Agronomy Pamphlet #72
ANNUAL PROGRESS REPORT December 1962

SOUTH EAST SOUTH DAKOTA EXPERIMENT FARM
Beresford, South Dakota

INTRODUCTION

On December 4, 1962, S.E.S.D. Experiment Farm was designated as the official volunteer weather observer for this area. This work is in cooperation with the U. S. Department of Commerce Weather Bureau and the State Climatologist of the Agricultural Engineering Department of S. Dak. State College. It is a program of continuous observation and recording of climatological conditions as they effect this geographical area. Proposals are being made to expand and broaden the ecope of these observations to meet the increaeing demands of technical research as well as to serve as a practical supplement to modern farming methods.

Thie pamphlet includes a review of the all-electric aspect of heat and power which is being incorporated into the expaneion of farmstead research and demonstration facilities. In cooperation with East River R.E.A. and with area electrical equipment distributors, a demonstration unit of kitchen and utility room appliances have been installed in a remodeled portion of the farm home. This ie not a model home open to the public. It is a demonstration of a phase of family living which is available for observation to interested groups by scheduled tours of the modern kitchen and utility room. For the calendar year of 1963, tour days are designated as the Thursday and Friday following the third Sunday of each month. Tours can be scheduled by contacting the superintendent by letter or phone.

THE SOUTHEASTERN SOUTH DAKOTA EXPERIMENTAL FARM BOARD

Officers	County	Address
Ervin Clelland, President	Clay	Vermillion
John Walker, Vice President	Turner	Parker
Bernard Uthe, Secretary	Lincoln	Canton
Lawrence Swaneon, Treasurer	Lincoln	Canton
Ercil Bowles	Lincoln	Centerville
Charles Ahrens	Chas. Mix	Wagner
Carl Wright	Clay	Volin
Leon Jorgenson	Hutchinson	Freeman
Calvin Mettler	Hutchinson	Menno
Eric Thormodsgaard	Lincoln	Hudson
Leonard Dailey	Union	Jefferson
Wesley Larsen	Union	Beresford
William DeJong	Yankton	Volin
Lawrence Holzbauer	Chas. Mix	Wagner

Jake Fredrikson, Superintendent, SESD Experiment Farm.

This report was prepared by the staff members of South Dakota State College as indicated in each section, and assembled by Q. S. Kingsley, Agronomy Department.

BRIEF HISTORY

This report marks the completion of the second year of research at this farm. Experimental work was continued in the areas of fertility and cultural practices, plant disease control, crop management, and crop variety testing. Investigations were expanded into corn plant populations, potassium deficiency, plant breeding and genetic studies on corn, grasses, legumes, sorghum and soybeans.

Livestock research was initiated in the spring of 1962 when 106 feeder pigs were placed in three temporary buildings constructed for this purpose. Results of this trial are summarized in this report. Ninety (90) fall pigs have been started as a continuation of this experiment.

Facilities for 100 head of cattle have been made ready by the erection of two 18' x 50' silos and the remodeling of an existing 38' x 100' cattle barn. A group of working pens which will include a livestock scale have also been built. Feeding equipment is designed to include as much automation as possible in research work where feed consumption must be accurately controlled and recorded.

The availability of the legislative appropriation on July 1 of 1961 made it possible to initiate an equipment purchasing program. This program has resulted in the acquisition of the necessary power and machinery to operate the entire half section farm as one unit.

The south quarter of the farm 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 experimental projects. Surplus grain from the agronomy plots as well as the filler areas on the south quarter are also utilized by the livestock feeding program.

Production from the 1962 crop year yielded the following feed and forage:

Corn silage	300 tons
Ground ear corn silage	6,000 bushels
Ear corn	6,400 bushels
Oats	1,600 bushels
Alfalfa hay	60 tons
Brome hay	300 tons

All crops on the north quarter were fertilized according to soil test recommendations. The rates used were:

Corn: 60 lbs. nitrogen and 40 lbs. phosphate, plowed down on spring plowing and disked in on fall plowing.
Oats as nurse crop for alfalfa: 15 lbs. nitrogen and 60 lbs. phosphate, drilled with the seed.
Five year old alfalfa: 40 lbs. phosphate, broadcast.

Plans for 1963 cropping program on the north quarter call for 33 acres of first year alfalfa hay, 17 acres of oats as nurse crop for alfalfa, and 105 acres of corn. A continued fertility program will be applied.

As the above production chart indicated, the 1962 cropping season was very favorable for corn and hay production, and moderately favorable for oats production.

Precipitation for the April through October growing season totalled 25.22 inches, which is an increase of 7.12 inches over the 1961 season. The rainfall distribution was as follows:

April.....	1.81 in.	August.....	3.60 in.
May.....	4.34 in.	September.....	3.01 in.
June.....	5.98 in.	October.....	.76 in.
July.....	5.72 in.	Total.....	25.22 in.

Temperatures in general were not extreme and difficulty of cultivation due to wet ground was confined to a small number of insignificant area. Warm and dry weather in late September and through October greatly aided the maturity of corn and sorghum.

NOTE: This is a progress report and therefore the results presented are not necessarily complete nor conclusive. Any interpretation given is strictly tentative because additional data resulting from continuation of these experiments may result in conclusions different than those of any one year.

FOREWORD

All experiments and work on the SESD Experimental Farm were conducted with the aid of Superintendent J. F. Fredrikson and his employees.

There are other fields of research which are not covered by this pamphlet, in plant breeding and genetic studies. These areas of research are corn by D. B. Shank and D. W. Beatty; grasses by J. G. Ross; legumes by M. D. Rumbaugh and sorghum and soybeans by C. J. Franzke.

TABLE OF CONTENTS

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

Q. S. Kingsley

Experiment #1

Objectives of Experiment

1. How much tillage is actually necessary for satisfactory corn production?
2. With less tillage and less nitrogen release will fertilized, minimum tillage plots yield more than fertilized, conventionally planted plots?
3. Evaluate various methods of seedbed preparation and planting, also varied cultivation methods after planting.

