Agronomy Pamphlet #60

ANNUAL PROGRESS REPORT December, 1960

SOUTHEAST RESEARCH FARM
Menno, South Dakota

INTRODUCTION

The season covered by this pamphlet is from April 1 through October 31. Rainfall during this period was abundant for good crop growth. A total of 25.17 inches was recorded, which is 5.10 inches above normal. The month of July was the only month with below normal rainfall. The temperatures were below normal except for September.

In general, small grain produced very well. Corn produced well, but was quite high in moisture (29% average) at picking time.

A complete pamphlet will follow later in the year, which will contain complete summaries of the five years work at this farm. All experiments, except a two-acre plot for grass and legume study, have been discontinued. Others of similar or different nature will be initiated in the future at the new Centerville farm, starting in 1961.

THE SOUTHEASTERN SOUTH DAKOTA EXPERIMENTAL FARM BOARD

Present directors of the farm are:

Officers	County	Address
Wesley Larsen	Union	Beresford
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Lawrence Swanson	Lincoln	Canton
Ercil Bowles	Lincoln	Centerville
John Walker	Turner	Parker
William De Jong	Yankton	Volin
Ervin Cleland	Clay	Vermillion
Calvin Mettler	Hutchinson	Menno
Charles Abrens	Charles Mix	Wagner

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.

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

For experiment objectives, cropping history and other details of the following experiments, see Agronomy Pamphlet #52.

Q. Kingsley and F. Shubeck

Table 1. Effect of Several Different Nitrogen Fertilizer Carriers on Corn Yield

Source of Nitrogen	Pounds per acre of N	P_2O_5	K_2O	Yield in Bu/Acre
None	0	0	0	66.5
Ammonium nitrate	40	20	0	77.7
Urea	40	20	0	79.6
Anhydrous ammonia	40	20	0	94.3
Solution 13-13-0	40	40	0	81.2
Solution 15-10-0	40	26.6	0	83.1
Fertilaid	300 lb. Fertilaid/A			59.0
Super-Gro	300 lb. Super-Gro/A			62.0
L.S.D. at 5%				15.3

All of the fertilizer treatments gave a sizable increase in corn yield over the check plot except the two "organics" Fertilaid and Super-Gro. The total yields and increases from fertilizer were among the highest obtained in any year since the beginning of the experiment in 1956. Therefore, these results are important because they represent a maximum (over a 5-year period) of what the fertilizers listed above can do in a favorable year.

Table 2. Influence of Commercial Fertilizer and of Legumes in Rotation on Yield of Corn

Preceding Crop or Legume in 1959	Pounds per acre N	P_2O_5	K_2O	Corn Yields Bu/Acre
1. None	0	20	0	66.6
2. None	40	20	0	71.6
3. Oats + biennial sweet clover (catch crop)	0	20	0	70.0
4. Oats + annual sweet clover (catch crop)	0	20	0	71.8
5. Oats + red clover (catch crop)	0	20	0	69.1
6. Oats + alfalfa (catch crop)	0	20	0	72.8
7. Red clover for hay	0	20	0	78.0
8. Alfalfa for hay	0	20	0	72.6
L.S.D. at 5%				14.4

In this experiment, treatment number one serves as a check plot because no nitrogen or legumes were used. In general, the increases in corn yields, due to legumes in the rotations, were small and insignificant. In 1959 the legumes were restricted in growth and in nitrogen fixation because of the dry weather. Therefore, the corn in 1960 that followed these legumes would be expected to show only minor increases over the check plot.

Table 3. Influence of Preceding Crops on Percent of Soil Moisture Under Corn in 1960

Soil Depth in Feet	Two year corn and oats rotation*		Three year oats-alfalfa-corn rotation**		Two year oats + s.clover-corn rotation**	
	April 15	Oct. 13	April 15	Oct. 13	April 15	Oct. 13
0-1	18.0	18.4	19.2	18.1	18.8	19.0
1-2	15.3	15.1	15.6	15.3	14.8	15.9
2-3	13.7	14.6	14.4	13.5	12.7	14.5
3-4	14.0	16.0	11.7	16.2	12.3	15.1
4-5	15.0	16.9	12.1	16.6	13.8	15.5

* Fertilized with 40-20-0 annually
** Fertilized with 0-20-0 annually

In the lower subsoil at the beginning of the growing season, there was more soil moisture for corn in the nonlegume rotation than in the legume rotations. This amount varied from approximately 1/2 inch to nearly an inch of available moisture. The above average rainfall in 1960 was sufficient to overcome this moisture deficiency and the yields of corn from the legume rotations were about the same as those from the fertilized nonlegume rotation. There was enough rainfall to produce a good crop of corn and also to replenish the subsoil moisture at the end of the growing season as shown by the Oct. 13 sampling data.

