	15.4
Treflan 20" row	3/4	97	82	-	-	27.0		
Amiben	3	91	78	92	95	16.0	20.9	21.9
Amiben 20" row	3	98	80	-	-	22.3		
Ramrod	4	96	56	87	95	19.8	22.2	18.2
Vernam	3	83	43	80	91	15.1	19.0	18.2
Randox	4	72	13	48	63	16.5	20.6	21.6
TH-052-H	3	17	23	42	65	10.3	17.9	17.8
TH-052-H	6	27	17	50	57	17.3	18.0	16.3
Dyanap	2+1	87	17	70	81	14.3	18.6	17.1
Patoran	2	40	43	81	83	15.9	20.6	16.4
Patoran	4	57	40	80	82	14.7	19.1	18.5
Tenoran	2	7	17	57	75	13.5	16.5	18.5
Tenoran	4	20	10	38	47	13.2	15.0	17.6
Check		0	0	47	53	11.6	20.7	17.9

* 0X, 1X and 2X - represents 0, 1 and 2 cultivations

WEED CONTROL IN SORGHUM

-- W. G. Wright

Objectives:

1. To screen new herbicides to determine their potential as sorghum herbicides.
2. To determine the number of cultivations needed with the various herbicides to give season-long weed control.

Description:

SD451 sorghum was planted in 40-inch rows and treated pre-emergence June 3, 1965. Post-emergence treatments were made June 30 when the grass was 1-4 inches tall. Plots in 20-inch rows received no cultivation. The first cultivation was omitted in the treated plots. Check plots received the first, second and first, second and third cultivations, respectively.

Results:

Atrazine pre-emergence gave excellent season-long weed control. Propazine gave good season-long control, but the early control was not as good. Ramrod and Herban, two promising new chemicals, both gave excellent early and late season weed control.

Daxtron and Knoxweed 42 both caused severe injury and a substantial stand reduction.

The post-emergence treatments of atrazine and atrazine and oil gave poor control. The grassy weeds were 1-4 inches tall when treated which accounts for the poor control. To be effective the post-emergence treatments must be applied when the weeds are 1/2 to 1-1/2 inches tall. This is pointed out very clearly when comparing the atrazine and oil treatments in the corn and sorghum experiments. A heavy rain immediately following planting caused extensive washing over the entire area. As a result the sorghum stand was not uniform over the entire plot area and may account for some of the variation in yield and weed control readings.

Table 32. Weed Control in Sorghum

		Percent weed control 6 weeks and 3 months after treatment						
	Rate	3 weeks	3 months			Yield bu/A		
Treatment	lb/A		0X*	1X	2X	0X	1X	2X
Daxtron	1	99	75	94	98	14.5	8.8	18.0
Daxtron	2	99	93	96	99	0	0	0
GS-14260	2	62	67	88	93	60.7	64.1	67.2
GS-14260	4	90	75	92	96	65.2	64.1	65.7
GS-13528	2	63	83	92	95	69.7	64.3	66.1
GS-13528	4	98	90	97	99	67.3	69.6	66.4
GS-13529	2	68	68	88	95	65.4	66.4	66.0
GS-13529	4	88	85	94	96	65.2	68.4	70.5
GS-14253	2	68.3	58	85	91	47.1	51.7	52.9
GS-14253	4	85	58	89	93	55.7	61.5	64.1
Ramrod	4	98.0	78	90	95	64.1	65.4	66.5
Atrazine	2.5	98.3	87	93	96	65.7	68.0	69.0
Atrazine Post	2.5	50.0	60	82	88	58.3	57.1	58.9
Atrazine + oil	1+2 gal	47	53	73	79	63.1	68.6	62.6
Atrazine + oil	1+1 gal	20.0	50	78	87	59.7	62.7	62.9
Propazine	2.5	77	80	88	94	62.1	62.2	61.2
Check	---	0	0	43	55	44.8	52.1	51.6
Herban	2	92	67	89	95	64.5	65.1	66.4
Herban	4	97.0	87	96	99	65.4	65.2	66.7
Atrazine + oil 20"	1+2 gal	68.3	65	65	65	60.1	60.1	60.1
Atrazine Post 20"	2.5	65.0	72	72	72	62.5	62.5	62.5
Knoxweed 42	2+1	75.0	30	73	88	17.0	22.2	19.7

* 0X, 1X and 2X represents 0, 1 and 2 cultivations

CORN BREEDING

-- D. W. Beatty and D. B. Shank

Corn yield tests in 1965 involved the evaluation of approximately 150 new experimental hybrids in comparison with the best check hybrids available in the area.

