1968

Annual Report

Dickinson Experiment Station

Dickinson, North Dakota

By

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Superintendent

Table of Contents

Annual Report
Of The
Dickinson Experiment Station

All of our efforts are directed toward increasing the income for those who are directly dependent upon agriculture. This is a very critical period in the economy of North Dakota since we are so wholly dependent upon agriculture. No period in the history of our state has had such high operating costs that must be financed by extremely low market prices, especially in the case of small grain production. This becomes more serious because small grain provides the main income to our farmers.

In all out agricultural enterprises we must be up to date. This is to know which crops and practices will give us the greatest net income. In most instances any enterprise, method or practice which only returns a dollar for each dollar spent is not sound and should be eliminated. Our knowledge of the latest in agriculture must extend out to the individual farm or ranch pointing to the over-all practices which in many cases is hard to break has no place in modern agriculture unless it provides the best results. Preference in the operation of an agricultural unit should be out unless it will match the resulting income of any other operation. When a small grain variety is selected by the farmer he must consider what it could yield for him during the current year and what will be the impact of it's production on his operation in the future years. It is not enough to know how much a practice such as fertilizer should increase the yield of a given crop, we must know how much it increases over the cost of both the fertilizer and the application.

Management is ever increasing in importance in every type of agricultural enterprise. In livestock production we must consider low cost housing, efficient use of roughage and gain raised on the farm or ranch, along with the proper handling of the livestock under the condition existing on each unit.

The value of any Branch Station is pointing the way for the methods of operation best suited to an expanding agriculture. The results of this will be strong economy and the best possible income for both agriculture in business in our state which is so wholly dependent upon agriculture.

Changing trends in crop production in the United States pose many questions for the farmer and rancher. In recent months our National Agricultural policy has placed less effort on reducing farm output by retiring land from cultivation and had given more emphasis to encouraging increased production of many crops.

Increased requirements for food to meet domestic needs, supply foreign markets and provide aid to undeveloped nations have reduced stocks of surplus crops to the point that there must be concern with assuring adequate supplies in the future.

The prevention of water and wind erosion is an ever present problem which must be met for maintenance of maximum soil fertility and production. This demands constant effort in the conversation of all our natural resources. Extensive and proper use of land and water are a must in a sound program geared to the agriculture of the west river area.

The seasons of short rainfall at the greatest single hazards to crop production in the west river area. This fact requires an agricultural improvement program built upon a foundation of sound dryland farming and ranching operations. There is the occasional season of too scanty rainfall for even dryland farming methods to pay out.

We are placing more emphasis each year on increasing yields through better crop varieties, the best use of fertilizer, and improved practices in tillage and crop rotations along with improved insect and weed control measures.

We can help in this over-all change or " Agricultural Revolution" by pointing the way towards new findings which when taken together even under the most adverse conditions will tend to stabilize our farm and ranch income.

Needs Of
The
Dickinson Experiment Station

It is desirable that an Experiment Station be kept in proper repair, neat and have the general appearance of a show place. This is very important, since the public often places the appearance above experiment results. Our job is to do both the experimental work and keep the station up to the satisfaction of the public. The job of keeping the station like a "model farm" is never ending and must be worked at constantly.

The experimental work must be improved in both method and projects along with keeping up to the changes made necessary by an ever advancing agriculture.

Equipment must be kept properly repaired up to date and modern in order to obtain results in line with farmers and ranchers have the right to expect. This with the ever mounting cost makes the proper functioning of an Experiment Station a costly operation.

I. Land

1. A special effort was made in 1968 to buy 480 acres of land, described as S ½, NW ¼ of Section 23, T. 140. R. 97.
2. The land was located, the purchase price of $155.00 per acre was agreed upon and an option was taken for 1% of the purchase price. The land transaction would have been closed in 1968 except that the original owners of the land, the Northern Pacific Railroad had delayed giving a quit claim deed for the coal and iron rights that were not released when the land was sold by the Railroad to the present owner.
3. We are anxious to increase our rangeland in the Badlands from 400 to 640 acres. This is being worked on with the Forest Service and the Bureau of Land Management. It is hoped that arrangements can be made to secure an acreage adjacent to the grazing land we already have known as Pyramid Park. If some land could be obtained from the Federal government as indicated , one or more small tracts are probably available from private owners. This land is necessary in order to give our cow herd an average of sufficient size to provide grazing for the whole herd in the Badlands from about June 20 to October 15 without over-grazing our range. We are in need of these separate pastures for the purpose, with the present acreage providing only two grazing areas.

II. Improvements Made in 1968.

1. The lots and alleys on the farm were all painted in 1968.
2. The "off-station" sites for crops work selected in 1967 were started with trials in 1968.
   These sites are located in Dunn, Golden Valley, Bowman, Adams and Morton counties.
   Contracts for these sites for 1969 have already been signed. This will be the second year of the trials on these sites which in all cases except one, Golden Valley County which is 6 acres consist of 10 acres, with half the acreage in trials and the other half in fallow each year.

3. Renovation of the shelter belts on both farms were continued.
4. Pruning and removing of dead trees was continued in 1968.
5. The sainfoin for pasture trials were planted in the spring of 1968; however a good stand was not obtained.
6. The SW ¼ SW ¼ of Section 5 was planted to a grass and alfalfa mixture in 1968.
7. New gates were constructed and much repairing done on lots and fences in 1968.
8. The chicken house on the livestock farm was improved and made into a shop for satisfactory working conditions during the winter months. This included removing the fixtures when used as a chicken house, repairing the cement floor, and construction of a chimney so a stove could be used for heating.

III. Improvements to be made in 1969

1. Painting of all buildings on the Agronomy farm.
2. Replace both spruce and broad leaf trees in our shelter belts where needed.
3. Replace dead apple and plum trees in our new orchard planting.
4. Continue renovation of our shelter belts on both farms in 1969.
5. Prune and properly keep up shelter belts.
6. Re-seed SW ¼ SW ¼ of Section 5 with a grass mixture since a good stand was not obtained in 1968.
7. Build a new entrance to the root cellar.
8. Build a new combination shed and seed house on the Agronomy farm. This project should have been completed before, but was not started due to the lack of time to get the job done.

IV. Other Projects

1. The garden project will be continued in 1969 in cooperation with the Extension Service and Horticulture Department at North Dakota State University. Adequate water is provided for the irrigation of the garden project.

V. Information

1. Our program included releasing information as available for improving farming and ranching operations. Such information is released through the Crops Day, Livestock Research Roundup, tours, meetings, publications, new releases, radio and TV programs, along with both office and farm calls.
2. Two thousand copies of our 1968 Livestock Research Roundup bulletin were released to farmers and ranchers.

Dickinson Experiment Station
Weather Station

We make a daily weather record which is sent to the National Weather Records Center, Arcade Building, Asheville, North Carolina which consists of the following:

1. Maximum, minimum and 7:00 a.m. temperature readings.
2. Wind velocity over each 24 hour period.
3. Free surface evaporation from April 1 to October 1.
4. Daily precipitation.
5. Snow fall each day and amount on the ground each day. The daily reports are summarized for each month and at the end of each year.

Dickinson Experiment Station
Precipitation

			1892-1968				Last 10 Years	
Month	1968	Accum.	Summary*	Av.	Accum.	Year	April-July	Annual
Jan.	.27	.27	33.24	.43	.43	1959	6.15	13.45
Feb.	.11	.38	32.72	.42	.85	1960	6.22	10.23
March	.18	.56	56.55	.73	1.58	1961	7.81	13.90
April	1.02	1.58	102.94	1.34	2.92	1962	12.59	18.34
May	1.25	2.83	177.33	2.30	5.22	1963	13.58	18.94
June	3.38	6.21	270.46	3.51	8.73	1964	13.78	18.68
July	2.83	9.04	169.54	2.20	10.93	1965	16.81	21.63
Aug.	3.99	13.03	140.35	1.82	12.75	1966	10.11	16.69
Sept.	.43	13.46	93.48	1.21	13.96	1967	9.01	14.24
Oct.	.91	14.37	62.07	.81	14.77	1968	8.48	15.73
Nov.	.34	14.71	39.88	.52	15.29	1944**	21.20	31.16
Dec.	1.02	15.73	30.58	.40	15.68	1936**	2.03	6.72

77- Year Average Precipitation = 15.69; 77- Year Average Precipitation, April-July = 9.35; *Total Precipitation in inches per month for 77 years; **Greatest Record; ***Least of Record; 1968 Greatest 24-hour precipitation, August 24, 2.27 inches. Above Normal for 1968 .05 inch.

Temperature
General Information

Latest Killing Frost In Spring			Earliest Killing Frost In Fall		
1915	June 16	30°F	1917	Aug. 9	30°F
1968	May 21	28°F	1968	Act. 3	28°F

Frost-Free Season		Shortest Of Record	Longest Of Record	
1968	133 days	69 days in 1915-1917	175 days	1962

Lowest Of Record		Highest Of Record	
1936 Feb. 16	-47°F	1936 July 6	114°F
1968 Jan. 4	-32°F	1968 June 4	98°F
		1968 July 11	98°F

If You Become Stuck In Snow Or Stalled In A Blizzard

Do not Panic. Work slowly.
Beware of over exertion and over exposure unless you are in prime physical condition. Exertion from attempting to manually push car, shovel heavy drifts, etc., during critical winter weather such as strong biting winds, blinding snow and bitter cold temperatures may lead to a heart attack.
Stay in vehicle. Do not attempt to walk and find help. Disorientation occurs quickly in blowing and drifting snow and you can become lost very quickly. The vehicle provides protection from the weather and is also the best possible location to be observed by highway maintenance crews.
Carbon monoxide and oxygen starvation are deadly. Make provision for a supply of fresh air. Freezing wet snow and wind-driven snow can effectively seal the car. Run the motor and heater sparingly and only with the down-wind window opened for ventilation.
Clap hands and move legs and arms vigorously from time to time to stimulate circulation, to warm extremities, and to relieve tensed muscles.
Turn on dome light at night for observation of people in car. Others coming along the road may also see the light.
Use candles and can to melt snow for drinking water. Do not eat snow.
Do not permit all occupants of car to sleep at once.

VI. Beef Cattle

A. Improving the cow herd.
1. We are making a special effort over the years to improve the production of our cow herd. The heifer calves selected as replacement animals are the best ones raised each year on the basis of pounds over the scale at weaning, good growth rate, economy of gains, carcass quality and against defects as dwarfism.
2. Each year heifers equal to about on fifth of the cow herd are saved for replacements. After culling out the cows with defects like lump jaw, cancer eye, bad feet, cows over 10 years old, ect., the poor producing cows still remaining in the

herd are replaced. This program results in weeding out a little less than the bottom one fifth of the herd each year.

3. We believe that the life of a cow in the breeding herd should not be over ten years unless she is and exceptionally good cow and sound.
4. If under conditions a heifer weans a light calf she probably always will wean a poor calf and should be culled.
5. One important factor in producing a heavy calf at weaning is the mother's ability to be a good milker.
6. Dry cows and a cow that loses her calf during the pregnancy period are not profitable, may even be diseased and should be removed from the herd at once. In either case the physiology of the cow's reproductive tract or disease may be the reason for the cow being dry or having an abortion.
7. A cow with high-strung temperament, a fence crawler, or one with a mean disposition, will never change and since her calves will probably have the same disposition should be removed from the herd.
8. The heifers selected for replacements are a most important consideration. Our replacement heifers are selected from the top 50% by weight of the current year's heifer crop. The heifers falling into this weight group are selected on the basis of type, thickness, bone, quality and breed character.

B. Bull Selection:
   1. At the present time the bulls listed below are being used in the Dickinson Experiment Station herd.
      a. TTT Lodge Heir 8, Number 11,643, 726
         Calved, April 3, 1961
         Bred by Thor Tagestad, Towner, North Dakota
      b. TTT Anxiety, Number 11,643,725
         Calved, April 3, 1961
         Bred by Thor Tagesad, Towner, North Dakota
      c. Husky Pioneer 314, Number 12,874,443
         Calved, April 15, 1963
         Bred by Tony Stroh, Killdeer, North Dakota
      d. Husky Pioneer 402, Number 13,351,427
         Calved, April 5, 1964
         Bred by Tony Stroh, Killdeer, North Dakota
      e. TTT Silver Beau, Number 13,799,402
         Calved, April 13, 1965
         Bred by Thor Tagestad, Towner, North Dakota
      f. BR Mill Iron 7115, Number 14,701,706
         Calved, March 22, 1967
         Bred by Brooks Hereford Ranch, Burlington, North Dakota
      g. BR Mill Iron 7179, Number 14,766,063
         Calved, May 2, 1967
         Bred by Brooks Hereford Ranch, Burlington, North Dakota

2. Two bulls were purchased in 1968 from Brooks Hereford Ranch in Burlington, North Dakota for the use in our herd. The following is a record of the performance of these bulls:

	Weight 4/9/68	Gain per day of age
BR Mill Iron 7115	850 lbs.	2.28 lbs.
BR Mill Iron 7179	800 lbs.	2.34 lbs.

We plan to purchase a third bull from the Brooks Hereford Ranch in 1969. We have made an effort to increase the size and meatiness of out cows by the bulls used. New bulls selected are in an effort to increase size, fleshing qualities and weaning weight. The essentials any breeder must consider in building his herd with the increasing overhead and narrow margins in the beef cattle industry.

