A N N U A L R E P O R T

1956

NORTHWESTERN MONTANA BRANCH STATION

Creston, Montana

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This report is in 6 parts:

1. Development of the Station.
2. Agronomy.
3. Horticulture.
4. Activities.
5. Livestock.
6. Weather.

Together, the six parts of this report presents a fairly comprehensive resume of the activities and accomplishments of the Station in 1956.

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DEVELOPMENT OF THE NORTHWESTERN BRANCH STATION 1956

Chief among station development items in 1956 was the erection of three steel grain bins to provide more adequate and more sanitary storage for grains, primarily milling wheat. These bins were placed on cement block foundations. Cost of bins and blocks $706.80 .

Two new items of technical equipment, a 1000 gram scale and a seed packaging machine, were purchased. Both items well speed up work and increase accuracy. Cost of the two items $240.00 .

Some use has been made of the donable properties warehouse in Helena. On occasional trips through that city a number of hand tools and equipment items have been secured at a fraction of new list price. Among these items is a wide carriage typewriter, vice, anvil, power grinder and electric drill. Total Cost $ 237.00 .

Some changes have been made in farm rotations, to make provision for some additional detailed work. In most cases this simply required some sub-division of existing plots to provide room for the additional work, without changing the rotation system as originally planned.

A rotation book was prepared that provides a permanent record for yields fertilizers used etc.

New work provided for by the sub-divisions is as follows:

1. A long term study of fertilizer treatments for wheat.
2. A direct comparison of wheat yields following fallow and following a cultivated corn crop.
3. Additional plots for detailed work with fertilizers on major crops.
4. A place to seed some additional detailed forage work each year.

IRRIGATED PASTURE MIXTURES

This is the third year of harvest for these pasture mixtures, yields shown are from four clippings made, 5/22, 6/25, and 8/16, from eighty square feet.

These pastures were irrigated, May 22, June 14, July 23, with a sprinkler system using three inch applications. Fifty pounds of Nitrogen per acre was applied in the spring.

This trial appears to be duplicating the results of a previous one in that ladino mixtures start strong and dwindle, while trefoil mixtures start slowly and improve in relation to ladino mixtures. Three year averages for ladino and trefoil mixtures with the same grasses are quite similar.

Analysis shows the 1956 yield of Orchard and trefoil to be significantly greater than for Orchard and Ladino.

These pastures are to be harvested one more year.

Quality analysis shows Alta fescue mixtures to be slightly lower in protein and phosphate percentages than other mixtures in this study.

Table I. Twelve Irrigated Pasture Mixtures, 1956.

Mixture	Pounds Per Plot I	II	III	IV	Total Pounds	Pounds Per Acre	Three Year Average
1. Orchard and Ladino	9.00	5.81	7.22	8.88	30.91	4207.6	4619
2. Orchard and Trefoil	10.33	9.81	7.72	8.80	36.66	4990.3*	4793
3. Brome and Ladino	7.00	6.61	6.88	7.39	27.88	3795.2	4316
4. Brome and Trefoil	8.13	7.63	8.09	7.91	31.76	4323.3	4252
5. Alta and Ladino	7.05	7.52	5.97	10.13	30.67	4175.0	4850
6. Alta and Trefoil	8.33	7.70	8.19	8.70	32.92	4481.2	4617
7. Interm. and Ladino	6.36	6.05	7.17	7.84	27.42	3732.5	4315
8. Interm. and Trefoil	7.52	7.77	7.20	7.97	30.46	4146.4	4105
9. Troy and Ladino	7.75	5.80	6.45	5.95	25.95	3532.4	4060
10. Troy and Trefoil	9.48	5.88	6.47	8.13	29.96	4078.3	3951
11. Orchard and Trefoil[1]	10.09	8.80	7.56	9.50	35.95	4893.7	4585
12. Troy and Trefoil[2]	7.67	7.98	8.13	9.98	33.76	4595.6	4007
Five grasses with Ladino						3888.5	4432
Five grasses with Trefoil						4404.0	4344

[1]and[2] Same as 2 and 10 except different seeding rates.
Note: Orchard and Ladino mixture is used as a check.
*Mixture significantly higher in yield than the check.

Mean Yield.....4247.1
S. E. $\bar{x}$.....245.809
L.S.D.(5%).....705.3
L.S.D.(1%).....945.5
C. V. 5.79%

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	3	4.5947	5.64*
Varieties	11	2.6709	3.28**
Error	33	.8152	
Total	47		

FIFTEEN IRRIGATED HAY MIXTURES 1956

This is the third year of harvest for these mixtures of grasses with Kenland clover and alfalfa for hay.

Three irrigations were used, three inch applications, by sprinkler on 5/22, 6/14, and 7/23. Two cuttings were made, one on June 25th and the other on August 16.

Kenland clover has nearly disappeared from some plots after three years of harvest, and this is reflected in yields. Six grasses with alfalfa averaged 4.05 Tons per acre this year compared to 3.52 tons per acre for the same grasses with clover. Three year average yields are close, 4.36 tons compared to 4.11 tons.

Samples from the second cutting have been sent to Montana State College for analysis for protein and phosphate content.

Species or Mixtures producing significantly less than Ladak alfalfa this season are Kenland Clover, Intermediate Wheat grass with Kenland, and Timothy with Kenland.

Orchard grass and alfalfa hay is the leading mixture for yield for the three year period. Only slight differences exsist in protein and phosphate content of the several mixtures. Analysis by chemistry research of Montana State College shows Proteins to vary from 11.1% to 13.0%; phosphate from .10% to .15%. Alfalfa mixtures average 12.2% protein, clover mixtures 11.8%.

Table II. Fifteen Irrigated Hay Mixtures, 1956.

Species or Mixture	Pounds Per Plot I	II	III	IV	Total Pounds	Tons Per Acre	Three Year Average
Ranger Alfalfa	17.11	14.97	14.19	15.69	61.96	4.22	4.01
Kenland Clover	9.59	13.63	11.94	11.38	46.54	3.17*	3.79
Tall Oat and Alfalfa	15.30	14.47	10.95	13.86	54.58	3.71	4.57
Brome and Alfalfa	13.81	14.80	15.19	16.64	60.44	4.11	4.54
Intermediate and Alfalfa	13.78	15.13	11.39	17.53	57.83	3.94	3.99
Orchard and Alfalfa	15.50	12.69	17.56	17.38	63.13	4.30	4.63
Alta and Alfalfa	15.72	15.16	14.16	18.08	63.12	4.30	4.29
Timothy and Alfalfa	15.88	13.56	12.70	15.88	58.02	3.95	4.19
Tall Oat and Clover	12.70	11.81	14.19	11.22	49.92	3.40	4.27
Brome and Clover	17.09	13.08	12.14	12.13	54.44	3.70	4.27
Intermediate and Clover	14.28	9.31	9.73	13.63	46.95	3.20*	3.96
Orchard and Clover	16.80	13.00	13.22	15.22	58.24	3.96	4.16
Alta and Clover	16.09	14.38	11.16	15.03	56.66	3.86	4.39
Timothy and Clover	12.47	13.89	7.69	10.42	44.47	3.03**	3.66
Ladak Alfalfa	14.63	13.63	13.53	15.33	57.12	3.89	4.02

Note: Ladak alfalfa is used as a check.
*Mixtures significantly less in yield than the check (5%).
**Mixtures significantly less in yield than the check (1%).

Mean Yield.....3.78T
S. E. $\bar{x}$.....2263
L.S.D.(5%).....65
L.S.D.(1%).....86
C. V. 5.99%

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	3	14.357	5.19
Mixtures	14	9.1744	3.32
Error	43	2.7641	
Total	59		

TEN TREFOIL VARIETIES WITH ORCHARDGRASS 1956

This is the second harvest year for ten trefoil varieties seeded with orchardgrass.

These were clipped four times, irrigated three times. At no time was there much trefoil in the clippings, although the growth has improved as compared to the first harvest year and stands of all varieties are good.

The table shows air dry weights in pounds per plot of 80 square feet. No significant differences between varieties has been demonstrated.

Table III. Ten Trefoil Varieties with Orchardgrass, 1956

Species	Seasons Yield In Pounds Per Plot I	II	III	IV	Total Pounds	Pounds Per Acre	Two Year Ave.
Iowa Empire	8.59	10.33	9.42	12.77	41.11	5596.10	5330
Empire	10.38	9.89	9.14	11.80	41.21	5609.71	5478
Cascade	9.00	9.38	8.98	12.05	39.41	5364.69	5418
Viking	10.23	8.75	10.03	11.20	40.21	5473.59	5362
Granger	9.19	9.20	8.31	10.84	37.54	5110.13	5125
Mansfield	9.08	10.28	9.75	10.30	39.41	5364.69	5424
Italian Broadleaf	10.22	9.88	9.41	12.66	42.17	5740.39	5565
Montana Early	11.97	9.77	8.84	10.44	41.02	5583.85	5482
Oregon Narrowleaf	11.02	9.66	10.25	9.78	40.71	5541.65	5564
N. Y. Narrowleaf	10.63	9.09	10.56	12.47	42.75	5819.34	5480

Mean Yield.....5521.23
S. E. $\bar{x}$.....245.406
L.S.D. .....N. S.
C. V. 4.4%

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	3	7.987	9.83**
Varieties	9	.5621	-
Error	27	.8126	
Total	39		

OFF-STATION HAY MIXTURES 1956

This is the first year of harvest for these mixtures in this location, in Western Sanders County near the Idaho line. Only one cutting was harvested, although doubtless a second cutting could have been secured.

Volunteer timothy and alsike clover made up much of the forage on all plots, even though an attempt was made to avoid this by cultivation during the seeding year.

This particular field had been recently cleared, and phosphate was used, about 300 pounds per acre prior to seeding the crop. It has not been irrigated, but is in an above thirty inch rain fall belt.

First cutting hays were harvested from a hay mixture nursery seeded on the John Harker place at Heron in 1955.

Volunteer alsike clover and volunteer timothy tended to obscure the actual differences between mixtures. However some significant differences were obtained.

Nearly all mixtures containing Kenland clover produced better than the same grasses with alfalfa, Kenland mixtures averaging 317 pounds more than alfalfa mixtures.

Mixtures producing significantly more than Timothy and alfalfa, were Timothy and Kenland, brome and alfalfa, brome and Kenland Intermediate wheatgrass and alfalfa and intermediate wheatgrass and Kenland.

Table IV. Agronomic data from off-station hay mixtures nursery grown on John Harkers farm, Heron, Montana, 1956.

Date Harvested. July 7, 1956 Size of Plot. 48 Sq. Ft.

Mixture	Pounds Per Plot I	II	III	IV	Total Pounds	Pounds Per Acre	Rank
Brome and Alfalfa	2.41	1.70	1.14	1.70	6.95	1576.78*	
Brome and Kenland	2.65	1.91	2.35	1.76	8.67	1967.01*	1
Intermediate and Alfalfa	2.03	1.89	1.60	1.60	7.12	1615.35*	
Intermediate & Kenland	1.82	1.98	1.67	2.43	7.90	1792.31*	2
Orchardgrass & Alfalfa	1.38	1.53	1.68	1.84	6.43	1458.81	
Orchardgrass & Kenland	1.73	1.30	1.87	1.30	6.20	1406.63	
Hopkins Timothy & Alfalfa	1.47	1.47	0.49	1.14	4.57	1036.82	
Timothy & Kenland	1.80	1.80	1.50	2.55	7.65	1735.59*	3
Alta Fescue and Alfalfa	1.14	1.79	1.30	0.98	5.21	1182.02	
Alta Fescue and Kenland	1.47	1.47	2.41	1.47	6.82	1547.29	
5 grasses with Alfalfa						1372.76	
5 grasses with Clover						1689.77	

Timothy and Alfalfa is considered the check mixture in this trial.
*Significantly greater than the check @ 5%.

Mean Yield.....1533.68
S. E. $\bar{x}$.....179.866
L.S.D.(5%).....521.45
C. V. 11.73%

SILAGE CORN

Silage corn for forage production, was started as a project in 1954. At that time a problem was so designed to include three factors, namely, plant populations, date of seeding, and varieties. The latter of these factors is to measure the performance of early medium and late maturity classes. This year it was designed as a multiple complex for the purpose of analysis.

Three varieties, three dates, and four plant populations, were included this season. Seeding dates were May 15, May 25, and June 5. Barnyard manure was spread on the entire plot at about six tons per acre. The previous crop was spring grain and the field was fall plowed. Three two inch irrigations were made during the growing season, and with greater rainfall than normal the moisture supply was very adequate. On June 30, the May plantings were injured by a light frost, and many of the top leaves turned white. However, all affected plants seemed to recover. To control weeds, four cultivations were necessary during the growing season. September 1, a killing frost terminated all growth.

Harvesting was started September 7. Center rows were cut and weighed. A spring scale was used in weighting all samples.

The data in the accompanying tables shows that DeKalb 1024, with 25,917 plants per acre seeded May 15 was the highest yielding combination. The analysis table shows a significant difference due to date of seeding, plant population, and varieties. Table VIa. One thing noted was the large reduction in plants in relationship to the number of seeds planted. There is still a question as to the cause. Next growing season, emergence counts will be made to attempt to find the cause of this reduction.

Table V. Yields of green corn silage grown in four row plots, 20 feet long three replications at three planting dates, four planting rates and three varieties.

Harvested. September 7, 1956

Size of Plot. 53.3 Square feet.

Plant Population Seeded	Harvested		Wisconsin 255 I	II	III	Sum	Kingscrost KF I	II	III	Sum	Dekalb 1024 I	II	III	Sum	Total of Three Varieties
			May 15				May 15				May 15				
10,000	9,443		29	50	57	136	46	67	61	174	88	90	70	248	558
20,000	16,229		50	59	67	176	62	80	80	222	104	118	124	346	744
30,000	23,423		63	70	78	211	78	84	97	259	114	154	87	355	825
40,000	28,043		72	71	82	225	70	88	88	246	145	152	103	400	871
		Sum	214	250	284	748	256	319	326	901	451	514	384	1349	2998
			May 25				May 25				May 25				
10,000	10,424		38	57	60	155	60	75	85	220	88	97	108	293	668
20,000	15,248		53	65	60	178	81	85	86	252	93	112	128	333	763
30,000	22,974		57	96	105	258	65	94	107	266	112	141	113	366	890
40,000	25,794		59	87	114	260	67	90	89	246	120	93	129	342	848
		Sum	207	305	339	851	273	344	367	984	413	443	478	1334	3169
			June 5				June 5				June 5				
10,000	8,748		43	47	47	137	54	58	68	180	78	77	82	237	554
20,000	14,021		60	67	70	197	59	68	67	194	89	89	108	286	677
30,000	18,600		61	80	83	224	57	91	94	242	81	95	122	298	764
40,000	23,914		52	80	89	221	88	94	90	272	100	123	142	365	858
		Sum	216	274	289	779	258	311	319	888	348	384	454	1186	2853
Sum of four rates			637	829	912	2378	787	974	1012	2773	1212	1341	1316	3869	9020

Table VI. Mean Yield of silage corn, three plots of each population, average yields for all varieties and average yields for all dates, in tons per acre green weight.

Variety	Population				Average	Average of
Amount Seeded	10,000	20,000	30,000	40,000	Each Variety	3 varieties
Actual Plants Harvested	9,538	15,166	21,666	25,917	Tons per Acre	all dates, T/A
		May 15				
Wisconsin 255	9.2	12.0	14.4	15.3	12.7	13.5
Kingscrost KF	11.8	15.1	17.6	16.7	15.3	15.7
Dekalb 1024	16.8	23.5	24.1	27.2	22.9	21.9
Average	12.6	16.9	18.7	19.7	16.9	
		May 25				
Wisconsin 255	10.6	12.1	17.6	17.7	14.5	
Kingscrost KF	15.0	17.1	18.1	16.7	16.7	
Dekalb 1024	19.9	22.7	24.9	23.3	22.7	
Average	15.2	17.3	20.2	19.2	18.0	
		June 5				
Wisconsin 255	9.3	13.4	15.2	15.0	13.2	
Kingscrost KF	12.2	13.2	16.5	18.5	15.1	
Dekalb 1024	16.1	19.5	20.2	24.8	20.2	
Average	12.5	15.4	17.3	19.4	16.2	
Average all Populations	13.4	16.5	18.7	19.5	17.0	

L.S.D. (5%).....1.13T
L.S.D. (1%).....1.50

Table VIa . Analysis of Variance

Variation Due to	D. F.	Sums of Square	Mean Square	F
Blocks	2	5,852.67	2,926.335	14.24**
Dates	2	1,389.97	694.985	3.38*
Varieties	2	33,151.07	16,575.535	80.69**
Population	3	14,241.67	4,747.223	23.12*
Population x dates	6	905.53	150.922	-
Population x varieties	6	767.33	127.888	-
Population x dates x varieties	12	1,627.14	135.595	-
Date x varieties	4	880.26	220.065	1.07-
Blocks x dates	4	1,372.33	343.083	1.67-
Blocks x varieties	4	661.23	165.308	-
Blocks x dates x varieties	8	2,406.44	300.805	1.46-
Error	54	11,009.33	205.431	
Total	107	74,264.97		

Vicia Species observation

Only seven strains of vicia were seeded during the past season. These were seeded in rows five feet long and two feet wide.

Observations were made during the growing season, but no records of any type were made as to forage growth. Observations will be made during the coming season to determine if they are annuals or perennials.

The following strains were seeded.

Row No.	P. I. No.	Species	Country
1	224,075	Vicia graminea	Argentina
2	225,732	Vicia sp	Turkey
3	227,053	Vicia sativia	Iran
4	228,297	Vicia sativia	Iran
5	222,177	Vicia dasycarpa	France
6	No Name or Number		
7	220,918	Vicia tetrosperma var graules	Belgium

CLOVER SEED PRODUCTION 1956

Seed was harvested in 1956 from 1/3 acre each of Kenland seeded in 1955 in 6, 12, and 24 inch rows; and 1/3 acre seeded in 24 inch rows in 1954. The Kenland seeded in six and 12 inch rows in 1954, because of ponding of water in low areas in the fields, suffered severe winter injury and was too foul with weeds for seed. An attempt was made to eliminate troublesome weeds from the 12 inch rows '54 planted clover by spraying stubble immediately after clipping with ½ pound 2,4-D per acre. Clover regrowth following clipping was retarded to the extent that by the time vigorous clover growth was resumed two to three weeks later weeds again constituted a large part of the total plant population.

A new seeding method was used for 1956 seedings. Oats were seeded in 14 inch rows May 10, sprayed with ½ pound ester 2,4-D on June 1, then Kenland was drilled across the oat rows. A good growth of weed free clover was obtained and the oats made 90 bushel per acre.

Favorable harvest weather made it possible to try out a (new for our station) harvest method. Clover was cut with a swather on September 17. On September 26 the swaths were dry and the clover threshed with an I.H.C. combine with flail type cylinder.

One-half of one plot was forked thru the combine two times and yield compared to a single pickup job on the other half, with little yield difference resulting, so the remaining plots were pickup threshed as one operation. The condition of the clover in the swath would doubtless determine wheather or not this could be done again.

Table VII. Yields of seed and forage of Kenland, 1956.

Row Spacing	Clean Seed Per Acre	Forage Per Acre[1]
6 in.	147 lbs.	2509 lbs.
12 in.	96 lbs.	1990 lbs.
24 in.	72 lbs.	2344 lbs.

[1]From clippings cut, May 31.

Grasses for Arid Lands

Significant yield differences were discovered by harvesting grass species from a dryland grass planting on the Carr place near Hotsprings.

Mountain brome, Russian Wild Rye and Alta fescue were seeded with the other species shown but were found in measureable quanties in only one of the three reps.

Nordan crested and Intermediate wheatgrass were significantly higher in yield than alfalfa.

Seed was harvested later from alfalfa left for seed in this location and from four samples taken from rows spaced six feet apart found to be producing at the rate of 100 pounds per acre.

Table VIII. Grass Yields for Arid lands, Hotsprings, Montana 1956. Grown on the Norman Carr farm.

Species	Pounds Per Plot I	II	III	Total Pounds	Pounds Per Acre	3 year Average Pounds/A
571 Crested	1.81	2.78	3.72	8.31	2514*	1397
Intermediate Wheat	1.61	2.81	3.50	7.92	2396*	1050
Manchar Brome	1.17	2.23	3.56	6.96	2105	935
Pubescent Wheat	1.50	2.47	3.44	7.41	2242	1175
Tall Wheat	1.16	2.92	3.50	7.58	2293	1138
Alfalfa[1]	1.22	2.19	3.16	6.57	1987	853

*Species yielding significantly more then the Alfalfa 5%.
[1]Alfalfa is used as the check in this plot.

Mean Yield...2260
S. E. $\bar{x}$..... 99.8
L.S.D.(5%)...315.0
C. V. 4.42%

Analysis of Variance

Source	D. F.	Mean Square	F.
Replications	2	12.8904	355.21**
Varieties	5	.6643	3.66**
Error	10	.03629	
Total	17		

IRRIGATED SPRING GRAINS

Wheat

The advance yield nursery with 27 entries was seeded on the station in field c-4a, May 8, 1956. Five replications were used to obtain better control in statistical analysis. The previous crop was Kenland red clover as a seed production study. The area was fall plowed and seed bed preparation done in the spring. The nursery was cultivated for weed control June 1, sprayed for weed control at the rate of ½ pound 2,4-D ester per acre, June 12, 1956. Irrigation water was applied July 18. Two inches were applied this date. This was the only irrigation during the growing season.

Lodging was quite severe this season but was also very specific to the weak straw varieties. Yields were very good with a mean of 61.1 bushels per acre. C. I. 13242 was high in yield with good straw strength. C. I. 13041 was lower in yield this season with 59.6 and with its poor baking quality it has become questionable as a recommended variety. Centana (12974) was equal and in some cases better in yield than the recommended varieties, Pilot and Ceres. Control in this plot was very good and a very desirable co-efficient of variability of 5.13% was obtained. Table IX.

Four off-station nurseries were seeded in Sanders, Missoula, Mineral and Lincoln counties. These nurseries consisted of thirteen varieties of which three were soft white wheat and ten hard red spring. These nurseries were seeded in single row plots eighteen feet long in four replications. To measure the use of moisture Bouyoucos blocks were buried at three levels, namely 6, 18 and 30 inches. Three readings were made during the growing season. Readings are listed below.

N2170, C. I. 12974 was the highest yielding variety in the nursery in Missoula county. Control was good in this nursery with a coefficient of variability of 5.72%. Three irrigations were made during the growing season. Table X.

Moisture level reading

	Date of Reading Moisture in percent			
Depth	6/8	7/25	9/5	Average
30	90	100	70	86.3
18	75	85	50	70.0
6	75	80	34	63.0

Irrigated yields in Lincoln county were quite low. Rainfall was low, and irrigation was not adequate for high yields. N2389 (C.I. 13041) was the highest yielding variety in this test. Table XI.

Moisture level reading

Depth	Date of Reading Moisture in percent 6/14	7/17	9/20	Average
30	90	85	60	78.3
18	75	65	17	52.3
6	60	43	5	36.0

The nursery in Mineral county was lost to weather conditions. Seeding was May 7, and that evening a hard rain fell, making a hard crust for the plants to come through. Because of that condition and very dry weather following, only a partial stand was obtained. Very little growth was made by these emerged plants during the rest of the growing season, therefore no harvest data were obtained.

The nursery in Sanders county was not harvested because of severe bird damage. Growth in this nursery was very good, and prospects for good yields were evident, until invasion by the birds.

Table IX. Agronomic data from Advanced Yield Spring Wheat Nursery, Irrigated, Creston, Montana 1956. Four row plots, five replications.

Date Planted. May 8, 1956 Date Harvested. September 19, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or N No.	Heading Date	Heading Height in Ins.	Lodging %	Plot Yield In Bushels Per Acre I	II	III	IV	V	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Lee x 1831	B-52-120	7-7	48	8	55.3	57.4	62.4	51.0	58.9	285.0	57.0	61.0
Marquis	3641	7-11	52	34	55.3	60.3	51.0	59.6	62.4	288.6	57.7	62.0
Lee	12488	7-4	47	23	63.1	58.9	52.5	45.4	51.0	270.9	54.2	58.0
2236 x Lee	B52-107	7-6	49	12	70.9	79.4	63.1	64.8[1]	60.3	338.5	67.7*	58.0
1898 x Lee	B52-57	7-8	50	-	79.4	79.4	74.4	62.4	62.4	358.0	71.6**	61.0
Lee x 1831 (B52-119)	13243	7-8	51	23	68.1	65.9	57.4	51.1	57.4	299.9	60.0	60.0
Conley (N.D. 1)	13157	7-9	52	8	59.6	50.3	56.0	53.9	73.0	292.8	58.6	61.0
Russell	12484	7-9	56	45	68.8	59.6	65.9	75.9	69.5	339.7	67.9*	61.0
1953 x Lee	B52-92	7-4	50	10	62.4	71.6	78.0	75.9	63.8	351.7	70.3**	61.0
1520 x 1752 (N2389)	13041	7-8	49	4	65.9	59.6	67.4	59.6	45.4	297.9	59.6	63.0
Rescue x 1831 (B51-9)	13304	7-14	52	95	65.2	61.0	57.4	56.7	51.0	291.3	58.3	61.0
Rescue	12435	7-11	52	96	61.7	56.0	52.5	45.4	56.0	271.6	54.3	60.0
Pilot	11945	7-8	48	46	53.2	62.4	50.3	42.5	62.4	270.8	54.2	61.0
1953 x Lee (B52-91)	13242	7-6	48	4	72.3	66.5	69.5	75.2	80.8	364.3	72.9**	62.0
Ceres	6900	7-5	51	58	52.5	68.8	58.0	58.1	63.9	301.3	60.3	61.0
Lee x Mida Sib (3880.127)	13152	7-5	50	14	61.0	61.0	51.8	44.0	61.7	279.5	55.9	57.5
Thatcher	10003	7-8	46	34	59.6	52.5	47.5	61.0	61.7	282.3	56.5	61.0
Pilot x Regent (N2183)	13042	7-7	48	8	54.6	64.5	59.6	56.0	56.0	290.7	58.1	60.0
R. L. 2563 x Lee (N.D. 3)	13159	7-9	48	-	56.7	52.5	61.7	56.0	72.3	299.2	59.8	60.0
Pilot[2] x Merit	N2164	7-10	51	13	68.8	65.9	56.7	61.7	64.5	317.6	63.5	61.0
Selkirk	13100	7-8	48	7	68.8	68.1	61.7	65.9	65.9	330.4	66.1*	59.0
Rescue x Th-S615 (B51-43)	13306	7-7	49	86	55.3	65.9	65.9	51.0	57.4	295.5	59.1	61.0
Pilot[2] x Thatcher (N2170)	12974	7-11	52	49	63.8	66.5	62.4	72.3	46.8	311.8	62.4	61.0
Chinook (H4258)	13220	7-9	52	81	39.0	60.3	36.9	43.3	58.9	238.4	47.7	59.0
Rescue x Thatcher (B50-18)	13244	7-13	54	41	69.5	73.7	61.7	63.1	89.3	357.3	71.5**	61.0
1953 x Lee	B52-90	7-9	48	35	52.5	53.9	47.5	51.0	70.9	275.8	55.2	62.0
1953 x Lee	B52-94	7-5	50	47	69.5	62.4	63.1	68.1	78.0	341.1	68.2**	60.0

[1]Calculated Missing Plot.

Note: Thatcher is the check in this Nursery.

*Varieties Yielding Significantly more than the check (5%).

**Varieties Yielding Significantly more than the check (1%).

Analysis of Variance

Source	D. F.	Mean Square
Replications	4	145.388*
Varieties	26	208.040**
Error	103[2]	49.330
Total	133	

[2]Value of one missing plot calculated.

Mean Yield....61.1
S. E. x.....3.141
L.S.D.(5%)....8.8
L.S.D.(1%)....11.7
C. V. 5.13%

Table_____. Agronomic data from irrigated spring wheat nursery grown in Missoula County on the Don Roth farm, Clinton, Montana 1956. Single row plots, four replications.

Date Planted. May 9, 1956 Date Harvested. September 5, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Plot Yield In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
1953 x Lee (B52-91)	13242	42.5	59.6	58.1	59.6	219.8	55.0	60
Ceres	6900	53.9	65.2	76.6	53.9	249.6	62.4	59
Pilot[2] x Thatcher (N2170)	12974	69.5	75.2	66.6	73.7	285.0	71.3	59
1520 x 1752 (N2389)	13041	66.6	79.4	70.9	62.4	279.3	69.8	59
Pilot	11945	56.7	56.7	70.9	70.9	255.2	63.8	61
Lemhi	11415	66.6	85.1	56.7	56.7	265.1	66.3	56
Awned Onas	12235	62.4	70.9	65.2	58.1	256.6	64.2	56
Rescue x 1831	B51-9	69.5	63.8	55.3	70.9	259.5	64.9	-
Rescue x Thatcher (B50-18)	13244	62.4	61.0	62.4	69.5	255.3	63.8	59
Marfed x Merit - 28	13058	75.2	63.8	63.8	69.5	272.3	68.0	60
Conley (N.D. 1)	13157	48.2	55.3	53.9	55.3	212.7	53.2*	60
Thatcher	10003	51.1	53.9	42.5	45.4	192.9	48.2**	-
2236 x Lee	B52-107	62.4	65.2	56.7	56.7	241.0	60.3	58

Note: Pilot 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
Replications	3	69.783	1.37
Varieties	12	180.004	3.53**
Error	36	51.035	
Total	51		

Mean Yield....62.4
S. E. $\bar{x}$.....3.57195
L.S.D.(5%)....10.3
L.S.D.(1%)....13.7
C. V. 5.72%

Table XI. Agronomic data from irrigated spring wheat nursery grown in Lincoln County on the Wilfred Johnson ranch, Eureka, Montana 1956. Single row plots, four replications.

