

Ninth Annual Report

1957

Northwestern Montana Branch
Montana Agricultural Experiment Station
Route 4, Kalispell, Montana

This report is divided into 15 projects
Sections by project number

<u>Project Number</u>	<u>Title</u>	<u>Author or Authors</u>
1062	General Administration	C. W. Roath
1063	Physical Plant	C. W. Roath
1064	General Farm	C. W. Roath
1065	General Services and Consultation	C. W. Roath Vern R. Stewart
5019	Irrigation Investigations	C. W. Roath
5020	Fertilizer Investigations	C. W. Roath Vern R. Stewart
5021	Weed Investigations	Vern R. Stewart
5022	Forage Species and Varieties	C. W. Roath Vern R. Stewart
5023	Small Grain Varieties	Vern R. Stewart
5024	Seed Production	C. W. Roath Vern R. Stewart
5025	Forage Production Methods	C. W. Roath Vern R. Stewart
5026	Small Grain Production Methods	Vern R. Stewart
5027	Potato Production	C. W. Roath
5028	Preliminary Investigations	C. W. Roath
5029	Farm Flock	C. W. Roath

1957

General Administration

Project No. MS 1062

by

C. W. Roath, Superintendent

General Administration

Costs of this fiscal project for 1957-58 which includes travel, phone, clerical help, expense while at Annual Conference, as well as salary for the Superintendent when engaged in administrative matters totaled \$2548.96.

A beginning has been made toward placing all fiscal matters as well as research under approved Montana projects. At present it appears reasonable to assume that ten research projects will be needed to describe present experimental work in sufficient detail and to set forth objectives and means of accomplishment, without being too vague or general.

Negotiations have been started which it is hoped will lead to lease of, and eventual purchase of, additional land for the Northwest Montana Branch Station. It is becoming increasingly difficult to find space and suitable conditions for station work on our present 51 tillable acres.

Most pressing among administrative problems now apparent in coming months is that of finding ways and means of continuing work at present levels while one man of a two man staff is on leave for study.

1957

Physical Plant

Project No. MS 1063

by

C. W. Roath, Superintendent

Physical Plant

Fiscal Plant Expenditures for 1957-58 total \$2493.17.

Funds from this project supplemented by \$4700.00 from a special fund provided by the 1957 legislature provided one new building for the station.

The place has been further improved by filling and grading around buildings, construction of a loading dock, and by some farmstead beautification work involving establishment of beds of hybrid lillies and named iris.

Plans for 1958-59 call for ceiling and insulating the heated portion of the new building, partitioning off two office rooms, and partially furnishing these so they may be occupied. Even before this is done the under-roof space is quite usefull.

1957

General Farm

Project No. MS 1064

by

C. W. Roath, Superintendent

General Farm

General Farm Expenditures for 1957 total \$2552.44. This covers cost of lease of farm machinery, tractor fuel, and general farm labor.

Matters receiving some attention which would improve labor and equipment efficiency include some revision of field arrangement and some adjustments in irrigation procedure.

Equipment items which would add materially to general farm operations include a gasoline tank and measuring pump, a fanning mill of sufficient capacity for cleaning the seed grains produced, and truck scales for accurate determination of farm plot yields.

Plans for the coming year call for establishment of additional pasture for sheep.

1957

General Service and Consultation

Project No. MS 1065

by

C. W. Roath, Superintendent

General Services and Consultation

Costs of this project for 1957-58 total \$316.72.

This includes costs of the Progress Report, participation in meetings, assistance in demonstrations and time spent on radio talks and reports of various kinds including field day.

Staff members have participated in 19 public meetings where talks or reports covering some phase of the station work have been made to some 848 persons.

Fourteen radio talks have been prepared for use over from one to four broadcasting stations.

Eight hundred copies of the Progress Report have been distributed, chiefly through Northwestern Montana County Agents.

Monthly letters have been sent to forty-five persons.

Plans for 1958-59 contemplate continuance of all forms of informational distribution now in use as well as accelerated use of demonstrations in cooperation with county agents.

Following is a list of activities which one or more of the staff members participated in the calendar year of 1957.

<u>Activity</u>	<u>Place</u>	<u>Date</u>
Western Montana District County Extension Agent Meeting	Missoula	January 7
Northwest Montana Branch Station Advisory Council Meeting	Missoula	January 7
Western Montana District County Extension Agent Meeting	Missoula	January 8, 9
Northwest Crop Improvement Association	Great Falls	January 31
Fertilizer Dealers School	Bozeman	February 6, 7, 8
Soils Research Review Conference	Bozeman	February 12, 13
Northwest Montana Seed and Feed Show	Kalispell	February 20, 21, 22
Conservation Days	Libby	March 13
Conservation Days	Eureka	March 14
Conservation Days	Hotsprings	March 14
Conservation Days	Polson	March 20

Activities (Continued)

<u>Activity</u>	<u>Place</u>	<u>Date</u>
Fertilizer Dealers Meeting	Kalispell	March 25
Conservation Day	Missoula	March 27
Columbia Sheep Breeders Association	Lakeside	June 24-25
County Agricultural Agency Council	Kalispell	July 1
Western Grass Breeders Conference	Bozeman	July 8, 9, 10
Central Montana Branch Station 50th Anniversary	Moccasin	July 18
Summer Staff Conference	Huntley	July 19, 20
Tour of off-station experimental plots	Flathead County	August 7
Sanders County Fair	Plains	August 24
Missoula County Fair	Missoula	September 4
Dairy School	Kalispell	October 10
District Soil Conservation Supervisors	Polson	October 18
Annual Conference	Bozeman	December 2-7
County Agricultural Agency Council	Kalispell	December 9
Agronomy and Soil Advisory Committee	Bozeman	December 19-20

1957

Irrigation Investigation

Project No. 5019

by

C. W. Roath, Superintendent

Irrigation Investigations

In this seasons work with irrigation rates, an abnormally dry season furnished the best opportunity afforded in years to compare irrigation rates under dry conditions. At the same time the dry conditions made it practically impossible to maintain irrigation schedules. So, results this season favor the rate that called for the highest rate of application at the time sufficient water was available.

Yield differences were not in all cases statistically significant. However the highest yield of all crops was from the highest rate, and in the case of potatoes and pasture the yields were significantly higher for the highest rate. This rate called for the application of .2 inches per day less rainfall, during the growth period of the crop.

\$1219.79 was the cost of this project.

Such significance as was obtained favored the highest rate of irrigation water application. In other words .2 inches per day less rainfall was the best schedule of irrigation rates used this season.

Plans include certain steps to make irrigation water available at all times to keep up with all rates used in this project.

As an indication of irrigation benefits, comparative yields of dryland and irrigated potatoes with similar treatments is given.

Cwt/Acre Gems with no Nitrogen	<u>Dry</u> 103.87	<u>Irrigated</u> 320.81
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Table I. Irrigation data from alfalfa study three irrigation rates, four replications, two cuttings, Creston, Montana 1957.

Rate*	Irrigation Dates	Total Inches	Plot Yields in pounds dry matter				Total Pounds	Pounds Oven Dry Corrected to 12% moisture
			I	II	III	IV		
1	5/21 7/6 7/23 8/7 12"	14.4	11.418	10.850	13.518	10.893	46.679	3.174
2	5/7 7/6 7/8 7/23 8/7 12"	10.5	8.793	12.018	10.193	12.293	43.297	2.944
3	6/3 7/8 7/31 9"	9.3	10.806	10.062	7.481	10.806	39.155	2.412

*1. .2 inch per day less rainfall
 2. 2 inches when tank loss is 2 inches
 3. 3. inches when tank loss is 3 inches

Mean Yield.....3.177 T/A
 S. E. \bar{x}852
 L.S.D. (5%).....2.952 (NS)
 C.V.7.917%

Table II. Irrigation data from pasture study, three irrigation rates, four replications, four clippings, Creston, Montana 1957.

Rate*	Irrigation Dates	Total Inches	Plot Yields in pounds dry matter				Total Pounds	Pounds Oven Dry Corrected to 12% moisture
			I	II	III	IV		
1	5/18 7/3 7/18 8/8 8/29 15 16.4	11.3	6.888	7.397	10.470	11.404	36.159	2.459
2	5/17 7/5 7/9 7/23 8/8 8/29 10.5	10.5	5.060	5.570	7.579	9.189	27.398	1.849**
3	6/3 7/9 7/30 8/29 12	11.3	4.796	5.063	7.406	8.828	26.093	1.774**

**Significantly less than No. 1 at 5%.
 *1. .2 inches day less rainfall
 2. 2 inches when tank loss is two inches
 3. 3 inches when tank loss is three inches

Mean Yield.....2.027 T/A
 S. E. \bar{x}136
 L.S.D. (5%)......470
 C. V.7.28%

Table III. Irrigation data from Vantage barley three irrigation rates, four replications, Creston, Montana, 1957. Size of Plot, 300 Square feet.

Rate*	Irrigation Dates	Total Inches	Plot Yield in Pounds				Total Pounds	Yield in Bushels Per Acre
			I	II	III	IV		
1	6/4 7/16	8.1	45	62	61	69	89.47	
2	6/4 7/17	4.2	52	45	43	63	74.63	
3	6/4 7/19	6.0	46	47	35	52	67.95	

* 1. .2 inches day less rainfall at jointing and heading

2. Amount of tank loss at jointing and heading

3. 3 inches when tank loss is three inches

Mean Yield.....74.35 bu/A
 S. E. \bar{x}3.498
 L.S.D.(5%).....12.118
 C. V.6.770%

Table IV. Irrigation data from Silage corn (Kingscrot KF), three irrigation rates, three replications, Creston, Montana 1957. Size of Plot 106.7 Square feet.

Rate*	Irrigation Dates	Total Inches	Plot Yields in Pounds Dry Matter				Total Pounds	Yield Tons/Acre Dry Matter
			I	II	III	IV		
1	7/1 7/16 8/7 ⁹	10.6	42.75	48.21	44.68	40.50	176.14	8.983
2	7/2 7/17 7/30 ⁶	8.2	44.52	44.22	45.71	40.37	174.82	8.915
3	7/9 7/17 7/29 ⁹	9.0	28.12	44.19	40.48	36.46	149.25	7.612

*1. .2 inches day less rainfall

2. 2 inches when tank loss is two inches

3. 3 inches when tank loss is three inches

Mean Yield.....8.503 T/A
 S. E. \bar{x}1.868
 L.S.D.(5%).....6.470 N.S.
 C. V.4.482%

Table V. Irrigation data from Netted Gem Potatoes at three irrigation rates, four replications.
Creston, Montana 1957.

Rate*	Irrigation Dates	Total Inches	Plot Yields in Pounds				Total Pounds	Yield Cwt Per Acre
			I	II	III	IV		
1	7/5 7/19 8/8 8/28 ^{1/2}	10.9	106	157	130	145	538	355.08
2	7/8 7/22 7/30 8/28 ^{3/4}	4.2	128	147	124	113	512	337.92
3	7/22 8/8 8/28 ⁷	5.0	125	123	117	99	464	306.24

- *1. .2 inches day less rainfall
- 2. 2 inches when tank loss is two inches
- 3. 3 inches when tank loss is three inches

Mean Yield.....333.08 Cwt/A
 S. E. \bar{x}4.018
 L.S.D.(5%).....13.918
 C. V.3.172%

Table VI. Summary of irrigation data on five crops at three rates of irrigation, Creston, Montana 1957.

	Irrigation Rates*			Precipitation			L.S.D.
	1	2	3	Pre-Growth	Growth Period	Evap-oration**	
Alfalfa				8.33	5.25	12.218	N.S.
Irrigation	14.4	10.5	9.3				
Precip. plus irrigation	27.98	24.08	22.88				
Yield	3.174 T/A	2.944T/A	2.412T/A				
Pasture				8.33	5.56	13.940	.47 T/A
Irrigation	16.4	10.5	11.3				
Precip. plus irrigation	30.29	24.39	25.19				
Yield	2.459T/A	1.849T/A	1.774T/A				
Barley				8.33	5.54	13.855	N.S.
Irrigation	11.3	8.1	4.2				
Precip. plus irrigation	25.19	21.97	18.07				
Yield	89.47	74.63	67.95				
Corn Silage				8.33	5.56	12.014	N.S.
Irrigation	10.6	8.2	9.0				
Precip. plus irrigation	24.49	22.09	22.89				
Yield	8.983T/A	8.915T/A	7.612T/A				
Potatoes				8.65	4.49	10.678	13.918 Cwt.
Irrigation	10.9	4.2	5.0				
Precip. plus irrigation	24.04	17.34	18.14				
Yield	355.08	337.92	306.24				

*See rates for individual crops.

**Moisture loss from evaporation tank during growth period.

1957

Fertilizer Investigations

Project No. 5020

by

C. W. Roath, Superintendent

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by

Vern R. Stewart, Assistant Agronomist

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Introduction

Commercial fertilizers were used during the 1957 growing season on grains, seed crops, and forages, both on and off the station. Soil analysis by county laboratories supplied information as to phosphate and organic matter levels of the locations.

The applications of fertilizer and seeding were done with a four row tractor mounted seeder for all cereals. In the spring and winter wheat tests the phosphate was applied with the seed. Nitrogen was applied by broadcasting on the surface of the plot at seeding time.

Fertilizer application on the barley trials consisted of placing the nitrogen and phosphate at a four inch depth. The barley was then planted in the same row at a one one-half to two inch depth. This was accomplished by adjusting the shoe depth on the planter. The method used on the corn silage trial will be given in the section on corn silage.

The fertilizer materials used on the cereals were Ammonia Nitrate (33%) and Treble Super Phosphate (42%).

The use of commercial fertilizers were beneficial, depending more or less upon need and moisture supplies.

In a number of cases yield data has been supplemented by chemical analysis of products produced.

The cost of this project was \$3324.30.

Plans for the coming year call for continuation of present trials in about present numbers, plus seeding of a productive hay mixture plot in three locations to which 16 fertilizer treatments will be applied. This new work is to replace current trials on clover and bromegrass when they are no longer productive.

Because of the unusually low phosphorous content of many of the forage samples analysed and the remarkable improvement obtained by use of fertilizer in some cases, it would seem highly desirable to determine this quality factor on all fertilizer plots on forages if at all possible.

Results of this years work are shown in subsequent tables.

Fertilizers on Bromegrass

A series of replicated trials with six fertilizer treatments on Lincoln Bromegrass were seeded in 1955 in locations representing selected soil fertility levels.

This is the second year of harvest. Table I, II, III, IV, show 1957 data.

The 50-80 treatment produced the highest yield in all tests in 1957.

Treatments giving yield response greater than needed to pay the cost of the annual fertilizer application in 1957 were:

<u>Location</u>	<u>Fertility Level</u>	<u>Some Return</u>	<u>Highest in 1957</u>	<u>Highest in 1956</u>
1	High O.M.-High P ₂ O ₅	all	25-0	50-0
2	High O.M.-Low P ₂ O ₅	0-80	0-80	25-80
3	Low O.M.-High P ₂ O ₅	50N, 25N & 50-80	50-0	50-0
4	Low O.M.-Low P ₂ O ₅	None	check	50-0

Prices: N. 15¢. P₂O₅ .09¢ lb. Hat \$15.00 per ton.

None of these samples were analysed chemically in 1957.

Fertilizer trials with 16 fertilizer treatments on Lincoln Bromegrass were seeded in 1956 in two locations. Harvested this season for the first time, they failed to produce fertilizer responses significant to the 5% level. Best yields were as much as a ton per acre above checks in one location, and nearly two tons above checks in another.

The 1957 data for these trials is shown in Table V and VI.

Protein and Phosphorous content of some of these samples was determined and is reported in Table XV.

Table I. Fertilizer on Brome grass, grown in Lake County on the Bess Smurr farm, Polson, Montana 1957. Four row plots four replications. Plot yields from 80 Sq. Ft. 1 cutting.

Treatment Rate Per Acre	Pounds Per Plot of Dry Matter				Total Dry Matter Corrected to 12% Moisture	Average Tons Per Acre
	I	II	III	IV		
0	10.88	15.23	11.15	14.41	51.67	3.94
50	13.06	10.96	12.11	14.25	50.38	3.84
25	10.62	11.85	12.10	15.06	49.63	3.78
50	11.39	15.44	13.39	14.17	54.39	4.14
25	13.92	11.14	14.17	14.68	53.91	4.11
0	12.35	7.36	7.84	13.54	41.09	3.13

Analysis of Variance

Source	D. F.	Mean Square	F
Treatments	5	5.842	1.731
Reps	3	8.777	2.601
Error	15	3.375	
Total	23		

Mean Yield.....3.82 T/A
 S. E.919
 L.S.D. N. S.
 C. V. 7.329%

Table II. Fertilizer on Bromes, Creston, Montana 1957. Plot Yields from 80 square feet, one cutting.

Treatment in lbs/Acre N P	Plot Yields, oven dry in lbs.				Total Pounds Oven Dry	Pounds Corrected to 12% Moisture	Average Tons Per Acre
	I	II	III	IV			
0 80	6.30	6.08	6.98	6.53	25.89	29.00	2.82**
50 0	7.61	8.66	7.62	6.83	30.72	34.41	2.34
25 0	7.17	6.66	7.69	5.89	27.41	30.70	2.09
50 80	9.73	9.46	10.01	10.01	39.21	43.92	2.99**
25 80	8.42	8.42	7.70	7.70	32.24	36.11	2.46
0 0	6.25	8.16	8.16	7.34	29.91	33.58	2.28

Analysis of Variance			
Variance	D.F.	Mean Square	F
Treatments	5	5.532	16.128**
Reps	3	.650	
Error	15	.343	
Total	23		

Mean Yield.....	T/A
S. E. \bar{x}	2.50
L.S.D.(5%).....	.089
L.S.D.(1%).....	.269
C. V.372
	3.795%

**Significantly higher in yield than the check (1%).

Table III. Fertilizer on Brome grass, grown in Flathead County on the Harold Passmore farm, R R #4, Kalispell, Montana 1957. Four row plots four replications. Plot yields from 80 Square feet.

Treatment Rate Per Acre N P	Pounds Per Plot of Dry Matter				Total Dry Matter Corrected to 12% Moisture	Average Tons Per Acre
	I	II	III	IV		
0 80	3.84	2.69	5.00	3.84	17.21	1.17
50 0	6.90	8.94	6.90	6.09	32.29	2.20**
25 0	5.81	4.65	5.81	4.65	24.43	1.66
50 80	6.15	6.53	8.84	9.23	34.44	2.34**
25 80	5.56	7.14	4.76	3.18	23.12	1.32
0 0	3.63	5.08	5.08	2.90	18.69	1.27

**Treatments significantly higher in yield than the check (5%).

Analysis of Variance

Source	D.F.	Mean Square	F
Treatments	5	9.908	6.401**
Reps	3	1.453	.939
Error	15	1.548	
Total	23		

Mean Yield.....1.66 T/A
 S. E. X......622
 L.S.D. (5%)..... 1.874 lbs.
 L.S.D. (1%)..... 2.596 lbs.
 C. V.11.207%

Table IV. Fertilizer on Bromegrass, grown in Flathead County on the F. F. A. Farm, Kalispell, Montana, 1957. Four row plots, four replications. Plot yields from 80 square feet, 1 cutting.

Treatment Rate Per Acre N	Pounds Per Plot of Dry Matter				Total Dry Matter	Total Dry Matter Corrected to 12% Moisture	Average Tons Per Acre
	I	II	III	IV			
0	3.01	0.69	2.31	2.09	8.10	9.07	0.62
50	4.20	4.20	3.85	3.15	15.40	17.25	1.20*
25	2.75	2.75	3.09	2.06	10.65	11.93	0.81
50	3.40	3.40	5.26	4.33	16.39	18.36	1.25**
25	3.22	3.22	3.54	3.86	13.84	15.50	1.05
0	2.62	2.95	2.95	2.62	11.14	12.48	0.85

*Treatments significantly higher in yield than the check (5%).
 **Treatments significantly higher in yield than the check (1%).

Analysis of Variance

Source	D.F.	Mean Square	F
Treatments	5	2.528	7.003**
Reps	3	0.443	1.227
Error	15	0.361	
Total	23		

Mean Yield..... .97 T/A
 S E \bar{x}301
 L.S.D. (5%)..... .907 lbs.
 L.S.D. (1%)..... 1.260
 C. V.7.253%

Table V. Fertilizer on Bromegrass grown at Creston, Montana 1957. Plot yields in pounds per plot of 80 square feet, 1 cutting.

Treatment Rate in #/A N	Pounds Per Plot, Dry Weight				Total Plot Wts. Oven Dry	Plot Wt. Corrected to 12% Moisture	Average Tons Per Acre
	P	I	II	III			
0		7.50	9.69	10.00	9.69	41.31	2.81
50	40	6.77	10.33	9.23	14.96	46.24	3.15
100	40	6.90	9.30	12.30	10.80	44.02	2.99
200	40	6.30	9.90	14.70	15.90	52.42	3.57
0	40	8.28	14.34	9.56	10.84	48.18	2.38
50	80	6.18	13.00	11.38	14.63	50.61	3.44
100	80	7.50	14.69	17.19	10.00	55.31	3.76
200	80	6.30	10.80	14.10	12.90	49.39	3.36
0	80	6.25	15.63	13.44	13.44	54.61	3.71
50	160	5.46	10.64	5.18	10.06	35.10	2.39
100	160	9.38	15.94	12.81	14.16	58.56	3.98
200	160	9.52	14.14	13.05	12.24	48.95	3.73
0	160	7.56	15.18	11.12	11.53	50.84	3.46
50	0	7.76	11.48	12.15	14.85	51.79	3.52
100	0	9.28	7.85	10.28	10.28	42.21	2.87
200	0	9.56	9.56	9.29	7.97	40.75	2.77

Mean Yield.....3.24 T/A
 S. E. \bar{x}325 T
 L.S.D. N. S.
 C. V. 9.852%

Analysis of Variance

Variance	D.F.	Mean Square	F
Treatment s	15	8.212	1.806
Reps	3	78.123	17.177**
Error	45	4.548	
Total	63		

Table VI. Fertilizer on Brome grass, grown in Lake County on the Howard Lulow farm, Polson, Montana 1957. Four row plots, four replications, yields from plots of 80 square feet, 1 cutting.

Treatment Rate Per Acre N	P	Pounds Per Plot of Dry Matter				Total Dry Matter	Total Dry Matter Corrected to 12% Moisture	Average Tons Per Acre
		I	II	III	IV			
0	0	4.70	6.47	5.88	5.29	22.34	25.02	1.70
50	40	5.64	8.32	5.94	5.05	24.95	27.94	1.90
100	40	9.50	10.40	6.53	8.32	34.75	38.92	2.65
200	40	12.30	11.70	11.40	10.20	45.60	51.07	3.47
0	40	5.40	6.82	5.68	3.41	21.31	23.87	1.62
50	80	6.06	7.88	6.06	6.06	26.06	29.10	1.98
100	80	8.35	8.93	8.64	5.18	31.10	34.82	2.37
200	80	12.77	13.07	11.29	10.98	48.11	53.88	3.67
0	80	10.80	8.70	7.50	4.20	31.20	34.94	2.78
50	160	11.69	10.74	6.00	5.37	33.80	37.86	2.58
100	160	11.17	9.57	9.57	8.61	38.92	43.59	2.97
200	160	13.10	11.64	9.60	8.73	43.07	48.24	3.28
0	160	8.15	10.77	6.98	4.66	30.56	34.23	2.33
50	0	9.80	6.95	6.32	7.58	30.65	34.33	2.34
100	0	11.48	10.17	11.81	7.54	41.00	45.92	3.12
200	0	11.97	9.79	9.52	6.80	38.08	46.46	3.16

Analysis of Variance

Source	D.F.	Mean Square	F
Treatments	15	1.654	.102
Reps	3	28.643	1.774
Error	45	16.148	
Total	63		

Mean Yield.....2.62 T/A
 S. E. \bar{x}2.009
 L.S.D.....N. S.
 C. V.23.747%

Fertilizers on Kenland Clover

Only one of the seven treatment fertilizer trials seeded in 1955 was harvested in 1957. In all others, stands were no longer comparable.

Yields of clippings from June 4 cutting are shown in Table VII. When harvested for seed, September 10, seed yields from these plots were inconsequential and is therefore not reported. Mean clipping yields are 1.45 T per acre and treatment response was not significant.

The four, 12 treatment, trials seeded in 1956 were harvested for hay. Two cuttings were obtained from those located on the station. Only one cutting was secured on those off-station in Lake County because of inadequate irrigation. Seasons yields are shown in Tables VIII, IX, X, and XI.

Two cutting yields on the Station trials were quite good, being 6.05 without gypsum and 6.17 where 300 pounds per acre of gypsum was used. C.Vs. were high where no gypsum was used, only 3.83% where gypsum was used. The only significant response was from Nitrogen. Soil in this location contains above 5% O.M. and about twelve pounds per acre available P_2O_5 .

One cutting only in the off-station location produced mean yields of 3.26 T with no gypsum, 3.71 T where 300 pounds gypsum per acre was used. The C. V. for plots without gypsum was 25.4 % where gypsum was used 6.4%. Eight treatments in the gypsum area were below checks, significant to the 5% level.

No explanation for lack of yield response to phosphate in these low phosphate soils is offered.

Protein and phosphorus determination of samples from these plots is reported in Table XV.

Table VII. Fertilizer on Kenland Clover, Creston, Montana 1957. Plot yields from 80 square feet, one cutting, i. e. one clipping on June 4.

Treatment Rate in #/A		Pounds Per Plot, Dry Weight				Total Plot Wts. Oven Dry	Plot Wt. Corrected to 12% Moisture	Average Tons Per Acre
N	P	I	II	III	IV			
0	120	4.48	4.73	4.86	4.61	18.68	20.92	1.42
0	60	5.60	7.14	4.62	4.20	21.56	24.35	1.66
50	0	3.98	3.49	5.48	4.15	17.10	19.15	1.30
50	120	6.30	3.64	4.34	4.76	19.04	21.32	1.45
50	60	5.54	5.84	5.40	3.65	20.43	22.88	1.56
Gypsum		3.68	5.72	3.10	4.85	17.35	19.43	1.32
0	0	2.74	5.68	5.88	4.31	18.61	20.84	1.42

Analysis of Variance

Variance	D.F.	Mean Square	F
Treatments	6	0.632	.515
Reps	3	9.827	.673
Error	18	1.228	
Total	27		

Mean Yield.....1.45 T/A
 S. E. \bar{x}169 T
 L.S.D. N. S.
 C. V.11.688%

Table VIII. Fertilizer on Kenland Clover, Creston, Montana. Plot Yields from 70 square feet, two cuttings.

Treatment Pounds/Acre		Plot Yields-Dry Weight				Total Pounds Oven Dry	Plot Wt. in Tons/Acre
N	P	I	II	III	IV		
0	0	13.32	15.87	20.48	23.04	72.71	5.66
10	80	22.17	24.77	21.60	19.01	87.55	6.81
20	80	19.76	19.99	19.27	17.85	76.87	5.98
40	80	19.44	20.14	18.97	22.32	80.87	6.29
0	80	18.95	18.48	20.59	19.18	77.20	6.01
10	160	21.48	20.26	20.98	20.74	83.46	6.49
20	160	21.50	21.50	22.00	21.50	86.50	6.73
40	160	19.75	21.25	21.50	22.00	84.50	6.57
0	160	20.29	18.01	17.56	19.38	75.24	5.85
10	0	18.54	17.56	18.06	16.35	70.51	5.48
20	0	17.41	18.18	16.10	17.40	69.09	5.37
40	0	17.66	14.26	16.71	20.22	68.85	5.36

Analysis of Variance

Variance	D.F.	Mean Square	F
Treatments	11	11.361	.498
Reps	3	1.416	.062
Error	33	22.808	
Total	47		

Mean Yield.....6.05
 S. E. \bar{x}743 T
 L.S.D. (5%).....N. S.
 L.S.D. (1%).....N. S.
 C. V.12.284%

Table IX. Fertilizer on Kenland Clover, Creston, Montana. Plot Yields from 70 square feet, two cuttings. 300 pounds per acre Gypsum applied on all treatments.

Treatment Pounds/Acre		Plot Yields-Dry weights				Total Pounds Oven Dry	Plot Wt. in Tons/Acre
N	P	I	II	III	IV		
0	0	17.11	22.41	20.15	19.60	79.27	6.17
10	80	19.30	21.18	20.36	22.26	83.10	6.46
20	80	19.68	19.19	19.93	19.19	77.99	6.07
40	80	21.17	20.36	18.76	17.96	78.25	6.09
0	80	17.78	16.01	17.17	17.63	68.59	5.34
10	160	19.24	18.46	21.06	22.36	81.12	6.31
20	160	18.72	18.95	17.09	19.65	74.41	5.79
40	160	18.53	18.08	17.04	17.40	71.05	5.53
0	160	20.28	19.76	18.72	19.24	78.00	6.07
10	0	21.53	20.43	18.77	17.94	78.67	6.12
20	0	20.16	23.86	21.02	23.01	88.05	6.85*
40	0	19.71	22.58	24.17	26.08	92.54	7.20**

Analysis of Variance

Variance	D. F.	Mean Square	F
Treatments	11	10.936	4.738**
Reps	3	1.840	0.797
Error	33	2.308	
Total	47		

Mean Yield.....	6.17
S. E. \bar{x}23 T
L.S.D. (5%).....	.68 T
L.S.D. (1%).....	.91 T
C. V.	3.836%

Table X. Fertilizers on Kenland Clover grown in Lake County on the Howard Lulow farm. Polson, Montana 1957. Four row plots, four replications. Plot yields from 80 square feet, one cutting.

Treatment Rate Per Acre		Pounds Per Plot of Dry Matter				Total Dry Matter	Total Dry Matter Corrected to 12% Moisture	Average Tons Per Acre
N	P	I	II	III	IV			
0	0	11.90	11.90	9.14	6.80	39.74	44.51	3.03
10	80	12.54	10.41	11.05	10.63	44.63	49.99	3.40
20	80	10.40	9.80	10.40	11.20	41.80	46.82	3.19
40	80	12.54	11.26	9.99	7.65	41.44	46.41	3.16
0	80	12.29	12.29	10.78	8.41	43.77	49.02	3.33
10	160	12.99	9.69	8.67	12.17	43.52	48.74	3.32
20	160	12.19	14.06	9.38	9.38	45.01	50.40	3.43
40	160	11.25	11.02	9.84	7.97	40.08	44.89	3.05
0	160	10.10	9.90	12.58	9.28	41.86	46.88	3.19
10	0	12.35	10.93	12.11	7.36	42.75	47.88	3.26
20	0	9.99	10.43	10.43	7.10	37.95	42.50	2.89
40	0	12.97	16.34	13.49	8.30	51.10	57.23	3.89

Analysis of Variance

Source	D. F.	Mean Square	F
Treatment	11	2.786	0.377
Reps	3	20.987	2.841
Error	33	7.387	
Total	47		

Mean Yield....3.26 T/A
 S. E. \bar{x}1.359
 L.S.D. (5%)....N. S.
 L.S.D. (1%)....N. S.
 C. V.25.402%

Table XI. Fertilizers on Kenland Clover grown in Lake County on the Howard Lulow farm, Polson, Montana 1957. Four row plots, four replications. Plot yields from 80 square feet, one cutting. Uniform applications of Gypsum at 300 lbs/Acre.

Treatment Rate Per Acre		Pounds Per Plot of Dry Matter				Total Dry Matter	Total Dry Matter Corrected to 12% Moisture	Average Tons Per Acre
N	P	I	II	III	IV			
0	0	11.70	14.38	14.36	12.92	53.36	65.10	4.43
10	80	9.92	10.35	7.11	11.64	39.02	47.60	3.24*
20	80	10.26	12.32	9.12	9.81	41.51	50.64	3.44*
40	80	11.07	11.79	10.59	11.55	45.00	54.90	3.73*
0	80	10.80	11.03	10.58	13.05	45.46	55.46	3.77*
10	160	11.16	15.44	12.82	11.16	50.58	61.71	4.20
20	160	11.41	10.26	11.18	12.55	45.40	55.39	3.77*
40	160	11.90	10.84	13.60	11.26	47.60	58.07	3.95
0	160	10.56	14.42	8.33	9.95	43.26	52.78	3.59*
10	0	11.25	10.13	9.00	9.68	40.06	48.87	3.32*
20	0	12.11	13.54	12.59	9.98	48.22	58.23	3.96
40	0	10.95	9.12	7.98	10.04	38.09	46.47	3.16*

*Treatments significantly lower in yield than the check (5%).

Analysis of Variance			
Source	D.F.	Mean Square	F
Treatment	11	5.480	2.641*
Reps	3	3.843	1.852
Error	33	2.075	
Total	47		

Mean Yield.....3.71 T/A
 S. E. \bar{x}721
 L.S.D. (5%).....2.069 lbs.
 L.S.D. (1%).....N. S.
 C. V, ,.....6.438%

Fertilizer on Alta Fescue Seed

All nitrogen treatments used in 1957 on a new stand of grass established in 1956 reduced seed yields in 1957, almost in proportion to the amount used. This was due to lodging of the grass that prevented seed formation and interfered with harvest.

Phosphate rates of 84 and 168 pounds P_2O_5 had little effect this season, being neither beneficial nor detrimental.

The mean yield of seed from all treatments was 448.46 pounds per acre. The check yield was 519.56 pounds per acre. The only treatment producing even slightly more than the check was 168 P_2O_5 . This treatment produced 528.15 pounds of seed.

See Table XII.

Table XII. Fertilizer on Alta Fescue seed 1957. Size of Plot, 53.28 square feet.

Treatment Rate in #/A		Grams Per Plot				Total Grams	Total Pounds	Pounds Per Acre
N	P	I	II	III	IV			
0	0	255	320	285	293	1153	2.542	519.56
33	0	265	140	270	255	930	2.050	419.00
66	0	240	325	281	150	996	2.196	448.84
99	0	85	235	290	215	825	1.819	371.79
0	84	340	310	260	215	1125	2.480	506.89
33	84	170	236	270	265	941	2.075	424.11
66	84	180	235	307	232	954	2.103	429.84
99	84	255	240	285	195	975	2.149	439.24
0	168	365	360	237	210	1172	2.584	528.15
33	168	270	270	270	265	1075	2.370	484.41
66	168	195	205	238	220	858	1.892	386.71
99	168	265	230	160	236	891	1.964	401.43

Analysis of Variance

<u>Variance</u>	<u>D.F.</u>	<u>Mean Square</u>	<u>F</u>
Treatment	11	3,343.92	1.119
Reps	3	2,975.67	.996
Error	33	2,988.60	
Total	47		

Mean Yield.....448.46
 S. E. \bar{x}49.26
 L.S.D.N. S.
 C. V.11.029%

Fertilizers on Hay

Two fertilizer trials on hay were harvested in 1957, one on Native hay west of Kalispell and one on Timothy-Alsike hay on peat soil in Lake county. Station personnel put out the one on native hay, the county agent in Lake county designed the one on Timothy-Alsike and made the fertilizer applications.

One cutting yields for these trials are shown in Table XIII and XIV.

As originally designed the Native meadow trial contained three reps with and three without phosphate. Field conditions in Rep three were so wet, and yields so low and lacking in treatment response as to obscure the results in other reps, so were discarded.

Based on four reps, yield improvement with some treatments was significant at the 1% level.

Phosphorous content improvement was quite spectacular. For this report see table XIII.

Little fertilizer effect is evident in the fertilizer trial on peat soil. The county agent insists that a very marked pattern of treatment response was evident on weed growth in 1956 when this hay was seeded, but harvest reveals little.

Table XIII. Fertilizer on Native Meadow grown on the H. C. Schermer Ranch, Flathead County, 1957.
 Yields from plots of 80 square feet, one cutting. Reps one and three have no phosphate,
 two and four have 160 pounds per acre of P₂O₅*

Treatment Rate in Pounds/Acre	Pounds Per Plot				Total Pounds Oven Dry	Pounds Corrected to 12% Moisture	Tons Per Acre			
	N	K	Tr.*	I				II	III	IV
33	0	0	0	7.80	9.62	10.76	7.56	35.14	40.03	3.63
66	0	0	0	9.76	8.72	9.17	6.83	34.48	38.62	3.50
99	0	0	0	9.72	10.18	10.00	5.50	35.40	39.65	3.60
198	0	0	0	13.05	12.65	10.33	5.48	41.51	46.49	4.22*
297	0	0	0	12.00	13.13	12.15	6.67	43.95	49.22	4.47**
396	0	0	0	14.44	14.34	12.78	8.85	50.41	56.46	5.12**
495	0	0	0	16.86	14.00	7.88	6.53	45.27	50.70	4.60**
0	0	0	0	8.25	8.50	9.74	5.47	31.96	35.80	3.25
0	0	Tr.	0	7.07	7.66	9.11	6.94	30.78	34.47	3.13
0	60	0	0	6.91	8.10	11.14	6.45	32.60	36.51	3.31
99	0	Tr.	0	8.39	9.78	10.56	6.60	35.33	39.57	3.59
99	60	Tr.	0	12.45	10.75	9.56	8.09	40.85	45.75	4.15*
99	60	0	0	11.93	9.38	9.23	5.95	36.49	40.87	3.71

*Esmine! Mean Yield.....3.79 T
 S. E. \bar{x}257 T
 L.S.D.(5%)..... .738 T
 L.S.D.(1%)..... .989 T
 C. V.8.864%

Analysis of Variance

Variance	D.F.	Mean Square	F
Treatments	12	8.628	3.039**
Reps	3	46.753	16.468
Error	37	2.839	
Total	52		

Table XIV. Fertilizers for Timothy-Alsike Hay on Peat Soils. (This work put out by County Agent, Ray Stack on Cal Livingston farm near Polson. Harvested and analyzed by N. W. Montana Branch Station.)