C. Trials with the cow herd.
   1. This is our third year with a trial to determine the value of straw in the ration for wintering breeding cows. Since there was quite a lot of waste the first year when long straw was fed, during the last two winters the straw was chopped in lengths not longer than about one inch.
      a. The cow herd is divided into two equal lots.
         aa. One lot receives 7 pounds hay, all the chopped straw they will eat free choice, and one pound of soybean Oilmeal.
         bb. The other lot receives 7 pounds hay, all the chopped straw they will eat free choice, and one pound of soybean oilmeal.
         cc. About February 1 each cow in both lots were fed the same ration consisting of 20 pounds of hay and 2 pounds of grain.
         dd. About two weeks before calving all cows were fed the same ration consisting of 20 pounds of hay and 2 pounds of grain.
         ee. In this trial the following determinations are made:
            1. Vigor of calf at birth.
            2. Loss of calves at birth.
            3. Weight of calves at birth.
            4. Weight of calves at weaning.
            5. Weight of cows at beginning of the trial, at calving and when calf is weaned.

   2. For the first two months of spring grazing about one half the herd is fed 3 pounds of a 15% protein supplement with the remaining on half of the herd receiving no supplement
      This is to determine.
      a. If this supplement would increase the weight of the calf at weaning because of increased milk flow.
      b. Would a higher percentage of the cows receiving the supplement breed on the first heat cycle after the bull is turned into the herd.

D. Trials in lots with animals being fed out for slaughter.
    1. Realizing that there is no one best wat to "feed out" cattle we feed mostly high roughage and low grain rations. In some cases we have fed high grain and low roughage rations. In either case the cost of gains are about the same with the gains just a little faster with high grain and low roughage ration.
    2. The main purpose of our feeding program is to use as the major part of the ration, home grown feeds. This applies especially to roughage which might be wasted or sold at a price below that it will bring as beef when fed in the ration.
    3. No feeder can afford not to feed a balanced ration which besides the grain and roughage must have adequate protein and minerals. We are also consideration to management and housing problems.
    4. In out feeding program wea are searching for reliable information on the following:
        a. Most economical shelters for beef cattle in North Dakota that result in fast and economical gains.
        b. Wheat, barley and oats in flattening rations for beef cattle.
        c. Comparison of supplements in a high roughage fattening ration.
        d. Long hay or chopped hay in rations for wintering heifers.
        e. Low level and medium growth in rations for wintering steers to be finished out by one of the following ways:
            aa. Finishing in dry lot.
            bb. Grazed in spring followed by dry lot feeding.
            cc. Grazed and fed grain on pasture followed by dry lot finishing.
        f. Implanting nursing steer calves with stilbestrol.
        g. Comparing stilbestrol and MGA, melengestrol acetate for feeding heifers for market.
        h. Feeding grain on pasture to yearlings.
        i. Determining replacement value of barley for hay.
        j. Red nose shots and high energy rations for calves.

VII. <u>Swine Program.</u>

A. Our effort is directed towards improving the meat qualities of our breeding herd of Yorkshires, along with gaining ability, efficiency of gain, and type. This is accomplished through a rigid program of selection. An effort is also being made to secure the best boars available for the herd improvement program.
    1. Boars used in our herd:
        a. OAMC4 Model 297-404802
        Farrowed July 26, 1964
        Sire: OAMCO Model 65-283296 PR
        Dam: OAMC1 Miss Capre 18-324583
        Bred by: Oklahoma State University

        b. ISU6 White Flame 17-8
        Farrowed: May 26, 1966
        Sire: HYP3 White Lightinin' 12-12 377475 PR
        Dam: ISU3 Princess Blender 7-8 387854 CL PR

Bred by: Iowa State University

c. ISU7 Rebel Blend 11-6
Farrowed: March 13, 1967
Sire: SSE4 The Rebel 391912CLCMS
Dam: ISU4 Blended Beauty 1-7 390505 CL PR****
Bred by: Iowa State University

d. DES7 One Hundred Ten 12 Fall 520281
Farrowed August 30, 1967
Sire: ISU6 White Flame 17-8 461422 CL
Dam: DES6 One Hundred Ten 481515
Bred by: Dickinson Experiment Station

e. DES8 Two
Farrowed February 25, 1968
Sire: ISU6 White Flame 17-8 461422 CL
Dam: DES6 One Hundred Three 10 Fall 481517
Bred by: Dickinson Experiment Station

2. Trials in swine production.
   a. A lot with the hog house insulated and providing a windbreak; a lot insulating the house without a windbreak; a lot with a windbreak and no insulation and a lot with the standard type house without insulation or windbreak as the control.
   b. The effect of sire and sex on feed efficiency and rate of gain of swine.
   c. Results of feeding pigs a pelleted or meal ration.
   d. Comparison of pigs fed on pasture to those fed in dry lot with a cement floor.
   e. New programs to be considered.
      aa. Economy of the swine operation including labor, housing and feeding in over-all swine production.
      bb. Improving farrowing facilities.
      cc. Control of disease.
      dd. New rations.
      ee. New pasture crops.

VIII. <u>Grass And Legume Investigations</u>

A. Improving of both pasture and hay in western North Dakota is the highly important part of these investigations.
   1. Uniform bromegrass trial, including hay yields.
   2. Crested wheatgrass trial, including hay yields, and composition of hay yields.
   3. Grass and Grass-alfalfa mixtures seeded in 1958 including grass, legume and weed content of the hay.
   4. Dry land alfalfa variety plots seeded in 1960 for a determination of total yield of alfalfa and weeds.
   5. Yields of alfalfa varieties and weeds from plots seeded in 1964.
   6. Hay yields from alfalfa plots seeded in 1967.

7. New seedings of alfalfa, Emerald Crown vetch and Eski sainfoin.
8. Sweet clover yields.

B. New fertilizer trial.
   1. Hay yields from new fertilizer trials with three rates of nitrogen fertilizer.
      a. Nordan crested wheatgrass in pure stand.
      b. Nordan crested wheatgrass with alfalfa.
      c. Russian wildrye in pure stands.
      d. Russian wildrye with alfalfa.

   2. Pasture yields from new fertilizer trials, fertilized at three rates.
      a. Russian wildrye and crested wheatgrass in pure stands.
      b. Russian wildrye and crested wheatgrass each seeded with alfalfa.

IX. Native Grassland Fertilization

A. Fertilization on four different soil series, including Vebar, Havre, Solonetz, and Manning with the most comprehensive work being done with the first three soil series mentioned.
   1. Fertilization with different rates of nitrogen, phosphorus and a nitrogen-phosphorus combination using a spring application.
   2. Yields from the check and each fertilized application to be separated into tallgrasses, midgrasses, shortgrasses, annual forbs, perennial forbs, total grass yield and total yield including forbs.

X. Agronomy Investigations.

A. The work in agronomy is directed along the following lines:
   1. One of the important trials and one which creates perhaps the greatest interest especially in the west river area is out work at Dickinson Experiment Station with small grain varieties. It is that the part of out over-all program that keeps west river farmers and ranchers up to date with the most promising of small grain varieties for our area.

      The off-station trials at Beach, Bowman, Hettinger, Glen Ullin and Killdeer are of real value to the farmers in western North Dakota. No phase of our work creates more interest among the farmers in each outlaying county than the results of these off-station trials in their respective areas.

      No phase of our work is of greater value to us and of more importance to the North Dakota Experiment Station in western North Dakota than our program of conducting off-station trials.
   2. Nursery trials are carried on in cooperation with the North Dakota State University, Uniform Regional Nurseries and several other nurseries with spring wheat, winter wheat, barley, oats and flax. Besides this trials are carried on with other Branch Stations when this cooperation is desired to make a trial applicable on a statewide basis.
   3. Fertilizer formulation, rates and methods of treatments on fallow.
   4. Comprehensive trials with fertilizer on continuous cropping, cornland, and fallow.

5. A comparison of different seeding and tillage implements like the hoe drill, double disc press drill, moldboard plow and roto tiller.
6. Maintenance of summerfallow in western North Dakota.
7. Continuous cropping trials.
8. A comparison of moldboard plow, duck foot and the roto tiller for spring tillage in rotation of wheat and corn and also for maintenance of fallow.
9. Roughage trials.
10. Trials in the production of grain sorghum in western North Dakota.
11. Corn production trials.
12. Winter wheat and winter rye variety trials.
13. Seeding rate trials with both wheat and oats.

XI. General Farming Operation

A. Feed on hand December 31,1968.

1.	150 ton hay @ $18.00	$2,700.00
2.	100 ton of straw @ $10.00	1,000.00
3.	1800 ton corn silage @ $7.24	13,032.00
4.	5000 bushels barley @ .85	4,250.00
5.	500 bushels oats @ .60	300.00

XII. Equipment And Livestock Purchased In 1968.

1. 1-Cultivator
2. 1-Standard M.M.U. 1949 tractor
3. 1-Chev. 3/4T, 1955 pickup
4. 1-John Deere 494 Drill
5. 1-9’ Bale loader
6. 1-28x7’ Trailer
7. 1-Sprayer
8. 1-Batch mixer
9. 8-Seed rollers
10. 2-Hog waterers
11. 2-Hereford Bulls
12. 36-red white faced steer calves
13. 9-red white faced heifer calves
14. 1-Horse
15. 3-Cattle oilers
16. 2-Hay feeders
17. 1- Hoof sander
18. 10-Mono Flo nipple drinkers
19. 1-Fan
20. 1-Exhaust fan for machine shed
21. 1-Syivainia light fixture
22. 1-Gultch light fixture
23. 1-Iron tub
24. 1-Syphon jet toilet

25. 1-Stainless steel sink
26. 1-30 cup percolator
27. 1-Garage door
28. 1-Mimeo Machine, Gestetner Model 366
29. 1-500 Gallon tank for shop
30. 1-Viking scale
31. 1- Plow hitch
32. 1-1 ½ H.P. submersible pump
33. 1-Outer case for recording snow and rain gage
34. 92 spruce trees 2', 20 potted spruce trees
35. 1-battery booster

Meeting and Tours
1968

Date		Attendance
January 11	Dauphin, Manitoba "Improving our Agriculture"	105
January 12	Brandon, Manitoba "Improving our Agriculture"	86
January 27	Mandan, N.D. "Judge Outstanding Farmer Contest"	40
January 30	Fargo, N.D. "Annual Experiment Station Conference"	attended
February 1-2	Fargo, N.D. "Annual Experiment Station Conference"	attended
February 3	Yellowstone Valley Feeder Tour "Panel of Improving the Income form Beef"	150
February 8	Ward Country Institute "Improving our Livestock"	300
February 13	Hettinger Station " Sheep Day"	160
February 20	Bismarck, N.S. -Stockmen's Seminar "More Roughage from Less Land"	200
February 22	Bismarck, N.D. – Burleigh Co. Livestock Institute "A Better Income from Beef Cattle"	125
February 28	Maddock-Benson County Institute "Improving our Livestock Operation"	80
March 3-5	Valley City "North Dakota Winter Show"	
March 11	Minot "Brook's Ranch Hereford Sale"	
March 19	Ed Wymer, S.C.S. "Visited Station"	

(meeting and tours continued).

March 19	Northwest Bell Telephone – Burkle "State Line"	
March 28	George Strum "Freeze Brand Demonstration"	
March 29	Cub Scout Troop "Tour of Station"	
April 2	Robert Askew "Visited tree plantings – orchards"	
April 9	Burlington, Brooks Hereford Ranch "Select herd bulls"	
April 17	Dickinson "North Dakota State University Alumni meeting"	
May 1	Kindergarten Class "Tour of Station"	18
May 2	Montana Dakota Directors	attended
May 3	Miles City, Montana "Range Livestock Station"	attended
May 14	Dr. Wm. Dinusson "Review present trials and plan new trials"	
June 7	Tri County "Judging Contest"	30
June 9	Grant County Agr. Imp. Ass'n. "More Feed from Less Acre"	92
June 13	N.D.S.U. Memorial Foundation "Election, Scholarship, rental of property"	
June 19	S.C.S. Tour "Judging Farms"	
July 12	A.S.C.S. "Bismarck Commemorative Program"	250
July 17	Dickinson Crops Field Day "Rate of Seeding & Fallow Trials"	300

(meeting and tours continued).

July 18	Northwest District 4-H Judging Contest "Assisted"	100
July 19	Hettinger Crops Field Day "Rate of Seeding & Fallow Trials"	25
July 25	Dunn County Off-Station Trials "Rate of Seeding & Fallow Trials"	30
July 28	Golden Valley Off-Station Trials "Rate of Seeding & Fallow Trials"	75
July 30	Agriculturists from Kenya, Africa "Tour of Livestock & Pasture Work"	6
July 31	Boy Scout Group "Tour of Station"	9
August 7	Dickinson "City Commission on Annexation"	50
August 28	Keith J. Blessum, State Climatologist and crew Inspected the weather station.	
September 30	Lefor, N.D. "Angus Tour"	
September 30	Minot, N.D. "Hereford Tour"	
October 1	Minot, N.D. "Hereford Tour"	200
October 2	Glen Ullin, Knights of Columbus "Crops Work at Dickinson Experiment Station"	52
October 2	Mackey, Dr. Johnson, & Kirkeide at Station "To Select Steers for Beef Evaluation Project"	4
October 16	Rotary Farmers Night "Hail Suppression"	81
October 25-26	Bismarck "Beef Evaluation Meeting"	

(meeting and tours continued).