Date Planted. May 23, 1956 Date Harvested. September 20, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or N No.	Plot Yield In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
1953 x Lee (B52-91)	13242	25.2	29.8	32.6	31.2	118.8	29.7	60
Ceres	6900	19.9	19.9	36.2	22.7	98.7	24.7	59
Pilot[2] x Thatcher (N2170)	12974	31.2	30.5	38.3	29.1	129.1	32.3	59
1520 x 1752 (N2389)	13041	29.8	29.1	34.0	56.0	148.9	37.2*	59
Pilot	11945	32.6	33.3	22.7	26.9	115.5	28.9	61
Lemhi	11415	24.1	14.9	35.5	24.1	98.6	24.7	56
Awned Onas	12235	22.0	31.2	35.5	22.0	110.7	27.7	56
Rescue x 1831	B51-9	33.3	24.8	33.3	24.1	115.5	28.9	-
Rescue x Thatcher (B50-18)	13244	31.2	27.7	28.4	22.7	110.0	27.5	59
Marfed x Merit-28	13058	29.1	21.9	35.5	33.3	119.8	30.0	60
Conley (N.D. 1)	13157	16.3	19.9	22.0	19.9	78.1	19.5	60
Thatcher	10003	18.4	21.3	28.4	22.0	90.1	22.5	
2236 x Lee	B52-107	21.3	25.5	33.3	29.1	109.2	27.3	58

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

Analysis of Variance

Source	D.F.	Mean Square	F.
Replication	3	132.9043	4.17*
Varieties	12	81.8149	2.57*
Error	36	31.903	
Total	51		

Mean Yield....27.8
S. E. $\bar{x}$.....2.8242
L.S.D.(5%)....8.1
C. V. 10.16%

IRRIGATED SPRING GRAIN

Oats

To test a larger number of varieties, the oat nursery was increased to 36 entries and included all of the Pacific Northwest Uniform nursery entries. Five replications were used in this test to increase precision of the test. Plots were four rows, ten feet long. Seeding was done May 8, with cultivation June 1, spraying June 12, and irrigation July 18. Irrigation water was applied at the rate of two inches. Harvesting was delayed because of other projects, thus considerable shattering was noted for all varieties. Centore, C. I. 3865 was the high yielding variety and shows considerable promise as a new variety. It out yielded Park 18 bushel this season, but was not significant statistically. See Table XII for complete yield picture.

Four off-station nurseries were seeded, one in each of the following counties, Sanders, Mineral, Missoula, and Lincoln. These nurseries consisted of ten entries.

Yields were high in the nursery on the Roth farm in Missoula county. Three irrigations were made during the growing season. However no statistical significance was obtained in this trial.

No significance was found in the nursery at Hotsprings. This can be contributed to the location of the nursery, which was on a steep slope. Differences were great between replications. Table XIII.

The nursery in Mineral county was lost because of weather conditions. A discription of these conditions can be found in the wheat section of this report, page 17.

Cattle destroyed the oat nursery in Lincoln county.

Table XII. Agronomic data from irrigated oat nursery grown at Creston, Montana in 1956. Four row plots, five replications.

Date Planted. May 8, 1956 Date Harvested. September 12, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or Sel. No.	Heading Date	Plot Yield in Ounces I	II	III	IV	V	Total Ounces	Average Bushel Per Acre	Bushel Wt. In Pounds
Park	6611	7-15	22.75	26.50	19.50	21.00	15.25	105.00	111.7	39
Mission	2583	7-10	18.00	13.00	19.00	14.75	19.75	84.50	89.9	42
Bridger	2611	7-17	20.25	25.75	23.75	22.75	24.50	117.00	124.4	42
Gopher	2027	7-8	16.00	8.50	16.00	28.75	9.50	78.75	83.6	40
(B-A x Iogold)x(V-R)	6612	7-11	27.00	19.75	18.00	23.00	21.75	109.50	116.5	41
Garry (Original)	6648	7-12	23.75	18.00	16.75	22.00	15.75	96.25	102.4	41
Garry (New)	6662	7-11	20.25	20.25	22.00	18.25	19.00	99.75	106.1	41
Rodney	6661	7-15	6.50	10.00	32.50	20.25	4.50	73.75	78.4*	41
Exeter	4158	7-16	21.25	20.25	20.00	21.25	21.25	104.00	110.9	40
Canada Hybrid	2795-11-5	7-9	25.50	14.75	17.50	19.00	18.75	95.50	101.6	40
Ajax	4157	7-10	23.50	15.00	17.75	14.75	16.00	87.00	92.5	41
Gopher x Bridger	44-5-3-12	7-17	23.00	9.50	16.25	11.00	15.50	75.25	80.0*	40
Gopher x Bridger	44-5-3-31	7-8	22.25	16.00	16.25	16.25	15.25	86.00	91.5	42
C.I. 4189 x Overland	6613	7-16	22.75	24.25	22.50	22.00	24.25	115.75	123.1	41
Jackson	5441	7-6	27.75	17.50	16.00	16.50	24.00	101.75	108.2	42
Clinton x Overland^2	AB6014	7-13	27.75	23.25	18.50	17.75	21.75	109.00	115.9	40
Eagle	4113	7-16	22.00	9.75	30.25	21.75	23.00	106.75	113.5	41
Overland x Mission	44-1-1-68	7-12	20.25	24.00	21.00	18.75	19.50	103.50	110.1	41
Craig	4332	7-12	23.50	23.25	18.25	19.00	28.75	112.75	119.9	40
C.I. 4189 x Overland	5347	7-15	21.25	17.75	29.75	17.00	23.50	109.25	116.2	41
V-R x Bannock (Centore)	3865	7-13	23.25	24.50	28.25	21.50	24.75	122.25	130.0	38
Overland	4181	7-12	22.50	19.75	25.00	22.75	23.50	113.50	120.7	41
Waubay	5440	7-5	17.25	15.00	20.00	19.75	17.75	89.75	95.5	40
Abegweit	-	7-11	19.50	15.75	23.25	24.25	21.00	103.75	110.3	40
Cody	3916	7-16	21.00	25.50	16.75	30.00	19.00	112.25	119.4	38
Clinton x Overland^2	5346	7-13	18.00	24.25	14.25	25.50	8.00	90.00	95.7	40
Clinton x Overland^2	5345	7-13	21.75	24.50	16.75	26.00	17.75	106.75	113.5	40

Continued

Table XII . (Continued) Agronomic data from irrigated oat nursery grown at Creston, Montana in 1956. Four row plots, five replications.

Date Planted. May 8, 1956 Date Harvested. September 12, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or Sel. No.	Heading Date	Plot Yield in Ounces I	II	III	IV	V	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Binder	-	7-18	21.00	27.00	19.75	25.00	16.25	109.00	115.9	40
Roxton	4134	7-15	23.50	15.50	15.75	18.00	16.25	89.00	94.7	39
Maganskii 044	044	7-17	19.00	18.50	11.75	15.50	18.75	83.50	88.8	40
Overland x Mission	44-1-1-76	7-14	20.50	14.75	11.00	20.25	20.25	86.75	92.3	40
Overland x Mission	44-1-1-1	7-9	18.00	16.75	18.50	14.25	18.75	86.25	91.7	40
Overland x Mission	44-1-1-49	7-11	19.50	14.50	16.00	16.00	14.25	80.25	85.4	41
Gopher x Bridger	44-5-3-26	7-11	26.00	15.50	16.25	14.25	20.50	92.50	98.1	41
Gopher x Bridger	44-5-2-2	7-9	12.50	16.00	18.00	13.50	15.50	75.50	80.3*	40
Gopher x Bridger	44-5-2-6	7-8	14.00	14.75	15.50	13.25	17.50	75.00	79.6*	40

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

Mean Yield.....103.0
S. E. x.....10.295
L.S.D. (5%).....28.8
L.S.D. (1%).....38.0
C. V. 10.00%

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	4	36.27	1.94
Varieties	35	37.6314	2.01**
Error	140	18.7421	
Total	179		

Table XIII . Agronomic data from irrigated oat nursery grown in Missoula County on the Don Roth farm, Clinton, Montana in 1956. Single row plot four replications.

Date Planted. May 9, 1956 Date Harvested. September 15, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or Sel. No.	Plot Yield In Ounces I	II	III	IV	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Park	6611	32.50	24.25	27.50	24.75	109.00	144.9	39
Gopher	2027	21.75	23.25	19.75	22.50	87.25	116.0	41
Bridger	2611	28.50	33.00	25.50	32.75	119.75	159.2	43
Canada Hybrid	2795-11-5	18.50	28.75	29.00	24.75	101.00	134.3	41
Garry (New)	6662	30.00	21.00	21.75	24.25	97.00	129.0	39
Rodney	6661	23.00	24.75	28.00	29.00	104.75	139.3	41
C.I. 4189 x Overland	6613	25.25	21.00	30.50	26.00	102.75	136.6	40
Craig	4332	20.25	26.50	20.50	23.75	91.00	121.0	39
C.I. 4189 x Overland	5347	26.75	26.00	21.00	19.00	92.75	123.3	39
V-R x Bannock	3865	31.00	26.50	25.00	31.00	113.50	150.9	37

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	3	1.855	
Varieties	9	26.511	
Error	27	13.777	
Total	39		

Mean Yield.....135.4
S. E. X.....9.869
L.S.D. .....N. S.
C. V. 7.29%

Table XIV. Agronomic data from irrigated oat nursery grown in Sanders county on the Jim Cook farm, Hotsprings, Montana, 1956. Single row plot, four replications.

Date Planted. May 17, 1956 Date Harvested. September 26, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or Sel. No.	Plot Yield in Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Park	6611	14.6	73.1	31.9	4.0	123.6	30.9	37
Gopher	2027	25.3	35.9	45.2	35.9	142.3	35.6	38
Bridger	2611	19.9	17.3	38.6	49.2	125.0	31.3	35
Canada Hybrid	2795-11-5	22.6	51.8	45.2	30.6	150.2	37.7	38
Garry (New)	6662	27.9	37.2	42.5	12.0	119.6	29.9	37
Rodney	6661	27.9	6.7	23.9	55.8	114.3	28.6	-
C. I. 4189 x Overland	6613	29.3	18.6	45.2	29.3	122.4	30.6	38
Craig	4332	17.3	33.2	11.9	22.6	85.0	21.3	-
C. I. 4189 x Overland	5347	38.6	18.6	42.5	26.6	126.3	31.6	38
V. R. X Bannock	3865	31.9	42.5	16.0	63.8	154.2	38.6	33

Analysis of Variance

Source	D. F.	Mean Square	F.
Replications	3	495.545	-
Varieties	9	881.09	-
Error	27	7661.445	
Total	39		

Mean Yield.....31.6
S. E. x.....8.4225
L.S.D. .....N. S.
C. V. 26.5%

IRRIGATED SPRING GRAIN

Barley

The interstate barley nursery grown in field C-4A (See Page 16 this report) consisted of 25 entries. Thirteen entries were two row selection and twelve six row selections. Four row plots, 10 feet long and five replication was the design of this nursery.

Yields were very good with a mean of 71.9 bushels per acre. Using Vantage as a check several two row selections were higher in yield. These selections were Carlsberg II, Herta and Weibulls 5425. The average of the two row for test weight was about two pounds higher than the average of the six row selections. Table XV.

Four off-station nurseries were seeded in Sanders, Missoula, Mineral and Lincoln counties. These nurseries consisted of ten entries with six two row and four six row selections.

In Sanders county poor location plus low moisture conditions contributed to the low yields in that nursery. The mean was 20.0 bushels per acre and the coefficient of varability was very high. Greatest difference were found between replications. Table XVI.

Carlsberg II was the high yielding variety in Missoula county, but was quite green at time of harvest. There were no varieties significantly higher in yield than Vantage which was used as the check variety. Table XVII.

Barley yields were fair to good in the Lincoln county nursery. Carlsburg II was the leading variety yield wise, being significantly better in yield than Vantage. Freja and Vantage were about equal in yield. The mean of of this nursery was 62.0 bushels per acre. Table XVIII.

The nursery in Mineral county was lost to weather conditions. See page 17 of this report for details.

A continuation study of two row vs six row varieties, an Isogenic nursery was seeded in the same field as the interstate nursery. No significance was found in yields of these varieties but considerable difference was found in lodging between selections and between the two vs the six rows within the selection. Selection 7-2-15 was the most resistant to lodging of all selections. As a whole the two row selections were more resistant to lodging than the sister selection for the six row character. Table XIX.

Three malting barley nurseries were seeded in western Montana, and a large plot seeded for measuring malting characteristics of some promising varieties. The nurseries were located in Flathead (station), Missoula, and Ravalli counties. The nurseries in Missoula and Ravalli county were irrigated and the station nursery non-irrigated. This nursery consisted of eight two row malting varieties and two six row feed barleys. These were grown in five row plots and three replications.

The nursery on the station showed considerable difference between variety as related to lodging. Carlsberg II and Heimdal had the least amount of lodging and the highest yields. Compana is used as a check in all of these nurseries. Table XX.

In Missoula county C. I. 50-5639-12 was high in yield, a six row selection. Vantage and Heimdal showed no lodging. Freja, Vantage and Betzes were also significantly better in yield than Compana, Table XXI.

Quackgrass was a problem in the Ravalli county nursery. This would account for the high coeefficient of varability and reduction in yields. Table XXII.

Freja ranks number one for the two row varieties grown in Western Montana in 1956. Table XXIII, shows the yields of all of the varieties.

In the large plots grown in Lake county Freja was the highest yielding variety. Malting tests are not completed on this material, so they can not be included in this report.

Table XV . Agronomic data from irrigated interstate barley nursery, Creston, Montana in 1956. Four row plot five replications, randomized block design.

Date Planted. May 8, 1956 Date Harvested. August 31, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or N No.	Heading Date	Height in Inches	Lodging %	Plot Yield in Ounces I	II	III	IV	V	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Hannchn (s)	4841	7-7	41	100	14.75	10.50	13.25	15.50	17.75	71.75	50.8	48.0
Dekap (s)	3351	7-1	35	100	17.50	14.25	18.50	18.00	21.25	89.50	63.5	46.0
Heines Hanna (s)	9532	7-5	36	99	19.00	18.00	17.00	20.00	16.75	90.75	64.3	49.0
Heimdal	8094	7-9	35	86	23.25	24.00	25.50	16.75	24.25	113.75	80.7	49.0
Carlsberg II	10114	7-9	32	34	29.25	29.75	21.50	26.75	23.00	130.25	92.4*	48.0
Betzes	6398	7-5	35	81	21.00	20.00	16.75	17.75	19.25	94.75	67.2	51.0
Freja (s)	7130	7-5	27	46	23.50	26.50	21.00	22.25	22.25	115.50	81.9	50.0
Compana	5438	6-29	33	92	14.00	19.75	11.00	16.50	16.50	77.75	55.1	49.0
Herta	8097	7-6	33	12	24.00	29.75	19.25	28.25	30.00	131.25	93.1**	52.0
Weibull's 5425	10083	7-8	34	22	29.50	28.00	19.00	32.50	29.75	138.75	98.4**	51.0
Peroline	9558	7-5	33	47	23.50	23.00	20.75	21.00	20.25	108.50	76.9	52.0
Ymer (s)	7275	7-6	31	77	19.50	21.75	11.50	23.00	21.50	97.25	69.0	49.0
Stamm	---	7-7	38	69	9.75	21.75	15.00	19.25	18.50	84.25	59.7	54.0
Glacier x Titan	50-5639-12	6-29	37	61	18.50	23.75	19.25	25.00	21.50	108.00	76.6	48.0
Glacier x Titan	50-5610-7	6-29	37	26	18.00	23.00	27.00	29.75	28.50	126.25	89.5*	46.0
Lico x C. I. 7152 (s)	49-5580-4	6-27	32	60	18.50	21.25	19.50	19.00	21.50	99.75	70.7	47.0
Vantage (s)	7324	7-3	38	39	19.25	24.75	19.00	15.50	26.50	105.00	74.4	48.0
Husky	9537	7-5	36	10	19.00	16.00	18.25	19.50	22.00	94.75	67.2	50.0
Vantmore (s)	9555	7-3	38	16	17.25	19.75	18.00	17.00	19.00	91.00	64.5	50.0
Titan	7055	6-29	36	71	16.75	19.75	7.75	13.75	16.75	74.75	53.0	49.0
Glacier (s)	4976	6-27	32	29	22.75	19.25	19.50	24.00	22.00	107.50	76.2	47.0
Utah 570-8	10118	7-10	38	47	16.25	18.25	16.25	21.75	21.00	93.50	66.3	44.0
Trail (B103)	9538	7-3	30	94	14.50	13.00	16.75	15.25	17.00	76.50	54.2	47.0
Hiland	9530	7-1	36	51	12.25	22.50	23.50	27.75	26.50	112.50	79.8	47.0
Balder	7131	7-7	33	58	18.25	20.75	24.00	21.25	18.75	103.00	73.0	50.0

Note: Vantage is used as a check in this nursery.
**Varieties yielding significantly more than the check at 5%.
*Varieties yielding significantly more than the check at 1%.
(s) indicates smut.

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	4	51.7905	5.27**
Variety	24	66.2818	6.76**
Error	96	9.8247	
Total	124		

Mean Yield...71.9
S. E. $\bar{x}$.....4.969
L.S.D.(5%)...13.9
L.S.D.(1%)...18.5
C. V. 6.90%

Table XVI . Agronomic data from irrigated off-station barley nursery grown in Sanders county on the Jim Cook farm, Hotsprings, Montana in 1956. Single row plots four replications.

Date Planted. May 17, 1956 Date Harvested. September 26, 1956 Size of Plot. 16 ft.

Variety or Cross	C. I. or N No.	Plot Yield In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre
Compana	5438	16.0	11.5	20.4	28.4	76.3	19.1
Freja	7130	7.1	14.2	22.2	41.7	85.2	21.3
Carlsberg II	10114	8.9	26.6	31.9	44.3	111.7	27.9
Ymer	-	8.9	14.2	17.7	35.5	76.3	19.1
Betzes	6398	11.5	10.6	20.4	40.8	83.3	20.8
Dekap	3351	8.0	25.7	29.2	35.5	98.4	24.6
Vantage	7324	8.9	16.0	9.8	31.9	66.6	16.7
Titan	7055	3.6	15.1	29.2	24.8	72.7	18.2
Glacier x Titan	50-5610-7	10.6	10.6	18.6	20.4	60.2	15.1
Glacier x Titan	50-5639-12	6.2	10.6	27.5	26.6	70.9	17.7

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

Mean Yield.....20.0
S. E. $\bar{x}$.....2.8333
L.S.D. (5%).....N. S.
C. V. 14.16%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	3	1059.302	33.00**
Varieties	9	58.783	1.83
Error	27	32.101	
Total	39		

Table XVII. Agronomic data from irrigated off-station barley nursery grown in Missoula county on the Don Roth farm, Clinton, Montana in 1956. Single row plots four replications.

Date Planted. May 9, 1956 Date Harvested. September 5, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Plot Yield Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Compana	5438	52.3	31.9	39.0	42.5	165.7	41.4**	49
Freja	7130	97.5	76.2	71.8	79.8	325.3	81.3	53
Carlsberg II	10114	86.0	83.3	110.8	82.4	362.5	90.6	52
Ymer	-	79.8	90.4	81.0	101.0	352.2	88.1	52
Betzes	6398	78.0	64.7	78.0	67.3	288.0	72.0	53
Dekap	3351	50.5	62.9	70.9	61.2	245.5	61.4*	49
Vantage	7324	68.2	64.7	91.3	83.3	307.5	76.9	50
Titan	7055	33.7	47.9	57.6	68.2	207.4	51.9**	47
Glacier x Titan	50-5610-7	53.2	62.0	68.2	55.9	239.3	59.8	42
Glacier x Titan	50-5639-12	71.8	64.7	78.9	71.8	287.2	71.8	47

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%).

Mean Yield.....69.5
S. E. $\bar{x}$.....4.876
L.S.D.(5%).....14.1
L.S.D.(1%).....19.1
C. V. 7.02%

Analysis of Variance

Source	D. F.	Mean Square	F.
Replications	3	193.8133	2.04
Varieties	9	1002.4333	10.54**
Error	27	95.1196	
Total	39		

Table XVIII. Agronomic data from irrigated off-station barley nursery grown in Lincoln county on the Wilfred Johnson ranch, Eureka, Montana in 1956. Single row plots four replications.

Date Planted. May 23, 1956. Date Harvested. September 20, 1956 Size of plot 16 feet.

Variety or Cross	C. I. or N No.	Plot Yield In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Compana	5438	54.1	54.1	46.1	40.8	195.1	48.8	48
Freja	7130	70.9	60.3	58.5	59.4	249.1	62.3	50
Carlsberg II	10114	76.2	81.5	70.0	70.0	297.7	74.4*	50
Ymer	-	82.4	73.6	56.7	62.0	274.7	68.7	50
Betzes	6398	75.3	72.6	43.4	52.0	243.3	60.8	51
Dekap	3351	65.6	68.2	62.9	62.0	258.7	64.7	49
Vantage	7324	82.4	53.2	47.9	68.2	251.7	62.9	47
Titan	7055	54.1	46.1	44.0	48.7	192.9	48.2	46
Glacier x Titan	50-5610-7	83.3	60.3	50.5	55.9	250.0	62.5	44
Glacier x Titan	50-5639-12	76.2	75.3	56.7	56.7	264.9	66.2	47

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

Mean Yield.....62.0
S. E. $\bar{x}$.....3.4479
L.S.D.(5%).....10.0
L.S.D.(1%).....13.5
C. V. 5.56%

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	3	654.527	13.76**
Varieties	9	262.725	5.52**
Error	27	47.552	
Total	39		

Table XIX. Agronomic data from irrigated isogenic, 2 vs 6 row, nursery grown at Creston, Montana in 1956.

Date Planted. May 10, 1956 Date Harvested. September 1, 1956 Size of Plot. 16 feet

Variety or Cross	Isogenic Number	Heading Date	Height in Inches	Lodging %	Plot Yield in Ounces I	II	III	IV	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Manchuria x Poppenheim	13-6-15	7-6	39	49	13.25	22.50	23.00	12.50	71.25	63.1	43
Manchuria x Poppenheim	13-2-15	7-6	40	20	19.75	14.00	19.00	18.75	71.50	63.4	49
Manchuria x Kolter	16-6-15	7-7	44	100	17.75	17.75	16.25	16.00	67.75	60.0	47
Manchuria x Kolter	16-2-15	7-6	44	99	15.75	9.25	15.50	20.25	60.75	53.8	46
Manchuria x Plumage	21-6-14	7-12	46	86	24.50	20.25	15.75	22.00	82.50	73.1	42
Manchuria x Plumage	21-2-14	7-12	46	10	17.50	17.50	15.75	16.50	67.25	59.6	46
Manchuria x C. I. 5037	7-6-15	7-1	37	50	23.00	29.00	18.00	16.50	86.50	76.7	45
Manchuria x C. I. 5037	7-2-15	7-1	36	7	15.25	16.25	21.00	21.00	73.50	65.1	44
Manchuria x C.I. 4254-1	23-6-14	7-2	42	100	15.00	10.25	14.75	19.50	59.50	52.7	45
Manchuria x C.I. 4254-1	23-2-14	7-1	45	76	11.75	15.75	15.75	14.25	57.50	51.0	47

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	3	.421	-
Variety	9	22.468	1.51
Error	27	14.866	
Total	39		

Mean Yield.....61.9
S. E. $\bar{x}$.....6.8339
L.S.D.(5%).....N. S.
C. V. 11.04%

Table XX. Agronomic data from 2 row malting barley nursery and advance yield nursery grown in Flathead county on the Northwestern Montana Branch Station, Creston, Montana in 1956. Five row plots, three replications.

Date Planted. May 18, 1956 Date Harvested. September 4, 1956 Size of Plot 48 Sq. Ft.

Variety or Cross	C. I. or N No.	Heading Date	Heading Height in Ins.	Lodging %	Plot Yield In Ounces I	II	III	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Vantage	7324	7-14	44	25	51.50	58.00	53.75	163.25	64.3*	49.0
Glacier x Titan	50-5639-12	7-12	40	45	71.75	69.75	50.00	191.50	75.5*	46.0
Compana	5438	7-10	30	100	35.50	45.50	31.25	112.25	44.2	45.0
Freja	7130	7-13	31	10	31.75	68.00	59.25	159.50	62.8*	49.0
Betzes	6398	7-19	35	47	49.00	54.00	48.25	151.25	59.6	50.0
Carlsberg II	10114	7-21	34	7	54.25	67.00	78.00	199.25	78.5*	47.0
Hannchen	4841	7-20	42	97	44.50	50.50	34.00	129.00	50.8	49.0
Heinas Hanna	9532	7-16	39	60	51.50	56.50	39.25	146.75	57.8	50.0
Heimdal	8094	7-20	37	7	72.00	74.50	53.25	199.75	78.6*	47.0
Stamm	-	7-19	42	90	48.50	48.00	51.00	147.50	58.1	53.0

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

Mean Yield.....63.1
S. E. x.....6.2729
L.S.D.(5%).....18.6
C. V. 9.94%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	2	259.69	3.07
Varieties	9	287.893	3.41*
Error	18	84.542	
Total	29		

Table XXI. Agronomic data from 2 row malting barley, an advance yield nursery grown in Missoula county on the R. G. Ostergrens farm, Missoula, Montana in 1956. Five row plots three replications.

Date Planted. May 7, 1956 Date Harvested. September 5, 1956 Size of Plot. 48 sq. ft.

Variety or Cross	C. I. or N No.	Height In Inches	Lodging %	Plot Yield in Ounces I	II	III	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Vantage	7324	32	-	65.00	60.25	69.00	194.25	76.5**	51
Glacier x Titan	50-5639-12	29	17	65.75	85.00	69.50	220.25	86.6**	47
Compana	5438	27	98	54.00	51.75	44.50	150.25	59.2	47
Freja	7130	26	10	66.50	74.00	75.75	216.25	85.2**	50
Betzes	6398	30	20	63.50	65.00	63.25	191.75	75.5*	51
Carlsberg II	10114	30	20	49.25	62.50	64.00	175.75	69.2	50
Hannchen	4841	31	52	46.50	56.75	45.25	148.50	58.5	49
Heinas Hanna	9532	31	38	40.50	64.00	44.00	148.50	58.5	52
Heimdal	8094	29	-	57.25	52.25	48.00	157.50	62.0	50
Stamm	-	37	20	42.00	49.75	40.00	131.75	51.9	55

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

Mean Yield.....68.3
S. E. $\bar{x}$.....4.2209
L.S.D.(5%).....12.5
L.S.D.(1%).....17.2
C. V. 6.19%

Analysis of Variance

Source	D. F.	Mean Square	F.
Replication	2	142.90	3.73*
Varieties	9	317.46	8.29**
Error	18	38.282	
Total	29		

Table XXII. Agronomic data from 2 row malting barley, an advance yield nursery grown in Ravalli county on the Homer Baily farm, Stevensville, Montana in 1956. Five row plots three replications.

Date Planted. May 9, 1956 Date Harvested. September 6, 1956 Size of Plot. 48 sq. ft.

Variety or Cross	C. I. or N No.	Plot Yield In Bushels Per Acre I	II	III	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Vantage	7324	31.3	57.3	57.6	146.2	48.7	50
Glacier x Titan	50-5639-12	48.5	22.7	67.1	138.3	46.1	48
Compana	5438	35.5	44.9	52.3[1]	132.7	44.2	46
Freja	7130	65.0	37.8	68.2	171.0	57.0	52
Betzes	6398	62.0	31.6	66.2	159.8	53.3	53
Carlsberg II	10114	33.1	35.4	32.2	100.7	33.6	46
Hannchen	4841	28.4	46.3	58.2	132.9	44.3	51
Heinas Hanna	9532	21.3	34.9	42.2	98.4	32.8	52
Heimdal	8094	37.8	32.2	37.5	107.5	35.8	45
Stamm	-	30.7	20.4	18.3	69.4	23.1	50

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	2	512.705	3.52
Varieties	9	324.922	2.23
Error	18	145.767	
Total	29		

Mean Yield.....41.9
S. E. $\bar{x}$.....6.9706
L.S.D. ..... N. S.
C. V. 16.63%

[1]Calculated missing plot.

Table XXIII. Summary of two row malting barley yield nurseries grown in Western Montana 1956.

Variety or Cross	C. I. or N No.	County			Average	2 row Rank
		Missoula	Ravalli	Flathead		
Vantage	7324	76.5	48.7	64.3	63.2	
Glacier x Titan	50-5639-12	86.6	46.1	75.5	69.4	
Compana	5438	59.2	44.2	44.2	49.2	7
Freja	7130	85.2	57.0	62.8	68.3	1
Betzes	6398	75.5	53.3	59.6	62.7	2
Carlsberg II	10114	69.2	33.6	78.5	60.4	3
Hannchen	4841	58.5	44.3	50.8	51.2	5
Heinas Hanna	9532	58.5	32.8	57.8	49.6	6
Heimdal	8094	62.0	35.8	78.6	58.8	4
Stamm	-	51.9	23.1	58.1	44.3	8
Mean Yield		68.3	41.9	63.1		
S. E. $\bar{x}$		4.22	6.97	6.27		
L.S.D. (5%)		12.5	N S.	18.6		
C. V. %		6.19	16.63	9.94		

Table XXIV. Yield data from large increase malting barley plots grown on the Walter Mangles farm, Polson, Montana. Three entries, with strips ten feet wide and 270 feet long. Whole plot was harvested or 2270 square feet.

Entry	C. I. No.	Yields Bu/A
Betzes	6398	27.6
Freja	7130	32.0
Hannchen	4841	30.4

DRYLAND SPRING GRAIN

Wheat

The Advanced yield spring wheat nursery consisted of 27 entries this season. Seeding was done May 3. Plots were four rows ten feet long and replicated three times. Growing conditions were very good during the growing season. Moisture was above normal for the season. See weather data in this report. There was no lodging in the nursery, and very little loose smut. This nursery was cultivated once during the growing season.