One test of forty-two 3- and 4-way hybrids produced an average yield of 109.8 bushels per acre with a mean moisture percentage of 25.7 at the time the plots were harvested on October 22. Two hybrids out-yielded the best of seven check hybrids while 27 ranked above the second highest check entry. The top yielding hybrid was a 3-way cross which produced 129.5 bushels per acre.

A test of experimental single cross hybrids made from 12 inbred lines produced a top yield of 121.5 bushels of corn and averaged 103.7 bushels over all entries. Some of the inbreds with top performances are new lines not yet released. These single cross hybrids might be used as they exist. On the other hand, they can be employed in 3- and 4-way hybrids. It is also possible to use results from a single cross test to predict how such 3- and 4-way hybrids would have performed if they had been included in the same test. This indicates desirable hybrids for the future.

As part of a region-wide cooperative effort between states, thirty-six 3-way hybrids were evaluated to determine the productiveness and performance of a number of new inbred lines when crossed to a common single cross parent. Those inbreds which performed well or had good "combining ability" will be used to develop more and better hybrids.

In cooperation with U. S. Department of Agriculture personnel at the Northern Grain Research Laboratory, two sets of single cross hybrids made from rootworm resistant inbreds were tested. They included some of the best rootworm resistant inbreds available (among them SD 10 released by the South Dakota Agricultural Experiment Station in 1965). Yield and performance information was obtained on these hybrids. This is an effort to obtain high yielding hybrids having rootworm resistance.

- - - - - - - - - -

PLANT PATHOLOGY SECTION

* * * * * * * * * * * * * *

PLANT DISEASE CONTROL - CORN DISEASES

-- C. M. Nagel

Present Status of the New Corn Virus Disease in the United States and South Dakota:

In the 1964 annual report for the Southeast South Dakota Experiment Farm, a somewhat detailed account was given of the new virus disease (Maize Dwarf Mosaic) which broke out in the eastern half of the Corn Belt in 1963. The appearance of Maize Dwarf Mosaic was largely confined at that time to the states of Ohio, Indiana, and Illinois. It created much concern for farmers and processors of corn and its products. The disease spread most rapidly in Ohio in 1964.

To summarize for the 1965 season, it now appears that the intensity, as well as the spread, was somewhat less striking when compared to 1964. What will happen in 1966 is not possible to predict due to the fact that not enough is known about the virus which causes Maize Dwarf Mosaic. Although much has been learned through the rapid expansion of research on this disease in a number of experiment stations and particularly in those states where the disease was first found, it is too soon to predict whether or not it will spread throughout the major corn producing states of the nation. Since 1964, the disease has been definitely diagnosed as being present in additional states in the Corn Belt. The disease for the first time was diagnosed as being present in southwestern Iowa in August of 1965, only an estimated 75 miles from the border of South Dakota. It has not been found in South Dakota to date.

In 1965, six corn tests were planted at six different locations through southeastern South Dakota in an attempt to detect if the disease was present. The special corn and sorghum used in these tests were known to be susceptible, so if Maize Dwarf Mosaic were present in the locations where these plots were, symptoms of the disease would be expected to develop. No positive evidence was obtained. However, Johnsongrass, which also is very susceptible to this virus disease, was found growing wild in southeastern South Dakota. Johnsongrass is a perennial grass which grows 6 to 8 feet tall having a below-ground root system which survives the winter. In the states where this disease has been found, Johnsongrass is usually infected and serves as the source of spread of Maize Dwarf Mosaic to corn during the growing season and also serves as an overwintering source of the virus in the root system which remains alive over winter and then makes it possible for the virus to spread to nearby corn.