November 4	Dr. Wm. Dinusson "Planned Livestock Trials for 1968-1968"	
November 6	Williams County Agricultural Imp. Association "Better beef Production"	300
December 11	Dickinson "19th Annual Livestock Research Roundup"	1000
December 17	Minot "Prepare for Agriculture meeting and T.V. Program With County Extension Agent"	3

Radio
1968

Date	Programs
January 12	More Feed From Less Land
February 2	More Feed From Less Land
February 23	Weather Report for 1967
March 15	Comparing Ground and Rolled Barley in Swine Ration
April 5	Swine Production
April 26	Stilbestrol in Livestock Feeding
May 17	Roughage for Beef Cattle
May 31	Profitable Cow Calf Operation
June 28	Trials to be Visited Crops Field Day
July 11	T.V. Program – Crops Field Day
August 2	Fall Seeding of Grass
September 13	Handling or Preconditioning Calves
October 4	Feeding out Yearlings
October 18	Beef Evaluation Meeting
November 22	Livestock Research Roundup Program
December 13	Wintering Cows on Straw or Hay
December 27	Comparison of Shelters for Beef Cattle

General Summary

Date 1968	Farm visits	No. tours	Attendance at meetings	Station calls	Radio talks	News Articles	Meetings attended
January	0	0	231	14	1	0	4
February	2	0	1015	17	2	0	7
March	0	1	10	12	1	0	6
April	0	0	0	14	2	0	3
May	1	1	468	14	2	0	3
June	9	0	112	18	1	0	4
July	2	2	795	6	1	0	8
August	1	0	50	4	1	0	2
September	9	0	0	18	1	0	3
October	10	0	537	15	2	0	5
November	0	0	300	15	1	0	2
December	0	0	1003	22	2	0	2
Total	34	4	4521	169	17	0	49

Report Of
Livestock Investigations
Dickinson Experiment Station
1968

By
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Table of Contents

Wintering Beef Cows On Hay Or Straw

Straw has been used as part of the wintering ration for pregnant beef cows on a trial basis for the past three winters. In December, 1965, the cow herd was split by age into a lot receiving 20 pounds of crested-brome-grass hay per day and the other lot was fed 7 pounds hay, 13 pounds wheat straw and 1 pound soybean meal per day. Each lot included heifers that would calve in the spring as two-year-olds. Calves begin to arrive the last week in March. In the fall of 1966 and 1967, the cow here was split into the same lots only the wheat straw was chopped and fed in a self-feeder since so much of the straw was wasted when fed whole. Beginning February 1, both lots were fed 2 pounds of barley plus 10,000 I.U. of vitamin A per head per day. On march 11, 1967, the straw and soybean meal were taken out of the ration and the hay was increased to 20 pounds. During this 89 day period, an average of 8.3 pounds of straw was consumed. Straw and soybean meal was fed until March 15 in 1968. During this 100 day period, they ate an average of 10.1 pounds of straw per day.

Beef cows wintered on hay lost weight through the winter in two out of three years and those wintered on 1/3 hay and 2/3 straw lost weight every winter. The range in weight changes over the three years for both lots was +16.5 to -71.9 pounds for the period of December on into May. The average weight change for this period is shown in table 1. These same lots of cows gained from 69.2 to 146.3 pounds each through the summer with the hay and straw lot outgaining the hay lot by 19.9 pounds on the average over the three years. This resulted in a total weight gain of 81.3 pounds for the hay lot and 66.5 pounds for the hay and straw lot. The results for 1967-1968 as shown in table 2.

Table 1. Three Year Summary of Performance of Beef Cows Wintered on Hay or Hay and Straw.

	Hay	Hay and straw
Total no. of cows	143	146
Avg. initial wt. (Dec.)	1029.3	1021.2
Avg. May wt.	1007.6	964.8
Avg. winter wt. change	-21.7	-56.4
Avg. fall wt. (Oct.)	1110.6	1087.7
Avg. summer wt. change	+103.0	+122.9
Avg. wt. change, entire trial	+81.3	+66.5
Feed cost/he.	$33.25	$32.36
Avg. calf birth wt.	71.1	70.2
Avg. weaning wt.	373.1	374.7
No. cows conceiving* - 1st cycle	56	57
2nd cycle	21	15
Later	6	10

*Data for first 2 Years only

Table 2. Performance of Beef Cows Wintered on Hay or Straw 1967-1968 Results.

	Hay	Hay and Straw
No. cows	42	42
Avg. initial wt. (Dec.)	1026.1	994.4
Avg. May wt.	980.4	922.5
Avg. winter wt. change	-45.7	-71.9
Avg. fall wt. (Oct.)	1113.1	1068.8
Avg. summer wt. change	+132.7	+146.3
Avg. wt. change, entire trial	+87.0	+74.4
Feed cost/hd.	$34.33	$33.19
Avg. calf birth wt.	74.2	73.5
Avg. weaning wt.	389.3	38436
Straw consumed, lb.		10.1
No. cows calving in 1968 that settled during		
1st cycle	26	28
2nd cycle	10	4
Later	4	7

Wintering costs with these two feeding programs were very nearly the same when the three years were averaged together. The value placed on the straw makes a big difference and it depends on whether straw is a by-product on the farming operation or if it has to be purchased.

Calf weights did not seem to be affected by the two wintering rations that were studies. Average birth weights and weaning weights were essentially the same for both lots.

To date the lower levels of winter nutrition furnished by straw had not affected conception dates of the cows that following summer. About the same number of cows have conceived during the first cycle and after the first cycle in both lots as is shown in table 1. Conception dates were determined by when the calf was born the following spring. Some cows were sold in the normal process of culling so the numbers shown are not the same as is included in the wintering period.

Three years results show that up to two-thirds of the hay in a wintering ration for a beef cow can be replaced with straw plus supplemental protein without affecting the production of the cow or the growth rate of her calf. The average cow will probably lose up to about 75 pounds through the winter; however, this will not be detrimental if she is in good condition when she enters the wintering period. Feeding straw and supplemental protein does not appreciably reduce the wintering feed bill but it can be used to stretch a short hay supply.

Supplementing Nursing Cows on Spring Pasture

One of the very important factors affecting the profit potential of a cow-calf operation is the length of the calving season. Winter and pre-breeding season nutrition can have a definite effect on conception dates and thus influence the duration of the calving season. Many beef cows are wintered to lose some weight, which may be economically desirable depending on their condition, and then they are turned out on grass and are required to provide milk for a calf. Under these conditions, these cows may not be in the required condition for conceiving upon first service.

A trial was started in the spring of 1967, to evaluate the effect of adding supplemental energy to the diet of nursing cows on spring pasture. Ninety cows ranging in age from two to ten years were randomly allotted to two fertilized crested wheatgrass pastures in 1967 and eighty four head were used in 1968. Turn-out dates were May 19, 1967, and May 23, 1968. One group of cows was fed three pounds of a 15% barley pellet from the turn-out date until they were taken to summer pasture. This was June 29, 1967, and June 27, 1968. These are also the dates bulls were turned out.

Average weight, weight gains and the amount of feed consumed are shown in table 3. Cow weight gains for two years show almost no response at weaning time. They gained an average of 7.6 pounds while they were being fed the grain but they lost half of this by weaning time.

Weight gains of the heifer calves were not affected during the summer; however, the steer calves lost an average of 10.6 pounds each. The steer calves lost weight both years, whereas the heifers showed a slight weight gain one year.

The additional energy intake had a very definite effect on when the cows conceived. Results from only one year are available for this portion of the trial but they were given supplemental grain (table 4). The young cows that dropped calves as two-year- olds and were being rebred, showed a small effect on conception date as a result of the extra feed intake. This is somewhat different than expected since these young cows should have a greater energy need to meet their own needs for body growth. There were two cows in the no supplement group that did not conceive. These preliminary results are interesting and need further observation to see if the present trend continues.

Table 3. Results of Feeding Three Pounds of a 15% Barley Pellet To Nursing Cows on Spring Pasture.

	No Supplement			Supplement		
	1967	1968	Av.	1967	1968	Av.
Cows						
Av. Initial wt.	991.2	955.7	973.4	973.0	952.6	962.8
Av. Wt., end of Feeding period	1070.2	1028.8	1049.5	1050.8	1042.8	1046.8
Av. Wt. at weaning	1121.1	1092.1	1106.6	1106.4	1095.3	1100.8
Av. Wt. gain while On feed	79.8	73.1	76.4	77.8	90.2	84.0
Av. Wt. gain entire Period	129.9	136.4	133.2	133.4	142.7	138.0
Heifer calves						
Av. Initial wt.	170.8	127.5	149.2	174.1	123.2	148.6
Av. Wt. gain during Feeding period		182.5			177.0	
Av. Weaning wt.	370.0	379.8	374.9	374.5	370.8	372.6
Av. Wt. gain during Feeding period		55.0			53.8	
Av. Wt. gain, Entire trial	199.2	252.3	225.8	200.4	247.6	224.0
Steer calves						
Av. Initial wt.	194.8	128.3	162.0	184.0	126.4	155.2
Av. Wt., end of Feeding period		186.9			183.6	
Av. Weaning wt.	408.0	403.3	405.6	390.0	386.4	388.2
Av. Wt. gain during Feeding period		57.6			57.2	
Av. Wt. gain, Entire trial	213.2	274.0	243.6	206.0	260.0	233.0
Barley, lb. per head				123	102	112
Feed cost per head				$2.31	$1.91	$2.11

Feed cost on a per cow basis averaged $2.11 per year. They were fed an average of 112 pounds.

Table 4. The Effect of Pre-breeding Supplementation on Date of Conception.

	No supplement		Supplement	
	2-year old Cows	Older cows	2- year old Cows	Older cows
Settled during first cycle	5	15	6	24
Settled during second cycle	1	8		4
Settled after second cycle	1	4		3

The additional energy intake had a very definite effect on when the cows conceived. Results from only one year are available for this portion of the trial but they show a significantly larger number of cows settled during their first cycle if they were given supplemental grain (table 4). The young cows that dropped calves as two-year-olds and were being rebred, showed a small effect on conception date as a result of the extra feed intake. This is somewhat different than expected since these young cows should have a greater energy need to meet their own needs for body growth. There were two cows in the no supplement group that did not conceive. These preliminary results are interesting and need further observation to see if the present trend continues.

Comparison of Shelters for Beef Cattle

The use of a pole shed or a solid board windbreak as shelter for young calves in the feedlot have been compared in a trial that started in the fall of 1964. A lot with a slatted board windbreak was added in the spring of 1966 and a lot with a slatted windbreak plus summer shade was added in the fall of 1966. The winter phase of this trial starts with the beginning of the trial in early November and ends in May. The summer phase extends from May on into August or September when the cattle are marketed. The winter phase has covered periods of 175, 181, 195 and 196 days and the summer phase has extended over periods of 147, 144, 119 and 105 days during the last four years.

An eight foot high solid windbreak encloses the lot on the north and west side as does the slatted windbreak which is nine feet high. The slatted windbreak is made of 1x6 inch boards spaced 1.5 inched apart, which makes a windbreak that is 20% open.

Eight Hereford heifer calves have been randomly allotted to each lot each year. All lots have been fed the same ration within each year. This has been a high roughage, fattening ration made up of 1 pound alfalfa hay, corn silage free choice, 3 pounds rolled barley, 1 pound protein supplement and 0.2 pound minerals with the barley being increased to 2 pounds, barley to 4 pounds and protein supplement to 0.5 pound. In May they were given 1 pound alfalfa, 8 pounds barley, no protein supplement and silage free choice plus minerals. All the cattle are implanted with stilbestrol in the fall and again in the spring.

Table 5. Four Year Summary of Performance as Affected by Types of Shelter.

	Shed[a]	Solid[a]	Slatt[b]	Slatt + shade [c]
	Winter Phase (November – May)			
Av. Initial wt.	328.4	326.7	332.8	332.2
Av. Daily gain	1.72	1.65	1.60	1.63
Av. Daily ration				
Alfalfa hay	1.3	1.3	1.4	1.4
Corn silage	23.1	22.6	26.2	26.2
Rolled barley	3.8	3.9	3.6	3.6
Supplement	0.7	0.7	0.7	0.7
Minerals	0.2	0.2	0.2	0.2
Feed cost/cwt gain	$12.50	$13.02	$14.56	$14.20
	Summer phase (May – September)			
Av. Initial wt.	648.6	634.8	636.7	650.6
Av. Final wt.	887.7	862.0	851.0	859.4
Av. Daily gain	1.86	1.76	1.76	1.86
Av. Daily ration				
Alfalfa hay	1.0	1.0	1.0	1.0
Corn silage	35.4	33.8	35.9	35.8
Rolled barley	6.4	6.4	6.6	6.9
Supplement	1.0	1.0	1.0	1.0
Minerals	0.2	0.2	0.2	0.2
Feed cost/cwt gain	$16.52	$16.97	$18.20	$17.47
	Entire Trial			
Av. Daily gain	1.77	1.70	1.70	1.71
Av. Daily ration				
Alfalfa hay	1.2	1.2	1.3	1.3
Corn silage	28.1	27.3	29.6	29.6
Rolled barley	4.9	4.9	4.8	4.8
Supplement	0.8	0.8	0.7	0.7
Minerals	0.2	0.2	0.2	0.2
Feed costs/cwt gain	$14.20	$14.72	$15.52	$15.43

a 4 years' results.

b 2 years' results except for 3 years' results for the summer phase.

c 2 years' results.