Treatment	Rate in Pounds/Acre		Pounds Per Plot, one cutting 7/10, 45 Square feet				Total Pounds Oven Dry	Pounds Corrected to 12% Moisture	Tons Per Acre
	N	P ₂ O ₅	I	II	III	IV			
5	22	0	x5.30	5.30	5.96	6.96	23.52	26.34	3.19
10	44	0	x5.03	6.11	5.75	x5.75	22.64	25.36	3.07
20	88	0	x5.96	7.62	6.96	6.63	27.17	30.43	3.68
35	132	0	x4.99	x7.64	6.46	6.76	25.85	28.95	3.50
45	176	0	x6.08	x6.41	6.08	7.43	26.00	29.12	3.52
55	220	0	x4.90	x5.88	7.52	5.88	24.18	26.88	3.25
65	264	0	x5.84	x6.19	x6.53	6.19	24.75	27.72	3.35
75	308	0	x4.31	x5.96	x6.96	4.97	22.20	24.86	3.01
90	350	0	x4.88	x7.15	x5.20	6.83	24.06	26.95	3.26
55	220	25	x5.30	x6.29	x5.30	x6.63	23.52	26.34	3.19
0	0	25	5.58	x4.41	x3.53	x4.99	18.51	20.33	2.46
55	220	50	5.55	x4.86	x4.51	x8.23	23.15	25.93	3.14
0	0	50	4.59	x7.06	x5.30	x7.77	24.72	27.69	3.35
55	220	100	4.20	7.00	x4.55	x6.30	22.05	24.70	2.99
0	0	100	4.99	3.44	x5.34	x5.34	19.11	21.40	2.59
55	220	150	5.60	3.85	x7.35	x5.25	22.05	24.70	2.99
0	0	150	5.02	4.35	6.69	x5.35	21.41	23.98	2.90

Fertilizer Effect on Protein and Phosphorus Content of Hay

Protein and Phosphorous of samples from fertilizer trials and from one species trial grown on low phosphate soil treated with phosphate fertilizer prior to seeding was determined by the Chemistry Department at Montana State College.

In only one fertilizer trial, the one on native hay was the improvement of phosphorous content impressive. The phosphorous content was doubled by use of 400 pounds per acre of T. S. P. Getting Phosphorous content up within the required range for animal nutrition might be more important to the stockman than increasing yield. In other trials certain treatments did fairly well.

Trial	Phosphorous Content	
	Least	Greatest
Fertilizer on Clover, Creston	.13	.23
Fertilizer on Brome, Polson	.17	.21
Fertilizer on Tim-Alsike, Polson	.09	.15

Improvement in protein percentage was seldom achieved with rates of nitrogen below 100 pounds per acre and was erratic. Protein production per acre ie (yield x %) was more consistent and ranged upward to 100% variation between low and high amounts.

See Table XV.

Table XV. Protein and phosphorous analysis of forage samples by the Department of Chemistry, Montana State College, 1957.

Clover hay at Creston on High O.M., Low Phosphate, soil.

Treatment Per Acre		Tons Per A. 2 cuts	First Cutting		Second Cutting		Pounds Protein Per Acre
N	P		Protein %	Phosphate %	Protein %	Phosphorous %	
0	0	5.54	9.3	.13	13.0	.14	590.4
10	80	6.67	10.8	.13	13.5	.18	789.3
20	80	5.00	11.3	.12	12.5	.17	697.4
40	80	6.16	12.2	.12	11.1	.17	746.4
0	80	5.88	12.2	.18	13.4	.18	754.2
10	160	6.36	12.3	.23	13.0	.18	812.6
20	160	6.59	12.3	.18	10.5	.17	791.7
40	160	6.44	10.5	.15	12.9	.18	739.3
0	160	5.73	10.8	.16	12.4	.18	661.1
10	0	5.38	10.5	.14	13.0	.15	619.6
20	0	5.26	12.1	.15	12.2	.13	651.8
40	0	5.24	10.8	.14	12.2	.13	602.0

Timothy-Alsike hay on peat soil, Polson, Montana

N	P	K	Tons Per Acre	Protein Percent	Phosphorous Percent	Pounds Protein Per Acre
5	22	0	3.19	8.3	.10	529.5
10	44	0	3.07	7.6	.09	466.6
20	88	0	3.68	8.4	.10	618.2
35	132	0	3.50	8.9	.14	623.0
45	176	0	3.52	6.5	.09	457.6
55	220	0	3.25	7.9	.13	513.5
65	264	0	3.35	9.0	.13	603.0
75	308	0	3.01	8.7	.14	523.7
90	350	0	3.26	9.1	.12	593.3
55	220	25	3.19	8.6	.13	548.7
0	0	25	2.46	7.6	.13	373.9
55	220	50	3.14	9.0	.15	565.2
0	0	50	3.35	7.9	.13	529.3
55	220	100	2.99	10.1	.15	604.0
0	0	100	2.59	8.6	.12	445.5
55	220	150	2.99	7.9	.12	472.4
0	0	150	2.90	-	-	-

Table XV. (Continued)

Native Hay, Marion, Montana 1957.

Nitrogen Per Acre	Tons Per Acre	No Phosphate		160 P ₂ O ₅		Pounds Protein Per Acre
		Pro- tein %	Phospho- rous %	Pro- tein %	Phospho- rous %	
33	3.63	4.6	.11	5.3	.21	334.0
66	3.50	6.2	.11	5.9	.19	434.0
99	3.60	5.8	.07	5.9	.20	417.6
198	4.22	6.3	.09	5.2	.19	513.7
297	4.47	6.8	.09	6.9	.19	607.9
396	5.12	6.6	.08	6.8	.17	675.8
495	4.60	7.3	.10	8.7	.19	671.6
0	3.25	5.5	.10	6.0	.21	357.5
0 & Tr.	3.13	5.7	.08	7.5	.21	356.8
0 & K.	3.31	5.9	.08	5.5	.21	390.6
99 & Tr.	3.59	5.7	.08	5.6	.19	409.3
99, K, & Tr.	4.15	5.6	.08	5.3	.19	464.8
99 & K	3.71	5.9	.09	5.7	.26	437.8

Tr.-Trace elements.

Bromegrass hay, Polson, Montana 1957.

N	P	Tons Per Acre	Protein Percent	Phos- phorous Percent	Pounds Protein Per Acre
0	0	1.70	7.3	.19	248.2
50	40	1.90	6.2	.19	235.6
100	40	2.65	7.0	.19	371.0
200	40	3.47	6.6	.16	458.0
0	40	1.62	6.5	.19	210.6
50	80	1.98	7.1	.19	281.2
100	80	2.37	5.9	.19	279.7
200	80	3.67	6.8	.17	499.1
0	80	2.78	6.8	.21	378.0
50	160	2.57	5.7	.19	293.0
100	160	2.97	6.3	.19	374.2
200	160	3.28	6.3	.20	413.3
0	160	2.33	8.7	.20	405.4
50	0	2.34	5.9	.18	276.1
100	0	3.12	6.4	.18	399.4
200	0	3.16	7.2	.17	455.0

Table XV. (Continued)

Hay Mixtures, one cutting, Kalispell, Montana.

Grass in Mixture with Alfalfa	Tons Per Acre	Pro- tein %	Phos- phorous %	Pounds Protein Per Acre
Intermediate	2.70	11.5	.15	621
Nordan Crested	2.93	13.9	.18	814
Standard Crested	2.50	13.5	.17	675
Pubescent Wheat	2.70	13.1	.14	707
Tall Wheat	2.80	13.4	.17	750
Manchar Brome	2.97	11.1	.13	659
Slender Wheat	3.10	11.1	.13	688
Reed Canary	2.43	12.2	.15	593
Orchard	1.90	11.6	.16	441
Sherman Big Blue	2.21	13.7	.18	605
Tall Oat	2.12	11.2	.19	475
Meadow Foxtail	2.26	11.9	.16	538
Meadow Foxtail	2.48	12.5	.18	620
Creep. Meadow Foxtail	2.29	11.8	.16	540
Alta Fescue	2.51	12.2	.17	612
Troy Blue	2.45	14.8	.18	725
Lincoln Brome	2.46	9.8	.16	482
Hopkins Timothy	2.64	11.1	.17	586

Winter Wheat

Two uniform fertility trials were seeded in the fall of 1956. These trials are given in the 1955 and 1956 annual reports of the Northwestern Montana Branch Station, and will not be included in this report.

One fertilizer trial was located on the George Hubbard farm in Flathead County, $1\frac{1}{2}$ miles northwest of the station. This soil is a fine sandy loam, on the Creston bench. Complete data was obtained, per specifications from this nursery. A slight modification was made in the other nursery located twelve miles east of Stevensville in Ravalli County. Because of the distance from the station, only moisture and yield data were obtained. Protein and Phosphours determinations will be made on the grain. Four row plots were used in the Ravalli County nursery, as compared to six in the Flathead County Nursery.

Results and Discussion

Precipitation was 4.42 inches below normal for the crop year, September 1, 1956 to August 30, 1957 in the Creston area this past season. Weather data is taken from records at the Northwestern Montana Branch Station. This accounts in part for the low yields obtained and the lack of response to nitrogen normally obtained in this area. Twenty-one and Twenty-eight hundredths inches (21.28 in.) of moisture were used in growing 23.1 bushels of grain in 1956-57 in this trial. All moisture determinations were made from the check plot. Table XVI, gives data on these calculations.

Tables XVII, XVIII, and XIX show plot yields and averages of forage weights taken at three stages of growth, namely 6-8 inches, before heading, and at harvest. In all cases significance was found when analysed statistically. Given in table XX are data for grain yields of individual plots.

Table XXI gives a summary of all data obtained in 1957 except moisture data found in table XVI. Quality data has not been received at this time and should be included in the 1958 annual report. The highest yielding grain was obtained by using 30 pounds of nitrogen and 60 pounds of P_2O_5 per acre. Also the greatest return per acre, or \$31.35 per acre. However, when compared to the 15 pound rate of P_2O_5 per acre there was not any significance between these two treatments at the 5% level. There is a lower grain straw ratio at the 15 pound rate of P_2O_5 . Lodging is high in the P_2O_5 plots, because of the late maturity of nitrogen plots, harvest was delayed. With this delay and early maturity of P_2O_5 plots, lodging was encouraged.

For the two year average, 30 pounds of P_2O_5 has resulted in the greatest yield per acre. The greatest return per acre for a two year average was at the 30 pound rate of P_2O_5 per acre and 30 pounds of nitrogen per acre, or \$36.07. The 30 pound rate of P_2O_5 per acre gave a return of \$35.01 per acre. This would appear to be the more economical rate because of transportation and handling cost. These figures include the gross return less cost of fertilizer and check value. See table XXII.

Table XVI. Moisture data taken from untreated plots of the uniform fertility study on Wasatch winter wheat grown on the George Hubbard farm, Creston, Montana in 1955-56.

Depth in Inches	Moisture in Percent at seeding					Moisture in percent at harvest					Loss in Inches	Loss Total	
	I	II	III	Total	Ave- rage	I	II	III	Total	Ave- rage			Loss %
0-6	27.1	26.7	20.0	73.8	24.6	9.4	9.2	8.5	27.1	9.0	15.6	1.22	
6-12	21.7	27.0	20.0	68.7	22.9	9.7	7.2	7.1	24.0	8.0	14.9	2.32	
12-24	23.3	17.5	19.2	60.0	23.3	8.1	6.7	5.9	20.7	6.9	16.4	2.56	
24-36	14.4	16.4	17.1	47.9	16.0	6.6	5.3	7.2	19.1	6.4	9.6	1.50	
36-48	17.0	19.2	12.5	48.7	16.2	10.9	6.7	6.6	24.2	8.1	8.1	1.26	8.86

-
25
-

Precipitation, seeding to harvest, 12.42

Total moisture used in production, 23.1 bushels of Winter Wheat was 21.28 inches.

Table XVII. Agronomic data from Uniform fertility study on the George Hubbard farm, Creston, Montana 1956-57 on Wasatch winter wheat. Six row plots three replications. Total plant cutting, dry weight, 6 to 8 inches tall, May 18, 1957.

Treatment and Rate per acre		Plot weights in grams			Total Grams	Average Pounds Per Acre
N	P ₂ O ₅	I	II	III		
0	0	4.2	5.4	4.4	14.0	74.7
	15	11.6	11.8	18.7	42.1	224.6*
	30	31.0	12.0	28.6	71.6	382.0** ✓
15		4.7	7.2	8.7	20.6	109.9
15	15	23.4	14.9	27.4	65.7	350.5**
15	30	25.1	12.7	15.8	53.6	286.0**
30		3.7	3.5	5.0	12.2	65.1
30	15	9.8	15.8	25.0	50.6	270.0**
30	30	16.9	21.7	26.8	65.4	348.9** ✓
	60	9.5	18.1	18.7	46.3	247.0*
15	60	25.4	38.6	29.5	93.5	498.8** ✓
30	60	15.3	11.7	19.6	46.6	248.6*
	90	13.5	23.4	18.8	55.7	297.2** ✓
15	90	15.1	25.2	28.3	68.6	366.0** ✓
30	90	12.6	23.2	19.2	55.0	293.4** ✓

*Treatments yielding significantly more than the check (5%).

**Treatments yielding significantly more than the check (1%).

Analysis of Variance				Mean Yield.....270.81
Source	D.F.	Mean Square	F	S. E. \bar{x} 48.8367
Reps	2	91.665	3.28	L.S.D. (5%).....142.5
Treatment	14	164.935	6.91**	L.S.D. (1%)....190.5
Error	28	27.9306		C. V.18.03%
Total	44			

Table XVIII. Dry weights of green material from Wasatch winter wheat cut, June 4, just before heading from uniform fertility trial on the George Hubbard farm, Creston, Montana 1956-57.

Planted. October 5, 1956

Size of Plot. 6 Square feet.

Treatment and Rate Per Acre		Grams Per Plot			Total Grams	Average Pounds Per Acre
N	P ₂ O ₅	I	II	III		
0	0	39.4	42.9	47.7	130.0	693.6
	15	91.0	114.0	95.5	300.5	1603.2**
	30	124.1	136.4	112.4	372.9	1989.5**
15		16.3	50.7	28.3	95.3	508.4
15	15	132.3	99.5	131.7	363.5	1939.3**
15	30	105.9	122.9	134.2	363.0	1936.6**
30		43.0	137.3	36.6	216.9	1157.2
30	15	76.8	88.4	104.9	270.1	1441.0*
30	30	115.2	122.0	140.6	377.8	2015.6**
	60	125.6	161.2	140.1	426.9	2277.6**
15	60	122.5	160.6	163.0	446.1	2380.0**
30	60	75.2	150.1	186.9	412.2	2199.1**
	90	64.6	119.8	162.8	347.2	1852.3**
15	90	162.7	133.5	134.2	430.4	2296.2**
30	90	111.2	144.8	132.6	388.6	2073.2**

*Treatments yielding significantly more than the check (5%).

**Treatments yielding significantly more than the check (1%).

Analysis of Variance				Mean Yield.....1757.5
Source	D.F.	Mean Square	F	S. E. \bar{x}232.4
Rep	2	2,929.82	4.63*	L.S.D. (5%).....673.8
Treatment	14	3,859.55	6.10*	L.S.D. (1%).....907.3
Error	28	632.745		C. V.13.22%
Total	44			

Table XIX. Straw-grain weights from uniform fertilizer test of Wasatch winter wheat on the George Hubbard farm, Creston, Montana 1956-57. Area harvested, 32 square feet.

Planted, October 5, 1956

Harvested, August 15, 1957

Size of Plot, 32 Sq. Ft.

Treatment and Rate per Acre		Ounces Per Plot			Total Ounces	Average Pounds Per Acre
N	P ₂ O ₅	I	II	III		
0	0	37.00	59.25	49.25	145.50	4126.3
	15	62.25	85.00	82.25	229.50	6508.6**
	30	81.25	79.00	69.75	230.00	6522.7**
15		49.00	72.50	48.00	169.50	4807.0
15	15	63.00	65.50	53.25	181.75	5154.4
15	30	80.00	94.00	72.50	246.50	6990.7**
30		57.00	56.50	55.00	168.50	4778.6
30	15	64.00	87.00	64.00	215.00	6097.3**
30	30	76.00	79.00	79.00	234.00	6636.2**
	60	70.50	83.75	81.00	235.25	6671.6**
15	60	80.00	85.00	89.50	254.50	7217.5**
30	60	86.00	103.50	96.00	285.50	8096.7**
	90	73.75	94.50	64.75	233.00	6607.8**
15	90	77.50	88.25	60.00	225.75	6402.2**
30	90	86.75	91.00	60.00	237.75	6742.5**

*Treatments yielding significantly more than the check (5%).

**Treatments yielding significantly more than the check (1%).

Analysis of Variance				Mean Yield.....6224.3
Source	D.F.	Mean Square	F	S. E. \bar{x}357.98
Rep	2	805.6	15.17	L.S.D.(5%).....1038.0
Treatment	14	489.416	9.21	L.S.D.(1%).....1397.0
Error	28	53.1104		C. V.5.75%
Total	44			

Table XX. Grain yield data from Uniform fertilizer nursery on winter wheat grown on the George Hubbard farm, Creston, Montana, 1957. Six row plots, three replications.

Planted. October 5, 1957 Harvested. September 3, 1957 Size of Plot. 32 Sq. Feet

Treatment and rate in Pounds Per Acre		Lod- ging	Grams per Plot			Total	Average	Bushel
N	P ₂ O ₅	%	I	II	III	Grams	Bushel Per Acre	Wt. in Pounds
0	0	45	333	560	490	1383	23.1	-
0	15	77	648	925	836	2409	40.2**	61.6
0	30	60	850	840	710	2400	40.0**	61.0
15	0	21	485	557	500	1542	25.7	60.0
15	15	47	670	670	499	1839	30.7*	61.5
15	30	80	755	905	758	2418	40.3**	61.2
30	0	17	575	550	550	1675	27.9	60.5
30	15	55	595	901	640	2136	35.6**	61.6
30	30	45	780	790	780	2350	39.2**	60.9
0	60	82	724	919	902	2545	42.4**	62.5
15	60	88	755	887	930	2572	42.9**	61.2
30	60	90	843	1030	860	2733	45.6**	60.9
0	90	87	760	975	685	2420	40.4**	61.9
15	90	77	796	950	655	2401	40.0**	61.0
30	90	98	877	957	655	2489	41.5**	61.0

*Treatments yielding significantly more than the check (5%).

**Treatments yielding significantly more than the check (1%).

Analysis of Variance

Source	D. F.	Mean Square	F
Rep	2	86,067.5	12.15**
Treatment	14	56,465.0	7.97**
Error	28	7,086.571	
Total	44		

Mean Yield....37.0
 S. E. \bar{x}2.4309
 L.S.D.(5%)....7.1
 L.S.D.(1%)....9.5
 C. V.6.57%

Table XXI. Summary of agronomic data of a uniform fertility trial conducted on the George Hubbard farm, with Wasatch winter wheat in 1956-57, Creston, Montana. Six row plots, three replications.

Planted, October 5, 1956

Harvested, August 15, 1957

Treatment and Rate Per Acre	N	P ₂ O ₅	Dry Weights in lbs/A cutting made 6 to 8" tall ¹	Dry Weights in lbs/A cutting made before heading ²	Grain Straw Weights in Lbs/Acre at Harvest ³	Grain Straw Ratios	Yield in Bushel Per A.	Bushel Weight in Pounds	Lod- ging in %	Fert- ilizer cost	Gross Return Per Acre	Return above Fertilizer cost or Below
0	0		74.7	693.6	4126.3	1.97	23.1	-	45	0.00	42.04	-
	15		224.6*	1603.2**	6508.6**	1.70	40.2**	61.6	77	1.35	73.16	29.77
	30		382.0**	1989.5**	6522.7**	1.72	40.0**	61.0	60	2.70	72.80	28.06
15			109.9	508.4	4807.0	2.12	25.7	60.0	21	2.10	46.77	2.60
15	15		305.5**	1939.3**	5154.4	1.80	30.7*	61.5	47	3.45	55.87	10.38
15	30		286.0**	1936.6**	6990.7**	1.89	40.3**	61.2	80	4.80	73.35	26.51
30			65.1	1157.2	4778.6	1.86	27.9	60.5	17	4.20	50.78	4.54
30	15		270.0**	1441.0*	6097.3**	1.85	35.6**	61.6	55	5.55	64.79	17.20
30	30		348.9**	2015.6**	6636.2**	1.82	39.2**	60.9	45	6.90	71.34	22.40
30	60		247.0**	2277.6**	6671.6**	1.62	42.4**	62.5	82	5.40	77.17	29.73
15	60		498.8**	2380.0**	7217.5**	1.80	42.9**	61.2	88	7.50	78.08	28.54
30	60		248.6*	2199.1**	8096.7**	1.96	45.6**	60.9	90	9.60	82.99	31.35
	90		297.2**	1852.3**	6607.8**	1.72	40.4**	61.9	87	8.10	73.53	23.39
15	90		366.0**	2296.2**	6402.2**	1.67	40.0**	61.0	77	10.20	72.80	20.56
30	90		293.4**	2073.2**	6742.5**	1.70	41.5**	61.0	98	12.30	75.53	21.19
Means			270.8	1757.5	6224.3		37.0					
S E \bar{x}			48.8367	232.4	357.98		2.4309					
L.S.D.(5%)			142.5	673.8	1038.0		7.1					
L.S.D.(1%)			190.5	907.3	1397.0		9.5					
C.V.%			18.03	13.22	5.75		6.57					

* 5% level
** 1% level

¹May 18, 1957
²June 4, 1957
³August 15, 1957

Table XXII. Summary of economic data from fertilizer study on winter wheat as it pertains to fertilizers, cost, and value, 1956-57.

Treatment rate per acre	Fert- ilizer Cost	1956			1957			Two Year Average			
		Yield in Bu. Per A.	Gross Return Per A.	Return above Fertilizer cost or below	Yield in Bu. Per A.	Gross Return Per A.	Return above Fertilizer cost or below	Yield.	Return Above Fert. Cost		
0	0	55.9	101.73		23.1	42.04		71.89	39.5		
	15	1.35	56.4	102.64	-44	40.2	73.16	29.77	87.91	48.3	29.33
	30	2.70	61.2	111.38	6.95	40.0	72.80	28.06	92.09	50.6	35.01
15	0	2.10	65.0	118.30	14.47	25.7	46.77	2.60	81.97	45.4	17.07
15	15	3.45	65.2	118.66	13.48	30.7	55.87	10.38	87.36	48.0	23.86
15	30	4.30	60.6	110.29	3.76	40.3	73.35	26.51	91.9	50.5	30.27
30		4.20	65.6	119.39	13.46	27.9	50.78	4.54	85.18	46.8	18.00
30	15	5.55	63.1	114.84	12.11	35.6	64.79	17.20	89.73	49.3	29.31
30	30	6.90	67.2	122.30	13.67	39.2	6.90	22.40	96.82	53.2	36.07

Wheat calculated @ 1.82/Bu.

P₂O₅ - .09/lb.

N - .14/lb.

Winter Wheat

Results and Discussion (Mc Fadgen)

No precipitation records were obtained in the area where the uniform nursery was grown. However, yields in the winter wheat region in Ravalli county were about average in 1956-57.

Observation of these plots, July 11, 1957 were as follows:

- (a) Delay of maturity in the nitrogen plots.
- (b) No visual response from P_2O_5 was noticeable on this date.

Table XXIII shows moisture data for, 0-6, 6-12 inch depths. Moisture data was obtained for 12-24, and 24-36 inch depths at seeding time, however moisture samples at these depths could not be obtained at harvest time. This was impossible with the equipment available and the extremely dry soil condition at harvest time. Therefore the moisture data shows only losses for the 0-6 and 6-12 inch depth. In that there were no precipitation records, complete weather data for this study could not be obtained.

High yields in this nursery were obtained using 30 pounds of nitrogen and 15 pounds P_2O_5 per acre. The greatest return per acre was the 30 pound rate of nitrogen and 15 pounds of P_2O_5 per acre or \$21.03 cents per acre. See table XXIV for yields and table XXV for economic data.

Table XXIII. Moisture data taken from untreated plots of the uniform fertility study on Wasatch winter wheat grown on the L. B. Mc Fadgen farm, Stevensville, Montana in 1955-57.

Depth in Inches	Moisture in Percent at seeding					Moisture in Percent at harvest					Loss in %	Loss in Inches
	I	II	III	Total	Ave- rage	I	II	III	Total	Ave- rage		
0-6	17.5	14.2	13.9	45.6	15.2	2.1	3.1	2.0	7.2	2.4	12.8	1.00
6-12	19.9	16.6	14.6	51.1	17.0	5.1	3.2	4.2	12.5	4.2	12.8	2.00

Table XXIV. Yield data from fertility nursery on winter wheat grown in Ravalli County on the L. B. Mc Fadgen farm, Stevensville, Montana 1957. Four row plots three replications.

Planted. October 10, 1956 Harvested. August 20, 1957 Size of Plot. 32 Square feet.

Treatment and Rate Per Acre		Cost of Fertilizer	Grams Per Plot			Total Grams	Average Bushels Per Acre	Bushel Weight in Pounds	Loss or Gain
N #/A	P ₂ O ₅ #/A		I	II	III				
0	0		545	664	515	1724	28.7	61.0	
0	15	1.35	565	540	265	1370	22.8	61.5	-12.08
0	30	2.70	675	540	485	1700	28.3	62.0	-3.43
15	0	2.10	710	626	534	1870	31.2	61.5	+2.45
15	15	3.45	683	675	770	2128	35.5*	61.5	+8.93
15	30	4.80	719	675	500	1894	31.6*	61.0	+ .48
30		4.20	845	870	510	2225	37.1*	62.0	+11.09
30	15	5.55	855	917 ¹	826	2598	43.3**	61.5	+21.03
30	30	6.90	750	774	685	2209	36.8*	61.5	7.66
0	60	5.40	530	610	370	1510	25.2	61.0	-11.77
15	60	7.50	575	725	517 ¹	1817	30.3*	61.2	-4.58
30	60	9.60	725	815	650	2190	36.5*	61.1	4.60
	90	8.10	510	490	435	1435	23.9	61.5	-16.83
15	90	10.20	718	653 ¹	435	1806	30.1	61.6	-7.63
30	90	12.30	545	575	550	1670	27.8	61.5	-13.93

¹Calculated missing plot.

*Treatments yielding more than the check (5%).

**Treatments yielding more than the check (1%).

Mean Yield.....31.3
 S. E. \bar{x}2.2826
 L.S.D.(5%).....6.5
 L.S.D.(1%).....9.0
 C. V.7.29%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	89,771.0	14.37**
Treatments	14	38,413.714	6.15**
Error	25	6,247.88	
Total	41		

Table XXV. Economic data from uniform fertilizer study grown on the L.B. Mc Fadgen farm, Stevensville, Montana, 1956-57. Wasatch winter wheat.

Treatment and Rate per Acre	Fertilizer Cost Per Acre	Average Bushels Per Acre	Gross Return Per Acre	Gain or Loss on Check and cost of Fertilizer
N	P ₂ O ₅			
0	0	28.7	52.23	
	15	22.8	41.50	-12.08
	30	28.3	51.50	-3.43
15	0	31.2	56.78	2.45
15	15	35.5	64.61	8.93
15	30	31.6	57.51	.48
30		37.1	67.52	11.09
30	15	43.3	78.81	21.03
30	30	36.8	66.79	7.66
0	60	25.2	45.86	-11.77
15	60	30.3	55.15	-4.58
30	60	36.5	66.43	4.60
	90	23.9	43.50	-16.83
15	90	30.1	54.78	-7.63
30	90	27.8	50.60	-13.93

Spring Wheat

One spring wheat uniform fertility study was seeded in the spring of 1957. The same data were obtained from this nursery as the winter wheat fertility study. (See page 24). This trial has been conducted for three years, starting in the spring of 1955.

This years nursery was located on Creston Sandy loam soil on the Creston bench. Land was supplied by George Hubbard, Creston, Montana . The soil laboratory analysis, conducted by the Flathead County Extension Service, was as follows, available P₂O₅ 24 pounds, organic matter 3.3%.

Results and Discussion (Hubbard)

Rain fall during the growing season of 1957 was below average. From seeding to harvest there was only 5.60 inches of precipitation. In measuring the moisture use, 11.01 inches of moisture was used to produce 31.8 bushels per acre of spring wheat. Table XXVI shows data for moisture use.

Statistical significance was found in the first cutting made, May 18, when plants were 6 to 8 inches tall. Significance was found in the high phosphate rates at the 1% level alone or in combination with nitrogen. There was no significance in cutting made at heading, at harvest and grain yields. See Tables XXVII, XXVIII, XXIX, XXX.

A summary of the data is found in table XXXI and also the grain straw ratio. Fertilizer treatments, in all cases reduce yields below the check, and increased the grain straw ratio. This would indicate that fertilizer increased forage growth with a reduction in total yield of grain. For the three year average of this uniform fertility study the check has been the highest yielding treatment.

Table XXVI. Moisture data taken from untreated plots of the uniform fertility study or Pilot spring wheat grown on the George Hubbard farm, Creston, Montana 1957.

Depth in Inches	Moisture in Percent at seeding					Moisture in Percent at Harvest					Loss in %	Loss in Inches
	I	II	III	Total	Ave- rage	I	II	III	Total	Ave- rage		
0-6	13.5	14.8	16.7	45.0	15.0	5.7	5.7	6.4	17.8	5.9	9.1	.71
6-12	15.2	22.8	15.1	53.1	17.7	5.1	4.3	4.8	14.2	4.7	13.0	2.02
12-24	13.8	11.9	13.1	38.8	12.9	3.7	5.2	6.5	15.4	5.1	7.8	1.22
24-36	13.3	11.9	12.2	37.4	12.5			6.9		6.9	5.6	.87
36-48	8.7	9.5	9.1	27.3	9.1			5.3		5.3	3.8	.59
Total Loss-----											5.41	

Precipitation seeding to harvest, 5.60

Total moisture used to produce 31.8 bushel per acre, 11.01 inches.

Table XXVII. Dry weights of green material from Pilot spring wheat cut May 18, when wheat was 6 to 8 inches tall. Uniform fertility trial grown on George Hubbard farm, Creston, Montana, 1957.

Planted, May 10.

Size of Plot, 6 sq. Ft.

Treatment and Rate in Pounds/A	N	P ₂ O ₅	Grams Per Plot			Total Grams	Average Pounds Per Acre
			I	II	III		
0		0	23.1	39.2	29.8	92.1	491.4
		15	22.0	15.0	15.9	52.9	282.2**
		30	26.4	35.2	23.2	84.8	452.4
15			23.2	28.0	16.3	67.5	360.1
15	15		16.6	18.1	21.9	56.6	302.0*
15	30		25.8	25.4	34.4	85.6	456.7
30			30.6	30.8	32.8	94.2	502.6
30	15		30.4	26.5	25.5	82.4	439.6
30	30		25.5	29.6	36.0	91.1	486.1
		60	22.2	23.6	18.6	64.4	343.6*
15	60		20.7	9.2	30.3	60.2	321.2*
30	60		23.5	23.2	31.2	77.9	415.6
		90	9.5	16.4	16.0	41.9	223.5**
15	90		14.1	14.3	10.9	39.3	209.7**
30	90		15.1	14.1	31.0	60.2	321.2*

*Treatments yielding significantly less than the check (5%).

**Treatments yielding significantly less than the check (1%).

Analysis of Variance

Source	D.F.	Mean Square	F	Mean Yield.....
Rep	2	44.056	1.45	373.9
Treatment	14	110.274	3.62*	S. E. \bar{x}50.969
Error	28	30.4236		L.S.D.(5%).....147.7
Total	44			L.S.D.(1%).....198.5
				C. V.13.63%

Table XXVIII. Dry weights of green material from Pilot spring wheat cut just before heading. Uniform fertility trial grown on George Hubbard farm, Creston, Montana, 1957. June 17.

Planted. May 10, 1957

Size of Plot. 6 Sq. Ft.

Treatment and Rate in Pounds/A		Grams Per Plot			Total Grams	Average Pounds Per Acre
N	P ₂ O ₅	I	II	III		
0	0	175	205	245	625	3334.4
	15	245	250	200	695	3707.9
	30	235	220	215	670	3574.5
15	0	240	175	155	570	3041.0
15	15	245	285	170	700	3734.6
15	30	215	205	235	655	3494.5
30	0	215	310	255	780	4161.4
30	15	200	270	260	730	3894.6
30	30	205	265	265	735	3921.3
	60	220	205	250	675	3601.2
15	60	245	210	250	705	3761.2
30	60	300	210	200	710	3787.9
	90	150	225	175	550	2934.3
15	90	205	205	170	580	3094.4
30	90	245	265	250	760	4054.7

Analysis of Variance

Source	D.F.	Mean Square	F
Rep	2	815.0	
Treatments	14	1,585.95	1.24
Error	28	1,272.74	
Total	44		

Mean Yield.....3606.5
 S. E. \bar{x}329.7
 L.S.D.(5%).....N. S.
 C. V.9.14%

Table XXIX. Straw-grain weights from uniform fertilizer test of Pilot spring wheat on the George Hubbard farm, Creston, Montana 1957.

Planted, May 10, 1957

Harvested, September 3, 1957

Size of Plot. 32 Sq. Feet.

Treatment and Rate per acre in lbs.	P_2O_5	I	II	III	Total Ounces	Average Pounds Per Acre
0	0	63.50	65.00	55.25	183.75	5211.0
	15	67.00	54.00	43.25	164.25	4658.0
	30	58.50	58.50	29.00	146.00	4140.5
15		67.00	79.00	65.50	211.50	5998.0
15	15	64.50	73.75	65.00	203.25	5764.1
15	30	54.00	63.50	55.25	172.75	4899.1
30		62.50	70.00	61.50	194.00	5501.7
30	15	67.25	75.25	62.25	204.75	5806.6
30	30	62.50	54.50	54.25	171.25	4856.5
	60	59.00	62.50	54.00	175.50	4977.1
15	60	61.00	60.00	55.25	176.25	4998.3
30	60	64.00	52.50	62.50	179.00	5076.3
	90	54.25	58.00	50.25	162.50	4608.4
15	90	63.00	69.25	48.75	181.00	5133.1
30	90	59.00	76.50	55.25	190.75	5409.6

Analysis of Variance

Source	D.F.	Mean Square	F
Rep	2	423.5	7.89**
Treatment	14	103.062	1.89
Error	28	54.8407	
Total	44		

Mean Yield.....5136.2
 S. E. \bar{x}363.75
 L.S.D.N. S.
 C. V.7.08%

Table XXX. Grain yield data from Uniform fertilizer nursery on spring wheat grown on the George Hubbard farm, Creston, Montana 1957. Six row plots three replications.

Planted. May 19, 1957

Harvested. September 3, 1957

Size of Plot. 32 Sq. Ft.

Treatment and rate Per Acre in Pounds					Total	Average	Bushel
N	P ₂ O ₅	I	II	III	Grams	Bushel Per Acre	Weight in Pounds
0	0	796	670	431	1897	31.8	58.0
	15	680	480	405	1565	26.2	58.5
	30	620	580	571	1771	29.7	58.2
15		660	651	675	1986	33.3	57.5
15	15	570	592	650	1812	30.4	57.6
15	30	510	566	490	1566	26.3	56.5
30		517	496	405	1418	23.8	-
30	15	680	645	592	1917	32.2	57.0
30	30	570	496	373	1439	24.1	-
	60	604	594	524	1722	28.9	57.0
15	60	559	565	445	1569	26.3	56.5
30	60	669	457	590	1716	28.8	56.5
	90	605	460	435	1500	25.2	57.3
15	90	680	694	420	1794	30.1	57.1
30	90	585	590	416	1591	26.7	55.5

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	59,756	11.06
Treatments	14	10,381.785	1.92
Error	28	5,403	
Total	44		

Mean Yield.....	28.1
S. E. \bar{x}	2.1226
L.S.D.	N. S.
C. V.	7.55%

Table XXXI. Summary of agronomic data of a uniform fertility trial conducted on the George Hubbard farm with Pilot spring wheat in 1957. Six row plots, three replications. Creston, Montana.