Table 1. Minimum Tillage of Corn

Treatment	Fertility*	Bu/A
1. Hard ground listing	80-28-0	95.4
2. Wheel track planting	80-28-0	102.0
3. Regular plant, spring plow	0- 0-0	94.7
4. Stubble mulch, Noble Blade	80-28-0	104.3
5. Spring list after fall subsoiling	80-28-0	93.8
6. Plow-plant	80-28-0	115.6
7. Loose ground listing, fall plow	80-28-0	86.2
8. Regular plant, fall plow	80-28-0	108.2
9. Roto tiller, regular plant	80-28-0	95.7
10. Regular plant, spring plow	80-28-0	103.5

LSD - 9.05

* The 80-28-0 is total fertility applied which included 60# of 18-46-0 applied as starter
70# of liquid nitrogen as side-dress (32%N)

The different methods of planting and seedbed preparation are listed under treatment in table 1. The hard ground listed plots had no seedbed preparation prior to the listing operation. With the wheel track planting, the corn was planted in fresh plowing in the tractor wheel tracks. In the stubble mulch plots, a wide V blade was used for tillage to keep the oats straw and stubble on the surface. The object of this treatment was to see if the organic mulch on the surface would be effective in reducing evaporation and in this way conserve water and increase corn yields. Subsoiling was done with a chisel that ran approximately 22 inches beneath the surface. With these heavier soils, considerable interest has been shown regarding the use of a chisel to break up compact substrata. The plow-plant method requires some explanation. This is another "once over" method where a one row planter was bolted on the rear of a mounted plow so that the plowing and planting was done in a single operation. The roto tiller prepared the seedbed in one operation and mixed the stubble through the soil to the cultivated depth.

It should be noted that fertilizer application machinery was improvised or adapted so that a starter fertilizer could be applied for each planting method. Some of the machinery adaptations are not perfect, to be sure, but they did work satisfactorily. In general, the corn yields with minimum tillage methods were excellent in 1962, a year of very favorable weather. Some water accumulated in the lister furrows and may be a factor in lowering this years yields, but could be an advantage during dry periods. The soil in this area of the farm is evidently fairly high in fertility, enough to give 94.5 bushels per acre in check plots with 12,000 plants per acre. It should be emphasized that one year's results with the unusually favorable conditiions of 1962 should not be taken as typical.

Experiment #2

Objectives of Experiment

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

Table 2. Crop Income for 1962 SESD Experiment Farm

Crop	Bu/A	Price per bu.(2)	Value of Grain	Cost of Machine Operation	Seed Cost	Fertilizer Cost	Total Cost*	Net Return/A*
Corn 0-0-0	93.4	$ .93(1)	86.86	20.31	2.55		22.86	64.00
50-20-0	98.3		91.42	20.91	2.55	8.05	31.51	59.91
Oats 0-0-0	52.8	.68	35.90	7.44	2.80		10.24	25.66
20-20-0	64.8		44.06	8.38	2.80	4.30	15.48	28.58
30-15-0	66.3		45.08	8.38	2.80	5.10	16.28	28.80
Soybeans 0-0-0	35.3	2.25	79.43	14.26	3.45		17.71	61.72
75# 18-46-0	36.9		83.03	14.86	3.45	4.60	22.91	60.12
Sorghum 0-0-0	67.9	.784	53.23	14.74	1.20		15.94	37.29
50-20-0	95.5		74.87	15.34	1.20	8.05	24.59	50.28

(1) Corn at 15.5% moisture
(2) December 4, 1962, Farmers Elevator, Vermillion, S. Dak.
* Does not include cost of land use.

This experiment was set up to operate as seven different rotations varying from continuous corn to a legume-grain sequence. Until the experiment has made one complete cycle, the resultswill be reported on an individual crop basis rather than as a rotation. The cost of machine operation was based on average custom rates of farmers and machinery dealers throughout the state. This would include labor, fuel, repair and so on.

Fertilizer for oats was applied broadcast and disked in. For corn, the fertilizer was broadcast and plowed under. The 1962 net returns for corn were about twice those obtained from raising oats. However, oats returned approximately $7.00 for $4.30 invested in fertilizer. Yield increases of corn for the fertilizer treatment were not as large in this experiment as in some of the others, but in 1962 sorghum produced the greatest return for every dollar spent.

Each year may produce different results, and no definite conclusion should be made till after a complete rotation cycle.

Experiment #3

Objectives of Experiment

1. Is drilling the fertilizer with the oats better than broadcasting it?
2. What are the optimum fertilizer rates and ratios for corn and oats?
3. Study residual effect of corn fertilizer on oats and oats fertilizer on corn.

Table 3. Fertilizer Rates and Ratios on Oats
Fertilizer Broadcast Versus Fertilizer Drilled with Seed

Fertility Rate	Fertilizer Broadcast Bu/acre	Fertilizer Drilled with Seed Bu/acre	Increase for Drilled over Broadcast
0-0-0	45.9	45.9	--
20-0-0	49.2	54.9	5.7
40-0-0	52.0	58.6	6.6
40-20-0	56.8	66.9	10.1
40-40-0	57.0	68.2	11.2
60-40-0	64.0	69.9	5.9
Average	54.2	60.7	

There were significant yield differences at the 5% level for fertilizer treatments and alao for methods of application. Yield increases in favor of drilled over the broadcast method were greater when both nitrogen and phosphorus were applied, compared to nitrogen alone except at the highest rate of application (60-40-0). No stand counts were made to see if germination was adversely affected at this high rate of application.

About aa much oats was obtained from 40-20-0 applied with the seed as from 60-40-0 applied broadcast.

The residual effect of these fertilizer rates and ratios will be measured by corn in 1963.

Table 4. Fertilizer Rates and Ratios on Corn

Fertility Rate	Bu/acre	% Protein
0-0-0	83.6	8.93
40-0-0	105.6	8.35
40-60-0	106.6	8.64
80-0-0	94.5	9.22
80-60-0	104.3	8.99
120-60-0	114.3	9.34

LSD - 11.1

The fertilizer for this experiment was broadcast and plowed under, and the residual fertility from this year's corn crop will be measured by oats in 1963.

There was a strong response to nitrogen in this experiment, but 40 pounds of nitrogen per acre was enough. Heavier rates of nitrogen did not produce an economic increase in yield. Phosphorus did not have much influence on yield until the higher rates of nitrogen were applied.

