Agronomy Pamphlet 43 DECEMBER 1958

ANNUAL PROGRESS REPORT

NORTHEAST RESEARCH FARM

WATERTOWN, SOUTH DAKOTA

Experiments

A. Testing, breeding and disease control of small grain. (4.[illegible] acres)

B. Testing, breeding and disease control of corn, soybeans and sorghum. (4.3 acres)

C. Fertility and cultural practice experiments. (11.3 acres)

D. Newly acquired land. (10.4 acres)

E. Grass and legume testing. (.66 acres)

Agronomy and Plant Pathology Departments
Agricultural Experiment Station
South Dakota State College
Brookings, South Dakota

Origin and History of Mobile Unit Farms

During the past several years there has been an increasing need for research work on crops and soils in the northeast and southeast areas of the state. After several meetings of the people interested in research for areas not already represented by experiment stations, plans were made to ask the State Legislature for additional appropriations for this work. Adequate funds were granted and two new Research Farms or "Mobile Units" were started in 1956. The term "Mobile Unit" was used for two reasons: (a) some of the equipment could be moved from one unit to another to prevent purchasing a full line of machinery for each location, (b) after 5 to 8 years (depending on the nature of the experiments selected) the experimental units would be moved to a new location within the area with an entirely new set of problems such as slope, drainage, fertility, soil type, etc.

In each of the two areas, meetings of interested farmers and county agents were held to set up area committees to assist the Agricultural Experiment Station in selection of the research farms and to plan the experiments. The Area Committees are composed of the county agents and one farmer from each county in the area.

After looking at several possible locations, a joint committee of farmers and college representatives selected the present farms. The amounts of land devoted to each form of agronomic research, and also the specific experiments on fertility and soil management, were selected by the respective area committees.

Each farm or unit represents a particular soil and problem area that is characteristic to that geographical region. The experimental work is performed precisely where the problems occur. Therefore, the results of these investigations are directly applicable to the regions studied, and in addition it is considerably easier for the people in these areas to observe experiments when the research is conducted near their homes.

Annual field days will be held to observe first hand the results and progress of all experiments in the field. In addition, it is planned to have a winter meeting in each area to permit the presentation and discussion of results for all people who are interested.

Table of Contents

ANNUAL PROGRESS REPORT
FOR NORTHEASTERN RESEARCH FARM
1957

NOTE: This is a progress report and therefore 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.

INTRODUCTION

In the spring of 1955, money was appropriated by the State Legislature to begin new research on crops, soils and crop diseases in the northeastern part of the state. A site involving 20 acres was originally selected. It is located on the Otto Korth farm, 15 miles north of Watertown at the junction of Highways 81 and 20.

The purpose of this farm is to provide research facilities to obtain solutions of local problems in crop production and soil management. Experiments involving fertilizers, plant disease control, crop management, soil fertility, and crop variety testing have been underway for two crop seasons.

An additional 13 acres were acquired for new experiments which were started in the summer of 1957. The farmers and county agents comprising the Northeast Research Farm Advisory Committee met in Watertown on Feb. 28, 1957 and selected 2 experiments to be started on the newly acquired land. These experiments were concerned with: (a) how to get alfalfa land back into grain production and (b) fertilization and weed control of flax.

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

1957 CROP SEASON

Table 1. Total Rainfall and Average Temperature by Months, with their Departure from Long-Time Averages at N. E. Research Farm*, 1957.

	April	May	June	July	Aug.	Sept.	Oct.	Total
Total Rainfall in Inches	4.26	5.98	2.85	0.74	5.26	2.12	3.12	24.33
Departure from Long-Time Average	+2.20	+3.18	-0.96	-2.10	+2.61	+0.19	+1.96	+7.08
Average Monthly Temperature in Degrees F.	42.5	52.5	63.3	76.3	68.7	56.4	46.1	
Departure from Long-Time Average	-2.9	-5.6	-4.9	+0.8	-2.9	-6.1	-1.5	

* The above rainfall and temperature data were taken and recorded at the N. E. Research Farm. The departure from long-time average was obtained by comparing the 1957 data taken at the farm to the long-time average at the city of Watertown Weather Station, Courtesy U. S. Weather Bureau, Huron, S. Dak.

Temperatures, in general, remained cool throughout the season except for the month of July. Crops were held back somewhat by cool temperatures and an excess of rain in the early part of the season. The low rainfall in June and July along with high temperature in late June and July, reduced quality of late maturing small grains, especially flax. The growing conditions for corn in August were very favorable, but the drying conditions at harvest time were very slow.

Precipitation, in general, was high early in the season, but low in June and July. The total for the year is several inches above average.

SMALL GRAIN VARIETY TESTING

by
D. D. Harpstead, V. A. Dirks and P. B. Price

The location of the Northeast Research Farm is particularly suited to the testing of small grains at high elevations and cool night temperatures. Large farming areas in this region are dependent upon profitable production under these conditions and therefore are vitally concerned with the selection of varieties most useful to them. The production of durum and hard wheat, flax, barley and oats makes up much of the farming activity in this region. Problems associated with these crops are being studied at the research farm.

Durum wheat and hard red spring wheat nurseries grown in 1957 included commonly available seed varieties, long-time check varieties against which to measure new selections, and numerous South Dakota and regionally developed lines not yet widely tested. These tests supply records of adaptability, agronomic desirability, disease reaction, and yield productivity. In addition, seed from these tests is sent to the flour milling and baking laboratories which test the quality of the product produced. Each year new untested lines are added from which a few will be selected for further testing.

In flax, early and late plantings are made of new and currently available varieties. More than 65 unnamed selections were tested in 1957. In this material selection is made for new combinations of types which will be superior to the presently available varieties in one or more of their characteristics.

Barley production in the Watertown area is influenced by malting barley purchases by the industry. Testing done on this station not only measures yield and agronomic qualities of the varieties but is also directed towards the determination of their malting reaction and value to industry. More than 50 unnamed selections were tested for yield and quality in 1957.

Cool nights and favorable moisture supplies produced excellent oat yield in 1957. The reaction of the late "Canadian-type" oats has been of special interest to the farmer and breeder alike. Selection of new types and planting rate studies have been worked on here.

In general the greatest yield reducing factors were: early infections of leaf rust on wheat, leaf or crown rust on oats and high July temperatures which damaged late varieties of all crops but in particular flax.

Summaries showing 1956 and 1957 yields and 1957 performance data are published in tables 2 through 5.

Table 2. Spring Wheat Variety Test at the Northeast Research Farm, Watertown, 1956-57.

