Agronomy Pamphlet 681

ANNUAL PROGRESS REPORT

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NORTHEAST RESEARCH FARM

Watertown, South Dakota

INTRODUCTION

The period covered by this pamphlet is from April 1 through October 31.

Rainfall late in 1949 and early in the 1950 season helped the crop outlook considerably. The rainfall for the recorded period was 14.04 inches, which is 3.32 inches below normal. The subsoil moisture at the end of the small grain season was very low, actually the lowest it has been since the farm was started.

Temperatures, in general, were below normal for the season. Small grain remained favorably to the cooler temperatures, and produced quite well. The corn responded to the cool planting season and normal fall with above normal yields. The average percent moisture in the corn at picking time was 31%.

The Field Day this year was reasonably successful. Small grains and weed control in flax plantings appeared to be the most interesting to the people.

NORTHEAST EXPERIMENTAL FARM COMMITTEE

Members	County	Address
W. H. Schwanke (Chairman)	Codington	Watertown-Route 4
F. Morris (Secretary)	Codington	Watertown
W. Peterson	Day	Lily
Donald Maddy	Marshall	Britton
Elmer Gregath	Roberts	Sisseton
Otto Beyer	Grant	Revillo
Oliver Hattmeyer	Hamlin	Estelline
Alfred Knovly	Deuel	Nacurta
Bob Myers	Clark	Clark

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FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

Q. S. Kingsley and F. E. Shubeck

Table 1. Residual Effect of Commercial Fertilizer on Yield of Oats

1956 Fertilizer Treatment			Fertilizer Applied in 1956-57-58-59-60			1960 Yield of Oats
N	P_2O_5	K_2O	N	P_2O_5	K_2O	Bu/A
0	0	0	0	0	0	68.8
40	20	0	40	20	0	67.1
80	40	0	0	0	0	62.9
120	60	0	0	0	0	60.7
160	80	0	0	0	0	68.9
200	100	0	0	0	0	64.9

L.S.D. at 5% level N.S.

For experiment objectives, cropping sequence and other details, see Agronomy Pamphlet #53.

There were no significant differences in oats yields due to treatments. In this experiment in 1959, the oats yields were 10 to 12 bushels per acre, so very little fertility was removed. This would explain why the check plot yield in 1960 was relatively high. It would appear that a ceiling was imposed on yields by climatic factors rather than lack of fertility.

Table 2. Comparison of Legumes, Commercial Nitrogen and Fallow for Increasing Yields of Spring Wheat

Preceding crop or treatment	Pounds per Acre of Fertilizer Applied to Wheat			Spring Wheat Bu/A
	N	P_2O_5	K_2O	
1. Oats (check plot)	0	40	0	23.5
2. Oats	30	40	0	22.2
3. Alfalfa for hay	0	40	0	22.6
4. Red Clover for hay	0	40	0	16.6
5. Sweet clover for seed	0	40	0	21.0
6. Sweet clover fallow	0	40	0	24.6

L.S.D. at 5% level N.S.

Neither legumes nor commercial nitrogen significantly increased the yields of spring wheat over that of the check plot. Treatment number 1 is considered to be the check plot because no nitrogen or legumes were used in that rotation. Yields were limited by climatic factors rather than plant food deficiencies.

Table 3. Influence of Crop Sequence on Percent of Water in Soil Under Wheat

1959 Crop	1960 Crop	Depth in feet	% Water 4/19/60	% Water 8/18/60
Oats + 30# N/A	Wheat	0-1	18.4	10.1
"	"	1-2	14.8	8.0
"	"	2-3	11.8	6.3
"	"	3-4	11.0	7.5
"	"	4-5	11.2	10.1
Alfalfa hay	Wheat	0-1	18.4	9.7
"	"	1-2	15.2	6.6
"	"	2-3	11.6	6.3
"	"	3-4	9.8	6.6
"	"	4-5	11.0	7.4
Sweet clover fallow	Wheat	0-1	21.5	10.9
"	"	1-2	18.3	7.9
"	"	2-3	12.9	7.0
"	"	3-4	10.3	8.2
"	"	4-5	10.0	9.3

At the beginning of the season, there was a little more water for wheat in the top 3 feet of soil when the wheat came after the sweet clover fallow treatment.

The yields of wheat were not significantly increased by this treatment, however (see Table 2).

At the end of the growing season, there was very little available subsoil moisture under wheat in any of the rotations.