Table 5. Fertilizer Rates and Ratios
Residual Fertility from Oats for Corn

Oat Fertility 1961	Average Oat yield Bu/acre 1961	Corn Bu/acre 1962
0-0-0	29.6	55.3
20-0-0	38.6	63.1
20-20-0	39.5	65.5
40-20-0	43.2	71.6
40-40-0	44.1	66.8
60-40-0	46.5	63.8
		NS

Table 6. Fertilizer Rates and Ratios
Residual Fertility from Corn for Oats

Corn Fertility 1961	Average Corn Yield Bu/acre 1961	Oats Bu/acre 1962
0-0-0	64.1	38.8
40-0-0	76.5	45.4
40-60-0	81.6	49.2
80-0-0	81.1	53.1
80-60-0	77.6	52.6
120-60-0	86.0	65.4
		LSD = 14.3

The 1962 crop season is the first measure of residual fertility left over from oats and corn planted in 1961. The area covered by this study is located on somewhat poorly drained soil, and was also subjected to run off from other areas of the farm. Each year the residual study moves northward, and by the time this experiment is completed every area will be studied. Tables 5 and 6 present the 1961 crop and the 1962 crop used to study the residual effect of fertilizer. The 40-20-0 fertilizer ratio (table 5) applied on oats in 1961 had the most beneficial effect on bushels of corn produced from the residual effect. It was at this ratio where oat yields leveled off for the most economical gain. Table 6 indicates the economical level of 40-60-0 for corn in 1961, but the residual from 120-60-0 produced the maximum yield of oats in 1962. Considering these data for comparative means suggest a more complete usege of 40-60-0 and an application of fertilizer every year to maintain top yields.

F. E. Shubeck

Experiment #4

Objectives of Experiment

1. Evaluate the use of starter fertilizer and side-dressed nitrogen on corn.
2. Ia the practice worthwhile of including a small amount of potassium in the starter "for insurance" against possible potassium deficiencies in boarderline response areas?

Table 7. Effect of Starter Fertilizer With Potash and Side-dressed Nitrogen on Yield of Corn.

Fertilizer treatments		Bu of #2 Corn per Acre	Bushels Increase over check	% water in ear at harvest	Tons of stover at 65% moisture	Number of leaning stalks in 80' of row
110# Starter/A of each of the ratios listed	Side-dress					
0-0-0	None	84.5	--	35.9	4.8	8.2
11-48-0	None	87.6	3.1	35.4	5.3	7.8
11-48-20	None	93.3	8.8	33.9	5.7	9.5
11-48-0	70# N/A	122.3	37.8	36.3	5.8	8.3
11-48-20	70# N/A	126.6	42.1	35.3	6.5	9.8
0-0-0	70# N/A	118.0	33.5	36.2	6.2	8.3

The biggest yield increases were due to the side-dressed nitrogen. Starter fertilizer also appeared to have a beneficial effect on yield. For the growing season of 1962, with above average rainfall, the inclusion of a small amount of potassium in the starter fertilizer appeared to be "good insurance". The yield increases from potassium were not statistically significant at the 5% level, however, and another year with a different amount and distribution of rainfall may give different results.

Most of the differences in per cent water in ears at harvest were minor. This corn was planted early and it was fully matured before it was picked.

There were substantial increases in tons of stover at 65% moisture, for all fertilizer treatments compared to that of the check plot.

The number of stalks leaning more than 20° from vertical were counted in each plot to see if the fertilizer treatments had a beneficial effect on strength of stalks for prevention of lodging. No major differences were detected.

Experiment #5
(Performed in cooperation with A. R. S. from Morris, Minn.)

Objectives of Experiment

1. What corn plant population is the best for this soil and climate?
2. With greater plant populations, what fertilizer rates and ratios should be used?
3. In an area subject to periodic droughts, does ear size provide an accurate basis for determining the optimum number of plants per acre?

Table 8. Effect of Corn Plant Populations and Fertilizer on Yield of Corn

Plants per acre	Fertilizer treatment N - P_2O_5 - K_2O	Bu/acre No. 2 Corn
6,000	100 - 80 - 0	65
9,101	38 - 31 - 0	89
9,101	38 - 129 - 0	87
9,101	161 - 31 - 0	88
9,101	161 - 129 - 0	88
14,000	0 - 0 - 0	109
14,000	0 - 80 - 0	106
14,000	100 - 0 - 0	108
14,000	100 - 80 - 0	110
14,000	100 - 160 - 0	109
14,000	200 - 80 - 0	104
18,900	38 - 31 - 0	103
18,900	38 - 129 - 0	120
18,900	161 - 31 - 0	114
18,900	161 - 129 - 0	109
22,000	100 - 80 - 0	116

There was enough fertility at this location of the farm to produce 109 bushels of corn with 14,000 plants per acre and no fertilizer added. Contrast this with the responses obtained in the preceding experiment with starter and side-dressing nitrogen.

In comparing the responses of the two experiments, it should be remembered that in the population study, all the fertilizer was broadcast and disked in, and an earlier maturing hybrid was used. The amount of moisture in ears at harvest was about 35% for the starter side-dress experiment but for the population experiment the ear moisture was approximately 20 to 25% at harvest.

The major influence on corn yield was due to the different plant populations as shown in figure 1.

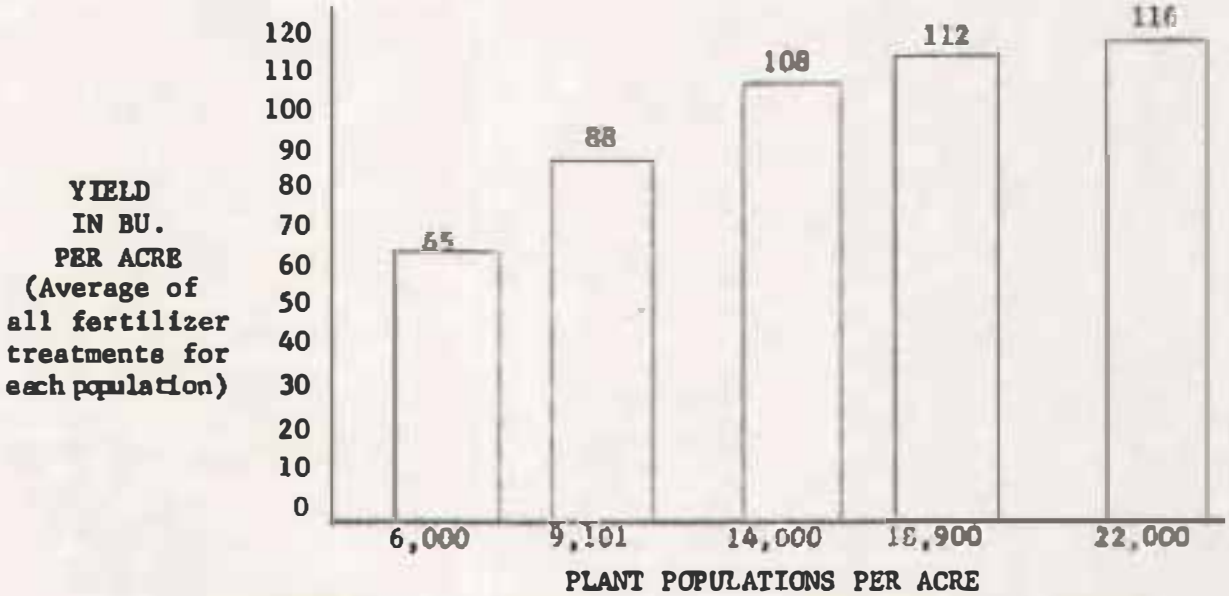

FIGURE 1. Influence of Plant Populations on Yield of Corn.