Variety	Yield in bu. per acre 1956	1957	Average	1957 Test Wt.	1957 Observations: Stem Rust %	Leaf Rust %	Lodging Score 1-10	Percent breaking
Hard Red Spring								
Rushmore	18.1	17.2	17.6	57	4	57	2.0	4
Lee	17.9	20.8	19.4	56	17	40	1.7	2
Selkirk	23.4	20.3	21.8	52	Tr	30	1.0	2
Conley	20.0	12.3	16.2	53	Tr	27	1.3	3
Mida	17.8	21.1	19.4	57	20	50	1.0	2
Rival	17.6	16.9	17.2	56	12	57	1.3	4
Pilot	16.8	16.0	16.4	56	17	60	1.7	2
Thatcher	19.6	12.5	16.0	54	4	80	2.0	10
Cadet	20.8	13.0	16.9	54	4	60	2.0	22
Ceres	18.5	14.3	16.4	55	20	57	1.7	0
Spinkota	22.0	20.7	21.4	61	4	60	1.7	1
Marquis	12.4	15.5	14.0	55	47	67	1.3	3
Willet	20.7	30.6	25.6	57	0	7	1.3	2
R.H. 1935	17.6	27.4	22.5	59	7	23	0.0	1
Henry	18.1	21.7	19.9	56	13	43	1.7	3
TTri 630	19.5	22.6	21.0	60	2	10	0.5	3
Lee^6 Kenya Farmer	--	17.3	--	56	15	20	1.0	1
Durum								
Stewart	20.7	15.5	18.1	56	70	5	2.7	1
Mindum	20.9	11.5	16.2	54	80	T	2.3	2
Vernum	21.2	15.1	18.2	58	33	T	2.7	4
Nugget	18.7	20.0	19.4	56	63	T	3.0	4
Sentry	23.7	25.9	24.8	62	33	10	1.7	2
Yuma	22.2	17.8	20.0	57	0	10	2.3	3
Ramsey	22.3	16.9	19.6	60	30	3	2.3	5
Langdon	23.4	19.1	21.2	59	40	40	2.0	3
Towner	22.9	12.8	17.8	60	33	10	2.7	4
L.S.D.	3.7	4.8	3.0					

Table 3. Flax Variety Tests at the Northeast Station, Watertown, 1957

Variety	Yield bu./A 1956	Yield bu./A 1957	Yield bu./A Ave.	Rank 1957	Test wt. 1957	Variety Performance Notes: Height (inches)	Variety Performance Notes: Pasmo* 0-9
Sheyenne	17.8	14.1	15.9	12	54.0	22	4
Redwood	14.8	14.3	14.5	8	53.0	22	5
Marine	17.0	14.2	15.5	9	53.5	22	2
B 5128	15.2	13.4	14.3	14	53.0	23	7
Bolley	14.3	13.3	13.8	15	53.0	24	7
C.I. 1656		14.8		3	54.0	23	3
Norland	15.5	15.2	15.3	1	53.0	25	6
Linda		14.6		5	52.0	23	8
Raja		15.0		2	53.0	22	7
Dakota	15.9	14.2	15.0	10	54.5	23	5
Redwing	16.1	14.5	15.3	6	53.5	24	5
Bison		13.8		13	53.5	25	4
Rocket		14.7		4	53.0	25	6
Royal		14.5		7	54.0	25	4
Crystal		14.2		11	53.5	23	6
L.S.D.	2.6	N.S.**					

*Notes made on 0-9 scale; 9 = most severe

**N.S. = yield differences not significant; i.e., there could frequently be differences as large as this due to chance alone.

Table 4 Barley variety test at the Northeast Research Farm, Watertown, 1957.

Variety	Yield bu/ acre 1956	Yield bu/ acre 1957	Yield bu/ acre Ave.	Test wt. 1957	Rank 1957	Variety Performance 1957 Height inches	Septoria* 0-9	Stem Rust percent
Custer	20.3	42.2	31.7	44.0	1	32	5	3
Feebar	25.4	21.9	23.7	42.0	20	28	0	0
Forrest	28.8	34.2	31.5	44.5	4	34	4	0
Fox	35.8	24.7	30.3	42.5	17	34	5	0
Husky		31.7	31.7	42.5	7	33	4	0
Kindred	23.4	23.5	23.5	45.5	19	31	6	0
Liberty	35.0	33.4	34.2	47.0	5	34	5	0
Manchuria	24.4	23.6	24.2	42.0	18	36	6	10
Montcalm	36.3	20.1	28.2	40.0	21	39	6	25
Odessa	28.7	29.2	28.9	42.0	11	35	6	5
Parkland	35.5	30.4	33.0	45.0	9	34	6	0
Plains	19.6	32.9	26.3	47.0	6	30	6	0
Spartan	27.8	34.8	31.3	48.5	3	34	5	3
Titan	21.6	26.3	24.0	43.5	15	35	7	40
Traill	36.8	29.3	33.1	44.0	10	33	6	Trace
Trebi	38.4	30.7	34.6	42.0	8	30	1	10
Tregal	27.8	25.9	26.8	41.5	16	32	2	8
Vantage		27.8	27.8	43.0	14	32	6	0
Vantmore	34.1	35.3	34.7	44.5	2	33	6	0
Velvon 11	27.4	29.0	28.2	39.5	12	31	0	20
Wisconsin 38	39.7	28.1	33.9	42.5	13	34	4	15
L.S.D.	7.7	7.0						

*Septoria 0 - resistant
9 - heavily infected

Table 5 Oat Variety Test at the Northeast Station, Watertown, 1957

Variety	Yield bu./A 1956	Yield bu./A 1957	Yield bu./A Ave.	Rank 1957	Test Wt. 1957	Variety Performance Notes 1957: Height (inches)	Lodging* 0-9	Crown Rust %	Stem Rust %
Andrew	56.4	72.5	64.4	12	35.5	40	1	45	10
Burnett	48.8	73.6	61.2	10	35.5	38	1	50	Tr
Cherokee	39.3	70.1	54.7	15	33.5	39	4	35	15
Garry	54.7	69.4	62.0	16	31.0	42	1	45	Tr
Marion	48.1	79.5	63.8	4	35.0	39	2	30	25
Minhafer	44.7	76.1	60.4	7	36.0	41	1	15	Tr
Mo-O-205	36.8	66.2	51.0	17	32.0	39	5	65	40
Ransom	30.2	72.1	61.1	13	34.0	37	4	45	--
Waubay	43.5	74.3	58.9	9	35.5	40	1	50	20
Clinton	29.0	70.7	49.8	14	31.0	39	2	55	25
James	36.8	50.3	43.5	19	34.0	40	4	30	30
Branch	43.1	74.9	59.0	8	28.5	42	2	55	10
Ajax	43.9	82.9	63.4	3	29.5	43	2	30	5
Sauk	58.7	84.3	71.5	2	33.0	40	1	35	20
Rodney	50.2	72.9	61.5	11	31.0	40	1	55	Tr
Simcoe	43.9	84.8	64.3	1	30.5	42	3	60	20
Jackson	40.1	79.1	59.6	5	35.5	41	4	35	15
Richland	33.4	65.9	49.6	18	30.0	34	3	40	5
Clintland		78.7		6	36.5	38	2	20	30
L.S.D.	9.5	11.3							

*Lodging notes made on 0-9 scale; 0 = best, 9 = poorest

SOYBEAN AND SORGHUM VARIETY TESTING
by
C. J. Franske

Table 6 lists only three commercial grain varieties and fourteen hybrid varieties of sorghum. These hybrids ranged in maturity from early milk stage to late dough stage. They are too late maturing, and would require extra drying due to the extra moisture content. Frost damage would be very high in these late maturing hybrids.