Table 4. Influence of Commercial Nitrogen and Residual Effect of Legumes in Rotation on Yield of Corn

1958 Crop	1959 Crop	Lbs. of Fertilizer Applied per Acre Each Year			Yield of Corn in 1960 Bu/Acre
		N	P_2O_5	K_2O	
1. Oats (check plot)	Wheat	0	40	0	50.1
2. Oats	Wheat	30	40	0	50.3
3. Alfalfa for hay	Wheat	0	40	0	45.8
4. Red Clover for hay	Wheat	0	40	0	50.1
5. S. Clover for seed	Wheat	0	40	0	54.7
6. Fallow	Wheat	0	40	0	56.5
L.S.D. at 5%					6.22

Thirty pounds of nitrogen did not increase the yield of corn over that of the check plot (rotation #1).

The fallow treatment in 1958 appeared to have a beneficial carry-over effect on the yield of corn in 1960.

Table 5. Effect of Fertilizer and Methods of Application on Yield of Flax

Lbs. per Acre N	Lbs. per Acre P_2O_5	Lbs. per Acre K_2O	Method of Fert. Application	Weed Control*	Yield in Bu/A
0	0	0	None applied	None	10.9
0	0	0	None applied	Weed control	8.8
40	30	0	Drilled with seed	None	8.7
40	30	0	Drilled with seed	Weed control	11.1
40	30	0	Disced in	None	6.7
40	30	0	Disced in	Weed control	8.7
40	30	0	Plowed under	None	10.7
40	30	0	Plowed under	Weed control	9.9
20	15	0	Drilled with seed	None	10.9
20	15	0	Drilled with seed	Weed control	10.2
L.S.D. at 5%					N.S.

* Weed control consisted of 5 lbs./A of TCA to control grassy weeds and 1/4 lb./A of MCP for broadleaved weeds.

No definite yield advantage was obtained for weed control treatment or for method of fertilizer application, under the conditions of this experiment.

Table 6. Effect of Time of Plowing Legumes on Yields of Flax and Corn

1957 Crop	1958 Crop	1959 Crop	Time of Plowing	1960 Crop Yield in Bu/A
1. Flax + alf.	Alf. hay	Alf. hay	June after 1st hay crop	14.9 flax
2. Flax + alf.	Alf. hay	Alf. hay	July after 2nd hay crop	11.2 flax
3. Flax + alf.	Alf. hay	Alf. hay	Early the following spring	9.4 flax
4. Flax + alf.	Alf. hay	Alf. hay	Spray to kill after 1st hay crop, then plow in spring	13.1 flax
5. Flax + alf.	Alf. hay	Alf. hay	July after 2nd hay crop	43.2 corn

By plowing alfalfa early (after the first hay crop was removed) the yield of the following flax crop was improved. The question then arises, which would be more advantageous to have, the second cutting of alfalfa or 3-4 bushels of flax?

The spraying of alfalfa was evidently successful in conserving soil moisture as indicated by the greater flax yield from this rotation than the flax yield of rotating number 3 where the alfalfa was spring plowed.

Another objective of this experiment was to determine whether it was best to follow alfalfa with a short season crop like flax or a long season crop like corn. Despite the deficiencies in subsoil moisture at the beginning of the season, the yields of corn after alfalfa were relatively high compared to the yields of flax after alfalfa.

CORN BREEDING AND YIELD TESTING

D. B. Shank and D. W. Beatty

Three corn yield trials were conducted by the Agronomy Department on the Northeast Research Farm in 1960. All three contained primarily experimental entries, with adapted commercial hybrids being used only as checks. One test was made up of experimental double crosses, one of South Dakota produced three-way crosses, and one of three-way crosses being tested regionally.

Yields were good, averaging 42.9, 47.6, and 49.5 bushels per acre for the three tests. Most of the entries produced good quality corn, with moisture percentages being down to the twenties or low thirties by the end of the first week in October. Stalk and root lodging were negligible in all cases. Any new promising hybrids adapted for the area represented by this research farm would come out of the trial on double crosses. The check hybrids for this test, SD210 and SD220, yielded 50.6 and 53.2 bushels per acre and contained 25.1 and 27.8 percent moisture at time of harvest, respectively. Five hybrids out-yielded the better of these two checks, but they were, however, slightly later in maturity. Three-way tests contain hybrids made up of three inbred lines and are conducted to find new inbred lines having a high yield potential when combined with a good single cross hybrid. In the trial containing South Dakota produced three-way hybrids, 36 out of 54 other entries out-yielded the two check hybrids, SD210 and SD220. Of the regional three-way crosses, made up of inbreds developed outside of South Dakota, only two entries out-yielded the same two check hybrids. These last results point up the fact that material developed in the area where it is to be used is generally the best adapted.