Control in this nursery was very good. Yields were high. The mean was 52.1. Pilot and Ceres were significantly higher in yield than Thatcher which was used as a check. Test weights were below normal in all but three varieties. For more details of this trial see Table XXIV.

The western regional white wheat nursery was seeded in four row plots, three replications with fifteen entries. The conditions listed above for the hard red spring nursery are the same for this nursery. The results were not significant when analysised statistically. The two hard red wheats were lower in yield than the white wheats, except Marfed. Test weights were all below standard. See Table XXV.

To determine the value of durm in the economic picture in Western Montana, a nursery was seeded in the Bad Rock community in Flathead county. Nine entries in four row plots ten feet long and three replications were included in this nursery. The previous crop was oats and the soil was very sandy. Hail damage July 20 was in part responsible for the low yields. Damage was not severe, but quite noticeable. Mindum and Sentry were highest yielding but not as high in yields as the hard red springs in the nursery. These results were not significant upon analysis. This nursery will be continued next year to further evaluate these varieties. Table XXVI.

The milling and baking plots included five varieties. These were seeded in seven foot drill widths, 100 feet long. Frost, on September 1, severely injured this planting. Because of the frost injury it was not used in milling and baking tests. N2389 was high in yield with 57.9 bushels per acre. Table XXVII.

Table XXIV. Agronomic data from dryland Advance Yield Spring wheat nursery, Creston, Montana 1956. Four row plots three replications.

Date Planted. May 3, 1956. Date Harvested. September 4, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or N No.	Heading Date	Heading Height In Ins.	Plot Yield In Bushels Per Acre I	II	III	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Lee x 1831	B52-120	6-29	42	49.6	47.5	52.5	149.6	49.9	59
Marquis	3641	7-5	46	48.9	56.7	48.2	153.8	51.3	59
Lee[2]	12488	6-27	41	48.2	46.1	49.6	143.9	48.0	57
2236 x Lee[2]	B52-107	6-27	41	58.9	55.3	61.0	175.2	58.4**	57
1898 x Lee[2]	B52-57	6-30	44	56.0	50.3	51.8	158.1	52.7*	57
Lee x 1831 (B52-119)	13243	6-29	45	57.4	52.5	55.3	165.2	55.1**	58
Conley (N.D. 1)	13157	7-5	46	47.5	45.4	46.8	139.7	46.6	56
Sentry Durum	13102	7-1	46	43.2	55.3	47.5	146.0	48.7	60
1953 x Lee[2]	B52-92	6-27	41	50.3	51.8	51.8	153.9	51.3	57
1520 x 1752 (N2389)	13041	7-2	43	56.7	53.9	56.7	167.3	55.8**	59
Rescue x 1831 (B 51-9)	13304	7-7	47	44.0	53.9	49.6	147.5	49.2	58
Rescue	12435	7-1	46	45.4	58.1	44.7	148.2	49.4	57
Pilot	11945	6-30	44	46.1	56.7	53.9	156.7	52.2	58
1953 x Lee (B52-91)	13242	6-28	43	53.2	59.0[1]	62.4	174.6	58.2**	58
Ceres	6900	7-3	47	53.2	53.9	53.9	161.0	53.7*	60
Lee x Mida Sib (3880.12)	13152	6-30	43	58.1	62.4	48.2	168.7	56.2**	58
Thatcher	10003	6-30	39	47.5	44.7	46.8	139.0	46.3	57
Pilot[2] x Regent (N2183)	13042	6-29	41	45.4	52.5	58.9	156.8	52.3	58
R.L. 2536 x Lee (N.D. 3)	13159	7-1	43	44.0	45.3	51.1	140.4	46.8	58
Pilot x Merit	N2164	7-2	43	58.1	58.1	60.3	176.5	58.8**	58
Selkirk	13100	7-2	43	51.8	56.7	59.6	168.1	56.0**	57
Rescue x Th S615 (B51-43)[2]	13306	6-28	44	52.5	53.9	54.6	161.0	53.7*	59
Pilot x Thatcher (N2170)	12974	7-4	46	51.8	52.5	58.1	162.4	54.1*	59
Chinook (H-4258)	13220	6-29	46	42.5	44.0	46.8	133.3	44.4	60
Rescue x Thatcher (B50-18)	13244	7-4	45	51.8	58.1	51.8	161.7	53.9*	59
1953 x Lee[2]	B52-90	6-27	41	46.8	48.9	53.2	148.9	49.6	58
1953 x Lee[2]	B52-94	6-27	42	48.2	55.3	58.9	162.4	54.1*	58

Note: Thatcher is used as a check in this nursery.
*Varieties yielding significantly more than thecheck (5%)
**Varieties yielding significantly more than the check (1%)
[1]Calculated missing plot.
[2]Loose Smut found in these varieties.

Analysis of Variance

Source	DF	Mean Square	F
Replication	2	68.435	4.76*
Varieties	26	46.361	3.23**
Error	51	14.333	
Total	79		

Mean Yield...52.1
S. E. x.....2.18579
L.S.D.(5%)...6.2
L.S.D.(1%)...8.3
C. V. 4.20%

Table XXV. Agronomic data from Western Regional White Spring Wheat Nursery, dryland at Creston, in 1956. Four row plots three replications.

Date Planted. May 3, 1956 Date Harvested. September 10, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or N No.	Heading Date	Heading Height In Ins.	Plot Yield In Bushels Per Acre I	II	III	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Thatcher	10003	7-1	42	45.4	45.4	46.1	136.9	45.6	57.0
Onas	6221	7-9	44	56.0	56.0	59.6	171.6	57.2	57.0
Lemhi x Hope-Fed.	13053	7-6	42	34.0	53.9	65.2	153.1	51.0	55.0
4232-20B	13259	7-1	42	50.3	45.4	53.9	149.6	49.9	58.0
Lemhi 53	13068	7-7	45	53.2	52.5	52.5	158.2	52.7	58.0
Henry	12365	6-30	44	44.7	39.0	60.3	144.0	48.0	58.0
Lemhi	11415	7-7	44	55.3	57.4	57.4	170.1	56.7	59.0
Baart[1]	1697	7-6	48	50.3	57.4	48.9	156.6	52.2	59.0
Kenya x Lemhi[6]	13258	7-7	45	57.4	61.7	53.9	173.0	57.7	58.0
Federation	4734	7-14	45	45.4	55.3	46.8	147.5	49.2	58.0
Marfed	11919	7-9	44	57.4	53.2	60.3	170.9	57.0	59.0
Idaed	11706	6-28	37	48.2	44.7	46.1	139.0	46.3	58.0
4232-20 S	13260	7-9	47	53.2	42.5	48.9	144.6	48.2	59.0
Onas 53	13257	7-9	43	50.3	60.3	61.0	171.6	57.2	58.0
Marfed x Merit-28	13058	7-5	43	46.8	58.1	45.4	150.3	50.1	58.0

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

Mean Yield.....51.9
S. E. $\bar{x}$.....3.558
L.S.D. .....N. S.
C. V. 6.86%

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	2	57.56	1.52
Varieties	14	54.357	1.43
Error	28	37.984	
Total	44		

Table XXVI. Agronomic data from Durm Yield Nursery at Creston, Montana. (Bad Rock Community) 1956. Four row plots three replications.

Date Planted. May 18, 1956. Date Harvested. September 17, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or N No.	Heading Height in Ins.	Lodging %	Plot Yield In Bushels Per Acre I	II	III	Total Bushel	Average Bushel Per Acre
Vernum	12255	39	10	16.3	26.9	29.1	72.3	24.1
Ramsey (Ld. 369)	13246	36		22.7	19.1	22.7	64.5	21.5
Towner (Ld 370*	13247	42	5	19.1	9.2	25.5	53.8	17.9
Mindum	5296	39	10	25.5	26.2	25.5	77.2	25.7
Ld 308 x Nugget	Ld 357	37	15	19.9	22.7	34.7	77.3	25.8
Yuma (Ld 364)	13245	36	15	18.4	21.3	18.4	58.1	19.4
Thatcher	10003	35		26.2	19.1	26.9	72.2	24.1
Rescue	12435	38		25.2	26.2	26.9	78.3	26.1
Stewart	12066	39	10	21.3	12.8	25.5	59.6	19.9
Langdon (Ld 372)	13165	34	5	19.9	11.3	24.8	56.0	18.7
Sentry (Ld 356)	13102	37		24.8	13.5	28.4	66.7	22.2
Lee	12488	37		26.2	28.4	24.1	78.7	26.2
Selkirk	13100	37		26.2	25.5	28.4	80.1	26.7

Note: Hail Damage July 20, 1956.

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	2	121.597	6.16**
Varieties	12	30.373	1.54
Error	24	19.755	
Total	38		

Mean Yield....22.9
S. E. $\bar{x}$.....2.5663
L.S.D.....N. S.
C. V. 11.21%

Table XXVII. Agronomic data from Milling and Baking Plots, Dryland, Creston, Montana 1956.

Variety or Cross	C. I. or N No.	Head Type	Bushels Per Acre	Rank
Thatcher x Rescue B50-18	13244	Bearded	56.8	2
Rescue	12435	Beardless	31.1	5
1520 x 1752 (N2389)	13041	Bearded	57.9	1
Thatcher	10003	Beardless	37.5	4
Pilot^2 x Thatcher (N2170)	12974	Bearded	48.2	3

Mean Yield.....46.3

DRYLAND SPRING GRAIN

Oats

The Pacific Northwest Uniform nursery with 36 entries was seeded in four row plots and replicated three times. The soil was very wet at the time of seeding and tended to pack. Emergence was quite even, but growth was slow because of the cool soil and weather conditions. Cultivation of plots was done in July as was spraying with ½ pound 2,4-D, per acre. Exeter and C. I. 6613 were significantly better in yield than Park which is used as the check variety. Test weights were all better than U.S.D.A. standard of 32 pounds per bushel. Mid season oats seem to produce better than the early or late varieties. Table XXVIII.

A cross was made between Gopher and Bridger to combine the desirable characteristics of these two recommended varieties in to one. The purpose is to develope a high quality high yielding dryland oat. In all cases Bridger out yielded all selections, whereas Gopher was lower in yield than all selections. Table XXIX shows the data from this nursery.

Table XXVIII. Agronomic data from dryland Pacific Northwest Unifrom nursery, grown at Creston, Montana 1956. Four row plots three replications.

Date Planted. May 14, 1956 Date Harvested. September 18, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Heading Date	Plot Yield in Ounces I	II	III	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Andrew x Clinton	5658	7-11	22.50	14.50	18.25	55.25	97.9	38
Clinton x Ukraine	6537	7-10	21.75	16.75	20.50	59.00	104.6	39
Andrew x Clinton	5657	7-11	15.00	16.50	16.50	48.00	85.1	35
Palomino	5636	7-10	25.50	20.50	21.75	67.75	120.1	39
Cody	3916	7-19	23.25	25.75	20.00	69.00	122.3	38
Clinton "59"	4259	7-10	17.75	17.25	14.00	49.00	86.9	39
Winema	4373	7-10	22.00	20.50	20.00	62.50	110.8	36
V-R x Bannock (Centore)	3865	7-17	26.75	23.75	23.75	74.25	131.6	38
Craig	5332	7-17	18.00	19.50	18.75	56.25	99.7	39
Overland	4181	7-18	25.50	22.50	16.50	64.50	114.3	38
Clinton x Overland^2	5345	7-14	23.00	24.00	19.00	66.00	117.0	38
Clinton x Overland^2	5346	7-16	23.50	24.75	21.00	69.25	122.7	38
(B-A x Iogold) x (V-R)	6612	7-13	25.25	17.50	16.50	59.25	105.0	39
Park	6611	7-18	25.25	21.00	17.00	63.25	112.1	37
C. I. 4189 x Overland	6613	7-19	28.25	30.25	19.25	77.75	137.8*	39
C. I. 4189 x Overland	5347	7-18	29.00	23.00	18.75	70.75	125.4	39
--	48AB6902	7-18	24.50	21.25	21.25	67.00	118.8	38
Markton	2053	7-16	23.25	24.00	17.25	64.50	114.3	39
Ajax	4157	7-14	20.75	18.50	10.50	49.75	88.2	39
Simcoe	6767	7-14	17.50	17.25	11.75	46.50	82.4	39
Fortune	5226	7-17	17.50	16.75	16.50	50.75	90.0	39
Garry (New)	6662	7-16	24.25	14.25	16.25	54.75	97.0	39
Garry (Original)	6648	7-15	17.00	18.75	15.75	51.50	91.3	39
Rodney	6661	7-19	20.50	16.25	15.50	52.25	92.6	40
Sauk	5946	7-15	22.50	18.00	18.50	59.00	104.6	39
Exeter	4158	7-19	27.75	28.75	23.25	79.75	141.4*	39

Continued

Table XXVIII. (Continued) Agronomic data from dryland Pacific Northwest Uniform nursery, grown at Creston, Montana 1956. Four row plots three replications.

Date Planted. May 14, 1956 Date Harvested. September 18, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Heading Date	plot yield in ounces I	II	III	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Shelby	4372	7-14	18.50	17.00	11.25	46.75	82.9	40
Bannock	2592	7-19	16.00	23.50	23.50	63.00	111.7	39
Victory	1145	7-21	25.75	24.25	19.50	69.50	123.2	41
Shasta	3976	7-22	29.50	21.50	21.75	72.75	129.0	39
Eagle	4113	7-19	26.00	26.75	20.75	73.50	130.3	41
Bridger	2611	7-22	24.25	25.00	19.50	68.75	121.9	40
Mission	2588	7-15	17.00	11.75	13.50	42.25	74.9	41
Gopher	2027	7-11	12.25	10.00	15.25	37.50	66.5	36
Dupree	4672	7-9	14.00	17.25	15.25	46.50	82.4	36
Jackson	5441	7-11	19.00	20.50	20.00	59.50	105.5	41

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

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

Mean Yield....106.8
S. E. $\bar{x}$.....8.2106
L.S.D.(5%)....23.1
L.S.D.(1%)....30.8
C. V. 7.69%

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	2	140.4795	19.64**
Varieties	35	37.2426	5.21**
Error	70	7.1524	
Total	107		

Table XXIX. Agronomic data for dryland selection nursery, Creston, Montana in 1956. Single row plots and four replications.

Date Planted. May 17, 1956 Date Harvested. September 18, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Heading Date	Plot Yield in Ounces I	II	III	IV	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Gopher	2027	7-14	11.50	18.00	12.25	12.00	53.75	71.5	36
Gopher x Bridger	44-5-3-12	7-19	17.50	16.25	20.50	17.50	71.75	95.4*	37
Gopher x Bridger	44-5-3-31	7-15	14.00	17.00	12.50	20.00	63.50	84.4	37
Gopher x Bridger	44-5-3-13	7-15	16.50	17.25	20.50	15.50	69.75	92.7*	39
Gopher x Bridger	44-5-3-26	7-16	19.50	19.75	19.00	16.50	74.75	99.4*	38
Gopher x Bridger	44-5-2-9	7-15	18.00	16.50	20.50	19.25	74.25	98.7*	39
Gopher x Bridger	44-5-2-2	7-15	16.00	24.25	22.00	15.75	78.00	103.7**	40
Gopher x Bridger	44-5-2-6	7-14	19.25	17.00	17.00	17.00	70.25	93.4*	37
Gopher x Bridger	44-5-2-5	7-18	13.50	10.50	20.50	16.00	60.50	80.4	37
Bridger	2611	7-20	22.50	21.50	26.00	21.50	91.50	121.6**	40

*Varieties yielding significantly more than Gopher (5%).
**Varieties yielding significantly more than Gopher (1%).
__Varieties yielding significantly less than Bridger (5%).
==Varieties yielding significantly less than Bridger (1%).

Mean Yield...94.1
S. E. $\bar{x}$.....7.174
L.S.D.(5%)...20.8
L.S.D.(1%)...28.1
C. V. 7.62%

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	3	10.0877	1.39
Selections	9	26.6729	3.66**
Error	27	7.2808	
Total	39		

DRYLAND SPRING GRAIN

Barley

The interstate barley nursery was grown in field A-1, following silage corn. This nursery contained 25 entries. Moisture during the growing season was very good. Cultivation was done during June for weed control.

Yields were very high, with a mean of 83.5 bushels per acre. Freja was highest in yield with 108.4 bushels per acre. Considerable smut was found on several varieties in the nursery. See table XXX. Lodging was severe in the weak straw varieties. In the two row selections Freja and Sanalta were equal in straw strength. None of the six row selections were equal to these varieties.

The isogenic nursery, 2 vs 6 row barley contained ten entries or five selections, with a character for two and six row heads. This nursery was sprayed for weed control June 14 and cultivated once during the growing season. None of the selections met the standard of 48 pounds for bushel weight. The six row selections were higher in yield than two row selections in all pairs except Isogenic numbers 21-6-14, and 21-2-14, in which case 21-2-14 was higher in yield. Lodging was more severe among the six row selections than the two row. Table XXXI.

Table XXX. Agronomic data from dryland interstate barley nursery at Creston, Montana in 1956. Four row plots and three replications.

Date Planted. May 5, 1956 Date Harvested. August 22, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Heading Date	Height in Inches	Lodging %	Plot Yield In Ounces I	II	III	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Hannchen	4841	7-4	39	95	18.75	23.50	15.75	58.00	68.5*	49
Dekap	3351	6-29	33	95	17.75	14.50	21.50	53.75	63.5*	48
Heines Hanna (s)	9532	7-2	35	45	19.25	21.50	23.00	63.75	75.3	51
Heimdal	8094	7-7	32	57	24.00	23.25	36.50	83.75	99.0	47
Carlsberg II	10114	7-7	30	5	25.75	19.75	25.75	71.25	84.2	47
Betzes	6398	6-29	33	55	24.00	20.75	23.75	68.50	80.9	51
Freja (s)	7130	6-29	27	2	25.50	21.50	36.75	91.75	108.4	50
Compana	5438	6-25	26	100	21.50	17.50	14.75	53.75	63.5*	47
Otis (s)	7557	6-22	30	95	20.00	26.00	27.50	73.50	86.9	47
Compana x Morgenrot (s)	49-527-24	6-21	23	77	17.75	15.00	12.00	44.75	52.9*	49
Sanalta (s)	6087	7-7	42	2	37.50	23.75	29.75	91.00	107.5	48
Australian	3038	6-29	34	95	26.25	19.00	17.50	62.75	74.2	47
Stamm	--	7-5	35	37	17.25	19.00	20.00	56.25	66.5*	53
Glacier x Titan	50-5639-12	6-25	30	12	22.00	17.75	31.50	71.25	84.2	46
Glacier x Titan (s)	50-5610-7	6-27	34	12	34.50	20.00	31.50	86.00	101.6	44
Lico x C. I. 7152 (s)	49-5580-4	6-21	32	42	17.75	37.50	30.50	85.75	101.3	46
Vantage (s)	7324	6-26	39	56	24.25	26.50	33.75	84.50	99.9	48
Husky (s)	9537	7-3	37	-	18.50	24.50	30.00	73.00	86.3	48
Vantmore (s)	9555	6-26	41	37	24.00	24.50	24.50	73.00	86.3	47
Titan	7055	6-25	33	15	26.00	15.50	17.50	59.00	69.7*	44
Glacier (s)	4976	6-21	32	10	26.25	28.75	14.25	69.25	81.8	41
Trail (B-103)[1]	9538	6-29	40	58	25.00	30.25	25.75	81.00	95.7	47
Hiland	9530	6-27	32	40	17.00	22.75	15.00	54.75	64.7*	43
C. I. 714 x Velvon 11	10006				28.50	22.25	28.50	79.25	93.7	44
U.M. 570	--	6-29	38	12	29.50	21.50	24.75	75.75	89.5	48

(s) Indicates smut found in this variety.
[1]Head broken down at the last node.
Note: Vantage is used as a check in this nursery.
*Varieties yielding significantly less than the check (5%).

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	2	22.325	-
Varieties	24	55.943	2.13
Error	48	26.2386	
Total	74		

Mean Yield.....83.5
S. E. $\bar{x}$.....10.484
L.S.D.(5%).....29.8
C. V. 12.56%

Table XXXI. Agronomic data from dryland isogenic, 2 vs 6 row nursery grown at Creston, Montana in 1956.

Date Planted. May 18, 1956 Date Harvested. September 8, 1955 Size of Plot. 16 feet.

Variety or Cross	Isogenic Number	Heading Date	Height in Inches	Lodging %	Plot Yield in Ounces I	II	III	IV	Total Ounces	Average Bushel Per Acre	Bushel Wt. in Pounds
Manchuria x Poppenheim	13-6-15	7-19	37	25	20.75	20.25	21.50	17.75	80.25	71.1	47.0
Manchuria x Poppenheim	13-2-15	7-16	41	2	17.75	16.00	16.75	18.50	69.00	61.2	45.0
Manchuria x Kolter	16-6-15	7-16	41	100	13.50	13.50	13.50	18.75	59.25	52.5	45.0
Manchuria x Kolter	16.2-15	7-17	43	52	14.25	13.25	13.00	13.50	54.00	47.9	50.0
Manchuria x Plumage	21-6-14	7-21	46	100	9.75	12.25	11.34[1]	16.00	49.34	43.7	40.0
Manchuria x Plumage	21-2-14	7-21	48	62	14.75	13.00	15.25	23.00	66.00	58.5	49.0
Manchuria x C.I. 5037	7-6-15	7-10	40	20	18.50	28.50	20.25	20.00	87.25	77.3	44.0
Manchuria x C.I. 5037	7-2-15	7-10	40	-	16.75	17.25	14.75	20.75	69.50	61.6	46.0
Manchuria x C.I. 4254-1	23-6-14	7-15	42	99	17.50	18.50	16.75	21.75	74.50	66.0	46.0
Manchuria x C.I. 4254-1	23-2-14	7-12	43	29	16.50	13.25	15.00	18.25	63.00	55.8	37.0

[1]Calculated missing plot.

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	3	19.244	3.05*
Variety	9	33.6006	5.33*
Error	26	6.3037	
Total	38		

Mean Yield.....59.6
S. E. $\bar{x}$.....4.4501
L.S.D.(5%).....13.0
L.S.D.(1%).....17.5
C. V. 7.47%

DRYLAND SPRING GRAINS

Date of Planting

In 1952 a date of planting study was started to determine the best dates to plant. Results from the study showed that the best planting dates for wheat was May 5, barley May 5 or April 15, and oats April 15. In 1956 seeding rates were added to the date of seeding study. Two rates were used for each cereal. The varieties used were recommened, namely Pilot wheat, Vantage barley, and Park oats. This trial was designed as a split plot.

Pilot wheat in this trial gave the best yields planted, April 25, at 60 pounds of seed per acre. There were significant differences between rates but none due to date of planting. See Table XXXII.

Park oats were high in yield with the combination of 80 pound seeding rates and planting date of April 15. Analysis shows no significance between seeding rates, but highly significant due to dates of planting. Table XXXIII.

Seeding 70pounds of seed per acre April 25 gave the highest yields of Vantage barley in 1956. There was no significance due to seeding rates but dates were significant at the 5% level. Table XXXIV.

Table XXXIIa. Agronomic data from Pilot spring wheat planted at five differnet dates and two rates of seeding at Creston, Montana 1956.

Replications	Date of Seeding	Rate of Seeding 30#	60#	Sum	Replication Total
I	April 15	24.25	25.50	49.75	
	April 25	27.25	26.25	53.50	
	May 5	23.25	21.75	45.00	
	May 15	22.75	22.75	45.50	
	May 25	12.50	14.25	26.75	220.50
II	April 15	16.25	20.25	36.50	
	April 25	18.75	28.25	47.00	
	May 5	15.25	22.00	37.25	
	May 15	21.75	23.25	44.50	
	May 25	11.25	15.25	26.50	191.75
III	April 15	18.75	21.00	39.75	
	April 25	14.25	16.25	30.50	
	May 5	11.25	22.50	33.75	
	May 15	17.50	22.25	39.75	
	May 25	11.50	19.75	31.25	175.00
Sum		266.50	321.25	587.25	587.25

Table XXXII b.

Date of Seeding	Rate of Seeding 30#	60#	Sum	Average Bushel/Acre
April 15	59.25	66.75	126.00	59.6
April 25	60.25	70.75	131.00	61.9
May 5	49.75	66.25	116.00	54.8
May 15	62.00	68.25	130.25	61.6
May 25	35.25	49.25	84.50	39.9
Sum	266.50	321.25		
Average Bushel Per Acre	50.4	60.7	Mean Yield.....55.6	

Table XXXII c. Agronomic data from date of planting study on Pilot wheat Creston, Montana 1956.

Planting Date	Seeding Rate 30# Heading Date	Height in Inches	Harvest Date	Seeding Rate 60# Heading Date	Height in Inches	Harvest Date
April 15	6-25	45	8-22	6-25	45	8-22
April 25	6-28	44	9-8	6-28	45	9-8
May 5	7-5	44	9-8	7-6	46	9-8
May 15	7-12	46	9-8	7-12	45	9-8
May 25	7-20	42	8-19	7-19	43	9-19

Table XXXIII a. Agronomic data from Park oats planted at five different dates and two rates of seeding, at Creston, Mont. 1956.

Replications	Date of Seeding	Rate of Seeding 40#	80#	Sum	Replication Total
I	April 15	27.00	31.00	58.00	
	April 25	31.50	26.00	57.50	
	May 5	28.25	30.00	58.25	
	May 15	26.50	30.00	56.50	
	May 25	15.50	20.00	35.50	265.75
II	April 15	30.75	29.00	59.75	
	April 25	24.50	26.00	50.50	
	May 5	24.75	28.50	53.25	
	May 15	26.50	26.75	53.25	
	May 25	19.00	19.50	38.50	255.25
III	April 15	28.00	22.75	50.75	
	April 25	29.00	27.50	56.50	
	May 5	28.50	25.25	53.75	
	May 15	21.50	24.00	45.50	
	May 25	18.00	14.75	32.75	239.25
Sum		379.25	381.00	760.25	760.25

Table XXXIII b.

Date of Seeding	Rate of Seeding 40#	80#	Sum	Average Bushel/Acre
April 15	85.75	82.75	168.50	149.3
April 25	85.00	79.50	164.50	145.8
May 5	81.50	83.75	165.25	146.5
May 15	74.50	80.75	155.25	137.6
May 25	52.50	54.25	106.75	94.6
Sum	379.25	381.00		
Average Bushel Per Acre	134.4	135.1	Mean.....134.8	
			Date of Seeding---L.S.D.(5%).....17.6	
			Date of Seeding---L.S.D.(1%).....17.9	
			C. V. 5.65%	

Table XXXIII c. Agronomic data from date of planting study on Park oats Creston, Montana 1956.

Planting Date	Seeding Rate 40 # Heading Date	Height in Inches	Harvest Date	Seeding Rate 80# Heading Date	Height in Inches	Harvest Date
April 15	6-29	43	8-22	6.29	41	8-22
April 25	7-7	42	9-8	7-5	39	9-8
May 5	7-9	42	9-8	7-9	42	9-8
May 15	7-16	41	9-8	7-16	41	9-8
May 25	7-20	35	9-19	7-20	36	9-19

Analysis of Variance

Source	D.F.	Sum of Square	Mean Square	F
Replication	2	35.617	17.809	2.89
Dates	4	443.688	110.922	18.00**
Error a	8	49.286	6.161	
Main Plots	14	528.591		
Rate	1	.102	.102	
Rate and Dates	4	14.210	3.553	
Error b	10	65.033	6.503	
Total	29	607.936		

Table XXXIV a. Agronomic data from Vantage barley planted at five different date and two rates of seeding at Creston, Montana 1956.

Replication	Date of Seeding	Rate of Seeding 35#	70#	Sum	Replication Total
I	April 15	26.75	17.50	44.25	
	April 25	17.75	23.25	41.00	
	May 5	17.25	19.75	37.00	
	May 15	23.25	20.25	43.50	
	May 25	16.00	18.25	34.25	200.00
II	April 15	20.50	23.00	43.50	
	April 25	22.50	25.50	48.00	
	May 5	22.50	20.25	42.75	
	May 15	19.00	23.50	42.50	
	May 25	15.50	16.50	32.00	208.75
III	April 15	16.75	26.50	43.25	
	April 25	25.75	29.50	55.25	
	May 5	15.00	21.00	36.00	
	May 15	23.25	19.00	42.25	
	May 25	16.50	14.50	31.00	207.75
Sum		298.25	318.25	616.50	616.50

Table XXXIV b.

Date of Seeding	Rate of Seeding 35#	70#	Sum	Average Bushel/Acre
April 15	64.00	67.00	131.00	77.4
April 25	66.00	78.25	144.25	85.2
May 5	54.75	61.00	115.75	68.4
May 15	65.50	62.75	128.25	75.8
May 25	48.00	49.25	97.25	57.5
Sum	298.25	318.25	616.50	
Average Bushel Per Acre	70.5	75.2		

Mean Yield.....72.9
Date of Seeding--L.S.D.(5%).....13.3
C. V. 7.88%

Table XXXIV c. Agronomic data from date of planting study on Vantage barley, Creston, Montana 1956.

Planting Date	Seeding Rate 35#/A Heading Date	Height in Inches	Harvest Date	Seeding Rate 70#/A Heading Date	Height in Inches	Harvest Date
April 15	6-22	38	8-22	6-22	39	8-22
April 25	6-28	38	8-22	6-28	37	8-22
May 5	7-1	38	8-22	6-30	39	8-22
May 15	7-8	40	9-8	7-7	39	9-8
May 25	7-15	36	9-8	7-14	39	9-8

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Square	F
Replication	2	4.588	2.294	
Date	4	209.716	52.429	6.66*
Error a	8	62.933	7.867	
Total Main plots	14	277.237		
Rate	1	13.333	13.333	
Rates and Date	4	21.209	5.303	
Error b	10	137.896	13.7896	
Total	29	449.675		

CERTIFIED GRAINS

Certified or Foundation Seed was used in seeding all field grains in 1956. Of the amount seeded only 3.3 acres were inspected for Certification. The following table gives the amount produced of the various crops.