Planted. May 10, 1957		Harvested. September 3, 1957					
Treatment and Rate Per Acre in Pounds	Dry Weights in lbs/A cutting made 6 to 8" tall ¹	Dry Weights in lbs/A cutting made before heading ²	Grain Straw Weights in Lbs/Acre at Harvest ³	Grain Straw Ratios	Yield in Bushels Per A.	Bushel Weight in Pounds	Three Year Average 1955-56-57
0	491.4	3334.4	5211.0	1.73	31.8	58.0	35.8
15	282.2**	3707.9	4658.0	1.96	26.2	58.5	32.5
30	452.4	3574.5	4140.5	1.32	29.7	58.2	35.7
15	360.1	3041.0	5998.0	2.00	33.3	57.5	34.4
15	302.0*	3734.6	5764.1	2.16	30.4	57.6	35.7
30	456.7	3494.5	4899.1	2.11	26.3	56.5	34.1
30	502.6	4161.4	5501.7	2.85	23.8	-	34.0
15	439.6	3894.6	5806.6	2.00	32.2	57.0	37.8
30	486.1	3921.3	4856.5	2.35	24.1	-	35.5
60	343.6*	3601.2	4977.1	1.88	28.9	57.0	29.54
60	321.2*	3761.2	4998.3	2.17	26.3	56.5	29.54
60	415.6	3787.9	5076.3	1.94	28.8	56.9	32.14
90	223.5**	2934.3	4608.4	2.05	25.2	57.3	24.54
90	209.7**	3094.4	5133.1	1.84	30.1	57.1	29.74
90	321.2*	4054.7	5409.6	2.30	26.7	55.5	29.44
Mean	373.9	3606.5	5136.2		28.1		33.8
S E \bar{x}	50.969	329.7	363.75		2.1226		
L.S.D.	147.7	NS	NS		NS		
L.S.D.	198.5	NS	NS		NS		
C.V.	13.63%	9.14%	7.08%		7.55%		

¹May 18, 1957
²June 17, 1957

³September 13, 1957
⁴Two year average

Chemical Analysis of
Material from 1956 Uniform Fertility Trial

Spring Wheat

The following tables include protein and phosphorous analysis of material gathered from the Uniform Fertility study grown on the M. C. Roberts farm in 1956. The soil which it was grown on is a Creston Sandy loam.

Table XXXII. Protein analysis of green material cut, May 19, 1956.

		Nitrogen (lbs./acre)			P ₂ O ₅ Means
		0	15	30	
P ₂ O ₅ (lbs/acre)	0	22.1	21.5	23.7	22.4
	30	23.7		25.8	24.8
	60	22.5		25.2	23.9
	90	20.7		25.7	23.2
Nitrogen Means		22.2	21.5	25.1	23.4

Table XXXIII. Phosphorus analysis of samples cut, May 19, 1956, 6 to 8 inches tall.

		Nitrogen (lbs./Acre)		P ₂ O ₅ Means
		0	30	
P ₂ O ₅ (lbs/acre)	0	.322	.361	.342
	30	.403	.408	.406
	60	.408	.459	.434
	90	.382	.486	.434
Nitrogen Means		.379	.428	.404

Table XXXIV. Protein, of samples cut, July 10, just before heading.

		Nitrogen (lbs/acre)			P ₂ O ₅ Means
		0	15	30	
P ₂ O ₅ (lbs/acre)	0	13.7	11.9	13.3	13.1
	30	15.6		13.2	14.4
	60	12.9		14.5	13.7
	90	12.0		12.1	12.0
Nitrogen Means		13.6	11.9	13.2	13.3

Table XXXV. Phosphorous of samples cut, July 10, just before heading.

		Nitrogen (lbs/acre)		P ₂ O ₅ Means
		0	30	
P ₂ O ₅ (lbs/acre)	0	.253	.237	.245
	30	.274	.255	.265
	60	.272	.291	.282
	90	.283	.298	.296
Nitrogen Means		.271	.270	.272

Table XXXVI. Phosphorous at harvest time, total plant.

		Nitrogen (lbs/acre)		P ₂ O ₅ Means
		0	30	
P ₂ O ₅ (lbs/acre)	0	.194	.195	.195
	30	.186	.192	.189
	60	.188	.176	.190
	90	.180	.172	.176
Nitrogen Means		.187	.184	.188

Table XXXVII. Protein of grain at harvest, September 10, 1956

		Nitrogen (lbs/acre)			P ₂ O ₅ Means
		0	15	30	
P ₂ O ₅ (lbs/acre)	0	16.7	12.7	14.9	14.8
	30	16.3		16.5	16.4
	60	15.5		16.7	16.1
	90	14.3		15.6	15.0
Nitrogen Means		15.7	12.7	15.9	15.5

Table XXXVIII. Phosphorous of grain at harvest, September 10, 1956

		Nitrogen (lbs/acre)		P ₂ O ₅ Means
		0	30	
P ₂ O ₅ (lbs/acre)	0	.317	.349	.333
	30	.307	.338	.323
	60	.338	.327	.333
	90	.373	.338	.356
Nitrogen Means		.334	.451	.336

Winter Wheat

The following tables include protein and phosphorous analysis of material gathered from the uniform fertility study grown on the Northwestern Montana Branch Station at Creston. The soil on which it was grown is a Creston sandy loam.

Table XXXIX. Protein of samples cut May 28, at heading stage.

		Nitrogen (lbs./acre)			P ₂ O ₅ Means
		0	15	30	
P ₂ O ₅ (lbs/acre)	0	16.3	18.4	17.8	17.4
	30	18.1		17.9	18.0
Nitrogen Means		17.2	18.4	17.8	17.6

Table XL. Phosphorous of samples cut May 28 at heading stage.

		Nitrogen (lbs./acre)			P ₂ O ₅ Means
		0	15	30	
P ₂ O ₅ (lbs/acre)	0	.250		.271	.261
	15	.274		.277	.276
	30	.295		.303	.299
Nitrogen means		.273		.284	.279

Table XLI. Protein at harvest time total plant, August 15, 1956.

		Nitrogen (lbs./acre)			P ₂ O ₅ Means
		0	15	30	
P ₂ O ₅ (lbs/acre)	0	8.6	8.2	10.3	9.1
	30	8.5		7.2	7.9
Nitrogen Means		8.6	8.2	8.8	8.6

Table XLII. Phosphorous at harvest time, total plant, August 15, 1956.

		Nitrogen (lbs./acre)		P ₂ O ₅ Means
		0	30	
P ₂ O ₅ (lbs./acre)	0	.192	.198	.195
	15	.189	.183	.186
	30	.210	.342	.276
Nitrogen Means		.197	.241	.219

Table XLIII. Protein of grain at harvest time.

		Nitrogen (lbs./acre)			P ₂ O ₅ Means
		0	15	30	
P ₂ O ₅ (lbs/acre)	0	13.8	13.0	14.8	13.8
	15	13.4	14.1	14.2	13.9
	30	14.2	14.2	13.8	14.0
Nitrogen Means		13.8	13.8	14.2	13.9

Table XLIV. Phosphorous, of grain at harvest time.

		Nitrogen (lbs./acre)		P ₂ O ₅ Means
		0	30	
P ₂ O ₅ (lbs/acre)	0	.353	.335	.344
	15	.349	.342	.346
	30	.331	.342	.337
Nitrogen means		.344	.340	.342

Spring Barley

In 1956 a uniform barley fertilizer study was designed for use in western Montana. The work was done in cooperation with the Extension Service working in seven western counties of Montana. This study consists of sixteen treatments including the check. Three rates of nitrogen and three rates of P_2O_5 per acre are used.

In 1957 three trials were seeded in the early part of May. The nursery located in Lake county was under irrigation. The nurseries in Flathead and Sanders county were seeded on dryland.

Results and Discussions

The nursery in Lake county was seeded on a heavy clay soil with low organic matter and high phosphate. This is in the Round Butte area ten miles west of Ronan. This nursery was observed, June 14, and found to be infested with canada thistle and mustard. The experiment was cultivated and sprayed for weed control on the above date. At heading time the black birds moved in to this trial and ate all headed grain. Because of this, the trial was abandoned.

Seeding in Sanders county was done on cut over timber land. A low organic and low phosphate condition was found when the soil was tested. Growing conditions were poor as was the seed bed, resulting in a poor stand. Cattle were allowed to graze this test and was abandoned for that reason.

Seeding of the nursery in Flathead county was on sandy soil, low organic and high P_2O_5 content, as determined by the county soil lab. On June 6, this nursery was sprayed for weed control. Observations that date, indicated a nitrogen response at the 25 and 50 pound rates per acre.

Plot variations were noted in stands at harvest time and no doubt account for the high C.V. in this test. High Yields were obtained from the 50 N, 160 P_2O_5 pounds per acre plots. However, because of economic conditions the greatest return per acre, calculating only the value of barley and cost of fertilizer, was the 25 pound rate per acre of Nitrogen. High protein percentages was found at the 100 pound rate of Nitrogen and 40 pounds of P_2O_5 per acre. See Table XLV.

Economic data is given in table XLVII. This shows that the 50 pounds of nitrogen per acre gave the greatest return per acre less cost of fertilizer when calculating the value of protein at .107¢ per pound.

Table XLV. Agronomic data from fertilizer application on Vantage barley grown in Flathead county on the Douglas Potts farm, Swan River Community. Four row plots, four replications.

Planted. May 7, 1958 Harvested. August 21, 1957 Size of Plot. 32 Sq. Ft.

Treatment and rate per acre in pounds	Grams Per Plot				Total Grams	Average Bushel Per Acre	Protein Percentage
	I	II	III	IV			
N							
P ₂ O ₅							
0	526	514	145	445	1630	24.8	12.3
25	636	507	500	385	2028	30.9	11.5
50	355	530	435	430	1750	26.7	13.2
100	257	543	425	395	1620	24.7	16.3
0	425	255	351	327	1358	20.7	10.3
25	575	531	490	561	2157	32.9	13.4
50	774	325	660	665	2424	37.0**	14.5
100	475	400	215	210	1300	19.8	16.0
0	463	209	385	300	1357	20.7	11.0
25	320	440	440	400	1600	24.4	11.6
50	640	700	590	550	2480	37.8**	12.1
100	745	351	460	575	2131	32.5	15.9
0	395	255	345	370	1365	20.8	11.0
25	491	595	355	561	2002	30.5	12.4
50	768	565	400	605	2338	35.7*	12.2
100	580	250	335	387	1552	23.7	15.6

*Treatment yielding significantly more than the check (5%).
 **Treatment yielding significantly more than the check (1%).

Mean Yield.....28.4
 S. E. \bar{x}3.3606
 L.S.D.(5%).....8.9
 L.S.D.(1%).....12.8
 C.V.11.83%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	69,254.66	5.99**
Treatments	15	41,030.533	3.55**
Error	45	11,557.444	
Total	63		

Table XLVI. Economic data from fertilizer trial on Vantage barley grown on The Douglas Potts farm, Swan River Community.

Treatment and rate per acre in Pounds	N	P ₂ O ₅	Bushels Per Acre	Return Per Acre for barley Only	Fert- ilizer cost Per Acre	Return per Acre less Fertilizer Cost	Per- cent Protein	Pounds or Protein Per Acre	Value of Protein at .107¢/#	Value of crop less Fert. cost	Loss or gain over check
0	0		24.8	16.12	00.00	00.00	12.3	146.4	15.66	31.87	-
25	40		30.9	20.09	7.10	-3.13	11.5	170.5	18.24	31.33	-.54
50	40		26.7	17.36	10.60	-9.36	13.2	169.2	18.10	24.86	-7.01
100	40		24.7	16.06	17.60	-17.66	16.3	193.3	20.68	19.14	-12.73
0	40		20.9	13.46	3.60	-6.26	10.3	102.3	10.94	20.80	-11.07
25	80		32.9	21.39	10.70	-5.43	13.4	211.6	22.64	33.33	1.46
50	80		37.0	24.05	14.20	-6.27	14.5	257.5	27.55	37.40	5.53
100	80		19.8	12.87	21.20	-24.54	16.0	152.0	16.26	7.93	-23.94
0	80		20.7	13.46	7.20	-9.95	11.0	109.3	11.70	17.96	-13.91
25	160		24.4	15.86	17.90	-18.16	11.6	135.8	14.53	12.49	-19.38
50	160		37.8	24.57	21.40	-12.95	12.1	219.5	23.49	26.66	-5.21
100	160		32.5	21.13	28.40	-23.39	15.9	248.0	26.54	19.27	-12.60
0	160		20.8	13.52	14.40	-17.00	11.0	109.8	11.74	10.86	-21.01
25	0		30.5	19.83	3.50	+.21	12.4	181.5	19.42	35.75	3.88
50	0		35.7	23.20	7.00	+.08	12.2	209.1	22.37	38.57	6.70
100	0		23.7	15.40	14.00	-14.72	15.6	177.5	18.99	20.39	-11.48

Barley @ .65¢/bushel
 Protein @ .107¢/pound
 Nitrogen @ .14¢/pound
 P₂O₅ @ .09¢/pound

Silage Corn

Research on the production of corn for silage was initiated on the station in 1953. Work has been done with varieties, planting dates, and planting rates. In 1956 fertilizer was applied as a uniform application to an irrigation study on corn. The response to this application was quite evident. In 1957 two fertilizer studies were designed to determine the effect of different rates of applications. One design was the nursery type, using two varieties and four treatments of fertilizers. The following planting plan is included to show the nursery type study.

Work Plan for Corn off-station

Design- Split Plot

Nursery type plots

Planting Rate 30,000 plants per acre

Size of plot 4 row, 20 feet 40"

Harvest two center rows, 16 feet or 106.6 sq. ft.

Variety	Treatment			
I Kingscrost KF	a	b	c	d*
Dekalb 1024	b	c	a	d
II KingscrostKF	a	c	d	b
Dekalb 1024	c	d	b	a
III Kingscrost KF	c	a	b	d
Dekalb 1024	a	c	b	d
IV Kingscrost KF	a	b	c	d
Dekalb 1024	d	c	b	a

* a-500#/A of 27-40-0 or 135 N, 70 P₂O₅

b-200 #/A of 24-20-0- or 48 N, 40 P₂O₅

c- 300#/A of 33-0-0 or 99 N, 0 P₂O₅

d- Check

Two of these nurseries were seeded, one in Lincoln county and the other in Sanders county. The nursery in Lincoln county was on a light sandy soil, while the Sanders county trial was on cutver timber land.

The other study was conducted on a field basis and rates, treatments and results follow in this report. Corn was seeded in rows 250 feet long of two varieties and fertilizer treatments put on after seeding in strips 21 feet wide at right angles to the corn rows. The soil was a light sandy soil which is high in P₂O₅ and low in organic matter. Seeding was done, May 31, 1957. All work was done with field equipment. Irrigation was provided during the growing season.

Results and Discussions

The nurseries in Lincoln and Sanders counties were abandoned. In Sanders county, a poor seed bed resulted in poor germination and as a result a poor stand. Growth was very poor, most plants did not get over three feet tall. Quackgrass and lack of proper irrigation in the Lincoln county trial resulted in its abandonment.

A dry season in 1957 caused the low yields obtained in the field nursery grown on the Harold Passmore farm. Irrigation rates and applications were not often enough to maintain an adequate moisture condition during the growing season.

When analysed statistically all treatments were significantly higher in yield than the check at the 1% level. Differences were also found to be significant for varieties. High yields for fertilizers were obtained by using 400 pounds of 24-20, however this difference is not significantly greater than the 150 pound rate per acre of 33-0-0. Dekalb 1024 on a dry matter basis was significantly higher in yield than Kingscrot KF. See Table XLVIII.

Table XLVII. Agronomic data from irrigated fertilized corn trial grown in Flathead county on the Harold Passmore farm, Rt. 4, Kalispell, Montana.

Planted.	May 31, 1957	Harvested.	Sept. 20, 1957	Size of Plot. 106.67 ft.	
Commercial Fertilizer Rate/Acre	Nitrogen Pounds Per Acre	P ₂ O ₅ Pounds Per Acre	Variety Kings- crot KF Dekalb 1024		Dryland Replication Total
24-20-0					
200	48	40	21.8	43.0	64.8
300	72	60	23.9	37.1	61.0
400	96	80	32.5	35.0	67.5
33-0-0					
150	50	0	29.7	48.1	77.8
175	73	0	34.2	25.7	59.9
300	99	0	30.1	34.8	64.9
450	147	0	34.0	33.0	67.0
27-14-0					
200	54	28	34.3	32.9	67.2
300	81	42	35.5	19.5	55.0
400	108	56	21.6	46.5	68.1
0	0	0	10.3	16.3	26.6
24-20-0					679.8
200	48	40	22.8	39.1	61.9
300	72	60	26.7	31.7	58.4
400	96	80	34.0	31.5	65.5
33-0-0					
150	50	0	29.7	43.5	73.2
175	73	0	34.2	24.1	58.3
300	99	0	34.3	36.9	71.2
450	147	0	34.0	33.0	67.0
27-14-0					
200	54	28	34.8	27.2	62.0
300	81	42	31.1	17.9	49.0
400	108	56	22.5	47.6	70.1
0	0	0	10.5	13.1	23.6
Total			622.5	717.5	1340.0
					660.2
					1340.0

Table XLVIII. Total yield for fertilizer and variety on two replications of silage corn grown on the Harold Passmore farm, Rt. 4, Kalispell, Montana 1957. Four row plot, 106.67 feet harvested.

Fertilizer Rate/Acre	N. P. K.	Plot Weight in Pounds			Average Pounds	Tons Per Acre
		Kings-crost	DeKalb 1024	Sum		
200#	24-20-0	44.6	82.1	126.7	31.7	6.5**
300#	24-20-0	50.6	68.8	119.4	29.9	6.1**
400#	24-20-0	66.5	66.5	133.0	33.3	6.8**
150#	33-0-0	59.4	91.6	151.0	37.8	7.7**
175#	33-0-0	68.4	49.8	118.2	29.6	6.0**
300#	33-0-0	64.4	71.7	136.1	34.0	6.9**
450#	33-0-0	68.0	66.0	134.0	33.5	6.8**
200#	27-14-0	69.1	60.1	129.2	32.3	6.6**
300#	27-14-0	66.6	37.4	104.0	26.0	5.3**
400#	27-14-0	44.1	94.1	138.2	34.6	7.1**
0	none	20.8	29.4	50.2	12.6	2.6
Sum		622.5	717.5	1340.0	30.5	
Average pounds		28.3	32.6			
Tons/Acre		5.8	6.7			

Note: Kingscrot variety check, in this nursery.

*Varieties yielding significantly more than the check (5%).

**Varieties yielding significantly more than the check (1%).

Mean Yield.....6.2

Fertilizers--L.S.D.(5%).....5
L.S.D.(1%).....7

Varieties----L.S.D.(5%).....3
L.S.D.(1%).....7

Variations Due to	D.F.	Sum of Square	Mean Square	F
Replication	1	8.28	8.28	2.91
Fertilizers	10	1785.31	178.531	62.95**
Error a	11	31.20	2.836	
Main Plots	21	1824.97		
Varieties	1	205.11	205.11	44.63**
Fert. x varieties	10	1466.19	146.619	31.90**
Error b	11	50.56	4.596	
Total	43	3546.83		

1957

Weed Investigations

Project No. 5021

by

Vern R. Stewart, Assistant Agronomist

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Introduction

Weeds are an economic problem in farming. Controlling them has become a necessity, to maintain maximum production. Weeds cost the farmer in Montana \$59,694.00 a year to control them. This does not include the cost of controlling weeds along the highways and roadways throughout the state.

Research on the Northwestern Montana Branch Station has been conducted in an effort to find an effective control of some of the troublesome weeds in Western Montana. The two weeds on which most effort has been placed are quackgrass (agropyron repens) and wild oats (Avena fatua). This past year studies were conducted on wheat thief (Lithospernum arvense) and weed control in Kendland clover grown for seed production. Each of these experiments is described later in this section of the annual report. Cost of this project in 1957 was \$711.38.

In 1956, a garden tractor was presented to the Northwestern Montana Branch Experiment Station through the cooperation of several farm organizations and agencies. Through facilities of the Flathead County Extension Service parts needed to build a tractor mounted "spray rig" were obtained.

The "spray rig" was completed in 1956. The parts of this spray rig are a stainless steel "pony beer keg" eight gallons, pressure gage, out let, hose and four foot boom. The beer keg (tank) is mounted on the rear of the tractor with the boom placed under the tank. Using a given amount of pressure material and a given speed a plot 15 x 20 feet can be covered very accurately and evenly.

A portable air compressor is used to build pressure in the tank. Using this equipment, many plots can be put out in a short time. This additional equipment has increased our quantity and quality of work.

In 1957 all experiments were designed so the above described equipment could be used. The plots were 15 feet wide and 20 feet long. These plots could be covered in three trips over the plot and still maintain the same pressure during the entire period of application of the material.

Chemical Control of Agropyron repens

In 1956 six herbicides were applied to an established stand of agropyron repens to determine the effectiveness of the compound for control of this plant. CMU was the only herbicide used which caused permanent soil sterilization. Different rates of each herbicide were used and are given in table I.

The material was applied with a "paint spray out fit". These herbicides were applied to plots five feet by twenty feet or 100 square feet. Cultivation was used in conjunction with all treatments.

This tillage work was done three weeks after application of all herbicides except CMU which was applied, April 21, 1956. Other compounds were applied, May 21, 1956.

In July of 1956 readings were made to determine percent of kill that year. These readings are found in Table I. In May of 1957 readings were made to determine the complete effectiveness of these herbicides. Study of these data shows that amino triazole and TCA were most effective of the non-permanent soil sterilents. Dalapon was somewhat less effective. IPC and MH were completely in-effective in the control of agropyron repens. Table I.

Table I. Chemical Control of quackgrass at Creston, Montana 1956. Six chemicals.

CMU applied 4/21/56		Other chemical applied 5/21/56		
Plot Number	Chemical	Rate in Pounds Per Acre	Per-cent Kill ¹	Grass Stand % 5/4/57
1	CMU	20	98	0
2	CMU	30	100	0
3	CMU	40	100	0
4	Dalapon ³	10	20	50
5	Dalapon	10	20	50
6	Dalapon	20	30	35
7	Dalapon	30	70	10
8	Weedazol ⁴	4	70	5
9	Weedazol	6	95	0
10	Weedazol	8	90	3
11	MH ⁵	4	0	100
12	MH	6	0	100
13	MH	8	0	100
14	Check	0	0	100
15	IPC ⁶	6	0	100
16	IPC	9	0	100
17	IPC	12	0	100
18	TCA ⁷	40	95	10
19	TCA	60	95	5
20	TCA	80	90	5

¹100 equal all plants killed.

23-(p-chlorophenyl)-1, 1-dimethylurea

32,2 dichloropropionic Acid

⁴(3 amino-1,2,4,-Triazole)

⁵Maleic Hydrazide

⁶Isopropyl-n-Phenylcarbamate

⁷Trichloro Acetic Acid

Experiments to control quackgrass (agropyron repens) in combination with herbicides and cultivation were located in two locations in 1957. Observations as to percent of kill are to be made in the spring of 1958.

One experiment is located on the Carr farm 1½ miles north of the Northwestern Montana Branch Station. The other is located on the Station. Three herbicides were used in the experiment.

Observation made in the fall of 1957 showed regrowth in plots treated with amino trizole (ATA) (ACP). This was the only plot in which regrowth was noted except in the check.

The planting plan shows the herbicide used and rates.

Test III
Quackgrass Treatments *

Plots 16 x 20

Location-Station E-4 and Rue Carr Farm

<u>Chemical</u>	<u>Acid Equivalent Pounds/A.</u>	<u>Pounds of Material Per Acre</u>	<u>Material Per Plot 320 Sq.Ft.</u>	<u>Plot Numbers</u>			
Dalapon	20	24	74.97	1	15	21	39
Dalapon	30	36	112.45	2	20	23	31
Dalapon	40	48	149.93	3	11	25	38
Weedazol	3	6	18.75	4	17	29	32
Weedazol	6	12	37.48	5	12	30	33
Weedazol	12	24	74.96	6	14	26	40
TCA	20	22	71.58	7	18	22	35
TCA	40	44	137.44	8	19	28	37
TCA	60	66	206.16	9	16	27	36
Check	0	0	0	10	13	24	34

*Tillage included in this trial

Material to be applied when quackgrass is 8 to 10 inches tall, plowed two weeks after application.

In 1957 several herbicides at different rates were applied to an established stand of Agropyron repens located on the Flathead County Air Port.

Compounds used were, Dalapon, TCA, Amino triazole, CMU, and Ureabor. Ureabor and CMU were applied before growth of A. repens. The date of application was April 8, 1957. The other materials were applied, May 17, 1957 when the A. repens was 4 to 6 inches tall.

Upon observation of these plots it was found that all materials appear to give a measure of control. To measure the complete effectiveness it will be necessary to make observations and plant counts early in the spring of 1958

Test IV
Quackgrass Treatments
Agropyron repens

CMU and Ureabor applied 4-8-57
Other plots applied 5-17-57
Plots 16 x 20 sq. ft.
Location, County Air Port (Flathead)

<u>Chemical</u>	<u>Acid Equivalent #/A</u>	<u>Material #/A</u>	<u>Material Per Plot 300 Sq. Ft.</u>	<u>Plot Numbers</u>			
Dalapon	20	24	74.97	1	23	48	61
Dalapon	30	36	112.45	2	28	37	69
Dalapon	40	48	149.93	3	29	39	58
CMU	20	25	98.09	4	25	52	67
CMU	40	50	117.09	5	32	49	56
CMU	60	75	156.12	6	20	41	66
TCA	40	44	137.44	7	36	45	63
TCA	60	66	206.16	8	22	53	72
TCA	80	88	274.86	9	26	46	70
Eurabor		435	3	10	34	42	55
Eurabor		217.5	1½	11	31	50	62
Eurabor		652.5	4½	12	27	47	68
Weedazol	3	6	18.75	13	33	38	65
Weedazol	12	12	37.48	14	35	44	57
Weedazol	6	24	74.96	15	30	43	59
*Dalapon	10	12	37.49	16	24	40	71
*Weedazol	3	6	18.75	17	21	51	60
Check	0	0	0	18	19	54	64

Trade or Common Name

Active Ingredients

Dalapon	2-2-Dichloropropionic Acid
Weedazol	3 amino - 1,2,4 triazole
CMU (Telver)	3, (P-Chlorophenyl)-1,1 dimethylurea
TCA	Trichloroacetic acid
Ureabor	Sodium borates and 3 dichlorophenyl-1,1 dimethylurea

*Application made three times during the growing season as follows

1. When vegetation is 6 to 8 inches high.
2. Three weeks following first application.
3. Four weeks following second application.

Rate to be the same each application.

Chemical Control of Perennial and Annual
Weed in Kendland Clover Grown for Seed

Considerable work has been done in the production of Kendland Clover seed on the Station at Creston. One of the greatest problems is the control of weeds, both annual and perennial. It was the purpose of this research problem to aid in control of these weeds. Five different herbicides were used in the trial.

Application was made just after emergence of weeds and clover. This was done with a sprayer mounted on a garden tractor and calibrated to apply the proper amount of material and water. Applications were made, April 18, 1957.

Results

Control of weeds using premerge was effective, at all rates with little or no effect on clover. This controlled only the small weeds and regrowth was noted later in the season. Neburon controlled the weeds but caused severe rolling of clover leaves and stunted the growth of the clover. No effect on clover or control of weeds was noted with other compounds. Seed yields were not obtained to measure the effect of the herbicides on total seed production.

Plan for Herbicide Treatment in Established Kendland Clover

Plot size 5 x 20 feet

<u>Chemical</u>	<u>Acid equivalent in #/A</u>	<u>Plot Numbers</u>			
Premerge.	1	1	17	30	45
Premerge	2	2	22	26	48
Premerge	3	3	23	27	37
Premerge	4	4	19	29	44
Neburon dupont	2	5	14	33	47
Neburon dupont	4	6	16	34	38
Neburon dupont	6	7	20	36	39
CDDA (Mansanto) ¹	2	8	21	25	46
3 y 9 ²	4	9	24	32	41
4(McPB)	2	10	18	31	43
4(McPB)	4	11	15	28	42
Check	0	12	13	35	40

¹A-Chloro-N,N-diallyacetamide ²Tris(2,4dichlorophenoxyethyl)phosphite

Weeds to be controled

<u>Common name</u>	<u>Botanical name</u>
Knot weed	<u>Polygonum aviculare erectium</u>
Catch fly or cow cockle	<u>Silene noctiflora</u>
Pig weed	<u>amarathus spp</u>
Fan weed	<u>Thlaspi arvense</u>
Chick weed	<u>Stellaria media</u>
Lambsquarter	<u>Chenopodium album</u>
Shepherds purse	<u>Capella buresa-pastoris</u>
Round leaved mallow	<u>Malva rotundifolia</u>
Quackgrass	<u>Agropyron repens</u>
Common rag weed	<u>Ambrosia artemisifolia</u>
Plantains	<u>Plantago rugellii</u>
Yellow goats beard	<u>Tragopogan pratensis</u>

Chemical Control of Lithospernum arvense

In 1956 the Extension service put out some field plot demonstrations to study the control of wheat thief, (Lithospernum arvense) in winter wheat. Materials used in the demonstration were Dinitro and different formulations of 2,4-D. The Station staff assisted in the harvesting of random samples from these treated areas.

Table II. Shows treatments and yield per acre of this demonstration.

To further measure the effect of these compounds on the yield of winter wheat a detailed study was designed by the Experiment Station. Three 2,4-D formulations were used at different rates for each and three rates of application for the dinitros used. Table III shows treatments and rates, percent of kill and yield of Wasatch winter wheat. These data are somewhat erratic as they pertain to percent kill. The high C.V. indicated a large amount of error. The C.V. for the grain yields is a little high to be considered a reliable test. However, these data tend to indicate a reduction in yield because of the treatments. Other differences between treatment are present in addition to the difference between the check.

Table II. Yield data from winter wheat (Tripplet) treated with herbicides for control of wheat thief (Lithospernum arvense). Grown in Flathead county on the Tom Ambrose farm, Rt. 4, Kalispell, Montana 1956.

Chemical	Rate Per Acre in Pounds	Size of Plot 600 Sq. Ft.	
		Pounds Per Plot	Bushels Per Acre
Dinitro	1.25	30	36.3
Dinitro	2.50	30	36.3
Dinitro	3.75	27	32.6
Dinitro	5.00	32	38.7
Chipman 2,4-D	.75	26	31.5
2,4-D	1.50	28	33.9
2,4-D	3.00	31	37.5
Dow 99	5.0	37	44.7
Check		27	36.0
		Mean	36.0

Table III. Agronomic data from the application of herbicides to control Lithospermum arvense (wheat thief) in winter wheat. Located on the Thomas Ambrose farm, Rt. 4, Kalispell, Montana 1956.

Treatment	Rate Per A. in Lbs.	Plot Yields In Bushels/A.			Total Bushel	Ave. Bu. Per A.	Per- cent Kill
		I	II	III			
2, 4D Amine	$\frac{1}{2}$	36.5	27.6	21.2	85.3	28.4	3.3
2, 4D Amine	1	31.6	31.8	33.1	96.5	32.2	3.3
2, 4D Amine	2	25.6	27.1	27.5	80.2	26.7	20.0
DNO SBP	$1\frac{1}{2}$	26.0	25.5	23.3	74.8	24.9	1.7
DNO SBP	$2\frac{1}{4}$	24.5	24.0	29.1	77.6	25.9	43.3**
DNO SBP	3	25.7	24.3	30.5	80.5	26.8	40.0**
Low Volital Ester	$\frac{1}{2}$	19.7	23.5	25.5	68.7	22.9	0
Low Volital Ester	1	18.0	24.5	20.4	62.9	21.0	36.7**
Low Volital Ester	2	15.3	14.0	13.3	42.6	14.2*	55.0**
2, 4-D Ester	1	25.5	19.5	21.8	66.8	22.3	18.3
2, 4-D Ester	2	22.3	15.0	27.8	65.1	21.7	21.7
Check		22.5	37.0	24.6	84.1	28.0	0

*Treatments yielding significantly less than the check 5%.

**Weed kill percent significantly higher than the check 5%.

Mean Yield.....27.6
 S. E. \bar{x}2.5404
 L.S.D.7.4
 C. V.10.33%

Percent Weed kill

Mean.....20.8%
 S. E. \bar{x}10.024
 L.S.D.29.3
 C. V,48.19%

Weeds in Fence Lines and Roadways

The control of weed grasses and other undesirable species in fence lines and along roadways is becoming more and more important in the agricultural areas of Western Montana. The need still remains great for more research and testing in this area of weed control.

CMU has been effective at 20 to 50 pounds per acre in the control of most herbaceous plants in Western Montana. However, Canada thistle (Cirsium arvense) appears within a year in the area treated.

In 1957 a trial was set up to test the effectiveness of three herbicides. These materials used were, CMU (Dupone), Norvan (Dow), and Ureabor (PCB). CMU and Norvan were applied in an aqua solution at 100 gallons per acre. This application was made with a sprayer mounted on a garden tractor. Ureabor was applied with a spreader provided by the (PCB) company. One rate of each compound was used. These rates being suggested by the manufacture. The purpose of this test was to compare the effectiveness of each of these herbicides.

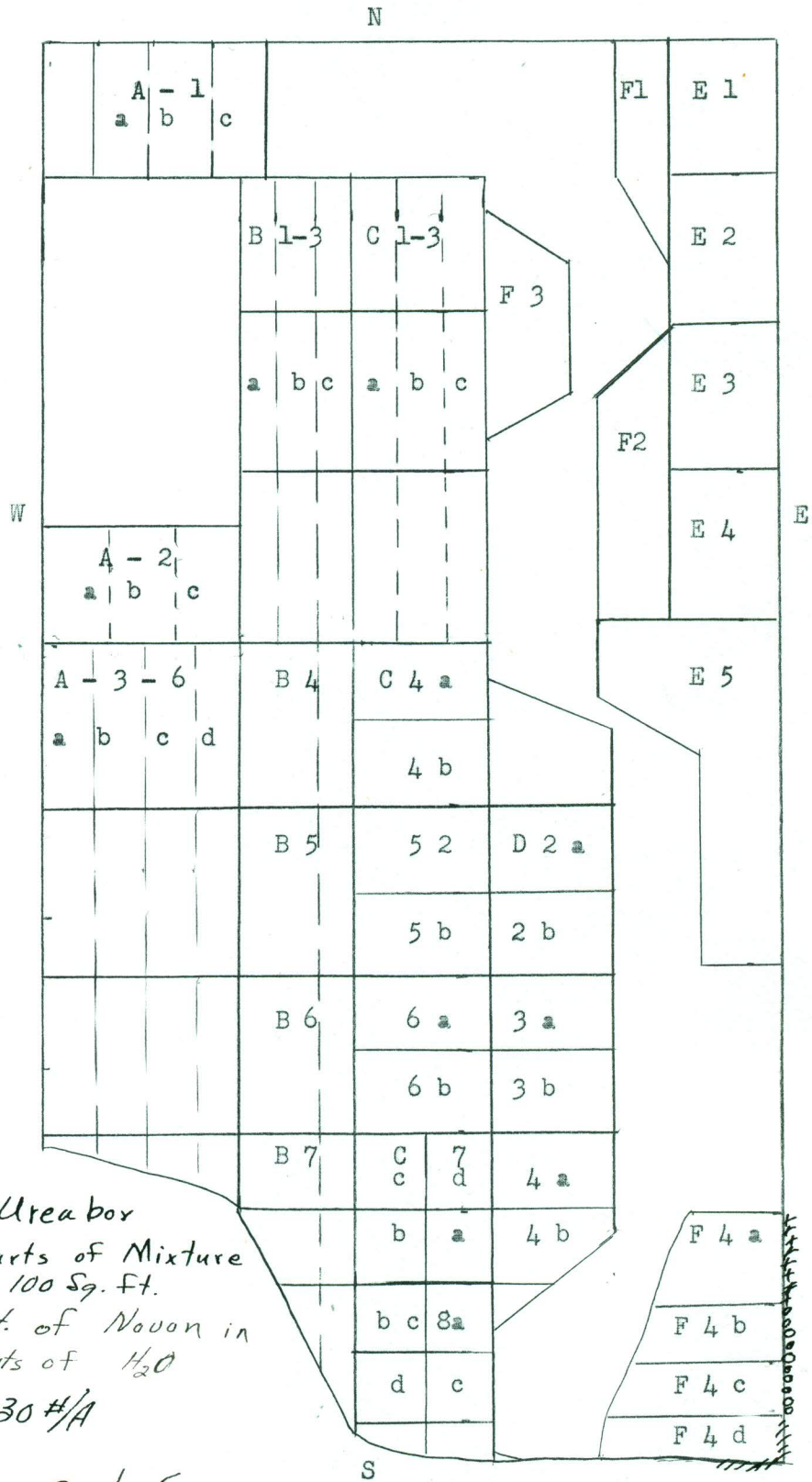
Results

Observations made during the growing season indicated all compounds were effective. Ureabor was very slow in acting when compared to CMU and Norvan.

Results of this test can not be conclusive until the spring of 1958.

The map and chart describe the experiment and gives the location of the same.

MONTANA AGRICULTURAL EXPERIMENT STATION
 Northwestern Montana Branch Station
 Route 4, Kalispell, Montana



1111 a - 435.6 #/A Urea bor
 0000 b - Nouon (3 quarts of Mixture
 per 100 Sq. Ft.
 Mixture = 1 qt. of Nouon in
 4 qts of 1/20

xxxx c = CMU 30 #/A

Applied April 9, 1957

General Farm

All cereal crops were sprayed with 2,4-D ester formulation at the proper stage of plant growth. Several fence rows were sprayed with Novon and CMU. The following table and map show date of treatments, rates, and location. Following this is information on specific compounds as to their apparent effectiveness as observed by the author.