Thus far, the virus disease has not been isolated from corn or Johnsongrass found growing in the wild in southeastern South Dakota; but since the plant grows and can live over winter here, the potential of its becoming infected and being an overwintering source of the virus and, hence, spreading to corn is a reasonable possibility. Further research will be required before definite statements can be made.

As a result of greenhouse experiments and field testing of disease-resistant inbred corn lines developed by the Plant Pathology Department and sent for testing to the Ohio and Indiana Experiment Stations, indications are that certain of these lines have considerable resistance to Maize Dwarf Mosaic. Additional testing will be necessary.

In other states a few lines similarly have been found as a result of inoculation experiments that possess a degree of resistance. These results indicate that it may be possible eventually to develop hybrids that will be tolerant or resistant to Maize Dwarf Mosaic from presently adapted corns without the necessity of going to "wild" corn to obtain sources of virus resistance. The latter would require many more years of research and testing.

On the basis of screening experiments of currently used commercial hybrids now grown in the Corn Belt states, indications are that most commercial hybrids are susceptible to the prevalent strain of the Maize Dwarf Mosaic virus.

Development of Disease Resistant Strains of Corn:

In 1965, approximately 307 three-way experimental corn hybrids were grown at the SESD Experiment Farm. Certain of these 3-way experimental hybrids involve inbred lines which possess varying degrees of resistance to root and stalk rot and certain other diseases. These inbred lines were developed by the Plant Pathology Department and were incorporated in hybrid combinations to observe their general performance in 3-way hybrids to a number of important corn diseases. All plots were replicated three times in each particular experiment. The plots were planted on May 13 and harvested on October 15. The yields appear to be good, but all data have not been completely processed to date.

Prior to the establishment of the Southeast South Dakota Experiment Farm, research by the Plant Pathology Department was directed towards the development of disease resistant strains of corn adapted to the northeastern quarter of South Dakota. However, since this material was available, it was thought desirable to evaluate these hybrids at the Experiment Farm because certain of these lines when in hybrid combination might possibly be adapted to the southeast hybrid corn growing area. It can be noted from the general performance and yields produced by these 3-way experimental hybrids grown in 1964 and reported on page 32 of the 1964 annual report, that many of these experimental disease resistant hybrids performed very well in comparison to a number of the best adapted commercial hybrids included in the experiments as checks for comparison. Since a number of the commercial checks were well down on the list, they do not appear in the table. Thus, when grown in the same experiments at the Experiment Farm with the best established commercial hybrids, certain of these earlier maturing, disease resistant hybrids which were developed for use in the northern half of South Dakota compared very favorably in yield performance. Even though much earlier, their performance was similar to or had a tendency to outyield the commercial hybrids in 1964. It would appear that the good performance of the much earlier group of hybrids may have been due to greater root and stalk rot resistance which certain of the early hybrids possess. Likewise, the greater root rot resistance might well have been expressed in the yields due to additional drought resistance.

. . . .

PERFORMANCE OF GROWING-FINISHING SWINE UNDER DIFFERENT ENVIRONMENTAL CONDITIONS

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

The performance of growing-finishing pigs maintained in pens with different floor construction has been studied in two experiments (winter and summer). The four types of floor construction are: completely slotted, 50% slotted, 25% slotted and a sloped concrete floor with a narrow gutter across the lower end of the pen. Pits under the slotted floors accumulate the manure.

In addition to floor type, a comparison has been made of number of pigs per pen and controlled and uncontrolled house temperatures. Pen size was 5 x 15 feet when 8 or 9 pigs were used per pen and 10 x 15 feet when the pig numbers were doubled, thus allowing the same number of square feet per pig. Feeder and water space per pig was also equalized between lots.