Crop	Variety	Generation	No. of Acres	Amont Produced	Field inspection	Laboratory Data
Wheat	Pilot	Foundation	1½	5013#	Passed	Blue Tag
Wheat	Wasatch	Foundation	.5	660#	Passed	Blue Tag
Wheat	12930	Approved	.2	420#	Passed	--
Wheat	N2389	Foundation	.5	2169#	Passed	--
Barley	Vantage	Certified	.6	2143	Passed	Blue Tag

DRYLAND WINTER GRAIN

Wheat

The interstate winter wheat nursery seeded at Creston consisted of seventeen entries. All were hard red winters except 27-15 x Rex-Rio-41 which is a bread type white wheat. Moisture conditions were very good. Ice which formed during January reduced the yield of much of the wheat, but had no effect on the station material. To control weeds this nursery was cultivated once and hand weeded to remove weeds within the row.

Drawf bunt was moderate to severe in this nursery. Newturk and Yogo-Rescue 66-22 were the varieties with the highest rate of infection. Wasatch had traces of bunt. C.I. 12696 was the highest yielding variety with 74.2 bushels per acre and free of drawf bunt. C.I. 12933 was next in yield followed by 12930. These are of the drawf bunt resistant varieties, of these, C.I. 12933 showed 0.1% drawf bunt this year. Lodging was moderate in the Yogo-Rescue crosses and in some of the older varieties. No lodging was noted in C. I. 12933, 12930 and C. I. 12696. The mean yield of this nursery was 65.5 bushels per acre. Table XXXV.

Twenty entries were grown in the Uniform Western Regional Hard Red winter nursery. This was seeded very late in the season, Oct. 17, 1955. Emergence was poor due to dry conditions in the area. Winter killing was severe in the less hardy varieties due to the lack of snow cover.

There was no evidence of drawf bunt in this nursery. Stands were poor in most varieties. This nursery tested the winter hardness of these varieties. C. I. 12696 was poorest in stand (7%), and lowest in yield (2.3). C. I. 12806 was best in stand (90%) and highest in yield (17.0). Because of erratic stands a high C. V. was obtained. Wasatch, the check variety was low in yield 6.4 bushel per acre and a stand of 33%. C.I. 12930 and 12933 were 53 and 72% in stand respectively. However the difference of yield of these two varieties was not significant. Table XXXVI.

To study a large selection of crosses of Yogo-Turkey/oro 221 a single row three replicated nursery was seeded. There were 163 entries in this nursery. Only a portion of them were harvested. Many being eliminated because of poor characteristics. Lodging was severe in this nursery, but no notes were taken for comparisons. Drawf bunt was noted in several of the varieties. The mean of this nursery was 53.5 bushels per acre. No one variety can be selected at this time for high yielding ability.

Planting dates of winter wheat have been a question in Northwestern Montana for many years. To determine the optium date a study was began in the fall of 1955. Two varieties were used in this study. See Table XXXVII a. One years data shows that Sept. 24 was the best planting date in 1955, and 12930 was the highest yielding variety. Table XXXVIIb.

Table XXXV. Agronomic data from interstate winter wheat nursery grown at Creston, Montana in 1955-56. Four row plots four replications.

Date Planted. September 19, 1955 Date Harvested. August 16, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Heading Date	Height in Inches	Lodging %	Drawf Bunt %	Plot Yield In Bushel Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Blackhull-Rex/Rio/Rex	12932	6-10	37	7	.1	64.5	60.3	71.6	64.5	260.9	65.2	62
Yogo	8003	6-11	41	20	.7	55.3	61.0	56.7	67.4	240.4	60.1	62
Yogo x Rescue 56-28		6-10	41	54	.3	71.6	61.7	59.6	73.7	266.6	66.7	61
Yogo x Rescue 56-30		6-10	38	26	.7	75.2	75.9	54.6	81.5	287.2	71.8	62
Yogo x Rescue 66-22		6-8	38	-	.8	60.3	44.0	44.4	51.1	199.8	50.0**	61
Newturk		6-11	40	78	.8	61.0	56.7	54.6	63.1	235.4	58.9	63
Kharkof 17-7		6-10	41	26	T	66.6	55.3	57.4	69.5	248.8	62.2	62
Cheyenne		6-10	39	-	1.6	71.6	61.7	70.2	80.8	284.3	71.0	62
Karmont		6-10	39	44	.3	58.1	63.1	52.5	59.6	233.3	58.3	62
Wasatch	11925	6-9	41	7	T	61.7	61.0	69.5	68.1	260.3	65.1	62
Blackhull/Rex x Cheyenne	12933	6-10	40	-	.1	75.9	80.1	56.0	80.1	292.1	73.0	63
27-15 x Rex-Rio-41 (Burt)	12696	6-9	37	-	-	82.2	76.5	51.6	86.5	296.8	74.2	61
Norin 10 x Brevar-11		6-8	24	-	1	81.5	69.5	59.6	66.6	277.2	69.3	58
Norin 10 x Brevar-17		6-8	22	-	2	71.6	73.0	73.0	73.7	291.3	72.8	60
Yogo x Rescue 56-19		6-10	37	5	.3	60.3	63.1	53.9	70.2	247.5	61.8	59
Rio-Rex Nebred	12930	6-8	37	-	-	68.1	74.4	51.6	80.1	274.2	68.6	63
Columbia	12928	6-8	36	-	T	57.4	69.5	60.3	73.0	260.2	65.1	63

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

Mean Yield.....65.5
S. E. $\bar{x}$.....3.32995
L.S.D.(5%).....9.5
L.S.D.(1%).....12.6
C. V. 5.11%

Analysis of Variance

Source	D. F.	Mean Square	F.
Replications	3	464.20	10.47**
Varieties	16	168.2375	3.79**
Error	48	44.3548	
Total	67		

Table XXXVI. Agronomic data from Uniform hard red winter wheat nursery grown in Flathead county on the Conrad Gilbertson farm in the Stillwater area, Kalispell, Montana in 1955-56. Single row plots four replications.

Date Seeded. October 17, 1955 Date Harvested. August 23, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Height in Inches	Stand Per-cent	Plot Yield In Bushels Per Acre I	II	III	Total Bushel	Average Bushels Per Acre
Minturki x Tim/Vaulgare[2]	12806	27	90	21.3	17.0	13.5	51.8	17.3**
Yogo x Rescue	56-30	24	40	16.3	12.8	10.6	39.7	13.2*
H44 x Minturki[4]	Minn 2844	27	58	17.7	15.6	11.3	44.6	14.9**
Kharkof	1442	25	70	17.0	19.1	14.9	51.0	17.0**
Yogo	8003	26	68	19.9	8.5	19.1	47.5	15.8**
Wasatch	11925	25	33	5.7	9.2	4.3	19.2	6.4
Blackhull/Rex x Cheyenne	12933	23	72	9.2	19.9	12.8	41.9	14.0**
Kiowa	12133	21	44	8.5	8.5	9.2	26.2	8.7
Blackhull/Rex x Rio/Rex	12932	24	65	8.5	15.6	11.3	35.4	11.8*
Rio	10061	24	67	13.5	17.0	10.6	41.1	13.7**
Rio/Rex x Nebred (Columbia)	12928	21	68	15.6	17.7	11.3	44.6	14.9**
Rio/Rex x Nebred	12930	20	53	13.5	14.2	7.1	34.8	11.6*
Orfed x Wasatch	12943	22	47	14.2	16.3	12.1	42.6	14.2**
175a - 53 Utah		21	55	7.8	9.9	10.6	28.3	9.4
175a - 55 Utah		23	32	9.2	7.1	11.3	27.6	9.2
Rio/Rex x Nebred	12929	23	32	9.2	12.1	6.4	27.7	9.2
Cheifkan x Mt/Tg	160-49-A-13	23	30	5.7	2.1	5.1	12.9	4.3
Commanche x C. I. 12250		20	35	3.5	8.5	7.1	19.1	6.4
Kharkof-17-7		27	60	13.5	18.4	8.5	40.4	13.5**
27-15 x Rex/Rio - 41	12696	18	7	9.0	3.5	3.5	7.0	2.3

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

Mean Yield.....11.4
S. E. $\bar{x}$.....1.8152
L.S.D.(5%).....5.2
L.S.D.(1%).....6.9
C. V. 15.92%

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	2	34.472	3.49
Varieties	19	53.7597	5.44
Error	38	9.88516	

Table XXXVII. Yield data from Yogo x Turkey/oro-221 F_2 derived lines in winter hardness and smut nurseries.

1955-56 Plots No. Replication # 1	Plot Yield in Ounces I	II	III	Total Ounces	Average Bu/Acre
5	22.50	25.50	19.00	67.00	63.3
8			15.50	15.50	42.5
9	24.00	25.00	13.50	62.50	59.1
10	19.75		18.50	38.25	54.2
11	18.00		16.25	34.25	48.6
12	22.75	18.00	13.25	54.00	51.1
13	22.25		16.00	38.25	54.2
14	25.75	16.50	16.00	58.25	55.1
15	13.75		14.50	28.25	40.1
16	27.25		15.00	42.25	59.9
17	20.25	22.00	22.00	64.25	60.7
18	20.00	23.00	16.50	59.50	56.3
19	18.25	19.75	16.00	54.00	51.1
20	19.75		15.75	35.50	50.3
21	21.75		14.50	36.25	51.4
22	20.50	20.75	19.75	61.00	57.7
23	21.25	26.00	16.00	63.25	59.8
24	20.75	21.50	21.75	64.00	60.5
25	27.50		19.00	46.50	65.9
26			13.00	13.00	36.8
27	23.00		15.00	38.00	53.9
28	22.50		16.50	39.00	55.3
29	17.00	19.00	14.25	50.25	47.5
30	25.25		19.00	44.25	62.7
31	20.00	18.00	13.00	51.00	48.2
32	19.50		16.00	35.50	50.3
33	27.00		16.25	43.25	61.3
34	24.00		23.75	47.75	67.7
35	21.50		14.25	35.75	50.7
36			16.00	16.00	45.4
37	22.75		12.00	34.75	49.3
38	21.00	21.00	19.00	61.00	57.7
39	20.00	20.00	17.00	57.00	53.9
40			13.75	13.75	39.0
41		16.75	20.75	37.50	53.2
43	24.50		15.00	39.50	56.0
45	22.75	20.50	18.00	61.25	57.9
46	19.75	22.50	12.75	55.00	52.0
48			14.50	14.50	41.1
53		16.75	18.00	34.75	49.3
57		21.00	15.25	36.25	51.4
60	20.00		13.00	33.00	46.8
63	23.50	28.25	17.75	69.50	65.7
66			18.75	18.75	53.2
68	18.00	17.75	17.00	52.75	49.9

Table XXXVII. (Continued) Yield data from Yogo x Turkey/oro-221 F_2 derived lines in winter hardness and smut nurseries.

1955-56 Plots No. Replication #1	Plot Yield in Ounces I	II	III	Total Ounces	Average Bu/Acre
70	20.25	20.25	19.25	59.75	56.5
71	14.25			14.25	43.2
72		21.50	15.50	37.00	52.5
73	14.50	26.25	16.00	56.75	53.5
74		27.50	18.00	45.50	64.5
76	19.50		15.50	35.00	49.6
78	16.00		14.50	30.50	43.3
79			18.75	18.75	53.2
81		21.50	12.25	33.75	47.9
83	19.25		18.50	37.75	53.5
85			14.25	14.25	40.4
88		24.25	17.50	41.75	59.2
89			13.25	13.25	37.6
90	18.00		18.25	36.25	51.4
91	20.50		23.50	44.00	62.4
92	18.00	19.50	23.00	60.50	57.2
93		24.00	19.00	43.00	61.0
94	17.75		14.25	32.00	45.4
95	16.75	20.00	16.75	53.50	50.6
99		25.75	14.50	40.25	57.1
103			20.00	20.00	56.7
106		17.75	17.50	35.25	50.0
107			24.00	24.00	68.1
109			18.00	18.00	51.1
111		25.75	20.25	46.00	65.2
112		26.00	12.50	38.50	54.6
115			21.50	21.50	61.0
117	21.00		18.00	39.00	55.3
119	20.00	18.00	17.25	55.25	52.2
121	19.75	23.50	17.50	60.75	57.4

Mean Yield.....53.5

Table XXXVIIa. Agronomic data from Date of Planting Study with winter wheat, three dates, two varieties, four row plots and four replications. Plot size 16 feet.

Replication	Date	Variety		Sum	Total
		Wasatch	12930		
I	Sept. 14	56.0	73.0	129.0	
	Sept. 24	67.3	70.2	137.5	
	Oct. 4	65.0	64.5	129.5	396.0
II	Sept. 14	66.6	60.2	126.8	
	Sept. 24	63.1	64.5	127.6	
	Oct. 4	40.4	65.9	106.3	360.7
III	Sept. 14	52.5	59.6	112.1	
	Sept. 24	56.0	65.2	121.2	
	Oct. 4	53.1	58.1	111.2	344.5
IV	Sept. 14	69.5	48.2	117.7	
	Sept. 24	50.3	73.0	123.3	
	Oct. 4	59.6	43.2	102.8	343.8
Sum		699.4	745.6	1445.0	1445.0

Table XXXVII b.

Date of Seeding	Wasatch	12930	Sum	Average
September 14	244.6	241.0	485.6	60.7
September 24	236.7	272.9	509.6	63.7
October 4	218.1	231.7	449.8	56.2
Sum	699.4	745.6	1445.0	
Average	58.3	62.1		

Analysis of Variance

Variation due to	D.F.	Sum of Square	Mean Square	o⁻ F
Replication	3	266.43	88.81	4.54
Dates	2	194.01	97.005	4.96
Error a	6	117.38	19.563	
Main Plots	11	577.82		
Varieties	1	56.54	56.54	
Variety and Date	2	132.01	66.005	
Error b	9	1005.86	111.762	
Total	23	1772.23		

DRYLAND WINTER WHEAT

Six off-station nurseries were seeded in six Western Montana counties. These counties will be listed with each Table. These nurseries consisted of nine entries, all hard red except C. I. 12696. Seeding was done in single row plot 18 feet long and four replications.

The location of the nursery in Lake county was poor, being in a low place. Because of this condition two replications were quite poor and low in yield. Results thus obtained were not significant when analysed statistically. Drawf bunt was very bad in mon-resistant varieties. A trace was found in C. I. 12930, but none in Wasatch or C.I. 12933. Stands were good to fair with C. I. 12696 being the poorest. Table XXXVIII.

The low coefficient of variability indicated good data were obtained from the nursery in Missoula County. C. I. 12930 was significantly better in yield than Wasatch at the 1% level as was Columbia. However the difference between Columbia and C. I. 12930 was not significant. C. I. 12696 was poorest in Stand with 72%. Drawf bunt was found only in Newturk and Yogo. Table XXXIX.

The seed bed in Lincoln county was very dry. However spring survival was fair. Yields did not vary among varieties but stands varied considerably. Yogo and Columbia wer high in yield with 19.2 bushels per acre. No drawf bunt was found in the nursery. The mean yield was 15.5 but results were not significant. Table XL.

As in past trials in Ravalli county, Newturk was the high yielding variety again in 1956, with 34.6 bushel per acre. No drawf bunt was found in this nursery. C. I. 12930 was second in yield. It was equal in stand to Newturk and there was no lodging as compared to ten per-cent in Newturk. Table XLI.

Table XXXVIII. Agronomic data from dryland winter wheat nursery grown in Lake County on the Walter Mangle Farm, Polson, Montana in 1955-56. Single row plot four replications.

Date Planted. September 24, 1955 Date Harvested. August 8, 1956 Size of Plot 16 feet.

Variety or Cross	C. I. or N No.	Stand in %	Drawf Bunt %	Heading Height in Ins.	Plot Yeild In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Wasatch	11925	78	-	44	48.2	38.2	7.1	9.9	103.5	25.8	61
Yogo	8033	84	15.0	38	48.9	54.6	8.5	6.4	118.4	29.6	61
Kharkof 17-7		80	T	40	48.2	39.0	19.1	9.2	115.5	28.9	60
Columbia	12928	81	-	30	49.6	41.1	5.7	8.5	104.9	26.2	62
Newturk		69	15.0	38	48.9	45.4	9.2	6.4	109.9	27.5	61
Blackhull-Rex x Cheyenne (M482296)	12933	85	-	39	45.4	44.0	33.3	8.5	131.2	32.8	61
Blackhull-Rex x Rio-Rex (M482271)	12932	71	.33	36	38.3	36.9	6.4	6.4	88.0	22.0	-
27-15 Rex-Rio-41	12696	60	-	31	37.6	35.4	7.1	7.8	87.9	22.0	59
Rio-Rex x Nebred (M482235)	12930	84	T	37	39.7	48.2	29.1	12.8	129.8	32.5	62

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

Mean Yield.....27.5
S. E. $\bar{x}$.....3.1811
L.S.D. (5%).....N. S.
C. V. 13.86%

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	3	3228.03	79.74**
Varieties	8	58.493	
Error	24	40.477	
Total	35		

Table XXXIX. Agronomic data from dryland winter wheat nursery grown in Missoula County on the William Lucier, farm Frenchtown, Montana in 1955-56. Single row plots four replications.

Date Planted. September 16, 1955 Date Harvested. August 8, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Stand in %	Drawf Bunt %	Heading Height in Ins.	Plot Yield In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Wasatch	11925	79	-	38	36.9	22.7	36.9	34.0	130.5	32.6	60
Yogo	8033	86	10	37	41.1	42.5	42.5	35.5	161.6	40.4*	57
Kharkof 17-7		82	-	37	32.6	25.5	38.3	32.6	129.0	32.3	58
Columbia	12928	90	-	31	51.8	42.5	41.8	49.6	185.7	46.4**	58
Newturk		80	9	35	36.9	35.4	42.5	32.6	147.4	36.8	59
Blackhull-Rex x Cheyenne (M482296)	12933	74	-	33	41.1	39.0	34.7	31.9	146.7	36.7	59
Blackhull-Rex x Rio-Rex (M482271)	12932	79	-	34	44.0	35.4	43.2	39.7	162.3	40.6*	57
27-15 Rex-Rio-41	12696	72	-	30	24.8	32.6	26.2	27.7	111.3	27.8	57
Rio-Rex x Nebred (M482235)	12930	87	-	30	50.3	44.7	43.6	44.0	182.6	45.7**	60

Note: Wasatch is used as a check in this nursery.
*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
Replications	3	37.557	2.24
Varieties	8	157.581	9.38**
Error	24	16.796	
Total	35		

Mean Yield....37.7
S. E. $\bar{x}$.....2.049
L.S.D.(5%)....6.0
L.S.D.(1%)....8.1
C. V. 5.44%

Table XL . Agronomic data from Dryland winter wheat nursery grown in Lincoln County on the Carl Lundeen farm, Eureka, Montana in 1955-56. Single row plots four replications.

Date Planted. September 29, 1955 Date Harvested. August 24, 1956 Size of Plot. 16 feet.

Variety or Cross	C. I. or N No.	Stand in %	Drawf Bunt %	Heading Height in Ins.	Plot Yield In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre
Wasatch	11925	63	-	30	15.6	15.6	13.5	9.9	54.6	13.7
Yogo	8033	65	-	28	26.2	17.0	13.5	19.9	76.6	19.2
Kharkof 17-7		60	-	28	16.3	11.3	13.5	17.7	58.8	14.7
Columbia	12928	81	-	24	13.5	25.5	17.0	20.6	76.6	19.2
Newturk		65	-	25	14.2	15.6	15.6	19.9	65.3	16.3
Blackhull-Rex x Cheyenne (M482296)	12933	52	-	25	14.9	13.5	8.5	13.5	50.4	12.6
Blackhull-Rex x Rio-Rex (M482271)	12932	68	-	26	14.2	14.2	14.9	14.9	58.2	14.6
27-15 Rex-Rio-41	12696	48	-	25	20.6	12.8	12.1	10.6	56.1	14.0
Rio-Rex x Nebred (M482235)	12930	46	-	25	20.6	16.3	12.1	12.8	61.8	15.5

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

Mean Yield.....15.5
S. E. $\bar{x}$.....1.7373
L.S.D.(5%).....N. S.
C. V. 11.21%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	23.494	1.95
Varieties	8	21.439	1.78
Error	24	12.073	
Total	35		

Table XLI. Agronomic data from dryland winter wheat nursery grown in Ravalli County on the L. B. McFadgen farm, Stevensville, Montana in 1955-56. Single row plot four replications.

Date Planted. September 22, 1955 Date Harvested. September 6, 1956 Size of Plot. 16 feet

Variety or Cross	C. I. or N No.	Stand %	Lodging %	Height in Inches	Plot Yield In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre	Bushel Wt. in Pounds
Wasatch	11925	96	10	34	31.9	21.3	31.2	24.1	108.5	27.1	62
Yogo	8033	84	12	29	34.7	23.4	14.2	26.2	98.5	24.6	62
Kharkof 17-7		72	12	32	31.2	21.3	22.0	24.1	98.6	24.7	61
Columbia	12928	92	2	30	26.9	14.9	25.5	30.5	97.8	24.5	63
Newturk		85	10	34	48.2	22.0	34.0	34.0	138.2	34.6	62
Blackhull-Rex x Cheyenne (M482296)	12933	95	-	31	22.7	25.5	24.1	39.7	112.0	28.0	63
Blackhull-Rex x Rio-Rex (M482271)	12932	92	20	32	26.2	29.8	26.9	22.7	105.6	26.4	62
27-15 Rex-Rio-41	12696	69	10	29	10.6	8.5	29.1	16.3	64.5	16.1	-
Rio-Rex x Nebred (M482235)	12930	86	-	29	24.1	30.5	29.8	26.9	111.3	27.8	62

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

Mean Yield.....26.0
S. E. $\bar{x}$.....3.404
L.S.D.(5%).....N. S.
C. V. 13.09%

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	3	73.271	1.58
Varieties	8	92.742	2.00
Error	24	46.352	
Total	35		

WINTER BARLEY

Eight winter barley nurseries were seeded in the fall of 1955. One located on the station and five off-station in Lincoln, Lake, Mineral, Missoula, and Sanders counties. These nurseries each contained ten entries.

The station nursery was seeded in Field Number B-8, October 1, 1955. This is an area with a high water table in the spring and a large wild oat population. Because of the wet condition early in the growing season it was impossible to control and of the wild oats. Because of the condition the nursery was abandoned.

The off-station nurseries had a mortality rate of 100 percent, due to winter killing. Not one of the nurseries remained in sufficient stand to warrant harvesting.

DATA FROM ROTATIONS

A Rotation Record Book has been prepared, for keeping permanent yield records for each rotation, and each plot in each rotation.

Data since 1949 has been entered. Schedules for fertilizer, manure and green manure use have been set up for each rotation. Also certain tillage practices have been specified, so that each years data will be somewhat comparable with each other years, so far as conditions are concerned.

Crop sequence by years has been listed for each rotation so that a glance at the Rotation Book will tell us what goes where when.

One interesting bit of information came from the yield summary made, showing that spring grain yields following cultivated crops on dryland have equaled spring grain yields following fallow.

Yields of spring grain following various crops and fallow at Creston, Grain yields in pounds per acre, five year average, dryland.

Spring grain after fallow	2835
Spring grain after peas	2174
Spring grain after potatoes	3071
Spring grain after corn	3200

IRRIGATION

Comparison of BPI Tank with Barrel Evaporation Rates 1956

Period	Loss in inches Tank	Barrel
April 23 to June 3	3.067	6.2[1]
June 3 to September 30	6.235	6.9[2]

[1]For this period the barrel was completely filled and half submerged, one-half the barrel below ground level. In that position evaporation was more than double that of the tank.

[2]June 3 the barrel was placed almost entirely below ground with the top two inches above ground level, and then filled to approximately ground level. In this position the moisture loss from the two vessels was quite comparable, being.66 inches more than the tank for the period.

It would appear that a steel barrel placed almost entirely below ground level and filled to ground level will provide a moisture loss meter quite comparable to the six foot BPI pan. It is my opinion that a half barrel would be even better , easier to enstall and fill, and less dangerous than the whole barrel.

Table XLII. Summary of Five crops irrigated at three rates 1956.

Crop------Alfalfa				Pasture			Barley		
Growth period for crop---5/1-8/14				5/1-9/1			5/15-8/12		
Irrigation Rate---1	2	3	1	2	3	1	2	3	
Pre-growth Precipitation	13.32	13.32	13.32	13.32	13.32	13.32	13.95	13.95	13.95
Growth period Precipitation	8.54	8.54	8.54	10.70	10.70	10.70	7.91	7.91	7.91
Inches Irrigation water	9.77	6.00	6.00	12.80	8.00	9.00	6.20	3.20	3.20
Total Moisture for crop	31.63	27.86	27.86	36.82	32.02	33.02	28.06	25.06	25.06
Yield Per Acre	3.5 T	3.8 T	3.6 T	2.6 T	2.8 T	2.3 T	76 Bu.	81 Bu.	80 Bu.
L.S.D. (5%)		N. S.			N. S.			N. S.	
Evap. Tank loss for period		6.956			7.693			5.762	

Crop------Corn Silage			Potatoes		
Growth period for crop---5/29-9/1			6/12-9/1		
Irrigation Rate--1	2	3	1	2	3
Pre-growth Precipitation	14.38	14.38	14.38	15.25	15.25	15.25
Growth period Precipitation	7.48	7.48	7.48	6.61	6.61	6.61
Inches Irrigation water	9.47	4.00	6.00	7.90	4.00	6.00
Total Moisture for crop	31.33	25.86	27.86	29.76	25.86	27.86
Yield Per Acre	27 T	26 T	23 T	312 cwt	350 cwt	308 cwt
L.S.D. (5%)		.31T			22 cwt.	
Evap. Tank loss for period		5.352			4.15	

Irrigation of Alfalfa at Three Rates 1956

Alfalfa was sprinkler irrigated at three rates.

1. .2 inches per day less rainfall, May 1- Aug. 14, when three inches is needed.
2. May 1-August 14 apply two inches whenever two inches is lost from Tank[1].
3. May 1-August 14 apply three inches whenever three inches is lost from Tank.

Soil moisture was optimum at the beginning of the period. The amount and frequency of application at all rates was reduced by frequent rainfall.

Pre-growth precipitation, September 1, 1955 to May 1, 1956 was 13.32 inches.

Growth period precipitation, while not considered adequate, was frequent and totaled 8.54 inches.

The pre-growth moisture, 13.32 inches, plus the growth period moisture of 8.54 inches, plus the water applied by irrigation totaled: Rate 1. 31.63 inches. Rate 2. 27.86 inches. Rate3. 27.86 inches.

Table XLIII. Alfalfa Hay, Two Cuttings

Rate	Irrigation Dates			Total Inches	Plot Yields In Pounds I	II	III	IV	Total Pounds	T/A 1956
1	5/22	6/15	7/31	9.77	13.32	11.52	13.22	13.41	51.47	3.50
2	5/22	6/14	7/30	6.00	14.59	13.00	13.00	15.59	56.18	3.82
3	6/1		7/31	6.00	10.75	11.75	16.13	14.84	53.47	3.64

Mean Yield.....3.65
S. E. $\bar{x}$.....2138
L.S.D. .....N. S.
C. V. 5.86%

[1]Tank- BPI Pan six foot tank two feet deep.

Irrigation of Pasture at three rates 1956

Pasture, primarily orchardgrass and Ladino, was sprinkler irrigated at three rates.

1. .2 inch per day less rainfall, 6/1 to 9/1, whenever three inches was needed.

2. 5/1-9/1, apply two inches when evaporation tank loss is two inches.

3. 5/1-9/1, apply three inches when tank loss is three inches.

Soil was wet May 1, from melting snow. The total amount applied and frequency of application by all rates was deminished by frequent summer rains. Pre-growth precipitation, September 1, 1955 to May 1, 1956 was 13.32. The growth period, May 1- 9/1 rainfall was 10.7 inches. These amounts added to the moisture applied by irrigation makes the total amount of moisture available to the crop 36.82 inches for Rate 1, 32.02 inches for Rate 2, and 33.02 inches for Rate 3.

Table XLIV. Irrigated Pasture, four clippings, 80 Square feet.

Date os clippings. 1-6/1 2-6/26 3- 7/20 4-8/17

Rate	Irrigation Dates				Total Inches	Plot Yield in Pounds I	II	III	IV	Total Pounds	Tons Per A.
1	5/22	6/15	7/31	8/24	12.8	9.90	9.08	9.36	10.67	39.01	2.65
2	5/22	6/14	7/30	8/20	8.0	10.30	9.67	10.14	10.96	41.07	2.79
3	6/1	7/31	8/24		9.0	10.31	8.54	8.42	6.80	34.07	2.31

Mean Yield.....2.59
S. E. $\bar{x}$.....1422
L.S.D. .....N. S.
C. V. 5.49%

Irrigation of Corn Silage 1956

Corn for silage was sprinkler irrigated at three rates.

1. .2 inch per day less rain whenever three inches is needed.
2. Apply two inches whenever evaporation tank loss is three inches.
3. Apply three inches whenever tank loss is three inches.

(Figure all rates from seeding date)

Soil moisture was very adequate at seeding time. All rates were reduced by frequent summer rain.

Pre-growth moisture, September 1, 1955 to May 29, 1956 was 14.38 inches. Growth period moisture May 29 to September 1 was 7.48 inches.

Totals including irrigation by rates were: Rate 1. 31.33 inches, Rate 2. 25.86 inches, Rate 3. 27.68 inches. Rates 1 and 2 were both significantly above rate 3 @ 5%.