<u>Date</u> 1957	<u>Operation</u>	<u>Location</u>	<u>Her- bicide</u>	<u>Rate in #/A</u>	<u>Remarks</u>
Apr. 9	Sprayed fence line and road ways	See map (1)	CMU	30-50	Good control of Quackgrass
Apr. 9	Sprayed fence line and road ways	See map (2)	Novon		Control of all grassie plants
May 3	Sprayed Winter Wheat	F-1, B-4 F4, bc	2,4-D*	.375	(a)
May 16	Sprayed winter wheat nursery	E-2	2,4-D*	.375	(a)
May 29	Sprayed spring grain	A3-6c, B1-3c, B-6, C1-3c, C8c, D2a, E1-4, D5b.	2,4-D**	.5	(b)
July 10	Sprayed Pastures for <u>Cirsium arvense</u>	See map (3)	2,4-D	2.0	(c)

*Low volatility ester 2# 2,4-D acid equi. per gal. (Dow 99).

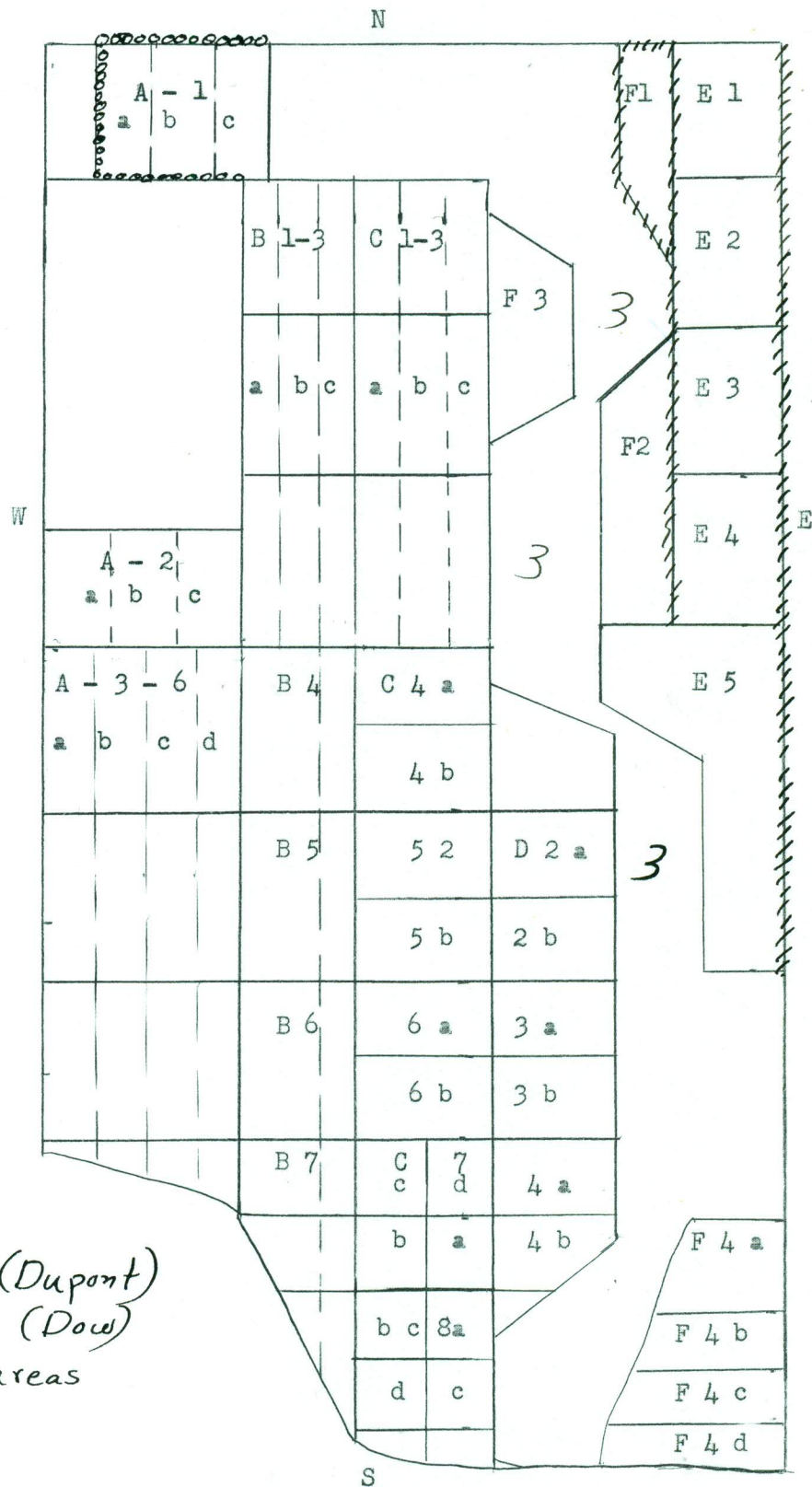
**Ester formulation 2,4-D c.8# 2,4-d acid equi. per gal. (Chipman).

(a) Weeds, broadleaved died very slowly, and not completely. Rate as recommended by manufacture was not adequate for this area.

(b) Very good control of broad leaved weeds.

(c) Very good control of Cirsium arvense.

MONTANA AGRICULTURAL EXPERIMENT STATION
 Northwestern Montana Branch Station
 Route 4, Kalispell, Montana



1. *||||* CMU (Dupont)
2. *oooo* Novon (Dow)
3. Pasture areas

1957

Forage Species and Varieties

Project No. 5022

by

C. W. Roath, Superintendent

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by

Vern R. Stewart, Assistant Agronomist

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Introductions

This part of the ninth annual report concerns both annual and perennial forage crops. The report of perennial forages will be on grass and legume species and varieties, whereas the annual forage report will concern, varieties of corn, sorghums, millets and other annual crops used for forage production. The method of research used will be explained for each experiment or grouped, if similar methods are used for several experiments.

\$1909.35 were spent on this project.

Plans for the coming season call for and harvest of several trials seeded prior to 1957, harvest of trials with perennials seeded in 1957, seeding and harvest of annual forages again in 1958, seeding of one-half acre of additional land to detailed species or variety studies, according to a schedule worked out by workers with forage crops at conference time.

Results are shown in subsequent tables.

Irrigated Pastures

This is the fourth and last year of harvest for irrigated pasture mixtures seeded in 1953. See tables I and II.

By comparing this seasons yield with the four year average it will become evident that some mixtures have declined drastically in the four year period. Trefoil mixtures are above Ladino mixtures with the same grass in every case for this season, ahead for the four year period in a few cases. Mixtures significantly low this season compared to Orchard-ladino are Brome, Intermediate and Troy with ladino. One mixture is higher in yield this year, Orchard and Trefoil (2). This is the same mixture as the other orchard-trefoil in the trial seeded at a different rate. ie,

Orchard 4 lbs, Trefoil 10 lbs.
(2)Orchar 8 lbs, Trefoil 5 lbs.

This is the second four year frequent clipping study in which Alta-Ladino and Orchard-Ladino have maintained the same relative position above sodgrass mixtures. In this one however Orchard-Trefoil forged ahead by virtue of greater 3rd and 4th year yields.

A new pasture trial has been seeded involving four mixtures and nine fertilizer treatments designed to determine what mixture and what fertilizer treatment will best maintain production over a ten year period.

A study to determine which variety of trefoil is best with Orchard grass has failed to establish significant differences in three years and three year average yields are close.

For observations on Bluegrass see table IV.

Table I. Irrigated Pasture Mixtures, 1957. Seasons yield from four clippings of oven dry forage adjusted to 12% moisture from 80 square feet.

Mixture	Pounds Per Plot				Total Pounds	Pounds Oven Dry	Pounds Corrected to 12% Moisture	Four Year Average
	I	II	III	IV				
Orchard & Ladino	3.7	2.78	3.0	5.30	14.78	2011.93	2253.36	4028
Orchard & Trefoil	4.17	5.44	4.28	4.89	18.78	2556.43	2863.20	4411
Brome & Ladino	2.33	2.61	2.17	2.66	9.77	1329.94	1489.53*	3610
Brome & Trefoil	3.14	4.02	3.14	4.64	14.94	2033.71	2277.76	3759
Alta and Ladino	3.31	3.11	3.22	6.09	15.73	2141.25	2398.20	4237
Alta and Trefoil	4.72	3.94	3.72	4.81	17.19	2339.99	2620.79	4118
Intermediate & Ladino	3.30	1.86	2.28	3.13	10.57	1438.84	1611.50*	3639
Intermediate & Trefoil	3.23	3.23	2.55	2.67	11.68	1589.94	1780.73	3524
Troy and Ladino	2.56	2.39	1.83	1.77	8.55	1163.87	1303.53*	3371
Troy and Trefoil	4.48	3.14	4.86	3.19	15.67	2133.08	2389.05	3561
Orchard & Trefoil (2)	4.38	5.66	5.59	6.53	22.16	3016.53	3378.51**	4284
Troy & Trefoil (2)	3.59	4.25	3.05	4.98	15.87	2160.30	2419.54	3610

*Mixture yielding significantly less than the check at (5%).
 **Mixture yielding significantly less than the check at (1%).
 Orchard and Ladino is used as the check.

Mean Yield.....2232.14
 S.E.X.....221.37 lbs.
 L.S.D. (5%).....634.83 lbs.
 L.S.D. (1%).....789.74 lbs.
 C.V.9.9%

Table II. Four year Production of Irrigated Pastures 1954-57.

Mixture	1954	1955	1956	1957	Four Year Total
Alta-Ladino	5476	5188	4175	2397	17236
Alta-Trefoil	4470	4563	4481	2622	16136
Orchard-Ladino	5443	4825	4208	2256	16732
Orchard-Trefoil	5143	4695	4990	2866	17694
Brome-Ladino	5328	4622	3795	1488	15233
Brome-Trefoil	4877	4219	4323	2281	15700
Intermediate-Ladino	5073	4605	3732	1610	15020
Intermediate-Trefoil	4227	4084	4146	1781	14238
Troy blue-Ladino	4054	4324	3532	1305	13225
Troy blue-Trefoil	3685	3887	4078	2391	14041
Orchard -Trefoil 2	5211	3650	4894	3378	17133
Troy-Trefoil 2	3422	4003	4596	2421	14442

Table III. 1957 yields per plot, 80 square feet of Trefoil varieties from three cuttings when grown with Orchardgrass.

Variety	Pounds Per Plot				Pounds Oven Dry	Pounds Corrected to 12% Moisture	Pounds Per Acre	3 year Average Pounds/A.
	I	II	III	IV				
Iowa Empire	6.20	3.80	3.19	4.97	18.16	20.34	2768.78	4476
Empire	5.29	3.70	3.64	5.22	17.85	19.99	2721.14	4559
Cascade	5.53	3.40	3.56	4.75	17.24	19.31	2628.57	4488
Viking	5.22	3.83	3.28	4.38	16.71	18.72	2548.26	4424
Granger	4.19	3.18	3.20	3.59	14.16	15.86	2158.94	4136
Mansfield	4.89	3.94	4.09	3.58	16.50	18.48	2515.59	4455
Italian Broadleaf	5.08	3.62	3.67	5.74	18.11	20.28	2760.62	4630
Montana Early	5.78	3.54	3.36	3.57	16.25	18.20	2477.48	4480
Oregon Narrowleaf	5.61	3.49	3.92	3.21	16.23	18.18	2474.75	4534
N. Y. Narrowleaf	6.13	4.18	4.09	3.75	18.15	20.33	2767.42	4576

Mean.....
 S.E. \bar{x}167.71 lbs.
 L.S.D.(5%).....N. S.
 C. V.6.501%

1
5
1

Table IV. Bluegrass Observations: Yields and characteristics of 42 bluegrasses from 32 square feet, grouped by sod forming tendency. (1 cutting when seed was ripe).

Row	Cereal Number	Stand	Height in Inches	Cunces Per Plot Oven Dry	Ozs/plot Corrected to 12% Moisture	Pounds Per Acre
Bunchgrass						
19	P-846	fair	30	7.75	8.68	738.48
21	P-5731	fair	36	9.75	10.92	929.05
29	P-13791	fair	24	2.00	2.24	190.57
35	P-8903	good	44	29.00	32.48	2763.33
Slight Sod Forming Tendency						
2	P-13827	poor	20	6.00	6.72	571.72
18	13783-33	good	24	20.5	22.96	1953.39
26	P-13824	fair	22	6.75	7.56	643.19
30	13948-204	good	22	4.50	5.04	428.79
36	P-15398	good	30	12.25	13.72	1167.27
39	13949-410	good	30	17.25	19.32	1643.71
Rapid sod formers						
8	P-13818	good	28	47.25	52.92	4502.33
14	4249-1P-3128	good	36	32.25	36.12	3073.02
16	P-13821	good	26	22.00	24.64	2096.32
23	13783-301	good	22	27.0	30.24	2572.76
24	13833-211	good	18	21.0	23.52	2001.03
27	4808-523	good	24	16.5	18.48	1572.24
28	4694-8	good	32	37.0	41.44	3525.63
31	5971-208	good	20	15.25	17.08	1453.13
33	P-14094	good	32	28.00	31.36	2668.05
34	13783-507	good	36	25.00	28.00	2382.18
37	13775-202	good	28	31.00	34.72	2953.91
41	13802-409	fair	24	27.25	30.52	2596.58
Moderate Sod forming tendency						
1	P-13819	good	30	30.25	33.88	2882.44
3	13838-513	fair	26	17.25	19.32	1647.71
4	4729-11	fair	32	11.00	12.32	1048.16
5	P-14093	fair	30	9.50	10.64	905.23
6	P-15391	fair	26	9.75	10.92	929.05
7	P-11040	poor	18	1.00	1.12	95.28
9	P-15396	fair	32	12.00	13.44	1146.85
10	14095-803	fair	36	25.00	28.00	2382.18
11	13949-308	poor	28	18.50	20.72	1762.82
12	P-15395	fair	30	21.75	24.36	2072.50
13	13703-208	good	36	29.75	33.32	2837.80
15	13783-29	good	26	16.00	17.92	1524.60
17	13838-305	fair	28	18.75	21.00	1786.64

Table IV. (Continued)

Row	Cereal Number	Stand	Height in Inches	Ounces Per Plot Oven Dry	Ozs/plot Corrected to 12% Moisture	Pounds Per Acre
20	P-14093L-4683	good	30	15.25	17.08	1453.13
22	P-15397	good	24	13.75	15.40	1310.20
25	P-13946	good	26	15.0	16.80	1429.31
32	13775-212	good	26	21.5	24.08	2048.68
38	5971-408	good	24	15.5	17.36	1476.95
40	13775-211	good	24	16.5	18.48	1572.24
42	4260-1P410	fair	18	8.0	8.96	762.3

Stands--Good 75-100% Fair 50-75% Poor under 50%.

In forage yields the first year of harvest:

4 bunch type ave. 1166.36
 6 Slight sod forming Ave. 1068.01
 12 Rapid sod formers Ave. 2616.43
 20 Moderate sod formers Ave. 1551.80

Irrigated Hay

This is the fourth year of harvest for a study comparing alfalfa and clover mixtures. Alta fescue and Potomac Orchard in mixtures with alfalfa lead in this study. Clover mixtures were very productive for the first two years but yields the last two years were primarily due to the grass. This is the second four year hay mixture study in which mixtures of alfalfa and Orchard and alfalfa and Fescue have done well when compared to single species or other mixtures. Table V.

Alfalfa and Trefoil varieties seeded in 1953 in an irrigated legume nursery were harvested once this year. Yields may provide some indication of their relative productivity the fourth year after seeding. Table VI.

Orchard grass variety yields, alone and with alfalfa are shown in Tables VII and VIII. Mean yields with alfalfa are 1.4 tons greater than mean yields of orchard alone. This is the first harvest year for this work and no conclusions have been reached.

Eighteen grasses were seeded in mixtures with alfalfa on the F.F.A. farm near Kalispell in 1956, and one cutting secured in 1957. (Inadequate irrigation made comparable second cutting yield data impossible). Relative protein and phosphorous content determined from samples of these is shown in the fertilizer section of this report. See table IX.

Table V. 1957 Irrigated Hay Mixtures. Seasons yields in pounds per plot of 80 square feet for the fourth year of harvest. Two cuttings, (oven dry samples).

Species or Mixture	Pounds Per Plot				Pounds Oven Dry	Pounds Corrected to 12% Moisture	Tons Per Acre	Four year Average Tons/Acre
	I	II	III	IV				
Ranger Alfalfa	11.98	8.74	8.07	10.15	38.94	43.61	2.968	3.75
Kenland Clover	4.47	8.35	6.52	5.28	24.62	27.57	1.876**	3.31
Tall Oats and Alfalfa	7.73	8.13	5.42	9.03	30.31	33.95	2.311	4.01
Brome and Alfalfa	7.27	8.86	8.86	10.73	35.72	40.01	2.723	4.09
Intermediate & Alfalfa	6.09	7.37	5.29	8.73	27.48	30.78	2.095*	3.52
Orchard & Alfalfa	8.38	8.38	9.90	13.70	40.36	45.20	3.076	4.24
Alta and Alfalfa	10.40	12.91	11.55	15.71	50.57	56.64	3.855*	4.18
Timothy and Alfalfa	7.82	8.79	6.69	8.55	31.85	35.67	2.496	3.77
Tall Oat and Clover	5.59	6.10	8.05	4.49	24.23	27.14	1.847**	3.67
Brome & Clover	8.92	7.36	7.29	7.85	31.42	35.19	2.395	3.80
Intermediate & Clover	11.09	6.93	5.54	9.81	33.37	37.37	2.543	3.61
Orchard & Clover	10.87	8.64	9.11	13.01	41.63	46.63	3.174	3.91
Alta and Clover	10.64	10.01	7.04	7.28	34.97	39.17	2.666	3.96
Timothy & Clover	8.06	8.01	4.82	4.66	25.55	28.62	1.948**	3.23
Ladak Alfalfa	10.28	11.59	7.91	9.22	39.00	43.68	2.973	3.76

Ranger Alfalfa is used as a check.

*Mixture yielding significantly more or less than the check (5%).

**Mixture yielding significantly more or less than the check (1%).

Mean Yield.....
 L.S.D.(5%).....73T
 L.S.D.(1%).....98T
 C. V.9.822%

Forage Species and Varieties

Irrigated Legumes: One cutting of alfalfa and trefoil varieties was harvested from legume plots seeded in 1953. These were pretty well sodded in with bluegrass but forage taken was probably 80% the legume seeded.

Table VI. Yields from 48 square feet plots, one cutting made June 22, 1957. (4th year of harvest).

Variety	Pounds Per Plot			Pounds Oven Dry	Pounds Corrected to 12% Moisture	Tons Per Acre
	I	II	III			
Alfalfa						
Nomad	3.26	4.35	2.45	10.06	11.27	1.70
Sevelra	4.17	5.28	4.45	13.90	15.57	2.35
Rhizoma	5.12	3.59	6.66	15.37	17.21	2.60
Ranger	4.45	5.84	3.62	13.91	15.58	2.36
Ladak	3.81	3.26	7.61	14.68	16.44	2.49
					Average	2.30
Treffoils						
Montana Early	3.59	3.07	5.12	11.78	13.19	1.99
Empire	2.89	2.36	3.81 ¹	9.06	10.15	1.54
Cascade	3.66	2.44	6.34	12.44	13.93	2.11
					Average	1.88

¹Missing plot.

Analysis of Variance

Variance	D.F.	Mean Square	F
Varieties	7	1.670	0.947
Reps	2	3.770	2.137
Error	14	1.764	
Total	23		

Mean Yield.....2.14
 S. E. \bar{x}390 tons
 L.S.D.(5%).....N. S.
 C. V.18.175%

Table VII. Orchardgrass Varieties, Creston, Montana 1957. Yield in pounds per plot of 80 square feet, two cuttings. (Orchard grass with no alfalfa).

Variety	Pounds Per Plot			Total Pounds	Pounds Corrected to 12% Moisture	Tons Per Acre
	I	II	III			
Potomac	15.27	18.60	20.91	54.78	61.35	5.567
P-2453	16.66	11.15	17.90	45.71	51.20	4.646
Akaroa	19.84	15.76	14.22	49.82	55.80	5.064
Cornell Syn 2F	16.97	16.23	18.11	51.31	57.47	5.215
Iowa #6	21.07	16.45	17.18	54.70	61.26	5.559
Trogdon	13.38	15.72	14.40	43.50	48.72	4.421
Commercial	16.06	16.38	14.40	46.84	52.46	4.761
Utah Syn 2	15.58	19.66	17.67	52.91	59.26	5.378
Iowa #1	13.82	14.97	14.73	43.52	48.74	4.423

Analysis of Variance

Variance	D.F.	Mean Square	F
Varieties	8	6.770	1.265
Reps	2	0.660	0.123
Error	16	5.353	
Total	26		

Mean Yield.....5.004
 S. E. \bar{x}407 T/A
 L.S.D.N. S.
 C. V.8.141%

Table VIII. Orchardgrass varieties with alfalfa, 1957, Creston, Montana. Yields in pounds per plot of 80 square feet, two cuttings

Variety	Pounds Per Plot			Total Pounds	Pounds Corrected to 12% Moisture	Tons Per Acre
	I	II	III			
Potomac	18.97	21.19	22.50	62.66	70.18	6.37
P-2453	20.78	25.30	23.04	69.12	77.41	7.03
Akaroa	20.51	21.00	20.82	62.33	69.81	6.34
Cornell Syn 2F	21.01	20.21	20.15	61.37	68.73	6.24
Iowa #6	22.63	20.18	20.24	63.05	70.62	6.41
Trogdon	19.98	20.24	17.22	57.44	64.33	5.84
Commercial	24.17	21.93	24.54	70.64	79.12	7.18*
Utah Syn 2	22.16	19.98	23.06	65.20	73.02	6.63
Iowa #1	18.18	19.04	19.25	56.47	63.25	5.74

Analysis of Variance

<u>Variance</u>	<u>D.F.</u>	<u>Mean Square</u>	<u>F</u>	
Varieties	8	7.386	3.289*	Mean Yield.....6.42
Reps	2	0.175	0.779	S. E. \bar{x}264T
Error	16	2.246		L.S.D.(5%)..... .79T
Total	26			C. V.4.14%

*Significantly higher in yield than Potomac (5%).

Table IX. Grass alfalfa mixtures grown on the F.F.A. farm, Kalispell, Montana 1957. Four row plots, three replications, yields from 80 square feet, one cutting.

Mixture	Pounds Per Plot Oven Dry			Total	Totals	Average
	I	II	III	Pounds Oven Dry	Corrected to 12% Moisture	Tons Per Acre
Alfalfa and Grass						
Intermediate Wheat	11.21	8.53	6.82	26.56	29.75	2.699
Nordan Crested	13.50	7.80	7.50	28.80	32.26	2.927
Standard Crested	10.76	6.40	7.43	24.59	27.54	2.499
Pubescent Wheat	10.12	8.35	8.10	26.57	29.76	2.70
Tall Wheat	10.38	8.35	8.86	27.59	30.90	2.80
Manchar Brome	11.48	7.22	10.50	29.26	32.77	2.974
Slender Wheat	10.17	9.88	10.46	30.51	34.17	3.10
Reed Canary	8.33	7.52	8.06	23.91	26.78	2.43
Potomac Orchard	5.82	5.57	7.34	18.73	20.98	1.90
Sherman Big Blue	6.72	6.72	8.33	21.77	24.38	2.21
Tall Oat	6.12	7.51	7.23	20.86	23.36	2.119
Meadow Foxtail	5.58	8.76	7.90	22.24	24.91	2.26
Meadow Foxtail	6.18	8.60	9.67	24.45	27.38	2.484
Creeping Meadow						
Foxtail	6.83	6.33	9.36	22.52	25.22	2.288
Alta Fescue	7.70	8.80	8.25	24.75	27.72	2.515
Troy Blue	7.94	8.97	7.17	24.08	26.97	2.447
Lincoln Brome	8.92	7.65	7.65	24.22	27.13	2.462
Hopkins Timothy	6.83	8.40	10.76	25.99	29.11	2.642

Analysis of Variance

Source	D.F.	Mean Square	F
Mixtures	17	3.118	.712
Rep	2	2.655	.606
Error	34	4.378	
Total	53		

Mean Yield.....2.525 T/A
 S E \bar{x} 1.208
 L.S.D.N. S.
 C. V.14.572%

Dryland Legumes and Grasses

This is the first harvest year for a dryland legume nursery seeded in 1956 comparing alfalfas and milkvetches. Milkvetches were significantly below alfalfas. See table X.

Grasses seeded at Hot Springs on very dry alkaline soil in 1953 were harvested again this year. Table XI. Nordan Crested leads the other grasses in production this year, but is badly beaten by Ladak alfalfa. Excessive variation in plot yields makes the C.V. extreme and eliminates significance.

Four year production is shown in Table XII.

Table X. Dryland Legumes grown at Creston, Montana in 1957. Seasons yields from 80 square feet, one or two cuttings as indicated.

Species or Mixture	Cuttings	Pounds Per Plot			Pounds Oven Dry	Pounds Corrected to 12% Moisture	Tons Per Acre
		I	II	III			
Rambler & Crested	2	8.67	6.16	8.52	23.35	26.15	2.373
Ladak & Crested	2	11.79	6.88	8.93	27.60	30.91	2.805
Ladak & Crested	2	11.57	6.62	10.65	28.84	32.30	2.931
Cicer & Crested	1	11.27	6.44	7.40	25.11	28.12	2.552
Sickle & Crested	1	10.24	4.27	7.11	21.62	24.21	2.197
Crested	1	10.85	6.65	5.25	22.75	25.48	2.312
Ladak (check)	2	10.09	8.06	5.98	24.13	27.03	2.453
Ladak	2	8.05	5.31	7.70	21.06	23.59	2.141
Cicer	1	4.31	4.60	3.16	12.07	13.52	1.227**
Sickle	1	2.32	4.97	4.31	11.60	12.99	1.179*

**Species or Mixture yielding significantly less than the check (1%).

*Species or Mixture yielding significantly less than the check (5%).

Mean Yield.....2.217
 S E \bar{x}291 T.
 L.S.D.(5%)..... .86 T.
 L.S.D.(1%).....1.185 T.
 C. V.13.08%

Analysis of Variance

Variance	D.F.	Mean Square	F
Species	9	11.192	4.089**
Reps	2	22.345	8.164**
Error	18	2.737	
Total	29		

Table XI. Grasses for Arid Lands grown in Sanders County on the Norman Carr farm, Hot Springs, Montana, 1957. Yields from 48 square feet from 1 cutting on June 26.

Species and Variety	Ounces Per Plot Oven Dry			Total Ounces Oven Dry	Totals Corrected to 12% Moisture	Average Pounds Per Acre
	I	II	III			
Nordan Crested	12.00	32.75	9.50	54.25	60.76	1148.74
Russian Wild Rye	2.75	8.25	1.75	12.75	14.28	269.98
Intermediate Wheat	10.25	7.25	7.00	24.50	27.44	518.79
Manchar Smooth Brome	11.00	2.75	1.75	15.50	17.36	328.21
Pubescent Wheat	26.00	13.00	6.25	45.25	50.68	958.17
Tall Wheat	20.50	7.25	11.25	39.00	43.68	825.825
Ladak Alfalfa	12.75	52.15	40.69	105.49	118.26	2235.85

Analysis of Variance

Source	D.F.	Mean Square	F
Varieties	6	337.57	2.946
Rep	2	74.47	.650
Error	12	114.57	
Total	20		

Mean Yield.....	897.94
S. E. \bar{x}	6.18
L.S.D.....	N. S.
C. V.	43.706%

Table XII. Four Year Production Grasses on Arid Lands. Hot Springs, Montana

Species and Variety	Pounds Per Plot				Four Year Total
	1954	1955	1956	1957	
Nordan Crested	639	1038	2514	1149	5340
Intermediate Wheat	253	501	2396	519	3669
Manchar Brome	140	559	2105	328	3132
Pubescent Wheat	310	973	2242	958	4483
Tall Wheat	397	726	2293	826	4242
Ladak Alfalfa	38	534	1987	2236	4795

Annual Forages Silage Corn Varieties

The production of corn for silage has been emphasized in the research program of corn production at the Northwestern Montana Branch Station. Several different varieties have been tested over the past six years, grouping them as to maturity class. The results of these tests has led to the recommending of Kingscrost KF as a silage variety.

In 1957 a large scale variety testing program was established in cooperation with Dr. Hehn of the Agronomy and Soils Department, Montana State College. The test in 1957 consisted of 36 entries for which the seed corn companies, submitting entries for testing, paid \$10.00 to the Agronomy and Soils Department per entry. One-half of the amount or \$150.00 was given to this Station for cooperation in the program.

The nursery was seeded, May 25, in single row plots ten hills per row and four replications. The rate of seeding was approximately 30,000 plants per acre. This was accomplished by thinning the hills to seven plants per hill. Row spacing was 40 inches and 40 inches between hills. Planting was done with a hand type planter.

Results and Discussion

Emergence was very good in this planting. Thinning was done about ten days after emergence. The nursery was cultivated three times during the growing season. Irrigation was delayed by order of the superintendent thereby reducing the total growth potential of the crop. A total of four inches of irrigation was applied. These applications were made, July 22, (2 inches) and July 29, (2 inches). This amount was not adequate for maximum production with the below normal precipitation rate.

No notes were taken as to silking and tasseling date. Yield data in tons per acre of dry matter are given in table XIII.

Table XIII. Agronomic data obtained from the irrigated Corn Silage Variety Trial grown at the Northwestern Montana Branch Station, Kalispell, Montana.

Entry	Silage yield	Moisture	Alfalfa	Maturity
	adj. to 70% moisture	at harvest	hay equiv.	rating
	T/A	%	T/A	Days
120-140 day maturity				
DeKalb 423	18.0	83.0	6.1	120-125
DeKalb 893	14.3	86.2	4.9	135-140
DeKalb 661	12.6	83.7	4.3	125-130
DeKalb 856	11.6	87.3	4.0	120-125
Mexican June	11.0	90.0	3.8	140
Mean	13.5	86.0	4.6	
101-119 day maturity				
Pfister 55	18.7	79.0	6.4	105-109
Pfister 62	16.3	83.5	5.6	107-111
Funks G-20	16.0	85.4	5.5	108-112
Haapala Sweet Dent (Late)	15.2	83.6	5.2	110
Pfister 57	14.6	84.1	5.0	108-112
DeKalb 414	14.1	84.0	4.8	112-116
DeKalb 59	13.6	81.2	4.6	107-111
DeKalb 222	12.8	81.7	4.4	108-112
Pfister 44	12.7	86.1	4.3	101-105
Kingscrot M2	12.3	85.7	4.2	105
DeKalb 409	11.6	87.0	4.0	110-114
DeKalb 251	11.6	88.1	4.0	110-115
DeKalb 56	11.6	84.0	4.0	100-104
DeKalb 62	11.4	83.5	3.9	105-109
Pfister 43	11.2	84.0	3.8	103-107
Funks G-6	11.0	88.3	3.8	105-109
DeKalb 58	10.5	84.2	3.6	105-109
DeKalb 67	9.7	87.3	3.3	112-116
Mean	13.1	84.5	4.5	
91-99 day maturity				
Pfister 32	15.9	80.5	5.4	89-93
Idahybrid 330	15.6	82.9	5.3	95
DeKalb 44	11.5	83.3	3.9	93-97
DeKalb 46	10.6	83.9	3.6	89-93
Funks G-35A	9.4	86.2	3.2	94-98
Mean	12.6	83.4	4.3	

Table XIII. (Continued) Irrigated Corn Silage Variety Trial

Entry	Silage yield	Moisture	Alfalfa	Maturity
	adj. to 70%	at	hay	
	Moisture	Harvest	Equiv.	Rating
	T/A	%	T/A	Days
80-90 day maturity				
Pride N21	13.5	84.4	4.6	90
Magill N. D. 306	11.5	80.6	3.9	84
AES 201	11.0	85.2	3.8	90
DeKalb 30	10.9	79.9	3.7	75-85
Idahybrid 216	10.4	85.6	3.5	90
DeKalb 40	9.7	83.3	3.3	86-90
Standard 401	9.3	85.0	3.2	85
Wisconsin 270	8.9	85.8	3.0	90
Mean	10.7	84.1	3.6	
Mean	12.5	84.5	4.3	
L.S.D. at 5% level	3.8		1.3	

Dates: Planting-May 24, Harvest-September 14.

Plot technique: Four replications of single row plots

C.V.: 22%

Silage Yield Variance Analysis (T/A)

<u>Source</u>	<u>D.F.</u>	<u>Sum of Square</u>
Replications	3	58.0**
Entries	35	24.4**
Error	105	7.3
Total	143	

Off-station Corn Nurseries

The off-station corn variety nurseries contained five entries, grown in four row plots 20 feet long and replicated four times. One nursery was located in Lincoln county and the other in Sanders county. The nursery in Lincoln county was grown on the H. Underwood farm near Eureka. The Sanders county nursery was grown on the Wayne Balch farm at Plains. The nursery on the Balch farm was cared for as a 4-H project by Corale Balch. Both nurseries were grown under irrigation.

Results and Discussion

Poor irrigation and infestation of quackgrass lead to abandonment of the nursery in Lincoln county. Emergence was poor and growth uneven. Dry conditions following planting accounts for poor emergence.

Yield data for both green and dry weights for the nursery in Sanders county is shown in Table XIV. The late maturing varieties, DeKalb 1024 and 1051 are high in yield both on a green and dry matter basis.

Table XIV. Agronomic data from irrigated silage corn nursery grown in Sanders County on the Wayne Balch farm, Plains, Montana 1957. Four row plots, four replications.

Planted. May 29, 1957 Harvested. September 16, 1957 Size of Plot. 106.67 Square feet.

Variety	Green Yield				Total Pounds	Tons Per Acre	Oven Dry Yield				Total Pounds	Average Tons Per Acre
	I	II	III	IV			I	II	III	IV		
Kingscrot KF	47	88	62	53	250	12.76	11.96	22.40	15.78	13.49	63.63	3.25
DeKalb 1024	128	137	68	80	413	21.08**	52.00	55.66	27.62	32.50	167.78	8.57**
DeKalb 1051	114	124	55	70	363	18.52**	43.05	46.82	20.77	26.43	137.07	7.00**
Funks G-40A	69	101	51	36	257	13.12	15.09	22.09	11.16	7.87	56.21	2.87
Funks G-6	68	109	71	58	306	15.61**	28.87	46.27	30.14	24.62	129.90	6.63**

Mean Yield.....16.22
 S.E. \bar{x}3116
 L.S.D.(5%).....4.7
 L.S.D.(1%).....6.6
 C. V.9.41%

Mean Yield.....5.66
 S. E. \bar{x}4725
 L.S.D.(5%).....1.46
 L.S.D.(1%).....2.04
 C. V.8.35%

Note: Kingscrot KF is used as a check in this nursery

*Varieties yielding significantly more than the check (5%).

**Varieties yielding significantly more than the check (1%).

Millets and Sorghums, etc.

In 1957 a request was made of the Northwestern Montana Branch Station by the Advisory group that the station study more closely the annual forage yields using forages listed in Table XV.

Research on oats, field peas and vetch (*Vicia* sp) has been conducted in the past. Results have not been encouraging. Yields from these forages did not compare to the perennial crops, such as legume-grass mixtures.

In the spring of 1957 a trial was designed to study some of the foxtail millets, sudan grasses, vetch, with Bridger oats used as a check

One years data show German and Siberian Foxtail Millets to be high in yield for the millets and sorghums. However oats was the highest in yield of all entries. These differences between the oats and foxtail millets were not significant at the 5% level. Table XV.

In checking the TDN analysis in "Morrison Feeds and Feeding" it was found that the TDN for Foxtail Millets was 50% where as for oat hay it was 47.3%. These figures may or may not apply to this test. It is stated only as a point of interest, and not as fact.

Table XV. Yield data from annual forage study grown at Creston, Montana in 1957.

Planted. June 5, 1957 Harvested. August 28, 1957 Plot Size 80 Sq.Ft.

Crop	Seeding rate in lbs. Per Acre	Plot Yields				Total Pounds	Average Tons Per Acre	Tons/Acre Corrected to 12% Moisture
		I	II	Oven III	Dry IV			
German Foxtail Millet	20	10.9	12.7	13.3	11.0	47.9	3.2	3.7
Siberian Foxtail Millet	20	14.4	11.3	12.8	10.9	49.4	3.4	3.8
Piper Sudan Grass	20	9.2	8.1	9.5	10.6	37.4	2.6	2.9
Sweet Sudan grass Common	20	7.7	7.0	5.8	9.1	29.6	2.0	2.2
Sudan grass	20	7.5	6.6	10.3	6.3	30.7	2.1	2.4
Bridger Oats	80	10.2	13.2	11.8	14.3	49.5	3.7	4.1
Common Vetch	20	4.9	4.0	3.2	2.7	14.8	1.0	1.1

Mean Yield.....2.521
 S. E. \bar{x}1855918
 L.S.D.(5%)..... .5
 L.S.D.(1%)..... .8
 C. V.7.36%

1957

Small Grain Varieties

Project #5023

by

Vern R. Stewart, Assistant Agronomist

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Introduction

This section of the annual report includes all work done on small grains as it pertains to testing and selecting for a new variety. The objectives of the small grain variety project is to (1) determine the adaptation of new and introduced varieties; (2) to evaluate new selections and crosses developed in the breeding program of the Montana Agricultural Experiment Station; and (3) to select for disease resistance. (Drawf bunt in winter wheat).