Table 6. 1967-1968 Results of the Trial Comparing Shelters for Young Beef Cattle in a Feedlot.

	Winter phase (November – May)			
	Shed	Solid	Slatt	Slatt + shade
Av. Initial wt.	357.9	353.8	353.8	353.8
Av. Daily gain	1.83	1.80	1.71	1.65
Av. Daily ration				
Alfalfa hay	1.9	1.9	1.9	1.9
Corn silage	25.5	25.7	25.7	25.7
Rolled barley	3.9	3.9	3.9	3.9
Supplement	0.5	0.5	0.5	0.5
Minerals	0.2	0.2	0.2	0.2
Feed cost/cwt gain	$12.60	$12.81	$13.53	$14.00
	Summer phase (May – September)			
Av. Initial wt.	715.7	706.9	688.1	676.9
Av. final wt.	910.0	920.0	874.4	857.5
Av. Daily gain	1.85	2.03	1.77	1.72
Av. Daily ration				
Alfalfa hay	1.0	1.0	1.0	1.0
Corn silage	38.1	39.1	38.7	39.0
Rolled barley	7.9	7.9	7.9	7.9
Minerals	0.2	0.2	0.2	0.2
Feed cost/cwt gain	$17.53	$16.16	$18.41	$19.05
	Entire trial			
Av. Daily gain	1.83	1.88	1.73	1.67
Av. Daily ration				
Alfalfa hay	1.6	1.6	1.6	1.6
Corn silage	29.9	30.4	30.2	30.3
Rolled barley	5.3	5.3	5.3	5.3
Supplement*	0.5	0.5	0.5	0.5
Minerals	0.2	0.2	0.2	0.2
Feed cost/cwt gain	$14.34	$14.07	$15.27	$15.81

*Supplement fed only in November – May phase.

Results available are for a varying number of years for different portions of the trial as is indicated by the footnotes to table 5. This is important to note when results for the shed and solid windbreak lot are compared to the two slatted windbreak lots. Average daily gains showed the same trend from one treatment to the next for the two phases and over the entire trial. Some of the differences in daily gain may be significant during an individual phase but there is no appreciable difference in average daily gain when the entire feeding period is considered. 1967- 1968 results are shown in table 6.

Feed consumption varied very little when the shed and solid windbreak lot are compared and the slatted lot and the slatted windbreak plus summer shade lot are compared. These two comparisons put the lots together that have been conducted for an equal number of years, since feed consumption has been higher the last two years.

Feed cost per hundredweight gain also is about equal for lots that have been on trial for the same number of years. Feed cost per hundredweight gain has been about $1.00 higher for the two slatted windbreak lots during the last two years when figures have been available for all four lots.

Results of this trial to date show very little response to the type of shelter used. Average daily gain and the cost of gain have been nearly the same for all four lots involved. This would mean the cattle confined to a lot with a solid or sheltered windbreak could be expected to perform as well as cattle in a lot with an open front shed for protection.

Chopped Hay In a Wintering Ration for Replacement Heifers

Chopping of roughages that are fed to ruminants is one of the methods of handling bulky feedstuffs that has recently increased in popularity. The purpose of chopping roughages is mainly to reduce waste and also adapt it so it can be fed through a mechanized feeding system and be mixed with other feedstuffs. Lower quality roughages such as straw can also be fed or worked into a mixed ration more easily.

A feeding trial has been conducted where chopped or long crested wheatgrass – bromegrass hay was fed free choice to two lots of Hereford heifer calves. In the 1966-1967 trial, each lot was also fed 3 pounds corn silage, 3 pounds rolled barley, 0.2 pound minerals and 1 pound of soybean meal which was changed to 1 pound alfalfa hay after three months. During the following winter, each lot was fed 1 pound alfalfa hay, 2 pounds rolled barley and 0.2 pound minerals plus hay free-choice in either of the two forms. Eleven head were in each lot each year with the trial lasting for 195 days the first winter and 163 days the second winter.

Table 7. Effects of Feeding Long or Chopped Hay in a Wintering Ration.

	Long Hay			Chopped hay		
	1966-1967	1967-1968	Av.	1966-1967	1967-1968	Av.
Av. Initial wt.	385.9	388.6	387.2	374.5	394.5	384.5
Av. Final wt.	647.7	590.9	619.2	640.5	652.7	646.6
Av. Daily gain	1.34	1.24	1.29	1.36	1.58	1.47
Hay fed, lb. per day	9.8	12.6	11.2	11.1	13.7	12.4
Feed cost Per cwt. Gain	$14.53	$14.23	$14.38	$15.99	$12.68	$14.34
Feed cost Per head	$38.05	$28.78	$33.42	$42.51	$32.74	$37.62

Results for the two years of the trial as shown in the table 7 indicate a difference in response between the two years. During the first winter, the chopped hay lot ate more hay but their gains were nearly the same as the gains for the long hay lot. This resulted in a higher feed cost on both a per hundredweight and a per head basis. Hay consumption was greater for both lots during the second winter and the chopped hay lot significantly outgained the long hay lot. The increase in hay consumption probably was due to better quality than the year before. Feed costs on a per hundredweight basis were appreciably lower for the chopped hay lot; however, it still cost more to winter them on a per head basis. Since there may be varying amounts of waste when hay is fed in the long form, depending on its quality, the amounts shown in table 7 are average amounts fed and not necessarily consumed since the amount of waste was not measured. More detailed results for 1967-1968 are presented in table 8.

Average results over the two feeding periods involved show a 14% increase in gain and a 11% increase in hay consumption when it was fed in the chopped form. Feed costs were higher for both years on a per hundredweight basis and also averaged out higher on a per head basis for the lot receiving chopped hay.

The trial shows what may happen when hay of comparable quality is fed in the long or chopped form and when additional concentrates or supplements are fed a the same level to both lots. Feeding in this manner has shown that chopping hay increases consumption, increases rate of gain and increases the wintering cost on a per head basis. Since the average daily gain for the chopped hay is greater than is needed for wintering replacement heifers, portions of the concentrates or supplements may be reduced to reduce the overall cost of the wintering feed bill and still come through the winter with satisfactory gains.

Table 8. Performance of Replacement Heifers Wintered on Chopped or Long Hay – 1967-1968 Results.

	Long hay	Chopped hay
No. of head	11	11
Av. Initial wt.	388.6	394.5
Av. Final wt.	590.9	652.7
Av. Daily gain	1.24	1.58
Av. Wintering gain	202.3	258.2
Av. Daily ration		
Crested-brome hay	12.6	13.7
Alfalfa hay	1.0	1.0
Barley	2.0	2.0
Mineral	0.2	0.2
Feed cost/cwt.gain	$14.23	$12.68
Feed cost/hd.	$28.78	$32.74
Feed cost/hd/da	17.7 cents	20.1 cents

Implanting Nursing Steer Calves with Stilbestrol

Half of the steer calves raised at the Experiment Station for the last two years have been implanted with 12 mg. of stilbestrol in 1967 and 15mg. in 1968 when they were moved to summer pasture in the last week of June. These calves were allotted on the basis of age so that the number of early and late calves would be about the same in the implanted and in non-implanted groups. About two-thirds of the calves were pastured on native range in the Badlands and the remainder were on a native pasture at the Station. The calves were from cows ranging in age from two to eleven years. Weaning dated were October 25 and 27, 1967 and October 15, 1968. The time interval involved was 119 and 110 days for the two years.

Table 9. The Effect of Implanting Nursing Steer Calves on Rate of Gain.

	No stilbestrol			Stilbestrol		
	1967	1968	Av.	1967	1968	Av.
No. of calves	27	23		27	23	
Av. Initial wt.	185.9	173.7	179.8	182.2	173.7	177.9
Av. Mid-summer wt.	302.8	249.6	276.2	307.6	253.5	280.6
Av. Early summer Wt. gain	116.9	75.9	96.4	125.4	79.8	102.6
Av. Weaning wt.	396.9	382.2	389.6	390.2	385.7	388.0
Av. Late summer Wt. gain	94.1	132.6	113.3	82.6	132.2	107.4
Av. Wt. gain- Entire trial	211.0	208.5	209.8	208.0	212.2	210.0

The results from this trial to date indicate implanting calves at this young age was of no value (table 9). The implants may have had a slight effect during the early part of the summer, but this weight advantage was lost during the remainder of the growing season.

Feeding Grain on Pasture to Yearling Steers

A trial was started May 16, 1967 to compare feeding grain on pasture to yearlings or fattening them in drylot. Eight steers averaging 587 pounds were assigned at random to each lot. On lot was kept in drylot, started on six pounds of barley and increased to twelve pounds at the same time as the other lots. The remaining two lots were put on a fertilized crested wheatgrass pasture and given six pounds of grain. On July 11 one pasture lot was brought into drylot and all lots were increased to 12 pounds grain. The lot remaining on pasture was brought into drylot on August 22 since average daily gains were beginning to decrease. Average daily rations for the entire trial are shown in table 10. All the cattle were implanted with 30 mg. of stilbestrol at the beginning of the trial.

Table 10. Average Daily Fees Intake and Feed Costs for Steers in Drylot or Pasture.

Lot	Drylot	Short pasture period	Long pasture period
Pasture charge @ 10cents/hd./da.	---	$5.60	$9.80
Barley, av. Daily intake,			
Entire trial	10.2	10.2	10.2
Total and av. Daily intake,			
Feedlot phase	231 days	175 days	133 days
Alfalfa hay	1.0	1.0	1.0
Corn silage	29.1	29.1	29.9
Soybean meal	0.9	1.0	1.0
Minerals	0.2	0.2	0.2

Average daily gains for the entire length of the trial ranged from 2.08 pounds per day for the lot continuously in drylot to 2.23 pounds per day for the lot that was on pasture for a short period of time. A closer examination of the gains shown in table 11 show the highest daily gain was achieved by the short pasture lot. Their daily gain of 2.79 pounds during this 56 day period was obtained under the same conditions as the daily gain of 2.46 pounds by the long pasture lot. Since these two lots of cattle were handled the same, the difference in their gaining ability is due to chance variation. This shows how much difference there can be when two lots of cattle are handled alike. Daily gains for the long pasture lot decreased slightly during the later part of the 98 day pasturing period.

Table 11. Performance of Steers Fed Grain on Pasture or Fattened in Drylot.

	Drylot	Short pasture period	Long pasture period
Av. Initial wt.	585.6	587.5	588.8
Av. Wt. 7/11	713.8	743.8	726.2
Av. Daily gain-56 day period	2.29	2.79	2.46
Av. Wt. 8/22	820.6	846.2	821.2
Av. Daily gain-42 day period	2.54	2.44	2.26
Av. Final wt.	1066.2	1102.5	1080.0
Av. Daily gain in feed lot	2.08	1.64	1.65
Av. Daily gain, entire trial 231 days	2.08	2.33	2.13
Feed cost/cwt gain*	$18.43	$15.60	$15.07
TDN per lb. gain. lb.[a]	6.36	5.35	5.16
Feed from pasture is equal to			
Alfalfa, lb. per hd.		604/$7.55	1,044/$13.05
Or silage, lb. per hd.		2,012/$7.24	3,480/$12.53
Or concentrate, lb. per hd		402/$8.04	696/$13.92

____ Figures to the right of this line are performance figures while on pasture.
*Feed prices shown in table 13.
[a] TDN value used are: alfalfa hay, 50%; corn silage, 15%; concentrates, 75%.

Feed cost per hundredweight gain was lower for the cattle that were on pasture than for the cattle that were in drylot continuously. The longer pasture period reduced feed cost per hundredweight gain only slightly. The feed cost figures in table 11 include a charge for pasture.

Converting the feed used to a TDN basis shows the pasture reduced the amount of TDN fed from 6.36 pounds per pound of gain for the drylot to 5.16 pounds for the lot on pasture the longest and 5.35 pounds for the short pasture lot. Table 11 shows how much alfalfa hay, corn silage or concentrate it would take to equal the TDN furnished by the pasture. The TDN provided by pasture was equal to 402 pounds of barley for the short pasture lot an 696 pounds for the long pasture lot. This was worth $8.04 or $13.92 at the price of feed as shown in table 13.

This trial has been conducted for only one year but some observations can be made from the data available.

1. The best average daily gains were on early spring and summer pasture. In this trial the steers were on a crested wheatgrass pasture fertilized with 25 pounds of nitrogen for a short grazing period of 56 or a long grazing period of 98 days.
2. The feed cost shown vary from $15.07 to $18.43 per hundredweight gain. The difference in amount of labor required is not taken into consideration.

3. On the basis of the price of alfalfa hay, the feed furnished by pasture was worth $10.30 per acre.
4. It is necessary to keep a close check on how the cattle are gaining so they will be removed from pasture when the gains start to slow down.
5. The amount of forage produced by pastures can be rather variable from year to year depending on the weather, season, etc.\

Determining the Replacement Value of Barley for Hay

Four lots of eight steer calves each were randomly allotted and started on a free-choice feeding of excellent quality crested wheatgrass hay plus 1 pound of soybean oil meal, 0.2 pound minerals and varying levels of rolled barley. Barley was fed at the rate of 0, 2, 4, and 6 pounds per head per day to the four lots involved. The trial started on January 10 and continued for a period of 126 days. These steers were implanted with stilbestrol at the beginning of the trial. Average daily feed consumption is shown in table 12.

Table 12. Results of Trial to Determine Barley – Hay Replacement Values.

