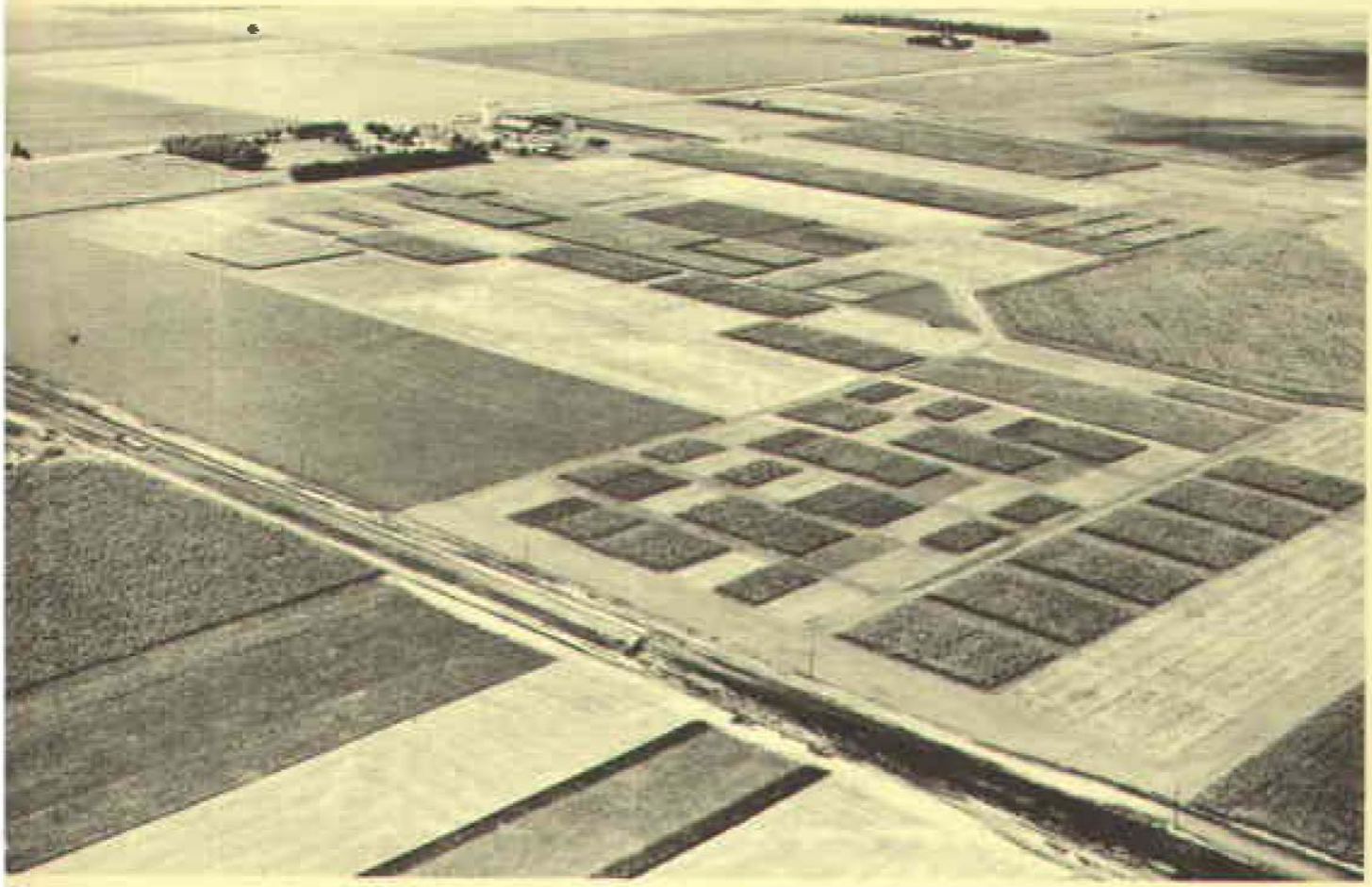
Fourth Annual Progress Report

December 1964

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

FOURTH ANNUAL PROGRESS REPORT
SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM

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This fourth 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

Orville G. Bentley, Director — A. L. Musson, Ass't Director

INTRODUCTION

-- J. F. Fredrikson

It is customary to refer to the acreage of land on this research farm as having two parts: the south quarter and the north quarter. The south quarter contains experimental plot work and the farmstead area, while the north quarter is farmed on a full scale field basis designed to produce feed and forage for the livestock feeding trials. Surplus grain from the agronomy plots, as well as the filler areas on the south quarter, is also utilized in the livestock feeding program.

This annual report points up the fact that areas of research have increased greatly since the station was started in the spring of 1961. This increase has pretty well used up available land area on the south quarter and it can be expected that as the need for new sites for agronomic research grows, these new sites will be located on the north quarter. The entire acreage is available for the primary purpose of research.

The crops grown on the north quarter this past year were: 50 acres of alfalfa, 14 acres of oats, 3 acres of grain sorghum and 88 acres of corn. The 14 acres of oats and 3 acres of grain sorghum were used by Foundation Seed Stock for the increase of new varieties of seed, and the yield from these acreages will not be reported as feed produced.

Production from the 1964 crop year yielded the following feed and forage:
(Determined by sampling and field measurements)

Corn silage	235 tons	Oats	800 bushels
Ground ear corn silage	4,800 bushels	Alfalfa hay	172 tons
		Brome hay	30 tons

All corn ground on the north quarter was fertilized with 60 lbs. of nitrogen and 40 lbs. of P_2O_5 applied with bulk applicators and plowed down in the fall. No fertility was added to the alfalfa. Manure from the livestock barns and pens was spread on the corn ground as time and weather conditions permitted.

Table 1 is a summary of weather conditions recorded as the official Weather Observer for this area. This year's precipitation and temperature averages are compared with the averages of the current 12 year period. It is customary to use generalities when referring to weather conditions. Averages are only a small degree more specific than generalities and do not point out the extremes of temperature and precipitation that often affect crop production. A typical example of this fact is the period of hot, dry weather in July which impaired pollination of many varieties of corn and sorghum and thereby reduced the yield. Because of such stress periods, usually associated with rainfall distribution, this growing season could be termed as only moderately favorable for crop production.

A large scale field demonstration on the use of chemicals for the control of corn root worm was applied in cooperation with the Extension Service. An area of approximately 40 acres on the north quarter was used for this demonstration. Results of this work are reported elsewhere in this publication.

In addition to the cattle feeding trial discussed in this report, 116 calves were wintered here as a means of utilizing the hay which was produced during the 1963 season. This was the wintering phase of a pasture feeding study carried out at the Brookings station. Incorporated into this wintering period was a study of rations on free-choice mineral consumption and the adequacy of mineral supplements in supplying additives to the ration. An equal number of calves will be carried on a similar study during the present wintering phase. These calves are wintered in open, outdoor dirt lots without shelter.

The annual field day was held at the farm on September 18, 1964, with about 300 people in attendance.

Table 1. Precipitation and Temperature 1964

Month	Rainfall in Inches	Departure from 12 yr Average 1953-1964		Average Temp. (F)	Departure from 12 yr Average 1953-1964	
		12 yr Average	De-parture		12 yr Average	De-parture
Jan.	.05	.41	- .36	24.3	18.1	+ 6.2
Feb.	.10	1.42	-1.32	27.1	26.7	+ .4
March	2.11	1.56	+ .55	29.3	33.1	-3.8
April	3.77	2,82	+ .95	50.5	49.5	+1.0
May	2.10	3.45	-1.35	63.7	61.9	+1.8
June	6.29	4.10	+2.19	70.1	71.8	-1.7
July	3.02	2.63	+ .39	77.2	76.7	+ .5
Aug.	2.32	2.79	- .46	69.0	69.8	- .8
Sept.	3.07	2.58	+ .49	62.3	64.5	-2.2
Oct.	.20	1.11	- .91	51.2	56.1	-4.9
Nov.	.03	1.15	-1.12	35.4	37.3	-1.9
Dec.	.13	.64	- .51	15.3	23.2	-7.9
Total	23.19	24.66	-1.47	47.9	49.1	-1.2

Frost free days: May 31 to September 27, 119 days.

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

-- F. Shubeck and L. Nelson

Experiment No. 1 - Minimum Tillage for Corn

Objectives of Experiment

1. How much tillage is actually necessary for corn production?
2. Can yield from minimum tillage methods be maintained or improved over that 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*	Bu/acre
1. Hard ground listing	80-28-0	81
2. Wheel track planting	80-28-0	78
3. Conventional plant, spring plow	0-0-0	78
4. Stubble mulch, Noble blade	80-28-0	76
5. Spring list after fall subsoiling	80-28-0	76
6. Plow-plant	80-28-0	82
7. Loose ground listing, fall plow	80-28-0	82
8. Conventional plant, fall plow	80-28-0	78
9. Rototiller, Conventional plant	80-28-0	73
10. Conventional plant, spring plow	80-28-0	85

* Fertility includes 60# of 18-46-0 starter + 70# nitrogen side dressed.

Discussion and interpretations of results

Corn yields were quite similar for most planting methods. Yields from minimum tillage plots compared favorably with those from conventional methods. Use of the rototiller appeared to lower corn yields but this was not statistically significant at the 5% confidence level.

In plots that were listed without plowing (treatments 1 and 5), fall subsoil tillage did not increase yields over treatment 1.

Yields with spring plowing (No. 10) appeared to be a little better than with fall plowing (No. 8). This is similar to results of 1963 but a reversal from 1962. Fall plowed plots were plowed in mid October.

Experiment No. 2 - Starter Fertilizer for Corn

Objectives of experiment

1. Evaluate use of starter fertilizer and sidedressed nitrogen on corn.
2. Is the practice of including a small amount of potassium in the starter "for insurance" against possible potassium deficiencies in borderline response areas worthwhile?

Table 3. Effect of Starter Fertilizer with Potash and Sidedressed Nitrogen on Yield of Corn.

Fertilizer Treatments Starter N	P_2O_5	K_2O	Lbs/A Sidedress	Bu of #2 Corn /A	% Water in Ears at Harvest	Tons of Stover at 70% Water
0	0	0	None	48	34	4.6
11	48	0	None	59	31	4.6
11	48	20	None	67	33	5.2
11	48	0 + zinc	None	51	31	4.6
11	48	0	70# N/A	70	31	6.2
11	48	20	70# N/A	62	32	6.3
0	0	0	70# N/A	55	34	5.6

Discussion and interpretation of results.

In 1963 there appeared to be a decrease in corn yield when a starter fertilizer high in phosphorus was used. A possible explanation advanced was the phosphate induced zinc deficiency theory. Work in Nebraska strengthened this theory.

In 1964, however, the starter fertilizer high in phosphorus appeared to increase yields both with and without supplemental nitrogen. Zinc did not increase corn yields. The effect of potash is still questionable because when it was applied with starter alone, it appeared to be beneficial but detrimental when applied with starter + sidedress nitrogen. Soil tests indicate a medium supply of phosphorus and a high amount of potash.

Maturity, measured by % of water in ears at harvest, was favorably influenced by starter fertilizer. Percent moisture in ears was about 3% less when starter was used.

Stover yields were reported at 70% moisture. The starter sidedress combination gave the highest yields of stover. Nitrogen sidedress alone without the starter also gave a substantial yield increase of stover.

Experiment No. 3 - Corn Plant Population.

Objectives

1. What corn plant population is best for this soil and climate?
2. In an area subject to periodic droughts, does ear size provide an accurate basis for determining the optimum number of plants per acre?

Table 4. Effect of Corn Plant Populations on Yield, Ear Weight and % of Barren Stalks.

Plants per Acre	Bu of #2 Corn/Acre	Average Ear Weight in Lbs.	% of Barren Stalks
10,000	50	.45	5.2
12,000	45	.37	7.0
14,000	39	.31	12.9
16,000	37	.28	22.1
18,000	29	.24	36.2

Discussion and interpretation of results

All plots were fertilized with 60 lbs. of N and 40 lbs. of P_2O_5 broadcast and disked in before planting and 40 lbs. of nitrogen/acre sidedressed when the corn was about 2 feet high. One hundred lbs. of nitrogen/acre were considered adequate for all populations after reviewing results from 2 previous population experiments at this location.

The yield of ear corn decreased as plant populations were increased. Yields with all populations were low in this experiment. A single cross hybrid was used that had performed very well in variety yield trials in 1963. Part of the reason for low yields was due to mismatching of pollen drop and silk emergence due to the climatic conditions. This emphasizes one of the risks in using a single cross hybrid where plants are very uniform in all characteristics including time of pollen drop. Some damage may be attributed to western root worm beetles feeding on corn silks at time of emergence. A spray program for control of adult beetles is planned for next year.

Average ear weight at harvest decreased sharply with increased populations. This year the populations with the largest ears also yielded the most corn which is contrary to results of previous experiments at this station.

The percentage of barren stalks increased tremendously with increases in plant populations.

Experiment No. 4 - Fertilizer Rates and Ratios

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 for 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 5. Effect of Fertilizer Rates and Ratios on Yield of Corn and Residual on Oats in a Corn-Oats Rotation

Fertility Treatment Lbs/A of			Bu. of Corn/A Fertilizer on Corn in 1964 (First Year Effect)	Bu. of Oats/A Fertilizer Applied on Corn in 1963 (Residual Effect)
N	P_2O_5	K_2O		
0	0	0	63	39
40	0	0	72	39
40	60	0	65	43
80	0	0	68	37
80	60	0	74	44
120	60	0	80	48

The heavier rates of nitrogen with 60 lbs of P_2O_5 gave the highest corn yield. Residual effect was more pronounced with nitrogen and phosphorus combinations. Residual effect of nitrogen alone was not very great under the conditions of this experiment.

Table 6 Effect of Fertilizer Rates and Ratios on Yield of Oats and Residual on Corn in an Oats-Corn Rotation

Fertility Treatment Lbs/A of			Bu. of Oats/A * Fertilizer on Oats in 1964 (First Year Effect)	Bu. of Corn/A Fertilizer Applied on Oats in 1963 (Residual Effect)
N	P_2O_5	K_2O		
0	0	0	37	61
20	0	0	38	60
40	0	0	43	61
40	20	0	43	61
40	40	0	44	60
60	40	0	50	68

*Average of fertilizer broadcast and fertilizer drilled with the seed.