This work was done on both dryland and irrigated conditions on the station and in several locations in the seven western counties in Montana. Spring grain nurseries, which include wheat, oats and barley were located in the following counties: Sanders, Mineral, Missoula and Lincoln. The nursery in Mineral county was dryland where as the others were grown under irrigated conditions. Winter wheat nurseries were grown in all seven of the western counties served by the N. W. Montana Branch Station. Each of these nurseries will be discussed by crop later in this report.

All of this work is done in cooperation with the personnel in Montana State College, Extension Service, and the Agricultural Research Service, United States Department of Agriculture.

Spring Wheat

The spring wheat variety nurseries grown in 1957, were, advance yield, (dry and irrigated) durum, uniform western regional white wheat, four off-station nurseries, milling and baking plots, and barley streak mosaic on spring wheat varieties.

Advance Yield Nurseries

The advanced yield nursery was grown under both dryland and irrigated conditions. These nurseries consisted of 24 entries made up of recommended varieties and other promising selections. The dryland nursery was grown on Conrad Gilbertson farm northwest of Kalispell in a very low rain fall area. The irrigated nursery was grown on the station. Three replications were used for the dryland test and five for irrigation. Both nurseries were sprayed for weed control with 2, 4-D, and the dryland nursery was also cultivated. Seeding dates are included in the table of results of each nursery. Three inches of water were applied to the irrigated nursery, July 10, 1957.

Results and Discussion

In the dryland nursery, only one variety was found to be significantly lower in yield than Thatcher, which is used as a check, namely Rescue. Yields were low for this region of Flathead county, due to low rain fall during the growing season.

The mean for this nursery was 12.0 bushels per acre. Table I.

The mean yield of the irrigated nursery was 52.3 bushels per acre. C.I. 13242, a selection that is showing promise as a new variety, was significantly better in yield than Pilot. Leaf rust was severe in the nursery this year. Lodging, rust, and smut notes for this nursery can be seen in table II.

Durum Wheat

The government wheat programs have brought about an increased acreage of durumwheat in Montana. Some durum has been grown west of the continental divide. Because of this a testing program was undertaken on durum wheat. Studies have been conducted for two years.

Results and Discussions

In the past two years, the hard red spring wheat has out yielded the durum entries in the nursery. The data thus far gathered has been non-significant when analyzed statistically. In 1957 a C.V. of 24.41% was obtained. The author finds this difficult to explain. Stands were fair, however conditions were very dry, this could in part account for the high C.V. Data obtained to date does not encourage the growing of durum in some areas of Flathead county. Table III.

Off-Station Nurseries

The off-station nurseries will be discussed as a unit, a unit including wheat, oats and barley. This discussion will be only as to seeding methods, observations, weed control and other factors that pertain to all three crops. Specific results as to yield and other agronomic factors will be discussed in the division pertaining to that particular crop.

The off-station variety nurseries were seeded in single plots, rows eighteen feet long replicated four times. There were ten entries each of wheat, oats and barley. Seeding date and harvest dates for each are in the individual tables for each nursery.

Inspections of off-station plots were made twice during the growing season. Weed control methods were employed during the first observation. Following is information on observations, by county, location and date.

<u>County</u>	<u>Name of farmer</u>	<u>Address</u>	<u>Date</u>	<u>Remarks</u>
Sanders	Jim Hauser	Lonepine	6-12-57	Nursery in good shape. Cultivated but not sprayed.
			7-15-57	Good Shape, weed free
Mineral	Charles Fry	Tarkio	6-12-57	Cultivated and sprayed
			7-15-57	Centana outstanding in appearance, equal to Pilot.
Missoula	Don Roth	Clinton	6-11-57	Cultivated and sprayed, some quackgrass.
			7-11-57	Uniform irrigation apparent. Quackgrass throughout the plot.
Lincoln	Wilerd Johnson	Eureka	6-13-57	Cultivated and sprayed. Infestation of quackgrass and Canada thistle.
			7-2-57	Cattle had eaten off plot and was abandon because of this.

Results and Discussion

Only one of the irrigated spring wheat nurseries was harvested. Cattle destroyed the nursery in Lincoln county and birds the one in Sanders county. Results from the nursery at Roths in Missoula county was not found to be significant when analysed statistically. The high C.V. is due in part to the heavy growth of quackgrass in replications three and four of the nursery. Marfed x Merit-28, C.I. 13058 was the highest yielding variety. This entry is a white wheat. Of the hard red springs, Centana was the leading variety in the yield column. The mean for the nursery was 30.3 bushels per acre. Table V.

Uniform Western Regional White Wheat

One uniform nursery of this type is grown. The past year it was located on the station under non-irrigated conditions, however, where moisture conditions are usually quite favorable. (See weather data in this report). The nursery contained 16 entries. Three hard red spring varieties were included as checks. This nursery is grown in cooperation with ARS USDA.

Results and Discussion

Leaf rust was very prevalent this year and considerable was found on many of the varieties in this test. Stem rust was noted on eight varieties. It was most severe on the variety, Lemhi. There was not any statistical difference found in the nursery when analysed. The highest yielding variety was C.I. No. 13268. The mean for the test was 55.4 bushels per acre. See table VI for complete results.

Milling and Baking Plots

Each year several varieties for which milling and baking data are desired are grown in drill strips. These strips are seven feet wide and 90 to 100 feet long. They are harvested with a field combine. Weights are taken from a measured area to determine the yield. Quality data will be reported by Dr. McNeal in his annual report.

Results and Discussion

Centana was the highest yielding variety in these plots but C.I. 13304 had the highest test weight. See table VII.

Barley Stripe Mosaic Yield Nursery

This test was conducted to determine the effect of Barley strip mosaic on the yield of spring wheat. Paired varieties were used, one being infected the other disease free. The disease has a tendency to draw some varieties, caused yellowing of the leaves and interferes with the plant growth process. It is a seed born disease. Material for the test was furnished by Dr. McNeal, ARS, USDA.

Results and Discussion

Yields were reduced considerably because of the infected seed that was planted. Thatcher, disease free, is used as a check in this nursery. Looking at the data it will be found that the difference between disease free and diseased Rescue is highly significant. Table VIII.

Table I. Agronomic data from dryland Advanced Yield Spring wheat nursery, grown on the Conrad Gilbertson farm in the Stillwater area, Kalispell, Montana 1957. Four row plots, three replications.

Variety or Cross	C.I. or N No.	Head- ing Date	Heading Height Inches	Grams Per Plot			Total Grams	Average Bushel Per Acre
				I	II	III		
1898 x Lee ²	B52-57	6-24	25	123	150	100	373	12.4
Thatcher	10003	6-22	24	115	150	100	365	12.2
1953 x Lee	B52-92	6-18	25	140	155	155	450	15.0
Pilot ² x Regent(N2183)	13042	6-22	25	105	110	98	313	10.4
Lee x K.F.(R.I. 2937)	13221	6-19	25	120	117	90	327	10.9
Thatcher x Lee	B55-8	6-25	26	80	125	95	300	10.0
Rescue ²	12435	6-26	25	75	98	76	249	8.3*
Conley	13157	6-26	28	109	85	121	315	10.5
Thatcher x Lee	B55-4	6-18	25	97	166	87	350	11.7
Russell ²	12484	6-25	27	95	105	116	316	10.5
Rescue x 1831(B51-9)	13304	6-28	24	105	120	91	316	10.5
Ceres ²	6900	6-26	27	120	125	104	349	11.6
Thatcher x Lee ²	B55-2	6-25	25	143	135	100	378	12.6
Lee x 1831 (B52-119)	13243	6-18	26	145	158	136	439	14.6
1520 x 1752 (N2389)	13041	6-24	26	124	114	135	373	12.4
Centana	12974	6-26	26	120	151	114	385	12.8
Thatcher x Lee	B55-21	6-18	27	125	141	119	385	12.8
Pilot	11945	6-23	29	135	140	135	410	13.7
Thatcher x Lee	B55-5	6-18	25	135	146	60	341	11.4
Selkirk	13100	6-23	27	132	135	115	382	12.7
1953 x Lee (B52-91)	13242	6-18	26	150	130	136	416	13.9
Lee ²	12488	6-16	26	100	115	110	325	10.8
1953 x Lee	B52-90	6-18	27	113	170	126	409	13.6
1953 x Lee	B52-94	6-16	26	115	130	107	352	11.7

Note: Thatcher is used as a check in this nursery.

*Varieties yielding significantly less than the check (5%).

¹Calculated missing Plot.

²Loose Smut.

Mean Yield.....12.0
 S. E. X.....1.0042
 L.S.D. (5%).....2.9
 C. V.8.37%

Analysis of Variance		D.F.	Mean Square	F
Source	Replications	2	3,177.4	10.50**
	Varieties	23	750.230	2.48*
	Error	44	302.573	
	Total	69		

Leave off
 Table II. Agronomic data from irrigated Advanced Yield Spring Wheat nursery, Creston, Montana 1957. Four row plots, five replications.

Start here.
 Planted. April 30, 1957

Harvested. September 3, 1957

Size of Plot 16 square feet.

Variety or Cross	C.I. or N No.	Head- ing Date	Heading Height Inches	Lod- ging %	Leaf Rust %	Loose Smut L-M-H ¹	Grams Per Plot					Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
							I	II	III	IV	V			
1898 x Lee	B52-57	7-1	48	4	13	L	505	584	435	727	535	2786	55.7	61.9
Thatcher	10003	6-29	46	39	88	-	462	340	480	568	515	2365	47.3	60.5
1953 x Lee	B52-92	6-25	47	48	63	-	555	720	536	659	750	3220	64.4**	62.5
Pilot x Regent (N2183)	13042	6-28	47	28	63	-	400	383	584	676	500	2543	50.9	61.9
Lee ⁶ x K.F.(R.L. 2937)	13221	6-25	46	8	3	M	435	309	395	490	485	2114	42.3	61.4
Thatcher x Lee	B55-8	6-30	47	16	72	L	492	470	485	746	499	2692	53.8	60.9
Rescue	12435	7-1	48	56	68	-	485	471	435	442	315	2148	43.0	60.5
Conley	13157	6-30	49	28	63	-	435	479	660	682	492	2748	55.0	61.1
Thatcher x Lee	B55-4	6-27	45	56	62	-	515	780	460	731	790	3276	65.5**	61.4
Russell	12484	6-29	53	28	52	-	350	641	457	510	667	2625	52.5	61.2
Rescue x 1831 (B51-9)	13304	7-3	48	70	70	-	450	475	470	405	415	2215	44.3	61.5
Ceres	6900	7-1	50	51	68	-	485	370	420	540	490	2305	46.1	62.4
Thatcher x Lee	B55-2	7-1	49	33	68	-	470	425	550	690	593	2728	54.6	60.9
Lee x 1831 (B5a-119)	13243	6-27	51	28	3	-	426	500	501	473	615	2515	50.3	61.5
1520 x 1752 (N2389)	13041	6-28	48	4	75	-	390	542	425	640	494	2491	49.8	63.2
Centana	12974	7-3	49	26	87	-	410	486	431	580	564	2471	49.4	62.2
Thatcher x Lee	B55-21	6-26	48	19	3	-	372	460	415	745	505	2497	49.9	61.4
Pilot	11945	6-29	46	20	72	-	335	480	430	490	470	2205	44.1	61.5
Thatcher x Lee	B55-5	6-26	47	15	32	-	421	521	547	533	555	2577	51.5	61.8
Selkirk	13100	6-30	47	7	13	-	588	566	474	700	660	2988	59.8	61.2
1953 x Lee (B52-91)	13242	6-27	48	11	67	-	694	400	775	565	720	3154	63.1*	63.0
Lee	12488	6-25	48	41	17	L	675	485	468	454	730	2812	56.2	61.5
1953 x Lee	B52-90	6-27	47	53	67	-	655	555	447	665	535	2857	57.1	63.6
1953 x Lee	B52-94	6-25	47	45	3	-	625	400	456	376	660	2517	50.3	62.5

¹L-light

M-Medium

H-Heavy

Note: Thatcher is used as a check

*Varieties yielding significantly more than the check (5%).

**Varieties yielding significantly more than the check (1%).

Analysis of Variance

Source

D.F.

Mean Square

F

Reps

4

29,616.00

2.97*

Varieties

23

21,107.826

2.12**

Error

92

9,980.032

Total

119

Mean Yield.....52.3

S. E. \bar{x}4.4677

L.S.D.(5%).....12.6

L.S.D.(1%).....16.6

C. V.8.54%

Table III. Agronomic data from dryland Durum yield nursery, grown on the Conrad Gilbertson farm in the Stillwater area, Kalispell, Montana 1957. Four row plots, three replications

Variety or Cross	C.I. or N No.	Head- ing Date	Heading Height in Ins.	Grams Per Plot			Total Grams	Average Bushel Per Acre
				I	II	III		
Ramsey	13246	6-26	25	86	110	105	301	10.0
Sentry + Ld 379- Ld 357	Ld393	6-21	23	25	25	30	80	2.7
Stewart	12066	7-3	26	85	110	111	306	10.3
Selkirk	13100	6-24	26	118	145	130	393	13.1
Rescue	12435	6-25	24	130	105	125	360	12.0
Lee2	12488	6-18	25	90	115	110	315	10.5
Langdon	13165	6-25	27	35	65	108	208	6.9
Sentry x Ld 379- Ld-357	Ld392	6-22	23	55	78	120	253	8.4
Towner	13247	6-28	28	67	85	80	232	7.7
Ld 308 x Nugget	Ld357	6-19	24	76	86	107	269	9.0
Yuma	13243	6-27	24	90	90	80	260	8.7
Mindum	5296	6-29	27	90	110	90	290	9.7
Vernum	12255	6-26	27	80	80	100	260	8.7
Sentry	13102	6-23	26	45	50	50	145	4.8
Thatcher	10003	6-21	25	110	114	135	359	12.0

Note: Thatcher is used as a check.

1 Calculated missing plot.

2 Loose Smut

Analysis of Variance		Mean Yield.....9.0	
Source	D.F.	F	S.E. \bar{x}2.1972
Reps	2	1.05	L.S.D.(5%).....N. S.
Varieties	14	1.53	C.V.24.41%
Error	27		
Total	43		

Table IV. Agronomic data from irrigated off-station spring wheat nursery grown in Missoula county on the Don Roth ranch, Clinton, Montana 1957. Single row plots four replications.

Planted. May 6, 1957

Harvested. September 5, 1956

Size of Plot. 16 Sq. Ft.

Variety or Cross	C. I. or N No.	Heading Height in Ins.	Grams per Plot				Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
			I	II	III	IV			
Ceres	6900	40	411	360	255	280	1306	32.7	60.3
Pilot	11945	39	440	121	624	394	1579	39.5	59.5
1520 x 1752 (N2389)	13041	38	400	366	445	435	1646	41.2	59.5
1898 x Lee	B52-57	41	323	487	526	459	1795	44.9	59.6
Thatcher	10003	38	305	265	384	290	1244	31.1	57.8
i Centana	12974	41	609	440	535	370	1954	48.9	61.0
i Lemhi	11415	40	475	215	230	416	1336	33.4	57.0
Marfed x Merit-28	13058	40	531	305	553	650	2039	51.0	58.6
1953 x Lee (B52-91)	13242	41	439	210	340	474	1463	36.6	60.5
Marquis	3641	41	430	364	315	261	1370	34.3	59.6

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	30,306.600	2.77
Varieties	9	19,610.440	1.79
Error	27	10,940.859	
Total	39		

Mean Yield.....	39.9
S. E. \bar{x}	5.2299
L.S.D.....	N. S.
C. V.	13.1 %

Table V. Agronomic data from dryland off-station spring wheat nursery grown in Mineral county on the Charles Fry ranch, Tarkio, Montana in 1957. Single row plots four replications.

Planted. May 6, 1957

Harvested. August 30, 1957

Size of Plot. 16 Sq. Ft.

Variety or Cross	C. I. or N No.	Heading Height in Ins.	Stem Rust %	Grams Per Plot				Total Grams	Average Bushels Per Acre	Bushel Wt. in Pounds
				I	II	III	IV			
Ceres	6900	32	1.5	320	345	235	290	1190	29.8	61.6
Pilot	11945	30	T	381	287	230	251	1149	28.7	61.0
1520 x 1752 (N2389)	13041	30	-	376	320	225	300	1221	30.5	61.5
1898 x Lee	B52-57	31	-	245	265	292	355	1157	28.9	60.5
Thatcher	10003	30	-	309	325	150	410	1194	29.9	61.7
Centana	12974	30	.6	265	250	420	190	1125	28.1	60.5
Lemhi	11415	30	29	225	225	230	395	1075	26.9	59.7
Marfed x Merit-28	13058	30	T	355	373	410	320	1458	39.0	59.0
1953 x Lee (B52-91)	13242	30	-	252	315	355	305	1227	30.7	61.3
Marquis	3641	32	7	305	367	276	360	1308	32.7	61.0

Source	Analysis of Variance		
	D.F.	Mean Square	F
Replication	3	2,195.333	-
Varieties	9	2,893.111	-
Error	27	4,920.525	
Total	39		

Mean Yield.....30.3
 S. E. x.....3.5073
 L.S.D.N. S.
 C. V.11.58%

Table VI. Agronomic data from dryland western regional spring wheat nursery, Creston, Montana 1957. Four row plots three replications.

Variety or Cross	C. I. or N No.	Harvested. August 26, 1957	Head- ing Date	Heading Height IN Ins.	Leaf Rust %	Stem Rust %	Lod- ging %	Size of Plot. 16 Sq. Ft.			Average Bushel		
								Grams I	II	III	Total Grams	Per Acre	Bushel Wt. in Pounds
Onas	6221		6-30	42	70	T	-	280	510	632	1422	47.4	58.9
Kenya x Lemhi ³ No.23	13271		6-27	47	65	1	5	521	520	675	1716	57.2	59.0
Idaed	11706		6-20	39	23	-	13	530	568	451	1549	51.6	61.1
Kenya x Lemhi ² No.16	13269		6-27	42	7	-	2	562	585	600	1747	58.2	59.2
Henry	12365		6-23	42	12	-	9	445	631	628	1704	56.8	61.7
Kenya x Lemhi ² No.18	13270		6-25	41	33	-	2	525	555	485	1565	52.2	59.4
Marfed	11919		7-1	41	93	3	-	621	450	701	1772	59.1	-
Kenya x Lemhi ² No.15	13268		6-28	41	5	-	-	645	660	670	1975	65.8	59.2
Thatcher	10003		6-25	41	67	-	3	541	485	578	1604	53.5	60.3
Lemhi	11415		6-25	45	95	10	3	485	680	515	1680	56.0	59.6
2236 x Lee (B52-107)	13305		6-22	43	T	-	13	610	675	613	1898	63.3	-
Onas 53	13257		6-30	43	95	T	-	540	600	637	1777	59.2	60.0
Federation	4734		7-5	43	95	7	-	435	390	401	1226	40.9	57.6
Baart	1697		6-30	47	87	1	18	619	505	662	1786	59.5	62.4
Lemhi x Hope-Fed.	13053		6-29	38	93	T	5	524	510	340	1374	45.8	58.0
Lemhi 53 (K x L ⁰).	13258		6-27	44	88	-	-	505	599	670	1774	59.1	60.0

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	12,035	1.76
Varieties	15	12,784.133	1.87
Error	30	6,827.666	
Total	47		

Mean Yield.....55.4
 S. E. \bar{x}4.7706
 L.S.D.N. S.
 C. V.8.61%

Table VII. Agronomic data from dryland Milling and Baking plots, Creston, Montana 1957.

Variety or Cross	C. I. No.	Head Type	Bushels Per Acre	Bushel Wt. in Pounds
Centana	12974	Bearded	41.5	59.9
Rescue	12435	Beardless	33.4	59.0
Ceres	6900	Bearded	34.8	60.5
Rescue x 1831 (B51-9)	13304	Beardless	36.2	61.0
Pilot ² x Regent (N2183)	13042	Bearded	38.9	58.6
Thatcher	10003	Beardless	33.4	57.6
1953 x Lee (B52-91)	13242	Bearded	37.5	60.0

Table VIII. Agronomic data from Barley Stripe Mosaic Yield Nursery using diseased and disease free seed. Creston, Montana 1957. Four row plots, three replications.

Planted. April 27, 1957

Harvested. August 26, 1957

Size of Plot 16 Sq. Ft.

Variety or Cross	C. I. or N No.	1956 Row No.	Percent Disease 1956	Head- ing Date	Grams Per Plot			Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
					I	II	III			
Rescue	12435	1424	*	6-28	395	533	490	1418	47.2	60.1
N2389	13041	1417	3.7	6-25	590	565	500	1655	55.2	63.0
N2389	13041	1418	*	6-26	560	470	484	1514	50.5	63.0
Supreme	8026	1405	18.0	6-24	495	387	380	1262	42.1	58.4
Supreme	8026	1406	*	6-24	455	420	500	1375	45.8	59.5
N2183	13042	1433	29.7	6-25	500	540	355	1395	46.5	59.8
Rescue	12435	1423	30.7	6-30	365	330	295	990	33.0**	56.7
Centana	12974	1455	29.7	6-28	290	360	273	923	30.8**	58.0
Pilot	11945	1428	*	6-25	567	563	563	1693	56.4	60.5
Lee	12488	1438	*	6-22	675	475	463	1613	53.8	59.4
Thatcher	10003	1459	23.0	6-26	483	428	405	1316	43.9	59.0
Lee	12488	1457	27.7	6-28	245	335	300	880	29.3**	56.5
N2183	13042	1434	*	2-26	505	610	530	1645	54.8	60.7
Pilot	11945	1427	32.0	6-26	375	347	365	1087	36.2*	57.5
Centana	12974	1456	*	6-29	550	549	590	1689	56.3	61.0
Thatcher	10003	1460	*	6-26	455	430	555	1440	48.0	58.5

Note: Disease free Thatcher is used as a check.

*Treatment and Varieties yielding significantly less than the check (5%).

**Treatment and Varieties yielding significantly less than the check (1%).

Mean Yield.....45.6
 S. E. \bar{x}3.357
 L.S.D. (5%).....9.7
 L.S.D. (1%).....13.1
 C. V.7.36%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	3,352.5	-
Treatments and Varieties	15	25,100.4	7.43**
Error	30	3,380.766	
Total	47		

Winter Wheat

The objectives for winter wheat are essentially the same as for the other small grains, except more emphasis is placed on drawf bunt control and selection of varieties with quality acceptable to the milling and baking trade.

The nurseries grown this year were the Western Regional Hard Red Winter, Interstate, Yogo x Turkey-Oro 221 selections, six off-station, winter vs spring wheat both seeded in the fall, and Chemical control of Drawf Bunt.

All winter wheat work is done under dryland conditions.

Western Regional Hard Red Winter

The western regional hard red winter wheat nursery is a cooperative nursery and is grown throughout the western states. The nursery this year was grown on the Conrad Gilbertson farm, northwest of Kalispell in a known drawf bunt infested area. Good stands were secured in the fall of 1956. The nursery consisted of twenty entries not all of which were included in the Uniform nursery.

Results and Discussion

There was no winter killing in the nursery this season. The lack of moisture reduced yields somewhat. The location was poor, in that it was too close to the fence, and snow drifted across some of the plots. This condition accounts in part for the differences found in the analysis due to replications. Kharkof is the highest yielding variety but not significantly better than Westmont or Wasatch. There was no drawf bunt in the nursery. The mean for the nursery was 19.3 bushels per acre. Table IX.

Interstate

The interstate nursery is grown on most of the experiment stations in Montana. This nursery consists of entries from other workers and breeding material which shows promise in preliminary trials. This years nursery consisted of sixteen entries. It was grown on the station at Creston.

Results and Discussion

Stands obtained in the fall of 1956 were excellent and there was no winter killing. Rain fell just after most varieties headed in late May or early June. Yields were average to slightly under past years. The highest yielding variety was Norin 10 x Brevar-17 which is a white wheat. Westmont was the highest yielding hard red winter. The mean for the nursery was 51.5 bushels per acre. See table X for complete results of this test.

Yogo Turkey/Oro-221 Selections

This nursery is breeding material and is grown to study Agronomic characteristics, quality properties, dwarf bunt resistance, and lodging to list a few things being studied in this cross. There were 81 entries this year and replicated six times. The nursery was grown on the station at Creston.

Results and Discussion

Stands obtained and climatic conditions were the same as recorded above under the Interstate nursery.

Only yield data was obtained from the nursery. The yields in this nursery were below the yields of the interstate nursery. Westmont and Itana which were used as checks were higher in yield than any of the selections in the nursery. The mean yield of this nursery was 48.4 bushels per acre. See table XI for the yields of all selections. This material was turned over to Dr. Hehn for quality analysis.

Table IX. Agronomic data from Western Regional Hard Red Winter Wheat nursery grown on the Conrad Gilbertson farm in the Stillwater area, Kalispell, Montana. Four row plots, four replications.

Variety or Cross	C. I. or N No.	Harvested. August 13, 1957	Head- ing Date	Height in Inches	Lod- ging %	Size of Plot. 16 Sq. Ft.				Average Bushel Per Acre
						I	II	III	IV	
Columbia	12928	6-8	25	.8	146	225	180	230	781	19.5
Westmont	12930	6-9	26	1.2	165	164 ¹	180	202 ¹	711	17.8
Blackhull/Rex x Rio/Rex	12932	6-9	26	7.5	190	190	190	215	785	19.6
Itana	12933	6-14	29	5.5	235	131	180	240	786	19.7
Burt	12696	6-10	25	1.2	217	130	170 ¹	210	727	18.2
Rio	10061	6-12	26	1.5	243	189	155	170	757	18.9
Comanche	11675	6-8	27	6.0	200	169	164	198	731	18.3
Wasatch	11925	6-10	30	7.0	190	190	160	228	768	19.2
Kharkof	1442	6-14	31	8.5	215	230	200	248	893	22.3
Orfed x Wasatch	12943	6-11	27	3.5	171	174	140	124	609	15.2
Wasatch x 148a	13075	6-12	32	3.7	205	220	200	242	867	21.7
Wasatch 148a	13251	6-14	31	8.0	165	190	170	275	800	20.0
Rex/Rio 12246 x Cheyenne ⁴	13261	6-15	29	4.2	170	180	153	242	745	18.6
Rex/Rio 12246 x Cheyenne ⁴	13262	6-15	29	7.0	204	143	175	200	722	18.1
Kharkof 17-7	13263	6-10	30	10.7	207	210	210	222	849	21.2
Cheyenne	8885	6-10	28	.5	235	191	196	255	877	21.9
Minturki x Timophe vi/vulgare ²	12806	6-23	31	-	201	180	205	243	829	20.7
Yogo x Rescue 56-30	-	6-12	28	5.5	191	148	201	186	726	18.2
H44 x Minturki ⁴	Minn 2844	6-11	32	2.5	196	175	225	300	896	22.4
Comanche x C. I. 12250	-	6-8	23	.5	140	145	170	115	570	14.3*

Note: Wasatch is used as the check.

*Varieties yielding significantly less than the check (5%).

Mean Yield.....19.3
 S. E. \bar{X}1.4293
 L.S.D.4.1
 L.S.D.5.4
 C. V.7.41%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	6,222.7	7.62**
Varieties	19	1,853.3421	2.27**
Error	54	817.1462	
Total	76		

Table X. Agronomic data from the Interstate hard red winter wheat nursery, Creston, Montana, 1957.
Four row plot four replications.

Planted. September 22, 1956 Harvested. July 31, 1957 Size of Plot 16 Sq. Ft.

Variety or Cross	C. I. or N No.	Head- ing Date	Height in Inches	Lod- ging %	Grams Per Plot				Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
					I	II	III	IV			
Comanche x C. I. 12250		5-28	38	-	355	510	450	410	1725	43.1**	60.9
Columbia	12028	5-30	40	-	575	518 ¹	449	520 ¹	2062	51.5*	62.8
Westmont	12930	5-29	42	-	610	570	594 ¹	654	2428	60.7	62.5
Rego 56-28	13181	6-2	48	46	566	520	445	468	1999	50.0**	61.0
Itana	12933	6-3	44	-	576	495	610	644	2325	58.1	62.5
Burt	12696	6-1	34	-	648	640	520	568	2376	59.4	61.5
Wasatch	11925	5-31	45	10	483	400	430	400	1713	42.8**	61.5
Kharkof 17-7	13263	6-2	47	52	515	483 ¹	485	440	1923	48.1**	62.0
Cheyenne	8885	6-1	45	-	529	665	580 ¹	597 ¹	2371	59.3	62.0
Yogo x Rescue 56-30		5-31	45	36	443	490	406	405	1744	43.6**	62.3
Norin 10 x Brevar-17		6-2	27	-	641	650	650	645	2586	64.7	60.2
Newturk	6935	6-1	45	14	430	440 ¹	455	425	1750	43.8**	61.5
Yogo	8033	6-2	46	44	500	414	434	455 ¹	1803	45.1**	62.1
Karmont	6700	6-1	45	31	450	435	440	522	1847	46.2**	62.5
Triplet	5408	6-3	44	-	490	511	498	610	2109	52.7*	63.0
Omar	13072	6-4	44	-	561 ¹	553	537	567	2218	55.5	60.8

¹Calculated missing plot (9).

Note: Westmont is used as a check in this nursery.

*Varieties yielding significantly less than the check (5%).

**Varieties yielding significantly less than the check (1%).

Mean Yield.....51.5
S. E. X.....2.5290
L.S.D.(5%).....7.3
L.S.D.(1%).....9.7
C. V.4.91%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	1,966.6667	-
Varieties	15	21,145.8	8.27**
Error	36	2,558.4166	
Total	54		

Table XI. Agronomic data from Yogo x Turkey/Oro-221 selections, Creston, Montana 1957. Single row plots, six replications.

Entry	Harvested. August 2, 1957						Size of Plot. 10 Square feet		Average Bushel Per Acre	Bushel Wt. in Pounds
	I	II	III	IV	V	VI	Total Grams			
Columbia										
Yogo x Turkey/Oro	402	552	471	495	545	478 ¹	2943	49.1	65.0	
- 5	557	555	590	140	605	540	2987	49.8	62.1	
- 8	494	611	400	445	505	505	2960	49.3	61.5	
- 9	560	450	474	556	535	490	3065	51.1	64.3	
-10	550	495	494	495	554	500	3088	51.5	63.6	
-11	439	320	485	445	445	460	2594	43.2	62.1	
-12	469	490	470	475	563	465	2932	48.9	62.5	
-13	555	526 ¹	460	560	493	570	3164	52.7	63.0	
-14	514	520	475	490	533	480	3012	50.2	62.0	
-15	520	505	575	499	450	450	2999	50.0	62.0	
-16	511	473	500	521	486	435	2926	48.8	62.4	
-17	505	505	540	450	517 ¹	485	3002	50.0	63.0	
-18	511	454	535	389	558	455	2902	48.4	62.6	
-19	499	521	501	444	535	401	2901	48.4	63.0	
Yogo	470	483	585	506	553	503 ¹	3100	51.7	64.0	
Yogo x Turkey/Oro	470	490	465	473	430	403	2731	45.5	63.0	
-20	460	501	501	457 ¹	430	410	2759	46.0	64.3	
-21	361	361	479	450	415	446	2512	41.9	63.0	
-22	431	475	438	471	475	445	2735	45.6	63.0	
-23	537	485	615	654	571 ¹	465	3327	55.5	63.6	
-24	489	391	475	425	500	485	2765	46.1	63.6	
-25	530	505	555	525	555	460	3130	52.2	63.5	
-26	509	485	485	527	509	500	3015	50.3	63.5	
-27	465	469	475	410	410	412	2641	44.0	62.1	
-28	475	495	534	469	549	515	3037	50.6	64.0	
-29	500	488	515	465	580	504	3052	50.9	63.1	
-30	560	473	532	465	516	525	3071	51.2	63.0	
-31	495	505	490	451	540	500	2981	49.7	63.0	
-32	505	440	530	515	535	514	3039	50.7	63.0	
-33	483	430	425	479	435	510	2762	46.0	62.5	
-34	470	557	570	524	525	355	3001	46.0	62.4	
-35								50.0	63.9	

Continued

Table XI. (Continued).

Entry	Grams Per Plot						VI	Total Grams	Average Bushel	
	I	II	III	IV	V	Per Acre			Wt. in Pounds	
Yogo x Tureky/Oro-36	524	525	435	514	514	560	3072	51.2	63.0	
-37	459	550	392	434	361	426	2622	43.7	62.6	
-38	525	592	555	370	474	445	2961	49.4	63.5	
-39	450	490	590	445	499	475	2949	49.2	63.0	
-40	399	415	367	493	486	371	2531	42.2	62.5	
-41	455	460	495	435	445	475	2765	49.4	62.0	
-43	500	415	465	487	495	510	2872	47.9	63.0	
-45	241	506	444	555	634	495	2875	47.9	64.5	
Turkey x Oro-221	436	565	620	545	460	255	2881	48.0	61.5	
-46	513	534	593	460	655	489	3244	54.1	61.5	
-48	430	475	546	475	550	540	3016	50.3	62.5	
-53	475	466	476	465	430	671	2983	49.7	63.0	
-57	450	480	592	520	532	523	3097	51.6	62.1	
-60	451	590	499	432	443	465	2880	48.0	63.5	
-63	415	531	592	589	480	570	3177	53.0	63.3	
-65	490	524	545	445	555	450	3009	50.2	63.3	
-66	475	538	440	550	520	465	2988	49.8	63.0	
-68	470	440	515	470	450	425	2770	46.2	-	
-70	482	501	550	515	517	441	3006	50.1	63.0	
-72	441	511	484	482	490	465	2873	47.9	63.6	
-73	395	526	505	534	465	422	2847	47.5	62.4	
Blackhull/Rex x Cheyenne G.I.12933	518	574	520	630	664	565	3471	57.9	64.1	
Yogo x Turkey/Oro-74	456	510	515	385	520	440	2826	47.1	62.9	
-76	471	501	520	465	560	484	3001	50.0	62.0	
-78	405	442	400	390	535	423	2595	43.0	64.0	
-79	369	425	455	456	419	395	2519	42.0	63.0	
-81	490	525	479	480	448	432	2854	47.6	62.9	
-83	435	515	501	415	545	435	2846	47.4	62.5	
-85	325	435	435	591	445	457	2688	44.8	64.9	
-88	455	470	479	509	465	465	2843	47.4	63.0	
-89	429	385	510	501	530	465	2820	47.0	62.4	
-90	315	452	440	480	541	455	2683	44.7	62.0	
Rio/Rex x Nebred C.I.12930	475	590	642	570	520	555	3352	55.9	63.5	

Continued-

Table XI. (Continued).

Entry	Grams Per Plot						Total Grams	Average Bushel		Bushe l Wt. in Pounds
	I	II	III	IV	V	VI		Bushel Per Acre	Bushel	
Yogo x Turkey/Oro -91	350	465	501	545	593	490	2944	49.1	61.7	
-92	366	440	545	460	495	446 ¹	2752	45.9	63.1	
-93	486	363	445	435	460	455	2643	44.1	63.6	
-94	330	500	536	555	555	414	2890	48.2	62.5	
-99	433	525 ¹	535	490	625	535	3143	52.4	63.5	
Wasatch	380	505	440	432	435	470	2662	44.4	63.0	
-103	381	475	615	544	376	472	2863	47.7	62.5	
-106	380	420	455	500	471 ¹	496	2722	45.4	62.0	
-107	401	519	370	432	480	430	2632	43.9	63.0	
-111	470	525 ¹	445	679	465	525	3109	51.8	64.3	
-112	395	460 ¹	465	395	535	502	2752	45.9	62.6	
-115	363	436 ¹	447 ¹	455	476	435	2612	43.5	62.5	
-117	450	475	475	460	445	490	2795	46.6	63.5	
-119	455	375	406	510	476	525	2747	45.8	62.5	
-121	393	505	450	410	445	499	2702	45.0	63.5	
Cheyenne	450	475	645	595	435	518	3118	52.0	64.5	
Kharkof 17-7	455	515	450	580	580	474	3054	50.9	62.6	

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	5	26,154.26	-
Varieties	80	6,313.797	-
Error	385	55,193.85	
Total	470		

Mean Yield.48.4
 S. E. \bar{X}9.5911
 L.S.D.N. S.
 C. V.19.82%

Off-Station

The off-station winter wheat nurseries are grown in single row plots, 18 feet long and replicated, four times. There were ten entries grown this past season. These nurseries were located in Lake, Sanders, Mineral, Missoula, Lincoln, and Ravalli counties.

Results and Discussion

Inspections of off-station plots were made during the growing season. Weed control methods were employed during the inspection if necessary. Following, is information on observations, by county, location and date.