Lot	2	3	4	5
Initial wt., lb.	391.2	390.6	395.6	396.8
Final wt., lb.	610.6	636.8	685.6	681.8
Av. Daily gain, lb.	1.74	1.95	2.30	2.26
Feed per lb. gain, lb.	9.23	8.09	6.85	6.77
Feed per day, lb.	16.06	15.77	15.76	15.31
Crested hay	14.86	12.57	10.29	8.65
Barley	----	2.00	4.27	5.46
Soybean oil meal	1.00	1.00	1.00	1.00
Mineral	0.2	0.2	0.2	0.2
TDN per lb. gain*, lb.	4.89	4.51	4.05	4.14
TDN intake per cwt., lb.	1.70	1.72	1.73	1.74
TDN for maintenance, lb.	4.29	4.40	4.66	4.64
TDN per lb. gain only, lb.	2.43	2.25	2.02	2.09
Feed cost per lb. gain, cents	10.82	10.63	10.10	10.68
Lbs. hay 1 lb. barley replaces	---	2.6	2.5	2.3

*TDN value used: Hay, 52%; barley, 75%; soybean oil meal, 75%.

Average daily gains as shown in table 12, are equal to or better than expected for all the lots. The addition of barley in the ration in increments of two pounds resulted in good increases in rate of gain except for the lot receiving six pounds.

Calculations based on the amount of feed required to produce one pound of gain when no grain was fed, shoe that the addition of two pounds of grain replaced 5.2 pounds of hay or one pound of grain replaced 2.6 pounds of hay. Adding another 2 pounds of barley showed that 2.5 pounds of hay replaced by 1 pounds of barley. Adding the least 2 pounds of grain reduced the replacement value of 1 pound of barley to 2.3 pounds of hay.

When examining the results of this trial, some general observations should be kept in mind:

1. The crested wheatgrass hay used was of exceptional quality, analyzing 12.9% protein.
2. In maintenance of wintering rations, the first pound or two of grain always has a higher value.
3. The calves used were very efficient, taking less than five pounds of TDN per pound of gain.
4. The calves were eating feed on a net energy basis. This is illustrated in table 12 where it shows all lots consumed enough feed to provide approximately 1.7 pounds of TDN per hundred pounds liveweight.
5. If the hay used would have been of average quality the replacement values probably would have been greater.

Barley-hay replacement values such as these can be of practical value when the supply of hay is short. By knowing what amount of hay a given amount of grain will replace, it is possible to determine the relative costs of buying additional hay with the added cost of hauling it compared to feeding some grain. These results are from only one year but they show that feeding 2 pounds of barley at 2 cents per pound would be cheaper than buying 5.2 (2.6x2) pounds of hay at 0.9 cents per pound. Results from this trial will be more broadly applicable when several year's feed has been sampled and fed.

Table 13. Feed Prices for all 1967-1968 Trials.

Alfalfa hay	$25.00 per ton	Trace mineral salt	$50.00 per ton
Crested wheatgrass-Brome hay	$18.00 per ton	Ground limestone	$50.00 per ton
Wheat straw	$10.00 per ton	Grinding, rolling or chopping	$2.00 per ton
Corn silage	$7.20 per ton	Barley	$0.95 per bushel
Soybean oil meal	$90.00 per ton	Oats	$0.60 per bushel
Di calcium - Phosphate	$120.00 per ton	Vitamin A	$0.20 per million Units

Red Nose Shots and High Energy Rations For Calves

All of the 1968 calf crop was used to evaluate the effect of a red nose injection administered prior to weaning and also to see how they would perform during a three week post-weaning period when fed a high energy ration. The steers and heifers were split by age and half of them were given a red nose shot eight days before they were weaned. The calves were weaned on the 15th of October, hauled to the Experiment Station and immediately exposed to three pounds of whole oats and crested wheatgrass hay free-choice. About three-fourths of the calves were gathered, weighed and hauled about 40 miles to the Station. The remaining calves were gathered, hauled about two miles to the Station and then weighed.

The calves were divided by sex into two pens and started on a ration of 3 pounds whole oats, one-half pound soybean meal, 350 mg. terramycin per day plus crested wheatgrass hay free-choice. The bunks were cleaned up on the second day so the feed was increased gradually until they were up to 5 pounds of whole oats and 1 pound of soybean meal by October 30. As it developed, the calves could have been brought up on feed at a faster rate. This level of feed intake provided the protein and energy required for normal growth in accordance with National Research Council recommendations. Under normal conditions, this normal growth would be about 1.6 pounds per head per day on this ration. It should be remembered that the nutritive requirements for a calf this size are very high. It needs a much more concentrated diet in respect to both energy and protein than a larger animal due to it's inability to consume large quantities of feed.

Table 14. Performance of Calves Given a Red Nose Shot and Fed a Hight Energy Ration for a Three-Week Postweaning Period.

	Heifers		Steers	
	Check	Red nose shot	Check	Red nose shot
No. head	24	25	24	24
Av. Wt., 10/15	379.8	361.6	370.2	392.9
Av. Wt., 11/4	397.3	378.2	388.8	417.5
Avg. wt. gained	17.5	16.6	18.8	24.6
Av. Daily gain	0.88	0.83	0.93	1.23
Av. Daily ration				
Crested hay, lb.	4.2		4.2	
Whole oats, lb.	3.8		3.8	
Soybean meal, lb.	0.6		0.6	
Antibiotic pellets, mg.	350		350	
Feed cost/lb. gain	18.94 cents		15.07 cents	
Feed cost/hd	$3.23		$3.25	

The results in table 14 show the calves responded favorably to the high energy ration but did not respond to the red nose injection. The heifers gained an average of 0.85 pounds and the steers 1.08 pounds per day. The calves that were injected gained 1.03 pounds per day compared to 0.90 for the non-treated calves. This amounted to an additional 2.5 pounds gain by the treated calves in the 20 day period, which is an insignificant difference.

Feed consumption was the same for heifers and steers; however, the feed cost per pound of gain was nearly four cents less for the steers. Feed cost figures are not available for the treated or the non-treated calves. Feed cost on a per head basis averaged $3.24 for all the calves.

During this 20 day period, it was not necessary to treat any calves for respiratory ailments or "shipping fever" type symptoms. Numerous calves had a nasal discharge but remained alert and bright in general appearance so they were not treated. The greatest incidence of nasal discharge was about 6 to 8 days after the calves were weaned at which time about 40% of the calves were affected. One of the heifers was treated the first day for what appeared to be a case of over-eating.

In summary, it should be noted that the calves did gain weight rather then lose weight or " hold their own" during this critical period, the gains were not overly expensive and the incidence of illness requiring treatment was nearly nill. There is no indication that the red nose injection was beneficial since average daily gains were nearly the same and some of the calves with nasal discharge had received the red nose injection.

During this critical period of a calves life, it is important that it remains healthy and it is desirable that it gains weight. The returns to a farmer or rancher would be greater if he kept the calves for a period longer than three weeks because at the end of this short period, the calves are just getting on their feet, are taking feed well and are just beginning to put on pounds.

Insultation and Windbreaks For Wintering Market Hogs

Winter weather conditions in North Dakota are such that rate of gain and feed efficiency of growing pigs are both adversely affected. A greater amount of energy is required to maintain body temperature when outside air temperatures are low, and daily gains are reduced since a smaller portion of the energy taken in is available for growth. This results in a higher feed cost per unit of gain.

A trial was started in the fall of 1966, to see if the performance of growing pigs could be improved by insulating the houses or by providing a windbreak for the feeding area. Half of the portable 8x10 foot houses were insulated with baled straw and half of the lots had a four foot high windbreak extending from the house so it provided protection from the wind on the north and west sides of the self-feeders. Each house was located in a one acre pasture that had been seeded to winter wheat in the spring.

The four treatments involved were 1) control, 2) insulation only, 3) windbreak only and 4) insulation and windbreak. The trial was replicated twice each year. Lots of six barrows and six gilts averaging 60.2 pounds and five barrows and four gilts averaging 43.0 pounds were allotted to each treatment for the first year. For the second year, seven barrows and five gilts averaging 58.2 pounds and six barrows and seven gilts averaging 42.4 pounds were used.

The rations used for this trial varied slightly from one year to the next as is shown in table 15. The same ration was used for both replications the first year but a higher protein ration was fed to the lightweight replication the second year until they reached an average weight equal to the average intial weight of the heavyweight replication.

Table 15. Rations Used for the Swine Winter Shelter Study.

	1966	Grower,[a] 1967	Finisher, 1967
Barley	88.5%	79.8%	89.0%
Soybean meal	4.5	9.1	4.5
Meat scraps	4.5	9.1	4.5
Di calcium phosphate	0.8	0.8	0.8
Limestone	0.5	0.5	0.5
Trace mineral salt	0.6	0.6	0.6
Zinc and vitamins [b]	0.1	0.1	0.1

[a] Used for lightweight replication only.

[b] Includes 34.0 gm. Forafeed; 22.7 gm. Vitamin B_{12}; 2.8 gm. Vitamin A; 1.4 gm. Vitamin D; 9.0 gm. Zinc sulfate.

Table 16. The Effect of Additional Winter Protection for Growing Hogs on Rate of Gain and Feed Efficiency.

	No insulation		Insulation		Average	
		Feed/cwt.		Feed/cwt.		Feed/cwt.
	ADG	gain	ADG	gain	ADG	gain
No windbreak	1.32	425.0	1.24	427.2	1.28	426.1
Windbreak	1.30	409.0	1.32	412.1	1.31	410.6
Average	1.31	417.0	1.28	419.6		

The average daily gains, as shown in table 16, increased very slightly when a windbreak was provided. The is response was more noticeable if the house was insulated. Over the two year period, insulating the houses seemed to have a slightly depressing effect on daily gains. This was more apparent if a windbreak was not provided. Results for 1967-1968 are given in table 17.

Feed required per unit gain was affected more by the addition of a windbreak than by insulating the house. Feed efficiency was improved for both groups when a windbreak was added and it was slightly poorer for both groups when insulation was added. This uniformity of response was not evident when daily gain was the measurement being compared.

Temperatures readings were recorded at various times throughout the trial. Insulating the houses resulted in a slightly higher temperature reading but it was of no practical value. House that had metal roofs were dryer if they were insulated due to a reduced amount of condensation forming on the ceiling.

Insulating hog houses with baled straw for growing out market hogs through the winter proved to be of no practical value during the two years this trial was conducted. Providing a windbreak for the feeding area was also of no appreciable value; however, this trial was conducted during two relatively mild winters when there were relatively few cold, windy days.

Table 17. 1967-1968 Results of Providing Additional Protection for Growing and Finishing Pigs.

	No insulation		Insulation		Average	
		Feed/cwt.		Feed/cwt.		Feed/cwt.
	ADG	gain	ADG	gain	ADG	gain
No windbreak	1.36	431.1	1.20	449.9	1.28	440.5
Windbreak	1.29	420.2	1.28	427.1	1.28	423.6
Average	1.32	425.6	1.24	438.5		

Effect of Sire and Sex
On Feed Efficiency and Rate of Gain of Swine

Feed efficiency and rate of gain are two performance traits are very important to a swine producer. They are traits that directly affect the profitability of swine operation and they are traits that can be improved rather rapidly by selection. Both traits have a heritability of about 30% and they are closely correlated. That means if rate of gain, which is rather easy to measure, is improved, feed efficiency is also likely to improve.

A trial was started on May 15 to measure both rate of gain and feed efficiency for both barrows and gilts sired by two different Yorkshire boars. Six pigs were allotted to each lot. There were two lots of barrows and one lot of gilts by each sire. The ration fed to all lots shown in table 18. The pigs were in a 8x19 foot, concrete floored lot that had a self-feeder and waterer and was shaded on one end.

Table 18. Composition of the Swine Ration.

Barley	600 lbs.	Trace mineral salt	5 lbs.
Oats	300	Fortafeed	340 gms.
Soybean meal	70	Vitamin A	30
Di calcium phosphate	13	Vitamin D	14
Ground limestone	10	Zinc sulfate	68

A rather large difference developed in the gaining ability and efficiency of feed conversion between the two sires used, especially when two lots of gilts are compared. Barrows sired by sire I showed an 8.6% advantage in gainalility and a 4.3% improvement in feed efficiency. Gilts from sire I showed a greater degree of improvement in both traits being 18.2% better in rate of gain and requiring a 15.1% less feed to produce a pound of gain.

Table 19. The Effect of Sire and Sex on Feed Efficiency and Rate of Gain of Pigs in Concrete Lots.

	Sire I		Sire II	
	Barrows*	Gilts	Barrows*	Gilts
Av. Initial wt.	69.2	67.5	69.6	66.3
Av. Final wt.	207.2	204.3	195.6	191.3
Av. Daily gain	1.62	1.37	1.48	1.12
No. days of trial	85	100	85	112
Feed/cwt gain	392.0	399.5	409.6	470.7

*An average of two lots.

Four more lots of pigs using 8 barrows and 9 gilts from one boar and 10 barrows and 10 gilts from another sire were put in pasture lots and fed the same ration as shown in table 18. These pigs were started on trial June 5 and averaged 38.2 pounds. Average daily gains (table 20) were not appreciably different when the barrows and gilts were averaged together for the two sires. However, barrows sired by sire II outgained the barrows from sire III but sire III has the faster gaining gilts by a small margin. Sire II shown in table 19 and 20 is the same individual. Feed efficiency was improved by 7.7% for barrows and gilts when sire III was uses.