Excessively hot weather just before normal heading time forced the oats to head out prematurely and injured the yield substantially. As a result, responses to fertilizer were small. There was very little residual effect on corn to fertilizer applied on oats in 1963.

Table 7. Effect of Fertilizer Rates, Ratios and Methods of Application on Yield of Oats

Fertility Treatment Lbs./A of N	P_2O_5	K_2O	Bu./A Fertilizer Broadcast	Bu./A Fertilizer Drilled with Seed
0	0	0	37	37
20	0	0	37	39
40	0	0	43	42
40	20	0	46	41
40	40	0	39	49
60	40	0	46	54
Average			41	44

There was an advantage in favor of drilling fertilizer with the seed at the higher rate of phosphorus application. This may be associated with the drought escape theory. For example, phosphorus is known to speed up rate of maturity. When heat and drought come at a critical period, the speeding up effect of phosphorus fertilizer may be enough to bring the plant partially through the critical period before the heat has caused serious damage. In this way it "escapes" some of the drought.

Experiment No. 5 - Most Profitable Rotation

Objectives of Experiment

1. How much will fertilizer increase net profit?
2. Which rotation will bring in the greatest cash return?

Table 8. Net Returns from Rotation Experiment

	Rotation	Returns above Cash Costs per Acre* Fertilized	Unfertilized
1.	Continuous corn	$58.28	$53.37
2.	Corn - oats	33.02	35.04
3.	Corn - corn - oats alfalfa - Alfalfa hay	34.33	38.56
4.	Oats sweet clover - corn	36.92	38.59
5.	Corn - soybeans - oats	41.50	41.02
6.	Corn - oats - soybeans	43.55	33.14
7.	Continuous sorghum	41.62	37.10

* Does not include cost of land use.

Table 9. Crop Yields from Rotation Experiment

Cropping Sequence	Fertilizer N	Fertilizer P_2O_5	Fertilizer K_2O	# Sidedress Nitrogen	Yields Oats bu/A	Yields 1st Yr Corn bu/A	Yields 2nd Yr Corn bu/A	Yields Soybeans bu/A	Yields Sorghum cwt/A	Yields Hay T/A
1 Cont. Corn	0	0	0		---	65.9	---	---	---	---
1 Cont. Corn	50	20	0		---	77.9	---	---	---	---
2 Corn-Oats	0	0	0		47.0	70.3	---	---	---	---
2 Corn-Oats - - - - - - (Corn	50	20	0							
(Oats	30	15	0		53.7	75.1	---	---	---	---
3 Corn-Corn-Oats + Alfalfa-Alfalfa Hay	0	0	0		42.9	59.3	74.2	---	---	3.2
3 Corn-Corn-Oats + (Corn 75#	18	46	0							
Alfalfa-Alfalfa Hay - - (Corn 75#	18	46	0	40	58.3	70.6	67.7	---	---	2.6
(Oats	15	60	0							
4 Oats + Sw. Clover-Corn	0	0	0		47.0	77.8	---	---	---	---
4 Oats + Sw. Clover-Corn -(Oats	30	15	0							
(Corn 75#	18	46	0		59.2	77.3	---	---	---	---
5 Corn-Beans-Oats	0	0	0		45.6	81.6	---	23.1	---	---
(Corn	50	20	0							
5 Corn-Beans-Oats - - - - (Oats	20	20	0		53.9	90.3	---	24.8	---	---
(Beans 75#	18	46	0							
6 Corn-Oats-Beans	0	0	0		47.3	55.1	---	24.6	---	---
(Corn 75#	18	46	0	40						
6 Corn-Oats-Beans - - - - (Oats	30	15	0		59.1	88.1	---	27.9	---	---
(Beans 75#	18	46	0							
7 Cont. Sorghum	0	0	0		---	---	---	---	57.2	---
7 Cont. Sorghum	50	20	0		---	---	---	---	69.9	---

Table 10. Custom Rates, Seed Costs, Grain and Hay Prices Used in Calculations of Net Returns in Rotation Experiment - 1964

Operation	Custom Rates * Average Rate per/A
Plowing	$4.00
Discing	1.50
Cultivating	1.20
Swathing (Incl. hay)	1.25
Baling - .12/bale @ 50#	4.80
Corn Picking	3.50
Combining (oats)	4.00
(soybeans)	4.00
(sorghum)	4.00
Corn Planter w/fertilizer	1.25
Corn Planter w/o fertilizer	1.00
Grain Drill w/fertilizer	1.25
Grain Drill w/o fertilizer	1.00
Sidedress Nitrogen	.35
Harrowing	.50

Seed Costs	
Corn	$2.20/A
Oats	2.30/A
Soybeans	3.00/A
Sorghum	1.20/A
Alfalfa	3.30/A
Sweet Clover	1.00/A

Grain and Hay Prices **	
#2 Corn	$1.08/bu
Soybeans	2.63/bu
Oats	.60/bu
Sorghum	1.70/cwt
Alfalfa Hay	18.00/ton

* Established using Ag Economics Fact Sheet No. 188 as a guide.

** Grain prices taken at Farmers Coop. Elevator, Brookings, South Dakota, on December 3, 1964. Price of hay established on December 4, 1964, at J. W. Eesland and Son, DeSmet, South Dakota.

Discussion and interpretation of results

In 1964, for the first time all seven rotations could be evaluated because the longer rotation with hay had not finished one complete cycle until this year. Table 9 lists yields obtained with each cropping sequence. Every crop in each sequence was grown every year. In calculating net returns per acre (table 8), an acre was divided into as many parts as there were crops in the sequence. The net returns for each fraction of an acre were calculated and then totaled for the whole acre.

Custom rates, seed costs, grain and hay prices used in these calculations, are given in table 10. These values will vary somewhat with location and time.

Continuous corn headed the list again in 1964 as the most profitable cropping sequence. This has occurred every year since 1961 when the experiment was started. Both continuous corn and continuous sorghum gave an economical return for use of fertilizer.

It is interesting to note that the inclusion of a sweet clover catch crop in an unfertilized corn-oats sequence increased yield of corn about 7 bushels per acre. This is very similar to increases obtained with the sweet clover catch crop treatment in 1963 and 1962.

The unfertilized alfalfa hay rotation gave a little higher net return than the fertilized alfalfa hay rotation.

When oats was included in a cropping sequence, the returns above cash costs were usually less.

Many other comparisons can be made but it may be risky to base plans on short time results which may change with different climatic conditions.

ROW SPACING STUDY IN SORGHUM AND SOYBEANS

-- L. Nelson and F. Shubeck

Objectives

1. Determine how different row spacings affect yields of grain.
2. Study weed control in different row spacings.
3. Determine the effect narrow rows have on efficiency of water utilization.

Experimental Methods

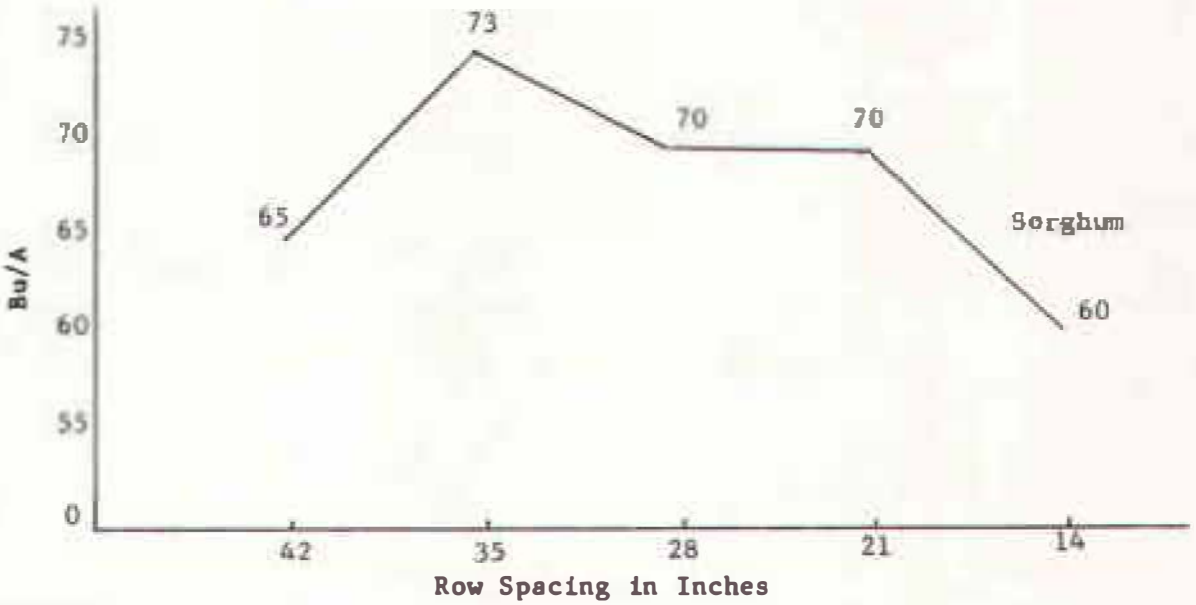
Planting - This experiment was planted with a 12 foot press drill in row widths of 14, 21, 28, 35 and 42 inches. These spacings were obtained by covering various combinations of flutes in the grain drill. Planting rates were changed to give a lower plant population within each row as the rows came closer together. The number of plants per linear foot of row for sorghum were as

follows: 2.6, 2.9, 4.3, 4.4 and 4.7 plants per foot for the 14, 21, 28, 35 and 42 inch row spacings, respectively,

Weed Control - Grain sorghum was given a broadcast treatment of Atrazine at the rate of 3# of 80W per acre. Soybeans received a broadcast treatment of Amiben at the rate of 3# acid equivalent per acre. All plots received one cultivation except the sorghum in 14 inch row which had no cultivation.

Harvesting - All plots were harvested with a 6' pull type Case combine. Both crops were combined after the moisture per cent was at a safe storage level. The narrow rows were difficult to harvest accurately and plans are being made to use a self-propelled combine in the future.

Table 11. Effect of Row Spacing on Yield of Sorghum



Sorghum

Yields appear to be slightly higher at the 35, 28 and 21 inch row spacing when compared with the 42 inch spacing. These apparent increases were not statistically significant, however, at the 5% confidence level. The rather weak showing of the 14 inch row spacing may have been caused by an insufficient stand for this spacing. A heavier stand is planned for next year.

All of the plots received one cultivation except for the 14 inch rows. The cultivating was done with a small tractor with narrow tires designed for plot work. Sorghum in the 14 inch row covered the row so quickly that it could not be cultivated without damaging the plants. Atrazine was quite effective but one cultivation was needed to control the weeds. This was due in part to the low rates of Atrazine used. A low rate was used because sorghum might be damaged at higher rates when used as a pre-emergence.

Preliminary soil moisture testing was started this fall, but the small amount of data was not conclusive. More intensive work will be done on this during the 1965 growing season.

Table 12. Effects of Row Spacing and Plant Population on Soybean Yields

Row Spacing	Plants/ft of Row	Plants/Acre	Yield in Bu./Acre
14 inches	2.6	96,000	27.7
21 inches	4.9	121,000	28.7
28 inches	4.4	82,000	28.4
35 inches	4.1	60,500	26.2
42 inches	6.0	74,000	25.7

Soybeans

There was a yield increase of soybeans at the 21 and 28 inch row spacing at their respective populations compared to the 42 inch row with its population as shown in table 12. This increase was significant at the 5% confidence level.

Reports from other work done on row spacing indicate that narrow rows will shade out weeds. In this experiment in 1964, there were no apparent differences in weed control among the different row spacings. Excellent control was obtained in all plots. The weed control was accomplished by killing two crops of weeds with the disc before planting. The plots also received a broadcast treatment of Amiben at the rate of 3# acid equivalent per acre. One cultivation was given to all plots during the growing season using a small tractor with narrow tires specially designed for plot work. Weed counts will be made in 1965 if there appear to be any differences.

Another result that may be expected from narrow rows is an increased efficiency of water usage because of less evaporation due to an early covering of the row by leaves. In preliminary tests with soil moisture, evidence of this was not conclusive. More intensive testing is planned for 1965 in the area of water utilization.

MAXIMUM FORAGE EXPERIMENT

-- L. Nelson and F. Shubeck

Objectives:

1. Compare several different varieties and hybrids for yields of forage.
2. Compare 20 inch and 40 inch row spacing in forage production.
3. Compare nutritive value of different forage crops.

Discussion and Interpretation of Results

Ten forages were compared in 20 and 40 inch rows. Land was fall plowed with a broadcast application of 60-40-0. There were 5 replications but plots were not randomized. Plant population was doubled in 20 inch rows.

With all crops except the corn, the 20 inch rows yielded more forage than the 40 inch rows. A complete lab analysis was run on each type of forage by George F. Gastler of Station Biochemistry. The constituents are reported in % content of moisture-free material.

Revised plans for this experiment in 1965 will include some changes in the types of forage planted. Also, cuttings will be made throughout the season on Sudan grasses to see what effect this will have on forage production.

Table 13. Maximum Forage Experiment

Type of Forage	Row Spacing	Ton/Acre @ 70% Moisture	Lbs. Dry Matter/A	% Crude Fat	% Crude Fiber	% Crude Protein	% Nitrogen Free Extract	% Ash
Hybrid Sudan	40	11.8	7078.6	1.64	32.11	8.27	49.32	8.66
(Yield king)	20	13.3	7989.0	2.13	30.96	7.27	52.09	7.56
Rancher	40	10.8	6503.6	2.51	24.98	5.28	60.04	7.20
	20	12.9	7721.1	2.45	25.36	6.07	58.04	8.10
Piper Sudan	40	9.3	5575.7	1.68	34.72	7.59	47.52	8.51
	20	10.8	6481.8	1.66	34.91	6.57	49.23	7.64
SD 252 (Sokota)	40	12.0	7204.9	2.38	26.33	7.84	53.76	9.70
	20	13.4	8067.4	2.05	28.56	7.72	50.02	11.66
S-100 (Sexauer)	40	12.2	7290.9	1.66	34.14	5.89	51.27	7.05
	20	14.0	8363.6	1.89	30.91	7.05	51.61	8.55
SX-11 (Dekalb)	40	11.6	6969.7	1.80	29.66	6.47	53.37	8.71
	20	12.9	7718.9	1.81	31.32	7.49	49.56	9.84
Rox Orange	40	12.8	7666.7	2.48	27.69	8.37	53.06	8.41
	20	14.2	8511.6	2.69	28.00	8.33	52.99	8.00
F.S.210 (Frontier)	40	13.3	7938.9	2.32	29.39	8.65	50.50	9.15
	20	14.5	8677.2	2.14	30.49	8.44	49.82	9.13
Hydan 38 (Frontier)	40	12.4	7427.1	2.12	31.87	8.83	48.49	8.70
	20	15.2	9104.2	2.08	28.95	9.20	50.39	9.40
High Sugar Corn	40	9.4	5671.6	2.15	26.55	10.86	52.11	8.34
(Farmers)	20	8.1	4870.0	1.78	29.16	10.83	48.98	9.26

SOIL POTASSIUM OF THE SOUTHEAST FARM

-- Dwight Hovland

Field plots were established in 1962 to compare corn production on soils treated with fertilizer containing potassium and on other soils treated with fertilizer containing no potassium. Two sites were used, one on a poorly-drained soil and the other on a well-drained soil. This should allow some measure of potassium availability in the soils of the area.