Table 6 1957 Sorghum Variety Test

Variety	Date Pollinated	Height	Maturity	Bu./A.
Dual		62	2	25.9
Norghum		42	2	14.0
Reliance		40	2	16.0
DeKalb D50-A		56	5	3.3
" C44-A		44	6	2.0
" F62-A		48	7	1.0
" E56-A		48	7	1.4
Kingscrost Expt. 3010		54	5	9.2
" " 3009A		56	5	16.8
" " 3009B		48	5	0.7
" " 3013		45	6	2.7
" " 3055		63	4	5.0
RS 610		47	5	4.6
Texas 620		47	6	1.8
RS 650		45	6	1.0
RS 590		47	6	2.6
RS 501		56	5	14.0

Maturity Range

1. Very Ripe
2. Ripe
3. Hard Dough Stage
4. Late Dough Stage
5. Soft Dough Stage
6. Milk Stage
7. Early Milk Stage

Table 7 1957 Soybean Variety Test

Variety	*Maturity	Height	Bu./A.
Capital	+1	27	20.6
Chippewa	+4	27	21.9
Grant	-1	26	19.5
Mandarin Ottawa	0	22	18.1
Norchief	0	20	19.0
Blackhawk	+9	33	21.6
Monroe	+4	38	18.9

Mandarin Ottawa maturity check - matured Sept. 27.

*Maturity index - Mandarin (Otto) as 0 and rating the other strains plus or minus in days.

This past season the following were tested at the N. E. Research Farm. Notes and Yields were taken. Due to lack of space none of the sorghum tests were replicated.

16 Sorghum varieties in a test plot.
15 Commercial hybrids in a test plot.
22 Long rows of commercial hybrids and varieties in an observational block for field day.
40 One rod rows, 10 rows of each of 2 varieties of grain sorghum and 2 varieties of forage sorghum for Ray Kinch.
28 Millet strains in an observational plot.
24 Varieties and strains of soybeans Groups 0 & I replicated twice (48 rows) in a test plot.
162 S. Dak. strains of soybeans in an observational plot.

CORN YIELD TESTING
by
D. B. Shank and D. E. Kratochvil

In 1957 four corn trials were conducted on the Northeast Research farm. They were:

(1) Commercial hybrids with 27 entries
(2) Early double crosses with 30 entries
(3) Three way crosses with 61 entries
(4) A study of maximum yields involving hybrids and stands

Results

Results obtained from the commercial hybrid test are given in table 8. Included are 2-, 3- and 4-year averages. The 2-year averages are of the results obtained in 1956 and 1957 on the Northeast Research Farm. The 3- and 4-year averages include, in addition, results obtained in 1955 and 1954 on the Korth farm, the site of the Northeast Research Farm.

The 1957 climatic conditions were nearly normal except for cool temperatures during May and June and cool, wet weather the latter part of September and throughout October. Yields of corn were above average, with hybrids which are usually too late to mature generally producing the higher yields. Moisture percentages at harvest time (planting date May 28, harvesting date October 17) were high for all entries. A.E.S. 101, which is normally regarded as too early for the area, was the only entry with less than 30 per cent moisture.

In table 8, each hybrid has been ranked on the basis of a performance rating which evaluates the entries on their relative yields and maturity. This rating was obtained by first converting yields for each hybrid to a percentage of the average yield of all the entries.

Table 8 Area 5 (Codington County) 1957 Corn Performance Tests

Hybrid or Variety	Acre Yield Bu.	Moisture Per Cent	1957 Yield Bu.*	1957 Moisture Per Cent	1957 Performance Rating
	4-Year Average				
Pioneer 388	45	25	55	32	1
Sokota S.D. 220	44	25	53	36	3
Sokota S.D. 250	43	29	53	44	8
Average of 3 entries tested 4 years	44	26			
	3-Year Average				
S. D. 210 (Exptl. #16)	51	21	49	36	6
S. D. Exptl. #18	47	21	46	35	15
Farmers 205	47	29	44	41	23
Disco 101-A	47	31	53	47	14
S. D. Exptl. #17	41	21	47	35	11
Peavey PV355	41	24	37	40	26
Average of 9 entries tested 3 years	46	24			
	2-Year Average				
Pfister P.A.G. 32	52	30	52	40	5
Average of 9 entries tested 2 years	48	29			
DeKalb 62			58	43	2
Pfister P.A.G. 44			56	43	4
Haapala H366			53	42	7
Disco 96-WR			53	43	9
Kingscrost KS4			54	48	10
DeKalb 59			55	49	12
Kingscrost KS3			52	45	13
Funk G-21A			53	48	16
Pioneer 390			47	39	17
A.E.S. 101			38	23	18
Funk G-26			51	47	19
Tomahawk 4A			50	45	20
United Hagie UH305			53	50	21
Gurney 100			48	47	22
Jacques 957JA			42	45	24
Van's Hybrid V54			41	45	25
Cargill 530			32	37	27
Average of 27 entries tested 1 year			49	42	

* Differences in yield of less than 7 bushels per acre are not statistically significant.

Similar calculations were made for moisture at harvest time after first subtracting each moisture percentage from 100 so as to rank the hybrids on their ability to produce sound, rather than soft corn. The performance rating then equaled

$$\frac{6\ (\text{yield percentage}) + 4\ (\text{Moisture percentage})}{10}$$

The hybrid with the highest performance rating is listed as number 1, the second highest as number 2, and so on.

Yields obtained on the early double crosses are not available. The objective is to develop new, superior hybrids for the area. Likewise the study on maximum yields with hybrids and stands has not been completed. The test on three way crosses was cooperative work with the Department of Plant Pathology, and any report on it will be made by that Department.

GRASSES AND LEGUME TESTING

by

M. W. Adams and J. G. Ross

Objectives

To determine the adaptability of various legume and grass forages to growing conditions (soil and climate) in the area served by the experimental farm. Adaptability would be measured by:

a) Ease of getting a stand

b) Stand survival
   Winter resistance
   Drought resistance

c) Yield of forage, or green manure value

d) Consistency of performance

In addition, if there are specific disease factors, such as bacterial wilt of alfalfa, or insect factors, such as the spotted alfalfa aphid, it would be desirable to have information with respect to varietal reaction to these hazards.

Table 9 % Stand and Pounds of Dry Matter Produced by 8 Varieties of Red Clover at N. E. Research Farm, 1957.

	%	# DM/acre		
	Stand	1st cut	2nd cut	Total
Wagner	87	3116	931	~~4047~~
Comm. Common	77	2031	720	2751
Comm. Mammoth	83	2512	466	2978
Wisconsin Synthetic	85	2772	843	3615
Pennscott	82	2996	779	3775
Dollard	73	3116	779	3895
LaSalle	97	2683	814	3497
Kinland	97	2230	867	3097

Dollard, despite poor average, stand stood 2nd high in yield. At the present time it appears that locally grown red clover is as satisfactory as anything that can be grown except for Dollard. One of the more attractive features of Dollard is its ability to live over and produce well in the second harvest year.