<u>County</u>	<u>Name of Farmer</u>	<u>Address</u>	<u>Date</u>	<u>Remarks</u>
Lake	Walter Mangles	Polson	4-19-57 5-8-57	Cultivated, considerable mixture in nursery. Fair stand. Very good. Not very heavy tillering
Sanders	Sid Cross	Camas Praire	4-3-57	Full of cheat grass and was cultivated out by Mr. Cross.
Mineral	Charles Fry	Tarkio	4-19-57 5-6-57 6-12-57 7-11-57	Cultivated. Good Stand Growing well Good Smut in Triplet and Cheyenne. None found in Westmont and Itana.
Missoula	William Lucier	Frenchtown	4-19-57 7-11-57	Cultivated. Good Stand Itana and Westmont looked very good, should be highest yielding in the nursery.
Lincoln	Carl Lundeen	Eureka	4-22-57 5-1-57 6-13-57 7-2-57	Cultivated, fair stand. Growing some Good stand, very dry. Russian thistle removed. Very dry.
Ravalli	L. B. McFadgen	Stevensville	4-19-57 6-11-57 7-11-57	Cultivated. Good stand In good shape Columbia very good also Omar.

The nursery on the Sid Cross farm in Sanders County was cultivated out with field equipment. See in above tabular form.

Yields in the nursery at Mangles were poor. Late seeding and a hail storm just before harvest contributed to the low yield. Westmont is highest in yield, but results are not significant at the five percent level. See table XII.

Table XIII, shows results of the nursery in Mineral county. The mean of this nursery was 19.4 bushels per acre. Westmont is highest in yield with 21.5 bushels per acre, however these results were not significant when analyzed statistically.

Westmont was high in yield in the nursery in Missoula county. These data were significant at the 5% level. Table XIV. Westmont was significantly higher in yield than other entries except Columbia and Itana.

Very dry conditions in Lincoln county existed during the growing season. The mean of that nursery was 6.0 bushels per acre. Burt and Omar are the low yielding entries in this nursery. Yogo is high, but not significantly higher than Westmont. Table XV, give the data for this trial.

Little yield difference was found in the nursery grown in Ravalli county. The soft wheats and Burt were lower in yield than the hard red winters. Columbia was high in yield with 45.1 bushels per acre followed by Westmont with 41.5 bushels per acre. These data were not significant when analyzed statistically. See table XVI.

Summarizing the winter wheat data for 1957, Westmont ranks number one, followed by Cheyenne, Itana and Columbia. Table XVII.

Table XII. Agronomic data from off-station winter wheat nursery grown in Lake county on the Walter Mangles farm, Polson, Montana. Single row plots, four replications.

Planted. September 29, 1956 Harvested. August 5, 1957 Size of Plot 16 Sq. Ft.

Variety or Cross	C. I. or N No.	Height in Inches	Stand in Percent	Grams Per Plot				Total Grams	Average Bushel Per Acre
				I	II	III	IV		
Wasatch	11925	31	94	95 ¹	80	63	80	318	8.0
Westmont	12930	26	80	212	65	80	85	442	11.1
Itana	12933	28	75	86	70	60	75	291	7.3
Cheyenne	8885	26	76	84	71	60	50	265	6.6
Triplet	5408	27	81	101	130	85	70	386	9.7
Columbia	12928	25	77	95	50	69	72	286	7.2
Yogo	8033	30	94	100	98	70	95	363	9.1
Kharkof 17-7	13263	30	81	70	110	67	108	355	8.9
Burt	12696	25	80	35	80	81	86	282	7.1
Omar	13072	22	82	100	65	87	55	307	7.7

Hail damage to entire plot.
¹Calculated missing plot.

Mean Yield.....8.2
 S. E. \bar{x}4.3855
 L.S.D.N. S.
 C. V.5.35%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	3	1,214.967	
Varieties	9	779.1777	
Error	26	7693.038	
Total	38		

Table XIII. Agronomic data from off-station winter wheat nursery grown in Mineral County, on the Charles Fry farm, Tarkio, Montana. Single row plots, four replications.

Planted. September 27, 1956 Harvested. August 5, 1957 Size of Plot. 16 Sq. Ft.

Variety or Cross	C. I. or N No.	Height in Inches	Grams Per Plot				Total Grams	Average Bushel Per Acre
			I	II	III	IV		
Wasatch	11925	34	186	155	210	170	721	18.0
Westmont	12930	29	199	193	279	190	861	21.5
Itana	12933	31	165	170	215	215	765	19.4
Cheyenne	8885	31	145	170	215	165	695	17.4
Triplet	5408	32	225	165	185	176	751	18.8
Columbia	12928	28	270	201	210	185	866	21.7
Yogo	8033	32	220	155	165	152	692	17.3
Kharkof 17-7	13263	31	218	160	225	191	794	19.9
Burt	12696	29	175	180	200	175	730	18.3
Omar	13072	29	235	205	220	215	875	21.9

Note: Westmont is used as the check in this nursery.

Mean Yield.....19.4
S. E. \bar{x}1.271
L.S.D.N. S.
C. V.6.55%

Analysis of Variance			
Source	D.F.	Mean Square	F
Replication	3	2,975.5666	4.61
Varieties	9	1,248,4444	1.93
Error	27	646.2148	
Total	39		

Table XIV. Agronomic data from off-station winter wheat nursery grown in Missoula County, on the William Lucier farm, Frenchtown, Montana. Single row plots, four replications.

Planted. September 27, 1957 Harvested. August 5, 1957 Size of Plot. 16 Sq. Ft.

Variety or Cross	C. I. or N No.	Height in Inches	Stand in Percent	Grams Per Plot				Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
				I	II	III	IV			
Wasatch	11925	32	83	210	262	155	186	813	20.3**	-
Westmont	12930	29	92	300	345	350	231	1226	30.7	61.2
Itana	12933	30	93	290	282	270	225	1067	26.7	60.9
Cheyenne	8885	30	87	225	330	245	190	990	24.8*	60.1
Triplet	5408	28	82	190	165	160	140	655	16.6**	-
Columbia	12928	32	92	350	335	310	190	1185	29.6	62.1
Yogo	8033	32	82	210	219	120	165	714	17.9**	-
Kharkof 17-7	13263	32	87	250	200	180	170	800	20.0**	-
Burt	12696	30	90	225	170	225	175	795	22.4**	-
Omar	13072	29	78	220	245	140	155	760	19.0**	-

Note: Westmont is used as a check in this nursery.
 *Varieties yielding significantly less than the check (5%).
 **Varieties yielding significantly less than the check 1%.

Mean Yield.....22.5
 S. E. \bar{x}1.7461
 L.S.D. (5%).....5.1
 L.S.D. (1%).....6.8
 C. V.7.76%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	10,938.566	8.97**
Varieties	9	10,201.744	8.36**
Error	27	1,219.5925	
Total	39		

Table XV. Agronomic data from off-station winter wheat nursery grown in Lincoln county, on the Carl Lundeen farm, Eureka, Montana. Single row plots, four replications.

Planted.. September 21, 1956

Harvested. August 29, 1957

Size of Plott. 16 Sq. Ft.

Variety or Cross	C. I. or N No.	Height in Inches	Stand in Percent	Grams Per Plot				Total Grams	Average Bushel Per Acre
				I	II	III	IV		
Wasatch	11925	17	57	80	70	50	75	275	6.9
Westmont	12930	15	71	82	55	70	55	262	6.6
Itana	12933	15	76	76	60	60	60	245	6.1
Cheyenne	8885	16	81	100	75	75	65	315	7.9
Triplet	5408	14	59	70	50	45	45	210	5.3
Columbia	12928	14	76	65	65	55	45	230	5.8
Yogo	8033	16	66	75	65	85	55	280	7.0
Kharkof 17-7	13263	17	64	80	80	50	60	270	6.8
Burt	12696	15	60	40	70	30	45	185	4.6*
Omar	13072	13	79	35	55	40	15	145	3.6**

Note: Westmont is used as a check in this nursery.

*Varieties yielding significantly less than the check (5%).

**Varieties yielding significantly less than the check (1%).

Mean Yield.....6.0
 S E \bar{x}5644
 L.S.D. (5%).....1.6
 L.S.D. (1%).....2.2
 C. V.9.41%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	3	613.8933	4.82**
Varieties	9	635.5588	4.99**
Error	27	127.410	
Total	39		

Table XVI. Agronomic data from off-station winter wheat nursery grown in Ravalli county, on the L.B. McFadgen farm, Stevensville, Montana. Single row plots, four replications.

Planted. September 27, 1956 Harvested. Augsut 20, 1957 Size of Plot. 16 Sq. Ft.

Variety or Cross	C. I. or N No.	Height in Inches	Lod- ging percent	Grams Per Plot				Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
				I	II	III	IV			
Wasatch	11925	42	-	345	484	255	440	1524	38.1	60.5
Westmont	12930	35	-	330	355	555	420	1660	41.5	61.0
Itana	12933	38	-	486	375	270	415	1546	38.7	61.2
Cheyenne	8885	39	3	426	324	400	480	1630	40.8	60.2
Triplet	5408	38	-	335	330	292	370	1327	33.2	60.1
Columbia	12928	36	-	565	360	440	440	1805	45.1	62.1
Yogo	8033	42	10	385	430	420	230	1465	36.6	60.8
Kharkof 17-7	13263	38	15	516	420	333	370	1639	33.5	-
Burt	12696	34	-	325	440	230	327	1322	33.1	59.9
Omar	13072	33	-	515	250	269	290	1324	33.1	58.9

Note: Westmont is the check in this nursery.

Analysis of Variance			
Source	D.F.	Mean Square	F
Replication	3	9,8996	1.36
Varieties	9	6,819.33	-
Error	27	7,645.970	
Total	39		

Mean Yield.....38.1
 S. E. \bar{x}4.3721
 L.S.D.N. S.
 C. V.11.48%

Table XVII. Summary of Winter Wheat in off-station trials in seven western Montana counties 1957.

Variety or Cross	C.I. or N No.	Still- water ¹	Creston ²	Lake	Mineral	Missoula	Lincoln	Ravalli	Average Bushel Per Acre
Wasatch	11925	19.2	42.8*	8.0	18.0	20.3*	6.9	38.1	21.9
Westmont	12930	17.8	60.7	11.1	21.5	30.7	6.6	41.5	27.1
Itana	12933	19.7	58.1	7.3	19.4	26.7	6.1	38.7	25.1
Cheyenne	8885	21.9	62.0	6.6	17.4	24.8*	7.9	40.7	25.9
Triplet	5406		52.7*	9.7	18.8	16.6*	5.3	33.2	22.7
Columbia	12928	19.5	51.5*	7.2	21.7	29.6	5.8	45.1	25.8
Yogo	8033		45.1	9.1	17.3	17.9*	7.0	36.6	22.2
Kharkof 17-7	13263	21.2	48.1*	8.9	19.9	20.0*	6.8	33.5	22.6
Burt	12696	18.2	59.4	7.1	18.3	22.4*	4.6*	33.1	23.3
Omar	13072		55.5	7.7	21.9	19.0*	3.6*	33.1	23.5
Mean Yield		19.3	51.5	8.2	19.4	22.5	6.0	38.1	23.6
S E \bar{x}		1.4293	2.5290	4.355	1.271	1.7461	.5644	4.3721	
L.S.D.(5%)		4.1	7.3	N. S.	N. S.	5.1	1.6	N. S.	
C. V.		7.41%	4.91%	5.35%	6.55%	7.76%	9.41%	11.48%	

*Significantly less than Westmont at the 5% level

¹Taken from Western Regional Hard Red winter nursery

²Taken from Interstate nursery

Winter vs Spring wheat planted in the fall

The seeding of spring wheat in the fall was done by mistake by a local farmer. The wheat came through the winter in fine shape and yields were excellent. It was decided to conduct a study to compare a spring wheat planted in the fall with a winter wheat.

Two varieties of each were selected and are listed in the table below as are seeding and harvesting dates.

Results and Discussion

Heading data on the spring varieties were five to six days earlier than the winter varieties. The highest yield was from a spring wheat selection N2389. Pilot, a recommended variety of spring wheat was lower in yield than the winters. These data were not significant at the 5% level. Table XVIII.

Table XVIII. Agronomic data from Winter vs Spring wheat with all varieties seeded in the fall. Creston, Montana 1957.

Planted. September 28, 1956 Harvested. July 31, 1957 Size of Plot. 16 Sq. Ft.

Variety	Head- ing Date	Height in Inches	Lod- ging %	Grams Per Plot				Ave- Total raga Grams Bu/A.	Bushel Wt. in Pounds	
				I	II	III	IV			
Pilot (Spring)	5-28	40	-	445	445	400	390	1680	42.0	61.6
2389 (Spring)	5-30	43	-	545	472	460	567	2044	51.1	63.4
Triplet (Winter)	6-3	42	-	625	525	290	531	1971	49.2	63.0
Wasatch (Winter)	6-2	47	7	445	470	465	540	1920	48.0	63.3

Mean Yield.....47.6
S. E. \bar{x}3.5897
L.S.D.N. S.
C. V.7.54%

Chemical Control of Drawf Bunt

In the fall of 1956 Chemical treatments were made on Triplet winter wheat seeded in a naturally infested drawf bunt area. Three rates of HCB (Hexachloro benzene) at three dates were used.

Results and Discussion

Little drawf bunt was found in western Montana in 1957. There were just a few heads of bunt in this experiment. Counts could not be made because of these conditions so the effectiveness of the compound could not be determined.

Treatment	Rate Per Acre	Time of Application	Plot Number		
			I	II	III
40% HCB (Hexachlorobenzene)	2½	Pre-emergence	1	15	21
"	5	Pre-emergence	2	20	23
"	10	Pre-emergence	3	17	25
"	2½	2 weeks post emergence	4	12	29
"	5	2 weeks post emergence	5	14	30
"	10	2 weeks post emergence	6	18	26
"	2½	4 weeks post emergence	7	19	22
"	5	4 weeks post emergence	8	16	28
"	10	4 weeks post emergence	9	13	27
"	Check		10	11	24

Plots-4 row-20 feet long, three replications.
Packing Instructions 12.5 grams per envelope. 120 envelopes
Seeded 9/25/56

Oats

Two variety nurseries were grown on the station in 1957. Four off-station nurseries were also seeded. The explanation on this type nursery is found in the Introduction of this section of the annual report.

Station Variety Nurseries

The two nurseries grown on the station were grown under irrigated and dryland conditions. The irrigated nursery was replicated five times, and the dryland three times. These nurseries consisted of all the entries in the Uniform Pacific Northwest nursery plus several added by Mr. Theis, oat coordinator at Montana State College. A total of 36 entries were grown in this nursery.

Results and Discussion

The yields of these nurseries are the lowest recorded on the station in nine years of oat research. Just before heading the plants turned brown. Beginning with the leaves and reaching the leaf sheath. In pulling-up one of these plants so discolored, the root development was found to be very poor. This caused severe lodging in the nurseries. These symptoms indicated a Helmenthosporium sp, however no material was studied to determine the causative organism. There appeared to be little difference between the irrigated and dryland oats in the rate of infection of this disease. The mean for the irrigated test was 76.4 bushels per acre and the dryland mean was 52.7 bushels per acre. Lodging was severe in both trials. Tables XIX and XX show irrigated and dryland results respectively.

Table XIX. Agronomic data from irrigated oat nursery grown at Creston, Montana 1957. Four rows, five replications.

Planted. April 30, 1957		Harvested. August 16, 1957		Size of Plot 16 Square Feet									
Variety or Cross	C. I. or N No.	Heading Date	Heading Height in Ins.	Lodging %	Helminthosporium sp. I-10 I	II	III	IV	V	Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds	
Park (3)	6611	7-4	44	50	8.2	536	310	535	370	270	2021	75.8	35.5
Mission (3)	2588	6-30	50	37	8.0	380	295	240	210	269	1394	52.3	35.5
Bridger	2611	7-8	48	50	8.0	490	328	325	415	306	1864	69.9	33.5
Gopher (3)	2027	6-28	44	23	8.0	140	100	152	120	315	827	31.0	25.5
Garry (Original) (3)	6648	7-2	49	41	7.0	442	270	380	345	334	1771	66.5	31.5
Garry (New) (3)	6662	7-2	49	49	7.4	456	325	483	476	334	2074	77.8	38.1
Rodney	6661	7-5	48	46	5.4	150	190	100	80	193	713	26.8	35.4
Exeter	4158	7-6	47	71	6.0	500	636	305	605	625	2671	100.2*	40.2
Clinton x Overland ²	5346	7-5	44	47	6.2	590	470	316	468	506	2350	88.2	37.9
Clinton x Overland ²	5345	7-3	44	41	4.8	532	505	481	485	534	2537	95.2*	38.6
C. I. 4189 x Overland	6613	7-6	43	72	6.0	475	455	380	551	590	2451	92.0	38.8
C. I. 4189 x Overland	5347	7-4	43	71	5.2	550	492	481	565	425	2513	94.3	38.1
Burnett	6537	6-24	44	26	7.6	270	364	345	382	410	1771	66.5	33.6
Palomino (3)	5636	6-26	45	14	6.0	220	314	105	370	270	1279	48.0	24.8
Centore	3865	7-3	45	83	6.6	531	502	440	653	555	2681	100.6*	36.5
Andrew x Clinton (3)	5658	6-28	49	32	6.6	185	130	192	294	185	986	37.0	26.5
Andrew x Clinton (3)	5657	6-25	44	14	6.8	170	129	165	349	169	982	36.8	24.0
Cody	3916	7-7	41	35	4.8	585	561	550	610	450	2756	103.4**	36.0
Clinton "59"	4259	6-25	42	5	6.0	360	239	192	224	275	1290	48.4	32.5
Overland	4181	6-30	42	35	5.2	595	485	495	680	315	2570	96.4	38.5
Marktton	2053	7-2	49	43	7.2	374	260	230	240	254	1358	51.0	34.1
48 Ab 6909	-	7-3	44	32	5.2	533	569	625	433	460	2620	98.3*	39.8
Simcoe (3)	6767	6-30	52	9	6.2	326	192	230	206	336	1290	48.4	32.1
Eagle	4113	7-6	48	27	4.8	595	575	624	465	588	2847	106.8**	41.7
Sauk	5946	7-2	50	20	3.6	594	422	580	576	562	2734	102.6**	38.2
Victory	1145	7-7	50	82	9.2	420	330	490	401	520	2161	81.1	41.0
Bannock	2592	7-6	47	51	5.0	565	415	629	479	635	2723	102.2**	37.6
Binder	-	7-9	48	18	6.2	515	450	556	490	560	2571	96.5*	38.5

Continued-

Table XIX (Continued)

Variety or Cross	C. I. or N No.	Heading Date	Height In Ins.	Lodging %	Helminthosporium ϕ .1-10	Grams Per Plot				Average Bushel			
						I	II	III	IV	V	Total Grams	Per Acre	Bushel Wt. in Pounds
Abegweit	4970	7-1	47	34	6.0	312	363	525	435	565	2200	82.5	37.2
Cherokee	3846	6-24	42	28	6.8	160	195	240	221	140	956	35.9	27.4
Winema	4373	6-26	40	3	5.0	455	749	585	730	630	3149	118.2**	37.5
(B-A x Iogold)(V-R)	6612	7-1	42	25	4.8	671	620	575	660	541	3067	115.1**	38.5
Clinton x Overland ²	AB6014	7-4	43	29	5.8	551	575	635	571	395	2727	102.3**	37.5
Gopher x Bridger	44-5-2-2	6-30	51	24	6.6	285	310	310 ¹	440	270	1615	60.6	35.0
Gopher x Bridger	44-5-3-26	7-7	45	30	6.6	330	460	465	510	319	2084	78.2	38.9
Ajax (3)	4157	6-30	51	70	7.8	311	439	220	410	315	1695	63.6	35.6

¹ Calculated missing plot.

Note: Park is used as a check in this nursery.

*Varieties yielding significantly more than the check (5%).

**Varieties yielding significantly more than the check (1%).

(3) Indicated regrowth in the plot at harvest time.

Mean Yield.....76.4
 S. E. \bar{x}6.8363
 L.S.D. (5%).....19.1
 L.S.D. (1%).....25.1
 C. V.8.95%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	4	11,621.25	1.75
Varieties	35	97,459.14	14.68**
Error	138	6,639.67	
Total	177		

Table XX. Agronomic data from dryland Pacific Northwest Uniform oat nursery grown at Creston, Montana 1957. Four row plots three replications.

Variety or Cross	C. I. or N No.	Harvested.	August 14, 1957	Size of Plot 16 square feet	Head-		Lod-	Grams Per Plot			Total Grams	Average Bushel	
					ing Date	Height in Ins.		ging %	I	II		III	Bushel Per Acre
Burnett	6537	6-20	41	63	176	210	332	718	44.9	30.5			
Palomino	5636	6-26	43	70	165	230	217	612	38.3	28.0			
Andrew x Clinton	5657	6-25	43	63	155	230	172	557	34.8	28.9			
Andrew x Clinton	5658	6-25	43	80	207	140	280	627	39.2	28.0			
Centore	3865	6-28	41	80	365	431	331	1127	70.5*	31.2			
Cody	3916	7-1	36	63	335	304 ¹	293	932	58.3	30.2			
Clinton 59	4259	6-22	39	40	160	143	215	518	32.4	30.2			
Overland	4181	6-27	38	73	370	390	332	1092	68.3	34.8			
Clinton x Overland	5345	6-29	41	73	310	236	321	321	60.22	-			
Park	6611	6-30	41	67	277	283	195	741	46.3	30.4			
Markton	2053	6-28	46	83	461	286	195	755	47.2	32.1			
C.I. 4189 x Overland	6613	7-2	44	90	450	375	350	1097	68.6*	35.3			
48 AB 6909	-	6-30	44	87	265	357 ¹	410	1235	77.2**	35.9			
Ajax	4157	6-28	49	87	165	165	270	792	49.5	32.3			
Simcoe	6767	6-28	46	58	485	336	170	500	31.3	30.1			
Eagle	4113	6-30	48	57	350	418	414	1235	77.2	36.2			
Exeter	4158	7-3	46	100	350	176	200	200	37.52	-			
Sauk	5946	6-29	42	50	100	176	430	1198	74.9**	33.8			
Rodney	6661	7-3	44	76	250	271	216	492	30.8	29.9			
Improved Garry	6662	6-29	42	80	385	342	225	746	46.6	31.7			
Victory	1145	7-3	47	93	216	381	310	1037	64.8	34.5			
Mission	2588	7-1	46	90	290	270	302 ¹	899	56.2	37.0			
Bridger	2611	7-4	50	75	110	100	235	795	49.7	37.0			
Gopher	2027	6-25	42	67	310	245	271	481	30.1	-			
Clinton x Overland ²	5346	6-26	39	75	297	310	263	818	51.1	29.5			
Abegweit	4970	6-28	41	60	365	382	340	947	59.2	34.9			
C.I. 4189 x Overland	5347	6-29	41	90	365	382	260	1007	63.0	35.2			

Continued

Table XX. (Continued)

Planted. April 26, 1957 Harvested. August 14, 1957 Size of Plot 16 square feet.

Variety or Cross	C. I. or N No.	Heading Date	Heading Height in Ins.	Lodging %	Grams Per Plot I	Grams Per Plot II	Grams Per Plot III	Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
Binder	-	7-3	41	90	301	200	310	811	50.7	36.0
Winema	4373	6-20	35	67	371	192	505	1068	66.8*	32.1
(B-A x Iogold x (V-R))	6612	6-24	37	73	453	185	370	1008	63.0	34.5
Bannock	2592	7-2	45	73	358	385	265	1008	63.0	32.4
Shasta	3976	7-4	45	93	235	298	201	734	45.9	30.0
Gopher x Bridger	44-5-2-2	6-28	48	83			220		41.32	-
Gopher x Bridger	44-5-3-26	6-29	47	83	230	265	231	726	45.4	30.7
Gopher x Bridger	44-5-3-31	6-27	44	88	224	305	236	765	47.8	33.7
Clinton x Overland	AB6014	6-29	39	70	225	320	225	770	48.2	29.5

1Calculated missing plot.

2Not included in the analysis of Variance

Note: Park is used as the check in this nursery

*Varieties yielding significantly more than the check (5%).

**Varieties yielding significantly more than the check (1%).

Mean Yield.....52.7
 S. E. X.....7.0155
 L.S.D.(5%).....19.9
 L.S.D.(1%).....26.5
 C. V.13.31%

Analysis of Variance

Source	D.F.	Mean square	F
Replications	2	1,132	-
Varieties	32	16,453.781	3.92**
Error	61	4,195.344	
Total	95		

Oats off-station

Results and Discussion

The irrigated nursery in Lincoln county was lost to cattle grazing in the plot. No results were obtained from that trial.

The test at Housers' in Lonepine gave significant results at the 5% level. Considerable difference existed between replications due to uneven irrigation and soil variation. Yields were fair, but no large differences were noted in the test. The mean of this test was 62.4 bushels per acre. Test weight per bushel was fair but not as high as generally found in western Montana. Table XXI.

Quackgrass in the nursery in Missoula county caused considerable reduction in yield. Bird damage was slight in this trial. The mean of this nursery was 36.0 bushels per acre. When analyzed statistically the yields were found to be non-significant. Table XXII.

Dryland yields were good in the Tarkio flats area of Western Montana in 1957. The mean being 50.1 bushels per acre. Centore was high in yield, but no significance was found at the 5% level. Table XXIII.

Table XXI. Agronomic data from off-station irrigated oat nursery grown in Sanders County on the Jim Houser farm, Lonepine, Montana 1957. Single row plots four replications.

Planted. May 9, 1957 Harvested. September 5, 1957 Size of Plot. 16 Sq. Ft.

Variety or Cross	C.I. or N No.	Heading Height				Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds	
		In	Ins.	I	II				
Park	6611	29	112	330	300	455	1197	56.1	37.0
Bridger	2611	31	120	342	375	474	1311	61.5	37.7
Gopher	2027	25	190	360	360	356	1266	59.4	36.6
Centore	3865	25	270	355	485	406	1416	66.4	36.6
C. I. 4189									
x Overland	6613	28	170	330	395	300	1195	56.0	38.5
Exeter	4158	29	295	336	324	484	1439	67.5	39.0
Canada									
Hybrid 2795-11-5		28	320	330	270	465	1485	69.6	37.0
Rodney	6661	26	180	380	320	442	1322	62.0	39.5
Overland	4181	24	270	330	375	385	1360	63.8	37.2
Clinton x									
Ukraine	6537	24	290	395	323	305	1313	61.2	38.6

Analysis of Variance				Mean Yield.....62.4	
Source	D.F.	Mean Square	F	S. E. \bar{x}5.3492	L.S.D.N. S.
Replication	3	61,767.83	18.99**	C. V.8.57%	
Varieties	9	2,358.877			
Error	27	3,252.196			
Total	39				

Table XXII. Agronomic data from off-station irrigated oat nursery grown on the Don Roth farm in Missoula county, Clinton, Montana 1957. Single row plots, four replications.

Planted. May 6, 1957 Harvested. September 5, 1957 Size of Plot 16 Sq. Ft.

Variety or Cross	C.I. or N No.	Heading Height in Ins.	Grams Per Plot				Total Grams	Average Bushels Per Acre	Bushel Wt. in Pounds
			I	II	III	IV			
Park	6611	44	170	150	286	112	718	33.7	31.0
Bridger	2611	55	210	172	581	140	1103	51.7	32.1
Gopher	2027	43	88	75	145	95	403	18.9	25.5
Centore	3863	40	135	357	175	215	882	41.4	32.5
C.I. 4189 x									
Overland	6613	44	150	170	410	175	905	42.5	31.9
Exeter	4158	46	134	282	302	180	898	42.1	33.6
Canada									
Hybrid	2795-11-5	42	80	195	390	125	790	37.1	30.1
Rodney	6661	41	125	115	235	110	585	27.4	28.4
Overland	4181	41	135	80	464	265	944	44.3	33.7
Clinton x									
Ukraine	6537	43	80	120	180	85	465	21.8	23.0

Analysis of Variance					Mean Yield.....36.0
Source	D.F.	Mean Square	F	S.E. \bar{x}7.7598	L.S.D.N. S.
Replication	3	71,655.36	1.047	C.V.21.56	
Varieties	9	12,593.22	1.84		
Error	27	6,843.729			
Total	39				

Table XXIII. Agronomic data from off-station dryland oat nursery grown in Mineral county on the Charles Fry farm, Tarkio, Montana 1957. Single row plots four replications

Planted. May 6, 1957 Harvested. August 30, 1957 Size of Plot 16 Sq. Ft.

Variety or Cross	C.I. or N No.	Heading Height in Ins.	Grams Per Plot				Total Grams	Average Bushels Per Acre	Bushel Wt. in Pounds
			I	II	III	IV			
Park	6611	28	346	175	225	230	976	45.8	33.9
Bridger	2611	29	284	168	200	180	832	39.0	34.5
Gopher	2027	26	160	130	320	155	765	35.9	30.0
Centore	3865	27	365	235	395	465	1460	68.5	35.6
C.I. 4189 x									
Overland	6613	25	140	568	455	295	1458	68.4	38.4
Exeter	4158	27	286	270	270	365	1191	55.9	38.0
Canada									
Hybrid	2795-11-5	28	245	371	180	160	956	44.8	34.3
Rodney	6661	29	175	135	265	375	950	44.6	32.6
Overland	4181	26	410	180	196	180	966	45.3	33.0
Clinton x									
Ukraine	6537	28	175	330	256	360	1121	52.6	36.5

Analysis of Variance					Mean Yield.....50.1
Source	D.F.	Mean Square	F	S. E. \bar{x}9.9131	L.S.D.N. S.
Replication	3	1,206.7666		C. V.19.79%	
Varieties	9	1,4348.26	1.29		
Error	27	11,169.025			
Total	48				

Spring Barley

The work in spring barley is designed to develop new varieties in feed type and malting types. Stronger straw, leaf disease resistance and smut resistance are some of the agronomic characteristics which are being sought.

The nurseries grown this year were as follows; interstate and station yield (dryland and irrigated); dryland advance yield; dryland Glacier x Titan 50-5610-7 head row; Glacier x Titan 50-5610-7 smut; four off-station yield; and four malting barley and advance yield nurseries.

Interstate and Station Yield

This nursery is grown throughout the state of Montana and includes selections and varieties from other states, breeding material from Montana State College and recommended varieties. Two nurseries were grown this year, one under irrigation and one under dryland conditions. The irrigated nursery was located on the station and was grown in five replications. Three inches of irrigation water were applied in early July. The dryland nursery was grown on the Conrad Gilbertson farm northwest of Kalispell. Rain fall in that area was much below normal during the growing season.

Results and Discussion

Yields were about average in the irrigated nursery. Lodging was quite heavy throughout, but considerable differences in lodging was noted between varieties. Leaf spot (leaf disease) was found on most varieties. Loose Smut was found in several varieties. Several varieties were found to be significantly higher in yield than Vantage which is used as a check. Utah 570-8 was highest in yield with 98.5 bushels per acre. The mean of this nursery was 73.3 bushels per acre. Table XXIV.

Yields were very low in the nursery on dryland. The mean being 14.8 bushels per acre. The lack of moisture caused difficulty in later maturing varieties. Emergence of the inflorescence from the boot was not complete. This caused small kernel size in these varieties. Ingrid and Samalta were affected the most. There was not any statistical differences in this test and a high C.V. was obtained. Table XXV give agronomic data for this nursery.

Dryland Advanced Yield

This nursery includes the most promising barley varieties and is grown in comparison with recommended varieties. Seven entries were included in the nursery this year. It was grown in five row plots eighteen feet long replicated three times.

Results and Discussion

Yields of varieties in this nursery were very good with a mean of 67.2 bushels per acre. Freja was the highest yielding variety, but the data were not significant. Test weights were all above USDA standard of 48 pounds per bushel. Lodging was almost 100 per cent in some varieties. Table XXVI shows the data for this test.

Dryland Glacier and Titan Sel. 50-5610-7 Headrow

This selection of Glacier - Titan was grown out in head rows to aid in the selection of a variety. They were grown in three replications single row plots, eighteen feet long.

Results and Discussion

Selections from this nursery were made on agronomic appearance, straw strength and loose smut present. Several selections were made from the nursery. Yields and bushel weights are recorded in Table XXVII. Test weights were below USDA standard for all selections made.

Glacier and Titan Sel. 50-5610-7 Smut nursery

The material in this nursery was planted from seed from three heads encultated with loose smut in 1956. They were grown in single row plots ten feet long. No replications were made.

Results and Discussion

No loose smut was found in any of the selections in this nursery. A table of data is not included because yields were not taken. This material is in storage and is available for use in the future.

Table XXIV. Agronomic data from irrigated interstate and station yield barley nursery, Creston 1957. Five replications, four row plot.

Planted. April 30, 1957 Date Harvested. August 22, 1957 Size of Plot 16 Square Feet

Variety or Cross	C. I. or N No.	Head- ing Date	Height in Inches	Lod- ging %	Loose Smut (x)	Grams Per Plot					Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
						I	II	III	IV	V			
Glacier x Titan (50-5639-12)	10421	6-21	40	60	-	527	400	580	570	636	2713	67.9	50.8
Titan	7055	6-22	44	62	x	396	506	450	421	566	2339	58.6	51.0
Vantage	7324	6-25	44	22	x	410	600	610	710	482	2812	70.4	49.7
Dekap	3351	6-24	36	100	-	584	581	560	530	530	2785	69.7	49.2
Hannchen	4841	6-30	44	98	x	590	450	553	471	455	2519	62.9	52.0
Compana	5438	6-23	34	100	x	350	405	470	365	405	1995	50.0	47.2
Traill	9538	6-26	44	62	-	410	650	480	585	555	2680	67.1	51.5
Heines Hanna	9532	6-26	40	98	x	521	510	580	414	562	2587	64.8	53.4
Freja	7130	6-26	35	98	x	500	675	800	590	701	3266	81.8	52.5
Herta	8097	6-28	37	42	-	602	514	686	496	555	2853	71.4	54.5
Heimdal	8094	6-30	37	75	-	785	614	725	625	765	3514	88.0**	53.1
Hiland	9530	6-26	42	62	-	570	580	425	518	649	2742	68.7	48.7
Glacier	4976	6-22	42	88	x	652	586	697 ¹	670	692 ¹	3297	82.6	47.5
Carlsberg II	10114	6-29	36	36	-	745	710	714	715	790	3674	92.0**	51.6
Ingrid	10083	6-30	37	61	-	695	842	665	775	785 ¹	3762	94.2**	56.0
Piroline	9558	6-27	39	72	x	641	704	750	595	737	3427	85.8**	53.9
Utah 570-8	10118	6-28	43	52	x	614	665	1020	760	875	3934	98.5**	47.4
Betzes	6398	6-28	39	98	-	455	476	602	440	534 ¹	2507	62.8	52.1
Vantmore	9555	6-26	47	66	x	445	330	490	438	530	2233	55.9	53.4
Glacier x Titan	50-5610-7	6-24	43	76	-	570	600	595	556	555	2876	72.0	48.2

¹Calculated missing plot.

Note: Vantage is used as a check in this nursery.

**Varieties yielding significantly more than the check (1%).

Mean Yield.....73.3
 S. E. \bar{x}4.5285
 L.S.D.(5%).....12.7
 L.S.D.(1%).....17.0
 C. V.6.19%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	4	21,324	3.26 *
Varieties	19	57,253.73	8.75*
Error	72	6,541.277	
Total	95		

Table XXV. Agronomic data from dryland interstate and station yield barley nursery, Creston, Montana 1957.
Grown on Conrad Gilbertson farm, Steillwater community. Three replications, four row plots
ten feet long.

Variety or Cross	C. I. or N No.	Head- ing Date	Height in Inches	Loose Smut	Size of Plot. 16 Square Feet			Average Bushels Per Acre	
					Harvested. August 13, 1957	Planted. May 24, 1957	Harvested. August 13, 1957		
					Grams	Per Plot	Total Grams	Per Acre	
					I	II	III		
Glacier x Titan	50-5610-7	6-21	16	-	123	135	110	368	15.4
Hiland	9530	6-23	16	-	123	125	145	393	16.4
C.I. 7114 x Velvon 11	10006	6-15	19	-	85	120	110	315	13.2
Glacier x Titan (50-5639-12)	10421	6-18	19	-	94	110	130	334	13.9
Vantage	7324	6-27	17	-	70	130	115	315	13.2
Titan	7055	6-21	17	-	150	140	125	415	17.3
Parkland	10001	6-16	17	-	25	95	125	245	10.2
Forrest	9187	6-25	18	x	70	140	81	291	12.1
Liberty	9549	6-25	18	x	80	105	100	285	11.9
Trail	9538	6-25	17	-	90	100	115	305	12.7
Vantmore	9555	6-26	19	-	76	175	125	376	15.7
Wolfe	-	6-18	16	-	99	95	170	364	15.2
Otis	7557	6-17	15	-	85	132	120	337	14.1
Dekap	3351	6-23	14	-	110	165	174	449	18.7
Piroline	9558	6-24	15	-	155	155	175	485	20.2
Ingrid	10083	7-6	13	-	105	125	95	325	13.6
Betzes	6398	6-16	15	-	155	145	140	440	18.4
Freja	7130	6-26	14	x	149	70	120	339	14.2
Compana	5438	6-16	14	-	100	95	135	330	13.8
Sanalta	6087	7-2	17	-	105	162	115	382	15.9
Hannchen	4841	6-28	15	x	115	150	125	390	16.3
Heimdal	8094	7-7	13	-	83	115	125	323	13.5
Heines Hanna	9532	6-26	15	-	70	120	175	365	15.2
Carlsburg II	10114	7-7	14	-	100	135	111	346	14.4
Herta	8097	7-6	14	-	95	115	114	324	13.5

Analysis of Variance		F	
Source	D.F.	Mean Square	F
Replications	2	5,181.2	8.21**
Varieties	24	926,887.5	1.47
Error	48	631,214.5	
Total	76		

Mean Yield.....	14.8
S. E. X.....	1.8161
L.S.D.	N. S.
G. V.	12.27%

Table XXVI. Agronomic data from dryland advance yield barley nursery, Creston, Montana 1957. Three replications five row plots, 18 feet long.