With the favorable climate of 1962, the heaviest plant populations gave the greatest yield. Above 14,000 plants per acre, the increases in yield were smaller for each increase in plant population than those below 14,000.

In a year of unfavorable climate, similar experiments in Brookings, Codington and Grant counties gave a yield decrease with increasing plant populations. (See Agronomy Pamphlet #63.)

The ear size was profoundly effectdd by plant populations as shown in the figure 2.

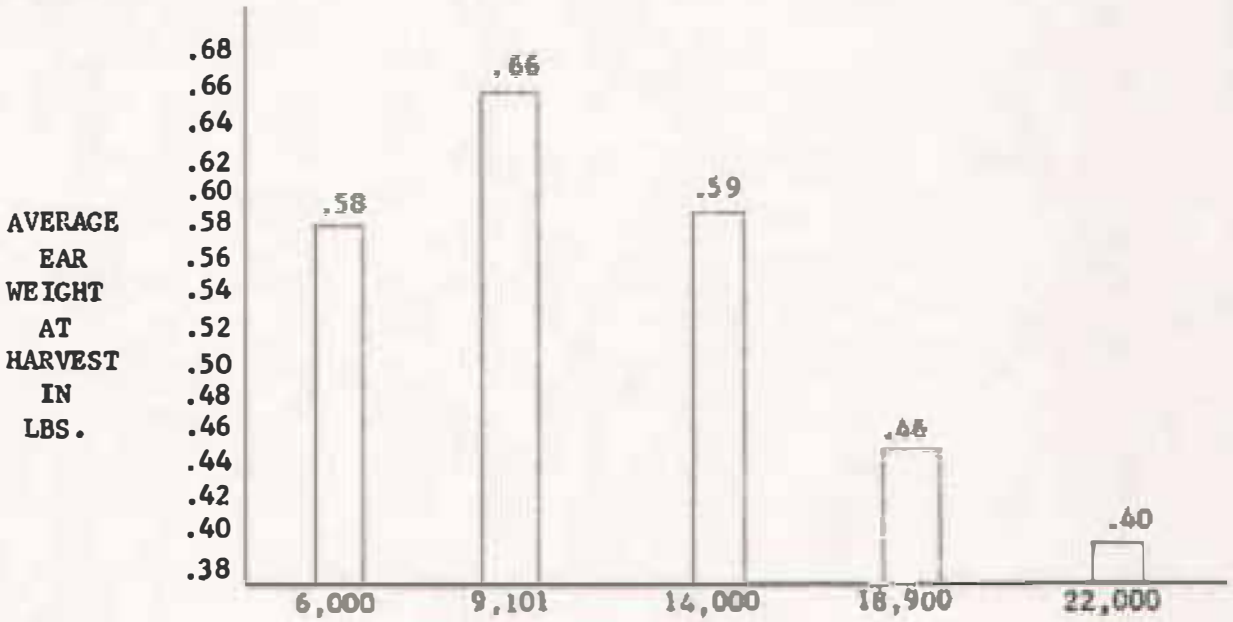

FIGURE 2. Effect of Plant Population on Ear Size.

The above data illustrates that the field with the biggest ears will not always yield the most corn.

SOIL POTASSIUM OF SOUTHEAST FARM

Dwight Hovland

Experiment #6

During the 1961 growing season some agrologists observed what they considered potassium deficiency symptoms in corn plants that were growing on some of the soils of the Southeast Farm. Corn was planted on these soils again in 1962. The soils were divided into plots and potassium fertilizer was added to the soils on some plots while on other plots no potassium fertilizer was used. Thus, comparison of corn produced on these soil fertility plots should aid in determining if availability of soil potassium is limiting corn growth.

Analysis of variance showed no significant differences in the 1962 corn fruit yield on these soil fertility plots, however, the results do warrant further study.

A summary of the yields is presented in table 9.

Table 9. Influence of Potassium Fertilizer on 1962 Corn Fruit Yield of Some Well-drained Soils and Some Poorly-drained Soils of the Southeast Farm.

Soils	Treatments*		
	a	b	c
	(bu/ac)		
Poorly-drained	51	52	56
Well-drained	90	92	88

*Treatment Key: a = no potassium fertilizer
b = 125 pounds of K broadcasted per acre (250 lb. 0-0-60 per acre)
c = 12.5 pounds of K hilldropped per acre (25 lb. 0-0-60 per acre)

CORN AND SORGHUM FORAGE STUDIES

Q. S. Kingsley

The varieties and combinations tested in table 10 were used as an observation, but the trials should be continued to place proper value on corn and sorghum. The selection of row spacing is important when cultivations and harvesting methods are considered. Adequate sub soil moisture is a necessity when using the higher seeding rates.