During the winter trial two lots of pigs were also confined in an uninsulated house and bedded with straw. Feeders and waterers were located inside of these houses. Identical rations were fed to all lots of pigs in both experiments. The composition of the rations fed are shown in Table 33.

Table 33. Swine Rations Used at SESD Experiment Farm [a]

	lb.	lb.	lb.
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[b]	2.5	2.5	2.5
Calculated analysis:			
crude protein, %	16	14	12
calcium, %	.72	.61	.58
phosphorus, %	.59	.48	.51

[a] The 16% crude protein ration is fed from weaning to 75 lb., the 14% ration from 75 lb. to 125 lb. and the 12% ration is fed to market weight.

[b] Each pound of premix provided 2 gm. oxytetracycline, 600,000 U.S.P. units of vitamin A, 60,000 I.C. units of vitamin D_3, 400 mg. of riboflavin, 1000 mg. of pantothenic acid, 3000 mg. of niacin, 20,000 mg. of choline and 2 mg. of vitamin B12.

Results and Discussion:

Results of the two trials are shown in Tables 34 and 35. It is obvious that the type of floor did not have any effect on pig gains during either the winter or summer trial. Likewise, the number of pigs per pen did not have any effect on rate of gain. One would hardly expect a difference to exist between groups of this size (8 and 16 pigs) when feeder and water space are equalized.

Feed efficiency, although it did vary between lots more than the rate of gain, did not show any significant trends due to floor type or pen size. Slightly more feed was required per unit of gain during the summer trial than during the winter although rate of gain was quite similar in both trials.

Somewhat difficult to explain is the performance of the pigs in the uninsulated house during the winter trial. These pigs actually gained slightly faster and required less feed than those in the controlled temperature house. Although the temperature in the uninsulated house did vary more than in the insulated house, and temperatures below freezing were common in the uninsulated house on certain days, these temperatures were not of long duration. It should also be remembered that the pigs were confined in the uninsulated house and, based on results of research at the Experiment Station at Brookings, one would expect better performance than if their feeder and waterer were outside.

Temperature and labor data were also obtained. These results will be presented when sufficient information has been acquired. It might be pointed out here, however, that the day-to-day labor requirements were considerably less with pigs on the slotted floor.

Table 34. Results of Winter Trial (1964-65) and Summer Trial (1965).

Floor Type	Completely Slotted	50% slotted	25% slotted	Narrow gutter	Uninsulated house
Winter Trial					
No. of pigs	32[a]	32[a]	32[a]	32[a]	16[b]
Av. initial wt., lb.	37.7	38.5	37.9	38.5	38.2
Av. final wt., lb.	178.7	181.3	179.2	181.4	186.2
Days on experiment	91	91	91	91	91
Av. daily gain, lb.	1.55	1.54	1.55	1.57	1.63
Av. daily feed, lb.	4.88	4.85	4.80	4.85	4.70
Feed per lb. gain, lb.	3.15	3.20	3.09	3.08	2.88
Summer Trial					
No. of pigs	36[c]	35[c]	36[c]	34[c]	
Days on experiment	95	95	95	95	
Av. daily gain, lb.	1.53	1.58	1.59	1.54	
Av. daily feed, lb.	5.20	5.36	5.48	5.53	
Feed per lb. gain, lb.	3.40	3.39	3.45	3.59	

[a] Two lots of 8 pigs each and one lot of 16 pigs
[b] Two lots of 8 pigs each
[c] Two lots of 8 or 9 pigs each and one lot of 17 or 18 pigs

Table 35. Results of Different Numbers of Pigs Per Pen

	Winter Trial		Summer Trial	
	Single Pen	Double Pen	Single Pen	Double Pen
Pigs per pen	8	16	9	17 or 18
Days on experiment	91	91	95	95
Av. daily gain, lb.	1.52	1.58	1.59	1.61
Av. daily feed, lb.	4.74	4.94	5.52	5.72
Feed per lb. gain, lb.	3.11	3.13	3.47	3.55

COMPARISON OF CORN SILAGE AND HIGH-MOISTURE EAR CORN RATIONS WHEN FED AT DIFFERENT LEVELS TO BEEF CATTLE DURING GROWING AND FINISHING

-- F. Whetzal and J. Fredrikson

This experiment was the third in a series of trials conducted at the SESD Experiment Farm in which rations with different levels of high-moisture ear corn and corn silage were fed to beef cattle in the feed lot.