Planted. April 27, 1957		Harvested. August 15, 1957			Size of Plot. 48 Sq. Ft.					
Variety or Cross	C. I.	Head-	Height	Lod-	Grams Per Plot			Total	Average	Bushel
	or N No.	ing Date	in Inches	ging %	I	II	III	Grams	Bushel Per Acre	Wt. in Pounds
Vantage	7324	6-24	33	39	1530	1625	1420	4575	63.6	51.4
Glacier x Titan (50-5639-12)	10421	6-19	31	67	2275	1850	1340	5465	75.9	50.2
Compana	5438	6-20	24	98	1655	1385	1325	4365	60.6	49.6
Titan	7055	6-17	33	40	1770	1110	1360	4240	58.9	50.9
Freja	7130	6-25	26	47	1675	1615	2260	5550	77.1	52.5
Otis	7557	6-18	27	75	1180	1205	1814	4199	58.3	53.0
Dekap	3351	6-22	25	92	1615	2015	1831	5461	75.9	50.5

Analysis of Variance				Mean Yield.....67.2
Source	D.F.	Mean Square	F	S. E. \bar{x}8.0267
Replication	2	29,061		L.S.D.N. S.
Varieties	6	120,702.33	1.08	C. V.11.94%
Error	12	111,264.58		
Total	20			

Table XXVII. Agronomic data from dryland headrow nursery. Eighteen feet single rows, three replications, Glacier x Titan, Sel. # 50-5610-7. Mean Yield.....63.8

Planted. April 27, 1957		Harvested. August 15, 1957			Size of Plot. 16 Square Feet.				
	Bozeman	Head-	Grams Per Plot			Total	Average	Bushel	
	1956 Row No.	ing Date	I	II	III	Grams	Bushels Per Acre	Wt. in Pounds	
Glacier x Titan	56-7568-8	6-23	475	625	529	1629	68.0	45.6	
Glacier x Titan	56-7568-9	6-21	469	616	655	1740	72.6	46.6	
Glacier x Titan	56-7568-26	6-20	520	410	550	1480	61.8	47.1	
Glacier x Titan	56-7568-21	6-19			586	586	73.4	47.6	
Glacier x Titan	56-7568-43	6-19	525	530	405	1460	60.9	47.9	
Glacier x Titan	56-7568-46	6-20	530	325	485	1340	55.9	47.3	
Glacier x Titan	56-7568-49	6-23	670	268	550	1488	62.1	-	
Glacier x Titan (Off-Type)	56-7568-15	6-21	495	360	460	1315	82.3	47.0	
Glacier x Titan (Off-Type)	56-7568-16	6-22		494	455	949	59.4	47.5	
Glacier x Titan	56-7568-4	6-20	425	525	690	1640	68.4	-	
Glacier x Titan (Off-Type)	56-7568-36	6-25		520	482	1002	62.7	43.5	
Glacier x Titan (Off-Type)	56-7568-20	6-29		510	588	1098	68.7	46.5	
Glacier x Titan	56-7568-40	6-22	582	480	520	1582	66.0	-	
Glacier x Titan	56-7568-34	6-22		505	365	870	54.5	47.1	
Glacier x Titan	56-7568-7	6-21	550	380		930	38.8	-	
Glacier x Titan	56-7568-37	6-22	540				67.6	-	

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Off-Station

Four off-station nurseries were seeded in the spring of 1957. Discussion on agronomic observations etc are found on page two of this section of the report under the introduction.

Results and Discussion

The nursery in Sanders county was irrigated and fair yields were obtained. The mean was 55.6 bushels per acre. Betzes was high in yield, but results were not significant when analyzed statistically. The difference found in replications was due to the lack of uniform irrigation and soil variation. Table XXVIII.

The irrigated nursery in Lincoln county was destroyed by cattle, and birds destroyed the nursery in Missoula county.

Above average yields were obtained from the nursery in Mineral county. The mean was 58.6 bushels per acre. In all cases the six row varieties out yielded the two row varieties. Stem rust was found on all varieties. Carlsburg II, a late variety, had 25% stem rust on it. Table XXIX gives the results in complete detail for this experiment.

Table XXVIII. Agronomic data from off-station irrigated barley nursery grown in Sanders county on the Jim Hauser farm, Lonepine, Montana 1957.

Planted. May 9, 1957 Harvested. September 5, 1957 Plot size 16 Sq.Ft.

Variety or Cross	N No.	C. I. Height or in				IV	Total Grams	Average Bushels Per Acre	Bushel Wt. in Pounds
		Inches	I	II	III				
Compana	5438	17	410	325	311	368	1414	44.2	50.0
Betzes	6398	20	625	593	439	395	2052	64.1	53.1
Glacier x Titan (50-5610-12)	10421	21	615	495	565	350	2025	63.3	48.1
Carlsberg II	10114	20	400	474	510	377	1761	55.1	51.1
Dekap	3351	18	425	423	415	351	1614	50.5	50.6
Ingrid	10083	18	440	485	423	425	1773	55.4	53.0
Herta	8097	20	445	463	530	359	1797	56.2	52.5
Glacier x Titan 50-5610-7	21	486	605	349	376	1816	56.8	48.0	
Vantage	7324	23	324	450	596	370	1740	54.4	48.0
Freja	7130	19	425	500	445	410	1780	55.6	52.5

Note: Vantage is used as the check in this nursery.
Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	20,594.933	3.88*
Varieties	9	8,306.6	1.56
Error	27	5,311.118	
Total	39		

Mean Yield.....55.6
S. E. \bar{x}4.5563
L.S.D.(5%).....N. S.
C. V.8.20%

Table XXIX. Agronomic data from off-station dryland barley nursery grown in Mineral County on the Charles Fry farm, Tarkio, Montana 1957. Single row plots, four replications.

Planted. May 6, 1957	Harvested. August 30, 1957	Size of Plot 16 Square Feet								
Variety or Cross	C. I. or N No.	Height in Inches	Stem Rust %	Grams Per Plot				Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
				I	II	III	IV			
Compana	5438	23	6	425	380	500	520	1825	57.1*	49.0
Betzes	6398	24	8	365	415	501	575	1856	58.0*	51.6
Glacier x Titan (50-5639-12)	10421	24	5	660	555	550	575	2340	73.2	46.2
Carlsberg II	10114	24	25	358	401	418	349	1526	47.7**	48.5
Dekap	3351	22	6	560	460	495	445	1960	61.3	50.0
Ingrid	10083	24	14	497	415	460	335	1707	53.4**	52.0
Herta	8097	24	10	579	315	397	469	1760	55.0*	52.0
Glacier x Titan	50-5610-7	24	7	540	310	355	568	1773	55.4*	47.5
Vantage	7324	26	T	530	531	613	640	2314	72.3	47.1
Freja	7130	22	11	380	405	421	480	1686	52.7*	49.7

Note: Vantage is used as a check in this nursery.

*Varieties yielding significantly less than the check (5%):

**Varieties yielding significantly less than the check (1%).

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	3	12,191.3	2.37
Varieties	9	17,455.64	3.40**
Error	27	5,140.966	
Total	39		

Mean Yield.....	58.6
S. E. \bar{x}	4.4828
L.S.D.(5%).....	13.0
L.S.D.(1%).....	17.6
C. V.	7.65%

Malting Barley and Advanced Yield Nurseries

These nurseries include varieties with malting characteristics. Some varieties are now being used in some areas for malting. Others are now being tested to determine the acceptance by the malting barley trade. Two feed barlies are included plus Compana which is used as a check for the yield factor. Ten entries were grown this past year. Plots, used were, five rows, 18 feet long, replicated three times. All nurseries were grown under irrigation, but the one grown on the station at Creston. Moisture conditions were very favorable in the area where it was grown. The locations of the other plots were in Missoula, Lake, and Ravalli counties. The location of these nurseries in the county and the name of the farmer will follow in results and discussion.

Results and Discussion

Following in tabular form is the location by county, address, farmers name, and date of observations made of the malting barley and advance yield nurseries.

<u>County</u>	<u>Name of Farmer</u>	<u>Address</u>	<u>Date of Observation</u>	<u>Remarks</u>
Flat-head	Station	Creston		Heading notes taken on this nursery.
Lake	Walter Mangles	Polson	6-11-57	Very clean, no weed control measures needed.
			8-5-57	Severe hail storm hit entire plot.
Missoula	R. Ostergren	Missoula	6-11-57	Cultivated and sprayed. In very good shape.
			7-11-57	Good stand, uniform irrigation. No outstanding differences between varieties at this observation.
Ravalli	Homer Bailey	Stevensville	6-11-57	Cultivated and sprayed nursery. Third replication had received some irrigation. Whole plot needed irrigation.
			7-11-57	Clean nursery, irrigation application uneven. Dry area through all replications. Some plant diseases present.

Yields from three nurseries were very good. The nursery in Lake county was hailed August 5, 1957. Significant results were obtained from three of the nurseries. Results were non-significant from Ravalli county. Where bushel weights were obtained they were all higher than the 48 pound USDA standard. Pirolina had the heaviest test weight in two nurseries, where as Ingrid was highest in the nursery in Ravalli county, that difference being only .5 of a pound. Tables XXX, XXXI, XXXII, and XXXIII show the agronomic data of the individual nurseries. Table XXXIV gives a summary of yield data for western Montana in 1957. Ingrid ranks first in this summary followed by C. I. 10421.

Table XXX. Agronomic data from dryland malting barley and advanced yield nursery, Creston, Montana 1957.
Five row plot, three replications

Planted. April 26, 1957		Harvested. August 15, 1957				Size of Plot. 48 Square Feet.				
Variety or Cross	C. I. or N No.	Head- ing Date	Height in Inches	Lod- ging %	Grams Per Plot			Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
					I	II	III			
Freja	7130	6-24	35	75	1840	1825	1935	5600	77.8*	54.1
Betzes	6398	6-24	39	83	1965	1410	1680	5055	70.2	54.8
Compana (LS)	5438	6-19	35	100	1370	1510	1515	4395	61.1	51.0
Piroline	9558	6-23	39	17	2115	1860	1531	5506	76.5*	56.0
Ingrid	10083	6-30	36	27	1970	1815	2180	5965	82.9*	55.5
Carlsberg II	10114	6-29	35	3	1830	1875	1985	5690	79.1*	53.0
Heines Hanna (LS)	9532	6-26	40	93	1423 ¹	1482	1387	4292	59.6	54.5
Vantage	7324	6-25	47	10	1290	1790	1485	4565	63.4	55.4
Traill (LS)	9538	6-27	45	27	1385	1640	1790	4815	66.9	54.5
Glacier x Titan	50-5639-12	6-18	43	10	1960	1885	1945	5790	80.4*	52.2

¹Calculated missing plot.

Note: Compana is used as a check in this nursery.

*Varieties yielding significantly more than the check.

LS-Loose Smut

Mean Yield.....71.2
S. E. \bar{x}4.6615
L.S.D.(5%).....13.8
C. V.6.49%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	3,344.50	
Varieteis	9	128,197.5	3.42*
Error	17	37,524.647	
Total	28		

Table XXXI. Agronomic data from Malting barley and Advanced Yield nursery. Grown in Lake County on the Walter Mangles farm, Polson, Montana. Five row plots, three replications.

Planted. April 29, 1957 Harvested. August 19, 1957 Size of Plot. 16 Square Feet.

Variety or Cross	C. I. or N No.	I	II	III	Total Grams	Average Bushel Per Acre
Freja	7130	80	110	100	290	12.1
Betzes	6398	100	50	70	220	9.2
Compana	5438	96	100	100	296	12.3
Piroline	9558	135	100	115	350	14.6
Ingrid	10083	175	120	85	380	15.8
Carlsberg II	10114	159	90	101	350	14.6
Heines Hanna	9532	70	55	70	195	8.1
Vantage	7324	155	155	165	475	19.8**
Traill	9538	100	125	101	326	13.6
Glacier x Titan	50-5639-12	170	140	170	480	20.0**

Note: Hail damage very severe.

Compana is used as the check in this nursery.

**Varieties yielding significantly more than the check (1%).

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	2	927	1.94
Varieties	9	2,980.8	6.10*
Error	18	477.1888	
Total	29		

Mean Yield.....	14.0
S. E. \bar{x}	1.5766
L.S.D. (5%).....	4.7
L.S.D. (1%).....	6.4
C. V.	11.27%

Table XXXII. Agronomic data from Malting barley and Advanced Yield Nursery. Grown in Missoula County on the R. G. Ostergren farm, Missoula, Montana. Five row plots, three replications.

Planted. May 6, 1957		Harvested. August 19, 1957			Size of Plot. 48 Square Feet				
Variety or Cross	C. I. or N No.	Height in Inches	Lodging %	Grams Per Plot			Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
				I	II	III			
Freja	7130	27	37	1030	1610	1510	4150	57.7	57.0
Betzes	6398	33	33	1586	1586	1610	4782	66.4	58.2
Compana	5438	26	20	1166	995	1705	3866	53.7	54.2
Pirolina	9558	31	-	1740	1627	1950	5317	73.9*	57.5
Ingrid	10083	32	3	1989	2000	2105	6094	84.7*	56.5
Carlsberg II	10114	26	-	1595	1531	1910	5036	70.0	53.8
Heines Hanna	9532	26	68	849	1514	1774	4137	57.5	56.6
Vantage	7324	38	2	1113	1435	1950	4498	62.5	56.8
Traill	9538	28	17	1380	990	2185	4555	63.3	56.0
Glacier x Titan	50-5639-12	32	2	1605	1585	2040	5230	72.7*	55.0

Compana is used as a check in this nursery.

Mean Yield.....66.2
 S. E. \bar{x}5.7996
 L.S.D.17.2
 C. V.8.76%

Analysis of Variance			
Source	D.F.	Mean Square	F
Replications	2	626,282.5	10.78**
Varieties	9	150,262.0	2.59*
Error	18	58,085.38	
Total	29		

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Table XXXVIII. Agronomic data from Malting Barley and Advanced Yield nursery. Grown in Ravalli County on the Homer Bailey farm, Stevensville, Montana. Five row plots, three reps.

Planted.	May 7, 1957	Harvested.	August 19, 1957	Size of Plot.			48 Square Feet		
Variety or Cross	C. I. or N No.	Height in Inches	Grams Per Plot			Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds	
			I	II	III				
Freja	7130	24	1725	1785	2095	5605	77.9	52.6	
Betzes	6398	26	1545	2175	2055	5775	80.2	54.6	
Compana	5438	21	1550	1393	1424	4367	60.7	50.6	
Piroline	9558	24	1840	1920	2090	5850	81.3	55.0	
Ingrid	10083	26	1855	2360	2060	6275	87.2	55.5	
Carlsberg II	10114	26	1875	1840	2250	5965	82.9	49.5	
Heines Hanna	9532	24	815	1910	1780	4505	62.6	54.1	
Vantage	7324	26	895	2543	1635	5073	70.5	50.8	
Traill	9538	26	1837	1405	1677	4919	68.3	52.0	
Glacier x Titan	50-5639-12	25	1984	1436	2284	5704	79.3	50.1	

Analysis of Variance			
Source	D.F.	Mean Square	F
Replication	2	336,627.5	2.47
Varieties	9	139,580.5	1.02
Error	18	136,208.44	
Total	29		

Mean Yield.....75.1
 S. E. \bar{x}8.8812
 L.S.D.N. S.
 C. V.11.83%

Table XXXIV. Summary of Yield and testweight data for Malting barley and Advanced yield nurseries in western Montana 1957.

Variety or Cross	C. I. or N No.	Yield in Bushels Per Acre				Average Bushel Per Acre	Rank	Test Wt. in Pounds			Average Bushel Per Acre
		Creston	Lake	Missoula	Ravalli			Cres- ton	Miss- oula	Ra- valli	
Freja	7130	77.8*	12.1	57.7	77.9	56.4	6	54.1	57.0	52.6	50.6
Betzes	6398	70.2	9.2	66.4	80.2	56.5	5	54.8	58.2	54.6	55.9
Compana	5438	61.1	12.3	53.7	60.7	47.0	9	51.0	54.2	50.6	51.9
Piroline	9558	76.5*	14.6	73.9*	81.3	61.6	4	56.0	57.5	55.0	56.2
Ingrid	10083	82.9*	15.8	84.7*	87.2	67.7	1	55.5	56.5	55.5	55.8
Carlsburg	10114	79.1*	14.6	70.0	82.9	61.7	3	53.0	53.8	49.5	52.1
Heines Hanna	9532	59.6	8.1	57.5	62.6	47.0	10	54.5	56.6	54.1	55.1
Vantage	7324	63.4	19.8*	62.5	70.5	54.1	7	55.4	56.8	50.8	54.3
Traill	9538	66.9	13.6	63.3	68.3	53.1	8	54.5	56.0	52.0	54.2
Glacier x Titan	10421	80.4*	20.0*	72.7*	79.3	63.1	2	52.2	55.0	50.1	52.4
Mean		71.2	14.0	66.2	75.1	56.6					
S E \bar{x}		4.6615	1.5766	5.7996	8.8812						
L.S.D. (5%)		13.8	4.7	17.2	N. S.						
C. V. %		6.49	11.27	8.76	11.83						

Compana is used as a check

*Significantly higher in yield than the check (5%).

Winter Barley

Work on winter barley was started in 1950. Variety trials have been seeded on the station every year since. Results have been erratic. No particular variety can be selected as being outstanding in yield performance.

One nursery was seeded on the station this year, namely the enterstate yield nursery. Twelve entries were grown in the nursery. These entries were from other workers and breeding material from Montana State College.

Results and Discussion

The mean of this years nursery was much below the means of nurseries grown in past years. A hail storm about the middle of July did considerable damage to some of the riper plots and less to the later maturing varieties. Alpine, a late variety, was highest in yield with 74.3 bushels per acre. Kearney was low in yield with 37.2 bushels per acre. Lodging was 85% in this variety. Hail damage was also greatest in this variety. Yields and other Agronomic data for the other variety are found in Table XXXV.

Total cost for small grain project \$2059.73

Table XXXV. Agronomic data from winter barley nursery grown at Creston, Montana 1957. Four row plots, four replications.

Planted. September 28, 1956 Harvested. July 25, 1957 Size of Plot. 16 Square Feet

Variety or Cross	C. I. or N No.	Head- ing Date	Height in Inches	Lod- ging %	Hail Damage %	Grams Per Plot				Total Grams	Average Bushel Per Acre	Bushel Wt. in Pounds
						I	II	III	IV			
Kearney	7580	5-27	33	85	40	270	285	280	355	1190	37.2	47.4
W.Va. CCx-1-45-22	7582	5-28	37	12	15	440	485	410	410	1745	54.6	47.4
Winter Club	592	6-3	35	10	0	486	526	470	487	1969	61.6	43.2
Ohio Winter	7072	5-28	34	68	21	415	525	435	460	1835	57.4	45.4
Ellis	-	6-2	35	24	10	445	582	443	460	1930	60.3	50.0
Alpine	-	6-2	38	6	1	525	680	610	563	2378	74.3*	47.6
Olympia	-	5-29	38	14	10	555	535	550	568	2208	69.0	50.0
CCx-242	-	5-30	33	76	24	455	530	440	515	1940	60.6	49.0
CCx-51-449	-	5-31	39	58	20	515	485	515	375	1890	59.1	48.3
CCx-51-330	-	6-4	36	25	9	449	395	450	570	1864	58.3	44.5
CCx-54-30	-	5-24	35	72	28	505	510	460	543	2018	63.1	49.3
CCx-51-74	-	5-31	34	38	20	498	360	585	452	1895	59.2	49.0

Note: Winter Club is used as a check in this nursery.
*Varieties yielding significantly more than the check (5%).

Mean Yield.....59.5
S. E. \bar{x}3.7491
L.S.D.(5%).....10.8
L.S.D.(1%).....14.2
C. V.6.3%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	3	1,791	-
Varieties	11	18,638.272	5.18**
Error	33	3,595.939	
Total	47		

1957

Seed Production

Project No. 5024

by

C. W. Roath, Superintendent

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by

Vern R. Stewart, Assistant Agronomist

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Introduction

Certain small grain varieties are scheduled for production at the N. W. Branch Station as needed for distribution to seed growers. Alta Fescue seed is produced each year in quantities generally found more than adequate for seed grower use. Kenland Medium Red Clover is grown for distribution to seed growers and in studies to determine best production procedures.

\$456.88 was expended on this project.

Plans for the coming year call for a demonstration of methods for clover seed production in Lake County, continued study of methods on the Station, continued production of Alta fescue and small grains as scheduled.

Alta Fescue Seed Production

Seed and fall pasture was secured from $1\frac{1}{2}$ acres of Alta Fescue seeded in 1956. Seed was harvested from approximately $1\frac{1}{2}$ acres of Alta Fescue seeded in 1949 before this field was fall plowed. Approximately $1\frac{1}{2}$ acres of new seedings were made using the same seed supply used for previous seedings.

The mean yield of seed from the 1956 seeding (See Fertilizer on Alta Fescue seed under #5020) was 448 pounds per acre, that from the 1949 seeding only about 75 pounds per acre.

The $1\frac{1}{2}$ acres of 1956 seeded fescue was fenced and forty ewes pastured for 27 days, August 13 to September 10. This would be equal to six sheep per acre for four months.

The 1949 seeding held up well in seed production through 1955 or for six years but the 56 and 57 crops were light.

Clover Seed Production

Clover Seed: Both seed and forage yields were determined for Kenland clover seed fields in 1957.

Forage yields from June 4th clippings were determined by taking random samples from 16 sq. ft. at four locations in each field.

Table I. Green Forage Yields from clover seed fields clipped June 4, 1957.

Treatment	Pounds Per Plot				Total Pounds	Tons Per Acre
	I	II	III	IV		
Seeded in 12" rows 1955	8	6	8	7	29	9.97
Seeded in 24" rows 1955 (Cultivated)	5	6	5	6	22	7.49
Seeded in 12" rows 1956	7	6	6	5	24	8.17

Note: Green weights shown are approximately 15% oven dry forage.

Seed yields were determined by running the entire field of swathed and air dried clover once thru the combine.

1/3 acre, 12 inch rows 1955, seeding 62 lbs. x 3-186 pounds per acre.

1/3 acre, 24 inch rows, cultivated 1955 seeding 66 lbs. x 3-198 pounds per acre.

1 acre, 12 inch rows seeded in grain in 1956, 200 lbs. -200 lbs. per acre.

Small Grains

To maintain a high quality of small grain seeds for distribution, foundation and certified seed are produced by the Montana Agricultural Experiment Station. The Northwestern Montana Branch Station is responsible for the production of Vantage and Freja barley; Westmont winter wheat; Park oats; and Pilot spring wheat.

Following in tabular form are data of small grain seeds produced on the station in 1957.

<u>Crop</u>	<u>Variety</u>	<u>Generation</u>	<u>Number of Acres</u>	<u>Amount Pro- duced</u>	<u>Field in- spec- tion</u>	<u>Lab- oratory Data</u>
Wheat (Spring)	Pilot	Certified	2.5	57 bu.	passed	Red Tag
Oats	Park	Foundation	.75	.75 bu.	passed	Blue Tag
Oats	Park	Certified	.3	28 bu.	passed	Non-eligible
Barley	Freja	Foundation	.75	40 bu.	passed	Blue Tag
Barley	Vantage	Certified	2.6	177 bu.	passed	Blue Tag
Wheat	Westmont	Foundation	.75	24 bu.	passed	Blue Tag

1957

Forage Production Methods

Project #5025

by

C. W. Roath, Superintendent

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by

Vern R. Stewart, Assistant Agronomist

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Forage Production Methods

Work on this project this year consists primarily of seeding rates and row and hill spacings for corn silage and hay. A little preliminary work was done on hay harvesting.

\$1526.27 has been spent on this project.

Plans for next year include harvest for another year of present rate and spacing hay plots, harvesting some additional plots seeded in 1957, and expanding hay harvesting work.

Results of this seasons work is shown in Tabular form.

Row Spacing and Seeding Rates for Hay in Table I, II, III, and IV.

Preliminary Hay Harvesting, Table V.

Table I. Row spacings and seeding rates for hay 1957. Yields in pounds from 70 square feet plots, two cuttings.

Rate	Spacing (Inches)	Pounds Per Plot			Total Pounds	Pounds Corrected to 12% Moisture	Tons Per Acre
		I	II	III			
ALFALFA							
1	6	13.31	19.59	18.59	51.49	57.67	5.98
1	12	15.34	18.30	17.59	51.23	57.38	5.95
1	24	15.79	17.24	17.67	50.70	56.78	5.89
2	6	13.59	18.90	15.98	48.47	54.29	5.63
2	12	17.37	18.65	16.07	59.09	58.34	6.05
2	24	18.21	18.27	16.08	52.56	58.88	6.11
							L.S.D.(5%)..... .92T
ALFALFA-BROME							
1	6	14.96	16.14	14.94	46.04	51.56	5.35
1	12	14.74	14.38	13.17	42.29	47.36	4.91
1	24	16.24	15.65	14.42	46.31	51.87	5.38
2	6	17.03	15.52	18.47	51.02	57.14	5.93*
2	12	11.84	14.20	16.55	42.59	47.70	4.95
2	24	14.75	16.25	20.41	51.41	57.58	5.97*
							L.S.D.(5%)..... .58T
ALFALFA-ORCHARD							
1	6	15.23	16.02	17.07	48.32	54.12	5.61
1	12	18.36	15.44	18.07	51.87	58.09	6.02
1	24	17.52	17.42	15.69	50.63	56.71	5.88
2	6	16.81	19.64	16.81	53.26	59.65	6.19
2	12	18.57	16.80	21.20	56.57	63.36	6.57
2	24	16.74	16.20	21.25	54.19	60.69	6.29
							L.S.D.(5%)..... 1.23T

Table II. Row spacings and seeding rates for alfalfa 1957.
Yield from 70 sq. ft. plots, two cuttings.

Reps	Spacing (Inches)	Rate 1	Rate 2	Sum	Total Pounds
I	6	13.31	13.59	26.90	93.61
	12	15.34	17.37	32.71	
	24	15.79	18.21	34.00	
II	6	19.59	18.90	38.49	110.95
	12	18.30	18.65	36.95	
	24	17.24	18.27	35.51	
III	6	18.59	15.98	34.57	101.98
	12	17.59	16.07	33.66	
	24	17.67	16.08	33.75	
	Sum	153.42	153.12	306.54	

	Pounds Per Plot	Three plot Total	Tons Per Acre
S E \bar{x}	0.810		
L.S.D.(5%)	2.645	7.935	.92
C.V....	4.756%		

Table III. Row spacings and seeding rates for alfalfa-brome hay
1957. Yield from 70 sq. ft. plots, two cuttings.

Reps	Spacing (Inches)	Rate 1	Rate 2	Sum	Totals
I	6	14.96	17.03	31.99	89.60
	12	14.74	11.88	26.62	
	24	16.24	14.75	30.99	
II	6	16.14	15.52	31.66	92.23
	12	14.38	14.29	28.67	
	24	15.65	16.25	31.90	
III	6	14.94	18.47	33.41	97.96
	12	13.17	16.55	29.72	
	24	14.42	20.41	34.83	
	Sum	134.64	145.15	279.79	

	Pounds Per Plot	Three Plot Total	Tons Per Acre
S E \bar{x}	.571		
L.S.D(5%)	1.864	5.592	.58T
L.S.D(1%)	2.712	8.136	.84T
C. V.	3.674%		

Table IV. Row spacings and seeding rates for Alfalfa-orchardgrass hay 1957. Yields from 70 square feet plots, two cuttings.

Reps	Spacing (Inches)	Rate 1	Rate 2	Sum	Total Pounds
I	6	15.23	16.81	32.04	103.23
	12	18.36	18.57	36.93	
	24	17.52	16.74	34.26	
II	6	16.02	19.64	35.66	101.52
	12	15.44	16.80	32.24	
	24	17.42	16.20	33.62	
III	6	17.07	16.81	33.88	110.09
	12	18.07	21.20	39.27	
	24	15.69	21.25	36.94	
	Sum	150.82	163.02	314.84	314.84

	Pounds Per Plot	Three Plot Total	Tons Per Acre
S E X	1.08		
L.S.D.(5%)	3.527	10.581	1.23

Table V. Date of alfalfa harvest (Prelim) Yields from 80 square feet plots, two cuttings.

Treatment	Pounds Per Plot				Pounds Oven Dry	Pounds Corrected to 12% Moisture	Tons Per Acre
	I	II	III	IV			
Cut when ready							
1st Cut 6/21	8.578	9.531	7.816	6.672			
2nd Cut 8/21	<u>6.875</u>	<u>6.875</u>	<u>7.500</u>	<u>7.500</u>			
Season Yield	15.453	16.406	15.316	14.172	61.347	68.71	4.68
Clipped 5/6 to delay maturity to dry weather							
1st cut 7/5	6.75	7.50	5.75	6.50			
2nd cut 8/21	<u>4.787</u>	<u>5.524</u>	<u>5.524</u>	<u>5.156</u>			
Seasons Yield	11.537	13.024	11.274	11.656	47.49	53.19	3.62

Mean4.15

Corn Silage

The method of producing maximum corn silage yields has been studied at this station since 1954. These studies have been designed to study varieties, population rates, and seeding dates. Varieties have been grouped as to maturity classes.

This past season, three seeding dates, six varieties, and four plant populations were used. Seeding dates, rates and populations are listed in the following table. Seeding was done with a belt seeder. Plots were two rows, 20 feet long and replicated three times. Barnyard manure was applied to the area before seeding at about six tons per acre. This is grown in a rotation consisting of a grain crop, row crop and clover. The corn follows a grain crop. Five inches of water were applied by irrigation during the growing season. Four cultivations were made to control weeds during the growing season. Frost on September 9 terminated all growth.

Results and Discussion

This years high yield came from the combination of the high population rate, seeded May 25 with the variety Dekalb 1051. On a green weight basis the late varieties give a higher yield per ton per acre, but on a dry basis little difference is found in total dry matter between the late and medium varieties. For all varieties, May 25 was the best seeding date. For population the high rate was highest yielding. The variety differences were not large. Only Funks G-40A was significantly lower in yield than the rest of the varieties. The other five were all about equal in yield on a dry matter basis.

Considerable reduction in plant emergence as compared to seed planted was found in the study, however it is not as great as it was in 1956.

The tables following in this section give yields as related to seeding date, population and variety. Included also is a complete analysis of variance.

Table VI. Yields of corn silage, oven dry, grown in two row plots, 20 feet long. Three replications of three plantings, four populations, and six varieties.

Harvested. September 11 and 12, 1957

Size of Plot. 106.67 sq. Ft.

Variety	Plot Yields in Pounds				Plot Yields in Pounds			
	I	II	III	Sum	I	II	III	Sum
	Seeded - - - -20,000				30,000			
	Harvested - - 18,253				26,694			
	Seeded, May 15							
Dekalb 1024	11.1	17.3	16.9	45.3	13.5	17.8	21.5	52.8
Dekalb 1051	14.1	16.0	16.5	46.6	22.3	11.3	16.5	50.1
Funks G-6	15.9	16.2	16.6	48.7	19.6	27.4	18.4	65.4
Dekalb 67	13.6	15.5	16.8	45.9	17.1	15.3	23.5	55.9
Kingscrot KF	9.5	18.3	12.8	40.6	18.7	16.3	14.4	49.4
Funks G-40-A	16.2	15.0	12.2	43.4	16.5	12.3	12.8	41.6
Sum	80.4	98.3	91.8	270.5	107.7	100.4	107.1	315.2
	Seeded, May 25							
Dekalb 1024	10.0	16.6	13.3	39.9	18.6	21.8	21.5	61.9
Dekalb 1051	20.3	19.4	18.7	58.4	15.0	13.8	15.7	44.5
Funks G-6	19.7	18.6	26.2	64.5	16.7	14.6	18.3	49.6
Dekalb 67	21.2	20.5	15.5	57.2	23.1	18.0	16.8	57.9
Kingscrot KF	15.3	15.2	17.9	48.4	19.9	21.1	16.7	57.7
Funks G-40-A	19.7	13.8	14.2	47.7	13.8	18.6	13.1	45.5
Sum	106.2	104.1	105.8	316.1	107.1	107.9	102.1	317.1
	Seeded, June 5							
Dekalb 1024	10.7	7.8	11.9	30.4	10.6	13.7	10.9	35.2
Dekalb 1051	8.4	8.1	21.6	38.1	10.8	13.7	14.3	38.8
Funks G-6	10.1	9.5	8.1	27.7	12.1	9.1	12.0	33.2
Dekalb 67	11.2	12.0	12.1	35.3	15.4	15.5	13.4	44.3
Kingscrot KF	13.9	9.2	10.3	33.4	15.9	12.7	11.0	39.6
Funks G-40-A	9.6	7.8	11.7	29.1	12.2	8.3	15.0	35.5
Sum	63.9	54.4	75.7	194.0	77.0	73.0	76.6	226.6
Sum of 3 Dates	250.5	256.8	273.3	780.6	291.8	281.3	285.8	858.9

Continued-

Table VI. Yields of corn silage, oven dry, grown in two row plots, 20 feet long. Three replications of three plantings, four populations, and six varieties. (Continued)

Harvested. September 11 and 12, 1957					Size of Plot. 106.67 Sq. Ft.				
Variety	Plot Yields in Pounds				Plot Yields in Pounds				Sum for 4 Populations
	I	II	III	Sum	I	II	III	Sum	
	Seeded - - - - 40,000				60,000				
	Harvested - - - 35,847				50,306				
	Seeded, May 15								
Dekalb 1024	19.7	11.3	19.2	50.2	21.3	18.5	20.6	60.4	208.7
Dekalb 1051	21.5	13.1	15.7	50.3	17.8	15.4	19.9	53.1	200.1
Funks G-6	14.2	16.5	19.6	50.3	17.8	17.6	23.0	58.4	222.8
Dekalb 67	20.5	19.2	23.9	63.6	22.2	20.4	20.1	62.7	228.1
Kingscrot KF	13.7	19.7	18.6	52.0	20.4	14.3	21.9	56.6	198.6
Funks G-40-A	18.0	19.0	17.9	54.9	18.2	14.2	15.7	48.1	188.0
Sum	107.6	98.8	114.9	321.3	117.7	100.4	121.2	339.3	1246.3
	Seeded, May 25								
Dekalb 1024	15.3	21.3	15.1	51.7	15.5	24.3	34.5	74.3	227.8
Dekalb 1051	33.8	23.5	18.4	75.7	25.7	22.0	21.4	69.1	247.7
Funks G-6	18.1	21.9	24.8	64.8	21.2	24.6	17.1	62.9	241.8
Dekalb 67	18.2	21.5	18.0	57.7	21.3	19.6	12.9	53.8	226.6
Kingscrot KF	18.5	22.8	24.4	65.7	22.9	21.7	17.0	61.6	233.4
Funks G-40-A	16.5	16.8	23.0	56.3	19.8	19.5	14.6	53.9	203.4
Sum	120.4	127.8	123.7	371.9	126.4	131.7	117.5	375.6	1380.7
	Seeded, June 5								
Dekalb 1024	11.1	9.5	15.7	36.3	12.9	27.2	13.6	53.7	155.6
Dekalb 1051	13.9	13.8	11.9	39.6	17.5	17.7	12.4	47.6	164.1
Funks G-6	19.4	13.5	15.2	48.1	12.4	17.3	15.8	45.5	154.5
Dekalb 67	10.5	11.7	16.8	39.0	11.5	11.9	15.6	39.0	157.6
Kingscrot KF	12.9	14.9	16.6	44.4	15.4	14.5	15.1	45.0	162.4
Funks G-40-A	13.9	14.9	13.9	42.7	15.5	19.2	12.9	47.6	154.9
Sum	81.7	78.3	90.1	250.1	85.2	107.8	85.4	278.4	949.1
Sum of 3 Dates	309.7	304.9	328.7	943.3	329.3	339.9	324.1	993.3	3576.1

Table VII. Mean Yields of six varieties of silage corn for three seeding dates and four populations over dry weights. (Weights in table are tons per acre).