SMALL GRAIN VARIETY TESTING

Oat and Flax Variety Trials

D. D. Harpstead

Oats Trials

Oat varieties which have shown superior performance at the northeast station are largely a group which has had only average performance at the Menno station. This is probably the reaction to the cooler night temperatures common to the higher elevations in the Watertown area.

Among the varieties which have the highest average five-year yields are Rodney, Garry, Andrew and Minhafer. These varieties represent a wide range of characteristics and enable the producer to select the type which will fit well into his farming system.

While diseases have not been limiting factors in the past five year period the variety Minhafer offers the greatest protection from rust. Varieties offering similar protection but later in maturity are being tested in this area.

Successful oat production which will produce maximum yields in this area would appear to depend on early planting on soils which have the available nutrients for rapid growth of the crop. If the maturity of the crop is delayed, very low test weights are the usual result.

The 1960 crop yields are reported in Agronomy Pamphlet #57.

Flax Trials

The five recommended flax varieties, Marine, Bolley, Arny, Redwood and B-5128 remain as good production choices in the northeast area of South Dakota. Numerous trials have shown that only the varieties Marine and Bolley should be considered if planting must be delayed after May 15.

Hard freezes can damage young flax plants. In 1959 the flax crop was severely set back from this cause. The occurrence of these frosts has been infrequent enough so that early planting of flax can be considered a safe and worthwhile farming practice.

Wheat Trials
V. A. Dirks

The problems associated with wheat production at the northeast farm in 1960 were threefold: stand procurement, heat and drouth in July and diseases, notably the rusts. Earliness and disease resistance were major factors favoring varietal performance; stand problems were caused by heavy rain shortly after seeding, and were randomly distributed. The range of yields was extreme, from over thirty bushels per acre to six. Earlier varieties also tended to have superior test weights.

The bread wheat varieties Lee and Selkirk, were in the highest yielding group. The badly rusted late variety Marquis was low, and Ceres close to it. The durum wheat performance of Wells, Langdon, Lakota and Ramsey was in the top class, approaching thirty bushels per acre. The 1960 results are very similar to the long time trends at this station, which indicate a slight superiority for durum wheat.

Winter wheat survival at the northeast farm was excellent in 1960. The performance of these winter wheats indicates the importance of the "escape value" of earliness and the promise of this crop if dependable hardiness could be coupled with earliness. Experimental spring wheat lines in the nursery exceeded the yield of the best varieties by as much as twenty-five percent and indicate the importance of continued selection of lines for this specific area of the state.

Barley Trials
P. B. Price

The barley plots at Watertown were planted in relatively dry soil. Despite the marginal soil moisture conditions during a large part of the growing season, yields were quite satisfactory. Hot windy weather the last two weeks prior to harvest reduced test weight somewhat.

Diseases were neither prevalent nor severe. Septoria infection was at a lower level than during 1958 and 1959. Rusts and other leaf diseases were slight and did not influence crop yields to any extent.

Traill, as indicated, was the top yielder. Betzes, a two-row barley, performed surprisingly well, as it is not considered to be well adapted to this area.

GRASS TESTING

R. A. Moore and J. G. Ross

Smooth bromegrass continues to be the highest yielding grass species tested at this location. Homesteader is a northern type, well adapted to this area. All varieties respond to commercial nitrogen. Application of nitrogen is essential for seed production.

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.

FORAGE LEGUME VARIETY TESTING

M. D. Rumbaugh and R. A. Moore

Alfalfa: The four recommended varieties, Ladak, Ranger, Teton, and Vernal continued to perform well at Watertown in 1960. Teton has yielded relatively better at this location than expected on the basis of its performance in other trials throughout the state. This variety is primarily recommended as the legume component of pasture mixtures.

Red Clover: The six red clover varieties tested produced an average yield of .63 tons of dry forage per acre. Differences between the varietal means were not significant. On the basis of prior trials, Dollard is the red clover variety approved for use in South Dakota.

Sweet clover: The biennial, yellow-flowered varieties, Goldtop and Madrid are recommended for use throughout South Dakota. These varieties yielded well at Watertown in 1960 as in previous years. Goldtop has a somewhat lower coumarin content than Madrid and is also slightly more resistant to the blackstem disease.