Table 10 Pounds of Dry Matter Produced per Acre by 7 Varieties of Sweet Clover at N. E. Research Farm, 1957

	#DM/acre
Spanish	5096
Evergreen	4988
Madrid	5650
A46-S65 (goldtop)	5721
Comm. White	4733
Comm. Yellow	5539
Brandon Dwarf	2689

Brandon Dwarf is a type that is much less coarse, and more leafy than the others so the yields given do not reflect accurately the real value of the strains. Utilization trials - either green manure or feeding - are really most essential in making final evaluations. The new goldtop sweetclover is vigorous, and in addition possesses some foliage disease resistance and is not as high in the bitter substance (coumarin) as are the other strains.

Table 11 A Comparison of 12 Different Alfalfa Varieties in Regard to % Stand, Height at 2nd Cutting, % Flowering at 2nd Cutting and Pounds of Dry Matter Produced, N. E. Research Farm, 1957

	% Stand	in. Ht. at 2nd cut	% Flowering at 2nd cut	#DM/acre 1st cut	#DM/acre 2nd cut	Total
Ranger	99	18	25	2838	1220	4058
Ladak	98	19	15	3534	1201	4735
Cossack	99	18.5	50	2580	1176	3736
Grimm	94	17.5	80	3042	1020	4062
Vernal	100	17	15	3151	1294	4445
Narragansett	99	16	20	3113	1137	4250
H_2	100	12	5	3253	931	4184
Rhizoma	97	15	15	2995	622	3617
DuPuits	98	21.5	85	2879	1010	3889
Nomad	96	12.5	0	2931	549	3480
Lahontan	96	18	25	2200	559	2759
Terre Verde	3 (winterkilled)		--	--	--	--

This test appeared to provide quite reliable information on the performance of the included strains. But further years of measurement and observation will be required since the various factors that make for the superiority of one strain over another do not necessarily become manifest in the first year of a test.

Grass Performance Tests Watertown - 1957

Seedings of grass made at Watertown in 1956 were unsuccessful but in 1957, stands were obtained of the following grasses in comparative tests to determine yield and adaptability:

Smooth Bromegrass	10 varieties	Tall Wheatgrass	5 varieties
Switch Grass	4 "	Pubescent Wheatgrass	3 "
Russian Wildrye	2 "	Stream-bank Wheatgrass	1 "
Crested Wheatgrass	10 "	Beardless Wheatgrass	1 "
Intermediate Wheatgrass	7 "		

PLANT DISEASE CONTROL

Corn Diseases

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

Objective:

To determine the influence of root rot resistant lines on yields of three-way crosses in corn.

Discussion and Interpretation of Results

Damage to the roots by soil-borne diseases is one of the weaknesses not only of corn but of most other crops as well. Over a period of years, experiments have been conducted at the Experiment Station at Brookings to develop strains of corn which are resistant to one or more diseases. These lines now are being tested in hybrid combinations to determine their effectiveness, not only in yielding ability, but particularly in the control of certain important diseases.

In 1957, 57-three-way crosses were compared with four commercial hybrids considered to be among the top yielding varieties adapted to the area. These results of Table 12 indicate that those crosses with the more highly resistant lines produced yields which were definitely superior to the commercial hybrids in this experiment.

Table 12 Yield Performance of 57 Experimental Three-Way Crosses in Corn Involving Root Rot Resistance Lines in Comparison with Four of the Top Yielding Adapted Hybrids for the Area.

Expt'l or Hybrid No.	Moisture %	Yield Bu/A*	Expt'l or Hybrid No.	Moisture %	Yield Bu/A*	Expt'l or Hybrid No.	Moisture %	Yield Bu/A*
1	37.8	56.7	20	39.6	46.3	39	35.7	41.2
2	42.1	55.2	21	36.7	46.0	40	40.0	41.1
3	43.0	55.1	22	43.2	45.5	41	34.7	41.0
4	37.0	52.1	23	36.3	45.0	42	34.9	40.7
5	43.4	51.0	24	39.4	45.0	P388**	36.9	40.7
6	36.6	50.7	25	36.9	44.7	43	37.8	40.5
7	35.6	50.7	26	39.2	44.6	44	37.4	40.5
8	38.5	50.0	27	38.6	44.4	45	38.8	40.3
SD220**	35.5	49.6	Pf32**	38.1	43.9	46	40.3	40.1
9	38.8	49.5	28	35.5	43.9	47	37.3	39.6
10	35.2	49.1	29	36.3	43.6	48	37.5	39.5
SD250**	43.8	49.1	30	30.7	43.5	49	39.0	38.2
11	37.5	48.9	31	41.2	42.9	50	36.7	38.2
12	38.4	48.9	32	36.4	42.7	51	32.5	38.1
13	38.9	48.7	33	36.2	42.6	52	37.6	37.5
14	38.6	48.7	34	37.8	42.5	53	36.3	37.4
15	37.4	48.1	35	38.2	42.5	54	36.2	37.0
16	38.1	48.0	36	36.2	42.5	55	40.5	36.9
17	39.6	47.7	37	38.4	42.3	56	34.6	31.9
18	34.6	46.6	38	35.7	41.7	57	38.3	29.0
19	38.6	46.4						

* Differences of less than 5.9 bushels per acre are not significant differences.

** Commercial Hybrids: S.D. 220 = South Dakota 220; SD 250 = South Dakota 250; Pf32 = pfister 32; P88 = pioneer 388.

Potato Diseases

C. M. Nagel
Department of Plant Pathology

Objective:

1. To select a more effective potato "seed" piece treatment for the control of "seed" piece decay to improve field stands.
2. To determine the effectiveness of Terraclor as a soil treatment at various dosages for the control of potato scab.

Discussion and Interpretation of Results

Potato growers frequently experience poor stands which reduce the yields per acre and thereby increase the cost of production. A "seed" treatment which would have a broader range of control than Semesan Bel, which is one of the more effective potato "seed" treatments for this area, would be desirable and profitable to the grower.

In an attempt to find a more effective "seed" treatment, eleven different treatments were tested in 1957. The results obtained are presented in Table 13. Phytomycin at one hundred parts per million of water plus Captan 50W at two pounds per one hundred gallons dipped for 1/2 minute was the best treatment, when compared to the seed lot having no treatment, namely treatment No. 11, Certain other treatments were inferior either because they were toxic to the "seed" piece or because they were ineffective in preventing disease organisms from rotting the "seed". The lowest sum of the two rankings indicates the best treatment, namely, treatment 3 in table No. 13.

Table 13 The Effect of Eleven Potato"Seed" Piece Treatments on Number of Plants per Plot and on Yield.