Table 4. Effect of Tillage and Planting Method on Yield of Corn

Treatment	Yield in Bu/Acre
10 tons of manure per acre	69.1
60-40-0 from commercial fertilizer	77.3
Skip row planting with legumes between rows + 0-40-0	67.7
Check (no legumes, manure or commercial fertilizer)	70.9

In this continuous corn experiment the plots receiving 60-40-0 appeared to yield a little more than those receiving 10 tons of manure. This trend occurred in 3 of the 5 years that the experiment has been underway. The check plot yield at this location was high, so no statistical significance (at 5%) can be attributed to any apparent yield increases due to treatments. Some of the inconsistancies of the results with this experiment can be related to soil variability.

The minimum tillage plots were flooded out, so no data is available for this experiment.

Table 5. Comparison of Yield and Value of Various Grains and Forage Crops, S. E. Unit, 1960

Crop (5)	Yield of Grain/A	Price per Unit (3) Dec.1960	Value of Grain	Yield of Stover in Tons/A (2)	Value per ton of Stover (4)	Value of Stover	Total Value
Corn	91.0 bu/A	$0.86 (1)	$78.26	1.3	$5.00	$6.50	$84.76
Oats	63.7 bu/A	0.53	33.76	1.26	5.00	6.30	40.06
Soybeans	29.3 bu/A	1.95	57.14	---	---	---	57.14
Forage Sorg.	2651 lb/A	1.15/100	30.49	4.4	5.00	22.00	52.49
Grain Sorg.	2374 lb/A	1.15/100	27.30	2.9	5.00	14.50	41.80
Sudangrass	1054 lb/A	.75/100	7.91	2.0	5.00	14.50	22.41

(1) Number 2 corn at 15.5% moisture
(2) Air dried
(3) At Farmers'Coop. Elevator, Brookings, Dec. 19, 1960
(4) Based on the price of unbaled prairie hay
(5) All crops were fertilized with 40-20-0 annually

In calculating the values of the different crops, the grain prices used were those quoted at the Farmers' Coop. Elevator at Brookings, Dec. 19, 1960. The price used for the stovers was $5.00 per ton except for soybean stover which was given no cash value.

Corn was the most valuable crop by a considerable margin. Soybeans and forage sorghum were next in order with grain sorghum and oats following. Sudangrass gave the lowest return per acre of the six crops tested.

SMALL GRAIN TESTING

Oat Variety Trials

D. D. Harpstead

During the five years in which oat trials were grown on the Menno Station, production in excess of 80 bushel averages occurred in only two years. During the same period, two very poor seasons were sampled. The outstanding oat production in 1960 is largely a product of good rainfall during early parts of the growing season, cool May temperatures, and an adequate soil fertility program.

The importance of readily available soil nutrients is apparent when the 1960 results are compared to the average yields on farms in surrounding counties. Harvest yield levels in oats are determined largely during the first four to six weeks of the growing season. If this period does not provide the essentials of good plant growth, favorable conditions later in the season cannot compensate for these deficiencies to produce maximum yields.

The five-year average yields strongly favor the midseason varieties and types which are known to do well under corn belt growing conditions. The danger of damaging stem rust infections cannot be ignored in this area even though only local effects have been observed in recent years. With this in mind, the prudent producer will include disease resistance among the criteria for the selection of a variety.

In 1960 and in the five-year averages, Mo-0-205 gave the highest yield averages. Other varieties which have done well in this area and may be expected to hold an increasingly more important place, are Burnett and Clintland 60. Oat variety yields from this station are available in Agronomy Pamphlet #57.

Wheat and Rye Trials

V. A. Dirks

Wheat is not a major crop in southeastern South Dakota, partly because the hazards of plant diseases have limited wheat yields and often depressed wheat quality. In 1960, diseases and high July temperatures were the major yield influencing factors at this station.

Rye and winter wheat, seeded on fallow, survived adequately, as they have every year since work was begun with winter grain. The critical element with winter grains appears to be adequate fall moisture to get good growth. Winter wheat should have early maturity and at least some stem rust resistance for best performance. The disease resistant variety Minter has done very well at Menno, while Antelope rye has done best of the ryes. Winter grains have an important place in weed control practices in the area.

Spring wheats are generally less dependable than winter grains. Disease resistance is all important, and in 1960, as usual, Selkirk was outstanding. Durum wheats are inferior to bread wheats in this area.

The average annual yields for three varieties, each best in its class, over the entire period tests have been run at the station, show:

Selkirk spring wheat,	20.0 bu/acre
Minter winter wheat,	29.7 bu/acre
Antelope rye	35.2 bu/acre.

FORAGE LEGUME VARIETY TESTS

M. D. Rumbaugh and R. A. Moore

Alfalfa: After 4 years of testing, Vernal continues to be the top-ranking alfalfa variety with respect to forage production. Ladak and Ranger, both of which are recommended hay varieties, have yielded slightly less than Vernal. Teton, which is primarily suggested for use as the legume component of pasture mixtures, has averaged .6 ton less hay per acre than Vernal during the 4-year test period.