Table XLV. Corn Silage Pounds from 106.66 Square feet.

Rate	Irrigation Dates			Tdtal Inches	Plot Yields in Pounds I	II	III	IV	Total	Tons Per A.
1	7/18	8/3	8/24	9.47	136	128	131	141	536	27.36
2	7/30	8/20		4.00	126	144	126	120	516	26.34
3	8/3	8/28		6.00	118	116	99	112	445	22.72

Mean Yield.....25.48 T.
S. E. $\bar{x}$..... .0889
L.S.D. (5%)..... .31
C. V. 0.35%

Irrigation of Barley at Three Rates 1956

Barley was sprinkler irrigated at three rates.

1. .2 inches per day less rainfall when jointing and heading.
2. Amount of evaporation tank loss at jointing and heading.
3. Apply three inches when loss from tank is three inches. All rates figured from seeding date.

Soil moisture was very adequate at seeding time. Frequent summer rains reduced the amount of irrigation required by all rates.

Pre-growth moisture, September 1, to May 15 was 13.95 inches.

Growth period moisture May 15, to August 12 was 7.91 inches.

Total including irrigation water was: Rate 1. 28.06 inches, Rate 2. 25.06 inches, Rate 3. 25.06 inches.

Table XLVI. Barley in pounds from 300 square feet.

Rate	Irrigation Dates		Total Inches	Plot Yields in Pounds I	II	III	IV	Total Pounds	Bu./ Acre
1	6/13	7/10	6.20	27.0	23.5	24.0	26.0	100.5	76.0
2	6/12		3.20	30.1	23.5	29.0	25.0	107.6	81.4
3	6/12		3.20	21.0	34.0	27.0	24.0	106.0	80.2

Best rate for barley is number two.

Mean Yield.....79.2
S. E. $\bar{x}$.....6.948
L.S.D. .....N. S.
C. V. 8.77%

Irrigation of Netted Gem Potatoes 1956

Netted Gem potatoes were irrigated by sprinkler system at three rates, all calculated from time of emergence.

1. .2 inch per day less rainfall, whenever two inches is needed.

2. Two inches whenever tank loss was two inches.

3. Three inches when tank loss was three inches.

Soil moisture was quite adequate when the crop was planted.

All rates were reduced by frequent rain. Pre-growth moisture September 1, 1955 to June 12, 1956 was 15.25 inches. Growth period rain, June 12 to September 1, was 6.61 inches. Total moisture including irrigation by rates was: Rate 1. 29.76, inches, Rate 2. 25.86 inches, Rate 3. 27.86 inches.

The best rate for potatoes with significance at the 1% level this year is the two inch application whenever the evaporation tank loss is two inches, Rate 2, even though the amount of water applied at this rate is less than for other rates used.

Table XLVII. Irrigated Potatoes, Pounds from 50 feet of 40 inch row.

Rate	Irrigation Dates			Total Inches	Plot yield in Pounds I	II	III	IV	Total Pounds	Cwt Per A.	% # 1's
1	7/18	7/31	8/28	7.9	125.0	110.0	132.0	110.0	477.0	311.7	94.09
2	7/30		8/20	4	133.5	127.0	143.0	131.5	535.0	349.6	92.01
3	7/31		8/28	6.0	119.5	120.0	122.0	110.0	471.5	308.08	94.30

Best rate for Potatoes, two inch tank loss.

Mean Yield.....323.1
S. E. $\bar{x}$.....6.3827
L.S.D.(5%).....22.1
L.S.D.(1%).....33.5
C. V. 2.0%

Fertilizer on Russian Wild Rye Seed

This is the fourth harvest year for 80 seed plots with twenty fertilizer treatments.

There has been little or no uniformity of responce. The greatest variation in yield is between the replications of a given treatment rather than between treatments.

If one were to believe what the four year average yields tell him he would conclude that by using fifty pounds of Nitrogen the seeding year and again the fourth year he would get the maximum possible yield. Personally I doubt that there is magic in this particular treatment when I look at the yields of Individual plots and see the variation from $\frac{1}{4}$ ounce to $2\frac{1}{4}$ ounces.

Probably this work should be discontinued and started over under more uniform soil conditions.

Table XLVIII. Fertilizer on Russian Wild Rye Seed. Ounces from 16 feet of two feet row and pounds per acre.

Treatment	Pounds Per Acre	Plot Yield In Ounces I	II	III	IV	Total Ounces	Pounds Per Acre	Four Year Ave.
Nitrogen every year including seeding year.	50	1.25	.50	1.50	.25	3.50	74.44	182
	100	1.75	1.50	.75	.25	4.25	90.40	208
	200	1.75	1.25	.50	.75	4.25	90.40	186
Nitrogen every harvest year.	50	.25	.25	.25	.25	1.00	21.27	137
	100	.75	.75	.25	.25	2.00	42.54	138
	200	1.75	1.25	1.50	.25	4.75	101.03	160
Nitrogen every year beginning 2nd harvest year.	50	.50	.50	.50	.25	1.75	37.22	138
	100	1.25	.50	1.75	.75	4.25	90.40	187
	200	1.25	.75	.50	.50	3.00	63.81	133
Nitrogen 1st and 4th years.	50	1.75	.50	.25	2.25	4.75	101.03	246
	100	2.25	.75	.25	.25	3.50	74.44	186
	200	1.75	1.25	.50	1.00	4.50	95.71	184
N. 1st 2 years.								
50 50 N 50 P		2.25	.25	.25	.25	3.00	63.81	192
100 50 N 50 P		.50	.25	1.50	.25	2.50	53.17	191
200 50 N 50 P		1.50	1.25	.25	.25	3.25	69.13	205
Nitrogen alternate years.	50	2.00	1.25	.25	.25	3.75	79.76	150
	100	1.00	.25	.25	.25	1.75	37.22	131
	200	3.00	1.00	.25	.25	4.50	95.71	194
50 1st, 100 2nd, 200 3rd.		1.25	1.25	1.50	.25	4.25	90.40	191
Checks	No N.	1.50	.50	.25	.25	2.50	53.17	142

Mean Yield.....71.25
S. E. $\bar{x}$.....22.25
L.S.D. .....N. S.
C. V. 31.65%

Fertilizer on Alta Fescue 1956

Plots of alta fescue seed, treated with fertilizers in 1955, were harvested in 1956 to determine wheather or not there was any residual effect on yield.

Another similar study has been started on fescue seeded in the spring of 1956.

Yields found to be significant when compared to no fertilizer were produced by plots treated with 66-66-0 and with 99-0-0.

Table XLIX.

Treatment Per Acre 1955		Grams per Plot				Total	Pounds	Two year
N	P	I	II	III	IV	Grams	Per Acre	Average
33	0	49	46	75	55	225	112.5	145
0	0	85	57	62	43	247	123.5	177
33	33	75	78	95	64	312	156.0	216
33	66	85	80	65	54	284	142.0	181
0	66	65	45	45	65	220	110.0	154
66	66	120	70	84	80	354	177.0*	234
66	132	70	105	70	49	294	157.0	204
99	0	98	112	77	67	354	177.0*	191

*Treatments yielding significantly more than the check 5%.

Mean Yield.....143.1
S. E. $\bar{x}$.....15.9106
L.S.D.(5%).....46.8
C. V. 11.12%

Fertilizer on Native Meadow

Curious as to why phosphate applications were not beneficial in this meadow which by test is very phosphate deficient harvest has been continued, for three years following fertilizer application in 1954.

Apparently we have been rewarded for continued effort, for yield of plots treated with 160 P_2O_5 in 1954 were found to be producing significantly more than the checks this season.

Three year average yields favor using 80 pounds nitrogen per acre. In this study this treatment has produced .85 tons more native hay for the three year period for a total of 2.55 tons of hay for a fertilizer cost of $11.20.

Protein content is shown to be lower for all treatments than for the checks by sample analysis by Chemistry Research at M.S.C. Phosphate content is also lower than the check in some treatments. Treatments used apparently stimulate yield at the sacrifice of quality.

Table L. Fertilizer on Native Meadow, Carter Hardy ranch, Marion, Montana. Harvested to measure residual effect of 1954 treatments.

Treatment and rate in Pounds Per Acre		Pounds from 96 sq. ft.				Total	Pounds Per Acre	3 Year Average
N	P	I	II	III	IV	Pounds	1956	Tons/A
0	80	3.60	6.30	3.60	9.00	22.50	2550	
0	160	5.40	7.20	7.20	10.00	29.80	3380**	1.16
40	0	5.40	6.30	3.60	9.00	24.30	2754	1.24
80	0	8.10	5.85	6.30	13.50	33.75	3825**	1.97
0	0	8.10	3.60	6.30	8.10	26.10	2958	1.12
40	80	7.20	7.20	6.30	7.20	27.90	3163	1.49
40	160	5.85	8.55	4.50	8.55	27.45	3113	1.62
80	80	5.40	10.35	6.75	5.85	28.35	3217	1.77
80	160	6.75	10.80	5.40	8.10	31.05	3521**	1.85

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

Mean Yield....3167
S. E. $\bar{X}$.....96.52
L.S.D.(5%)....281
L.S.D.(1%)....382
C. V. 3.04%

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	3	18.4294	101.81**
Treatment	8	2.0225	16.15**
Error	24	.181	
Total	35		

Clover treated with Fertilizer

This is the first harvest year for this fertilizer trial on Kenland Clover grown on the Station at Creston.

Two treatments have produced significant yield increases over the checks, the 120 pound rate of phosphate and the 50-60 treatment.

Yield differences to be significant in this trial must exceed 1050 pounds which leaves some treatments with apparent increases below the necessary level. Gypsum plots and plots with nitrogen alone were slightly below the checks.

Analysis by the Chemistry Research Department at M.S.C. indicates some interesting improvement in quality of forage due to fertilizers. From this standpoint as well as from a yield standpoint the use of 120 pounds of phosphate was best. The protein percentage was 14.7 compared to 12.3 for the check an increase of 2.4%. The phophate content was .20% for the 120# phosphate treatment, .10% for the check which is a 100% increase in the phosphate content of the forage due to this treatment.

Table LI. Yields from Clover treated with Fertilizers and grown at the Station.

Harvest Dates: 6/23 and 8/15, 1956

Treatments N	Treatments P	Plot Yield in Pounds I	II	III	IV	Total Pounds	Pounds Per Acre
0	120	18.0	18.5	16.5	19.5	72.5	9869*
0	60	18.0	17.0	16.5	15.5	67.0	9120
50	0	14.0	14.0	15.5	15.5	59.0	8031
50	120	16.5	16.5	16.0	16.0	65.0	8848
50	60	18.5	18.5	17.0	16.5	70.5	9597*
Gypsum		16.0	15.5	13.0	16.0	60.5	8236
Checks		12.5	15.5	17.0	16.5	61.5	8372

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

Mean Yield.....8875.4
S. E. $\bar{x}$.....353.98
L.S.D. 1050.9
C. V. 3.98%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.524	
Treatment	6	6.619	3.92*
Error	18	1.6904	
Total	27		

Fertilizer on Clover

Plot yields varied considerably within treatments in this Kenland Clover nursery, with the effect that no significance in yields from the seven fertilizer treatments was obtained.

Greatest three replication total yields were obtained from treatments containing both Nitrogen and phosphate.

Table LII. Yields from Fertilizer on Clover grown on the McIntyre farm at St. Ignatius.

Harvest Date. June 28, 1956

Treatment N	Treatment P	Pounds Per Plot I	II	III	Total Pounds	Pounds Per Acre
0	120	8.06	4.73	5.56	18.35	3330.5
0	60	7.13	5.64	6.24	19.01	3450.3
50	0	6.72	5.88	6.44	19.04	3455.8
50	120	6.40	8.73	7.57	22.70	4120.1
50	60	7.64	7.06	7.64	22.34	4054.7
Gyp		5.36	6.85	5.36	17.57	3189.0
Check		5.64	5.94	5.64	17.22	3125.4

Mean Yield.....3533.8
S. E. $\bar{x}$.....306.8
L.S.D. .....N. S.
C. V. 8.68%

Fertilizer on Clover

In this the first harvest year for Kenland Clover plots on the Smurr farm near Polson treated with seven fertilizer treatments, best yields were obtained from the use of the highest rate of phosphate. This difference was not statistically significant.

The use of fifty pounds of Nitrogen increased yields from the sixty pound $P_2 O_5$ application slightly but did not beneficially effect the 120 pound $P_2 O_5$ application.

Soil tests showed this soil to be higher in organic matter and in available phosphate than would be presently considered adequate for production without fertilizer use.

Quality differences were not great due to treatments, as shown by protein and phosphate percentages of samples analysed by Chemistry Research at M.S.C. Protein percentages varied from 13.7 to 15.4, phosphate percentages from, .22 to .26.

Table LIII. Yields from fertilizer on clover grown on Smurrs farm in Polson, Montana 1956.

Harvest Dates. June 28, 1956, August 10, 1956.

Treatment		Plot Yield in Pounds				Total	Pounds
N	P	I	II	III	IV	Pounds	Per A.
0	120	19.5	18.7	22.0	17.6	77.8	10,590.5
0	60	17.3	16.1	18.5	13.5	65.4	8,902.6
50	0	18.7	16.3	19.7	16.1	70.8	9,637.7
50	120	17.7	22.3	18.9	18.5	77.4	10,536.1
50	60	17.0	14.5	17.5	18.3	67.3	9,161.2
Gyp		18.6	16.2	13.2	19.2	67.2	9,147.6
Check		16.2	17.4	17.8	17.2	68.6	9,338.2

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	1.5527	-
Treatment	6	6.3165	1.55
Error	18	4.066	
Total	27		

Mean Yield.....9637.7
S. E. $\bar{x}$.....548.95
L.S.D. .....N. S.
C. V. 5.70%

Table LIV. With Hay @ $20.00 Nitrogen @.14 and Phosphate @ .09, what increased value per acre over fertilizer cost was derived from fertilizer use on clover.

Treatment	Fertilizer Cost	Less Fertilizer Value	Over Check Increase	Less Fertilizer Value	Increase
0-120	$10.80	95.10	1.72	87.89	4.17
0-60	5.40	83.63	-9.75	85.80	2.08
50-0	7.00	89.38	-4.00	73.31	-10.41
50-120	17.80	87.56	-5.82	70.68	-13.04
50-60	12.40	79.21	-14.17	83.57	- .15
Check		93.38		83.72	

Table LV. Improvement in Quality due to Fertilizers, Pounds per Cwt.

Treatment	Smurr		Station		F. F. A	
	Protein	Phos.	Protein	Phos.	Protein	Phos.
0-120	15.1	.22	14.7	.20	14.3	.16
0-60	13.7	.22	13.6	.18	13.4	.14
50-0	14.8	.26	12.8	.13	13.7	.15
50-120	15.4	.24	14.7	.19	14.2	.17
50-60	14.1	.22	12.7	.16	12.4	.15
Gypsum	15.1	.22	11.5	.08	13.1	.14
Check	15.2	.24	12.3	.10	13.0	.12

Fertilizers on Bromegrass 1956

This is the first harvest year for this off-station fertilizer trial on bromegrass, seeded in early spring in 1955.

For some reason growth following cutting June 18-28 was very slow and in no location did regrowth justify making a second cutting. Clover in plots in these same locations made two nice cuttings.

Table LVI. Fertilizers on Brome Grass, 1956. Four plot Average Pounds Per Acre.

Treatment N	Treatment P	Creston	F.F.A.	Passmore	Smurr	McIntire	Total	Average
0	80	3675	1582	2216	5587	2548	15608	3122
50	0	4628	3920	6021	7292	4602	26463	5293
25	0	4220	3420	3338	5860	4425	21263	4253
50	80	5241	4434	5171	6256	3760	24862	4972
25	80	5105	3245	3413	6328	3903	21994	4399
0	0	3607	2208	2027	4336	2433	14611	2922

Fertilizer on Brome grass, Creston, Montana

County soil analysis shows this soil to contain twelve pounds of available phosphate, to have an organic matter content of 6.6 percent, and a ph reading of 8.

Yields shown arein pounds per plot and per acre from eighty square feet, from one cutting only.

Inter-plot variations within treatments were sufficient to make four plot total differences less than significant in the fertilizer trial on bromegrass at the Station this season.

As can be seen in the adjoining chart yields per acre based on four plot totals were above the checks for all treatments, and in direct relation to the amount of nitrogen used. Also higher where phosphate was used in addition to nitrogen.

Table LVII. Fertilizer on bromegrass nursery grown at Creston, Montana, 1956.

Treatment Rate Per Acre		Pounds Per Plot				Total Pounds	Pounds Per Acre
		I	II	III	IV		
N	P						
0	80	8.5	6.5	6.0	6.0	27.0	3675
50	0	12.0	6.0	9.0	7.0	34.0	4628
25	0	5.5	9.5	8.5	5.5	29.0	3951
50	80	8.0	9.0	11.0	10.5	38.5	5241
25	80	8.5	10.5	8.5	10.0	37.5	5105
0	0	5.5	7.5	7.0	6.5	26.5	3607

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	3	.623	-
Treatment	5	7.036	2.24
Error	15	3.146	
Total	23		

Mean Yield.....4367
S. E. $\bar{x}$.....482.9
L.S.D. .....N. S.
C. V. 11.06%

Fertilizer on Bromegrass F.F.A. Farm

One cutting yields of bromegrass hay from fertilier plots on the F.F.A. farm near Kalispell shows significant increases over checks for all treatments receiving Nitrogen at the 1% level.

Yields were higher where fifty pounds of Nitrogen was used than where twenty-five pounds of Nitrogen was used, and higher for the 50-80 treatment than the 50-0 treatment, but these differences did not obtain statistical significance.

County soil analysis shows this soil to contain fifteen pounds of available phosphate, to have an organic matter content of 2.9 percent, and a ph reading of 8.

Yields shown are in pounds per plot and per acre from 80 square feet, from one cutting only.

Table LVIII. Fertilizer on bromegrass nursery grown on the F. F. A. Chapter farm, Kalispell, Montana 1956.

Treatment Rate Per Acre		Pounds Per Plot				Total Pounds	Pounds Per Acre
N	P	I	II	III	IV		
0	80	2.32	2.32	4.07	2.91	11.62	1582
50	0	8.40	7.80	7.20	5.40	28.80	3920**
25	0	6.91	5.65	6.91	5.65	25.12	3420**
50	80	7.84	7.84	9.05	7.84	32.57	4434**
25	80	5.80	5.80	6.44	5.80	23.84	3245**
0	0	4.73	3.38	3.38	4.73	16.22	2208

**Treatment significantly more in yield than the check.

Mean Yield.....3136
S. E. $\bar{X}$.....21.28
L.S.D.(5%).....643
L.S.D.(1%).....888
C. V. 6.79%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	.9099	1.49
Treatments	5	15.2946	25.02**
Error	15	.61116	
Total	27		

Fertilizer on Bromegrass, Smurr farm, Polson, Montana

This is the first harvest year for fertilizer plots on bromegrass on the Smurr farm near Polson.

Even though analysis of the soil in this location show organic matter and available phosphate above the level where fertilizers are usually recommended, significant increases were obtained from the use of fifty pounds Nitrogen, 50-80, and 25-80, with the highest yield coming from the 50-0-0 application.

Yields shown are in pounds per plot and per acre from 80 square feet, from one cutting only.

Table LIX. Yields from fertilizers on bromegrass nursery grown on the Smurr farm 1956. Polson, Montana.

Treatment Rate Per Acre		Pounds Per Plot				Total Pounds	Pounds Per Acre
		I	II	III	IV		
N	P						
0	80	13.68	10.64	9.50	7.22	41.04	5587
50	0	14.48	12.67	13.39	13.03	53.57	7292*
25	0	11.55	11.90	9.45	10.15	43.05	5860
50	80	12.99	13.99	9.66	9.32	45.96	6256*
25	80	13.53	12.84	10.06	10.06	46.49	6328*
0	0	9.45	8.05	7.00	7.35	31.85	4336

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

Mean Yield.....5946
S. E. $\bar{x}$.....519.7
L.S.D.(5%).....1568
C. V. 8.74%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	3	13.1239	3.60*
Treatment	5	12.9109	3.54*
Error	15	3.644	
Total	23		

Fertilizer on Bromegrass, McIntire farm, St. Ignatius

Yields from one cutting of bromegrass on plots on the McIntire farm near St. Ignatius show all Nitrogen treatments to be significantly higher than untreated checks.

Highest yields came from the use of the highest nitrogen rate. Adding phosphate to these did not furthur increase yields.

Yields shown are in pounds per plot and per acre from 80 square feet, from one cutting only.

Table LX. Yields from fertilizer on bromegrass nursery grown on the McIntire farm at St. Ignatius 1956.

Treatment Rate Per Acre		Pounds Per Plot				Total Pounds	Pounds Per Acre
		I	II	III	IV		
N	P						
0	80	3.83	4.68	6.38	3.83	18.72	2548
50	0	8.99	7.70	8.99	8.13	33.81	4602**
25	0	10.98	6.59	7.90	7.04	32.51	4425**
50	80	7.39	5.06	8.17	7.00	27.62	3760*
25	80	5.99	6.85	8.13	7.70	28.67	3927**
0	0	2.84	4.47	5.28	5.28	17.87	2433

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

Mean Yield.....3610
S. E. $\bar{x}$.....326.4
L.S.D.(5%).....980.0
L.S.D.(1%).....1361
C. V. 9.04%

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	3	2.557	1.78
Treatment	5	11.5259	8.02**
Error	15	1.4375	
Total	23		

Fertilizer on bromegrass, Passmore farm, Creston

This is the first harvest year for this bromegrass nursery treated with six fertilizer treatments.

Visual response to certain treatments was very evident.

Regrowth following harvesting of the first cutting was very slow so only one cutting was made.

As can be seen by the adjoining table, increases were highly significant even at the 1% level from all treatments containing Nitrogen.

County soil analysis shows this soil to contain 29 pounds of available phosphate, to have an organic matter content of 2.2 percent, and a ph reading of 8.

Yields shown are in pounds per plot andper acre from 80 square feet, from one cutting only.

Table LXI. Yields from fertilizer on bromegrass grown on the Passmore farm, Creston, Montana 1956.

Treatment Rate per Acre		Pounds Per Plot				Total Pounds	Pounds Per A.
		I	II	III	IV		
N	P						
0	80	2.41	4.22	4.22	5.43	16.28	2216
50	0	10.37	8.98	11.75	13.13	44.23	6021**
25	0	6.58	4.78	4.19	8.97	24.52	3338**
50	80	9.66	8.37	7.72	12.24	37.99	5171**
25	80	5.37	4.18	7.76	7.76	25.07	3413**
0	0	3.24	2.59	3.24	5.82	14.89	2027

**Treatments significantly more than the check 1%.

Mean Yield....3697
S. E. $\bar{x}$.....293.6
L.S.D.(5%)....882
L.S.D.(1%)....1217
C. V. 7.94%

Analysis of Variance

Source	D. F.	Mean Square	F
Replication	3	12.789	10.99
Treatment	5	34.4469	29.62
Error	15	1.16295	
Total	23		

With Nitrogen @ .14 pound, P_2O_5 @ .09 pound and bromegrass hay @ $20.00 Ton, how much per acre would the farmer make by using the following treatments?

Treatment Pounds/Acre		Cost Of	Farmers				
N	P	Fertilizer	Smurr	McIntire	Station	F. F. A.	Passmore
0	80	7.20	5.31	-6.05	-6.52	-13.36	-5.31
50	0	7.00	21.56	14.69	3.21	10.12	32.94
25	0	3.50	11.74	16.42	- .06	8.62	9.61
50	80	14.20	5.00	- .93	2.14	8.06	17.24
25	80	10.50	9.42	4.44	4.48	- .13	3.36
0	0						

Value of Hay @ $20.00 Ton, Over Fertilizer Cost.

7.20	48.67	18.28	29.55	8.62	14.96
7.00	65.92	39.02	39.28	32.20	53.21
3.50	55.10	40.75	36.01	30.70	29.88
14.20	48.36	23.40	38.21	30.14	37.51
10.50	52.78	28.77	40.55	21.95	23.63
0.0	43.36	24.33	36.07	22.08	20.27

Soils Research

Fertilizers on Spring Wheat

The Uniform fertility study was continued in Montana this past season with one nursery established off-station in the Creston area. This nursery was located on the M. C. Roberts farm with the following legal discription, SE¼, Section 16, Township 28, Range 20. Soil was classed as Creston Sandy loam #156.

The following information was obtained during the growing season; moisture data, plant weights at two stages of growth, plant analysis, straw and grain weights, and grain yields.

Moisture use for the crop was 13.7 inches using 1.5 cubic feet for basis of calculation. Table LXII a. No significant differences were found in green weights at either the eight inch cutting or the cutting just before heading. Table LXII b, and LXII c. The check plot had the highest bundle weight and the highest grain yield. Table LXII d, and LXII e.

Fertilizers in this trial gave no increase in yield. From the economic stand point, in regards to yield, fertilizers decrease the dollar return per acre. Table LXII f.

Last years quality data was not ready in time to be included in the 1955 annual report, so it is included in this report. Table LXIII.

Table LXII a. Agronomic data from Uniform fertility Study, Creston, Montana on Pilot spring wheat grown in Flathead County on the M. C. Roberts farm, Rt. #4, Kalispell, Montana.

	Moisture in Percent At seeding				Moisture in Percent At Harvest					Loss
Depth	I	II	III	Ave-rage	I	II	III	Ave-rage	Less %	in In.
0-6	46.3	30.0	14.2	30.2	13.9	15.4	11.1	13.5	16.7	1.30
6-12	24.7	20.6	16.9	20.7	13.8	14.6	13.4	13.9	6.8	.53
12-24	13.2	16.0	14.6	14.6	8.0	8.7	16.6	11.1	3.5	.55

Total inches moisture used 12.37

Precipitation from seeding to harvest 9.99 inches.

Table LXII b. Green plant material cut at 8" high, May 19, 1956. Six feet square.

Treatment and Rate Per Acre In Pounds	Plot Weights in Grams I	II	III	Total Grams	Average Pounds Per Acre
Check	38.4	24.8	20.6	83.8	447.1
15 $P_2 O_5$	43.8	22.0	10.0	75.8	404.4
30 $P_2 O_5$	30.6	25.2	15.4	71.2	379.9
15 N	43.5	30.3	16.2	90.0	480.2
15 N 15 $P_2 O_5$	38.4	26.4	19.7	84.5	450.8
15 N 30 $P_2 O_5$	37.6	28.4	20.9	86.9	463.6
30 N	31.9	25.4	33.6	90.9	485.0
30 N 15 $P_2 O_5$	25.3	26.8	23.4	75.5	402.8
30 N 30 $P_2 O_5$	23.7	19.2	30.3	73.2	390.5
60 $P_2 O_5$	25.5	30.5	12.8	68.8	367.1
15 N 60 $P_2 O_5$	27.2	21.4	20.3	68.9	367.6
30 N 60 $P_2 O_5$	35.7	17.7	23.3	76.7	409.2
90 $P_2 O_5$	27.8	17.8	29.1	74.7	398.5
15 N 90 $P_2 O_5$	30.3	17.9	18.4	66.6	355.3
30 N 90 $P_2 O_5$	24.7	17.2	15.1	57.0	304.1

Mean Yield.....406.5
S. E. $\bar{x}$.....59.15
L.S.D. .....N. S.
C. V. 14.55%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	2	560.18	-
Treatment	14	29.846	-
Error	28	40.974	
Total	44		

Table LXII c. Green Forage cut before heading, July 10, 1956, Six Square feet. Weight is given in dry matter.

Treatment and Rate Per Acre in Pounds	Plot Yields in Grams I	II	III	Total Grams	Average Pounds Per Acre
Check	126.0	130.0	68.5	324.5	1731.2
15 $P_2 O_5$	193.0	118.8	50.4	362.2	1932.4
30 $P_2 O_5$	164.0	104.0	95.3	363.3	1938.2
15 N	203.2	147.0	91.2	441.4	2354.9
15 N 15 $P_2 O_5$	162.3	171.5	117.7	451.5	2408.8
15 N 30 $P_2 O_5$	107.7	164.9	73.5	406.1	2166.6
30 N	95.0	118.2	141.0	354.2	1889.7
30 N 15 $P_2 O_5$	234.1	123.4	125.0	482.5	2574.2
30 N 30 $P_2 O_5$	232.8	172.2	142.6	547.6	2921.5
60 $P_2 O_5$	195.5	127.2	83.5	406.2	2167.1
15 N 60 $P_2 O_5$	150.0	115.2	65.8	331.0	1765.9
30 N 60 $P_2 O_5$	141.0	143.5	133.8	418.3	2231.7
90 $P_2 O_5$	137.8	72.0	134.5	344.3	1836.9
15 N 90 $P_2 O_5$	170.2	109.0	90.0	369.2	1969.7
30 N 90 $P_2 O_5$	148.8	115.0	174.8	438.6	2339.9

Mean Yield.....2148.6
S. E. $\bar{x}$.....305.898
L.S.D. .....N. S.
C. V. 14.24%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	2	14,867.05	13.57**
Treatment	14	1,288.88	1.18
Error	28	1,095.79	
Total	14		

Table LXII d. Bundle weight at time of harvest, 32 Square feet. Harvested. September 19, 1956.