The objectives of the trial were to measure gain, feed efficiency, production per acre and the effect on carcass characteristics when the two feeds were fed singly or in combination during the growing and finishing phase of the trial. Also, the value of using higher levels of stilbestrol during the finishing phase was evaluated.

Procedure:

One hundred steer calves with an average filled weight of 508 pounds were allotted to the following treatments:

Lot 1 - Phase 1 - High-moisture ear corn full fed for 198 days
Phase 2 - Corn silage full fed remainder of time on trial (163 days)

Lot 2 - Phase 1 - Corn silage full fed for 198 days
Phase 2 - High-moisture ear corn full fed remainder of time on trial (130 days)

Lot 3 - Corn silage fed at 20 pounds per head daily with high-moisture ear corn full fed for entire trial (291 days)

Lot 4 - High-moisture ear corn fed at 20 pounds per head daily with corn silage full fed entire trial (291 days)

Two pounds of a 40 percent protein supplement were fed per head daily. The supplement contained 50 percent dehydrated alfalfa meal, 45.5 percent soybean meal, 4.2 percent urea with stilbestrol and vitamin A added to supply 10 mg. and 10,000 I.U. per head daily, respectively.

To increase the level of stilbestrol during the finishing phase, one-half of the cattle in each lot were implanted with 24 mg. of stilbestrol after 198 days on trial.

The high-moisture ear corn fed the first 112 days was purchased from a nearby farm and contained an average of 48 percent moisture. It was corn that had been replanted after being hailed out and was immature when harvested. The ear corn fed the remainder of the trial contained an average of 34.5 percent moisture and yielded approximately 43 bushels (15 percent moisture basis) per acre. The corn silage yielded an estimated 9 tons of 68.8 percent moisture silage per acre. The grain content of the corn silage was somewhat low because of corn rootworm damage which resulted in many unfilled ears.

The cattle were fed twice daily during the trial. When the cattle were sold, final filled and shrunk weights were taken and the cattle trucked about 40 miles to market. It was intended that the cattle would be sold when the animals in the lot averaged about 1150 pounds. The cattle were sold on a grade and yield basis and carcass data were obtained at slaughter.

Table 36. Phase 1 (Dec. 9, 1964 to June 25, 1965, 198 days)

Treatment	H.M. ear corn	Corn silage	20# C.S. H.M. E.C. full-fed	20# H.M. E.C. C.S. full-fed
	2 lb. protein suppl./head daily			
Lot number	1	2	3	4
Animals/lot	25	25	25	25
Initial filled wt., lb.	508	508	508	507
Final filled wt., lb.	924	819	939	929
Av. daily gain, lb.	2.10	1.57	2.18	2.13
Av. daily ration, lb.				
Corn silage	---	44.6	20.2	9.5
H.M. ear corn	19.8	---	12.3	18.5
Protein suppl.	1.93	1.95	1.95	1.96
Feed/cwt. gain, lb.				
Corn silage		2845	926	444
H.M. ear corn	945	---	566	867
Protein suppl.	92	124	90	92
Gain/acre[a]	459	633	550	445
Feed cost/cwt. gain, $[b]				
Corn silage	---	10.67	3.47	1.66
H.M. ear corn	10.63	---	6.37	9.75
Protein suppl.	3.59	4.84	3.51	3.59
Total	14.22	15.51	13.35	15.00
Initial cost of cattle/head, $[c]	124.46	124.46	124.46	124.22
Feed cost/head, $	59.16	48.24	57.54	63.30
Initial and feed cost/head, $	183.62	172.70	182.00	187.52
Initial and feed cost/cwt., $	19.87	21.09	19.38	20.19

[a] Based on yields: corn silage, 9 tons/acre and high-moisture ear corn, 43 bu. (15% moisture) per acre.