One lot of barrows on concrete from each sire was fed a meal ration and the other lot was fed the same ration in a pelleted form. These are the same barrows shown in table 19. Performance figures for this comparison are recorded in table 21. Average daily gains were slightly less for the pelleted lots; however, pelleting improved feed efficiency by 10.9%. Even at this rate of improvement, feeding a pelleted ration did not pay for the additional cost of getting the feed pelleted. However, there is a hidden factor they may have a very definite influence and that is the type of self-feeders that allow a very minimum amount of feed to be wasted. A feeder that wasted more feed would favor the pelleted ration since a smaller amount of feed would be wasted if it were pelleted.

Table 20. Effect of Sire and Sex on Feed Efficiency and Rate of Gain of Pigs in Pasture Lots.

	Sire II			Sire III		
	Barrows	Gilts	Average	Barrows	Gilts	Average
Av. initial wt.	39.0	38.4	38.7	38.1	37.5	37.8
Av. final wt.	210.0	192.6	201.3	198.1	194.3	196.2
Av. daily gain	1.42	1.21	1.32	1.33	1.23	1.28
No. days on trial	120	127		120	127	
Feed/cwt gain	387.8	387.2	387.5	346.9	368.6	357.8

Table 21. Results of Feeding Pigs a Pelleted or Meal Raton.

	Sire I		Sire II		Av. for	Av. for
	Meal	Pellet	Meal	Pellet	meal	pellet
No. days on trial	85	85	85	85		
Av. initial wt.	69.7	68.7	69.7	69.6	69.7	69.2
Av. final wt.	209.3	205.2	198.5	192.6	203.9	198.9
Av. daily gain	1.64	1.61	1.52	1.45	1.58	1.53
Feed/cwt gain	424.0	360.0	424.3	395.0	424.2	378.0

This trial points out just how important the boar in a breeding herd is and the magnitude of his influence on the performance of the pigs he sires. Rate of gain and feed efficiency can be rapidly raised or lowered as a result of the boar that is used. This is why it is important to select boars for use that have performance information available on them or their parents.

Date	Meetings and Tours, 1968	Attendance
January 31- February 2	Annual Experiment Station Conference	
February 3	Montana-Dakota Feeder Tour Fairview , Montana	
February 6	Annual North Dakota Beef Cattle Improvement Assn. Minot	
February 13	Annual Sheep Field Day Hettinger	
February 22	Burleigh County Agriculture Know-How Program	125
March 3-5	North Dakota Winter Show Valley City	
March 11	Brooks Ranch Hereford Sale Burlington	
March 28	Freeze Branding Demonstration	
March 29	Cub Scout Troop Tour Dickinson Experiment Station	10
May 1	Kindergarten Class Tour Dickinson Experiment Station	18
May 3	Field Day at U.S. Range Livestock Experiment Station Miles City, Montana	
May 14	Planning of Trials with Dr. W.E. Dinusson	3
June 7	Tri-County Livestock Judging Contest Dickinson Experiment Station	30
June 9-12	North Dakota Stockmen’s Assn. Convention Dickinson	

Date	Meeting and Tours, 1968 (continued)	Attendance
June 25	Agricultural Committee, Chamber of Commerce	
July 17	Crops Field Day Dickinson Experiment Station	300
July 18	Southwest District 4-H Livestock Judging Contest Dickinson Experiment Station	100
July 24-27	Summer meeting of Northern Great Plains Station Of American Society of Range Management Bridger, Montana	
September 6	Bowman 4-H Achievement Day	
October 1	Livestock Producers Meeting Killdeer	25
October 25-26	North Dakota Hereford's Assn's. Beef Evaluation Conf. Bismarck	
November 4	Planning 1968-1969 Trials with Dr. W.E. Dinusson	3
December 11	Livestock Research Roundup 19th Annual Dickinson Experiment Station	1000

Radio Programs, 1968

Date	Subject
January 26	Energy for Livestock.
February 16	Sheep Field Day Reports from Hettinger Experiment Station.
March 8	Trial at Dickinson Experiment Station to Determine Replacement Value of Barley for Hay.
March 29	Winter Shelter for Feeding Market Hogs.
April 19	Wintering Replacement Heifers on Chopped Hay.
May 10	Miles City Experiment Station's Field Day.
June 7	Approaching Cattle Breeding Season.
June 21	Linebreeding Research at the Miles City Range Livestock Experiment Station.
July 21	Crops Field Day at Gain as Related to Weight in Hogs.
August 16	Rate and Cost of Gain as Related to Weight in Hogs.
August 30	What's Under the Hide.
September 20	New Advances in Raising Young Pigs.
October 11	Multiple Births In Beef Cattle.
November 1	Effect of Sire and Sex on Feed Efficiency and Rate of Gain for Swine.
November 15	19th Annual Livestock Research Roundup.

General Summary

	Farm Visits	No. tours	Attendance at meetings	Station calls	Radio Talks	News articles	Meetings attended
January				5	1		1
February		1	125	3	1		3
March	3	1	10	5	2		3
April	1			2	1		
May	1	1	21		1		2
June			30	3	2		3
July			400	1	1	1	3
August				1	2		
September	7	1			1		1
October	3		30	6	1		3
November	1		3	6	2	1	1
December			1000	5			1
Total	16	4	1619	32	15	2	21

Report Of

Grass And Legume Investigations

At The

Dickinson Experiment Station

1968 Crop Season

BY

Warren C. Whitman and Harold Goetz

Table of Contents

Hay Yields From Grass and Grass-Alfalfa Mixture Plots

1. Uniform Bromegrass trial:

The 1968 hay yields for the 14 varieties of bromegrass in the uniform bromegrass trial are given in table 1. The 13-year average yields for the trial are given in table 2. In general, this trial is beyond its period of major usefulness, but the plots of the different varieties have maintained their stands and their individual identities quite well, so yield clippings have been continued on the trial. Clippings were not made on this trial in 1956 and in 1964. The 1968 yields were quite low relative to the average yields for the 13 years of trial. The 1968 average yield for all varieties was 890 pounds in 1959 and 410 pounds in 1961, the two previous lowest yields of the trial period. In general the southern varieties were the best producers in the 1968 season, with Lincoln brome the top yielder at 1018 pounds per acre. Surprisingly, Canadian common (a northern type) at 953 pounds per acre produced the second highest yield. With this yield Canadian common ranked with such appreciably higher then Mandan 404 and Manchar, the two other northern strains in the trial.

The data of table 2 show that for the period of the trial the southern type bromes have shown the best overall yields, with all of them except Martin yielding over 1300 pounds per acre. Lincoln, Achenbach, Fischer, and Oklahoma synthetic have averaged very nearly the same for the period, with the range being only from 1374 pounds per acre for Oklahoma synthetic to 1418 pounds for Lincoln. As shown in table 2, Lincoln had produced slightly better than the other varieties. The northern type varieties, Homesteader, Mandan 404, Manchar, and Canadian common show the lowest average yields for the period of the trial, despite the fact that they have not always been low yielders in each year of clipping.

The general differences between varieties in the trial have been rather small, averaging only a little over 200 pounds per acre between the lowest-producing variety, Canadian common and the highest producing variety, Lincoln. The overall excellent performance of Lincoln brome has marked it clearly as the outstanding variety in the trial. In stand maintenance and leafiness near the ground the norther statins have been slightly to the southern stains.

Table 1. Composition of 1968 Hay Yields From Bromegrass Plots Seeded in 1953.

	Dry – Weight yield – lbs./acre			
Variety	Grass	Other Grass	Weeds	Total
Lincoln	1018	---	----	1018
Canadian common	953	---	----	953
Fischer	949	---	----	949
Achenbach	930	---	----	930
Lyon	928	---	----	928
Lancaster	922	---	----	922
Bin 12	907	---	----	907
Martin	898	---	----	898
Kuhl	882	---	3	885
Mandan 404	876	---	----	876
Oklahoma synthetic	848	---	----	848
Homesteader	844	---	----	844
Elsberry	780	---	2	782
Manchar	726	---	----	726
Average	890	---	----	890

Table 2. Hay Yields from Bromegrass Plots Seeded in 1953.

	Dry-weight yields – lbs./acre													
														13-yr.
														Average
														yield
Variety	1954	1955	1957	1958	1959	1960	1961	1962	1963	1965	1966	1967	1968	lbs./acre
Lincoln	1606	1498	1459	1260	906	1115	432	1596	2275	2242	1097	1929	1018	1418
Achenbach	1702	1463	1318	1159	734	1247	389	1771	2116	2242	1220	1783	930	1390
Fischer	1637	1414	1408	1239	849	1111	461	1740	2166	2243	1125	1640	949	1383
Oklahoma synthetic	1363	1426	1614	1190	789	1135	461	1579	2359	2226	1081	1790	848	1374
Lyon	1380	1511	1417	1140	707	1042	394	1524	2267	2163	1191	1867	928	1349
Lancaster	1275	1476	1397	1142	864	1095	405	1516	2185	2398	987	1839	922	1346
Kuhl	1334	1352	1486	1107	704	1088	401	1626	2339	2210	1086	1731	885	1335
Elsberry	1190	1548	1537	1184	952	1010	438	1628	2192	1988	968	1775	781	1322
Bin 12	1289	1326	1380	1206	1007	1071	416	1650	2076	1914	999	1793	907	1310
Martin	1247	1335	1160	1179	951	986	384	1596	1981	2020	1062	1539	898	1257
Homesteader	1214	1433	1319	1099	677	1000	402	1560	1768	2061	1008	1797	844	1245
Mandan 404	1261	1359	1226	1069	865	991	385	1524	1911	1878	934	1494	876	1213
Manchar	1241	1473	1132	1126	746	1057	448	1451	1978	1882	888	1500	726	1204

2. Crested Wheatgrass trial:

The 1968 yield from the crested wheatgrass variety plots seeded in 1958 are given in table 3, and the 10-year average yields (1959-1968) for the crested wheatgrass varieties are given in table 4. These plots have deteriorated to a considerable extent and have been heavily invaded by volunteer alfalfa, listed as “Weeds” in table 3. As the result of this invasion, the plots which contained the most alfalfa were generally the best producers in the 1968 season. The varieties in which relatively little alfalfa invasion had taken place were the poorest producers. The plots of Turkish Fairway, which appears as the best producing variety in the 1968 season, have not only been invaded by alfalfa, but the grass itself has largely been replaced by invasion of other varieties from adjacent plots. Nordan crested, commercial crested, and Nebraska 10, the lowest yielding varieties in the 1968 season, actually have the best plot stands in the trial and have been invaded by alfalfa only to a minor extent.

The 10-year average yields (table 4) show that in general the standard derived varieties, Mandan 2359, Summit, Nebraska 10, Commercial, and Nordan, continue to be somewhat better producing than the Fairway-derived varieties. As previously mentioned the Fairway -derived varieties have all shown serious stand deterioration.

Table 3. Composition of Hay Yields in 1968 from Crested Wheatgrass Plots Seeded in 1958.

	Dry – Weight yield – lbs./acre		
Variety	Grass	Weeds*	Total
Turkish Fairway	1367	380	1747
Neb. 3576 Fairway	1184	533	1717
Mandan 2359	1221	271	1492
South Dakota 15	1104	358	1462
Common Fairway	1068	340	1408
Summit crested	969	318	1287
Nordan crested	1026	184	1212
Commercial crested	1057	148	1205
Nebraska 10	992	156	1148
Average	1110	299	1409

*Most of material listed as “weeds” is volunteer alfalfa.

Table. 4 Hay Yields from Crested Wheatgrass Varieties Seeded in 1958.

Dry – weight yield – lbs./acre

Variety	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	10-yr. average yield
Mandan 2359	1157	1689	833	1768	2119	864	1808	871	2482	1492	1508
Summit crested	1320	1614	856	2023	1995	889	2011	903	2139	1287	1505
Nebraska 10	1137	1791	864	1890	2109	871	1784	864	2042	1148	1450
Commercial crested	1452	1815	824	2080	1978	818	1538	750	1811	1205	1428
Neb. 3576 Fairway	1371	1605	905	1680	1846	715	1650	962	1677	1716	1403
Nordan Crested	1427	1461	886	2006	2069	910	1669	687	1592	1212	1390
South Dakota 15	1164	1546	770	1566	1788	712	1523	781	2437	1462	1375
Commercial Fairway	1425	1619	873	1759	1734	887	1435	862	1499	1408	1350
Turkish Fairway	753	930	562	1338	1558	747	1308	669	1793	1747	1141
Average	1246	1563	810	1790	1911	824	1647	817	1941	1409	1394

3. Station grass and grass-alfalfa mixture trials:

Yields of the grass-alfalfa mixtures and the straight grass seeding in this trial are given in tables 5, 6, and 7. The 1958 yields of the grass-alfalfa mixtures are given in table 5, and the 10-year average yields of the mixtures are given in table 6. Table 7 gives the 10-year average yields of the straight grass seedings.

The 1968 average yield of 1623 pounds per acre for all mixtures was considerably below the average yield of all mixtures for the 10-year period. Lower average yields were obtained only in 1961 and 1964. The highest yielding mixture in the 1968 season was Nordan crested wheatgrass and Teton alfalfa at 1986 pounds per acre (oven-dry weight). The green-Teton alfalfa mixture and the Lincoln brome-Ladak alfalfa mixtures ranked second and third in total production in the 1968 season. In contrast to the situation prevailing in recent past seasons alfalfa provided less than half of the total yield in each of these three mixtures. The amounts of alfalfa in the mixtures remains relatively high in most cases, averaging 30.7 percent for all mixtures. As shown in table 5, most of the mixture plots have shown an appreciable invasion of grass from other plots. The principal invading grass has been crested wheatgrass.