Treatment No.	Materials	Yield Bu/A	Rank in Yield	Rank in No. Plants Per Plot
1.	Phytomycin - 100 ppm, 30 second dip	355.5	4	7
2.	Captan 50W - 2 lb/100 gal., 30 second dip	303.0	7	1
3.	Phytomycin - 100 ppm - Captan 50W - 2 lb. 100 gal, 30 second dip	393.9	1	2
4.	Omadine, Zinc 50% WP - 2 lb/100 gal. 30 second dip	373.7	3	5
5.	Phytomycin - 100 ppm - Omadine, Zinc 50% WP - 2 lb/100 gal., 30 second dip	330.0	5	8
6.	Phytomycin - Catechol - wax emulsion, instant dip	259.1	11	11
7.	Wax emulsion, instant dip	293.4	9	9
8.	Phytomycin - Terraclor - wax emulsion, instant dip	259.3	10	10
9.	Omadine, Copper 50% WP - 1 1/2 lb/100 gal., 30 second dip	310.7	6	3
10.	Phytomycin - 100 ppm - Omadine, Copper 50% WP- 1 1/2 lb/100 gal., 30 second dip	378.0	2	4
11.	No treatment-Control	300.9	8	6

The control of potato scab other than through a scab resistant variety would be valuable to the growers provided an effective chemical could be found which was easy to apply and reasonable to price.

Terraclor seemed to meet at least certain of these requirement; therefore, an experiment was conducted to determine the effectiveness of Terraclor for combating scab. Although scab can be controlled on the "seed" piece by using an effective "seed" treatment, this control in itself will not insure scab-free potatoes at harvest time as the potato scab organism can live in field soil for many years, and is usually present to re-infect the new tubers which are being produced by the plant. An insecticide was included in one series of plots to eliminate any influence which insects may have on scab infection. The summarized results in Table 14 show that Terraclor alone or in combination with an insecticide produced approximately 100 per cent more tubers which graded U.S. #1 than did the plots not treated with Terraclor.

Table 14 The Percentage of U.S. #1 and U.S. #2 and cull Tubers, Produced in Plots Treated with Terraclor and/or Dieldrin in Comparison to no Soil Treatment.

Soil Treatment	Pounds Applied per Acre	Percentage tuber which graded U.S. #1	U.S. #2 and culls
Terraclor 20%	200 lbs.	67	33
Terraclor 20% - dieldrin	200 lbs.	76	24
No treatment-control	none	40	60

Small Grain Diseases

Spring Wheat and Barley Rust Trials

J. F. Hennen
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Objective

To determine the prevalence, distribution and races of rust and also to test new and promising varieties for their rust reaction.

Discussion and interpretation of results

Rust notes were taken on 29 lines of wheat and 20 lines of barley during the milk to soft dough stage. The data taken for each line was as follows:

- Prevalence - the percentage of the plants showing infection,
- Severity - the average area of the plants covered with rust, and
- Reaction - the type of reaction between the rust and the plant which indicates resistance or susceptibility.

The data are given in Tables 15 and 16. Rust collections were made from several key lines for race identification.

The following races or rust were identified at the Federal Rust Laboratory at St. Paul, Minnesota from collections of stem rust on wheat sent in from throughout the state:

Stem Rust Races	No. of Rust Isolates
11	6
15	3
15B	48
17-29 group	1
56	33

The most prevalent race of stem rust since 1950 has been 15B. This race and some closely related forms are among the most destructive stem rust races that have occurred since race identification began in the early 1920's. There are at present no commercial varieties of bread wheat available for South Dakota that are resistant to all rust collections of race 15B. Yuma and Langdon are the only durum wheats that have so far been resistant to all rust collections of race 15B. Race 56 has been second in prevalence since 1950. However, all presently recommended spring wheat varieties are resistant to race 56. Race 11 has occurred primarily on experimental material; however, Selkirk and Conley are susceptible to some collections at high temperatures. Therefore, this race must be watched as it could be a possible threat in the future. Likewise, races 15 and 17-29 are possible sources for future trouble due to the ability of some collections of these races to infect some of the new durum and bread wheat varieties such as Yuma, Langdon, Ramsey, Towner and Selkirk.

Stem rust on wheat was not as damaging as in 1956. One of the main reasons for this was that rust spores did not blow in from the South as early or in such large amounts as in 1956. The first rust infections were found during the first week of June in 1956 but not until the third week of June in 1957. Although weather conditions were generally favorable for rust development there was not enough initial inoculum nor time of crop growth after the first infections for sever build up of rust. It appears that the strains of race 15B of stem rust that appeared last year on resistant varieties such as Selkirk, Ramsey, Towner and Langdon were absent in 1957.

These small grain rust nursuries are grown at many locations throughout the United States in the spring wheat and barley areas by the State Agricultural Experiment Stations in cooperation with the United States Department of Agriculture.

Table 15 Results from the Barley Uniform Rust Nursery Showing the Amount, Security and Reaction of Stem Rust on the Following Varieties or Strains when Grown at the N. E. Research Farm, 1957.

Variety or Strains		Stem Rust			Leaf Rust		
		Preva-lence	Seve-rity	Reac-tion	Preva-lence	Seve-rity	Reac-tion
1.	Cheveron	100	5	HR*1	100	5	S
2.	H-111-87	-	t	R*2	0	0	O
3.	Kindred	0	0	0*3	-	t	R
4.	Valentine	0	0	0	100	1	S
5.	Hietpas 5	100	10	S*4	-	T	S
6.	Quinn	100	30	CS*5	0	0	O
7.	Bolivia	100	50	CS	-	t	R
8.	Abyssinian	100	20	CS	100	1	S
9.	Rabat	100	40	CS	100	5	S
10.	Estate	100	50	CS	-	t	S
11.	Montcalm	100	30	CS	100	5	S
12.	Traill	0	0	0	100	30	S
13.	UM 570B	-	t	R	100	10	S
14.	Gospick	0	0	0	100	5	S
15.	H154a - 28 - 5 - 4- 3	-	t	R	100	10	S
16.	Feebar	0	0	0	100	15	S
17.	Liberty	0	0	0	100	15	S
18.	Forrest	0	0	0	100	10	S
19.	Fox	0	0	0	100	5	S
20.	Fayette Sel.	0	0	0	100	5	S

* 1. H.R. - Highly Resistant, 2. R - Resistant, 3. O- No rust infection, 4. S - Susceptible, 5. CS - Completely susceptible.

Table 16 Spring Wheat Rust Nursery

Variety or Strain	1956 Preva-lence	1956 Seve-rity	1956 Reac-tion	Stem Rust 1957 Preva-lence	1957 Seve-rity	1957 Reac-tion
1. Russell	100	10	S	100	0	0
2. Selkirk	100	1	CS	0	0	0
3. Preston	100	40	CS	100	20	CS
4. T. timopheevi	100	tr	CS	0	0	0
5. McMurachy	100	40	CS	0	0	0
6. Frontana	100	20	S	0	0	0
7. Ceves	100	50	CS	100	10	CS
8. Kenya Farmer	100	tr	HR	0	0	0
9. Frontana x K58-New-thatch	0	0	0	0	0	0
10. Rushmore	100	30	CS	0	0	0
11. Mentana	100	40	CS	100	5	CS
12. Conley	tr	tr	HR	0	0	0
13. N. D. 4	tr	tr	HR	0	0	0
14. N.D. 52	0	0	0	0	0	0
15. Yuma	tr	tr	CS	0	0	0
16. Ramsey	100	30	CS	0	0	0
17. Towner	100	30	CS	0	0	0
18. Langdon	100	10	CS	0	0	0
19. St. 464	100	5	CS	0	0	0
20. Lee	100	40	CS	0	0	0
21. Marquis	100	60	CS	100	10	CS
22. Reliance	100	60	CS	100	10	CS
23. Mindum	100	40	CS	100	tr	CS
24. Vernal	100	20	CS	0	0	0
25. Kenya 58	100	20	CS	100	5	CS
26. Bowie	-	-	-	0	0	0
27. Khapli	0	0	0	0	0	0
28. Thatcher	-	-	-	0	0	0
29. R.L. 3206	-	-	-	0	0	0

Smut Resistance in Oats

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Objective:

To control oat diseases.