[b] Feed cost calculated using the following prices: corn silage, $7.50/ton; high-moisture ear corn, $22.50/ton for 40.8% moisture ear corn (fed for 112 days in phase 1) and $24.50/ton for 34.5% moisture ear corn (phase 2).

[c] Cost of cattle: $24.50/cwt. filled weight.

Results:

Phase 1. The results for the first 198 days on trial are shown in Table 36. The three lots of cattle fed high-moisture ear corn at the different levels gained at about the same rate during the period while those fed corn silage gained at a slower rate. The daily gains made by the cattle fed corn silage (lot 2) were considerably lower than in the two previous experiments and could probably be attributed to the poorer quality silage.

Beef production per acre favored the higher silage ration while the cost of gain was greatest with the highest silage ration and lowest when silage was restricted to 20 pounds per head daily (lot 3).

Table 37. Phase 2 (June 25, 1965 until cattle marketed)

Treatment	Corn silage Full-fed	H.M. ear corn full-fed	20# C.S. H.M. E.C. full-fed	20# H.M. E.C. C.S. full-fed
	2 lb. protein suppl./head daily			
Lot number	1	2	3	4
No. steers[a]	25	25	24	24
Initial filled wt., lb.	924	819	937	933
Final filled wt., lb.	1172	1159	1134	1152
Days fed	163	130	93	93
Av. daily gain, lb.	1.52	2.62	2.11	2.36
Av. daily ration, lb.				
Corn silage[b]	61.0	.9	20.1	17.6
H.M. ear corn	---	26.7	18.0	20.0
Protein suppl.	1.98	2.0	2.0	2.0
Feed/cwt. gain, lb.				
Corn silage	4010	33	952	746
H.M. ear corn	---	1020	852	848
Protein suppl.	130	76	95	85
Gain per acre, lb.[c]	437	370	391	370
Feed cost/cwt. gain, $[c]				
Corn silage	15.04	.12	3.57	2.80
H.M. ear corn	---	12.50	10.44	10.39
Protein suppl.	5.07	2.96	3.71	3.32
Total	20.11	15.58	17.72	16.51
Initial cost of cattle/head, $	183.62	172.70	182.00	188.30
Feed cost/head, $	49.87	52.97	34.91	36.16
Initial and feed cost/head, $	233.49	225.67	216.91	224.46
Initial and feed cost/cwt., $	19.92	19.47	19.13	19.49

[a] One steer died in each of lots 3 and 4.

[b] Corn silage was fed in decreasing amounts while change was being made to high-moisture ear corn ration.

[c] Gains and feed costs based on yields and prices shown in footnote, Table 36.

Phase 2. The results for the finishing phase are shown in Table 37. Daily gains for the cattle switched from a corn silage ration (lot 2) to high-moisture ear corn during the finishing phase increased from 1.57 pounds to 2.62 pounds. Changing from a high-moisture ear corn ration (lot 1) to corn silage during the finishing phase decreased daily gains from 2.10 pounds to 1.52 pounds. The cattle fed a constant amount of silage or high-moisture ear corn gained at about the same rate during the finishing phase with lot 3 gaining somewhat less and lot 4 somewhat faster than during phase 1.

Feed costs per unit of gain were the lowest ($15.58) for the cattle fed the high moisture ear corn ration and highest when corn silage was fed ($20.11).

A summary of the two phases and the carcass data are shown in Table 38.

Over-all, the daily gains were highest for the cattle fed 20 pounds of high-moisture ear corn with a full feed of silage followed by those fed 20 pounds of corn silage with ear corn full-fed. The two lots were sold after 291 days on trial. The low rate of gain made by the cattle when changed from a high-moisture ear corn ration to corn silage (lot 1) resulted in the lowest daily gains and a 70 day longer feeding period than for the two lots of cattle marketed first. The cattle switched from corn silage to a high-moisture ear corn ration required a 38 day longer feeding period than those fed the combination corn silage-ear corn rations and were fed 32 days less than those finished on corn silage.