Ten replications of three treatments were used at each site. The same plots were planted to corn in 1963 and 1964. Both of the last two years corn pollination was limited by soil moisture stress (hot, dry weather) and adult beetle of western corn root worm grazing corn silk.

A summary of the 1964 yields is presented in table 14. Corn grain yield decreased on both the poorly-drained and the well-drained soils with the high rate of potassium fertilization.

Table 14. Influence of Potassium Fertilizer on 1964 Corn Grain Yield of Some Well-drained Soils and Some Poorly-drained Soils of the Southeast Farm.

Soils	Treatments *		
	a	b	c
		(bu./A) **	
Poorly-drained	65	51	66
Well-drained	46	32	42

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

** Each value is the average of ten replications

HIGH PHOSPHORUS EXPERIMENT

-- Raymond Ward

Farmers sometimes apply large amounts of phosphorus (P) to certain crops. Since this practice may involve corn, it is desirable to know what effects high P fertilizer rates have on corn yields. The high P experiment was initiated to study these effects.

Research work has shown that P fertilizer can "tie up" available zinc (Zn) enough to limit corn yields. Therefore, the various rates of P fertilizer will be used to study Zn availability to corn. Corn is more sensitive to Zn deficiencies than other crops grown in South Dakota; therefore, information obtained for Zn on corn may not pertain to other crops.

Experimental Plan

A brief outline of the experimental plan is presented. The experiment will be continued. The plan calls for continuous corn to be grown on the experimental site, with each plot receiving the same fertilizer treatment annually. The corn planting rate is to be approximately 16,500 seeds per acre (9½ inches between seeds in 40-inch rows). Nitrogen, at the rate of 80 pounds of N per acre, and potassium, at the rate of 33 pounds of K (40 lbs. of K_2O) per acre, are to be broadcast annually over the entire experimental area to eliminate these limiting factors. Other cultural practices will be carried out to control insects, diseases and weeds. Pioneer 3558 seed corn was planted in 1964.

Experimental treatments are as follows:

1. 0 lbs of P (0 lbs of P_2O_5) per acre broadcast and plowed down
2. 10 lbs of P (23 lbs of P_2O_5) " " " " " "
3. 20 lbs of P (46 lbs of P_2O_5) " " " " " "
4. 40 lbs of P (92 lbs of P_2O_5) " " " " " "
5. 80 lbs of P (184 lbs of P_2O_5) " " " " "

Each treatment listed above will receive:

a. No additional fertilizer
b. Thirteen lbs of P/A as a starter fertilizer, applied 2 inches to the side and 2 inches below the seed
c. Ten lbs of Zn/A broadcast and plowed down

Experimental Results

Table 15. Organic Matter, "Available" P, Exchangeable K, and pH of the Surface and Subsurface Soils

Soil	Organic Matter %	"Available" P Lbs/A	Exchangeable K Lbs/A	pH
Surface (plow layer)	2.7	16.0	597	6.0
Subsurface	2.3	10.4	448	6.2

The soil test values show that the soil has a medium supply of available nitrogen (organic matter), a medium level of available soil P and a high exchangeable K level. The soil samples were taken before the fertilizer treatments were applied.

Early in the season there was a plant growth response to the larger rates of broadcast P and to starter fertilizer. However, by tasseling time the differences in growth were very small. Starter fertilizer seemed to cause more tillering on the corn.

Table 16. Influence of Various Rates of Broadcast P, Starter, and Zn Fertilizer on the Yield of Corn

Lbs of P Broadcast/A	No Additional Fertilizer	13 Lbs of P Starter/A	10 Lbs of Zn Broadcast/A	Average Yield
		Bushels of Ear Corn per Acre		
0	55.3	46.5	54.2	52.0
10	57.0	48.9	57.4	54.4
20	51.6	41.7	55.7	49.7
40	52.7	47.1	55.9	51.9
80	47.8	42.2	53.9	48.0
Average	52.9	45.3	55.4	

The striking difference in corn yields shown in table 16 is the lower yields caused by starter fertilizer. On the average, corn yields on P plots with starter fertilizer were 7.6 bu/A less than on P plots with no starter fertilizer and 10.1 bu/A less than on P plots with Zn fertilizer. This difference was statistically significant at 1% confidence.

Corn plots receiving starter fertilizer had more tillers per plant than other fertilizer treatments. This tillering caused a greater stress on soil moisture and may have been the cause of the lower yields.

Analysis of variance showed no statistical (real) difference among broadcast P plots. However, it is interesting to note the trend in yields with increasing P rates. When broadcast P was applied and no starter or Zn applied, 80 pounds of P reduced the corn yield 7.5 bu/A compared to no broadcast P. Starter and 80 pounds of broadcast P reduced the corn yield 4.3 bu/A below starter and no broadcast P. Zn and 80 pounds of broadcast P reduced the corn yield 0.3 bu/A below Zn and no broadcast P.

1964 CORN ROOTWORM CONTROL DEMONSTRATION

-- Benjamin Kantack and Raymond Venard

Various insecticides recommended for control of resistant corn rootworm were applied. Both recommended and non recommended insecticides were applied as band treatments when the corn was planted.

Infestation by the western corn rootworm was light to moderate with considerable variation in the degree of infestation over the entire fields. The field was harvested for silage and corn yield data were not taken. On the basis of lodging counts, Niran, Thimet and Diazinon and the Aldrin-Ethyl Parathion combination appear to be the most effective. It should be emphasized that at least 1.0 lb actual insecticide or 10 lbs of 10% granules be used for control of resistant western corn rootworms as lower dosages do not hold up under heavy infestations.

Lodging counts were as follows:

Variety	Insecticide	Lbs/A of Actual Ingredient	% Lodging
Pioneer 329	Thimet	1.0	0
	Niran	0.5	0
	Aldrin	0.5	23
	Check		15
Pioneer 3558	Heptachlor	0.5	13
	Chlordane	1.0	27
	Di-Syston	1.0	12
	Aldrin plus Ethyl Parathion	1.0 + 1.0	0
	Aldrin plus 4072	1.0 + 1.0	3
	4072	1.0	3
	Diazinon 14G	1.0	1
	Niran	1.0	0

PRE AND POST EMERGENCE WEED CONTROL IN SORGHUM

-- Wayne G. Wright

Objectives

To determine the influence of pre and post emergence applications of atrazine, propazine and Randox (CDAA and CDAA-T) on crop injury, weed control and sorghum yields.

Description

The sorghum variety, SD 441, was planted in 40 inch rows on May 27, 1964. Post emergence application was made June 5, 1964, when the sorghum was 1/4 inch tall and the weeds 1/2 to 3/4 inch tall. Each treatment was subdivided so that one subplot received no cultivation, one subplot received just the second and third cultivations, and one subplot received just the third cultivation.

Results

There was no visible injury to the sorghum plants from any of the herbicide treatments. Atrazine and propazine at 2.5 lb/A and one cultivation gave better weed control than Randox or Randox-T at 4 lb/A and two cultivations. In most cases herbicide treatments showed a slight increase in yield over the untreated check.

Table 17. Pre and Post Emergence Weed Control in Sorghum

Treatment	Rate Lb/A	Applied	Culti-vation	% Weed Control	Yield Lb/A
Atrazine	2.5	Pre	0 *	90	2940
Atrazine	2.5	Pre	1 *	99	3180
Atrazine	2.5	Pre	2 *	99	2870
Atrazine	2.5	Post	0	93	2625
Atrazine	2.5	Post	1	99	2597
Atrazine	2.5	Post	2	99	2728
Atrazine	4.0	Post	0	88	3148
Atrazine	4.0	Post	1	99	2940
Atrazine	4.0	Post	2	99	2679
CDAA	4	Pre	0	0	2570
CDAA	4	Pre	1	83	2646
CDAA	4	Pre	2	93	2891
CDAA-T	4	Pre	0	0	2831
CDAA-T	4	Pre	1	85	2733
CDAA-T	4	Pre	2	92	2712
Propazine	2.5	Pre	0	55	2924
Propazine	2.5	Pre	1	95	2777
Propazine	2.5	Pre	2	99	2880
Propazine	2.5	Post	0	35	2472
Propazine	2.5	Post	1	78	2390
Propazine	2.5	Post	2	89	2532
Propazine	4.0	Pre	0	73	3033
Propazine	4.0	Pre	1	98	2788
Propazine	4.0	Pre	2	99	3145
Check		---	0	0	2308
Check		---	2 **	50	2478
Check		---	3	60	2658

* 0 represents no cultivation; 1, third cultivation only; 2, second and third cultivations; and 3, first, second and third cultivations.
** First and second cultivations

HERBICIDE RESIDUE IN THE SOIL

-- Wayne G. Wright

Description of Experiment

The plots were located at the S.E.S.D. Experiment Farm near Centerville. Treatments were applied with a hand sprayer over a stand of oats approximately 4 inches high on May 25, 1962. The plots were evaluated June 28, 1962 and September 24, 1962. The plot area was raked clean of old growth during the early spring of 1963 and 1964. Soybean and oats were drilled in the plots separately and in rows on May 23, 1963 and May 26, 1964. Stand counts were made of both oats and soybeans on July 10, 1963 and July 6, 1964, to determine the degree of toxicity remaining in the soil one and two years after application. The experiment will be continued in 1965 with oats and soybeans again used as the bio-assay crops.

Table 18. Herbicide Residue in the Soil

Treatment	Rate Lb/A	Crop % Stand 6-28-62	All Veg. % Stand 9-24-62	Grass % Kill 7-6-64	Broad-leaf % Kill	Oats % Stand 7-10-63	Oats % Stand 7-6-64	Soybeans % Stand 7-10-63	Soybeans % Stand 7-6-64
Amate	500	22	48	0	0	100	100	77	100
Amate	1000	0	11	0	0	100	100	100	100
Ametryne	10	0	1	50	0	100	100	77	100
Ametryne	50	0	0	40	20	17	65	45	60
Atrazine	10	0	0	0	0	0	97	59	95
Atrazine	50	0	0	50	50	0	0	18	0
Benzabor	200	96	90	0	40	100	100	100	100
Benzabor	500	88	87	0	40	67	97	64	65
Borascu (conc)	1000	83	47	0	0	99	98	45	52
Urox	200	89	45	99	70	7	8	27	25
Dalapon	20	0	55	0	0	100	100	100	100
Dalapon	100	0	58	0	0	100	100	86	87
Dicamba	10	7	45	0	0	100	100	73	70
Dicamba	50	0	6	0	0	100	100	41	100
Diuron	10	31	10	100	8	57	65	50	50
Diuron	50	0	1	100	100	17	15	23	0
Erbon	50	2	3	0	0	93	85	91	80
Erbon	200	0	3	0	0	100	100	100	100
Fenac	10	56	50	0	0	40	82	50	47
Fenac	50	41	5	98	100	13	5	0	0
Fenuron	50	0	0	52	50	0	0	51	5
Fenuron	200	0	0	100	100	0	0	18	0
Linuron	10	0	3	45	0	93	100	100	100
Linuron	50	0	3	95	0	10	15	54	55
Monuron	10	0	1	97	92	37	65	45	0
Monuron	50	0	0	100	100	0	0	45	0
Polybor Chlorate	500	60	57	0	0	100	100	64	65
Polybor Chlorate	2000	44	2	95	92	100	75	14	0
Prometryne	10	0	7	0	0	76	80	54	55
Prometryne	50	0	5	94	45	1	52	41	45
Propazine	10	0	40	30	47	0	0	27	8
Propazine	50	0	27	90	97	0	0	2	0
Sodium Chlorate	500	28	45	15	0	76	100	54	100
Sodium Chlorate	2000	0	5	85	85	43	30	18	0
Simazine	10	0	10	0	0	0	100	64	100
Simazine	50	0	5	100	100	0	0	4	0
T.B.A.(2,3,6)Lith	10	83	45	0	0	100	100	100	87
T.B.A.(2,3,6)Lith	50	73	25	40	50	17	47	0	22
TCA	50	92	95	0	0	100	100	100	100
TCA	200	38	75	0	0	100	100	100	100
Amitrol-T	20	0	92	0	0	100	100	64	50
Amitrol-T	100	0	87	0	0	80	100	40	100
MCPA	400	0	3	0	0	100	100	100	100
CDAA-T	50	27	47	0	0	80	100	45	87

Results

A comparison is made of the dissipation rate of the various herbicides from the date of treatment, May 25, 1962 to July 7, 1964--26 months later (see table 18).

It is evident that large differences exist in the dissipative rate of the herbicides and that more changes were observed in 1964. However, a full summary of the comparative results will not be attempted until the study has continued at least one more year and the respective dissipation patterns are more complete.

1964 - CENTERVILLE - SORGHUM BREEDING

-- A. O. Lunden and C. J. Franzke (Emeritus)

Objective

Preliminary testing of South Dakota sorghum lines and hybrids and regional sorghum hybrids. This is in cooperation with the regional sorghum testing program composed of sorghum breeders in the various state experiment stations.

Field plots of 27 South Dakota lines and hybrids and 50 regional hybrids were planted for yield and/or preliminary observation. These are hybrids which have not been released for commercial production but will be released by the various experiment stations if test results are favorable. A partial listing of yield results is presented in table 19. Several hybrids in the 600 series of maturity performed quite well in this season but often these would be "high risk" selections, would not mature before killing frost, and would produce very low yields of low quality grain.