Table 10. Performance of Annual Forages S.E.S.D. Expt. Farm, 1962

Environment:
Fertilizer - 60-40-0
Populations and seeding rates:
Corn: 40" rows - 12,000 per A
20" rows - 22,000 per A
Sorghums and Sudan
40" rows - 6# per A
20" rows - 12# per A
Planting date: June 18
Harvest date: Sept. 12
Approximate sorghum seeds per pound 22-25,000

Crop	Yields, Tons Per Acre			
	40 in. rows		20 in. rows	
	Silage wt.	Air Dry wt.	Silage wt.	Air dry wt.
Rancher Sorghum	21.1	6.2	28.3	6.5
Piper Sudan	14.1	4.3	14.7	4.3
Hybrid Sudan	24.6	7.4	28.1	7.1
S. D. 252F	13.1	3.4	13.6	3.5
Volkman S-100	20.4	8.4	22.5	7.4
DeKalb SX-11	26.6	7.4	27.9	7.4
Rox Orange	25.1	7.4	22.7	4.6
Frontier FS210	24.9	6.8	26.0	6.0
Hydan 38	24.5	7.7	28.0	8.1
Sudan & Soybeans	13.0	4.4	14.6	5.0
H. S. Corn	24.9	6.9	29.0	6.3
S. D. 622 Corn	20.7	5.3	24.9	6.7
Filler Mixture	23.0	7.3		

CORN PERFORMANCE TRIALS, AREA E - 1962

J. J. Bonnemann

This is the second year the Corn Performance Trials have been under the supervision of Statewide Services at the SE Farm. Varieties tested were those entered by commercial producers of seed corn and checks developed by Experiment Stations. The trials are conducted on a fee basis and including checks, 36 entries were under trial.

The corn was planted May 17 and harvested October 25. Yields ranged from 131.3 to 98.0 bushels per acre. Very little lodging occurred. Moisture in the ear corn ranged from 24.0 to 34.5 percent. The ear corn averaged 28.8 percent moisture for all varieties.

Two year averages are given for those entries under trial in both 1961 and 1962.

Table 11. Corn Performance Trials, Area E, SE Farm, 1962

Hybrid or Variety	Yield Bu/ac	Performance rating	Moisture at harvest %	Stalk lodging %	1961-1962 Averages Yield Bu/ac	% Moisture
DeKalb 3 x 1	131.3	1	28.1	0		
Pioneer 318-A	127.5	2	28.3	0		
Dekalb 661	120.3	6	28.0	1		
Disco 112-A	120.1	4	25.0	0	102.4	23.4
Iowa 5063	119.3	3	24.2	1		
Cargill 259	118.6	7	26.8	0		
Green Acres 446	118.0	11	29.5	0	100.3	29.3
Pioneer 329	117.8	10	29.3	0	102.9	27.6
Sokota 619	117.4	5	25.2	0		
Sokota 645	117.4	8	27.8	0		
Pioneer 328	116.5	12	28.5	0	101.5	27.7
DeKalb 3 x 2	116.1	15	30.4	0		
DeKalb 488	115.3	16	30.3	0		
Disco 115-A	114.5	13	27.4	0		
SD Exptl 38	112.7	9	24.0	0		
Cargill 270	112.5	20	29.0	0		
N2142A	112.2	17	28.0	1		
Pioneer 362	111.6	19	27.9	0	99.4	25.0
Pride 78A	111.0	27	34.0	1		
Pioneer 3618	110.9	18	26.9	0		
SD Exptl 36	110.4	14	24.3	0		
Green Acres 004	110.2	25	31.4	0	96.9	29.3
Pioneer 3445	109.4	23	29.0	0		
SD 622	109.0	21	28.4	2	98.2	26.9
Pride 66A	108.7	24	29.7	1		
SD Exptl 27	108.1	22	27.6	2	99.0	24.6
SD 604	106.4	26	28.6	1	96.3	25.9
Curry's C-62	106.1	28	29.6	1	92.2	27.8
DeKalb 633	105.0	33	34.5	1		
DeKalb 444	104.7	29	29.2	0		
Cargill 285	103.8	35	33.9	0		
SD Exptl 35	102.9	30	29.0	0		
SD 620	101.5	34	31.3	0		
DeKalb 440	100.7	31	29.0	2		
Sokota 625	100.3	32	29.6	0		
Green Acres 614	98.0	36	31.7	1		
Average	111.8		28.8			
L.S.D.-.05	13.0					

STANDARD VARIETY TRIALS OF SMALL GRAIN, SE FARM, 1962

J. J. Bonnemann

Testing of standard varieties of spring grain was conducted by Statewide Services in 1962. Five-year averages are given where available as the plots were conducted in the same manner as in previous years from 1958-60 at Menno and 1961 at the SE Farm.

Diseases, especially barley yellow dwarf, reduced the yield greatly during 1962. The test weights were also very low for most of the entries.

The recommended oat varieties Minhafer and Clintland 60 performed satisfactorily this past season. Andrew, Mo. 0-205 and Minhafer have also yielded well over the past five years.

Liberty barley produced well in 1962 and has performed quite satisfactorily for the past several years.

Selkirk and Rushmore spring wheat have been satisfactory for yield over the past few years. Rushmore is not recommended for the area as diseases, especially rusts, are of greater intensity in this area of the state. Pembina is considered quite similar to Selkirk in yield potential and has some higher quality characteristics. Stem rust, in addition to barley yellow dwarf caused very serious reductions of wheat yields and test weight.

SMALL GRAIN VARIETY TESTING, SE FARM, 1962

Table 12. Small Grain Variety Testing.

	Maturity	Yield, Bu/A. 1962	Yield, Bu/A. 1958-62[a]	Test Weight
Oats				
Dupree	E	56.8		31
CI7399	ML	54.3		33
Minhafer	E	53.9	51.9	33
Osage	M	53.7		31
Portage	L	50.9		32
Marion	M	50.6	50.2	31
Tonka	E	49.5		36
CI7473	L	48.4		31
Waubay	M	47.1	45.0	32
Garry	L	45.1	49.9	26
Clintland 60	ME	44.7	44.7	33
Dodge	ML	44.1		32
Andrew	E	43.7	54.1	32
Ransom	E	42.2	45.9	31
Mo. 0-205	M	39.0	53.9	31
Rodney	L	38.9		30
Garland	ML	37.3		33
Nehawka	E	36.9	47.7	31
Burnett	ML	34.8	48.6	31
Nodaway	M	32.8		33
L.S.D.-.05		12.5		