Discussion and interpretation of results

Twenty-six oat varieties and selections from several state experiment stations, along with certain smut differentials and resistant varieties, were tested for their reaction to the smut races prevalent in South Dakota. Twenty-five of the varieties and selections were resistant to smut. The results obtained are shown in Table 17.

Table 17 North Central States Uniform Oat Smut Nursery - Watertown, South Dakota, 1957

1957 No.	Variety or Cross	C.I.No.	% Smut[a]
	Smut Differentials and Resistant Varieties		
1	Anthony	2143	97
2	Black Diamond	1878	28
3	Black Mesdag	1877	3
4	Camas	2965	9
5	Fulghum	708	2
6	Gothland	1898	38
7	Markton	2053	0
8	Monarch	1876	0
9	Navarro	996	0
10	Nicol	2925	0
11	Saia	7010	0
12	Tetraploid: A. Abyssinica x A. Strigosa	7232	0
13	Victoria	2401	0
14	Victory	560	71
	Commercial Varieties and Selections		
15	Ajax x (Hawkeye-Victoria)	7107	0
16	Beacon x (Hawkeye-Victoria)	7270	0
17	Beedee	6752	0
18	Burnett	6537	1
19	Cherokee Reselection: D69 Bond	7194	2
20	Clintland: Landhafer x Clinton[4]	6701	0
21	Clintland[2] x (Clinton 59[7] x Landhafer[4] x (Clinton B-C x RL 2105))	7234	0
22	Clintland x (Garry x Hawkeye-Victoria)	7266	0
23	Clintland x (Garry x Hawkeye-Victoria)	7267	0
24	Clintland x (Garry x Hawkeye-Victoria)	7269	5
25	Clinton 59: D69 Bond	4259	3
26	Columbia-Merion x (Victoria x H-B) x (Victory x Hajaira-Ajax))	7272	0
27	D69-Bond x (Victoria-Richland x Bannock)	7117	0
28	Fundy: Ajax x Abegweit	7288	42
29	Garry: Victory x (Victoria x Hajaira-Banner)	6662	0
30	(Landhafer x (Mindo x H-J)) x Andrew	7198	0
31	(Landhafer x (Mindo x H-J)) x Andrew	7271	0
32	Markton-Rainbow x D69 Bond	7154	1
33	Minhafer: (Bond-Rainbow x H-J) x Landhafer	6913	0
34	Nemaha x (Clinton x Boone-Cartier)	7268	2
35	Nemaha x (Clinton x Boone-Cartier)	7179	0
36	Putnam: Boone-Cartier x Clinton	6927	0
37	Rodney x Landhafer-Forvic	7235	1
38	(Rox x (Victoria x H-B)) x (Ajax) x (Vic x H-B))	5962	0
39	(Rox x (Victoria x H-B)) x Ajax x (Vic x H-B))	6964	0
40	Shield:(Rox x Victoria x H-B)) x Ajax x (Vic x H-B))	7209	0

a - Inoculated with prevalont South Dakota races of smut.

Control of Pasmo of Flax

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Objective:

To find sources of resistance to pasmo, a disease which attacks the leaves, stems and flora parts of flax.

Discussion and interpretation of results

Pasmo produces leaf spots and causes defoliation; it also produces large lesions on the stems and floral branches, which become brittle and easily break. This results in reduced total yield as well as less oil of poorer quality.

Experiments were conducted to further select strains of flax with greater resistance to pasmo to be used in developing commercial varieties resistant to this disease. Approximately 100 lines selected from the 1956 test were re-tested in 1957. These included previously selected lines having resistance to pasmo, equal to or greater than that of Marine. Marine appears to possess the best tolerance to pasmo now present in a recommended variety; however, the degree of resistance is inadequate to provide satisfactory protection. From 10 to 20 individual plants were selected within certain strains for their apparent superior resistance to pasmo. The number of lines with apparent acceptable resistance has been reduced to 50. These were harvested for further testing and also for making crosses with each other and with commercial varieties. Some of these may not have sufficient resistance to replace present sources. In addition to selecting for pasmo resistance within the 100 strains, 13 other species of the flax family were examined. None of them showed marked resistance to pasmo and all but one were susceptible to rust. Other species of flax not yet examined may possess desired resistance.

Soybean Diseases

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Objective

Soybeans are subject to a number of leaf, stem and root diseases that reduce yield and quality of beans to different extents. Appraisal of the occurrence and abundance of these diseases on varieties and strains of soybeans aid in the evaluation and development of varieties and strains for disease resistance for commercial use.

Discussion and interpretation of results

Twenty-four varieties and strains were examined August 12, 1957, when the plants were flowering. At that time the diseases present were the leaf disease bacterial pustule and bacterial blight and were present in about equal abundance. The average percentages of leaves infected by a combination of these diseases in two replications were as follows:

Table 18 Average Percentage of Soybean Leaves Infected by Two Leaf Diseases Bacterial pustule and Bacterial blight at N. E. Research Farm, 1957.

Variety or Strain	Percentage Leaves Infected	Variety or Strain	Percentage Leaves Infected
Monroe	100	Giant	60
A4K - 1433	100	Chippewa	50
CX 147 - 25	100	Capital	50
CX 185A - 25 - 1	100	0 - 55 - 2066	50
Norchief	100	W9 - 1982 -32[2]	50
Mondarin (Ottawa)	75	CX 197 - 23 - 3	50
W9S - 2703	75	M317	35
Blackhawk	75	M320	35
0 - 52 - 793[1]	75	0 - 52 - 710[1]	35
CX203 - 11 - 3	75	M315	20
M319	75	M316	15
M318	75	A4K - 1347	15

A difference of 30 percent is deemed necessary to judge significance in amount of disease between any two varieties.

Downy mildew was not present on any of the above varieties but was present in trace amounts in a border row of beans.

FERTILITY AND CULTURAL PRACTICE EXPERIMENTS

by F. E. Shubeck and Q. S. Kingsley

Fertility Experiment #1

Type of Experiment

Apply fertilizer every year or once in 4 or 5 years.

Objectives of Experiments

1. When there is no legume in the rotation, is it better to apply small amounts of fertilizer every year, or the same amount all in one application but only once in 4 or 5 years? What is the effect on % of protein in grain?
2. Will this high rate of application have any undesirable effects on the grain as "burning" or lodging?
3. Which method will give the most efficient recovery of fertilizer nutrients?