Costs of gain were greatest for the cattle finished on corn silage (lot 1) and lowest when corn silage was limited to 20 pounds with high-moisture ear corn full-fed (lot 3).

Carcass grade and dressing percent were similar for the three lots of cattle fed different levels of high-moisture ear corn during the finishing phase. The cattle finished on corn silage dressed 1.3 percent less and graded about 1/3 of a grade higher than the other three lots. The outside fat cover was similar and about 1/10 inch less for the cattle finished on corn silage or high-moisture ear corn when compared to those finished with a combination of corn silage and high-moisture ear corn.

Returns per head over initial and feed costs were greatest for the cattle fed 20 pounds of corn silage with high-moisture ear corn full-fed (lot 3). The lowest returns per head were shown for the cattle finished on the corn silage ration. This was due to the low gains and high feed requirement during the finishing phase and also the lower dressing percent.

The response of the cattle to the higher stilbestrol levels is shown in Table 39. The cattle implanted with 24 mg. of stilbestrol in addition to the 10 mg. fed gained about 7 percent faster than those not implanted (2.16 pounds vs. 2.02 pounds). The higher levels of stilbestrol had no effect on carcass grade.

Table 38. Summary of Phases 1 and 2 and Carcass Data

Treatments	H.M. ear corn F.F. 198 days C. sil. F.F. 163 days	C. sil. F.F. 198 days H.M. ear corn F.F. 130 days	20# C. sil. with H.M. E.C. F.F. entire trial	20# H.M. E.C. with C. sil. F.F. entire trial
	2 lb. protein suppl./head daily entire trial			
Lot number	1	2	3	4
No. steers	25	25	24	24
Initial shrunk wt., lb.	482	479	480	480
Final shrunk wt., lb.	1139	1138	1120	1133
Days fed	361	329	291	291
Av. daily gain, lb.	1.82	2.00	2.20	2.24
Av. daily ration, lb.				
Corn silage	27.5	27.2	20.1	12.1
H.M. ear corn	10.9	10.5	14.1	19.0
Protein suppl.	1.95	1.96	1.97	1.97
Feed/cwt. gain, lb.				
Corn silage	1514	1356	915	538
H.M. ear corn	598	526	642	846
Protein suppl.	107	98	89	88
Feed cost/cwt. gain, $	16.88	15.08	14.44	15.39
Gain per acre, lb.	422	477	447	407
Dressing percent	60.3	61.6	61.6	61.6
Carcass grade[a]	20.8	19.8	19.5	19.6
Marbling score[b]	6.9	6.0	5.9	5.9
Fat thickness, in.	.64	.62	.72	.76
Rib eye area, sq. in.	12.1	12.3	11.5	11.7
Av. selling price/cwt., $[c]	24.46	24.90	24.91	24.93
Av. price rec'd. per head, $	278.65	283.40	278.97	282.41
Initial value per head, $	124.46	124.46	124.46	124.46
Feed cost per head, $	109.03	101.21	92.45	99.46
Total cost	233.49	225.67	216.91	223.92
Returns per head over initial and feed cost, $	45.16	57.73	62.06	58.49

[a] Carcass grade: C- = 19; C = 20 and C+ = 21.
[b] Marbling score: 5 = small; 6 = modest and 7 = moderate amount.
[c] Calculated from average carcass prices received:
Prime, $41.00; Choice, $40.50; Good, $39.00 per cwt.

Table 39. Response of Cattle to Higher Stilbestrol Levels During Finishing Phase

Treatments[a]	Implanted	Nonimplanted
No. of cattle	50	48
Initial filled wt., lb.	906	899
Final filled wt., lb.	1166	1143
Av. gain, lb.	260	244
Av. daily gain, lb.	2.16	2.02
Av. carcass grade	19.9	20.0

[a] The 24 mg. stilbestrol implants were administered in addition to the 10 mg. per head daily of stilbestrol that was fed to all cattle.