[a] 1958-60 data from Menno Station

Table 12. Small Grain Variety Testing - Continued

	Maturity	Yield, Bu/A. 1962	Yield, Bu/A. 1958-62 [a/]	Test Weight
Barley				
Liberty	M	42.3	33.4	42
Kindred	M	32.1		40
Larker	M	31.6		44
Traill	M	26.3		41
Trophy	M	24.8		40
Plains	E	21.5	24.3	38
Custer	E	20.2		34
Feebar	M	18.0		35
Otis	E	17.7	24.0	38
Parkland	L	15.4		39
Spartan	M	14.4	20.4	38
Betzes	L	11.8		36
L.S.D.-.05		7.4		
Spring Wheat				
Lathrop	-	10.3		51
Spinkcota	M	10.1	18.7	56
CI13465	M	8.5		50
Rushmore	E	8.1	19.0	46
Pembina	M	7.3		42
CI13162	E	7.2		50
CI13242	ME	6.9		45
Lee	E	6.9	16.5	46
Canthatch	E	6.5	17.8	48
Thatcher	E	6.5	17.9	45
Conley	M	6.4	14.9	42
Ceres	ML	5.9		44
Selkirk	M	5.7	18.6	43
Mida	L	4.7	16.5	56
Justin	M	4.5		41
Durum Wheat				
Wells	E	8.3	22.8	48
Lakota	E	7.8	23.0	46
CI13340	M	7.6		46
Langdon	M	4.9	22.8	45
Ramsey	M	4.6	17.4	44
L.S.D.-.05		3.0		

[a/] 1958-60 data from Menno Station

NOTE: Trials were severely infected by barley yellow dwarf.

GRAIN SORGHUM PERFORMANCE TRIALS, AREA E, 1962

J. J. Bonnemann

Performance trials measuring the potential of commercial grain sorghum hybrids and selected Experiment Station entries were conducted by Statewide Services in 1962. The entries included are the choice of the cooperating producers and checks developed by Experiment Stations. Previous results are not included in this report as this is the first year the grain sorghum trials were conducted on a fee basis.

The state is divided into 13 crop adaption areas on the basis of elevation, temperature, rainfall, soil type and other related factors. This trial, located in Area E was one of seven planted in the state and received a fertilizer application of 60-40-0 plowed down the previous fall.

Twenty-three entries were grown in this 1962 trial. The sorghum was planted May 24 and harvested October 11. The first killing frost occurred September 20, 1962.

Yields are reported on a dry matter basis in hundred-weight (cwt) per acre with yields from 27 to 63 cwt per acre and grain moisture from 15.6 to 25.4 percent.

Table 13. GRAIN SORGHUM PERFORMANCE TRIAL, AREA E, SE FARM, 1962

Variety	Yield[a] cwt./A	Percent Moisture	Test weight lbs.	Date headed	Height inches	Statistical Significance[b]
DeKalb 50A	63	20.8	57.5	8/3	63	
RS 610	59	18.3	57.5	8/3	54	
RS 501	56	20.9	59.0	7/29	68	
Northrup King 210	56	18.8	56.5	8/3	57	
Frontier 400 C	55	20.4	57.5	8/3	58	
SD 503	55	17.9	57.5	7/30	58	
Frontier 400 B	54	18.4	55.5	8/3	56	
Northrup King 222	53	15.6	58.5	8/3	47	
Northrup King 227	53	17.8	56.0	8/4	51	
Frontier 61X	52	17.9	58.5	8/4	52	
RS 608	52	16.7	57.0	8/5	56	
SD 502	52	18.4	58.5	7/29	55	
Steckley's R-103	50	17.6	56.0	8/4	53	
DeKalb S-33	49	18.6	56.5	7/30	48	
SD 451	49	18.2	57.5	7/28	57	
DeKalb C-45	47	17.6	55.0	8/3	49	
Paymaster "Comanche"	47	19.6	57.0	8/4	52	
Frontier 388	45	22.0	59.0	8/1	52	
SD 441	42	17.7	57.0	7/24	58	
Steckley's Ex 3490	42	16.4	58.0	7/24	52	
Reliance	33	17.7	57.0	7/24	52	
SD 102	29	19.9	55.5	7/22	43	
Norghum	27	25.4	56.5	7/25	48	
Mean	49	18.8				

Yield differences of less than 6 cwt per acre are not significant

a - Dry matter basis

b - Using Duncan's Multiple Range Test at the 5% level.

SOYBEANS

C. J. Franzke

Hawkeye is the maturity check for group II. The varieties in this group are adapted to an area in general from highway #16 on the north to the state line on the south. All varieties and selections grown in this test were well advanced in maturity that they were not hurt by the September 20th killing frost. With ample rainfall and cool temperatures favoring good pod set, high yields and a good quality of beans were produced.

Table 14. Summary of the Soybeans at SESD Farm, Group I

Variety	Height In.	Maturity ± Days	Lodging	Bu/Acre
Adams	36	+ 3	3	39.1
Horosoy	38	- 1	2	48.3
Hawkeye	39	0	3	48.2
Lindarin	41	- 2	3	49.0
Ford	43	+ 4	3	52.4

Hawkeye Matured October 1.

CROP DISEASE CONTROL

Sugar Beets

K. D. Fisher
Plant Pathology Department

Investigations on various seed treatments of sugar beets were continued at the Southeastern South Dakota Experiment Farm in 1962. For the second year, no significant differences in stand of plots treated with various fungicides were noted three weeks after planting. Fungicides which compared favorably were Thiram (75%), Dichlone (50%), Captan (75%), Captan (60%) + Dieldrin (15%), Ceresan M, Dexon (70%) and Dexon (35%) + PCNB (35%). Stands of all treated seed were significantly higher than the non-treated check plot.

The Plant Pathology Department sugar beet plots were originally set up in 1961 to provide for continuous cropping of beets after three years. Subsequent to this, crop rotations as they affect disease development and control can be investigated. This year two-thirds of the allocated land was planted to sugar beets; one-third for the second year, the other one-third for the first time.

While Cercospora leafspot developed to epidemic proportions in the Hurley-Centerville area, it did not become severe in the experimental plots until late in the season. No control measures were applied in order to check the development of disease. The following data were collected 6 weeks prior to harvest time.

	Spots/leaf	leaves/plant	% foliage green
First year beet land	3.6	33	67
Second year beet land	7.6	34	60

These data indicate leafspot damage (under favorable weather conditions) will be more severe in second year beet land. Due to the higher than normal rainfall and the late season development of the disease, no significant differences in yield and sucrose content were observed. Nevertheless, it is suggested that sugar beet growers avoid a beet after beet sequence in their rotations if at all possible to minimize the build up of Cercospora leafspot.

VEGETABLES

K. D. Fisher

Plant Pathology Department

Control of bacterial wilt of cucumber and melons by use of systemic insecticides was investigated. The disease is transmitted by the striped and spotted cucumber beetles, and control of the insects would interfere with the spread of disease. The late wet spring contibuted to poor stands and plant survival resulting in insufficient plants for an accurate statistical study. However, the preliminary data indicate both Di-syston (10% granular) applied as a preplant band application at 1 lb/A active and Sevin (50%) (1 lb/A active) at planting time as a spray reduced the incidence of bacterial wilt by controlling the insect vector. Further studies are planned.