Red Clover: Four of the 6 red clover varieties tested during 1960 yielded in excess of 3 tons of dry hay per acre. The differences between varieties were not significant. Dollard is the only red clover variety currently recommended for use in South Dakota.

Sweet clover: The 2 approved vaireties, Goldtop and Madrid, ranked first and second, respectively, in a forage yield trial of 9 entries in 1960. Both of these varieties are biennial, yellow-flowered, and possess desirable agronomic characteristics.

Birdsfoot Trefoil: The 9 varieties tested produced an average of .99 tons of dry matter per acre in 1960. Moisture conditions were favorable and two cuttings were obtained. The Empire variety is recommended for use in pasture mixtures in the southeastern part of South Dakota.

GRASS VARIETY TESTING

R. A. Moore and J. G. Ross

Smooth bromegrass continues to be the highest yielding grass species tested at this location. The more aggressive sod-forming southern types appear to be adapted, but to maintain high yields it is necessary to apply commercial nitrogen or re-establish the stands about every four years. Lincoln and Achenbach are the better varieties of this type. The less aggressive northern types such as Homesteader, are also adapted, but total yield is slightly less. Stands can, however, be maintained for a longer period of time without renovation.

Intermediate wheatgrass approaches bromegrass in yield and quality and in dry years surpasses bromegrass. Poor seed production limits the use of this species.

Nordan crested wheatgrass and the fairway types of crested wheatgrass are excellent for early spring and late summer forage production.

SORGHUM AND SOYBEAN TESTING

C. J. Franzke

The sorghum and soybean testing at the Southeast Research Farm is to elevate the performance of standard varieties and hybrid sorghums and Group II soybean varieties and strains. Weather conditions were favorable for producing high yields of sorghum. There were 8 hybrids out of 27 tested that yielded over 100 bushels per acre. Also the season was favorable for maturing the late hybrids.

Climatic conditions were favorable for producing high soybean yields. In the U. S. Regional Uniform Variety test the lowest yield was 26.1 bushels per acre and the highest yield was 41 bushels per acre. There were 8 varieties of soybeans out of 13 tested that yielded over 30 bushels per acre. In the U. S. Regional Preliminary Soybean test there were 16 strains out of 27 tested which yielded 30 bushels and over.

CROP DISEASE CONTROL

Corn Diseases

C. M. Nagel and D. B. Shank
Plant Pathology - Agronomy Departments

Root rot, and lodging due to stalk rot are serious disease problems of hybrid corn in the southeastern area of the state. Both of these diseases are caused by fungi (molds) which are capable of infecting corn plants in the field in midseason and result in important yield losses to farmers.

The disease performance experiments with hybrid corn were continued in 1960. One-hundred and twenty experimental hybrids were grown the past season; the purpose being to incorporate recently developed inbred disease-resistant lines of corn into hybrid combinations so they may be tested as hybrids for their

disease and yield performances including stalk rot (lodging) resistance under the climate and soil conditions prevalent in the area of the Menno Research Farm.

A problem in these experiments has been to produce from these disease resistant lines combinations which would fit the growing season of the area. Advancements have been made during the past few years as a result of the earlier experiments at the Menno Research Farm. However, it appears that still later combinations will be required as it appears that the experimental hybrids are ripening earlier than they should which would tend to cause them to yield below their potential.

The moisture percentage of ears at harvest time indicates a majority of the experimental hybrids may still be too early for the area. On the basis of these data, one might not expect them to yield as well as a hybrid which is first of all fitted properly to the growing season of the area. Further, this earliness may likewise adversely influence the disease performance potential of such lines as it may be related to higher yields.

The performance rating (which takes into consideration the ear moisture content at harvest time and the bushels per acre yield) indicates that certain of the experimental hybrids did as well or better when compared to 4 commercial hybrids used as controls which have in previous seasons rated near the top in State Hybrid Corn Performance Tests conducted by the Agronomy Department of the Agricultural Experiment Station.

The experiments were harvested on October 17. The results of the two experiments conducted at the station are presented in the following table.

Table 6. Performance of 62 experimental corn hybrids having varying degrees of resistance to root rot in comparison to 4 of the better performing commercial hybrids grown at the Southeast Research Farm, Menno, S. Dak. 1960.

Expt'l. Hybrid or Com'l Hybrid No.	Yield* Bu/A	Ear moisture at harvest time per cent	Performance Rating
Expt'l 1	81.14	15.3	1
SD 622	76.43	25.0	16
P 352	76.18	25.9	17
Expt'l 2	76.16	15.6	2
SD 420	75.49	19.0	7
Expt'l 3	74.22	14.9	3
" 4	73.44	14.6	6
" 5	73.40	15.4	8
De Kalb 410	73.34	16.6	12
Expt'l 6	73.28	13.5	4
" 62	50.98	18.2	66

*L.S.D. 9.42 bu/acre. This means that for any two hybrids to be significantly different in yield from one another, a yield difference of 9.42 bushels per acre is required.