Treatment and Rate Per Acre In Pounds	Plot Yields in Ounces I	II	III	Total Ounces	Average Pounds Per Acre
Check	94.25	87.50	66.50	248.25	7,040
15 $P_2 O_5$	97.50	69.50	32.25	199.25	5,651
30 $P_2 O_5$	93.00	80.00	54.25	227.25	6,445
15 N	92.25	62.50	45.25	200.00	5,672
15 N 15 $P_2 O_5$	95.00	48.50	90.50	234.00	6,636
15 N 30 $P_2 O_5$	88.50	72.50	41.50	202.50	5,743
30 N	84.50	58.00	68.75	211.25	5,991
30 N 15 $P_2 O_5$	91.00	64.50	83.50	239.00	6,778
30 N 30 $P_2 O_5$	93.50	79.75	70.75	244.00	6,920
60 $P_2 O_5$	74.50	70.75	35.25	180.50	5,119
15 N 60 $P_2 O_5$	82.00	60.25	44.25	186.50	5,289
30 N 60 $P_2 O_5$	79.50	82.25	68.00	229.75	6,516
90 $P_2 O_5$	78.75	33.25	77.25	189.25	5,367
15 N 90 $P_2 O_5$	70.00	48.00	58.00	176.00	4,991
30 N 90 $P_2 O_5$	66.50	67.00	54.25	187.75	5,325

Mean Yield.....5,965
S. E. $\bar{x}$.....708.956
L.S.D. .....N. S.
C. V. 11.88%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	2	2769.315	13.29**
Treatment	14	202.367	-
Error	28	208.354	
Total	44		

Table LXII e. Grain Yield data from Spring wheat fertility study on M. C. Roberts farm, Rt #4, Kalispell, Montana.

Treatment and Rate Per Acre In Pounds	Plot Yields In Bushels Per Acre I	II	III	Total Bushel	Average Bushel Per Acre
Check	49.6	42.5	36.9	129.0	43.0
15 $P_2 O_5$	48.2	37.9	15.6	101.7	33.9
30 $P_2 O_5$	53.2	41.8	28.4	123.4	41.1
15 N	52.1	31.2	15.2	98.5	32.8
15 N 15 $P_2 O_5$	49.3	23.8	47.5	120.6	40.2
15 N 30 $P_2 O_5$	48.6	39.3	19.1	107.0	35.7
30 N	46.8	28.0	37.6	112.4	37.5
30 N 15 $P_2 O_5$	49.6	34.4	43.6	127.6	42.5
30 N 30 $P_2 O_5$	48.2	37.9	36.2	122.3	40.8
60 $P_2 O_5$	37.6	37.6	15.2	90.4	30.1
15 N 60 $P_2 O_5$	42.5	33.3	22.3	98.1	32.7
30 N 60 $P_2 O_5$	28.0	44.7	33.3	106.0	35.3
90 $P_2 O_5$	41.8	20.6	9.9	72.3	24.1
15 N 90 $P_2 O_5$	36.2	23.8	28.0	88.0	29.3
30 N 90 $P_2 O_5$	34.0	35.8	26.6	96.4	32.1

Mean Yield.....35.4
S. E. $\bar{x}$.....4.9805
L.S.D. .....N. S.
C. V. 14.07%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	2	1061.5285	14.27**
Treatment	14	89.299	1.20*
Error	28	74.415	
Total	44		

Table LXII f. Fertilizer cost data from Uniform fertility study on M. C. Roberts farm, Rt #4, Kalispell, Montana on Pilot Spring Wheat.

Treatment and Rate Per Acre In Pounds	Fertilizer Cost Per Acre	Gross Return Per Acre	Net Return Per Acre	Increase or Decrease return over the Check
Check	0.00	79.98	79.98	-
15 $P_2 O_5$	1.35	63.05	61.70	-18.28
30 $P_2 O_5$	2.70	76.45	73.75	- 6.23
15 N	2.10	61.00	58.90	-21.08
15 N 15 $P_2 O_5$	3.45	74.77	71.32	- 8.66
15 N 30 $P_2 O_5$	4.80	66.40	61.60	-18.38
30 N	4.20	69.75	65.50	-14.48
30 N 15 $P_2 O_5$	5.55	79.05	73.50	- 6.48
30 N 30 $P_2 O_5$	6.90	75.89	68.99	-10.99
60 $P_2 O_5$	5.40	55.99	50.59	-29.39
15 N 60 $P_2 O_5$	7.50	60.82	53.32	-26.66
30 N 60 $P_2 O_5$	9.60	65.66	56.06	-23.92
90 $P_2 O_5$	8.10	44.83	36.73	-43.25
15 N 90 $P_2 O_5$	10.20	54.50	44.30	-35.68
30 N 90 $P_2 O_5$	12.30	59.71	47.41	-32.27

Cost N-14¢ Per Pound
$P_2 O_5$-.09@ Per Pound

Table LXIII. Protein data from Uniform spring wheat nursery, Creston, Montana 1955.

Treatment Pounds Per Acre		Percent Protein				
		8 inch Cutting	Before Heading	Total Plant	Grain Protein	Average for Total Plot
N	P					
0	0	20.8	14.5	6.8	11.8	13.5
15	0	20.8	13.3	7.0	11.9	13.2
30	0	22.2	15.2	8.2	12.3	14.5
0	30	20.7	13.0	7.3	12.2	13.3
30	30	22.2	16.8	6.2	12.4	14.4
0	15				11.8	
15	15				11.8	
30	15				12.7	
15	30				11.9	

Fertilizer on Spring and Winter Wheat

A long range production study was begun this season and included three factors. These factors are fertility level, spacing, and seeding rates. The object of this study is to discover the rate of seeding, spacing and fertility level best adapted for high economic yields of spring and winter wheat. The rotation on this will be spring wheat, fallow, and winter wheat. The trial will run nine years.

The fertility levels are; (a) 240 $P_2 O_5$ one application (made in 1956) and 20 pounds of Nitrogen per acre during the year grain is grown, (b) twenty pounds of Nitrogen plus 40 pounds $P_2 O_5$ each year grain is grown, (c) checks. Fertilizers are applied with an International fertilizer drill.

Two rates of seeding were used being, 30 pounds and 60 pounds per acre. Spacings are 6, 12, and 24 inches. Plots are eight rows for six inch spacings and four rows for twelve and 24 inch spacings. Length of plot is 18 feet and replicated twice.

For analysis a multiple complex is used.

The high yield this year was obtained from six inch spacing at the sixty pound seeding rate and fertility level b. When analysed statistically the following conditions were found to be significant; spacing, rates, and fertility levels, and a single order interaction of spacing x rates. See Table LXIV a and b.

Protein determination made on this study shows the 24 inch spacing with the highest protein percentage. See Table LXIV c.

Table LXIV a. Yields of Pilot spring wheat seed at two rates on three fertility levels and replicated twice.

Fertility Level	Block Number: Seeding Rate 1 I	II	Sum	Sedding Rate 2 I	II	Sum	Sum for both Rates
			6" Spacing				
240 $P_2 O_5$ 20 N annually	36.5	47.9	84.4	50.0	46.8	96.8	181.2
40 $P_2 O_5$ 20 N annually	44.3	54.2	98.5	64.2	64.2	128.4	226.9
Check	51.4	35.1	86.5	69.4	56.7	126.1	212.6
Sum	132.2	137.2	269.4	183.6	167.7	351.3	620.7
			12" Spacing				
240 $P_2 O_5$ 20 N annually	25.5	43.3	68.8	44.3	37.6	81.9	150.7
40 $P_2 O_5$ 20 N annually	50.3	45.7	96.0	49.6	49.3	98.9	194.9
Check	48.2	36.9	85.1	53.9	54.6	108.5	193.6
Sum	124.0	125.9	249.9	147.8	141.5	289.3	539.2
			24" Spacing				
240 $P_2 O_5$ 20 N annually	30.3	35.5	65.8	37.6	43.1	80.7	146.5
40 $P_2 O_5$ 20 N annually	36.9	36.9	73.8	37.2	42.9	80.1	153.9
Check	38.5	39.7	78.2	35.5	36.8	72.3	150.5
Sum	105.7	112.1	217.8	110.3	122.8	233.1	450.9
Sum of three Spacings	361.9	375.2	737.1	441.7	432.0	873.7	1610.8

Table LXIV b. Mean yields of two plots of each fertility level, and average yields for both rates and average yields of fertility levels for all spacings.

Rate	Fertility Level 240 P_2O_5 20 N (a)	40 P_2O_5 20 N (b)	Check (c)	Average for Seeding Rates
		6" Spacing		
30#	42.2	49.3	43.3	44.9
60#	48.4	64.2	63.1	58.6
Average	45.3	56.8	53.2	51.8
		12" Spacing		
30#	34.4	48.0	42.6	41.7
60#	41.0	49.5	52.3	47.6
Average	37.7	48.8	47.5	44.7
		24" Spacing		
30#	32.9	36.9	39.1	36.3
60#	40.4	40.1	36.2	38.9
Average	36.7	38.5	37.7	37.6
Average of all spacings	39.9	48.0	46.1	44.7

Fertility Level and spacing L.S.D. 5%...3.0
L.S.D. 1%...4.3

Seeding Rate L.S.D. 5%...2.5 bu.
L.S.D. 1%...3.5 bu.

Average seeding rate	
30#	41.0
60#	48.4

Summary-Best combination 6 inch spacing level b, at 60# a.

Analysis of Variance

Source	D.F.	Sum of Square	Mean Square	F
Blocks	1	.36	.36	-
Spacing	2	1,201.98	600.99	51.97**
Rate	1	518.32	518.32	44.82**
Fertilizer level	2	443.31	221.655	19.17**
Interaction of-				
Fertilizer x spacing	4	153.10	38.275	3.31-
Fertilizer x rate	2	16.79	8.395	-
Fertilizer x spacing x rate	4	594.89	148.723	12.86**
Spacing x rate	2	189.51	94.755	8.19**
Block x spacing	2	40.92	20.46	1.77-
Block x rate	1	14.69	14.69	1.27-
Block x spacing x rate	2	30.42	15.21	1.32
Error	12	138.78	11.565	
Total	35	3,343.07		

Table LXIV c. Protein data from rate, spacing and fertility level study, Creston, Montana 1955.

Seeding Rate	Fertility Level: 240 P_2O_5 20 N (a)	40 P_2O_5 20 N (b)	Check (c)	Average for seeding Rate
		6" Spacing		
30#	10.5	13.0	13.1	12.2
60#	11.3	12.7	14.6	12.9
Average	10.9	12.9	13.9	12.6
		12" Spacing		
30#	11.6	12.4	13.5	12.5
60#	11.8	12.4	15.7	13.3
Average	11.7	12.4	14.6	12.9
		24" Spacing		
30#	12.6	13.3	14.0	13.3
60#	12.6	13.7	16.0	14.1
Average	12.6	13.5	15.0	13.7
Average all Spacings	11.7	12.9	14.5	13.0

Rate average----30#/A --12.7 60#/A --13.4

Summary of these data. Seed in 24 inch rows, 60 pounds per acre with no fertilizer.

Fertilizer on Spring Wheat

A study was started in 1956 in field B5-c to determine the long term effect of fertilizers on high organic matter and low phosphate soils. This trial was set up to work under actual field conditions. Seeding and fertilizing are done with an international fertilizer drill, and harvested with a combine, six feet wide and fifty feet long or 300 square feet. Four samples are taken at random from each treatment. Yield and protein determination are made from these samples.

The four treatments are listed on Table LXV. This year the high yield came from twenty pounds of nitrogen per acre plus forty pounds of P_2O_5 per acre. The last treatment or 160 P_2O_5 this year was economical and paid for the high rate of application. Control was very good in this nursery and highly significant between treatments. There was not a large difference between protein in these treatments. Range was 14.8 to 15.1 percent.

Table LXV a. Yield data from long term effect of fertilizer practices on high organic matter and low phosphate soils. Yields on Pilot spring wheat in 1956.

Treatment	Rate Per A.	Plot Yields in Bu/A I	II	III	IV	Total Bushel	Ave. Bu/A.	Ave. % Protein
Check	0	41.1	35.1	31.5	33.9	141.6	35.4	14.8
N on each grain crop	20	36.3	41.1	38.7	43.6	159.7	39.9	15.1
N and P_2O_5 on each grain crop	20-40	53.3	65.3	53.3	62.9	234.8	58.7**	15.05
Build P level at 160 P_2O_5 and maintain with 40 P_2O_5 on spring grain		55.7	50.8	55.7	62.9	225.1	56.3**	15.08

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

Mean Yield.....47.6
S. E. $\bar{x}$.....2.33195
L.S.D. (5%).....7.5
L.S.D. (1%).....10.7
C. V. 4.90%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	25.95	1.19
Treatments	3	541.61	24.90**
Error	9	21.7522	
Total	15		

Table LXV b. Economic data from long range fertilizer study.

Treatment	Rate Per Acre	Fert-ilizer Cost	Gross Return	Net Return	Gain or Loss
Check	0	0	65.84	65.84	-
N each grain crop	20	2.80	74.21	71.41	5.57
N and $P_2 O_5$ on each grain crop	20-40	6.40	109.18	102.78	36.94
Build $P_2 O_5$ level with 160 $P_2 O_5$ and maintain with 40 $P_2 O_5$	-	14.40	104.72	90.32	24.48

Wheat @ $1.86 per Bushel.

$P_2 O_5$ @ .09 ¢ per pound.

Nitrogen @ .14 ¢ per pound.

Fertilizer on Winter Wheat

The uniform wheat nurseries also include work with winter wheat. This trial is conducted in the same manner explained on page 87 of this report and will be omitted here.

No significance was found in this data at the 5 percent point. However, when ploted (see figure 1), 30 pounds nitrogen is a consistent high point at every stage of harvest. The economical return was also at the 30 pound nitrogen level. Moisture use by this crop was 28.6888 inches. See tables LXVIa thru LXVId.

Quality data at this writing is not available and thus will be included in the 1957 annual report.

Table LXVI a. Agronomic data from uniform fertility study at Creston, Montana in 1955-56 on Wasatch winter wheat. Six row plots three replications.

Planted. Sept. 19, 1955 Harvested. Aug. 15, 1956 Plot Size. 32 Sq.Ft.

Treatment and rate Per Acre	Green Material from six feet of row. Cut May 28, '56 before Heading Weight in Ounces I	II	III	Total Grams	Average Pounds Per Acre
Check	104.3	126.8	135.8	366.9	1957.5
15 $P_2 O_5$	135.2	162.9	87.2	385.3	2056.1
30 $P_2 O_5$	128.6	108.4	153.7	390.7	2084.4
15 N	111.3	137.1	159.6	408.0	2176.7
15 N 15 $P_2 O_5$	119.4	144.2	128.0	391.6	2089.2
15 N 30 $P_2 O_5$	174.7	119.8	143.2	437.7	2335.2
30 N	170.8	184.9	160.5	516.2	2754.0
30 N 15 $P_2 O_5$	137.3	131.1	106.6	375.0	2000.7
30 N 30 $P_2 O_5$	106.9	138.2	111.6	356.7	1903.0

Mean Yield.....2151.1
S. E. $\bar{x}$.....213.83
L.S.D. .....N. S.
C. V. 9.94%

Table LXVI b. Agronomic data from Uniform fertility study at Creston, Montana in 1955-56 on Wasatch winter wheat. Six row plots three replications.

Treatment and rate Per Acre	Bundle weight at time of harvest 32 sq. ft. in ounces. 6-19-56 I	II	III	Total Ounces	Pounds Per Acre
Check	107.00	132.25	123.25	362.50	10,280
15 $P_2 O_5$	111.00	144.00	113.25	368.25	10,443
30 $P_2 O_5$	117.25	131.00	113.25	361.50	10,252
15 N	127.00	118.50	131.25	276.75	10,684
15 N 15 $P_2 O_5$	134.50	118.50	128.25	381.25	10,812
15 N 30 $P_2 O_5$	120.00	123.75	139.00	382.75	10,854
30 N	139.50	112.50	156.50	408.50	11,585
30 N 15 $P_2 O_5$	135.00	112.50	133.50	381.00	10,804
30 N 30 $P_2 O_5$	140.50	133.00	138.50	412.00	11,684

Mean Yield.....10,821
S. E. $\bar{x}$.....644.84
L.S.D. .....N. S.
C. V. 5.96%

Table LXVI c. Uniform fertility study on winter wheat, Creston, Montana 1955-56, moisture data.

Sample Depth	Moisture in Percent at seeding I	II	III	Ave-rage	Moisture in Percent at harvest I	II	III	Ave-rage	Loss %	Loss In Inches
0-6	18.2	18.0	17.5	17.9	15.6	11.0	11.1	12.6	5.3	.41
6-12	15.1	14.6	15.6	15.1	10.2	13.4	8.9	10.8	4.3	.34
12-24	14.1	13.9	13.3	13.8	13.1	6.7	7.3	9.0	4.8	.75
24-36	12.6	11.8	10.5	11.6	7.4	5.6	6.8	6.6	5.0	.78
36-48	10.4	7.9		10.4	8.2	9.0	6.8	8.0	2.4	.37

Total----------23.90

Precipitation from seeding to harvest 21.25 inches.

Table LXVI d. Grain yields from uniform fertility study on winter wheat at Creston, Montana in 1956.

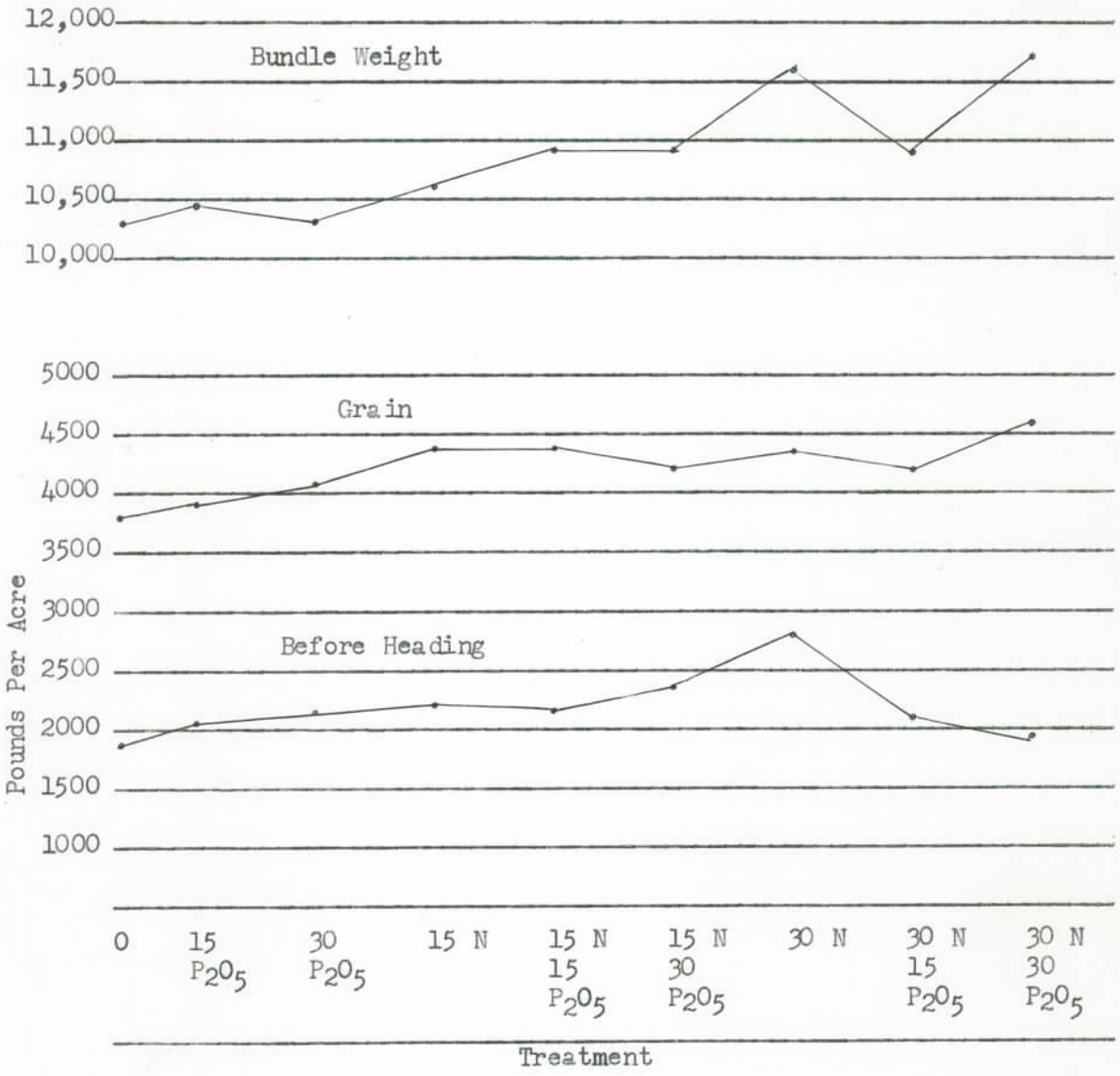
Treatment and rate Per Acre	Plot Yield in Ounces I	II	III	Total Ounces	Average Bushel Per Acre	Pounds Per Acre
Check	34.25	47.50	36.50	118.25	55.9	3354
15 $P_2 O_5$	39.50	49.00	31.00	119.50	56.4	3384
30 $P_2 O_5$	42.50	47.00	40.00	129.50	61.2	3672
15 N	45.00	45.50	47.00	137.50	65.0	3900
15 N 15 $P_2 O_5$	46.50	48.00	43.50	138.00	65.2	3912
15 N 30 $P_2 O_5$	43.25	43.25	40.75	127.25	60.6	3636
30 N	47.50	45.50	45.75	138.75	65.6	3936
30 N 15 $P_2 O_5$	41.50	43.50	48.50	133.50	63.1	3786
30 N 30 $P_2 O_5$	47.50	46.75	48.00	142.25	67.2	4032

Mean Yield.....62.2
S. E. $\bar{x}$.....3.101
L.S.D. .....N. S.
C. V. 4.99%

Table LXVI e. Fertilizer cost data from uniform fertility study at Creston, Montana in 1956, on Wasatch winter wheat.

Treatment and Rate Per Acre In Pounds	Fertilizer Cost Per Acre	Gross Return Per Acre	Net Return Per Acre	Increase or decrease in return over the check
Check	0.00	103.97	103.97	
15 $P_2 O_5$	1.35	104.90	103.55	-42
30 $P_2 O_5$	4.50	113.83	109.33	5.36
15 N	2.10	120.90	118.80	14.83 ✓
15 N 15 $P_2 O_5$	3.45	121.27	117.82	13.85 ✓
15 N 30 $P_2 O_5$	6.60	112.72	106.12	2.15
30 N	4.20	122.02	117.82	13.85
30 N 15 $P_2 O_5$	5.55	117.37	111.82	7.85
30 N 30 $P_2 O_5$	8.70	124.99	116.29	12.32 ✓

Figure 1, Yield of plant material and grain yields in pounds per acre from uniform fertility trial on winter wheat, Creston, Montana 1956.



Fertilizers on Winter Wheat

A fertilizer program was started in Ravalli county in the winter wheat region of that county in 1954. The trial has consisted of four treatments using recommendations by the soil lab as one of the treatments.

Results from these trials have not been very successful and give little information. No significant data was obtained from these two trials. Last years (1956) data is shown in Table LXVII.

Table LXVII. Agronomic data from fertilizer study in Ravalli County on L. B. McFadgen farm, Stevensville, Montana. Four row plots four replications.

Date Harvested. September 6, 1956 Date Planted. September 22, 1955 Size of Plot. 16 feet.

Treatment	Rate in lbs. Per Acre	Plot Yield In Bushels Per Acre I	II	III	IV	Total Bushel	Average Bushel Per Acre
Check	0	19.9	22.7	28.4	25.5	96.5	24.1
10-20-0	100	18.4	25.5	30.5	22.0	96.4	24.1
$P_2 O_5$	40	14.9	20.6	26.9	23.4	85.8	21.5
$(NH_4)_2$ & $P_2 O_5$	33 N & 40 $P_2 O_5$	31.2	12.8	19.9	18.4	82.3	20.6

Analysis of Variance

Source	D. F.	Mean Square	F
Replications	3	29.055	-
Treatment	3	13.324	-
Error	9	32.04	
Total	15		

Mean Yield.....22.6
S. E. $\bar{x}$ 2.83
L.S.D .....N. S.
C. V. 12.52%

Fertilizers on Barley

In cooperation with the extension service a uniform fertility nursery on barley was proposed and established in 1956. This trial consists of fifteen treatments, four replications, using four row plots, twenty feet long. Yield data and quality data are obtained from these nurseries.

Two nurseries were seeded in the spring of 1956. One on the station on a high organic low phosphate soil and one in Lake county on a low organic low phosphate soil.

Yields were good in the nursery at Creston, but yields were not significant. The high yield was from 100 N 80 $P_2 O_5$, but unless the value of protein is figured in the receipts the yield was not economical. The protein amounts in this nursery were increased with the increase in N & $P_2 O_5$ in combination. See Table LXVIII.

The nursery in Lake county was damaged severly by birds, making the data very irratic. However protein data was obtained and followed a definite pattern. The high fertilizer applications in combination gave the highest percent protein.

Table LXVIII. Agronomic data from fertilizer trial on Vantage barley at Creston, Montana in 1956. Four row plots and four reps.

Planted. May 18, 1956 Harvested. Sept. 18, 1956 Plot size. 32 sq. ft

Treatment Rate Per Acre In Pounds		Plot Yield In Bushels Per Acre				Total Bushel	Average Bushel Per Acre
N	P_2O_5	I	II	III	IV		
Check		49.2	58.9	86.9	49.6	244.6	61.2
25	40	58.9	65.6	67.8	62.9	255.2	63.8
50	40	58.1	65.6	70.0	58.1	251.8	63.0
100	40	74.9	50.5	51.8	63.8	241.0	60.3
0	40	48.3	62.5	63.4	45.2	219.4	54.9
25	80	50.1	67.4	46.1	63.8	227.4	56.9
50	80	67.4	83.7	74.9	59.8	285.8	71.5
100	80	73.1	67.8	85.1	75.3	301.3	75.3*
0	80	62.0	69.6	68.2	60.1[1]	259.9	65.0
25	160	63.4	70.5	51.4	42.1	227.4	56.9
50	160	67.8	48.3	63.8	51.0	230.9	57.7
100	160	57.6	71.8	67.8	45.2	242.4	60.6
0	160	63.8	76.2	67.4	55.4	262.8	65.7
25	0	47.0	50.5	50.5	54.1	202.1	50.5
50	0	52.3	60.7	66.0	57.6	236.6	59.2
100	0	38.6	47.9	60.7	49.6	196.8	49.2

[1]Calculated missing plot.
*Treatments yielding significantly more than the check,

Mean Yield.....60.7
S. E. $\bar{x}$.....4.401
L.S.D. (5%).....12.5
L.S.D. (1%).....16.7
C. V. 7.25%

Analysis of Variance

Source	D.F.	Mean Square	F
Replication	3	305.14	3.94*
Treatment	15	189.73	2.45**
Error	44	77.475	
Total	62		

Table LXIX. Agronomic data from fertilizer trial on Vantage barley in Lake county on Ed Turbull farm, Charlo, Montana. Four row plots, four replications.

Planted. May 16, 1956 Harvested. Aug. 20, 1956 Plot Size. 32 sq. ft.

Treatment Rate Per Acre In Pounds		Plot Yield In Bushels Per Acre				Total Bushel	Average Bushel Per Acre
N	P_2O_5	I	II	III	IV		
Check		7.1	50.5	48.3	35.5	141.4	35.4
25	40	17.7	31.5	38.1	49.2	136.5	34.1
50	40	33.2	32.4	34.6	35.0	135.2	33.8
100	40	38.6	34.6	26.6	31.1[1]	130.9	32.7
0	40	49.6	43.0	39.4	41.9[1]	173.9	43.5
25	80	41.2	34.6	44.8	19.1	139.7	34.9
50	80	46.5	26.1	31.9	29.7	134.2	33.6
100	80	43.0	37.7	58.1	50.5	189.3	47.3
0	80	31.9	35.9	30.6	43.0	141.4	35.4
25	160	35.5	41.2	41.7	37.3[1]	155.7	38.9
50	160	21.7	38.1	51.8	44.3	155.9	39.0
100	160	47.4	51.4	58.5	36.3	193.6	48.4
0	160	45.2	35.0	36.3	16.4	132.9	33.2
25	0	39.0	40.8	46.5	44.3	170.6	42.7
50	0	22.2	33.7	33.7	24.4	114.0	28.5
100	0	18.6	18.6	59.8	29.2	126.2	31.6

[1]Calculated missing plot

Mean Yield.....37.1
S.E. $\bar{x}$.....5.2335
L.S.D. .....N. S.
C. V. 14.11%

Analysis of Variance

Source	D.F.	Mean Square	F
Replications	3	237.507	2.17
Treatment	15	131.363	1.19
Error	42	109.561	
Total	60		

Tillage Research

Row Spacings and Seeding Rates for Alfalfa

This is the second harvest year for this work involving three row spacings and two seeding rates.

No significant differences in yield are found, due either to spacings or rates. Yields from plots seeded with twelve pounds of seed per acre in six inch rows are the same as from plots seeded with six pounds per acre in twelve inch rows. Plots seeded with three pounds per acre in 24 inch rows are not significantly lower in yield.

Table LXX. Row spacings and seeding rates for alfalfa 1956.

Replications	Spacing Inches	Rate 1	Rate 2	Sum	Total Pounds
1	6	19.0	19.0	38.0	
	12	16.0	20.0	36.0	
	24	17.0	19.0	36.0	110.0
2	6	20.5	19.0	39.5	
	12	20.0	19.0	39.0	
	24	18.0	18.0	36.0	114.5
3	6	19.0	18.5	37.5	
	12	20.5	19.5	40.0	
	24	20.5	18.5	39.0	116.5
Sum		170.5	170.5	341.0	341.0

Spacing Inches	Rate 1	Rate 2	Total Pounds	Tons Per Acre	Two Year Average
6	58.5	56.5	115.0	4.35	4.98
12	56.5	58.5	115.0	4.35	4.68
24	55.5	55.5	111.0	4.20	4.20
Sum	170.5	170.5	341.0		
Tons Per Acre	4.3	4.3			

Best rate and spacing this years test: six pounds per acre in twelve inch rows, same as twelve pounds in six inch rows.