Birdsfoot Trefoil: Due to excess variability within the test, the performance of trefoil varieties in 1960 could not be evaluated adequately. The Empire variety is recommended when it is desired to utilize this forage species. Trefoil is not as winter hardy as alfalfa and difficulty in obtaining stands is frequently encountered. It is suggested that the use of trefoil be restricted to pasture mixtures with desirable grasses.

SORGHUM AND SOYBEAN TESTING

C. J. Franzke

The sorghum and soybean testing at the Northeast Research Farm is to evaluate the performance of standard varieties and hybrid sorghums and Groups 0 and I soybean varieties and strains. Despite the rather dry weather conditions in 1960, there were 8 sorghum hybrids out of 27 tested that yielded 40 bushels per acre and over. The sorghum yields varied from 3.5 bushels to 62.7 bushels per acre. Even though the season was dry, there were only 5 hybrids out of 27 tested which would not need extra drying of the grain before storing. This would indicate the majority of the hybrids tested were too late maturing.

The Northeast Research Farm is in the transitional area between maturity Groups 0 and I. Therefore, soybean varieties and strains of both groups were tested to determine which varieties of a maturity group are adapted. Due to dry weather the soybean yields were low. The highest yield recorded was 15 bushels per acre. High temperatures and low humidity at flowering and pollination time causes much "blasting" or nonfertilization of the flowers. Vegetatively, soybeans are drought enduring.

POTATOES

K. D. Fisher
Plant Pathology Department

Yield, quality, and disease severity of sixteen selected potato lines were studied at the Northeast Research Farm in 1960. Although leaf roll and scab resistance are quite high in several lines, yield and quality of most lines were not superior to the check varieties, Norland and Red LaSoda. Yields of one USDA selection were significantly higher than both checks, however, quality was somewhat impaired by late maturity.

Table 7. Yield Performance of Sixteen New Potato lines grown at the Northeast Research Farm, Watertown, South Dakota, 1960

Variety	Yield/Acre* Hundred Wt.	U. S. #1 Percent
B2368-4	112	97
50B9-8	85	94
B605-10	83	86
B3696-13	83	83
B3857-19	83	90
B3837-4	82	78
B4090-3	81	93
B3352-8	77	91
B2368-13	71	85
B3900-3	65	82
B3903-1	55	85
B4134-14	49	82
B3947-2	46	78
B3309-8	41	80
B4158-1	39	49
B3139-24	33	82
Norland (check)	89	90
Red LaSoda (check)	93	90

*L.S.D. (Least Significant Difference) 13 Cwt/Acre. That is to say, if the yields of any two lines differ significantly from one another, the difference is equal to or greater than 13 Cwt/Acre.

CROP DISEASE CONTROL

Corn Diseases

C. M. Nagel
Plant Pathology Department

Root rot and lodging due to stalk rot are serious disease problems of hybrid corn in the eastern 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. Two-hundred and forty-two experimental hybrids were produced in 1959 and grown the past season to incorporate these newly developed disease resistant inbred lines of corn in hybrid combinations so they may be tested as hybrids for their disease resistance and yield performances under the climate and soil conditions prevalent in the area of the Northeast Research Farm.

In 1960 experimental hybrids which contain the new disease resistant parents again performed very well in four experiments conducted at the Northeast Research Farm as the data will indicate in Table 8.

Certain of these experimental disease resistant hybrids have rated at the top during each of the four years in which they have been under test.

These experiments were conducted on the basis of three replications, grown in randomized blocks and all results analyzed statistically according to accepted procedures.

The experimental plots were harvested on October 20, 1960.

Table 8. Performance of 62 experimental corn hybrids having varying degrees of resistance to root rot in comparison to 4 of the best performing commercial hybrids grown at the Northeast Research Farm, Watertown, S. Dak., 1960.

Expt'l Hybrid or Com'l Hybrid No.	Yield* Bu/A	Ear Moisture at Harvest Percent	Performance Rating
Expt'l 1	56.71	29.2	2
" 2	53.79	21.7	1
S.Dak. 210	50.65	20.3	6
Expt'l 8	50.32	27.1	10
DeKalb 46	47.00	20.1	16
Expt'l 27	46.91	27.9	32
S.Dak. 220	45.49	21.4	27
Expt'l 37	45.47	25.6	37
Pioneer 388	41.31	30.2	60
Expt'l 55	41.27	25.9	53
" 62	29.06	35.0	66

*L.S.D. (Least Significant Difference) 7.15 Bu./Acre. This means that for any two hybrids to be significantly different in yield from one another, a yield difference of 7.15 bushels per acre is required.