Table 19. Yield and Field Performance of Selected Experimental Sorghum Hybrids in 1964

State Number	Yield (Bu/A)
SD 60108	69.4
SD 61013	65.4
SD 60 100F	82.7
SD 60 101	81.6
SD 610	77.0
Ga 615	72.3
RS 610 (Nebr)	69.4
RS 624 (Nebr)	66.9
RS 622 (Tex)	66.9
RS 625 (Tex)	75.4
RS 626 (Tex)	98.5
RS 671 (Tex)	68.8

1964 - CENTERVILLE - CASTORBEANS

-- A. O. Lunden and C. J. Franzke
(Emeritus)

Objective

Preliminary testing of South Dakota strains of castorbeans to determine the potential of adapted selections.

Four dwarf selections from colchicine treated castorbeans were planted for yield and performance testing. These strains averaged only 39 inches in height and thus would be suitable for ease of harvest and growth under conditions of limited rainfall. Yields are reported in table 20. The equivalent value of the best strain would be equal to about 70 bu/A of oarley based on the long time market price of the two crops. Production of castorbeans requires a growers contract with one of the oilseed processing companies as no market guarantee is possible without such a contract. This crop will require further testing but may be a potentially useful crop for South Dakota.

Table 20. Yields of Castorbean Seed in 1964

Strain	Yield Lbs/A
SD63-1	1262
SD63-6	1537
SD63-7	1509
SD63-15	1962

1964 - CENTERVILLE - SOYBEANS

-- A. O. Lunden and C. J. Franzke
(Emeritus)

Objective

Performance testing of South Dakota soybean selections, new releases, and regional preliminary experimental lines. This is in cooperation with the North Central States Regional Soybean Program and the United States Regional Soybean Laboratory.

Replicated field plots of 11 South Dakota breeding selections, 6 released varieties, and 16 regional experimental lines were planted for yield and adaptability testing in 1964. These were all selections within "Group II" soybeans which are adapted to the northern segment of the soybean belt. The yields obtained are recorded in table 21. The top three selections from 27 experimental lines are reported along with six commonly grown Group II soybean varieties. Several experimental lines which appear promising will be repeated in the 1965 planting.

Table 21. Yield and Field Performance of Selected Soybean Lines in 1964

Line	Yield (Bu/A)	Days to Maturity	Height (Inches)
Harosoy	29.9	122	34
Harosoy 63	26.9	122	36
Houkeye	30.4	126	34
Houkeye 63	32.2	126	36
Lindorin	29.2	122	28
Lindorin 63	29.4	123	29
AI - 939	40.0	127	34
C-1335	43.1	129	31
SD 7-11	39.1	127	29

CORN BREEDING

-- D. B. Shank

Corn breeding work on the S.E.S.D. Experiment Farm has had to be confined to conducting yield trials on the latest maturing hybrids developed in the nursery at Brookings. At best, these are very early for southeastern South Dakota.

In 1964 two tests were carried out. One was on experimental 2-, 3-, and 4-way hybrids. The other consisted of single crosses which might be used either as they are, as new 2-way hybrids, or the results may be used for predicting new 3-, and 4-way combinations. Each test also involved two planting rates; namely, 11,760 and 15,680 kernels per acre.

Complete results are not yet available. However, in the 3-, 4-way test four entries outperformed the best check hybrid (a top yielder in the test of commercial hybrids in 1963) while 10 entries were higher than the next best check. In the single cross test three entries again outperformed the same best check hybrid while 25 ranked above the second check.

Whether yield differences existed between planting rates still has to be determined. However, in 1963, the higher rate yielded slightly more bushels per acre than the lower planting rate.

UNIFORM OAT PERFORMANCE NURSERY TRIALS

-- R. S. Albrechtsen

The 1964 Uniform Midseason and Uniform Early Oat Performance Nurseries included entries primarily from states in the North Central region of the United States and from Canada. These entries include superior new strains entered by the respective originating experiment stations plus appropriate long-time check varieties and some recently released varieties. Entries in the Uniform Midseason Nursery are primarily of the midseason to late maturity class, being as late as or later than the Clintland type oats. Most entries in the Uniform Early Nursery, on the other hand, are of a maturity equal to or earlier than the Clintland types.

These nurseries are grown by cooperating agencies throughout the North Central Region. Varieties originating at state experiment stations in this region are normally grown in these nurseries for a period of 2 to 4 years prior to release as a new variety. This makes possible the determination of areas of adaptation for newly developed varieties and serves as a basis for decision to release new varieties. Through such a cooperative testing program, varieties developed in one state may be found suitable for production in other states in the region.

Table 22. Results of the Uniform Midseason Oat Performance Nursery Centerville - 1964 (C64 UMOPN) *

1964 Entry No.	C.I. No.	Variety or Source	Height 7/20	Crown Rust 7/20	Stem Rust 7/20	Test Wt.	Seed Yield	Yield Rank	Statistical Significance**
			Inches			Lbs.	Bu.		
37	7571	USDA	29	S-50	MS-10	32.5	79.6	1	a
9	7814	Mich.	31	X-20	MS-10	30.0	72.8	2	ab
21	8048	N. Dak.	31	MS-10	MS-5	34.0	71.5	3	abc
25	8072	Wisc.	30	MR-2	MS-2	32.8	70.4	4	abcd
19	6662	Garry	31	X-20	MS-10	32.5	70.0	5	abcde
31	7988	Wisc.	31	X-5	S-5	31.5	69.2	6	bcde
35	7989	Canada	33	MS-5	S-5	31.8	69.2	7	bcde
10	7815	Mich.	33	MS-5	S-40	35.0	67.3	8	bcdef
27	7987	Mich.	33	X-10	S-30	32.0	66.0	9	bcdefg
20	7982	Mass.	31	X-10	MS-5	34.5	65.8	10	bcdefg
29	7811	Orbit	25	X-2	MS-tr	30.2	64.4	11	bcdefgh
26	8040	Wisc.	28	X-2	MR-tr	33.2	63.6	12	bcdefgh
33	7784	N. Dak.	30	S-10	S-30	33.8	63.5	13	bcdefgh
24	2027	Gopher	27	MS-10	S-20	33.2	62.3	14	cdefgh
1	8028	N. Dak.	27	S-30	S-10	32.2	61.9	15	cdefghi
11	7978	Wisc.	31	X-5	S-5	34.0	61.8	16	cdefghi
2	8029	N. Dak.	29	MS-2	S-10	32.8	61.3	17	cdefghi
7	7969	Ill.	30	X-2	MS-tr	33.0	60.6	18	defghi
12	8069	Ill.	28	S-20	S-10	34.2	60.2	19	defghi
8	4170	Andrew	28	MS-20	S-30	32.0	60.0	20	efghi
22	8070	Mass.	30	MS-10	S-10	35.5	60.0	21	efghi
14	7639	Cltd. 64	27	X-5	S-10	34.0	58.7	22	fghij
17	7461	Purdue	24	X-5	S-10	34.0	58.6	23	fghij
34	7680	Tippecanoe	25	MS-10	S-5	33.2	58.3	24	fghij
32	8073	N. Dak.	27	MS-5	MS-tr	30.8	58.1	25	fghij
23	8071	Mass.	29	MS-10	S-10	33.5	58.0	26	fghij
15	8032	N. Dak.	26	MR-2	S-10	33.5	57.5	27	fghij
5	8068	Ill.	27	S-20	S-10	33.2	57.0	28	ghijk
28	4988	Mo.-0-205	28	MS-10	S-20	33.2	56.8	29	ghijk
4	8067	Ill.	28	S-20	S-20	33.5	56.5	30	ghijk
30	7690	Brave	27	MS-10	S-10	33.0	55.8	31	ghijk
6	8064	Ill.	26	X-2	MS-5	33.0	55.3	32	hijk
13	7679	Purdue	23	X-20	S-10	31.0	55.1	33	hijk
18	8034	N. Dak.	25	MS-10	MS-tr	32.2	55.0	34	hijk
3	8063	Ill.	27	S-5	S-20	32.8	51.9	35	ijk
16	7463	Purdue	23	X-2	S-10	34.0	49.7	36	jk
36	8076	Purdue	27	X-20	S-5	31.8	47.4	37	k

* Seeded April 20, harvested July 20.
** Using Duncan's New Multiple Range Test.

Overall mean yield	=	61.4 Bushels per acre
C. V.	=	8.3 %
L.S.D. .05	=	8.2 Bushels per acre
Number of reps	=	3

Table 23. Results of the Uniform Early Oat Performance Nursery
Centerville - 1964 (Ce64) UEOPN) *

1964 Entry No.	C. I. No.	Variety or Source	Height 7/20 (in)	Crown Rust 7/30	Stem Rust 7/20	Test Weight (lbs)	Seed Yield (bu)	Yield Rank	Statistical Significance *
17	4988	Mo.-0-205	29	MS-10	S-20	33.5	63.7	1	a
8	7679	Purdue	26	X-10	S-10	31.5	62.9	2	a
22	7805	Mo.	27	MS-5	S-5	35.8	62.6	3	a
3	7969	Ill.	28	S-2	S-2	32.0	60.8	4	ab
20	7690	Brave	27	MS-5	S-10	32.8	60.8	5	ab
6	7970	Iowa	26	MS-2	0	33.8	60.2	6	ab
16	7698	USDA	28	MS-10	S-5	32.2	60.0	7	ab
21	7680	Tippecanoe	27	X-10	S-5	33.5	60.0	8	ab
7	7971	Ill.	32	S-5	S-5	33.5	59.9	9	ab
2	8064	Ill.	26	MS-10	0	32.2	58.9	10	abc
19	7663	USDA	26	S-10	S-5	34.0	58.5	11	abc
9	7639	Cltd. 64	29	X-2	S-5	33.2	58.2	12	abc
4	4170	Andrew	29	MS-10	S-20	32.0	57.6	13	abcd
23	8038	Mo.	30	S-10	S-2	33.8	57.0	14	abcde
14	839	Kanota	29	MS-10	MS-10	29.8	56.7	15	abcde
24	8039	Mo.	29	S-10	S-tr	34.0	56.5	16	abcde
1	8063	Ill.	26	S-20	S-5	32.5	56.1	17	abcde
5	7693	Ill.	26	MS-5	S-10	33.0	55.6	18	abcde
15	7697	USDA	28	MS-20	S-10	33.5	55.5	19	abcde
13	8066	Nebr.	21	MS-20	MS-tr	31.2	55.2	20	abcde
18	7272	Nodaway	28	S-10	S-5	33.2	53.6	21	bcde
11	7463	Purdue	25	X-5	X-20	34.0	51.0	22	cde
10	8065	Purdue	26	X-2	S-tr	34.8	49.8	23	de
12	2820	Columbia	27	MS-10	S-30	32.5	49.1	24	e

* Seeded April 20, harvested July 20.
** Using Duncan's New Multiple Range Test.

Overall mean yield	=	57.5 bu/A
C. V.	=	8.5 %
L.S.D. .05	=	6.9 bu/A
Number of reps	=	4

ROD ROW OATS I NURSERY

-- R. S. Albrechtsen

The Rod Row Oats I Nursery was comprised of new oat strains developed at the South Dakota Agricultural Experiment Station which were being evaluated for yield and other agronomic and disease characteristics at several locations within the state. The best performing entries in this nursery will be entered into Uniform Regional Nurseries for more extensive testing if they appear worthy of such. Any new strains exhibiting significant superiority throughout such a testing program will be considered for release as new varieties.

Table 24. Results of the Rod Row Oats I Nursery - Centerville - 1964 (Ca 64 RROI) *

1963 Entry No.	1964 Entry No.	Source	Height 7/20	Crown Rust 7/20	Stem Rust 7/20	Test Weight	Seed Yield	Yield Rank	Statistical Significance**
			Inches			Lbs.	Bu.		
Garry, ck.	5	check	33	S-20	0	31.8	71.4	1	a
63 RROI-3	10	PROII-B-60-2-29	31	X-10	S-20	32.3	70.0	2	ab
63 PRROI-10	24	PRO-B-60-112	31	MS-5	MR-tr	33.0	69.1	3	abc
63 RROI-22	9	PROII-B-60-2-108	30	X-5	MS-5	31.0	67.8	4	abcd
63 RROI-12	11	" - 68	29	MS-5	MS-2	30.5	67.5	5	abcd
Andrew, ck.	1	check	27	MS-10	S-10	31.0	67.3	6	abcde
63 RROI-8	7	PROII-B-60-2-62	30	MS-5	MS-tr	30.3	67.3	7	abcde
63 PRROI-6	18	PRO-B-60-80	28	S-10	MS-5	31.8	67.1	8	abcde
62 RROI-18	15	PROII-B-60-2-149	29	MS-5	0	33.5	66.3	9	abcdef
" -13	14	" - 88	27	MS-5	S-10	31.3	66.3	10	abcdef
62 RROI-19	8	" - 95	28	S-5	S-20	25.5	66.0	11	abcdef
63 PRROI-31	23	PRO-B-60-191	29	S-5	MS-tr	31.8	66.0	12	abcdef
63 PROI-18	13	PROII-B-60-2-92	29	X-2	MS-tr	30.5	65.1	13	abcdefg
" - 23	12	" -127	26	X-5	S-5	27.8	64.5	14	abcdefg
63 PRROI-9	21	PRO-B-60-85	28	X-10	S-5	31.8	63.8	15	abcdefg
Minhafer, ck.	2	check	29	X-5	0	31.5	63.6	16	abcdefg
63 RROI-7	6	PROII-B-60-2-60	28	S-10	S-5	29.5	63.3	17	bcdefgh
Dodge, ck.	4	check	30	MS-tr	0	32.3	61.5	18	cdefghi
63 PRROI-4	22	PRO-B-60-65	27	S-10	MR-tr	31.8	61.5	19	cdefghi
" -6	18	" -146	29	X-10	S-10	30.8	60.0	20	defghi
63 PRROI-21	17	" -154	29	MS-5	MS-5	32.0	59.4	21	efghi
" -38	16	" -222	29	MS-5	MS-tr	33.0	59.1	22	fghi
63 PRROI-30	20	" -188	29	S-10	S-10	30.3	59.0	23	fghi
Clintland 60, ck.	3	check	29	S-10	S-2	32.5	57.8	24	ghi
63 PRROII-26	31	PRO-B-60-298	26	S-5	S-tr	29.8	57.4	25	ghi
" -4	35	" -241	31	MS-5	S-10	29.0	55.5	26	hi
63 PRROII-30	25	" -323	25	MS-5	MR-tr	27.3	54.0	27	ij
" -32	26	PRO-B-60-330	27	MS-10	MS-5	30.5	47.6	28	jk
63 PRROII-12	29	" -256	26	MS-10	MS-tr	30.0	46.9	29	jk
" - 1	27	" -232	26	MS-10	MR-tr	30.5	46.7	30	jk
63 PRROII-13	30	" -257	24	MS-10	MS-tr	27.3	42.3	31	kl
" -11	34	" -255	25	S-5	S-tr	26.8	38.5	32	lm
63 PRROII-21	28	" -287	26	MS-10	MR-tr	27.3	37.0	33	lm
" -22	33	" -288	25	S-5	S-tr	24.3	34.8	34	mn
63 PRROII-20	32	" -286	27	S-5	S-tr	25.3	29.7	35	n

* Seeded April 20, harvested July 20.