SWINE HOUSING STUDIES: TYPE OF FLOORS, INSULATION AND METHODS OF HANDLING WASTE

R. W. Seerley, H. G. Young and J. F. Fredrikson[1]

Swine housing is in an era of research, new ideas, and changes. Never before have we been more conscious of housing management and facilities for swine. Many swine producers are wondering if they continue with the same facilities, or remodel the existing buildings, or construct a new building. If the producer decides to change or remodel, then a barrage of questions should be answered. Important considerations are: Complete confinement or pasture? What floor plan and manure handling method? Should the building be enclosed, insulated, ventilated, and how much automatic equipment?

Perhaps we should make it clear in this paper that the authors are not suggesting a change should be made by swine producers, but rather swine can be profitably reared with good management under many conditions on pasture, in confinement, or a combination of pasture and confinement. Confinement rearing is relatively new and many new ideas are being tested. The purpose of this research is to provide information on some of these ideas.

Experimental Procedure

Three temporary swine finishing houses were constructed to study the effects of different management systems and environmental conditions on the performance of swine. The results of these studies will be utilized in the design of a permanent swine finishing structure to be constructed at the station during 1963.

---

[1]Departments of Animal Science, Agricultural Engineering and Superintendent of Southeast Experiment Farm, Beresford, South Dakota, respectively.

The buildings described herein are small, flexible test units with the designed experimental variables built into then. The size, in particular, is not recommended for practical on the farm swine units. However, the test variables, the structure of the buildings, materials used, ventilation system, and methods of handling manure should be studied closely upon inspection of the buildings and these can be considered for application in a practical size unit.

House Construction

All three of the houses are 22' by 22' in size and are partitioned through the center to give a total of six 11' by 22' pens. The houses are constructed of conventional wood framing and plywood sheathing. Two of the houses are insulated while the third house is uninsulated and has no interior sheathing. The three structures were designed to be split down the center, mounted on skids and used as movable range shelters for breeding stock when the permanent facilities are complete.

Insulation and Ventilation

The two insulated houses were constructed with identical amounts of insulation, consisting of a two-inch fiberglass blanket with vapor barrier in the walls, and a three-inch fiberglass blanket with vapor barrier in the roof. A ventilation fan, of 800 cfm capacity controlled by a thermostat, will be installed in each house for cold weather operation.

Floor Systems

Three different floor systems were incorporated in the study, the systems include slotted floors, sloped floors with gutter, and conventional concrete floors.

Slotted floors made of concrete slats were placed in two of the pens and the hogs lived continuously on the slats. A pit, two feet deep, under the slotted floor held the manure that accumulated through the entire feeding period. No bedding was used with this system. Slats were 5' 3" long and cost $1.25 per slat.

Sloping floors (1/2 inch per foot) with a slotted gutter at the lower end were constructed in two of the pens. The hogs fed and rested on the sloping floor, and the slotted floor over the gutter was utilized as a dunging area. The pens were cleaned daily by washing down the floor with a hose, the water and manure collected in the gutter and was flushed into a sanitary lagoon. No bedding was used with this floor system.

Conventional conrete floors were used in two pens and served as a control for the other floor systems. These pens were bedded and cleaned 3 times a week.

Sanitary Lagoon

A sanitary lagoon was dug to be used for manure removal from the two pens with sloping floors. The lagoon was designed allowing approximately 15 sq. ft. of surface area per hog with a depth of approximately 4 feet.

Pen Arrangements

The various pens were located in the houses as follows:

House Number 1 - Insulated, both pens with sloping floor and drain into sanitary lagoon
House Number 2 - Insulated, one pen with slotted floor, on conventional concrete
House Number 3 - Uninsulated, one pen with slotted floor, on conventional concrete floor

Table 15. Cost Summary of Experimental Swine Finishing Houses at SESD Experiment Farm

	Total Cost of Structure and Equipment	Cost Per Hog	Cost per sq. ft.
Uninsulated House			
Concrete floor	$579.20	$32.17	$2.39
Slotted floor	691.70	38.42	2.86
Insulated House			
Concrete floor	697.36	38.74	2.88
Slotted floor	809.86	44.99	3.35
Insulated House			
Sloping floor*	737.80	40.99	3.05

* Cost of both pens was identical.

The houses provided 13.4 sq. ft. per pig in housing area (18 pigs per pen). When feeders and waterers are considered, the pigs had approximately 11 sq. ft. per pig.

Results

The results of this experiment shown in table 15 are preliminary and no conclusions are made at this time. More experiments in the summer and winter will be conducted before the data will be summarized.

Although there are 6 treatments involved, for all practical purposes this summer study can be considered as having only 3 major variables: (1) slotted floors, (2) concrete floors with bedding, (3) sloping concrete floors (no bedding) with dunging alley and lagoon. The other variable in the buildings, insulation versus no insulation, was virtually eliminated during the summer by keeping all of the buildings open for free air circulation.

Pigs gained 3% faster on the concrete floors with bedding (lots 4 and 5) than the average of pigs on slotted floors (lots 3 and 6) and those on concrete with the dunging alley. The pigs gained the same on the slotted floors and concrete floor with the dunging alley.

There were some differences in feed intake and feed efficiency among the lots, but a treatment trend was not detectable.

Tail biting was a problem in some of the groups. The cannibalistic nature of one or two pigs in a pen is a problem in confined pigs. The procedure used to stop tail biting among pigs in the herd is upon detection of a problem to paint the tail with a bitter tasting substance. If tail biting continues, the tail biter is removed from the pen and isolated for 3 to 5 days and then returned.

A study of the labor requirement for the various floors indicated that more labor was required for the conventional concrete floor and the sloping floor than by the slotted floor. The slotted floor was clean, and the pigs were generally cleaner on this floor than the other two types of flooring. Fecal material did build up around the edges of the pens where the slats rested on concrete blocks. Collection of manure under the slats throughout the feeding period worked satisfactorily. The floor arrangement and the

management in the house with the sloping floor and dunging alley was as good as expected. Pigs rested on the higher end of the floor and it was dry and clean. Pens on the level concrete floor generally had wet areas, and the bedding area was often damp. Cleaning these pens every other day helped keep the pigs fairly clean. Detailed studies on the labor and equipment requirements of these buildings are in progress, but will not be reported until more data are collected.