Variety	Populations				Average of each Variety in Tons Per Acre	
	Seeded---20,000	30,000	40,000	60,000	60,000	50,306
	Harvested---18,253	26,694	35,847	50,306		
	May 15					
Dekalb 1024	3.1	3.6	3.4	4.1	3.6	
Dekalb 1051	3.2	3.5	3.4	3.6	3.4	
Funks G-6	3.3	4.5	3.4	4.0	3.8	
Dekalb 67	3.1	3.8	4.3	4.3	3.9	
Kingscrost KF	2.8	3.4	3.5	3.9	3.4	
Funks G-40-A	3.0	2.8	3.7	3.3	3.2	
Average	3.1	3.6	3.6	3.9	3.6	
	May 25					
Dekalb 1024	2.7	4.2	3.5	5.1	3.9	
Dekalb 1051	4.0	3.0	5.2	4.7	4.2	
Funks G-6	4.4	3.4	4.4	4.3	4.1	
Dekalb 67	3.9	3.9	3.9	3.7	3.9	
Kingscrost KF	3.3	3.9	4.5	4.2	4.0	
Funks G 40-A	3.3	3.1	5.2	3.7	3.8	
Average	3.6	3.6	4.5	4.3	4.0	
	June 5					
Dekalb 1024	2.1	2.4	2.5	3.7	2.7	
Dekalb 1051	2.6	2.6	2.7	3.2	2.8	
Funks G-6	1.9	2.3	3.3	3.1	2.7	
Dekalb 67	2.4	3.0	2.7	2.7	2.7	
Kingscrost KF	2.3	2.7	3.0	3.1	2.8	
Funks G-40-A	2.0	2.4	2.9	3.2	2.6	
Average	2.2	2.6	2.9	3.2	2.7	
Average of all Populations	3.0	3.3	3.7	3.8	3.5	

L.S.D. for Dates (5%) .33 T/A
(1%) .43 T/A

Table VIII. Mean Yields of six varieties planted at four population rates for three seeding dates. Plot Yields in tons per acre.

Variety	Seeded-----20,000 Harvested---18,253	Population Rates			Average all Varieties
		30,000	40,000	60,000	
Dekalb 1024	2.6	3.4	3.1	4.3	3.4
Dekalb 1051	3.3	3.0	3.8	3.8	3.5
Funks G-6-	3.2	3.4	3.7	3.8	3.5
Dekalb 67	3.1	3.6	3.6	3.6	3.5
Kingscrot KF	2.8	3.3	3.7	3.7	3.4
Funks G-40-A	2.8	2.8	3.9	3.4	3.2
Average all Populations	3.0	3.3	3.7	3.8	3.5

L.S.D. for Varieties (5%)-.33 T/A
 (1%)-.43 T/A
 L.S.D. for Population (5%)-.26 T/A
 (1%)-.35 T/A

Complete Analysis of Variance

<u>Variation due to</u>	<u>D. F.</u>	<u>Sum of Square</u>	<u>Mean Square</u>	<u>F</u>	<u>q</u>
Blocks	2	8.24	4.12		
Date	2	1,354.96	677.48	57.60**	
Populations	3	488.57	162.86	13.85**	
Varieties	5	98.34	19.67	16.73**	
Varieties x Dates	10	105.49	10.55		
Varieties x Populations	15	230.70	15.38	1.31	
Varieties x Dates x Populations	30	350.49	11.68	.99	
Dates x Population	6	49.17	8.20		
Blocks x dates	4	39.99	10.00		
Block x Populations	6	35.05	5.84		
Block x Dates x Populations	12	146.15	12.18	1.04	
Error	120	1,411.03	11.76		3.4293
Total	215	4,318.18			

$$\frac{S.E.}{\bar{x}} \times 100 = C.V.$$

$$C.V. = 11.05\%$$

1957

Small Grain Production Methods

Project No. 5026

by

Vern R. Stewart, Assistant Agronomist

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Small Grain Production Methods

Introduction

The importance of obtaining economic production of cereals from an acre has made it necessary to study production methods of cereal crops. Three approaches have been made to this problem. They are (1) Seeding date; (2) Seeding rates and spacing; and (3) fallow vs cultivated row crop land for cereal production. Each of these methods or projects will be discussed in this section of the annual report.

Cost of this project in 1957 was \$704.94

Seeding Dates

A study was started in the fall of 1955 to determine the best date of seeding for winter wheat. Two varieties and three dates were used in the study. The varieties used were Westmont and Wasatch. Seeding dates were every ten days starting the 19th of September. Seeding was done with a hand belt seeder. Plots were cultivated and sprayed for weed control.

Results and Discussion

Differences were noted in tillering between dates of seeding. No tillering counts were made, however an observation made indicated that there was considerably less tillering in the late date of seeding, and the variety Westmont. The analysis of variance show differences to be present only for varieties. For a two year average, September 27 seeding has resulted in the highest yield in bushels per acre. Tables I, II, and III, show the results of the 1956-1957 test.

Table I. Agronomic data from date of planting study with winter wheat, three dates, two varieties. Four row plots four replications. Plot size 16 square feet.

Replication	Seeding Date	Variety		Sum	Total
		Westmont	Wasatch		
I	September 19	530	345	875	2865
	September 29	560	415	975	
	October 9	550	465	1015	
II	September 19	500	475	975	2840
	September 29	575	415	990	
	October 9	500	375	875	
III	September 19	576	500	1076	3137
	September 29	591	435	1026	
	October 9	570	465	1035	
IV	September 19	582	406	988	3118
	September 29	455	585	1040	
	October 9	610	480	1090	
		6599	5361	11960	11960

Table II.

Date of Seeding	Westmont	Wasatch	Sum	Ave. Bu./Acre
September 19	2188	1726	3914	48.9
September 29	2181	1850	4031	50.4
October 9	2230	1785	4015	50.2
Sum	6599	5361	11960	
Average Bu/Acre	55.0	44.7		

Mean Yield.....49.8
 Varieties-----L.S.D.(5%)..... .8 bu/A
 L.S.D.(1%).....1.1 bu/A

Table III. Agronomic data from date of planting study, Creston, Montana, 1957.

Seeding Date	Variety	Head- ing Date	Height in Inches	Lod- ging %	Average Yield Per Acre
September 19	Westmont	5-29	44	T	54.7
September 19	Wasatch	5-29	45	9	43.2
September 29	Westmont	5-31	38	5	53.0
September 29	Wasatch	6-2	42	5	46.3
October 9	Westmont	6-2	36	-	55.7
October 9	Wasatch	6-7	43	30	44.6

Analysis of Variance

<u>Variance due to</u>	<u>D.F.</u>	<u>Sum of Square</u>	<u>Mean Square</u>	<u>σ^2</u>	<u>F</u>
Replications	3	12,687	4,239.0	.	2.23
Dates	2	1,006	503.0		
Error a	6	11,414	1,902.333		
Main Plots	11	25,107	2,282.455		
Varieties	1	63,861	63,861.00		14.37**
Varieties and Dates	2	1,268	634.0		
Error b	9	39,990	4,443.33	66.658	
Total	23	130,226			

Space planted and Row planted Spring Wheat

Work has been done on seeding rates and row spacing of small grains at the Northwestern Montana Branch Station. This work has indicated differences between row spacing and also seeding rates. These data can be found in the annual reports of this station.

The trial in 1957 was designed to determine some of the factors that affect yield in grains when row or space planted.

Seeding of the row planted material was done with a four row mounted tractor powered, belt seeder. Space planting was done with a board, which has holes in it, spaced to give a certain plant population or seeding rate per acre. A board ten feet long and one foot wide was used. Holes on four inches centers or nine holes per square foot equals 360,000 plants per acre. Sixteen per square foot gave 720,000 plants per acre and 25 per square foot is 1,080,000 plants per acre. Seeding rates per acre as listed in above order are, 32.7 pounds per acre, 58 pounds per acre and 90 pounds per acre respectively. Plots were 40 square feet for space planted material or 40 square feet. Thirty-two square feet were harvested for yield.

Results and Discussion

Little difference was found between seeding rates in this test, difference of four bushels per acre was not found significant when analyzed statistically. A statistical difference was found to be highly significant due to the method of seeding. The high yield coming from the row planting method. The yield for the space method was 27.3 bushels per acre and for the row was 34.8 bushels per acre.

The heading date was the earlier for row planted material. Bushel weights were also found to be heavier for the row planted material. Tables IV, V, and VI show the data for the experiment.

Table IV. Agronomic data from spring and row planting of Pilot spring wheat at three rates of seeding, Creston, Montana 1957.

Planted. May 3, 1957 Harvested. August 26, 1957 Size of Plot 40 Sq. Ft.

Replication	Rate of Seeding	Plants Per Acre	Space Planted	Row Planted	Sum	Replication Total
	Lbs/A.					
I	35.7	360,000	30.8	35.0	65.8	
	58.0	720,000	34.6	31.0	65.6	
	90.0	1,080,000	21.1	36.0	57.1	188.5
II	32.7	360,000	27.8	27.7	55.5	
	58.0	720,000	29.3	33.0	62.3	
	90.0	1,080,000	29.7	34.1	63.8	181.6
III	32.7	360,000	22.1	29.3	51.4	
	58.0	720,000	25.0	31.4	56.4	
	90.0	1,080,000	32.1	45.9	78.0	185.8
IV	32.7	360,000	25.0	27.3	52.3	
	58.0	720,000	29.0	34.0	63.0	
	90.0	1,080,000	26.2	44.0	70.2	185.5
V	32.7	360,000	25.8	31.1	56.9	
	58.0	720,000	22.6	37.8	60.4	
	90.0	1,080,000	21.4	36.6	58.0	175.3
VI	32.7	360,000	29.8	30.7	60.5	
	58.0	720,000	25.0	48.5	73.5	
	90.0	1,080,000	33.6	33.0	66.6	200.6

Table V. Agronomic data from spacing and row planting of Pilot spring wheat at three rates of seeding, Creston, Montana 1957.

Planted. May 3, 1957 Harvested. August 26, 1957 Size of Plot 40 Sq. Ft.

Seeding Rate		Space Planted	Row Planted	Sum	Average Bushel Per Acre
Pounds Per Acre	Plants Per Acre				
32.7	360,000	161.3	181.1	342.4	28.5
58.0	720,000	165.5	215.7	281.2	31.8
90.0	1,080,000	164.1	229.6	393.7	32.9
Sum		490.9	626.4	1117.3	
Average Bushel/acre		27.3	34.8		

Rate of Seeding L.S.D.N. S.
 Method of Seeding L.S.D.(5%)..1.6
 Planting L.S.D. (1%).....2.2

Table VI. Heading dates and bushel weights from spring and row planting of Pilot spring wheat at three rates of seeding Creston, Montana 1957.

<u>Seeding Rates</u>		<u>Heading Date</u>		<u>Bushel Weight</u>	
<u>Pounds</u> <u>Per</u> <u>Acre</u>	<u>Plants</u> <u>Per</u> <u>Acre</u>	<u>Space</u> <u>Planted</u>	<u>Row</u> <u>Planted</u>	<u>Space</u> <u>Planted</u>	<u>Row</u> <u>Planted</u>
32.7	360,000	7-2	6-29	59.1	59.4
58.0	720,000	7-2	6-29	58.7	59.4
90.0	1,080,000	7-2	6-29	58.6	59.5

<u>Variation Due to</u>	<u>Analysis of Variance</u>				
	<u>D.F.</u>	<u>Sum of</u> <u>Square</u>	<u>Mean</u> <u>Square</u>	<u>o⁻</u>	<u>F</u>
Replication	5	58.874	11.7748		
Seeding rate	2	119.261	59.6305		2.37
Error a	10	251.452	25.1452	5.0145	
Total Main Plots	17	429.589			
Method	1	510.007	510.007		20.15**
Seeding rate and Method	2	90.186	45.0930		1.78
Error b	15	379.622	25.3081	5.0307	
Total	35	1,409.404			

Fallow vs Row crop for Small Grain Production

An observation of rotation yield data at the station showed that grain yields from an area in a cultivated crop under dryland conditions was equal to or better than grain grown on fallowed land. A detailed study has been designed under dryland conditions to measure these differences. The study consists of winter wheat grown on land that has been fallowed and land that has been in corn grown for silage. This study is located in field F-4 on the station.

Results and Discussion

There was not any significance in the study this year. Yield for fallow land was 36.0 and for corn land 37.1. The C. V. in the test is very good, indicating the reliability of this test. See table VII for yield data.

Table VII. Agronomic yield data from Westmont Winter Wheat grown on summer fallow and land in cultivated corn crop previous year.

Planted.	Harvested.				Size of Plot 600 Sq. Ft.	
	Plot Yields in Bushel/Acre				Total	Average
Treatment	I	II	III	IV	Bushel	Bu/Acre
Fallow land	36.9	35.7	33.3	38.1	144.0	36.0
Corn land	35.7	43.6	33.9	35.1	148.3	37.1
Analysis of Variance					Mean Yield.....	36.5
					S. E. \bar{x}	1.6905
					L.S.D.	N. S.
					C. V.	4.63%
Source	D.F.	Mean Square		F		
Replication	3	18.377		1.6		
Treatment	1	2.311				
Error	3	11.431				
Total	7					

1957

Potato Production

Project No. 5027

by

C. W. Roath, Superintendent

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Introduction

1957 was the fourth year for this work, the third in which seed size, fertilizer application, harvesting techniques etc. have been the same.

\$769.26 was the cost of this project.

One more year is planned without change. However there seems to be little chance that trends established will be reversed.

Nitrogen in addition to adequate phosphate has improved total yield and yield of tubers above 8 ounces in weight. Increasing the spacing between hills has increased production of large tubers. Use of small seed pieces favors light set and large tubers while use of large seed pieces encourages heavy set and production of small tubers.

Dryland yields were light and few tubers reached eight ounces in size.

Eight varieties were grown in a yield trial and scab observations made. A few hills were dug, August 23 to see if any variety was adapted to early harvest. Early gem appeared best for this purpose.

See Table XI.

Irrigated Potato Production

Influence of Seed Size, Spacings and Nitrogen Rates on Size, Set, and yield of Netted Gem potatoes.

The potatoes were planted May 24, in soil prepared for seeding in a three year rotation of grain in which Kenland Clover was seeded, Clover cut for hay and the second growth plowed down, followed by potatoes. Barn yard manure was added to one-half the plots. Nitrogen rates were side-dressed at planting time, together with a uniform application of 300 pounds per acre of treble super phosphate.

The potatoes were irrigated on July 12, July 25, and August 13 with a two inch irrigation. Harvest was completed, October 4, 1957. 1/100 acre plots were harvested. 100 pounds samples from each plot were counted and sorted to determine size and set.

Table I. 1957 Irrigated Summary

<u>Number of Plots</u>	<u>Treatment</u>	<u>Total Number Ones</u>	<u>Eight Ounces Plus</u>	<u>Minus Eight Ounces</u>	<u>Total Field Run</u>	<u>Tubers Per Hill</u>
36	Phos. no N.	292.97	137.64	155.33	320.81	5.24
36	Phos. 10 N.	284.30	155.61	128.69	319.28	5.25
36	Phos. 20 N.	280.97	139.69	141.28	316.90	5.21
36	Phos. 40 N.	309.64	168.03	141.61	350.70	5.47
72	All 1 $\frac{1}{4}$ oz. seed	289.94	158.44	131.50	321.79	5.05
72	All 2 $\frac{1}{2}$ oz. seed	294.10	142.03	152.07	332.04	5.54
48	9 in. Spacing	300.60	130.60	170.00	330.64	4.26
48	12 in. Spacing	296.29	157.94	138.35	329.23	5.49
48	15 in. Spacing	279.19	162.17	117.02	320.87	6.135
72	Manured	297.70	154.17	143.53	333.50	5.39
72	Manure (None)	286.31	146.30	140.01	320.33	5.20

Table II. Yields in Pounds per plot of 1/100 Acre of sorted tubers 8 ounces and over. Irrigated
No manure.

(Inches) Spacing	1 1/4 ounce seed			2 1/2 ounce seed			Total Pounds	
	I	II	III	Sum	I	II		III
Phosphate and No Nitrogen								
9	71	83	138	292@	99	107	88	294@
12	104	112	183	399	121	133	150	404
15	158	148	148	454	153	138	138	429
Sum	333	343	469	1145	373	378	376	1127
Phosphate and 10 pounds Nitrogen								
9	117	94	155	366	118	95	116	329
12	169	184	165	518**	159	108	135	402
15	177	174	197	548**	165	146	169	480
Sum	463	452	517	1432	442	349	420	1211
Phosphate and 20 pounds Nitrogen								
9	178	147	163	488*	70	75	88	233@
12	161	154	169	484*	144	150	120	414
15	177	146	134	457	147	153	126	426
Sum	516	447	466	1429	361	378	334	1073
Phosphate and 40 pounds Nitrogen								
9	193	125	208	526**	149	135	153	437
12	184	147	170	501*	184	172	189	545**
15	152	140	158	450	164	215	187	566**
Sum	529	412	536	1477	497	522	529	1548
Totals	1841	1654	1988	5483	1673	1627	1659	4959

Check is 1 1/4 ounce seed, 12 inch spacing, no Nitrogen.

*More than check @ 5%.

**More than check @ 1%.

@ Less than check @ 5%.

Mean Yield.....145.03
L.S.D. (5%), three plot total...82.63 lbs.
L.S.D. (1%), three plot total...111.39 lbs.

Table III. Yield in pounds per plot of sorted tubers under eight ounces from 1/100 acre plots. Irrigated, no manure.

Spacing (Inches)	1 $\frac{1}{4}$ ounce seed				2 $\frac{1}{2}$ ounce seed				Total Pounds	
	I	II	III	Sum	I	II	III	Sum		
Phosphate and No Nitrogen										
9	194	188	166	548*	195	161	232	588**	1136	
12	182	150	117	449	140	136	171	447	896	
15	85	109	93	287@	153	133	170	456	743	
Sum	<u>461</u>	<u>447</u>	<u>376</u>	1284	<u>488</u>	<u>430</u>	<u>573</u>	1491	<u>2775</u>	
Phosphate and 10 pounds Nitrogen										
9	149	146	145	440	164	153	170	487	927	
12	108	83	129	320@	142	143	158	443	763	
15	<u>121</u>	<u>122</u>	<u>84</u>	<u>327@</u>	<u>100</u>	<u>110</u>	<u>94</u>	<u>304@</u>	<u>631</u>	
Sum	<u>378</u>	<u>351</u>	<u>358</u>	1087	<u>406</u>	<u>406</u>	<u>422</u>	1234	2321	
Phosphate and 20 pounds Nitrogen										
9	171	126	160	457	236	171	201	608**	1065	
12	131	120	118	369	128	137	158	423	792	
15	<u>114</u>	<u>89</u>	<u>127</u>	<u>330@</u>	<u>106</u>	<u>106</u>	<u>125</u>	<u>337@</u>	<u>667</u>	
Sum	<u>416</u>	<u>335</u>	<u>405</u>	1156	<u>470</u>	<u>414</u>	<u>484</u>	1368	<u>2524</u>	
Phosphate and 40 pounds Nitrogen										
9	143	172	145	460	174	163	183	520	980	
12	127	141	132	400	136	98	137	371	771	
15	<u>115</u>	<u>101</u>	<u>134</u>	<u>350@</u>	<u>112</u>	<u>118</u>	<u>133</u>	<u>363@</u>	<u>713</u>	
Sum	<u>385</u>	<u>414</u>	<u>411</u>	1210	<u>422</u>	<u>379</u>	<u>453</u>	1254	<u>2464</u>	
Totals	1640	1547	1550	4737	1786	1629	1932	5347	10,084	

Check is 1 $\frac{1}{4}$ ounce seed, 12 inch spacing, 0 Nitrogen

*More than check @ (5%).

**More than check @ (1%).

@ Less than check @ 5%.

Mean Yield.....140.06

L.S.D. (5%) 3 plot total....80.44 lbs.

L.S.D. (1%) 3 plot total....108.44 lbs.

Table IV. Pounds per plot of tuber eight ounces and over. 1/100 acre plots. Irrigated and manured, 1957.

Spacing (Inches)	1 $\frac{1}{4}$ ounce seed				2 $\frac{1}{2}$ ounce seed				Total Pounds	
	I	II	III	Sum	I	II	III	Sum		
Phosphate and no Nitrogen										
9	132	81	139	352@	146	121	138	405	757	
12	129	135	185	449	134	135	142	411	860	
15	178	180	178	536	206	146	178	530	1066	
Sum	439	396	502	1337	486	402	458	1346	2683	
Phosphate and 10 pounds Nitrogen										
9	152	129	167	448	100	148	104	352	800	
12	192	206	206	604**	133	132	146	411	1015	
15	181	187	174	542*	194	156	152	502	1044	
Sum	525	522	547	1594	427	436	402	1265	2859	
Phosphate and 20 pounds Nitrogen										
9	150	159	179	488	85	100	64	249@	737	
12	146	171	186	503	166	125	133	424	927	
15	155	132	157	444	151	123	144	418	862	
Sum	451	462	522	1435	402	348	341	1091	2526	
Phosphate and 40 pounds Nitrogen										
9	168	156	173	497	149	127	145	421	918	
12	170	194	214	578**	179	154	201	534	1112	
15	149	191	144	484	164	179	175	518	1002	
Sum	487	541	531	1559	492	460	521	1473	3032	
Totals	1902	1921	2102	5925	1807	1646	1722	5175	11,100	

Check is 1 $\frac{1}{4}$ ounce seed, 12 inch spacing No Nitrogen.

*More than check @ 5%.

**More than check @ 1%.

@ Less than check @ 5%.

Mean Yield.....154.17

L.S.D.(5%) 3 plot total..92.29 lbs.

L.S.D.(1%) 3 plot total..124.41 lbs.

C. V.6.918%

Table V. Yield per plot in pounds. Single row plots, 130 feet, three reps 1957.
(Sorted tubers under eight ounces from manured soils) Irrigated.

Spacing (Inches)	1 1/4 ounce seed			2 1/2 ounce seed			Total Pounds		
	I	II	III	Sum	I	II		III	Sum
Phosphate and No Nitrogen									
9	157	213	171	541**	170	205	207	582**	1123
12	132	139	98	369	172	158	163	493*	862
15	124	125	115	364	101	140	127	368	732
Sum	413	477	384	1274	443	503	497	1443	2717
Phosphate and 10 pounds Nitrogen									
9	167	163	147	477*	165	125	160	450	927
12	88	74	83	245	162	164	170	496**	741
15	128	93	98	319	69	127	129	325	644
Sum	383	330	328	1041	396	416	459	1271	2312
Phosphate and 20 pounds Nitrogen									
9	144	139	130	413	201	159	230	590**	1003
12	140	118	140	398	147	152	173	472*	870
15	97	90	97	284	120	144	141	405	689
Sum	381	347	367	1095	468	455	544	1467	2562
Phosphate and 40 pounds Nitrogen									
9	143	149	150	442	195	188	174	557**	999
12	145	134	133	412	146	140	148	434	846
15	145	89	134	368	132	141	157	430	798
Sum	433	372	417	1222	473	469	479	1421	2643
Totals	1610	1526	1496	4632	1780	1843	1979	5602	10,234

Check is 1 1/2 ounce seed, 12 inches spacing, No Nitrogen.

*More than check @ 5%.

**More than check @ 1%.

Mean Yield.....142.139
L.S.D. (5%) 3 plot total.....83.87 lbs.
L.S.D. (1%) 3 plot total.....113.058 lbs.
C. V.6.819%

Dryland Potato Production

Single row plots (130 feet of 40 inch row) were seeded, May 23, on fallow ground in a rotation of fallow, potatoes, grain. Alternate plots had a green manure crop seeded with the grain and plowed down the fallow year.

Fertilizers as indicated were side dressed at planting time. The standard Phosphate application consisted of 200 pounds per acre of treble super phosphate.

This has been one of the driest seasons experienced on the Northwestern Branch Station and this condition is reflected in yields, particularly of large tubers.

Summary of Dryland Trials 1957

Table VI. Yields in Cwt. Per Acre.

No. of Plots	Treatment	Total No. Ones	Eight Ounces Plus	Minus Eight Ounces	Field Run	Tubers Per Hill (1)
54	1 $\frac{1}{4}$ ounce seed	88.65	13.5	75.15	109.20	3.83
54	2 $\frac{1}{2}$ ounce seed	83.35	5.72	77.63	101.78	4.07
36	12 inch spacing	87.46	5.80	81.66	108.0	3.30
36	18 inch spacing	85.19	9.72	75.47	107.03	3.49
36	24 inch spacing	85.89	13.86	72.03	101.44	5.06
36	Phos. & 0 N.	84.89	8.03	76.86	103.87	3.90
36	Phos. & 10 N.	88.17	9.92	78.25	105.19	4.05
36	Phos. & 20 N.	85.50	11.44	74.06	107.64	3.89
54	Green Manure	86.92	10.92	76.0	108.46	4.06
54	No green Manure	85.45	8.67	76.78	102.52	3.84

(1) This is the number recovered by the digger. A great many small tubers were left in the field. Thus the tubers per hill reported are not the actual number that set, only those that set that reached sufficient size to ride the digger chain.

Table VII. Yield in pounds per plot of 1/100 acre of tubers. Eight ounces and over from Dryland with no green manure, 1957.

Spacing (Inches)	1 $\frac{1}{4}$ ounce seed				2 $\frac{1}{2}$ ounce seed				Total Pounds
	I	II	III	Sum	I	II	III	Sum	
Phosphate and No Nitrogen									
12	10	6	14	30	0	4	2	6	36
18	5	19	8	32	1	12	1	14	46
24	3	23	25	51	1	5	2	8	59
Sum	<u>18</u>	<u>48</u>	<u>47</u>	<u>113</u>	<u>2</u>	<u>21</u>	<u>5</u>	<u>28</u>	<u>141</u>
Phosphate and 10 pounds Nitrogen									
12	1	1	3	5	0	4	0	4	9
18	4	14	16	34	4	3	7	14	48
24	6	42	31	79*	2	8	2	12	91
Sum	<u>11</u>	<u>57</u>	<u>50</u>	<u>118</u>	<u>6</u>	<u>15</u>	<u>9</u>	<u>30</u>	<u>148</u>
Phosphate and 20 pounds Nitrogen									
12	1	14	5	20	0	8	1	9	29
18	6	18	31	55	0	3	7	10	65
24	1	35	35	71*	4	8	2	14	85
Sum	<u>8</u>	<u>67</u>	<u>71</u>	<u>146</u>	<u>4</u>	<u>19</u>	<u>10</u>	<u>33</u>	<u>179</u>
Total	37	172	168	377	12	55	24	91	468

Check is 1 $\frac{1}{2}$ ounce seed, 12 inch spacing, no nitrogen.
 *More than the check @ 5%.

Mean Yield.....8.67
 L.S.D.(5%) 3 plot total.27.6 lbs.
 C. V.3.645%

Table VIII. Yield in pounds per plot of 1/100 acre of tubers under eight ounces from dryland with not green manure, 1957.

Spacing (Inches)	1 $\frac{1}{4}$ ounce seed				2 $\frac{1}{2}$ ounce seed				Total Pounds
	I	II	III	Sum	I	II	III	Sum	
Phosphate, No Nitrogen									
12	85	80	93	258	52	83	82	217	475
18	58	69	87	214	65	95	101	261	475
24	53	73	86	212	60	74	86	220	432
Sum	196	222	266	684	177	252	269	698	1382
Phosphate and 10 pounds Nitrogen									
12	78	91	93	262	54	96	83	233	495
18	61	100	96	257	55	78	82	215	472
24	61	70	90	221	61	74	97	232	453
Sum	200	261	279	740	170	248	262	680	1420
Phosphate and 20 pounds Nitrogen									
12	76	80	90	246	66	108	82	256	502
18	56	76	90	222	56	71	86	213	435
24	56	82	67	205	48	48	102	198*	403
Sum	188	238	247	673	170	227	270	667	1340
Total	584	721	792	2097	517	727	801	2045	4142

Check is 1 $\frac{1}{2}$ ounce seed, 12 inch spacing, no Nitrogen.
 *Less than check @ 5%.

Mean Yield.....76.70 lbs.
 L.S.D.(5%) 3 plot total..
 C. V.8.465%

Table IX. Yield in pounds per plot of 1/100 acre of tubers, eight ounces and over from dryland treated with green manure. 1957.

Spacing (Inches)	1 $\frac{1}{4}$ ounce seed				2 $\frac{1}{2}$ ounce seed				Total Pounds	
	I	II	III	Sum	I	II	III	Sum		
Phosphate and No Nitrogen										
12	11	0	2	13	7	5	3	15	28	
18	12	10	2	24	8	10	6	24	48	
24	25	8	18	51*	9	9	3	21	72	
Sum	48	18	22	88	24	24	12	60	148	
Phosphate and 10 pounds Nitrogen										
12	8	5	0	13	12	6	10	28	41	
18	12	9	9	30	13	14	12	39	69	
24	29	21	32	82*	7	2	8	17	99	
Sum	49	35	41	125	32	22	30	84	209	
Phosphate and 20 pounds Nitrogen										
12	30	2	4	36	16	6	8	30	66	
18	33	14	11	58*	4	7	5	16	74	
24	11	19	35	65*	10	8	10	28	93	
Sum	74	35	50	159	30	21	23	74	233	
Total	171	88	113	372	86	67	65	218	590	

Check is 1 $\frac{1}{4}$ ounce seed, 12 inch spacing, no Nitrogen.
 *More than check @ 5%.

Mean Yield.....10.93 lbs.
 L.S.D.(5%) 3 plot total..31.8 lbs.
 C. V.2.335

Table X. Yield in pounds per plot of 1/100 acre of tubers under eight ounces from dryland treated with green manure 1957.

Spacing (Inches)	1 1/4 ounce seed			2 1/2 ounce seed			Total Pounds		
	I	II	III	Sum	I	II		III	Sum
Phosphate and no Nitrogen									
12	104	85	70	259	72	81	73	226	485
18	70	79	58	207*	90	78	93	261	468
24	60	81	71	212*	58	78	86	222	434
Sum	234	245	199	678	220	237	252	709	1387
Phosphate and 10 pounds Nitrogen									
12	94	74	66	234	87	91	90	268	502
18	80	82	68	230	56	75	72	203*	433
24	76	84	64	224	70	86	82	238	462
Sum	250	240	198	688	213	252	244	709	1397
Phosphate and 20 pounds Nitrogen									
12	64	77	42	183*	98	96	98	292	475
18	53	96	59	208*	64	80	82	226	434
24	64	76	64	204*	52	79	76	207*	411
Sum	181	249	165	595	214	255	256	725	1320
Total	665	734	562	1961	647	744	752	2143	4104

Check is 1 1/4 ounce seed, 12 inch spacing, no Nitrogen.

*Less than check @ 5%.

Mean Yield.....76 pounds
L.S.D.(5%) 3 plot total...47.09 lbs.
C. V.7.098%

Table XI. Yields from 36 feet of 40 inch row of Potato varieties 1957.

Variety	Scab	Pounds Per Plot			Total	+ 8 %	Cull %	Cwt Per Acre
		I	II	III				
Early Gem	light	75	78	95	248	54.4	13.3	300.08
Merrimac	Medium	104	90	92	286	68.5	5.6	346.06
Knik	light	99	112	91	302	59.6	6.3	365.42
Manota	Heavy	109	67	91	267	61.0	6.0	323.07
Redglo	Medium	112	107	106	325	62.8	2.8	393.25
Redburst	Medium	117	96	68	281	65.8	6.0	340.01
Ia. 803-3	Light	80	70	79	229	70.7	7.0	277.09
Sheridan	Medium	74	89	83	246	59.3	2.4	297.66

Mean Yield.....330.33
 S. E. \bar{x}7.765
 L.S.D.N. S.
 C. V.8.533%

1957

Preliminary Investigations

Project No. 5028

by

C. W. Roath, Superintendent

Preliminary Investigations

A comparison of Raspberry yields when sawdust mulch was used with three Nitrogen rates was continued this year, and additional sawdust and Nitrogen added.

A neighbor family picked the berries and supplied the yield information for the fruit, so all treatments were harvested on the same dates by the same pickers. Pickings were made on alternate days.

The value of the crop on an acre basis was \$403.10 more for the best treatment than for the check when the berries are valued at the selling price of 1.25 per flat. Table I.

Strips of Vinol, black, four feet wide, were used as mulch for new settings of strawberries. Holes were punched in the center for the plants. A good stand was obtained of a vigorous variety, not so good of a less vigorous variety. Growth of annual weeds was effectively retarded between the rows. Quackgrass punctured the Vinol. In two or three cases weeds became so well established by coming up through the holes punched for the plants that plants were pulled when the weeds were pulled. I was not too favorably impressed, disadvantages seemed to effectively off-set advantages.

Virus-free plants of the Senator Dunlap variety of strawberries were set. Nearly all plants survived. Plants appeared healthy and vigorous. Runners formed at normal rate for the variety, as many as 20 from a parent plant. How long plants will remain healthy and vigorous is a question time will answer.

\$208.83, mostly for labor, was charged to this project.

Table I. Sawdust Mulch for Raspberries 1957 grown on the Station. Yield in boxes from 20 feet of 7 feet spaced row.

Sawdust	Sulfate of Ammonia		Treble Super Phosphate	Boxes Per Plot				Total Boxes	Flats Per Acre
	1956	1957		I	II	III	IV		
None	None	None	300 # in '56	15.5	18.25	17.5	17.5	68.75	445.64
3" in 56 & 57	None	None	300# in '56	24.0	21.50	24.5	26.75	96.75	627.12**
3" in 56 & 57	300#	150#	300 # in '56	28.0	28.00	28.25	24.00	108.25	701.68**
3" in 56 & 57	600#	300#	300# in '56	28.0	32.50	35.50	32.50	118.50	768.12**

**Treatments yielding significantly more than the check (1%).

Mean Yield.....630.6 flats
 S. E. \bar{x} 33.71 flats
 L.S.D.(5%).....107.71 flats
 L.S.D.(1%).....154.9 flats
 C. V.5.3 %

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Analysis of Variance

<u>Variance</u>	<u>D.F.</u>	<u>Mean Square</u>	<u>F</u>
Treatments	3	115.200	17.04**
Reps	3	1.997	0.295
Error	9	6.76	
Total	15		

1957

Farm Flock

Project No. 5029

by

C. W. Roath, Superintendent

Farm Flock Record

While our flock is small and numbers hardly adequate for division into lots for research, we have been keeping records of what happens under certain conditions.

Our gross return for the year from a flock of 41 ewes at the beginning of the year (including eight ewe lambs) has been \$1017.70, or \$24.82 per ewe of all ages. \$417.26 was from sale of wool, \$140.00 from ewes culled and sold, \$440.44 from sale of lambs, plus \$20.00 for an increase in inventory from 41 to 43.

The average fleece weight was 12.5 lbs, the lamb crop based on ewes two years old and over was 145%.

Lambs were lighter this year than in past years because of dry, short pasture.

In an attempt to increase the average lamb weight and the percent of lambs fat at weaning time, twin lambs were divided into three lots. Lot 1. Five sets of twins or ten lambs were left with their mothers. Lot 2. One each of twelve sets of twins or twelve lambs were weaned. Lot 3. One each of twelve sets of twins were left with their mothers. Weights and gains of these three lots are shown below. (Weaned lambs received $\frac{1}{2}$ pound oats per day on irrigated pasture.

	Weight Per Lamb			No. Fat
	May 29	Aug. 13	Gain	
Lot 1	39.6	61.6	22.0	None
Lot 2 (Weaned)	43.16	71.8	28.64	4
Lot 3	42.66	67.0	24.34	4

Whether or not this has any practical application it's hard to say, but in this case lambs weaned at about 2 $\frac{1}{2}$ months of age did better on irrigated pasture with oats than did their twins that were left with the mothers on short pasture.

Plans for this flock include the development of more irrigated pasture so that numbers can be increased, culling and selection for flock improvement, making replacements primarily with lambs from Registered parents, purchase of good Registered bucks, and keeping promising buck lambs for sale as yearlings. Perhaps also when numbers are increased some research project can be undertaken.

\$1141.70 was the cost of this project.

Weather Information

Precipitation was considerably below the 1949-1957 crop year average in 1956-57. The average for the crop year is 18.31 inches. This years total was 13.89 inches. The mean temperatures for the five months April thru August for 1957 were 55.6°F. The average for the years 1949-1957 is 57.4° F. The difference between these two means is 3.8 degrees F. The temperatures during the 1957 growing season were 38°F. below the average.

This years growing season was thirteen days longer than the average for 1949-1957 which is 109 days.

See Table I for complete weather.

Table I. Summary of climatic data by months for the 1956-1957 crop year (September to August) and averages for the period, 1949-1957, at the Agricultural Experiment Station, Creston, Montana.

	Month												Total or Ave. Growing Season
	Sept. 1956	Oct. 1956	Nov. 1956	Dec. 1956	Jan. 1957	Feb. 1957	Mar. 1957	Apr. 1957	May 1957	June 1957	July 1957	Aug. 1957	
Precipitation (inches)													
Current year	1.16	1.10	.53	.96	1.47	1.14	.75	1.22	1.75	2.51	.52	.78	13.89
Ave. 1949 to 1956-57	.97	1.57	1.10	1.60	1.66	1.16	.97	1.19	1.59	3.12	1.67	1.71	18.31
Mean temperature (°F)													
Current year	55.2	44.1	30.9	28.5	10.2	23.4	33.3	43.7	55.6	59.7	65.4	72.8	43.6
Ave. 1949 to 1956-57	53.9	43.8	32.7	26.2	20.0	26.3	30.5	42.4	51.4	56.9	63.9	63.2	42.6
Last killing frost in spring*													
1957 - - - - -													-May 23 (30°)
Ave. 1949-1957 - - - - -													-June 6 (30.4°)
First Killing frost in fall*													
1957 - - - - -													-September 9 (31°)
Ave. 1949-1957 - - - - -													-September 10 (29.4°)
Frost free period													
1957 - - - - -													-109 days
Ave. 1949-1957 - - - - -													-96 days
Maximum summer temperature - - - - -													-91° on July 13, 1957
Minimum winter temperature - - - - -													-34° below zero on Jan. 26, 1957.

*In this summary 32° is considered a killing frost.