** Using Duncan's New Multiple Range Test.

Overall mean yield = 58.3 bu/A
C. V. = 6.7 %
L.S.D. .05 = 6.4 bu/A
Number of reps = 3

STANDARD VARIETY TRIALS OF SMALL GRAINS, CENTERVILLE, 1964

-- Joseph J. Bonnemann

Five types of cereal grains were harvested from rod-row plots at the S.E.S.D. Research Farm in 1964. Data included in this report are current year yields and test weight and the three-year averages where available.

The oat yield results for 1964 are somewhat misleading as conditions during the growing season favored the later, ranker growing varieties usually adapted only in the northeastern area of South Dakota.

Oat varieties recommended by the Extension Service for the area served by the S.E.S.D. Research Farm are Andrew, Bonkee, Brave, Burnett, Clintland 64, Dodge, Garland, Minhafer, Mo. 0-205 and Tippecanoe.

Spring wheat varieties recommended are Crim and Lee. Lee is not as resistant to present races of stem rust as Crim. Antelope, Caribou and Pierre are the rye varieties currently recommended. Barley and winter wheat were also under trial.

A more detailed discussion and presentation of data is found in Circular 165, 1964, Small Grain Variety Trials.

Table 25. Standard Variety Small Grain Trials, S.E.S.D. Research Farm 1964

Variety	Yield, Bu/A		Test Weight
	1964	1962-64	Lb/Bu
Spring Wheat			
CI 13751	27.1		60.5
CI 13655	26.4		62.5
CI 13654	25.6		59.5
CI 13586	24.4		60.5
Wells	21.8	15.8	60.0
Lakota	21.7	16.4	56.5
Crim	21.4	13.9	58.5
Rushmore	19.4	13.1	57.0
Thatcher	19.0	11.9	57.5
Canthatch	18.5	11.8	57.0
Selkirk	18.2	11.5	54.0
Pembina	17.5	12.1	55.5
Lee	17.4	11.0	55.0
Justin	17.0	10.1	56.0
LSD .05	4.9		

Table 25. (Continued) Standard Variety Small Grain Trials - 1964

Variety	Yield, Bu/A 1964	Yield, Bu/A 1962-64	Test Weight Lb/Bu
Oats			
Ortley	61.1		35.0
Garry	58.8	47.3	33.0
Dupree	58.3	57.2	31.5
AuSable	57.0		34.0
Lodi	56.7		32.5
CI 7978	56.7		32.5
Mo. 0-205	56.5	49.3	33.5
Rodney	55.0	46.2	34.0
Burnett	54.4	46.5	34.5
Portage	52.5	52.2	33.0
Goodfield	49.8	47.8	35.5
Tippecanoe	49.6		33.5
Dodge	48.6	48.7	34.0
Clintland 60	48.3	47.3	34.0
Garland	47.8	43.4	33.5
Neal	47.6		31.5
Nodaway	47.5	43.3	33.5
Minhafer	47.0	50.4	32.5
Clintland 64	46.4		34.0
Coachman	46.1		34.0
CI 7679	46.1		31.5
Brave	45.6		32.5
CI 7454	45.3		31.5
Andrew	44.0	48.2	31.5
Nehawka	43.4	40.5	32.5
Bonkee	42.9		35.0
CI 7463	42.3		34.5
Putnam 61	39.8		32.5
Newton	39.4		32.5
L.S.D. .05 --	12.9		
Rye			
Elk	35.5	18.1	55.0
Pierre	30.9	19.4	55.0
Caribou	30.7	20.3	54.5
Antelope	25.2	19.1	53.5
L.S.D. .05 --	N.S.		

Table 25. (Continued) Standard Variety Small Grain Trials - 1964

Variety	Yield, Bu/A 1964	Yield, Bu/A 1962-64	Test Weight Lb/Bu
Barley			
Larker	42.1	32.5	49.5
Liberty	41.5	39.5	48.5
Traill	41.5	33.4	48.0
Betzes	41.3	24.0	47.5
Trophy	37.9	27.7	48.0
Parkland	37.0	23.2	48.0
Otis	36.4	23.7	48.0
Plains	34.8	25.9	49.0
Custer	32.9	21.7	46.0
Kindred	32.1	27.1	47.5
Spartan	31.2	21.2	48.0
Feebar	29.7	22.8	44.5
L.S.D. .05 --	4.2		
Winter Wheat			
Scout	40.7		60.5
Gage	39.2		60.5
Shoshoni	37.8		61.0
Cheyenne	37.4	15.5	60.0
Lancer	37.1	20.4	61.0
Warrior	36.3	16.2	60.5
Wichita	36.1	17.1	61.5
Winalta	35.6		61.0
Rodco	35.5	18.2	61.0
Omaha	35.0	17.2	61.0
Minter	34.6	20.1	62.0
SD 56-53	34.0	20.8	60.5
Ottawa	33.5	17.5	61.5
Aztec	32.6		62.5
Nebred	30.7	14.3	61.0
Bison	30.4	13.2	61.0
L.S.D. .05	N.S.		

CORN PERFORMANCE TRIALS, AREA E, 1964

-- Joseph J. Bonnemann

Corn performance trials have been conducted at the S.E.S.D. Research Farm for four years. Entries under trial were those selected by commercial seed producers and checks developed by experiment stations of the area. Fifty-eight entries were included in the 1964 trials. A nominal fee is charged for each entry, excluding checks.

The corn was planted on May 8 and harvested October 22. It was hand planted as checked corn, 4 kernels per hill, in 40 inch rows. The plots were 2 by 8 hills in size. The field received applications of Diazinon for root worm control and

Table 26. Corn Performance Trial, Area E. S.E.S.D. Research Farm - 1964

Variety	Performance Score	Moisture at Harvest, Ear Corn	Yield Bu/A	Variety	Performance Score	Moisture at Harvest, Ear Corn	Yield Bu/A
Pioneer 3306 (2x)	3	24.3	109.9	DeKelk xl-65 (2x)	35	22.4	87.7
Cargill 277 (3x)	1	21.6	109.2	Master F-102 (4x)	28	18.7	87.4
Pioneer 3291 (4x)	4	22.9	108.0	Sohota MS-75 (2x)	23	16.7	86.9
Pioneer 3558 (2x)	2	14.9	103.3	Nebr. 202 (4x)	24	16.6	86.5
United Hagie 1500 (2x)	8	21.5	102.7	DeKalb 3x1A (3x)	34	19.8	86.2
Northrup King PX66 (2x)	5	18.8	102.1	DeKalb 3x 1 (3x)	43	26.5	86.0
Pioneer 3418 (4x)	7	19.8	101.8	DeKalb 3x2A (3x)	39	21.4	85.6
SD 622 (4x)	9	20.4	100.1	Pioneer 3304 (2x)	44	25.2	84.7
DeKalb XL-361 (3x)	16	25.5	99.1	Disco 1090 (4x)	36	18.0	84.4
Funks G-4390 (2x)	6	14.6	98.9	Funks G-93 (4x)	41	21.1	84.1
United Hagie 1580 (2x)	10	21.6	98.2	Royal Iowa 5087 (4x)	38	17.3	83.6
DeKalb 441 (4x)	14	20.1	96.1	Master F-80 (4x)	33	14.9	82.8
SD Exp 45 (4x)	15	20.7	96.0	Northrup King KM579 (4x)	37	15.7	82.6
Sokota 645 (4x)	12	19.1	95.7	Green Acres 446 (4x)	51	27.0	82.1
United Hagie 147 (2x)	31	29.3	94.1	Northrup King KT 612 (4x)	42	20.3	81.8
Sokota 619 (4x)	11	16.5	93.8	SD 604 (4x)	40	15.7	81.0
Pioneer 3414 (4x)	13	16.5	93.7	Disco 112-A (4x)	45	20.6	80.6
Minn. 417 (4x)	17	18.1	93.2	Funks G-96 (4x)	49	23.9	80.4
Pioneer 321 (4x)	30	26.4	92.4	Cargill 330 (4x)	52	24.5	80.0
DeKalb XL-362 (3x)	27	24.5	92.0	Northrup King KM589 (4x)	46	17.8	78.4
United Hagie 152A (2x)	26	23.8	91.5	GreenAcres Nopi (4x)	54	29.1	77.6
United Hagie 158 (2x)	25	23.0	91.0	Funks G-62 (4x)	50	19.3	77.0
Northrup King KT623 (4x)	19	19.4	90.7	Master F-90 (4x)	47	15.4	76.3
DeKalb 441A (4x)	20	20.2	90.5	United Hagie 146 (2x)	48	16.9	76.3
Funks G-4582 (2x)	29	23.0	90.3	Cargill 969 (2x)	55	23.1	71.7
SD 620 (4x)	22	19.6	89.3	Funks G-4401 (2x)	53	20.0	71.3
Iowa 5063 (4x)	21	17.8	88.6	Green Acres 777 (2x)	56	22.3	66.1
Minn. 301 (3x)	18	12.7	88.5	Cargill 950 (2x)	57	22.0	64.5
Pioneer 328 (4x)	32	22.1	88.2	DeKalb 805 (2x)	58	23.5	60.9

Mean plot yield -- 88.0 bu/A L.S.D. .05 -- 19.2

2x -- single cross; 3x -- 3-way; 4x -- double cross.

Table 27. Grain Sorgbum Performance Trial, Area E - 1964

	Variety	Percent Moisture	Test Weight lb/Bu	Yield, 100#/A 1964	Yield, 100#/A 1962-64	Date Headed	Height in Inches
~~1.~~	~~NK 332~~						
1.	NK 222	24.9	57.0	32.2	42.4	7/28	45
2.	SD 503	18.3	57.0	30.1	43.2	7/15	48
3.	RS 501	24.4	58.2	30.0	44.1	7/26	58
4.	NK 133	23.7	57.5	28.9		7/27	45
5.	RS 610	32.1	56.8	28.1	44.4	7/20	47
6.	NK 212	23.7	55.8	27.8		7/31	45
7.	NK 144	19.1	57.2	26.8		7/29	41
8.	DeKalb C44B	17.6	51.5	26.8		7/31	45
9.	PAG 430	25.3	53.7	26.5		8/1	44
10.	Colo. 606	27.4	56.5	26.4		8/4	49
11.	NK 227	20.2	53.8	25.6	41.7	7/31	49
12.	RP 110	31.2	55.3	25.5		8/2	45
13.	SD 451	20.2	56.7	24.8	37.3	7/27	46
14.	TE 44	21.4	52.8	24.7		7/30	43
15.	Pawnee	19.6	57.8	24.6		7/30	46
16.	PAG 304	27.5	55.3	24.5		7/31	38
17.	SD 502	28.3	55.0	24.1		8/2	45
18.	Colo. 604	21.9	57.5	24.0		8/2	50
19.	DeKalb E57	17.5	48.5	24.0		8/5	46
20.	Frontier 400D	27.7	54.8	23.9		8/6	44
21.	Pioneer 846	27.1	54.5	23.7		8/7	45
22.	Comanche	25.6	51.5	23.5		8/4	44
23.	Pioneer X3101	24.6	54.7	23.0		8/3	45
24.	RS 608	24.0	54.0	22.8	39.6	8/5	42
25.	Frontier 388	17.7	56.7	22.6	37.5	7/31	44
26.	Ute	15.6	54.7	22.1		8/7	42
27.	Frontier 400C	19.3	53.5	21.9	40.8	8/4	45
28.	Frontier 401	25.7	55.0	21.8		8/4	42
29.	Pioneer X0921	29.7	51.2	21.7		8/4	44
30.	PAG 275	25.2	57.0	21.2		7/23	44
31.	Rocket A	14.9	53.0	21.1		8/5	41
32.	SD 441	25.1	55.5	21.0	34.0	7/24	49
33.	Kiowa	26.8	57.0	20.8		8/6	45
34.	Asgrow H623	16.6	50.8	17.0		8/6	41
35.	SD 102	28.9	53.5	16.2	24.6	7/31	40
				Mean 24.3			
	L.S.D. -- .05			7.7%			

Atrazine for grassy weed control. The effectiveness of the latter was reduced because only limited rainfall occured until mid-June.

Yields ranged from 109.9 to 60.9 bushels per acre. Moisture in the ear corn at harvest averaged 20.6% for all entries. The results are shown in table 26.

Data on the percentages of root lodging, stalk lodging and ears dropped will appear along with two, three and four year moisture and yield averages, in Circular 166 entitled "1964 Corn Performance Trials", which is now in press.

GRAIN SORGHUM PERFORMANCE TRIALS, AREA E, 1964

-- Joseph J. Bonnemann

Grain sorghum performance trials have been conducted on a fee basis at the S.E.S.D. Research Farm for three years. Hybrids entered, excluding checks included by the Experiment Station, are the choice of the entering producers.

Thirty-five entries were grown in the 1964 trial. The material was seeded on May 25 and harvested on October 7. Germination was quite uniform but wet, cool weather during June caused stand variations and resulted in non-uniform conditions in the plot. The first frost was reported on September 27.

Yields are reported in terms of 100 lbs/A. The yields ranged from 32.2 to 16.2 per acre. Because of the unevenness of the plots, moistures percentages are probably somewhat high.

The Grain Sorghum Performance Trial results are reported in table 27. Complete results of all trials and a more detailed discussion will appear in Circular 167, 1964 Grain Sorghum Performance Trials.