The highest producing mixture over the period of the trial has been the Nordan crested-Teton alfalfa mixture at 2941 pounds per acre (table 6). The Lincoln brome-alfalfa mixtures have been the next highest producers, with the Lincoln-Ladak mixture averaging 2765 pounds per acre, the Lincoln-Teton mixture 2649, and the Lincoln-Nordan-Ladak mixture 2622 pounds per acre. The green stipa-alfalfa mixtures showed a very high production for a short period after they became fully established, but they have since declined to levels comparable to the other mixtures.

The results of the trial show that there has been a substantial increase in yield in the grass-alfalfa mixtures compared to the straight grass seedings. For a period of the trial the mixture plots have produced about 27.1 percent more hay than the straight grass plots. Some individual comparisons show that the Nordan crested-Teton alfalfa mixture has produced an average of 45.8 percent more hay than straight Nordan crested; the Lincoln brome-Ladak mixture had produced 44.9 percent more than straight Lincoln brome; and the Russian wildrye-Teton mixture nearly 40 percent more than straight Russian wildrye.

In the straight grass seedings Nebraska 50 Intermediate wheatgrass shows the highest average yield for the period of the trial, 2214 pounds per acre. However, most of the yield produced on the intermediate wheatgrass plots in the last few seasons has been produced by crested wheatgrass. The intermediate wheatgrass plots have shown serious deterioration and have been heavily invaded by crested wheatgrass. Summit crested and Nordan crested have both maintained yields of slightly over a tone per acre in this trial. Lincoln brome and Southland brome have both yielded about 1900 pounds per acre. Manchar brome and northern brome have maintained yields near 1700 pounds per acre, while the two Russian wildrye varieties have produced about 1200 to 1300 pounds per acre.

Table 5. Composition of 1968 Hay Yields from Station Grass-Alfalfa Mixture Trial Seeded in 1958.

	Dry – weight yields – lbs./acre				
Mixtures	Grass	Alfalfa	Other Grass	Weeds	Total yield
Nordan crested-					
Teton alfalfa	1607	304	75	--	1986
Green stipa –					
Teton alfalfa	1233	503	210	--	1946
Lincoln brome-					
Ladak alfalfa	1316	492	--	--	1808
Green stipa (new)-					
Ladak alfalfa	474	449	754	79	1756
Lincoln brome-Nordan					
Crested – Ladak alfalfa	1236	217	196	--	1649
Intermed. Wheatgrass-					
Lakak alfalfa	829	210	608	--	1647
Russian wildrye (2355)-					
Teton alfalfa	716	426	365	--	1543
Manchar brome-					
Ladak alfalfa	1107	367	30	--	1504
Green stipa-					
Ladak alfalfa	773	104	583	--	1460
Lincoln brome-					
Teton alfalfa	915	290	252	--	1457
Intermed. Wheatgrass-					
Teton alfalfa	614	99	703	--	1416
Russian wildrye (2355)-					
Ladak alfalfa	1131	178	--	--	1309
Average	996	306	315	6	1623

Table 6. Average Hay Yields From Station Grass-Alfalfa Mixture Trial Seeded in 1958.

Dry – weight yields – lbs./acre

Mixtures	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	10-year Average Yield
Nordan crested-											
Teton Alfalfa	2359	3396	1360	2970	3959	1691	3961	3495	4232	1987	2941
Lincoln brome-											
Ladak alfalfa	2171	3272	903	2824	4524	1534	4105	2661	3851	1808	2765
Lincoln brome-											
Teton alfalfa	2329	2765	943	2682	4441	1698	3984	2603	3585	1458	2649
Lincoln brome-Nordan											
crested-Ladak alfalfa	2447	3204	1195	2663	3642	1862	3410	2475	3672	1649	2622
Intermed.wheatgrass-											
Teton alfalfa	3144	3381	647	2421	4182	1255	3075	1856	4173	1416	2555
Intermed.wheatgrass-											
Ladak alfalfa	2818	3258	755	_ 1/	4093	1440	3519	2418	3493	1648	2344
Manchar brome-											
Ladak alfalfa	2127	2764	692	2237	3654	1315	3259	2042	3531	1504	2313
Russian wildrye (2355)-											
Teton alfalfa	1449	2307	786	1825	2859	1307	2040	1690	2631	1543	1844
Russian wildrye (2355)-											
Ladak alfalfa	1653	1716	711	2201	2526	1220	2058	1286	1906	1309	1659
Green stipa (new)-											
Ladak alfalfa	-	-	-	3006	5714	1365	2942	2647	3708	1755	3020 2/
Green stipa-											
Teton alfalfa	-	-	642	2684	5579	1678	4781	3270	2955	1945	2942 3/
Green stipa-											
Ladak alfalfa	-	-	1035	2344	4290	1406	3717	2555	3436	1461	2531 3/
Average	**2297**	**2897**	**879**	**2321**	**4123**	**1481**	**3404**	**2416**	**3431**	**1623**	**2267**

1/ No harvestable yield in 1962.

2/ 7-year average.

3/ 8-year average.

Table 73 Average Hay Yields, 1959-1968, From Station Grass Trial Seeded in 1958.

Dry – weight yield – lbs./acre

Grasses	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	10-Year Average yield
Intermediate Wheat-grass (Neb.50)	2865	3440	743	1855	3167	1450	2439	2312	2272	1599	2214
Summet crested	2653	3310	1272	2317	2339	1138	2390	1811	2245	1101	2058
Nordan crested	2346	3203	1259	2032	2475	1117	2172	1972	2179	1388	2016
Lincoln bromegrass	2559	3107	971	2185	2507	799	2572	1515	2018	845	1908
Southland brome	2344	3293	750	2141	2442	703	2640	1594	2022	859	1879
Manchar brome	2332	2560	707	1937	2284	974	2391	1371	1856	1218	1763
Norther brome	2324	2876	540	1818	2035	763	2075	1291	1800	845	1637
Russian wildrye (2355)	1368	2086	686	1727	1929	913	1478	962	1394	672	1322
Russian wildrye (Com.)	1404	1913	756	1530	1574	1008	1522	792	1311	782	1259
Slender wheatgrass	1937	2601	-	-	2531	-	-	-	-	-	-
Green stipa (new)	-	-	755	2441	3118	1189	2354	1376	1679	1091	1750*
Green stipa (com.)	-	-	608	1916	2912	1237	1613	1257	1819	1344	1713*
Western wheatgrass	-	-	-	-	-	934	2609	1575	1794	1350	1652*
Average	**2215**	**2839**	**822**	**1991**	**2443**	**1019**	**2271**	**1486**	**1900**	**1107**	**1784**

*Not included in average yield of all grasses.

Appreciable stand deterioration has taken place in both the mixture plots and the straight grass seedings. In the straight grass plots the intermediate stands, the green stipa stands, and the northern brome stands have shown the most serious deterioration. There has been more deterioration in the Russian wildrye plots marked by the death of entire clumps of the grass. In all cases deterioration of the stands has been accompanied by substantial invasion of crested wheatgrass and some invasion of volunteer alfalfa. In the mixtures the intermediate wheatgrass- alfalfa plots, the green stipa-alfalfa plots, and the Russian wildrye-alfalfa plots have all been seriously invaded by crested wheatgrass.

4. Dryland alfalfa plots;

Most of the plots in the 1960 alfalfa seeding showed nearly complete deterioration by the 1968 season, so yield clippings were not made on these plots. The report on the alfalfa yields given in the 1967 write-up will be considered as the final report on the earlier alfalfa seeding. In this earlier trial Ladak and Rambler showed the best average production over the 7-year period, 1961-1967. Both of these varieties averaged slightly over 2 tons per acre, with the yield for all 12 varieties in the trial averaging 3614 pounds per acre.

The yields for the alfalfa varieties in the trial seeded in 1964 are given in table 8. The 1968 yields were produced from a single clipping, for very little regrowth occurred on the plots after the first clipping. The average yield of all varieties in the 1968 season was only 1129 pounds per acre, the lowest yield in the 4 years of the trial. The 1968 yield of all varieties was only about 1/3 of the average yield of all varieties for the 4 seasons of clippings. Norseman, Warrior, and Travois were the top-yielding varieties was only slightly greater than the yields of Teton, Vernal, Range, and Ladak.

On the basis of the 4-year average yields Vernal, Ranger, and Ladak have been the highest producers, with Vernal averaging 3737 pounds per acre, Ranger 3724 pounds, and Ladak 3685 pounds per acre. Cody and Dupuits have shown substantially lower yields than the other varieties, with Cody averaging 3010 pounds per acre and DuPuits 2947 pounds per acre. Lahontam showed serious stand damage in the 1968 season, and the plots of this variety were not harvested.

A new trial including 9 varieties of alfalfa, plus Emerald crown vetch and Eski sainfoin, was seeded in the 1967 season. The stands of crown vetch and sainfoin were too poor to harvest in the 1968 season, but yields were taken on all the alfalfa varieties. Yield data for this new seeding are given in table 9. The 1968 average of 436 pounds per acre of weeds was harvested from the plots. As shown in table 9, substantial amounts of weeds were present in all plots. Travois alfalfa was the top yielder at 2362 pounds per acre, respectively. Only one cutting was produced in the 1968 season in this trial.

Table 8. Hay Yields From Alfalfa Plots Seeded in 1964. 1/

	Dry – weight yield – lbs./acre				4-Year Average-
Variety	1965	1966	1967	1968	lbs./acre
Vernal	4535	4338	4815	1260	3737
Ranger	4423	4225	4994	1254	3724
Ladak	4002	4160	5336	1241	3685
Warrior	4096	4413	4654	1324	3622
Travois	3819	4273	4801	1320	3553
Norseman	4086	3815	4912	1389	3551
Uinta	3704	4428	4935	1005	3518
Teton	4472	3477	4363	1299	3403
Lahontan	2843	3267	4126	No stand	3413 2/
Culver	4687	3115	4638	1146	3397
Cody	3502	3521	4465	911	3010
DuPuits	3550	3544	4423	271	2947
Average	3977	3881	4705	1129	3463

1/ Yields of alfalfa only – no weeds included.
2/ 3-year average included in 4-year average yield.

Table 9.- Composition of 1968 Hay Yields From Legume Plots Seeded in 1967.

Variety	Dry – weight yield-lbs./acre Legume	Weeds	Total yield - lbs./acre
Travois alfalfa	2362	359	2721
Ladak alfalfa	2024	569	2593
Teton alfalfa	2034	461	2495
Roamer alfalfa	1851	471	2322
Norseman alfalfa	1631	468	2099
Fremont alfalfa	1585	503	2088
Ranger alfalfa	1656	350	2006
Vernal alfalfa	1639	279	1918
Dawson alfalfa	1444	486	1910
Emerald Crown vetch	No Stand	-	- 1/
Eski sainfoin	No Stand	-	- 1/
Average	1803	436	2239

1/ Not included in average.

5. Sweetclover yields;

Yields from the sweetclover trial seeded in 1967 are given in table 10. The yields of the yellow varieties Madrid, Goldtop, and common yellow were slightly better than the yield of common white Denta produced a substantially lower yield than all the other varieties, only 1048 pounds per acre in contrast to yields of over 2500 pounds per acre for the others. The stands of Denta were very poor, and only one of the 3 plots seeded was harvestable. Substantial amounts of weeds were present in nearly all plots, but there were fewer in the Madrid and common white plots than in the plots of the other varieties.

Table 10. Sweetclover Variety Yields in 1968 From Plots Seeded in 1967.

	Dry – weight yields – lbs./acre		
Variety	Sweetclover	Weeds	Total
Madrid	2922	99	3021
Goldtop	2806	359	3165
Common yellow	2734	424	3158
Common white	2568	102	2670
Denta	1048	582	1630 1/
Average	2416	313	2729

1/ Stand secured in only 1 of 3 plots seeded.

New Fertilizer Trial

1. Hay yields from new fertilizer trial:

This trial probably should not be referred to as a "new" trial, since hay yields have been taken from the plots for 11 consecutive seasons. This trial has been referred to as the New Fertilizer Trial, because it originally replaced a previous small plot trial. It anticipated that this trial will not be harvested after the 1968 season. In this trial Nordan crested wheatgrass and Russian wildrye are compared under hay clipping and pasture clipping in pure stands, in mixture with alfalfa, and with 33, 67, and 100 pounds nitrogen per acre. The trial was seeded in the spring of 1956, and hay clippings have been taken since 1958, although pasture clippings have been taken only since the 1961 season. Fertilizer applications were made on the plots in late fall in 1957 and 1958, but all subsequent applications have been made in early spring, usually in April.