Table 16. Results - Summer 1962

House Number	1		2		3	
Lot No.	1	2	3	4	5	6
Floor Type	Concrete dunging alley	Slotted	Slotted	Concrete	Concrete	Slotted
Insulation	Yes		Yes	Yes	No	No
No. pigs	18	16	18	18	18	18
Av. initial wt., lb.	33.5	33.8	33.5	33.3	33.7	33.3
Av. final wt., lb.	196.3	202.5	205.9	194.9	202.3	200.2
Days on experiment	115.2	114.0	122.2	110.0	114.0	114.7
Av. daily gain, lb.	1.41	1.48	1.41	1.47	1.48	1.46
Av. daily feed, lb.	4.82	4.85	4.70	4.99	4.77	5.00
Feed per lb. of gain, lb.	3.41	3.27	3.33	3.39	3.22	3.43

BEEF RESEARCH UNIT CONSTRUCTION

Harvey G. Young and Harold Winterfeld

The construction of the beef feeding unit at the Southeast South Dakota Experiment Farm is presently nearing completion and feeding trials are scheduled to start near the middle of January. The facilities include two 18' x 50' silos, a 36' x 100' feeding shed, paved exercise yards and mechanical feeding equipment. The unit is designed to house 100 feeder steers in four lots of 25 each.

Feeding will be done inside the feeding shed and all feed will be automatically metered, mixed and distributed to the animals. The automatic controls used in the feeding system are being installed by personnel from the Agricultural Engineering Department. Tests will be conducted to determine the accuracy and reliability of the controls and to evaluate the electric power requirements of the feeding equipment. Nutritional work will be carried on by the Aminal Science Department.

ELECTRIC HOUSE HEATING

Harold Winterfeld and Harvey Young

Electric house heating was installed at the Southeast Experiment Farm in 1961. It was through the cooperation of the Rural Electric Cooperatives and the Electrical Suppliers in the area that made the heating equipment available and the project possible.

It is a large two-story frame construction house. The outside walls are plastered and have no batt or fill insulation in them. Blanket insulation was put in the remodeled outside walls. Some windows and window frames are only in fair condition. Otherwide, the house is in fairly good repair.

With a total of 2376 square feet of floor space, excluding the basement, approximately 24 KW of electric heating was installed.

Each room is individually metered so that a study can be made of the kilowatthour consumption of electric energy used by the individual rooms.

Research data has been collected and compiled for the 1961-1962 heating season.

Further records will be kept on the electric house heating.

Table 17. ELECTRIC HOUSE HEATING
SOUTHEAST RESEARCH FARM
CENTERVILLE, SOUTH DAKOTA

1961 - 1962 HEATING SEASON
FIRST FLOOR ROOMS

Meter Number	Room	Square Feet Per Room	November Degree Days 864	December Degree Days 1539	January Degree Days 1621	February Degree Days 1344	March Degree Days 1322	Total Kilowatt Hours Per Room For Season
			KILOWATT HOURS USED					
5	Living	248	662	720	857	504	367	3110
10	Front Hall	120	239	679	182	49	54	1203
11	Downstairs Bath	46.25	179	219	184	189	230	1001
13	Dining	195	763	1181	1127	389	833	4793
14	Utility	80.9	37	43	46	1	18	145
16	Kitchen	207.49	454	553	780	641	686	3114
17	Entry	30	233	360	335	293	269	1490
18	Hall	99.58	156	363	417	289	244	1469
20	Family	211.25	562	900	869	879	958	4168
Total Kilowatt Hours Used Per Month			3285	5018	4797	3734	3659	20943

Table 18. ELECTRIC HOUSE HEATING
SOUTHEAST RESEARCH FARM
CENTERVILLE, SOUTH DAKOTA

1961 - 1962 HEATING SEASON
SECOND FLOOR ROOMS

Meter Number	Room	Square Feet Per Room	November Degree Daye 864	December Degree Days 1539	January Degree Days 1621	February Degree Days 1344	March Degree Days 1322	Total Kilowatt Hours Per Room For Season
			K I L O W A T T H O U R S U S E D					
1	#6 Bedroom	175.5	34	430	417	276	237	1394
2	#5 Bedroom	119.62	Wiring Not Complete	32	150	86	75	343
3	Upstairs Hall	257	764	674	610	343	374	2765
4	Upstairs Bath	61.8	245	492	378	352	284	1751
6	#1 Bedroom	116.18	28	308	319	279	208	1142
7	#2 Bedroom	124.9		13	38	76	7	134
8	#3 Bedroom	164.33	108	236	303	254	243	1144
9	#4 Bedroom	119.62	163	343	387	335	273	1501
Total Kilowatt Hours Used Per Month			1342	2528	2602	2001	1701	10174

ELECTRIC HOUSE HEATING
SOUTHEAST RESEARCH FARM
CENTERVILLE, SOUTH DAKOTA

1961 - 1962 HEATING SEASON

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 6690
(Taken at Research Farm)

6. Total kilowatt hours used 30,667

7. Cost of heating $466.34

Remodeled outside walls of kitchen end 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.

Table 19. APPLIANCE KILOWATT HOUR USAGE
SOUTHEAST RESEARCH FARM
CENTERVILLE, SOUTH DAKOTA

FOR MONTHS OF:
NOV., DEC., - 1961
JAN., FEB., MARCH - 1962
RESEARCH BY:
HAROLD WINTERFELD
HARVEY YOUNG
AGRICULTURAL ENGINEERING DEPT.
SDSC, BROOKINGS, S. DAK.

Meter Number	Appliance	November	December	January	February	March	Total kilowatt hours per appliance
		KILOWATT HOURS USED					For month shown
21	Deep Freeze	161	201	178	169	190	899
22	Refrigerator	144	176	153	145	163	781
23	Range	131	149	124	91	146	641
24	Dish Washer	33	41	34	33	38	179
26	Pump	6	7	4	7	5	29
27	Clothes Dryer	135	124	119	113	134	625
28	Water Heater	642	720	694	614	762	3432
Total Kilowatt Hours Used		1252	1418	1306	1172	1438	6586

686 kilowatt hours per month is the average kilowatt hours used to heat water. Enough electric energy is being used to heat 92 gallons of water per day.