FOUNDATION SEED STOCK INCREASES

-- G. W. Erion

The S.E.S.D. Research Farm has cooperated with the Foundation Seed Stock Division of South Dakota State University in the increase of Foundation Seed Stock releases. In 1964, there were seed increases 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 starts growth after June 1.

2. Tippecanoe Oat — 18 acres

Tippecanoe oat was developed in Indiana in cooperation with U.S.D.A. It was developed by crossing a Clintland 60 type with Mo-0-205, and backcrossing a

plant from this cross to another Clintland 60 type. In comparing Tippecanoe to Clintland 60, it is about 3 inches shorter, a couple of days earlier, very similar in yield and slightly higher in test weight.

3. Nebraska C.I. 7454 Oat 14 acres

Not released yet.

4. Reliance (AXB) Sorghum Isolation 3 acres

This sorghum isolation was an increase of Reliance male sterile. This male sterile seed is used as seed parent in SD 441 hybrid sorghum.

GRASS VARIETY TESTS AT CENTERVILLE

-- James G. Ross

Grass variety tests of smooth bromegrass, intermediate wheatgrass and pubescent wheatgrass were established in the fall of 1961. Yields from the bromegrass varieties obtained in 1964 are shown in table 28. Southern type varieties such as Lincoln, Lancaster and Southland were superior to the northern type as represented by Canadian commercial. A new variety Sac, released by the Wisconsin Experiment Station ranked second in yield. The yield of Homesteader, a variety released from the South Dakota Experiment Station, did not differ significantly from the highest yielding varieties.

As shown in table 29, the intermediate and pubescent wheatgrass yields were about the same as the bromegrass. In both 1963 and 1964 Oahe, a South Dakota release, yielded more than the other varieties.

Summer switchgrass planted in rows was harvested for yield on July 6. This was much before panicles started to form. When cut at 6 inches above the ground, a yield of 2.85 tons per acre was obtained. Tests to ascertain the usefulness of this grass for summer pasture are underway.

Table 28. Bromegrass Variety Test 1964

Variety	Tons per/A
Lancaster	2.11
Manchar	1.77
Saratoga	2.06
Southland	2.13
Wisconsin 55	1.95
Sac	2.12
Homesteader	1.99
Lincoln	2.05
Lyons	1.85
Canadian Commercial	1.85
Least Significant Difference	0.23

Table 29. Wheatgrass Variety Test

Variety	Species	Tons per Acre 1963	1964
Amur	Intermediate	1.69	1.90
Greenar	"	1.76	1.80
Nebraska 50	"	---	1.65
Oahe	"	1.88	2.14
Mandan 759	Pubescent	1.54	1.82
Lopar	"	---	1.58
Least Significant Difference		N.S.	N.S.

HARD RED WINTER WHEAT COLLABORATORS' QUALITY TEST

-- Darrell Wells

Variety	Score
Nebred	90
SD56-53 (Experimental)	86
Omaha	84

The 35 commercial laboratories concluded this year, as they did last year, that the quality of SD 56-53 was satisfactory to them.

ROOT AND STALK ROT DISEASE CONTROL IN HYBRID CORN
S.E.S.D. RESEARCH FARM, CENTERVILLE

-- C. M. Nagel

Approximately 300 experimental three-way corn hybrids involving one root and stalk rot resistant parent in each of the three-way hybrids were grown at the Research Farm in 1964. All hybrid entries were replicated three times in each particular experiment. Results were obtained on the over-all performance including resistance to disease, lodging, moisture and yields.

Research in progress is directed at developing a strain of corn which is resistant to disease. Over the past years, strains of corn have been developed by the Plant Pathology Department at the main Experiment Station at Brookings; and although it appears that many of these lines are adapted more to the north, it was thought desirable to evaluate these hybrids at the Research Farm in hopes that certain of these lines when in hybrid combination might also be adapted to the southeast area.

The approximately 300 experimental hybrids that were grown at the S.E.S.D. Research Farm in 1964 were divided into five different test groups and were grown on a six-acre piece of land. Only the 15 top-yielding three-way hybrids and commercial checks from each of the five experiments are presented in table 30. The commercial checks were the only hybrids that were common to all five experiments.

The plots were planted on May 14 and harvested on October 20.

Table 30. Yield Performance of Three-way Experimental Root and Stalk Rot Resistant Corn Hybrids in Comparison to Four Adapted Commercial Hybrids Grown at S.E.S.D. Research Farm in 1964.

Rank	Experiment # 1			Experiment # 2			Experiment # 3			Experiment # 4			Experiment # 5		
	Exp'l Hybrid or Commer. Check	Yield Bu/A	% Moisture at Harvest	Exp'l Hybrid or Commer. Check	Yield Bu/A	% Moisture at Harvest	Exp'l Hybrid or Commer. Check	Yield Bu/A	% Moisture at Harvest	Exp'l Hybrid or Commer. Check	Yield Bu/A	% Moisture at Harvest	Exp'l Hybrid or Commer. Check	Yield Bu/A	% Moisture at Harvest
1	P352	105.5	21.2	Exp'l	100.2	17.1	DEK410	97.7	19.2	Exp'l	89.2	16.6	Exp'l	77.2	14.8
2	Exp'l	99.5	19.9	"	98.9	16.0	Exp'l	96.2	21.3	"	86.2	17.6	"	76.6	15.8
3	DEK410	97.8	18.8	DEK410	99.6	17.8	"	94.5	18.8	"	83.2	15.3	"	73.9	13.5
4	Exp'l	96.0	17.1	Exp'l	97.4	17.8	"	92.2	18.1	"	84.4	17.6	"	72.0	15.8
5	"	96.1	18.5	"	96.2	17.3	"	90.9	17.0	"	84.1	17.3	"	71.3	14.3
6	"	96.3	18.9	"	97.6	20.5	"	90.1	15.8	"	84.5	19.2	"	72.2	16.4
7	"	95.8	19.0	"	95.5	17.9	"	89.3	18.2	SD622	85.0	23.7	SD420	71.3	15.2
8	"	93.8	16.3	"	94.4	16.8	"	86.5	15.2	Exp'l	77.7	13.9	P352	73.1	19.1
9	"	94.1	18.7	"	95.5	18.7	"	89.6	20.8	"	79.6	17.5	DEK410	71.3	15.9
10	"	94.7	19.7	"	93.9	17.8	"	86.1	15.7	"	80.8	19.7	Exp'l	71.1	16.0
11	"	90.8	15.6	"	92.3	17.6	"	87.9	18.8	DEK410	79.8	18.1	"	69.5	15.2
12	"	92.8	19.2	"	90.9	16.9	"	84.0	14.0	Exp'l	77.7	14.2	"	68.9	15.0
13	"	91.4	19.0	P352	92.0	20.1	"	82.7	14.1	"	78.7	17.1	"	68.2	14.2
14	"	91.3	19.0	SD420	92.4	20.8	"	83.4	15.4	"	78.5	16.8	SD622	70.6	19.8
15	"	91.2	18.9	Exp'l	90.4	18.9	"	83.1	16.0	"	77.9	16.5	Exp'l	68.2	19.0
LSD*		14.4			15.9			14.9			13.9			10.9	

* Differences of less than this are not considered significant.

IMPORTANT NEW CORN VIRUS DISEASE IN CORNBELT

-- C. M. Nagel

Corn growers particularly in southeastern South Dakota who have been reading reports in farm magazines and newspapers about the corn stunt virus disease threat in Ohio, Indiana and Illinois during 1963 and 1964, will be interested to know that research by plant pathologists in the experiment stations in those states have determined that the disease was not the well-known corn stunt disease. Rather it has proven to be a different virus disease, though very similar in symptoms and damage to those of the corn stunt disease. The new corn virus disease has been named "Maize Dwarf Mosaic" by plant pathologists who are actually engaged in the research on the disease.

To distinguish the disease found in Ohio, Indiana and Illinois from corn stunt, a disease known to occur in the southern parts of the United States, the new disease can be transmitted from one plant to another in the field by the corn leaf aphid and by mechanical means in greenhouse experiments. Because of the potential damage of this new disease to corn production in the corn growing states, pathologists from the cornbelt states met at a corn disease conference called by the Ohio Agricultural Experiment Station on November 23-24 at Wooster, Ohio to compare research results of workers pertaining to this new disease. The immediate necessity to search for sources of resistance to this new disease, which could be utilized in developing hybrids resistant to the disease, was planned. The disease has continued to spread quite rapidly, particularly in Ohio in 1964, and now may be found in most parts of that state. Although the damage has been limited, indications are that this disease could have very important and far reaching effects on corn production in the cornbelt of this country provided it continues to spread and in the absence of virus resistant hybrids.

The principal damage from the disease is serious dwarfing and failure to set ears or, when late season infection occurs, it may cause reduced kernel set.

The Plant Pathology Department at South Dakota Agricultural Experiment Station was represented at the corn disease conference and plans are underway to test out many inbred lines which are adapted to South Dakota as possible sources of resistance. If resistance is found, it is planned to incorporate them into new hybrids in the event the disease should continue to spread into the northwestern area of the cornbelt.

To date the disease has not been definitely diagnosed as being present in Iowa, Minnesota, Nebraska or South Dakota. Symptoms have been found, however, which are very similar to those of the new maize dwarf mosaic. Iowa has reported a disease similar to maize dwarf mosaic, but it has not been established as being the same disease.

NEW SEARCH FOR LATER MATURITY DISEASE RESISTANT INBRED CORN LINES

-- C. M. Nagel

Another phase of the research on corn diseases being conducted at the S.E.S.D. Research Farm is the development of new inbred lines starting with open pollinated varieties of later maturity than those now used to develop the three-way hybrids presented in the performance tests reported in table 30. Superior disease resistant inbred lines of later maturity are needed for the southeastern corner of

the state or south of the Centerville-Beresford area. A number of new lines have been selected during the past two seasons. Studies will continue using these lines to determine their degree of resistance to root and stalk rot, northern leaf blight, ear rot, maize dwarf mosaic and other desirable characteristics.

BARLEY YELLOW DWARF YIELD TEST NURSERY

-- R. S. Albrechtsen

The Barley Yellow Dwarf Yield Test Nursery included eight new oat strains which have exhibited possible resistance (or tolerance) to the barley yellow dwarf virus plus one susceptible and one tolerant check variety. This nursery was grown at the S.E.S.D. Research Farm because of the higher incidence and severity of the barley yellow dwarf (red leaf) disease in that area of the state. The incidence of infection was very low in 1964, but the disease has caused severe losses to the oat crop in South Dakota in some years and remains a potentially serious disease in our state.

Table 31. Results of the Barley Yellow Dwarf Yield Test Nursery Centerville - 1964 (Ce 64 BYDYT) *

1964 Entry No.	C. I. No.	Variety or Source	Height 7/20 (In.)	Crown Rust 7/20	Stem Rust 7/20	Test Wt. (Lbs.)	Seed Yield (Bu.)	Yield Rank	Statistical Significance **
4	7950	Coffman	29	S-5	MS-5	30.8	73.5	1	a
3	7949	"	29	S-5	S-5	31.3	66.5	2	ab
7	7953	"	29	S-10	MS-tr	30.8	62.1	3	abc
8	7954	"	27	MS-5	S-10	32.8	59.5	4	bc
2	7948	"	29	S-10	MS-5	32.0	58.7	5	bc
6	7952	"	28	X-10	MS-5	31.3	58.1	6	bc
10	7690	Res. ck.	27	MS-5	0	31.3	56.0	7	bc
5	7951	Coffman	30	S-10	S-20	30.3	55.5	8	bc
9	7563	Susc. ck.	27	X-5	MS-5	32.3	55.4	9	bc
1	7988	Coffman	31	MS-10	S-20	31.3	53.0	10	c

* Seeded April 20, harvested July 20.
** Using Duncan's New Multiple Range Test.
Overall mean yield = 59.8 bu/A
C. V. = 10.0 %
L.S.D. .05 = 10.3 bu/A
Number of reps = 3

S.E.S.D. RESEARCH FARM WINDBREAK

-- Paul Collins

In 1962 an eight row windbreak was planted north of the Station buildings. The area was fallowed for one season prior to planting. From north to south, the species used were as follows: Tatarian honeysuckle, 2 rows of Eastern red cedar, Ponderosa pine, green ash, 2 rows of Chinkota elm, and common lilac. All planting stock was procured from the state forester except the Chinkota elm which was

supplied by the Horticulture-Forestry Department at South Dakota State University. All rows were spaced 12 feet apart and spacing in the rows varied from 3 feet in the outside rows to 8 feet in most of the interior rows.

Growth of the two rows of Chinkota elm is already sufficient to provide some wind and snow protection after three growing seasons. In a few more years the slower growing evergreens will provide the main protection.

SWINE RESEARCH AT THE S.E.S.D. RESEARCH FARM

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

The development of the Research Farm in southeastern South Dakota has created the opportunity for studies in swine housing management. The initial step taken to develop a program was the construction of three temporary structures in which to finish out pigs grown in confinement. Results of the first summer's study were reported in the Animal Science Mimeo AS 63-1. Daily gains and feed required per pound of gain were approximately the same among pigs on slotted floor, concrete floor with slotted dunging alley and concrete floor with bedding. More labor was required for the conventional concrete floor and sloping floor than was required for the completely slotted floor.

In 1963, all swine were removed from the premises and the farm was repopulated with SPF (specific pathogen free) pigs. These SPF pigs came from the North Central Research Substation at Eureka. The uninsulated house was moved to pasture for the breeding stock, but the two insulated structures were used for growing-finishing pigs in the winter of 1963-64 and the following summer.

Winter Trial. The summary is shown in table 32. Pigs gained essentially the same and required approximately the same amount of feed per pound of gain in all lots. Pigs in lot 2 had a faster daily gain, but they had some advantage by finishing the test at a heavier average weight. Pens 1 and 2 were similar in design and the performance of pigs in these pens would be expected to be similar, so the observed difference in daily gains between these two lots was probably unimportant.

Table 32. Results of Winter Trial, 1963-64

House Number	1		2	
	Concrete, with Slotted Dunging Area *		Slotted	Concrete with Bedding
Pen number	1	2	3	4
Number of pigs	20	20	20	20
Avg. initial weight, lb.	99.3	96.6	101.0	99.7
Avg. final weight, lb.	210.2	227.0	212.0	212.6
Avg. daily gain, lb.	1.56	1.67	1.56	1.59
Avg. daily feed, lb.	6.25	6.18	6.28	6.28
Feed per lb. gain, lb.	4.01	3.70	4.01	3.96

* Pens 1 and 2 are the same design, but pen 1 had a 4 foot slotted floor in the lower end of the sloping floor while pen 2 had a 5' 3" slotted floor in the lower end of the pen.