Results of Experiment

Table 19 Residual Effect of Commercial Fertilizer on Yield of Oats and Percent of Protein in Grain.

1956 Fertilizer Treatment N	P_2O_5	K_2O	1956 Yield of corn bu/acre	1956 % Protein in corn grain	1957 Fertilizer Treatment N	P_2O_5	K_2O	1957 Yield of oats bu/acre	1957 % Protein in oats grain
0	0	0	35.6	11.78	0	0	0	54.7	13.58
40	20	0	47.9	11.29	40	20	0	68.0	14.71
80	40	0	50.6	11.25	0	0	0	61.8	13.80
120	60	0	51.6	11.35	0	0	0	61.4	14.40
160	80	0	54.9	11.11	0	0	0	67.7	14.53
200	100	0	64.9	11.47	0	0	0	67.1	14.63
L.S.D. at 5% Confidence level			5.3	-				8.1	-

Discussion and interpretation of results

This is the second year of the experiment. Fertilizer treatments for the two years are listed in the preceding table. The fertilizer applied in 1956 was broadcasted in the spring of 1956 and plowed under for corn. The 40-20-0 treatment applied in 1957 was disced in for the oats.

There was very little effect on % of protein in corn grain due to the fertilizer treatments. This is unusual because other experiments have indicated that nitrogen fertilizer usually increases the protein content in corn. With oats, there was a small but rather consistent increase in protein content in the grain from the plots fertilized in 1956 and also from those fertilized in 1957.

The annual application of 40-20-0 increased the yield of oats more than the residual effect of twice that amount of fertilizer applied for corn in 1956. It should be noted that the total rainfall for the 5 months; April, June, July and August of 1956, was 7.35 inches more than average. The question then arises, was some of the fertilizer leached below the roots of the relatively shallow rooted oats plants? If it was leached to a lower depth in the profile, can the next years corn crop recover it?

Fertility Experiment #2

Type of Experiment

Comparison of legumes to commercial nitrogen for increasing crop yields.

Objectives of Experiment

1. Compare efficiency of alfalfa, red clover and biennial sweet clover for increasing grain yields.
2. Compare commercial nitrogen to legume nitrogen as a means of increasing crop yields.
3. Will a sweet clover fallow treatment increase grain yields sufficiently or reduce risks enough to justify its adoption.

Results of experiment

Table 20 Comparison of Legumes, Commercial Nitrogen and Fallow for Increasing Spring Wheat Yields and % Protein in Grain.

Preceding Crop or Treatment	Pounds per acre of fertilizer applied to wheat N	P_2O_5	K_2O	Spring wheat bu/acre	% Protein in grain
1. Sweet clover *	0	20	0	26.7	16.77
2. Oats	30	20	0	23.2	15.56
3. Red clover*	0	20	0	21.0	15.58
4. Fallow	0	20	0	27.6	17.41
5. Alfalfa*	0	20	0	23.6	14.93
6. Oats	0	20	0	19.2	14.05
L.S.D. at 5% Confidence level				1.4	---

*Legumes were planted with oats as a nurse crop in 1956. The oats was cut when 6 to 8 inches high to reduce competition for sunlight and moisture and to insure a stand of legumes. The legumes were plowed under early the following spring.

Discussion and interpretation of results

This experiment has been underway for 2 years so this is the first year that a grain crop followed a legume. The fallow plots were fallowed in 1956, the first year of the experiment so they were not preceded by sweet clover. Therefore, for this years results, treatment number 4 above represents straight fallow, not sweet clover fallow. Treatment number 6 may be considered the check plot because it received no nitrogen fertilizer and was not preceded by a legume.

1956 was a year of above average rainfall. Some of the legumes growing in that year and plowed under in the spring of 1957, increased the yield of the following wheat crop as much as an application of 30 pounds of available nitrogen per acre. The comparative residual effect of the legume nitrogen and commercial nitrogen will be measured by next years corn crop.

The different legumes varied in their ability to increase yields of the succeeding wheat crop. The yield of wheat on fallow ground was high compared to the other treatments because of the favorable nitrogen and moisture relationships resulting from the fallow treatment.

Percent protein in grain was increased considerably by some of the treatments. In general, the treatments causing the greatest increase in yield, also caused the greatest increase in % of protein.

Table 21 Influence of Nitrogen Fertilizer on Yield of Oats Flax and Corn.

Fertilizer treatment Pounds per acre N	P_2O_5	K_2O	Oats bu/acre	Flax bu/acre	Corn bu/acre
0	20	0	51.3	10.3	41.6
30	20	0	60.8	12.0	45.3
L.S.D. at 5% level			12.0	2.1	2.9

Discussion and interpretation of results

The data in the above table also was obtained in experiment number 2. At the present date, none of these crops listed in table 21 have been preceded by a legume. All rotations in this experiment are 4 years in length so it will take 4 years to make one complete cycle. The rotation consists of flax + legume, legume hay and seed, spring wheat, and then corn. Nitrogen fertilizer increased the yields, to some extent, with all 3 crops.

Table 22 Influence of Crop Sequence on Percent of Water in Soil.

Fertilizer treatment 1957	1956 Crop	1957 Crop	Depth in ft.	May 3, 1967	% water in soil June 19, 1957	% water in soil July 3, 1967	% water in soil Sept. 4, 1957	% water in soil Oct. 14, 1967
0 - 20 - 0	flax	oats	0-1	27.0	27.4	11.8	28.6	29.1
0 - 20 - 0	"	"	1-2	18.9	18.6	10.9	18.3	24.5
0 - 20 - 0	"	"	2-3	13.8	12.1	7.6	8.7	14.8
0 - 20 - 0	"	"	3-4	10.3	13.9	9.8	10.9	11.7
0 - 20 - 0	"	"	4-5	10.9	12.4	13.0	13.3	12.3
0 - 20 - 0	fallow	wheat	0-1	26.2	25.4	12.4	28.9	29.4
0 - 20 - 0	"	"	1-2	20.5	19.4	9.8	23.0	24.4
0- 20 - 0	"	"	2-3	13.8	12.7	6.4	20.6	13.7
0 - 20 - 0	"	"	3-4	12.3	13.5	6.7	10.2	15.2
0 - 20 - 0	"	"	4-5	13.8	11.8	9.2	9.7	14.8
0 - 20 - 0	flax + alfalfa	alfa-lfa	0-1	26.0	24.8	12.3	28.3	26.1
0 - 20 - 0	"	"	1-2	20.8	17.6	8.7	14.1	19.3
0 - 20 - 0	"	"	2-3	10.8	13.4	6.7	9.1	10.0
0 - 20 - 0	"	"	3-4	8.7	13.6	8.4	8.3	9.6
0 - 20 - 0	"	"	4-5	8.3	11.8	10.0	9.0	11.1

Discussion and interpretation of results

The soil moisture data presented in table 22 also was obtained from experiment number 2. At the beginning of the 1957 growing season, there was approximately 2 to 3% more water in the 3rd and 4th ft. under plots that had been fallowed compared to corresponding depths under plots that had raised a crop of flax. This represents only a small amount of available water but its importance should not be overlooked (note in table 20 the wheat yield obtained from fallowed plots). By the beginning of the 1957 growing season, the soil moisture in the 3rd and 4th foot under alfalfa was about 3 to 5% less than the moisture under soil that had been fallowed the previous year.