Analysis of Variance

Source	D.F.	Sum of Square	Mean Square	F
Replication	2	3.695	1.8475	1.55
Spacings	2	1.778	1.889	
Error a	4	4.722	1.193	
Total main plots	8	10.195		
Rate	1	0		
Rate and Spacing	2	1.333	.6665	
Error B	6	12.867	2.144	
Total	17	24.395		

Row and spacing, and Seeding rates for alfalfa and bromegrass

During this second year of harvest of two seeding rates and three row spacings for bromegrass-alfalfa hay no significant yield differences have been found.

Bromegrass now occupies the entire area of the plots, although it is not yet as thick in plots seeded in 24 inch rows. The main apparent difference is in the alfalfa which of course remains as seeded, in rows 6, 12 or 24 inch rows.

While differences are not significant yields increase as row spacings increase, and the best single treatmentfor total yield this year was four and one-half pounds brome with one and one-half pounds alfalfa seeded in 24 inch rows.

Table LXXI. Row spacings and Seeding rates for alfalfa-brome hay 1956.

Replication	Spacing Inches	Rate 1	Rate 2	Sum	Total Pounds
1	6	23.13	23.38	46.51	
	12	23.41	20.56	43.97	
	24	24.13	23.03	47.16	137.64
2	6	23.22	22.92	46.14	
	12	22.31	24.17	46.48	
	24	25.91	21.66	47.57	140.19
3	6	23.28	19.45	42.73	
	12	22.53	24.30	46.83	
	24	23.22	23.00	46.22	135.78
Sum		211.14	202.47	413.61	413.61

Spacing Inches	Rate 1	Rate 2	Total Pounds	Tons/ Acre	Two year Average
6	69.63	65.75	135.38	5.12	5.61
12	68.25	69.03	137.28	5.20	5.91
24	73.26	67.69	140.95	5.33	5.72
Sum	211.14	202.47			
Tons/Acre	5.32	5.10			

Best rate and spacing this years test: four one-half pounds of bromegrass with one one-half pounds alfalfa in 24 inch rows.

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Square	F
Replications	2	1.634	.817	
Spacing	2	2.672	1.336	
Error a	4	5.625	1.406	
Total main plots	8	9.931		
Rate	1	4.176	4.176	1.48
Rate and spacing	2	3.362	1.681	
Error b	6	16.888	2.8147	
Total	17	34.357		

Row and spacing study alfalfa and orchardgrass

During this second harvest year of orchardgrass-alfalfa hay seeded in rows 6, 12, and 24 inches apart at two seeding rates no significant yield differences were obtained.

The greatest yield for a single treatment was produced by a seeding of three pounds orchard grass with three pounds of alfalfa in twelve inch rows.

A comparison of yields and response to treatment of the three mixtures in the study shows best yields seeding rates and spacings for the three to be as follows:

Variety or Mixture	Seeding grass	Rate alfalfa	Spacing	Tons/Acre
Alfalfa		6	12	4.4
Brome-alfalfa	4½	1½	24	5.5
Orchard-alfalfa	3	3	12	5.6

Most interesting is the comparative protein and phosphate percentages as determined by chemistry research, M. S. C.

	Protein %	Phos. %
Orchard and alfalfa in 6" rows	11.3	.17
Orchard and alfalfa in 12" rows	12.1	.17
Orchard and alfalfa in 24" rows	16.2	.18

Table LXXII. Row spacing and seeding rate for Orchard-alfalfa hay 1956.

Replication	Spacing Inches	Rate 1	Rate 2	Sum	Total Pounds
1	6	22.06	21.64	43.70	
	12	24.84	21.16	46.00	
	24	21.92	21.69	43.61	133.31
2	6	23.89	23.00	46.89	
	12	25.59	23.75	49.34	
	24	23.56	23.84	47.40	143.63
3	6	25.50	23.69	49.19	
	12	24.09	24.02	48.11	
	24	21.53	22.25	43.78	141.08
Sums		212.98	205.04	418.02	418.02

Analysis of Variance

Source	D.F.	Sum of Square	Mean Square	F
Replication	2	9.632	4.816	3.56
Spacing	2	6.298	3.149	2.33
Error a	4	5.406	1.3515	
Total main plots	8	21.336		
Rate	1	3.5030	3.503	5.23
Rate and spacing	2	3.427	1.7135	2.58
Error b	6	3.9838	.66397	
Total	17	32.2498		

Table LXXII a. Row spacing, and seeding rate for alfalfa-orchard hay 1956.

Spacing Inches	Rate 1	Rate 2	Total	Tons Per Acre	Two year Average T/Acre
6	71.45	68.33	139.78	5.29	5.27
12	74.52	68.93	143.45	5.42	5.66
24	67.01	67.78	134.79	5.10	5.49
Sums	212.98	205.04	418.02		
Tons Per Acre	5.37	5.17			

Best rate and spacing this years test: Three pounds grass with three pounds alfalfa in twelve inch rows.

Weed Control

Two detailed chemical control plots were established in 1956. One on the control of wild oats (Avena fatua) and the other on Quackgrass (A repens).

Control of wild oats in field crops with chemicals was the purpose of the first study. Plot size used was 8 x 20 feet with two crops, alfalfa and peas; two chemicals, Karmex (CMU) and I.P.C. A fallow plot treated with I.P.C. was included and it is to be seeded to spring wheat in 1957. To measure the amount of control, plant counts of wild oats, were made and crop stand estimated in percentages.

Little control of wild oats was obtained with Karmex in alfalfa, and plant stands were greatly reduced. Table LXXIII. I.P.C. had little effect on pea stands and only a small percent of control. See Table LXXIII for complete details of this trial. Counts of wild oats showed 95,832 plants per acre as a mean population.

A natural stand of quackgrass was used in this chemical control study. Six different chemicals were used each at three rates in single plots. Stands were estimated in percent. application of C.M.U. was made April 21, before any growth of grass, all other applications were made when grass was eight to ten inches tall. Three weeks after application these plots were plowed, and harrowed. Reading of kill was made, July 8, 1956. Broad leaf weeds were found in the T.C.A. plots. Highest percentage of kill was found in C.M.U. at 30 and 40 pounds per acre and the T.C.A. plots. Table LXXIV.

Control was obtained with four of the chemicals varying with the amount used. No control was obtained with I.P.C. or M. H. See table LXXIV.

Table LXXIII. Chemical control of wild oats, (Avena fatua) with two compounds and in two crops and fallow.

Rate in #/A.	Material	Crop	Crop Stand In Percent 1	2	3	Ave. in %	Wild Plants Per Sq.ft. 1	2	3	Ave.	Plants Per Acre
2	Karmex[1]	Alfalfa	40	10	50	33.3	1	5	2	2.7	74,052
3	Karmex	Alfalfa	20	5	30	18.3	2	4	4	3.3	143,748
4	Karmex	Alfalfa	10	40	5	18.3	3	1	2	2.0	87,120
Check		Alfalfa	30	5	70	35.0	4	2	2	2.7	117,612
4	I.P.C.	Peas	95	95	95	95	1	1	0	.7	30,492
8	I.P.C.	Peas	95	95	95	95	1	3	3	2.3	100,188
12	I.P.C.	Peas	95	95	95	95	1	3	0	1.3	56,628
Check		Peas	95	95	95	95	2	4	2	2.7	117,612
3	I.P.C.	Fallow					2	3	3	2.7	117,612
6	I.P.C.	Fallow					2	3	2	2.3	100,188
9	I.P.C.	Fallow					1	2	2	1.7	74,052

[1]C.M.U. Du pont

Mean of wild oats per acre 95,832
S. E. $\bar{x}$.....27,216.288
L.S.D. .....N. S.
C. V. 28.4%

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

C.M.U. applied 4/21/56 Other chemical applied 5/21/56

Plot Number	Chemical	Rate in Pounds Per Acre	Percent Kill[1]
1	C.M.U.[2]	20	98
2	C.M.U.	30	100
3	C.M.U.	40	100
4	Dalapon[3]	10	20
5	Dalapon	10	20
6	Dalapon	20	30
7	Dalapon	30	70 ✓
8	Weedazol[4]	4	70
9	Weedazol	6	95
10	Weedazol	8	90
11	M. H.[5]	4	0
12	N. H.	6	0
13	M. H.	8	0
14	Check	0	0
15	I.P.C.[6]	6	0
16	I.P.C.	9	0
17	I.P.C.	12	0
18	T.C.A.[7]	40	95
19	T.C.A.	60	95
20	T.C.A.	80	90

[1] 100 equal all plants killed.
[2] 3-(p-chlorophenyl)-1, 1-dimethylurea
[3] 2,2 dichloropropionic Acid
[4] (3 amino - 1,2,4,-Triazole)
[5] Maleic Hydrazide
[6] Isopropyl-n-Phenylcarbamate
[7] Trichloro Acetic Acid

General Farm

General farm spraying this year consisted of the following operations.

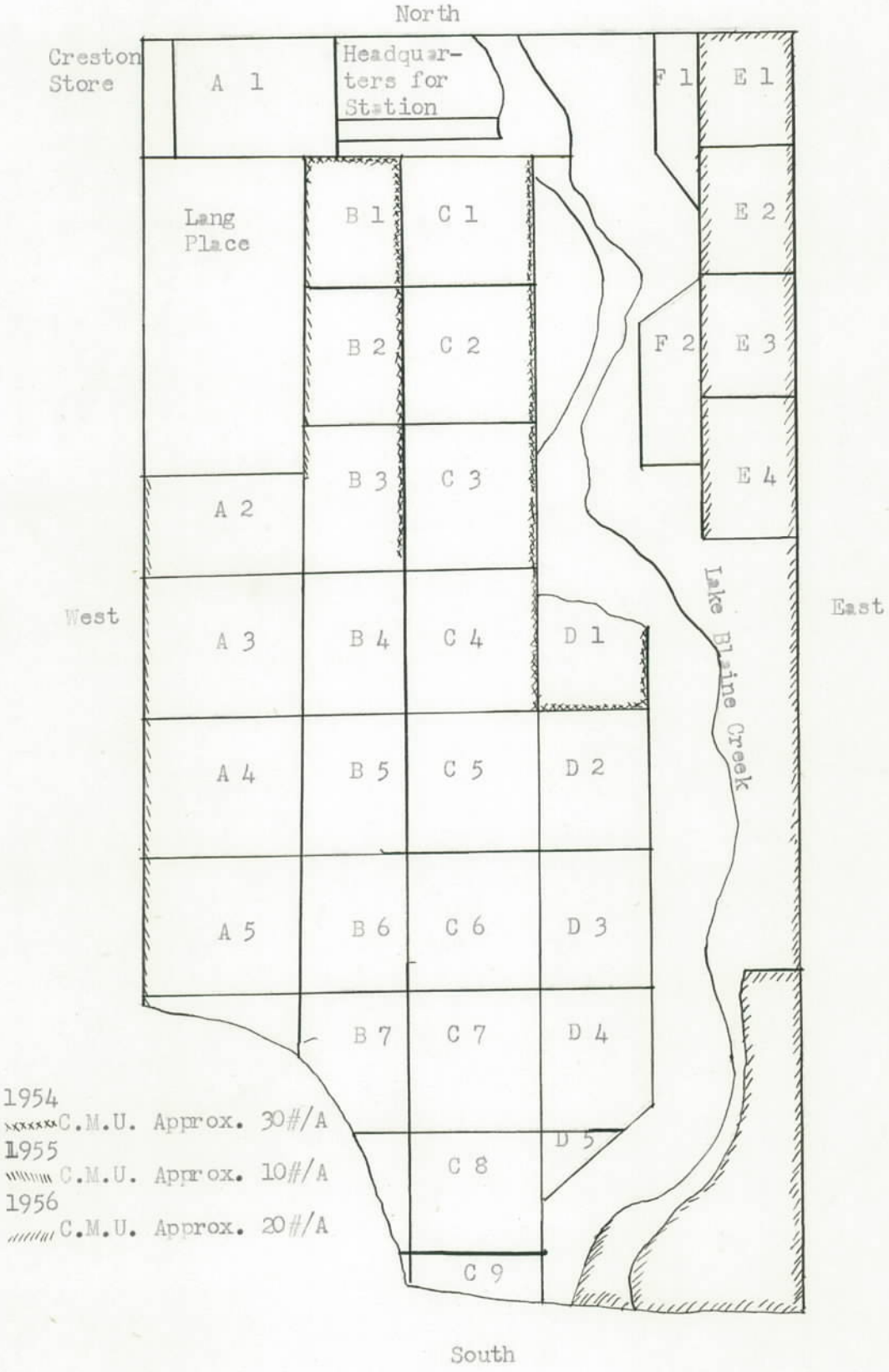
C.M.U. application in fence rows (see map page 118).

2-4,D. ½ pound per acre on all cereal crops.

2-4,D. 1 pound per acre on thistles in pasture and roadways.

In all applications of 2-4,D good weed control was obtaind. C.M.U. applications gave poor control of quackgrass in fence rows. This is due in part to too light of rate per acre.

PLOT LOCATION CRESTON STATION



Influence of Seed Size, Spacings, and Nitrogen Rates, on Size, Set, and Yield of Irrigated Netted Gem Potatoes.

The potatoes were planted May 24-26. The Nitrogen in the amounts shown was side-dressed at seeding time, together with uniform 300 pounds of treble super phosphate application to all plots.

The potatoes were irrigated, July 10, August 1, and August 21, with a total of eight inches.

Seed pieces were very carefully cut so as to vary as little as possible from the stated weight, using a postal scale to check the work.

Plots harvested were 1/100 acre in size. Single 40 inch rows, 130 feet long. Total weight figures were actual totals for each plot. Set, and yield of each size was determined by counting 100 pounds selected at random in the plots, sorting this 100 pound sample and weighting the sorts, then multiplying total plot weight by these percentage figures.

Killing frost September 2, very effectively killed the vines and stopped furthur growth. Harvest dates were October 1 to 4.

Nitrogen and spacings have a greater effect this year than last, otherwise the responses are very much the same.

Table H-1.

Number of Plot	Treatment	Yields in Cwt per Acre				
		Total No. 1	No. 1 8 oz. +	No. 1 - 8 oz.	Field Run Total	Tubers Per Hill
36	Phosphate, No N	211.1	82.0	129.1	241.1	4.38
36	Phosphate, 10 N	237.5	97.6	139.9	273.1	4.85
36	Phosphate, 20 N	249.0	85.6	163.4	281.2	5.43
36	Phosphate, 40 N	273.3	105.3	168.0	304.8	5.56
72	All plots 1¼ oz seed	238.6	107.9	130.7	269.7	4.60
72	All plots 2½ oz seed	246.9	77.4	169.5	280.4	5.51
48	9 inch spacing	251.7	80.6	171.1	284.3	4.32
48	12 inch spacing	233.2	95.7	137.5	268.3	4.85
48	15 inch spacing	241.2	101.6	139.6	272.6	5.99
72	Manured plots	254.5	101.7	152.8	289.1	5.20
72	Non-manured plots	231.0	83.6	147.4	262.3	4.91

Table H-2. Yields per plot in pounds. Single row plots, 130 feet long three replications of irrigated potatoes. Seed yield of tubers under 8 ounces grown in manured soils.

Row No.	Spacings	one one-fourth ounce seed A	C	E	Sum	two one-half ounce seed A	C	E	Sum	Total Pounds
				Phosphate no Nitrogen						
1	9	165	129	106	400	159	197	179	535	935
5	12	117	98	90	305	111	154	155	420	725
10	15	119	134	114	367	152	130	138	420	787
	Sum	401	361	310	1072	422	481	472	1375	2447
				Phosphate 10 Nitrogen						
2	9	118	175	89	382	178	240	169	587	969
6	12	134	104	104	342	137	162	131	430	772
9	15	100	101	111	312	219	141	144	504	816
	Sum	352	380	304	1036	534	543	444	1521	2557
				Phosphate 20 N						
3	9	185	173	185	543	216	236	196	648	1191
7	12	116	133	106	355	143	167	131	441	796
11	15	139	149	121	409	206	145	187	538	947
	Sum	440	455	412	1307	565	548	514	1627	2934
				Phosphate 40 N						
4	9	202	159	151	512	171	287	242	700	1212
8	12	98	159	151	408	203	118	260	581	989
12	15	144	150	145	439	90	160	172	422	861
	Sum	444	468	447	1359	464	565	674	1703	3062
	Totals	1637	1664	1473	4774	1985	2137	2104	6226	11,000

Table H-2 a.

Seed Piece Size	spacing in inches 9	12	15	Average for seed size All spacings
	0 Nitrogen			
1¼ ounce	133.3	101.7	122.3	119.1
2½ ounce	178.3	140.0	140.0	152.8
Average	155.8	120.9	131.2	136.0
	10 Nitrogen			
1½ ounce	127.3	142.0	104.0	124.4
2½ ounce	195.7	143.3	168.0	169.0
Average	161.5	142.7	136.0	146.7
	20 Nitrogen			
1½ ounce	181.0	118.0	136.3	145.1
2½ ounce	216.0	147.0	179.3	180.8
Average	198.5	132.5	157.8	162.9[2]
	40 Nitrogen			
1½ ounce	170.7	136.0	146.3	151.0
2½ ounce	233.3	193.7	140.7	190.4
Average	202.0	164.9	143.5	170.7[3]
Average of all Nitrogen levels	179.5**	140.3	142.1	154.1

L.S.D. spacing (5%) 18.8
L.S.D. spacing (1%) 25.4

**Significantly higher in yield than 12" spacing 1%.

L.S.D. seed piece size (5%) 30.8
L.S.D. seed piece size (1%) 41.4

[1]Significantly higher in yield than ¼ ounce seed piece size 5%.

L.S.D. Nitrogen level (5%) 21.7
L.S.D. Nitrogen level (1%) 29.3

[2]Significantly higher in yield than 0 Nitrogen 5%.
[3]Significantly higher in yield than 0 Nitrogen 1%.

Average seed piece size 1¼ 134.9
Average seed piece size 2½ 173.3[1]

Summary to grow seed stock plant 2½ ounce seed in nine inch spacing and forty pounds Nitrogen.

Analysis of Variance

Varation due to	D.F.	Sum of Square	Mean Square	σ^2	F
Blocks	2	1,170.5	585.25		
Nitrogen level	3	14,495.3	4,831.766		4.72**
Seed piece size	1	25,973.9	25,973.9		25.39**
Spacing	2	29,282.5	14,641.25		14.31**
Spacing x Nitrogen level	6	5,229.8	871.63		
Spacing x Seed piece size	2	1,616.7	808.35		
Spacing x Nitrogen level x seed piece size	6	1,091.0	181.83		
Nitrogen level x seed piece size	3	4,421.8	1,473.93		2.16
Blocks x Nitrogen level	6	6,473.2	1,078.87		1.06
Blocks x seed piece size	2	4,984.2	2,492.1		2.44
Blocks x Nitrogen level x seed piece size	6	650.1	108.35		
Error	32	32,727.0	1,022.72	31.97999	
Total	71	128,116.0			

spacing $\frac{\sigma}{\sqrt{24}} = \frac{31.97999}{\sqrt{24}} = \frac{31.97999}{4.89898} = 6.5279 \times \sqrt{2} = 9.2318 \times T = 5\% = 18.8$ $1\% = 25.4$

Seed piece size $\frac{\sigma}{\sqrt{9}} = \frac{31.97999}{\sqrt{9}} = \frac{31.97999}{3} = 10.66 \times \sqrt{2} = 15.0755 \times T = 5\% = 30.8$ $1\% = 41.4$

Nitrogen level $\frac{\sigma}{\sqrt{18}} = \frac{31.97999}{\sqrt{18}} = \frac{31.97999}{4.2464} = 7.5378 \times \sqrt{2} = 10.66 \times T = 5\% = 21.7$ $1\% = 29.3$

Table H-3. No. 1 tubers 8 ounces and over from irrigated plots with green manure and barnyard manure, 1956.

Row Nos.	Spacing		1¼ ounce seed A	C	E	Sum	2½ ounce seed A	C	E	Sum	Total Pounds
						Phosphate 0 Nitrogen					
1	9		56	72	72	200	101	82	37	220	420
5	12		122	96	87	305	98	88	90	276	581
10	15		143	148	156	447	81	90	36	207	654
		Sum	321	316	315	952	280	260	163	703	1655
						Phosphate 10 Nitrogen					
2	9		118	111	72	301	119	74	84	277	578
6	12		156	154	102	412	113	102	78	293	705
9	15		140	173	134	447	101	92	103	296	743
		Sum	414	438	308	1160	333	268	265	866	2026
						Phosphate 20 Nitrogen					
3	9		81	96	63	240	79	64	87	230	470
7	12		103	161	103	367	91	73	85	249	616
11	15		157	183	80	420	83	57	37	177	597
		Sum	341	440	246	1027	253	194	209	656	1683
						Phosphate 40 Nitrogen					
4	9		103	129	99	331	157	60	93	310	641
8	12		121	123	132	376	112	84	34	230	606
12	15		144	147	118	409	116	96	90	302	711
		Sum	368	399	349	1116	385	240	217	842	1958
		Total	1444	1593	1218	4255	1251	962	854	3067	7322

Table H-3 a.

Seed piece size in ounces		Spacing in Inches 9	12	15	Average for Seed size All spacings
			0 Nitrogen		
1¼		66.6	101.7	149.0	105.8
2½		73.3	92.0	69.0	78.1
	Average	70.0	96.9	109.0	92.0
			10 Nitrogen		
1¼		100.3	137.3	149.0	128.9
2½		92.3	97.7	98.7	96.2
	Average	96.3	117.5	123.9	112.6[2]
			20 Nitrogen		
1¼		80.0	122.3	140.0	114.1
2½		76.7	83.0	59.0	72.9
	Average	78.4	102.7	99.5	93.5
			40 Nitrogen		
1¼		110.3	125.3	136.3	124.0
2½		103.3	76.7	100.7	93.6
	Average	106.8	101.0	118.5	108.8[2]
	Average all N level	87.9**	104.5	112.7	101.7

L.S.D. spacing 5% 10.7
L.S.D. spacing 1% 14.4

Average for seed piece 1¼ oz. 118.2
Average for seed piece 2½ oz. 85.2[1]

**Significantly lower in yield than the 12" spacing 1%.

L.S.D. seed piece size 5% 17.4
L.S.D. seed piece size 1% 23.5

[1]Significantly lower in yield than 1¼ ounce seed piece 1%

L.S.D. Nitrogen level 5% 12.3
L.S.D. Nitrogen level 1% 16.6

[2]Significantly higher in yield than 0 Nitrogen 1%.

Summary, under these conditions to raise bakers plant 1¼ ounce seed in 15 inch spacing with 10 pounds nitrogen.

Analysis of Variance

Varation due to	D.F.	Sum of Square	Mean Square	$\bar{o}$	F
Blocks	2	8,903.00	4,451.50		13.61**
Nitrogen level	3	5,946.30	1,982.10		6.06**
Seed piece size	1	19,602.00	19,602.00		59.92**
Spacing	2	7,683.70	3,841.85		11.74**
Spacing x Nitrogen level	6	2,636.30	439.383		1.34
Spacing x seed piece size	2	10,399.60	5,199.80		15.89**
Spacing x Nitrogen x seed piece size	6	3,312.60	552.10		1.69
Nitrogen level x seed piece size	3	462.10	154.03		
Blocks x Nitrogen level	6	1,167.00	194.50		
Blocks x Seed piece size	2	4,060.80	2,030.40		6.21**
Blocks x Nitrogen level x seed piece size	6	5,517.40	919.57		2.81*
Error	32	10,468.50	327.141	18.0870	
Total	71	80,159.30			

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spacing $\frac{\bar{o}}{\sqrt{24}} = \frac{18.0870}{4.89898}$ 3.69199 x $\sqrt{2}$ = 5.2213 x 2.04 = 10.7 = 5%
2.75 = 14.4 = 1%

seed piece size $\frac{\bar{o}}{\sqrt{9}} = \frac{18.0870}{3} = 6.029 \times \sqrt{2} = 8.5263 \times 2.04 = 17.4 = 5\%$
$2.75 = 23.3 = 1\%$

Nitrogen level $\frac{\bar{o}}{\sqrt{18}} = \frac{18.0870}{4.24264} = 4.2633 \times \sqrt{2} = 6.0292 \times 2.04 = 12.3 - 5\%$
$2.75 = 16.6 - 1\%$

Table H-4. No. 1 Tubers under eight ounces from irrigated plots with green manure and no barnyard manure. 1956.

Row No.	Spacing Inches		1¼ ounce seed B	D	F	Sum	2½ ounce seed B	D	F	Sum	Total Pounds
						Phosphate 0 Nitrogen					
1	9		113	88	145	346	163	140	163	466	812
5	12		81	118	108	307	117	126	153	396	703
10	15		117	117	91	325	138	64	159	361	686
		Sums	311	323	344	978	418	330	475	1223	2201
						Phosphate 10 Nitrogen					
2	9		108	130	114	352	165	187	195	547	899
6	12		108	116	120	344	122	194	145	461	805
9	15		108	87	109	304	154	149	169	472	776
		Sums	324	333	343	1000	441	530	509	1480	2480
						Phosphate 20 Nitrogen					
3	9		220	183	182	585	151	145	240	536	1121
7	12		169	148	126	443	183	145	148	476	919
11	15		163	115	111	389	179	165	174	518	907
		Sums	552	446	419	1417	513	455	562	1530	2947
						Phosphate and 40 Nitrogen					
4	9		190	156	186	532	223	162	258	643	1175
8	12		136	112	139	387	167	173	163	503	890
12	15		118	95	110	323	189	242	167	598	921
		Sums	444	363	435	1242	579	577	588	1744	2986
		Total	1631	1465	1541	4637	1951	1892	2134	5977	10,614

Table H-4 a.

Seed piece size in ounces		Spacing in inches 9	12	15	Average for seed piece all spacings
			0 Nitrogen		
1¼		115.3	102.3	108.3	108.6
2½		155.3	132.0	120.3	135.9
	Average	135.3	117.2	114.3	122.3
			10 Nitrogen		
1¼		117.3	114.7	101.3	111.1
2½		182.3	153.7	157.3	164.4
	Average	149.8	134.2	129.3	137.8[2]
			20 Nitrogen		
1¼		195.0	147.7	129.7	157.5
2½		178.7	158.7	172.7	170.0
	Average	186.9	153.2	151.2	163.8[3]
			40 Nitrogen		
1¼		177.3	129.0	107.7	138.0
2½		214.3	167.7	199.3	193.8
	Average	195.8	148.4	153.5	165.9[3]
	Average all Nitrogen levels	167.0*	138.2	137.1	147.4

Spacing L.S.D. 5% - 13.4
Spacing L.S.D. 1% - 18.1

Average for seed piece size 1¼ oz. 128.8
Average for seed piece size 2½ oz. 166.0[1]

*Significantly higher in yield than the 12" spacing 1%.

Seed piece size L.S.D. 5% - 21.9
Seed piece size L.S.D. 1% - 29.5

[1]Significantly higher in yield than 1¼ ounce seed piece 1%.

Nitrogen level L.S.D. 5% - 15.5
Nitrogen level L.S.D. 1% - 20.9

[2]Significantly higher in yield than 0 nitrogen 5%.
[3]Significantly higher in yield than 0 nitrogen 1%.

Summary, under these conditions to raise seed stock plant 2½ ounce seed in 9" spacing and 40 Nitrogen.

Analysis of Variance

Variation due to	D.F.	Sum of Square	Mean Square	σ	F
Blocks	2	2,227.7	1,113.85		2.15
Nitrogen level	3	23,975.3	7,991.67		15.41**
Seed piece size	1	24,938.8	24,938.8		48.07**
Spacing	2	13,762.7	6,881.35		13.26**
Spacing x Nitrogen level	6	2,142.8	357.13		
Spacing x Seed piece size	2	1,637.0	818.50		1.58
Spacing x Nitrogen level x seed piece size	6	9,454.0	1,575.67		3.04*
Nitrogen level x seed piece size	3	1,484.9	494.97		
Blocks x Nitrogen level	6	4,042.1	673.68		1.30
Blocks x Seed piece size	2	1,557.0	778.50		1.50
Blocks x Nitrogen level x seed piece size	6	7,806.0	1,301.0		2.51*
Error	32	16,601.2	518.788	22.7769	
Total	71	109,629.5			

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spacing $\frac{\sigma}{\sqrt{24}} = \frac{22.7769}{4.89898} = 4.6493 \times \sqrt{2} = 6.5751 \times 2.04 = 13.4$ - 5%
$2.75 = 18.1$ - 1%

seed piece size $\frac{\sigma}{\sqrt{9}} = \frac{22.7769}{3} = 7.5923 \times \sqrt{2} = 10.7371 \times 2.04 = 21.9$ - 5%
$2.75 = 29.5$ - 1%

Nitrogen level $\frac{\sigma}{\sqrt{18}} = \frac{22.7769}{4.24264} = 5.3688 \times \sqrt{2} = 7.5926 \times 2.04 = 15.5$ - 5%
$2.75 = 20.9$ - 1%

Table H-5. No. 1 tubers eight ounces and over from irrigated plots with green manure, no barnyard manure.

Row No.	Spacing Inches		1¼ ounce seed B	D	F	Sums	2½ ounce seed B	D	F	Sums	Total Pounds
						Phosphate and 0 Nitrogen					
1	9		51	63	35	149	107	41	59	207	356
5	12		95	83	70	248	71	65	57	193	441
10	15		164	132	78	374	62	16	48	126	500
		Sum	310	278	183	771	240	122	164	526	1297
						Phosphate and 10 Nitrogen					
2	9		95	46	64	205	111	59	66	236	441
6	12		133	85	63	281	85	34	80	199	480
9	15		156	124	94	374	66	50	78	194	568
		Sum	384	255	221	860	262	143	224	629	1489
						Phosphate and 20 Nitrogen					
3	9		82	54	74	210	93	76	35	204	414
7	12		111	73	87	271	80	57	56	193	464
11	15		159	115	79	353	67	56	44	167	520
		Sum	352	242	240	834	240	189	135	564	1398
						Phosphate and 40 Nitrogen					
4	9		115	86	86	287	82	111	67	260	547
8	12		136	143	117	396	113	76	117	306	702
12	15		173	98	93	364	99	52	69	220	584
		Sum	424	327	296	1047	294	239	253	786	1833
		Total	1470	1102	940	3512	1036	693	776	2505	6017

Table H-5a.