Pigs were clean and healthy in all pens throughout the trial. No serious feet and leg problems were associated with any of the floor designs. However, pigs on the slotted floor were reluctant to move around in the pen and two brought less on the market because of enlargements on their legs. Tail biting occurred occasionally, but a bitter tasting solution placed on the tail was sufficient to discourage the tail biter.

The labor required for cleaning the pens was lowest for the pen with the slotted floor. Pens with the sloping floor were partially scraped daily, but the labor required was only 3 to 4 minutes to clean each time. When the pigs required most of the floor space for sleeping near the end of the trial, they used the slotted area for body waste and kept the concrete floor area clean. The feeder which extended across one end of the pen was also used to control floor space for the pigs. The feeder was moved about midway in the pen to start the trial and then moved back to provide more space as the pigs needed more area. The concrete floor with bedding required at least twice the labor as the other floors to keep the pen and pigs clean. The difference was due to cleaning out and adding fresh bedding daily. The bedding became wet every day because of the arrangement of the pen, crowded condition of the pigs and the lack of good habits by the pigs.

Summer Trial. The results are reported in table 33. There was a 7% range in daily gain between the treatment groups; but the fastest and slowest groups were in the same house with pens of similar design. If an average daily gain of pigs in lots 1 and 2 is used, pigs on the three floor designs gained nearly the same, which concurs with all of the previous trials in these houses.

Pigs on the slotted floor were more efficient in feed conversion, while pigs in the level concrete pen were rather inefficient. This is the first trial that an important difference in feed efficiency has occurred and the reason for the difference in this trial was unknown.

Table 33. Results of Summer Trial, 1964

House Number	1		2	
	Slotted Dunging Area *		Slotted	Concrete without Bedding
Pen number	1	2	3	4
Number of pigs	20	20	20	20
Avg. initial weight, lb.	61.4	60.2	59.8	59.2
Avg. final weight, lb.	222.6	221.7	211.4	212.0
Avg. daily gain, lb.	1.78	1.66	1.68	1.70
Avg. daily feed, lb.	6.60	6.07	5.58	6.46
Feed per lb. gain, lb.	3.71	3.65	3.31	3.80

* Pens 1 and 2 are the same design, but pen 1 had a 4 foot slotted floor in the lower end of the sloping floor while pen 2 had a 5' 3" slotted floor in the lower end of the pen.

Pigs were clean on the slotted floor throughout the trial, whereas pigs on the sloping floors in house 1 usually had some debris on them and pigs on the level concrete floor were usually filthy dirty. The level floor was cleaned daily, but it was wet throughout the trial.

Tail biting occurred among pigs on the slotted floor near the end of the trial, but treatment quickly eliminated the problem.

NEW SWINE RESEARCH BUILDING

-- H. G. Young and R. W. Seerley

The 1963 Legislature reappropriated $10,000 from the previous biennial appropriation for construction of a swine research facility. The swine research building was completed in the late fall of 1964 and should prove to be a valuable research and demonstration for hog feeders in the state. The Agricultural Engineering and Animal Science Departments were responsible for the planning and design of the structure and will collaborate on the research.

The structure was designed for the purpose of studying different floor management systems, liquid manure handling and waste disposal through use of a lagoon. These management practices are relatively new in South Dakota swine housing and each has created problems that require solution to increase their acceptance in the area. The basic structure, ventilation and heating systems are similar to the recommended design for swine housing in South Dakota.

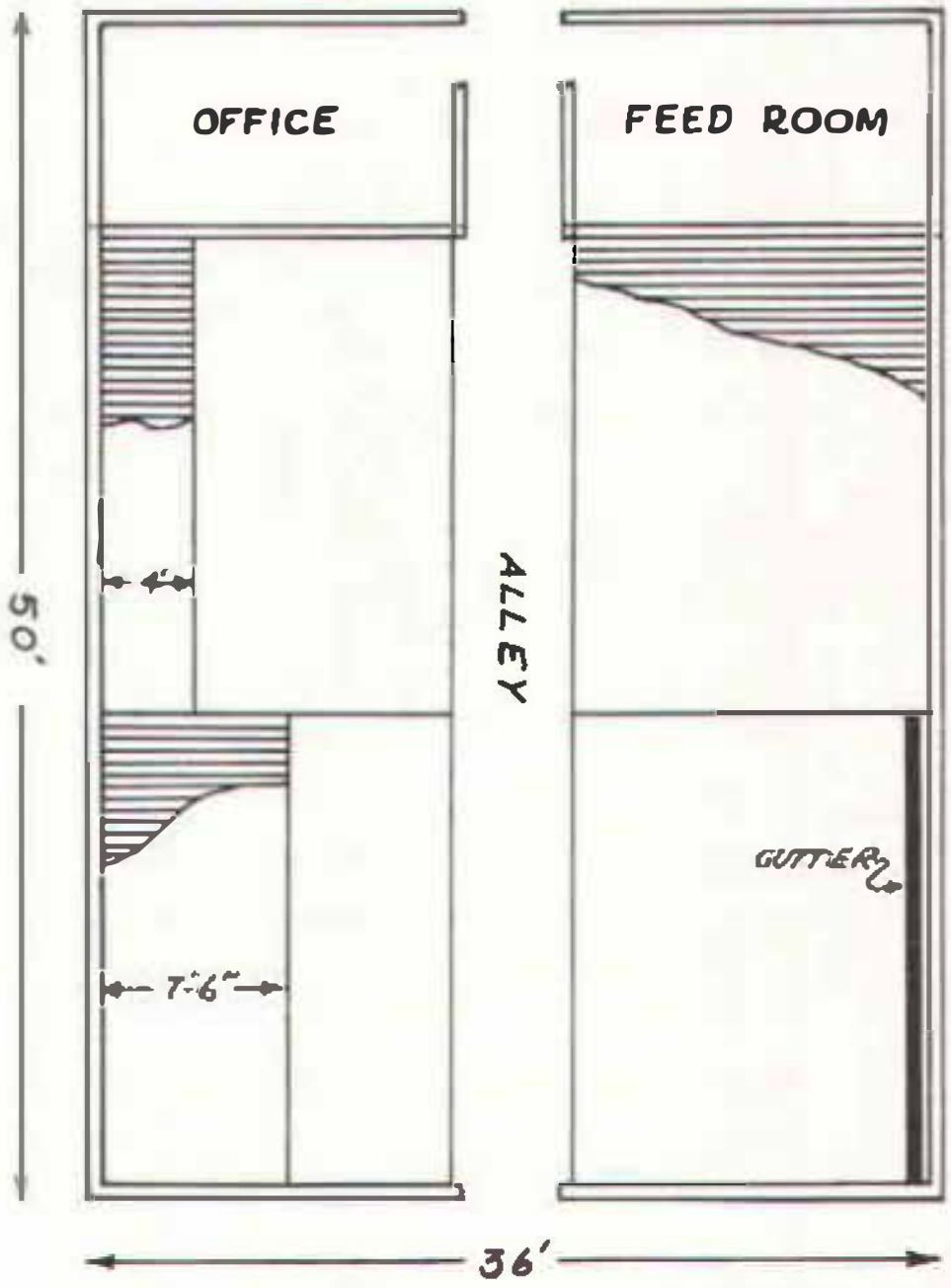
The building is 36' x 50' and includes an office and feed room as well as swine housing facilities. The pen area is 36' x 40' and contains 16 pens each 5' x 15' in size. The area is divided into four different floor types, each being 20' x 15' in size. Three of the floor types have slotted floor areas varying from 25 to 100 percent of the total floor area. The fourth section has a narrow flush gutter running across the lower end of the sloped concrete floor. Pit areas under the slotted floors are adequate to hold at least two weeks accumulation of manure. The structure is of conventional frame construction with trussed rafters and clear span roof. The sheathing is 3/8" C-C exterior grade plywood. Insulation consists of a 2-inch fiberglass blanket with vapor barrier in the walls and a 3-inch blanket of similar material in the ceiling.

Ventilation for the structure will be provided by four 16-inch fans, each having a capacity of approximately 2400 cubic feet per minute. The fans will be controlled in such a manner that the volume of ventilating air may be varied from a very small volume (as required in cold weather) to a maximum of 9600 cubic feet per minute for summer ventilation. The fans are also reversible and will exhaust air from the building in cold weather and will blow air into the structure in summer. Fresh air from the attic area will be drawn into the pen area through a ventilation duct running the length of the building.

The lagoon was designed to allow 40 square feet of surface area per animal and will be approximately five feet deep under normal operation. This design met standards that are currently accepted as adequate for a waste disposal lagoon. It is expected that the loading of the lagoon will be continuous during early periods of operation.

The research program planned for the swine facilities includes studies that touch on the engineering and economic aspects of swine housing management as well as the nutritional and feeding side of swine production and management. These topics include:

SWINE RESEARCH UNIT
FLOOR PLAN



1. Initial building costs including the comparison of the four types of floors.

2. Farrowing efficiency will be compared between various farrowing crates and farrowing pens with guard rails. Studies will also be made of the use of various materials for covering slotted floor areas during farrowing.

3. Growth and performance of swine at farrowing and during growing and finishing while on the four floor types.

4. Labor and other management requirements for buildings of this type.

5. The cost of operating the building and cost of producing market hogs.

6. Continuous temperature measurements will be made in the swine unit. Relative humidity will also be continuously measured.

7. Ventilation and heating requirements will be determined for all phases of the operation.

8. The effect of various loading rates and loading intervals of waste material from the structure into a manure disposal lagoon will be determined.

9. Management and nutrition studies with sows and growing-finishing pigs.

10. Maintaining SPF status of the herd.

The building will be in continuous use throughout the year and this will afford the opportunity to get both warm and cold weather data. The research results should prove valuable in determining the design criteria for swine buildings in South Dakota.

BEEF RESEARCH UNIT FEEDING SYSTEM

-- Harvey C. Young and Harold Winterfeld

The beef feeding facilities at the S.E.S.D. Research Farm involve the feeding of corn silage from one silo and chopped high moisture ear corn from the other silo to 100 head of cattle. Each silo has its own unloader. The silage is dropped into a cross auger which conveys the two feeds to bunk auger. By mechanically tilting the divertor board and rotating the 100 feet of tube auger the four lots of cattle can be fed different rations. Provisions for feeding the protein supplement mechanically are being worked on; at present however, the protein supplement is being fed into the auger manually.

The flexible sequence controls are programmed so as to start the feeding equipment and feed each lot its respective ration. After the feeding is completed the control shuts the equipment down. The controls are programmed each time the ration is changed.

Other than the routine maintenance and the failure of one of the relays in one of the control units, the system has been working satisfactorily.

GROWING AND FINISHING BEEF CATTLE WITH CORN SILAGE AND HIGH MOISTURE EAR CORN

-- F. W. Whetzal, J. Fredrikson and L. B. Embry

The experiment reported here was the second conducted at the experimental farm in which rations with different ratios of corn silage and high moisture ear corn were fed to beef cattle during the growing and finishing phase.

The objectives of the trial were to measure gain, feed efficiency and beef production per acre when the two feeds were fed at different levels during different phases of growth and finishing, to determine the value of using higher levels of stilbestrol during the latter half of the feeding period, and to evaluate the effects of the different treatments on certain carcass characteristics.

Procedure. One hundred Hereford steer calves that averaged about 430 pounds were allotted uniformly into 4 lots on the basis of filled weights. Shrunk weights were taken after feed and water were withheld overnight.

The following rations were fed:

Lot 1 - Corn silage limited to 30 lb. with high moisture ear corn full-fed (100 days)
Corn silage limited to 15 lb. with high moisture ear corn full-fed (112 days)
High moisture ear corn full-fed (109 days)
Lot 2 - Corn silage full-fed (100 days)
High moisture ear corn full-fed with ground alfalfa hay fed free-choice (221 days)
Lot 3 - Corn silage full-fed (100 days)
High moisture ear corn full-fed (221 days)
Lot 4 - Corn silage limited to 15 lb. with high moisture ear corn full-fed (240 days)
High moisture ear corn full-fed (81 days)

Two pounds of protein supplement were fed daily to all cattle during the entire trial with the exception of lot 2. This lot was fed 1 pound of supplement per head daily when chopped alfalfa hay was fed free choice.

During the first 100 days of the experiment vitamin A was added to the protein supplement at a level to supply 10,000 I.U. when 15 pounds of corn silage was fed (lot 4). No additional vitamin A was supplied when 30 pounds or more corn silage was fed. Vitamin A was supplied during the second 100 days at a level of 10,000 I.U. per head daily to those lots fed 15 lb. of corn silage or alfalfa hay free-choice and 20,000 I.U. when neither was fed (lot 3). After 200 days, the lot receiving alfalfa hay (lot 2) was supplied 10,000 I.U. per head daily with 20,000 I.U. supplied the other three lots during the remainder of the trial.

Stilbestrol was added to the protein supplement at a level to furnish 10 mg. per head daily to all cattle during the entire trial. During the latter part of the trial, higher levels were administered to one half of the cattle in each lot by implanting with 24 mg. of stilbestrol. The implants were made 144 days before the experiment was terminated.

The corn silage fed was produced on the farm and yielded about 12 tons of 64% moisture silage per acre. The yield was somewhat low due to drought and corn root worm damage.

The corn harvested as high moisture ear corn contained about 26.5% moisture and yielded about 54 bushels per acre on a 15% moisture basis.

The alfalfa hay was of good quality and feed requirements and costs were based on a yield of 2 tons per acre.

The cattle were fed twice daily during the trial. When the cattle were sold, final filled and shrunk weights were taken and the cattle were trucked about 40 miles to market. The cattle were sold on a carcass grade and yield basis and carcass data were obtained at slaughter.

Results. Phase 1: The results of first 100 days on trial are shown in table 34.

Average daily gains were decreased as the levels of corn silage fed were increased. However, the beef gains per acre were greater for the higher level silage rations.

With the feed prices used, the cost per hundred weight of gain was greater when the amount of corn silage fed was limited. Even though the cost per unit of gain was greater when the lower levels of silage were fed, the increased gains resulted in the initial and feed cost per hundred weight being nearly equal for all lots at the end of phase 1.