On October 14, at the end of the season, the percentage of soil water under alfalfa was somewhat less than that under wheat or oats. This may be accounted for in part by the above average rainfall in 1957, which minimized the soil moisture depletion effect of the alfalfa.

Fertility Experiment #3

Type of Experiment

Measure residual effects of legumes on small grain yields.

Objectives of Experiment

1. Determine how long a 1, 2, 3, and 4 year old alfalfa sod will have an influence on yield of subsequent crops.

2. Should nitrogen fertilizer be applied to the 2nd., 3rd., or 4th grain crop after alfalfa to obtain maximum yields that the rainfall and climate will permit.

3. To increase grain yields, is it better to depend on the effects of residual legume nitrogen or to omit the legume and apply commercial nitrogen each year?

Results and discussion

Each year a new stand of alfalfa will be started on new plots, and all the old stands will be maintained. This procedure will be continued until 1960 when all the alfalfa will be plowed under and the residual fertility will be measured by planting each plot to grain crops for several years and recording the yield increases. The residual effect of alfalfa will be compared to annual applications of commercial nitrogen on the grain crops beginning in 1960, after the alfalfa has been plowed. Therefore no results for this experiment will be available until 1961.

Fertility Experiment #4

Type of Experiment

Row spacing and seed crops of bromegrass and alfalfa.

Objectives of Experiment

1. Will the seed yield of bromegrass and alfalfa be greater if the plantings are made in wide spaced rows and cultivated?

2. Is the application of supplemental nitrogen necessary to obtain maximum bromegrass yields when the brome is planted in rows and cultivated?

Results of Experiment

Table 23 Effect of Row Spacing Cultivation and Fertilizer on Yield of Bromegrass Seed.

Row spacing	Lbs. of seed per acre (fertilized)*	Lbs. of seed per acre (unfertilized)
7 inches	447.3	241.9
21 inches	606.2	405.7
35 inches	555.1	397.6

*Fertilized with 40 lbs. of nitrogen per acre

Discussion and interpretation of results

With the unfertilized bromegrass, the practice of seeding in wide spaced rows and intertilling gave more seed per acre than the practice of seeding in 7 inch rows with no intertillage. There was practically no difference in seed yield between the 21 and 35 inch spacing, when no nitrogen was applied.

With the fertilized bromegrass, the 21 inch spacing gave a higher yield of seed than either the 7 inch or 35 inch spacing.

Table 24 Influence of Row spacing and Cultivation Yield of Alfalfa Seed

Row spacing	Pounds of Seed per acre
7 inches	94.1
21 inches	95.9
35 inches	95.8

Discussion and interpretation of Results

The alfalfe plots incurred some damage from lygus bugs before the plots were sprayed in an attempt to control these insects. Under the conditions prevailing for this experiment, there was practically no difference in yield of alfalfa seed due to the different row spacings used. In years when rainfall is not as plentiful as in 1957, there may be considerably more variation in seed yields due to row spacing.

Fertility Experiment #5

Type of Experiment

How to get alfalfa land back into grain production.

Objectives of Experiment

1. From a standpoint of yield of subsequent crops, when is the best time to plow under alfalfa?
2. Investigate the possibility of spraying to kill alfalfa.
3. When alfalfa is plowed under in late fall, will the yields

of the following crops be restricted because of the depletion of subsoil moisture?

4. Is it best to follow alfalfa with a short season crop like flax, or with a long season crop like corn?

Results of Experiment

No results from this experiment will be available until 1960. The alfalfa was planted in 1957; it will be allowed to grow for 2 more years and then plowed. The first grain crop will be in 1960. Since each crop in each rotation is planted every year, there will be a grain crop planted after alfalfa each year from 1960 on.

Discussion

The alfalfa will be allowed to grow 2 full years in addition to the year it was planted in order to accentuate any possible subsoil moisture depletion. A blanket application of phosphorus will be made twice in each rotation; 40 lbs. P_2O_5 to get the legume started, and 60 lbs. P_2O_5 on the third year legume.

The possibility of spraying to kill alfalfa in late summer has stimulated considerable interest because this would keep the ground covered during the winter and help to control erosion. If successful, it would stop transpiration losses immediately, because the plant is dead. If the plants were clipped, they would remain alive and continue to lose water through transpiration. The spraying method should promote rapid infiltration of water and should help to hold snow during the winter. It may cut down on losses from evaporation because the soil would not be turned up to come in contact with dry fall winds.

The advantages and benefits of legumes are well known but there is very little data on how to get legume ground back into grain production. Serious moisture deficiencies sometimes occur the first year after plowing legumes. This experiment was set up to try to find a way to utilize the increased fertility resulting from the alfalfa without succumbing to yield depressions due to depletion of subsoil moisture brought about by the alfalfa. The treatments are centered around time of plowing the legume (to conserve late summer and fall moisture) and type of crops to follow the legume.

Fertility Experiment #6

Fertilization and weed control of flax.

Objectives of Experiment

1. From a standpoint of weed control and maximum yields, what is the best way to fertilize flax - broadcast and disc in, drill with the seed, or plow under?
2. Can method of fertilizer application reduce the seriousness of the weed problem.

3. Will the heavier rates of fertilizer application increase the weed problem enough to require a spraying problem.
4. Is drilling the fertilizer with the seed a more efficient method of application? Is it safe to drill 30 lbs. of nitrogen with the seed?

Results of Experiment

Table 25 Effect of Fertilizer and Methods of Application on Yield of Flax.

Lbs. per acre N	P_2O_5	K_2O	Method of Application	Yield in bu/acre
0	0	0	none	6.2
60	40	0	plowed under	5.3
60	40	0	disced in	5.2
30	20	0	drilled with seed	4.0

Discussion and Interpretation of Results

The treatments for 1957 departed somewhat from the original plans. This was necessary because experiment #5 (time of plowing legumes) was expanded by vote of the Advisory Committee, to include an additional rotation. This forced the flax experiment (#6) to expand further west into an area where a different fertilizer had already been applied. Only a few plots were affected however and there were no distinguishable differences in yield results.

The spray treatments consisted of 5 lbs. of TCA per acre to control grassy weeds and 1/4 lbs. of MCPA per acre to control broad leaved weeds. Another experimental chemical, not sold on the open market, was also tried but it had little effect on the weeds.

The yields of flax were quite low this year. The weed competition in all of the fertilized plots was intense, regardless of method of fertilizer application. The spray treatments were beneficial in controling weeds but were questionable as to their effects on yield of grain. There appeared to be a ceiling imposed upon yields either by the climate, spray materials, or weed competition.

Next year the flax will follow an intertilled crop that had rigid weed control. This may be instrumental in obtaining more satisfactory flax yields.

NORTHEAST EXPERIMENTAL FARM COMMITTEE

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