CONTROL OF CATTLE GRUBS

-- Paul H. Kohler

In 1964, late season treatments for the control of cattle grubs were made on calves allotted for nutrition studies at the SESD Experiment Farm. Half of the calves of each lot were treated. Table 40 summarizes this work.

Table 40. Grub Counts for Cattle Grub Control Experiment

	No. of Calves	Dosage	Grubs/Calf (Avg.)		No. Calves Infested		Grub Reduction (%)	
1965 Grub Count Dates:			2/16	5/13	2/16	5/13	2/16	5/13
Treatment:								
Neguvon (8%) Pour-on (12-18-65)	112	0.5 oz/100 lbs body weight	0	.01	0	2	100	99.9
Untreated	118		2.2	4.7	26	55	---	---

CONTRIBUTORS TO S.E.S.D. EXPERIMENT STATION ANNUAL REPORT

Department of Agricultural Engineering

Young, H. G.	Assistant Professor	Farm Structures

Department of Agronomy

Albrechtsen, R. S.	Assistant Professor	Crop Breeding (Oats, Flax)
Beatty, Durwood W.	Assistant Professor	Crop Breeding (Corn)
Bonnemann, J. J.	Assistant Agronomist	Crop Performance Testing
Bullis, S. S.	Assistant	Crop Breeding (Grasses)
Erion, G. W.	Assistant Professor	Seed Stocks Foundation
Hovland, D.	Assistant Professor	Soil Fertility & Chemistry
Lunden, A. O.	Associate Professor	Crop Breeding (Sorghum, Soybeans)
Ross, J. G.	Professor	Crop Breeding (Grasses)
Shank, D. B.	Professor	Crop Breeding (Corn)
Shubeck, F. E.	Associate Professor	Soil Fertility & Management
Ward, Raymond C.	Instructor	Soil Fertility
Wright, W. G.	Instructor	Weed Control

Department of Animal Science

Kohler, Paul H.	Professor	Cattle Grub Control
Seerley, R. W.	Associate Professor	Swine, Nutrition & Management
Wahlstrom, R. C.	Professor	Department Head
Whetzal, F. W.	Instructor	Cattle Nutrition & Management

Department of Entomology-Zoology

Berndt, Wayne L.	Extension Entomologist	Pesticide Specialist
Kantack, B. H.	Extension Entomologist	Plant Pest Control

Department of Plant Pathology

Nagel, C. M.	Professor	Department Head

Northern Grain Insect Research Laboratory

Fitzgerald, Paul J.	Associate Professor	Plant Geneticist
Ortman, Eldon E.	Assistant Professor	Entomologist

Substation

Fredrikson, J. F.	Station Superintendent	Animal Science
Nelson, L. A.	Ass't Farm Superintendent	Agronomy

Cooperative Extension Service

Venard, Raymond L.	County Extension Agent	Clay County

NOTES

THE SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM CORPORATION

BOARD OF DIRECTORS

Members	County	Address
Ercil Bowles, President	Lincoln	Centerville
William DeJong, Vice President	Yankton	Volin
Bernard Uthe, Secretary	Lincoln	Canton
Lawrence Swanson, Treasurer	Lincoln	Canton
Ervin Cleland	Clay	Vermillion
Eric Thormodsgaard	Lincoln	Hudson
Carl Wright	Clay	Volin
Leon Jorgenson	Hutchinson	Freeman
Earl Rames	Hutchinson	Menno
Leonard Daily	Union	Jefferson
Wesley Larson	Union	Beresford
Lloyd Overgaard	Turner	Parker
Lawrence Holzbauer	Charles Mix	Wagner

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	Joseph Sperl	Lake Andes
Clay	Raymond Venard	Vermillion
Douglas	Norman Telkamp	Armour
Hutchinson	Denver Parks	Olivet
Lincoln	Bernard Uthe	Canton
Turner	Darrel Pahl	Parker
Union	Harmon Boyd	Elk Point
Yankton	Myron Barber	Yankton

District III Supervisor

Cecil D. Sanderson, Cooperative Extension Service
Brookings, S. Dak.