Phase 2: Results of last 221 days of the experiment are shown in table 35.

It was intended that corn silage would be fed to lots 1 and 4 during the remainder of the trial. However, due to a depleted supply of silage and because of excessive spoilage at the low rate fed, feeding was discontinued to lots 1 and 4 after 112 days and 140 days, respectively.

Daily gains were greater during the final phase for all lots except lot 4. The corn silage was of poor quality toward the end of the feeding period and the lower daily gains made by lot 4 may have been due in part to the necessity of limiting the amount of high moisture ear corn fed in order to get the steers to consume 15 pounds of the silage.

In comparing lots 2 and 3, feeding alfalfa hay increased daily gain by .11 pounds, decreased gains per acre by 88 pounds with a decreased protein supplement requirement per acre of 267 pounds.

Feed cost per hundred weight of gain ranged from a low of $14.85 when alfalfa hay was fed free-choice (lot 2) to a high of $17.19 when corn silage was fed for 140 days (lot 4).

Average carcass grades were quite similar for three lots of cattle with lot 3 grading an average of 1/3 grade lower. Dressing percent was quite similar for all lots. Implanting the steers with 24 mg. of stilbestrol increased daily gains by .07 and appeared to increase the dressing percent and lower the carcass grade by 1/6 of a grade (table 37).

Table 34. Phase 1 - 100 Days
Dec. 30, 1963 - April 8, 1964

Treatment	Corn Silage 30# H.M. Ear Corn Full-fed	Corn Silage Full-fed	Corn Silage Full-fed	Corn Silage 15# H.M. Ear Corn Full-fed
Lot Number	1	2	3	4
Number of steers [a]	25	25	24	25
Initial filled weight (lb.)	430	430	427	430
Final filled weight (lb.)	644	624	622	660
Avg. gain (lb.)	214	194	195	230
Avg. da. gain (lb.)	2.14	1.94	1.95	2.30
Avg. da. ration, lb.[b]				
Corn silage	27.2	28.7	28.5	14.7
H.M. ear corn	3.3	--	--	9.7
Protein supplement	2.0	2.0	2.0	2.0
Feed/cwt. gain (lb.)				
Corn silage	1274	1476	1462	637
H. M. ear corn	154	--	--	422
Protein supplement	92	101	101	86
Gains/A [c]	1133	1626	1642	812
Feed cost/cwt. gain, $[d]				
Corn silage	5.10	5.90	5.85	2.55
H.M. ear corn	2.16	--	--	5.91
Protein supplement	4.14	4.54	4.54	3.87
Total	11.40	10.44	10.39	12.33
Total feed cost/head $	24.40	20.25	20.26	28.36
Initial cost/head $[e]	122.55	122.55	121.70	122.55
Initial and feed cost/head $	146.95	142.80	141.96	150.91
Initial and feed cost/cwt. $	22.82	22.88	22.82	22.87

[a] One steer removed from lot 3.
[b] Corn silage contained 64% moisture and ear corn, 26.5% moisture.
[c] Based on yields: corn silage, 12 T/A; ear corn, 54 bu. with 15% moisture.
[d] Feed prices used: corn silage, $8/ton; H.M. ear corn, $28/ton and protein suppl., $90/ton.
[e] Cost of cattle, $28.50/cwt.

Table 35. Final Phase - 221 Days
April 8, 1964 - November 15, 1964

Treatments	15# C. Sil. 112 da. with H.M. E.C. FF. H.M. E.C. FF-109da.	H.M. E.C. FF. Grnd. Alf. Hay Fed F.C.	H.M. E.C. FF	15# C. sil.140 da. with H.M. E.C. FF H.M. E.C. FF 81da.
Lot Number	1	2	3	4
Animals/lot [a]	24	25	24	24
Initial filled wt. (lb.)	644	624	622	660
Final filled wt. (lb.)	1169	1168	1141	1153
Avg. da. gain (lb.)	2.37	2.46	2.35	2.22
Avg. da. ration (lb.)				
Corn silage	7.6	--	--	9.3
H.M. ear corn	18.3	19.5	19.6	18.3
Protein supplement	2.0	1.0	2.0	2.0
Alfalfa hay	--	4.6	--	--
Feed/cwt. gain, lb.				
Corn silage	320	--	--	418
H.M. ear corn	773	794	832	823
Protein supplement	84	41	85	89
Alfalfa hay		189	--	--
Gains/A [b]	526	437	525	486
Protein suppl. req./A	442	179	446	433
Feed cost/cwt. gain $				
Corn silage	1.28	--	--	1.67
H.M. ear corn	10.82	11.12	11.65	11.52
Protein supplement	3.78	1.84	3.82	4.00
Alfalfa hay[b]	--	1.89	--	--
Total	15.88	14.85	15.47	17.19
Carcass grade[c]	20.0	20.5	19.2	20.2
Dressing % [d]	62.2	61.6	61.6	61.8
Avg. selling price $	22.75	22.54	22.21	22.54
Avg. price rec'd/head $	265.90	263.26	253.40	259.94
Initial value/head $	146.95	142.80	141.96	150.91
Feed cost/head $	83.37	80.78	80.29	84.75
Total cost	230.32	223.86	222.25	235.66
Returns over initial & feed cost	35.58	39.40	31.15	24.28

[a] One steer died in lots 1 and 4.
[b] Based on alfalfa hay yield of 4 tons per acre and valued at $20/ton.
[c] Carcass grade score: choice - = 19; choice = 20; choice + = 21.
[d] Dressing percent equal hot carcass weight minus 2%.

Table 36. Summary of Phases 1 and 2 - Dec. 30, 1963 to Nov. 15, 1964 (321 days)

Treatments [a]	30# C.Sil. (100 da.) 15# " (112 da.) H.M. E.C. FF Entire Trial	C.Sil. FF(100 da.) H.M. E.C. FF with Alf. Hay Fed F.C. (221 da.)	C.Sil. FF(100 da.) H.M. E.C. FF (221 da.)	15# C. Sil. (240 da.) H.M. E.C. FF Entire Trial
Lot Number	1	2	3	4
Number steers	24	25	24	24
Avg. gain/steer (lb.)	737	738	706	720
Avg. da. gain/steer (lb.)	2.30	2.30	2.20	2.24
Avg. da. ration/head (lb.)				
Corn silage	13.6	8.9	8.9	10.9
H.M. ear corn	13.7	13.4	13.5	15.7
Protein suppl.	2.0	1.3	2.0	2.0
Alfalfa hay	--	3.2	--	--
Feed req./head (lb.)				
Corn silage	4366	2857	2857	3499
H.M. ear corn	4398	4301	4334	5040
Protein supplement	642	417	642	642
Alfalfa hay	--	102.7	--	--
Acres required/steer	1.19	1.36	1.11	1.30
Gains/A (lb.)	841	735	901	813
Prot. suppl. req./A (lb.)	733	415	819	725
Avg. init. and feed costs $	230.32	223.86	222.25	235.66
Avg. selling price/head $	265.90	263.26	253.40	259.94
Avg. returns/head over initial feed costs	35.58	39.80	31.15	24.28

a Two lbs. protein supplement/head daily fed to all lots except lot 2 which was fed 1 lb. daily when alfalfa hay was fed free-choice.

Table 37. Comparison of Control and Implanted Cattle

Treatment	Control	Implanted
Number steers [a]	48	48
Avg. initial filled weight	846	841
Avg. gain	311	321
Number days	137	137
Avg. daily gain	2.27	2.34
Dressing %	61.5	62.2
Carcass grade	20.2	19.7

a One control steer had a severe infection and was not included in summary.

Summary of Trial. A summary of the trial is shown in table 36.

Average daily gains were the same for lots 1 and 2. Feeding chopped alfalfa hay free choice during the last 221 days (lot 2) increased the over-all average daily gain by .1 pound (lot 3) but lowered the production of beef per acre by 166 pounds.

Average returns per head over initial cost per head and feed costs were greatest for lot 2 and lowest for lot 4. The lower returns per head shown by lot 4 were probably due in part to the feeding of low quality silage for a greater length of time.

CONTROL OF CATTLE GRUBS

-- Paul H. Kohler

In 1963 and 1964, late season treatments for the control of cattle grubs were made on calves allotted for nutrition studies at the S.E.S.D. Research Farm. Half of the calves of each lot were treated. Table 38 summarizes this work.

Table 38. Grub Counts for 1963 and 1964 Cattle Grub Control Experiment

Treatment	No. of Calves	Dosage	Grubs per Calf (Avg.)		No. Calves Infested		Grub Reduction (%)		Avg. Da. Gain * (Lbs.)
1963 Grub Count Dates:			2/15	3/25	2/15	3/25	2/15	3/25	
Co-Ral 1 mg./kg./day for 10 days in feed (Jan. 4-13, 1963)	50	10 mg./kg.	4.6	12.5	34	45	0	0	2.35 *
Untreated	50	---	4.5	12.4	35	44	-	-	2.28 *
1964 Grub Count Dates:			2/20	4/6	2/20	4/6	2/20	4/6	
Co-Ral 4% wt/vol pour-on 1 oz/head treated Jan. 6 & Jan. 31, 1964	50	2 oz/calf	2.3	8.5	33	41	72	69	2.07 **
Untreated	50		7.4	23.6	49	50	--	--	2.10 **

* 84 days post treatment.
** 100 days post treatment.

ELECTRIC HOUSE HEATING

-- Harold Winterfeld and
Harvey Young

The summary of the studies on the electric house heating for the 1963-64 heating period is included in tables 40 and 42. The amount of installed electric heating and the total area of floor space remained the same as for the 1961-62 and 1962-63 heating season.

For the months included in the 1963-64 heating season there were 5960 degree days. The total electric energy used for heating was 29,676 kilowatt hours. This is some 4500 kilowatt hours and 454 degree days less than the 1962-63 period. The summary is shown in table 39,

The kilowatt hour usage for the major appliance used in the home is summarized in table 41.

Table 39.

ELECTRIC HOUSE HEATING, 1962-1963 HEATING SEASON

S.E.S.D. RESEARCH FARM - CENTERVILLE

1.	Square feet area of first floor	1238
2.	Square feet area of second floor	1138
	Total square feet	2376
3.	Ceiling height first floor	9 feet
4.	Ceiling height second floor	8 feet
	Total cubic feet	20,256
5.	Degree days for months shown (Taken at Research Farm)	5960
6.	Total kilowatt hours used for heating	29,676
7.	Cost of heating	$445.14

Remodeled outside walls of kitchen and utility rooms were insulated with 2-inch blanket. Attic has 4" fill insulation over second floor ceiling. Rest of house is back plastered, no insulation.

A plastic covering was used on the outside of the house at the foundation for the 1962-1963 heating season.

Table 40. Electric House Heating, 1963-1964 Heating Season -- Second Floor Rooms

S.E.S.D. Research Farm, Centerville

Meter No.	Room	Sq.Ft. per Room	July Degree Days 0	Aug. D.D. 12	Sept. D.D. 44	Oct. D.D. 153	Nov. D.D. 742	Dec. D.D. 1559	Jan. D.D. 1258	Feb. D.D. 1092	March D.D. 1100	Total Kilowatt Hours Per Room For Season
			Kilowatt Hours Used									
1	#6 Bedroom	176	0	0	0	98	235	192	93	57	1	676
2	#5 Bedroom	120	0	4	0	30	104	328	230	131	143	970
3	Upstairs Hall	257	0	0	0	0	92	636	438	394	469	2029
4	Upstairs Bath	62	0	0	0	28	133	283	260	94	236	1034
6	#1 Bedroom	116	0	0	0	24	205	410	131	165	165	1100
7	#2 Bedroom	125	0	0	0	29	4	13	-	-	-	46
8	#3 Bedroom	164	0	16	21	51	295	560	417	348	346	2054
9	#4 Bedroom	120	0	2	29	74	380	635	445	168	342	2275
	Total Kilowatt Hours	1140	0	22	50	334	1448	3057	2014	1557	1702	10,184

Table 41. Appliance Kilowatt Hour Usage, S.E.S.D. Research Farm

For Months of: July, Aug., Sept., Oct., Nov., Dec.,- 1963
Jan., Feb., March - 1964.

Meter No.	Appliance	July	August	September	October	November	December	January	February	March	Total Kilowatt Hrs/ Appliance For Mo.Shown
		Kilowatt Hours Used									
21	Deep Freeze	268	221	161	233	180	186	181	167	175	1772
22	Refrigerator	216	190	141	209	164	161	163	147	162	1553
23	Range	126	246	26	163	123	134	140	114	127	1199
24	Dish Washer	35	36	25	40	30	33	33	24	27	283
26	Pump	12	11	7	10	10	9	8	6	15	88
27	Clothes Dryer	130	121	92	137	126	156	134	120	142	1158
28	Water Heater	544	515	401	571	529	611	572	504	574	4821
	Total Kilowatt Hours	1331	1340	853	1363	1162	1290	1231	1082	1222	10,874

Table 42. Electric House Heating, 1963-1964 Heating Season -- First Floor Rooms

S.E.S.D. Research Farm, Centerville

Meter No.	Room	Sq.Ft. per Room	July Degree Days 0	Aug. D.D. 12	Sept. D.D. 44	Oct. D.D. 153	Nov. D.D. 742	Dec. D.D. 1559	Jan. D.D. 1258	Feb. D.D. 1092	March D.D. 1100	Total Kilowatt Hours Per Room For Season
			Kilowatt Hours Used									
5	Living	248	0	0	0	50	704	798	407	461	217	2637
10	Front Hall	120	0	0	0	0	2	259	160	181	180	782
11	Downstairs Bath	46	0	2	9	7	138	252	202	210	218	1038
13	Dining	195	0	0	28	120	834	1406	900	899	1041	5228
14	Utility	81	0	0	0	3	49	121	43	0	20	236
16	Kitchen	208	0	2	35	83	292	687	630	513	495	2737
17	Entry	30	0	0	0	13	120	365	285	253	244	1280
18	Hall	100	0	0	0	0	139	140	111	1	13	404
19	Basement	196	0	0	0	0	24	67	123	0	0	214
20	Family	212	4	32	11	256	5961	988	937	962	1150	4936
Total Kilowatt Hours Used per Month		1240	4	36	83	532	2898	5083	3798	3480	3578	19,492

THE SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM CORPORATION

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