Seed piece size in ounces		Spacing in inches 9	12	15	Average for seed size all spacings
			0 Nitrogen		
1¼		50.0	82.7	124.7	85.8
2½		69.0	64.3	42.0	58.4
	Average	59.5	73.5	83.4	72.1
			10 Nitrogen		
1¼		68.3	94.3	124.7	95.8
2½		78.7	66.3	64.7	69.9
	Average	73.5	80.3	94.7	82.8
			20 Nitrogen		
1¼		70.0	90.3	117.7	92.7
2½		68.0	64.3	55.7	62.7
	Average	69.0	77.3	86.7	77.7
			40 Nitrogen		
1¼		95.7	132.0	121.3	116.3
2½		86.7	102.0	73.3	87.3
	Average	91.2	117.0	97.3	101.8[2]
	Average all Nitrogen levels	73.3*	87.0	90.5	83.6

L.S.D. spacing (5%) 11.1
L.S.D. spacing (1%) 15.0

Average for seed piece size 1¼ -97.7
Average for seed piece size 2½ -69.6[1]

*Significantly lower in yield than 12" spacing 5%.

L.S.D. seed piece size 1¼ ounce 18.1.
L.S.D. seed piece size 2½ ounce 24.5

[1]Significantly lower in yield than 1¼ ounce seed piece 1%.

L.S.D. Nitrogen level (5%) 12.9.
L.S.D. Nitrogen level (1%) 17.4.

[2]Significantly higher in yield than 0 Nitrogen 1%.

Summary- under these conditions to raise bakers plant 1¼ ounce seed in 15" spacings with 40 Nitrogen.

Analysis of Variance

Variation due to	D.F.	Sum of Square	Mean Square	σ	F
Blocks	2	15,775.90	7,887.950		22.13**
Nitrogen level	3	9,030.64	3,010.213		8.45*
Seed piece size	1	14,084.00	14,084.00		39.54**
Spacing	2	3,984.20	1,992.10		5.59**
Spacing x Nitrogen level	6	2,294.96	382.493		1.07
Spacing x seed piece size	2	13,862.91	6931.456		1.95
Spacing x Nitrogen level x seed piece size	6	1,713.33	285.555		
Nitrogen level x seed piece size	3	49.66	16.553		
Blocks x Nitrogen level	6	820.26	136.710		
Blocks x seed piece size	2	1854.88	927.440		2.60
Blocks x Nitrogen x seed piece size	6	2328.96	388.160		1.09
Error	32	11,398.00	356.188	18.8729	
Total	71	77,197.70			

Spacing $\frac{\sigma}{\sqrt{24}} = \frac{18.8729}{4.89898} = 3.8524 \times \sqrt{2} = 5.4481 \times 2.04 = 11.1$
$2.75 = 15.0$

Seed piece size $\frac{\sigma}{\sqrt{9}} = \frac{18.8729}{3} = 6.291 \times \sqrt{2} = 8.8968 \times 2.04 = 18.1$
$2.75 = 24.5$

Nitrogen level $\frac{\sigma}{\sqrt{18}} = \frac{18.8729}{4.24264} = 4.4484 \sqrt{2} = 6.3419 \times 2.04 = 12.9$
$2.75 = 17.4$

Influence of Seed Size, Spacings, and Nitrogen Rates, on Size Set, and Yield of Dryland Netted Gem Potatoes

The potatoes were planted May 24-26. The Nitrogen in the amounts shown was side-dressed at planting time, together with 200 pounds of treble super phosphate which was uniformly applied to all plots.

The potatoes were harvested Oct. 1-4. Plots were 1/100 acre in size, 130 feet of 40 inch row. Total weight of each plot was determined by weighing the total production of the plot. Set was calculated from the count of tubers in 100 pounds from each plot. Size and yield of each size was determined by sorting 100 pounds, weighing the sorts, and multiplying total plot weight by this percentage.

Killing frost stopped growth on September 2. Favorable summer precipitation in addition to good soil moisture at planting time resulted in rather high total yields, response to fertilizer, and production of higher percentages of large tubers than were obtained a year ago, in spite of the short growth period.

Table H-6.

No. Plot	Treatment	Yield Per Acre in Cwt. Total No. 1	No. 1 + 8	No. 1 - 8	Field Run Per Acre	No. of Tubers Per Hill
36	Phosphate and 0 Nitrogen	155.0	63.8	91.2	180.9	4.6
36	Phosphate 10 Nitrogen	167.6	75.6	92.0	195.6	4.8
36	Phosphate 20 Nitrogen	170.9	77.8	93.1	201.5	4.9
54	All plots with 1¼ oz.	156.6	83.1	73.5	190.1	4.3
54	All plots with 2½ oz.	171.6	61.7	109.9	195.2	5.2
36	12 in. spacing	178.1	60.6	117.5	209.1	3.9
36	18 in. spacing	165.5	75.8	89.7	193.6	5.0
36	24 in. spacing	147.2	80.8	66.4	175.4	5.5
54	Green manure	169.3	74.7	94.6	196.4	4.9
54	No green manure	159.6	70.0	89.6	189.1	4.7

Table H-7. Dryland with green manure.

Row	Spacing	1¼ oz. No. 1 - 8 oz. A	C	E	Sum	2½ oz. No. 1 - 8 oz. A	C	E	Sum	Total
					Phosphate and 0 Nitrogen					
1	12	87	106	115	308	133	198	112	443	751
4	18	71	62	145	278	103	141	92	336	614
7	24	53	55	50	158	76	67	65	208	366
	Sum	211	223	310	744	312	406	269	987	1731
					Phosphate and 10 Nitrogen					
2	12	89	110	97	296	133	148	129	410	706
5	18	66	91	60	217	158	132	105	395	612
8	24	45	79	35	159	70	71	72	213	372
	Sum	200	280	192	672	361	351	306	1018	1690
					Phosphate and 20 Nitrogen					
3	12	98	102	47	247	159	204	133	496	743
6	18	50	49	76	175	123	122	90	335	510
9	24	59	75	56	190	87	83	76	246	436
	Sum	207	226	179	612	369	409	299	1077	1689
	Totals	618	729	681	2028	1042	1166	874	3082	5110

Table H-7a. No. 1 tubers under 8 ounces from dryland plots with green manure.

Seed piece size	spacing in inches 12	18	24	Average seed piece size All spacings
		0 Nitrogen		
1¼	102.7	92.7	52.7	82.7
2½	147.7	112.0	69.3	109.7
Average	125.2	102.4	61.0	96.2
		10 Nitrogen		
1¼	98.7	72.3	53.0	74.7
2½	136.7	131.7	71.0	113.1
Average	117.7	102.0	62.0	93.9
		20 Nitrogen		
1¼	82.3	58.3	63.3	68.0
2½	165.3	111.7	82.0	119.7
Average	123.8	85.0	72.7	93.8
Average all N levels	122.2	96.5*	75.2*	94.6

Average seed piece size 1¼ oz. 75.1
Average seed piece size 1½ oz. 114.2[1]

Spacing L.S.D. 5% 11.7
Spacing L.S.D. 1% 16.0

*Significantly lower in yield than 12" spacing 1%.

Seed piece size L.S.D. 5% 16.6
Seed piece size L.S.D. 1% 22.6

[1]Significantly higher in yield than 1¼ ounce seed piece 1%.

Nitrogen level L.S.D. N.S.

Summary, to grow seed size tubers under these conditions plant 2½ ounce seed in 12 inch spacing and no nitrogen.

Analysis of Variance

Variation due to	D.F.	Sum of Square	Mean Square	$\bar{o}$	F
Blocks	2	3,367.60	1,683.80		5.76**
Nitrogen level	2	63.82	31.91		
Seed piece size	1	20,572.50	20,572.50		70.39**
Spacing	2	29,329.93	14,664.965		50.18**
Spacing x Nitrogen level	4	1,809.15	452.286		1.55
Spacing x seed piece size	2	3,339.67	1,669.835		5.71**
Spacing x Nitrogen level x seed piece size	4	1,786.75	446.688		1.53
Nitrogen level x seed piece size	2	1,371.38	685.69		2.35
Blocks x Nitrogen level	4	1,141.48	285.370		
Blocks x seed piece size	2	2,093.80	1,046.90		3.58**
Blocks x Nitrogen level x seed piece size	4	3,206.02	801.51		2.74
Error	24	7,014.50	292.271	17.0959	
Total	53	75,096.60			

Spacing $\frac{\bar{o}}{\sqrt{18}} = \frac{17.0959}{4.24264} = 4.0295 \times \sqrt{2} = 5.6986 \times 2.06 = 11.7$

$2.80 = 16.0$

Seed piece size $\frac{\bar{o}}{\sqrt{9}} = \frac{17.0959}{3} = 5.6986 \times \sqrt{2}$ 8.059 x 2.06 = 16.6

$2.80 = 22.6$

Table H-8. Dryland with green manure.

Row	Spacing	1¼ ounce + 8 No. 1 A	C	E	Sum	2½ ounce + 8 No. 1 A	C	E	Sum	Total Pounds
					Phosphate 0 Nitrogen					
1	12	60	61	52	173	70	40	63	173	346
4	18	76	67	56	199	58	56	38	152	351
7	24	91	134	86	311	68	58	64	190	501
	Sum	227	262	194	683	196	154	165	515	1198
					Phosphate 10 Nitrogen					
2	12	79	68	122	269	56	62	46	164	433
5	18	91	89	112	292	55	78	63	196	488
8	24	83	106	111	300	67	67	71	205	505
	Sum	253	263	345	861	178	207	180	565	1426
					Phosphate 20 Nitrogen					
3	12	83	85	85	253	54	31	38	123	376
6	18	93	87	93	273	76	94	60	230	503
9	24	120	97	80	297	75	88	72	235	532
	Sum	296	269	258	823	205	213	170	588	1411
	Totals	776	794	797	2367	579	574	515	1668	4035

Table H-8 a. No. 1 tubers 8 ounces and over, dryland with green manure.

Seed piece size in ounces	Spacing in inches 12	18	24	Average for seed piece size All spacings
	0 Nitrogen			
1¼	57.7	66.3	103.7	75.9
2½	57.7	50.7	63.3	57.2
Average	57.7	58.5	83.5	66.7
	10 Nitrogen			
1¼	89.7	97.3	100.0	95.7
2½	54.7	65.3	68.3	62.8
Average	72.2	81.3	84.2	79.2[2]
	20 Nitrogen			
1¼	84.3	91.0	99.0	91.4
2½	41.0	76.7	78.3	65.3
Average	62.7	83.9	88.7	78.4[2]
Average of all Nitrogen levels	64.2	74.6*	85.5**	74.8

Average seed piece size 1¼ oz. 87.7
Average seed piece size 1½ oz. 61.7[1]

Spacing L.S.D. 5% 8.3
Spacing L.S.D. 1% 11.2

*Significantly higher in yield than 12" spacing 5%.
**Significantly higher in yield than 12" spacing 1%.

Seed piece size L.S.D. 5% 11.7.
Seed piece size L.S.D. 1% 16.0

[1]Significantly lower in yield than 1¼ ounce seed piece 1%.

Nitrogen level L.S.D. 5% 8.3
Nitrogen Level L.S.D. 1% 11.2

[2]Significantly higher in yield than 0 Nitrogen 1%.

Summary to grow bakers under these conditions plant 1¼ seed, in 24 inch spacing with 10 pounds nitrogen.

Analysis of Variance

Variation Due to	D.F.	Sum of Square	Mean Square	σ	F
Block	2	95.51	47.755		
Nitrogen level	2	1,807.50	903.750		6.17**
Seed piece size	1	9,048.23	9,048.230		61.85**
Spacing	2	4,075.51	2,037.755		13.93**
Spacing x Nitrogen level	4	1,276.99	319.248		2.18
Spacing x seed piece size	2	235.36	117.680		
Spacing x Nitrogen level and seed piece size	4	1,713.10	428.275		2.92*
Nitrogen level x seed piece size	2	454.87	227.435		1.55
Block x Nitrogen level	4	1,536.39	384.098		2.63
Block x Seed piece size	2	214.66	107.33		
Blocks x Nitrogen level x seed size	4	1,717.74	429.435		2.94*
Error	24	3,511.04	146.293	12.0952	
Total	53	25,68690			

Spacing $\frac{\sigma}{\sqrt{18}} = \frac{12.0952}{4.24264} = 2.8509 \times \sqrt{2} = 4.0318 \times 2.06 = 8.3$ -5%
$2.80 = 11.2$ -1%

Seed piece size $\frac{\sigma}{\sqrt{9}} = \frac{12.0952}{3} = 4.0317 \times \sqrt{2}$ 5.7017 x 2.06 = 11.7
$2.80 = 16.0$

Nitrogen level $\frac{\sigma}{\sqrt{18}}$ $\frac{12.0952}{4.24264} = 2.8509 \times \sqrt{2} = 4.0318 \times 2.06 = 8.3$ 5%.
$2.06 = 11.2$ 1%.

Table H-9. Dryland, no green manure.

Row	Spacing	1¼ ounce seed - 8 oz B	D	F	Sum	2½ ounce seed - 8 oz. B	D	F	Sum	Total
					Phosphate 0 Nitrogen					
1	12	84	121	79	284	141	117	142	400	684
4	18	62	61	50	173	97	105	99	301	474
7	24	51	49	60	160	68	95	71	234	394
	Sum	197	231	189	617	306	317	312	935	1552
					Phosphate 10 Nitrogen					
2	12	88	88	107	283	133	172	119	424	707
5	18	81	65	79	225	97	109	105	311	536
8	24	63	73	44	180	65	64	70	199	379
	Sum	232	226	230	688	295	345	294	934	1622
					Phosphate 20 Nitrogen					
3	12	73	87	102	262	182	156	138	476	738
6	18	45	59	90	194	92	107	89	288	482
9	24	68	54	60	182	78	107	77	262	444
	Sum	186	200	252	638	352	370	304	1026	1664
	Totals	615	657	671	1943	953	1032	910	2895	4838

Table H-9 a. No. 1 tubers under 8 ounces from plots without green manure, Dryland 1956.

Seed piece size in ounces		12	18	24	Average for seed piece size all spacings
			0 Nitrogen		
1¼		94.7	57.7	53.3	68.6
2½		133.3	100.3	78.0	103.9
	Average	114.0	79.0	65.7	86.2
			10 Nitrogen		
1¼		94.3	75.0	60.0	76.4
2½		141.3	103.7	66.3	103.8
	Average	117.8	89.4	63.2	90.1
			20 Nitrogen		
1¼		87.3	64.7	60.7	70.9
2½		158.7	96.0	87.3	114.0
	Average	123.0	80.4	74.0	92.5
Average for all nitrogen levels		118.3	82.9*	67.6*	89.6

Average for seed piece size 1¼ 72.0
Average for seed piece size 2½ 107.2[1]

Spacing L.S.D. 5% 10.2
Spacing L.S.D. 1% 13.9

*Significantly lower in yield than 12" spacing 1%.

Seed piece size L.S.D. 5% 14.5
Seed piece size L.S.D. 1% 19.7

[1]Significantly higher in yield than 1¼ seed piece 1%.

Nitrogen level L.S.D. N. S. 5%.
Nitrogen level L.S.D N. S. 1%.

Summary, to raise seed under these conditions plant 2½ ounce seed, 12 inch spacing with no nitrogen.

Analysis of Variance

Variation Due to	D.F.	Sum of Square	Mean Square	σ	F
Blocks	2	490.32	245.16		1.10
Nitrogen level	2	355.76	177.88		
Seed piece size	1	16,783.46	16,783.46		75.54**
Spacing	2	24,317.43	12,158.72		54.72**
Spacing x Nitrogen level	4	654.21	163.55		
Spacing x Seed piece size	2	2,473.91	1,236.96		5.57*
Spacing x nitrogen level x seed piece size	4	846.85	211.71		
Nitrogen level x seed piece size	2	560.08	280.04		1.26
Blocks x Nitrogen level	4	61.62	154.1		
Blocks x Seed piece size	2	549.32	274.66		1.24
Blocks x Nitrogen level x seed piece size	4	1,405.84	351.46		1.58
Error	24	5,332.30	222.179	14.9057	
Total	53	53,831.10			

S_{pacing} $\frac{\sigma}{\sqrt{18}}$ $\frac{14.9057}{4.24264}$ = 3.5133 x $\sqrt{2}$ = 4.9685 x 2.06 = 10.2 - 5%.
2.80 13.9 - 1%.

Seed piece Size $\frac{\sigma}{\sqrt{9}}$ $\frac{14.9057}{3}$ = 4.9686 x $\sqrt{2}$ = 7.0266 x 2.06 - 14.5 5%.
2.80 19.7 1%.

Table H-10. Dryland no green manure.

Row	Spacing	1¼ ounce seed + 8 oz. B	D	F	Sum	2½ ounce seed + 8 oz. B	D	F	Sum	Total
				Phosphate 0 Nitrogen						
1	12	57	46	68	171	38	38	45	121	292
4	18	56	83	69	208	71	43	45	159	367
7	24	72	75	94	241	71	59	67	197	438
	Sum	185	204	231	620	180	140	157	477	1097
				Phosphate 10 Nitrogen						
2	12	74	59	76	209	34	40	58	132	341
5	18	84	105	81	270	99	72	52	223	493
8	24	78	76	101	255	68	69	70	207	462
	Sum	236	240	258	734	201	181	180	562	1296
				Phosphate 20 Nitrogen						
3	12	105	100	68	273	33	39	50	122	395
6	18	70	109	88	267	79	111	69	259	526
9	24	92	71	63	226	62	79	103	244	470
	Sum	267	280	219	766	174	229	222	625	1391
	Total	688	724	708	2120	555	550	559	1664	3784

Table H-10 a. No. 1 tubers 8 ounces and over, dryland conditions no green manure.

Seed piece size in ounces	Spacing in inches 12	18	24	Average for seed piece size All spacings
	0 Nitrogen			
1¼	57.0	69.3	80.3	68.9
2½	40.3	53.0	65.7	53.0
Average	48.7	61.2	73.0	61.0
	10 Nitrogen			
1¼	69.7	90.0	85.0	81.6
2½	44.0	74.3	69.0	62.4
Average	56.9	82.2	77.0	72.0[2]
	20 Nitrogen			
1¼	91.0	89.0	75.3	85.1
2½	40.7	86.3	81.3	69.4
Average	65.9	87.7	78.3	77.3[2]
Average all nitrogen level	57.2	77.0*	76.1*	70.1

Average for seed piece size 1¼ oz. 78.5
Average for seed piece size 2½ oz. 61.6[1]

Spacing L.S.D. 5% - 10.6
Spacing L.S.D. 1% - 14.4

*Significantly higher in yield than 12" spacing 1%.

Seed piece size L.S.D. 5% 15.0
Seed piece size L.S.D. 1% 20.3

[1]Significantly lower in yield than 1¼ oz. seed piece 5%.

Nitrogen level L.S.D. 5% 10.6

[2]Significantly higher in yield than 0 nitrogen 5%.

Summary, to raise bakers under these conditions plant 1¼ ounce seed in 18" spacing with 20# nitrogen.

Analysis of Variance

Variation due to	D.F.	Sum of Squares	Mean Square	σ	F
Blocks	2	29.46	14.73		
Nitrogen level	2	2,501.24	1,250.62		5.27*
Seed piece size	1	3,850.76	3,850.76		16.23**
Spacing	2	4,544.24	2,272.12		9.58**
Spacing x Nitrogen level	4	822.92	205.73		
Spacing x Seed piece size	2	1,347.90	673.95		2.84
Spacing x Nitrogen level x seed piece size	4	1,512.77	378.193		1.59
Nitrogen level x seed piece size	2	33.30	16.65		
Block x Nitrogen level	4	676.10	169.03		
Block x seed piece size	2	47.28	23.64		
Block x Nitrogen level x seed piece size	4	1,342.99	335.75		1.42
Error	24	5,694.84	237.285	15.4041	
Total	53	22,403.80			

Spacing $\frac{\sigma}{\sqrt{18}}$ $\frac{15.4041}{4.24264}$ = 3.6308 x $\sqrt{2}$ = 5.1347 x 2.06 = 10.6
2.80 = 14.4

Seed piece size $\frac{\sigma}{\sqrt{9}}$ $\frac{15.4041}{3}$ = 5.1347 x $\sqrt{2}$ = 7.2615 x 2.06 = 15.0
2.80 = 20.3

Nitrogen level $\frac{\sigma}{\sqrt{18}}$ $\frac{15.4041}{4.24264}$ = 3.6308 x $\sqrt{2}$ = 5.347 x 2.06 = 10.6
x 2.80 = 14.4

Potato Varieties 1956

Potato variety studies this year were limited to single row plots of a few varieties thought to have some scab resistance as a part in our continuing search for an early red scab free potato with quality.

This seasons plots were on irrigated, medium texture loam soil that has not raised potatoes during recent years.

Ten varieties were planted, May 29, in 30 feet single forty inch rows with thirty, two ounce seed pieces. These were harvested September 29, and notes taken as shown below. Ten tuber samples of each variety were sent to M.S.C. for positive scab readings.

Table H-11. Potato variety notes.

Variety	Color	Maturity	Defects	Scab observation Entire sample	Deep pits per Tuber[1]	Pounds Per 30 foot row
Manota	White	fair	Air Check	Moderate	2	50
Redburt	Red	fair		Heavy	10	69
Tawa	White	fair		Very light	0	25
Delus	White	fair		Light	1	28½
Sheridan	Red	good		Moderate	2	47
Kink	White	fair		Heavy	5	52½
Saco	White	fair	rough	Light	1	42½
Redglo	Red	poor	air check	Heavy	2	43
Merrimac	White	fair		Very light	0	37
Ea Gem	White	good	rough & checks	None	0	35

[1]Based on four washed tubers.

Obviously there is no early red potato in this group. Sheridan shows the most scab resistance and best maturity of the three red varieties tested. Neither is there much indication of a high producing white potato with scab resistance maturity and quality.

Sawdust Mulch for Raspberries

Six rows of Latham raspberries 100 feet long rows spaced seven feet apart that have become well established and have been used for fertilizer work in past years have been divided into four four row sections with one border row on each side, each section being comparable to each other section in previous treatment. Each row is considered a separate plot making four replications of present treatments.

This work was designed to determine which of four fertilizer treatments would be effective in maintaining and possibly increasing yields where sawdust mulch is used, and also to compare yields of mulched and clean cultivated plots.

On April 21, 1956 300 pounds per acre of treble super phosphate was drilled into the soil in all plots, as was one half the designated amount of nitrogen. On April 23, twenty bushel of fresh sawmill sawdust was scattered uniformly on each row in three sections. By weight this amounted to 24.8 tons per acre.

The sawdust was about three inches deep on the ground. The remaining nitrogen was then scattered on the sawdust.

The mulch restricted the growth of weeds to a few tall annuals.

Picking and weighing was done by members of a neighbors family who agreed to undertake the project for the fruit harvested. Through a misunderstanding, all four rows of a given treatment were weighed together rather than seperately.

Treatment	Ounces 420 foot row	Pounds Per Acre
Phosphate no mulch (check)	432	2100
Phosphate and mulch	597	2878
Phosphate, mulch and 300#/A Sulfate of Amon.	610	2956
Phosphate, mulch and 600#/A Sulfate of Amon.	625	3304

Activities 1956

Research is the primary purpose for which a Branch Station is established and should occupy the major portion of the time of Staff members. To be of the greatest value however, research must solve the problems of the area in which the Branch Station is situated. Problem solutions in the file of a research worker have little value until applied to the problems where and when they exsist. It is therefore a recognized function of a research worker to make the results of research known and to promote the application of solutions to problems. This gives rise to a phase of Branch Station work which we shall term activities.

Events participated in during 1956

Division of Agriculture Conference	Bozeman
Soils Planning Conference	Bozeman
Montana Seed Show	Kalispell
Co-op Seed Growers Annual Meeting	Charlo
Flathead Wool growers Meeting	Kalispell
Farmers School	Polson
A.C.P. Meeting	Kalispell
Potato Growers Meeting	Corvallis
Pamona Grange Meeting	LaSalle
Conservation Days at Polson, Libby, Eureka, Trout Creek, Hot Springs, &	Missoula
Disease and Insect School	Kalispell
Educators Conference	Kalispell
State Hort Soc. Meeting	East Shore
Crop Improvement Tour	Chester to Conrad
Summer Staff Conference	Moccasin
Western Section Agronomy Society	Lethbridge
Missoula County Fair	Missoula
Sanders County Fair	Plains
Garden Club Meeting	Bigfork
County Planning for Management of Soil Bank and Conservation Reserves	Kalispell
Station Advisory Committee Meeting	Missoula

Persons and Groups Visiting Station on one or more occasions.

Flathead, Lake, Sanders, Missoula, Ravalli, Lincoln and Mineral County Agents. California Spray Co. Representatives. Soil Conservation Unit Leader, Lake County. Dow Chemical Co. Representative. International Harvester Co. Representatives. Dr. Purdy and Dr. Kendrick, Pullman, Washington. Consolidated Mining Representatives. 4-H livestock judging contest participants. Creston upper grades tour. Northrup King Representative. Anaconda Fieldmen, Green and Turner. Field Day group from seven Counties total of 221. Adventist Youth Group farm tour. From M.S.C. Stitt, Post, Hehn, Eslick, Mercer, Beers, Haun, Shaw, Asleson, Klages, Jacobson, Frahm, Harrington, Yeager, Isaac, and Tretsven. From Branch Stations Assheim, Richardson, Merkley. Montana Seed Growers representatives Tewes and Halveson.

Reports issued.

Annual Report
Progress Report
Monthly letter beginning in September.

FARM FLOCK RECORD N.W. BRA. STATION 1956

The gross return from this flock of 37 ewes on hand January 1, 1956, which includes thirteen ewe lambs, has been as follows:

Wool (inc. Gov't. payments)	$263.52
Cull ewes	55.00
Lambs	245.11
Increse in Inventory-	
37 to 41, @ 10.00	40.00
	723.63

$723.63 divided by 37 equals gross per head $19.56. This compares to a gross of $21.66 for 1955 and $22.19 in 1954.

Nineteen of the 24 ewes over 1 year and one ewe one year old dropped 34 lambs. Twenty-six were weaned, eighteen of which were fat when weaned September 7, or in some cases earlier.

No trouble from worms was encountered this season. Worm control measures initiated this year include cross fencing pastures for rotation grazing, keeping phenothyazine-salt mixtures in pastures in steel barrel bunks, and giving each sheep one concentrated Pheno. capsule when turned out.

Certain other difficulties were encountered however. Five ewes over one year failed to breed. Eight lambs were lost at lambing time. Four ewes ruptured during pregnacy.

Eight ewes with twin lambs were kept in the feedlot, from May 5, to September 7 when the lambs were weaned and sold, to use silage and other feeds on hand. Feed used, grains, etc., are as follows:

1½ tons hay (est.) @ 20.00	30.00
7 tons corn silage @ 6.00	42.00
1435 lbs grain @ 2.00 cwt	28.70
Total feed cost	$100.70

Lamb weight into lot	497 lb. Ave. 31 lb.
Lamb weight out of lot	1341 lb. Ave. 83.8 lb.
Gain	844 lb. Ave. 52.8 lb.

Feed cost per 100 lbs. lamb gain $11.94

Ten of these feed lot twins were fat when weaned. Five singles were sold as fat lambs on August 3, and three of five others were fat when weaned September 7.

The average grease weight of fleeces when shorn was 13½ pounds.

Bad weather during breeding season may be partially responsible for the reduction in percentof lambs weaned from 157% in '55 to 105% in '56.

Table W-1 . Summary of climatic data by months for the 1955-56 crop year (September to August) and averages for the period, 1949-1956, at the Agricultural Experiment Station, Creston, Montana.

	Month												Total or Average Growing season
	Sept. 1955	Oct. 1955	Nov. 1955	Dec. 1955	Jan. 1956	Feb. 1956	Mar. 1956	Apr. 1956	May 1956	June 1956	July 1956	Aug. 1956	
Precipitation (inches)													
Current year	1.64	1.89	1.97	2.38	1.76	1.53	.87	1.28	1.06	4.20	2.13	3.21	23.92
Ave. 1949 to 1955-56	.98	1.64	1.18	1.69	1.69	1.17	1.00	1.18	1.57	3.21	1.83	1.70	18.98
Mean temperature (°F)													
Current year	52.5	44.6	23.5	21.8	23.3	20.9	31.5	44.2	54.3	59.0	64.8	62.0	41.90
Ave. 1949 to 1955-56	53.7	43.7	32.9	25.9	18.6	25.9	30.0	42.9	51.1	56.5	64.6	61.9	42.30

Last killing frost in spring*

1956 - May 3 (26°) 32° June 30

Ave. 1949-1956 - - - - - - - - - - - - - - - - - - May 29 (30°)

First killing frost in fall*

1956 - September 2 (32°)

Ave. 1949-1956 - - - - - - - - - - - - - - - - - - September 13 (29.6°)

Frost free period

1956 -122 Days

Ave. 1949-1956 -106 Days

Maximum summer temperature - - - - - - - - - - - - - - -90° on July 22, 1956

Minimum temperature (winter) - - - - - - - - - - - - - - 25° below zero on Feb. 16, 1956

*In this summary 32° is considered a killing frost.