Hay yields for Nordan crested wheatgrass for the period of the trial are given in table 11 and the hay yields of Russian wildrye for the same period are given in table 12. The 1968 hay yields of both Nordan crested wheatgrass and Russian wildrye were substantially below the 11-year average yields for the two grasses. They were not, however, the lowest yields obtained in the trial, since they were appreciably better than the 1961 yields for both grasses under all treatment. Surprisingly, the hay yields of crested wheatgrass were not greater under all treatments than the yields of Russian wildrye in the 1968 season. In the case of the grass alfalfa plots the yield for the crested wheatgrass plots was 1078 pounds per acre (oven-dry weight) while the yield from the Russian wildrye plots was 1166 pounds per acre. With 33 pounds N the yield of crested wheatgrass at 1349 pounds per acre exceeded the yield of Russian wildrye by 527 pounds. At 67 pounds N the yield of crested wheatgrass hay was1074 pounds more than the Russian wildrye yield for this treatment. However, at 100 pounds N per acre the yield of Russian wildrye exceeded the crested wheatgrass yield by 259 pounds. On the basis of the 11-year averages the Nordan crested wheatgrass hay yields have exceeded the Russian wildrye hay yields by 500 to 700 pounds per acre under all treatments including the check.

Considering the average yields for the period of the trial, substantial increases in yield of crested wheatgrass hay have been obtained by means of the fertilizer applications. With the average check yield of 1690 pounds per acre to grass-alfalfa plots have averaged 250 pounds per acre more than the checks, the 33-pounds-N plots 649 pounds more, the 67-pound-N plots 1047 pounds more, and the 100-pound-N plots 1295 pounds more than the untreated plots. If hay were valued at 1 cent per pound and nitrogen at 10 cents per pound, all rates of fertilization would have been economically profitable for crested wheatgrass hay production.

Table 11. Hay Yields of Nordan Crested Wheatgrass in Pure Stand. In Mixture with Alfalfa, and Fertilized at Three Different Rates.

	Dry – weight yields – lbs./acre				
Year	Grass Alone	With Alfalfa	33 lbs. N	67 lbs. N	100 lbs. N
1958	1809	1647	1832	2491	2724
1959	1416	1827	2120	1737	2011
1960	2134	2485	2910	2713	2714
1961	1036	1012	1187	1120	1108
1962	1859	2136	3171	3242	3573
1963	3075	3268	4438	6030	6881
1964	905	1044	1016	1401	1458
1965	1786	2412	3140	4281	4781
1966	946	1619	1604	1658	1795
1967	2524	2813	2960	3344	3795
1968	1095	1078	1349	2094	1992
Average	1690	1940	2339	2737	2985

Table 12. Hay Yields of Russian Wildrye in Pure Stands, in Mixture With Alfalfa, and Fertilized at Three Different Rates.

	Dry – weight yield – lbs./acre				
Year	Grass Alone	With Alfalfa	33 lbs. N	67 lbs. N	100 lbs. N
1958	941	1111	1224	1613	1984
1959	778	841	975	971	1086
1960	1287	1312	1710	1823	1997
1961	643	616	821	761	777
1962	1338	1395	2041	2077	2746
1963	1661	2230	2345	3806	4388
1964	1425	1446	2132	2055	2694
1965	1083	1415	2147	3618	4477
1966	1360	1719	1884	2253	2319
1967	998	1640	1756	2823	2405
1968	526	1166	822	1020	2251
Average	1095	1354	1623	2075	2466

The Russian wildrye hay yields over the period of the trial have been quite good in view of the fact that most of the production of this grass is made up of basal leaves. For the most part the Russian wildrye plots have shown fairly good response to the applications of nitrogen fertilizer. The 11-year average yields (table 12) show that the Russian wildrye-alfalfa mixture produced an average of 259 pounds of hay more per acre than the untreated check plots. Plots fertilized with 33 pounds of nitrogen produced 528 pounds more; those with 67 pounds N, 980 pounds more; and the plots with 100 pounds N, 1371 pounds more than the untreated plots. All rates of fertilization on Russian wildrye were economically profitable on the basis of the long-time average yields.

2. Pasture yields from new fertilizer trial:

Table 13 and 14 give the pasture-clipping yields for Nordan crested wheatgrass and for Russian wildrye over the 8-year period 1961-1968. The pasture-clipping treatment consists of allowing the grass to grow to a height of 4 inches and then cutting it back to a height of 2 inches. This treatment is repeated the 4-inch height. The clippings were made twice on each plot in the 1961, 1963, 1967, and 1968 seasons and three times on each plot in the 1962, 1964, 1965, and 1966 seasons. A comparison of the average pasture-clipping yields for the period of the trial with the hay-clipping yields shows that the Nordan crested wheatgrass pasture yields were appreciably less than the hay-clipping yields of this grass. In the case of Russian wildrye, however, the pasture – clippings yields were slightly greater than the hay-clipping yields (tables 12 and 14).

Under the pasture clipping treatment the crested-alfalfa plots produced an average of 580 pounds more grass per acre then the check plots. On the 33-pounds-N plots the average yield for the period of the trial was only 366 pounds more than the yield on the untreated plots, which was an average of 214 pounds less than the production on the grass-alfalfa plots. With 67 pounds of N per acre the increase in yield over the untreated plots averaged 893 pounds per acre, and with 100 N the yield increase was 1175 pounds per acre. On the basis of increased amounts of grass and relative costs of nitrogen, the 67-pounds rate would have been the most economical.

Table 13. Pasture Clippings Yields of Nordan Crested Wheatgrass in Pure Stand, in Mixture with Alfalfa, and Fertilized at Three Different Rates.

	Dry-weight yields – lbs./acre				
Year	Grass Alone	With Alfalfa	33 lbs. N	67 lbs. N	100 lbs. N
1961	938	982	1011	1171	1134
1962	2097	2284	2506	3098	3964
1963	1875	2223	2459	3738	4388
1964	1102	1100	1287	1338	1453
1965	1093	1483	1581	2091	2127
1966	1371	2970	1708	2179	2477
1967	836	1704	1403	2157	2269
1968	1232	2436	1519	1916	2134
Average	1318	1898	1684	2211	2493

Table 14. Pasture Clipping Yields of Russian Wildrye in Pure Stand, in Mixture with Alfalfa, and Fertilized at Three Different Rates.

	Dry – weight yields – lbs./acre				
Year	Grass Alone	With Alfalfa	33 lbs. N	67 lbs. N	100 lbs. N
1961	656	679	793	836	912
1962	2105	2221	2577	3134	3354
1963	1372	1597	2126	3086	3506
1964	980	1115	1592	2093	1859
1965	1209	1574	1965	2812	3052
1966	1458	1452	1822	2048	2699
1967	1134	1386	1347	1870	2362
1968	720	1185	1323	1538	1993
Average	1204	1401	1693	2177	2467

The 33-pound rate and the 100-pound rate would have been definitely marginal. The grass-alfalfa plots showed an average increase in yield of 44 percent over the check plots, much better than the yield increase of the plots fertilized with 33 pounds of nitrogen per acre.

The pasture-clipping plots of Russian wildrye-alfalfa produced an average of only 197 pounds per acre more than the check plots over the 8-year period of the trial. With 33 pounds of nitrogen per acre production of Russian wildrye averaged 489 pounds more grass than the untreated plots. The 67-pound rate of nitrogen fertilization increased the average pasture-clipping yields of wildrye by 973 pounds over the check yield, and the 100-pound rate increased production to 1263 pounds more than the production of the check plots. All rates of fertilization were thus economically profitable on Russian wildrye under pasture clipping. The 67- and 100- pound rates were the most economical.

The stands of both grasses have shown substantial loss of vigor under the pasture-clipping treatment. Deterioration of stands has been especially serious in the Russian wildrye plots, with many dead and low-vigor plants evident under all treatments including the controls. Annual weeds invaded may of the plots in the 1968 season.

Native Grassland Fertilization

The native grassland fertilization study initiated in 1964 was continued in the 1968 season with four range sites, three of which are at the same location as when the fertilizer experiment was first initiated, while one site was relocated in another area this year. The range sites selected represent extremes in site conditions normally encountered on the bulk of the rangeland in western North Dakota and includes substantial acreages in adjacent states. The range sites were designated by the soil series names of the sites and include the following: sandy hill site (Manning series), and a Solenetz panspot site (Rhodes series). The panspot site was relocated from privately owned land south of Belfield, North Dakota to U.S. Forest Service grassland on the Custer National Grasslands south of Fryburg, North Dakota in the spring of the 1968 season.

The sites were fertilized with nitrogen fertilizer at three different rates in early April this season. The rates of elemental nitrogen applied were 33 lbs. N, 67 lbs. N, and 100 pounds nitrogen per acre. In addition to the different rates of nitrogen applied on each site, treatments consisting of a combination of 33 lbs. N + 48 lbs. P and 48 lbs. P per acre were added to the Vebar, Havre, and Rhodes sites. The Manning site was not included in the nitrogen-plus-phosphorus or the phosphorus -alone treatments applied to the other three sites.

Production clippings were taken from the different treatment on each site at the end of the growing season. The experimental areas were grazed during the summer months which required placing steel wire cages over portions of the fertilized areas to exclude the livestock. The yields were had clipped and separated into components consisting of tallgrasses, midgrasses, shortgrasses, annual forbs, and perennial forbs. The various components were then oven-dried, weighed, and reported as dry-weight yields on a pounds per acre basis.

The 1968 growing season was only slightly better than the 1967 season in terms of grass yields. Early spring growing conditions were generally less conductive to cool-season grass growth than was experienced in 1967. Late spring and early summer rains in 1968 did, however, contribute substantially to the favorable growth and development of the warm season grasses later in the summer (table 15). Despite the less than optimum growing conditions in 1968, an appreciable response by the vegetation due to the nitrogen fertilization was observed on all sites. The presence of the phosphorus fertilizer did not show any positive effect on the plants of any of the sites.

Table 15 shows the yield data from all sites in the 1968 season. The per cent composition of yield from these sites for the 1968 season are given in table 16. In terms of highest grass yields of all sites studied the Havre silts was the highest producing both on check plots and at all levels of fertilization. The 67-pound-nitrogen rate, however showed the highest increase in production due to fertilization in the grass component on the Solonetz site. The total increase in grass yield over check plots on the Solonetz site was 435 pounds; 410 pounds on the Manning site, 240 pounds on the Vebar site, and 224 pounds on the Havre site. The 100-pound-nitrogen rate further increased the yield in the 1968 season above the observed from the 67-pound-nitrogen rate only substantially on the Manning site, with no increase on the Solonetz, Havre, and Vebar sites (table 15).

Table 15. Dry-weight Yield on Four Native Grass Range Sites Fertilized with Nitrogen, Nitrogen Plus Phosphorus and Phosphorus Alone in the 1968 Season.

Dry – weight Yield – lbs./ acre

Site	Treatment	Mid-grasses	Tall-grasses	Short-grasses	Total grasses	Perennial forbs	Annual forbs	Total yields
	Check	232	58	402	692	208	74	975
	33 lbs. N	213	7	524	744	254	62	1060
Vebar	67 lbs. N	298	11	622	932	391	171	1493
(Sandy Hills)	100 lbs. N	261	44	611	916	353	45	1315
	33 lbs. N + 48 P	226	60	538	825	396	54	1275
	48 lbs. P	172	18	392	583	181	43	807
	Check	2049	-	36	2085	294	5	2384
	33 lbs.N	1911	-	11	1922	368	10	2300
Havre	67 lbs. N	2304	-	4	2309	589	-	2898
(Sagebrush flat)	100 lbs. N	2229	-	38	2267	208	2	2477
	33 lbs. N + 48 P	1884	-	3	1887	124	-	2011
	48 lbs. P	1694	-	59	1752	414	12	2175
	Check	728	-	475	1202	87	212	1502
	33 lbs. N	1007	-	496	1503	52	61	1616
Solonetz	67 lbs. N	1124	-	514	1637	56	72	1765
(Panspots)	100 lbs. N	1190	-	372	1561	124	98	1783
	33 lbs. N + 48 P	670	-	479	1149	120	55	1324
	48 lbs. P	482	-	653	1135	157	20	1312
	Check	389	-	951	1339	158	127	1624
Manning	33 lbs. N	470	-	816	1286	189	124	1599
(River terrace)	67 lbs. N	619	-	1130	1749	109	147	2004
	100 lbs. N	999	-	1117	2116	119	152	2387

The nitrogen-plus-phosphorus treatment increased the yield above that observed in the check plots only on the Vebar site. The phosphorus alone did not indicate any increase in production on any of the sites. Plant composition did not appear to be greatly affected at any rates, combinations, or kinds of elemental fertilizers on any of the sites studied in the 1968 season (table 16).

The 5-year average yields are shown in table 17. In general, substantial increases in grass yields were observed at all rates of applied nitrogen. The greatest responses to the nitrogen were observed at the 67-pound-nitrogen rate with only slight additional increases at the 100-pound-nitrogen rate. The 33-pound-nitrogen plus 48 pounds-phosphorus treatment increased grass yields only slightly above check plot yields only on the Vebar site. No increases in grass yield with this fertilizer treatment were observed on either the Havre or Solonetz sites. The phosphorus treatment did not show any increase in production on any site and indicated a probably inhibition of plant development on the Vebar site.

The 5-year average production data shows that the Havre site has been the highest producing site during the study period (table 17). The greatest increase in yield over check plots was a total of 767 pounds grass at the 67-pound-nitrogen treatment. Increases in production at the 67-pound-nitrogen rate on the other site was 647 pounds on the Vebar site, 575 pounds on the Manning site, and 435 pounds increase over check plots on the Solonetz site.

Additional increases in yield above the obtained from the 67-pound-nitrogen treatment were observed at the 100-pound-nitrogen treatment only on the Vebar and Manning site (table 17). Grass production was actually less on the Havre and Solonetz sites at the 100-pound-nitrogen treatment than was observed at the 67-pound-ntrogen treatment on these sites. The 33-pound-ntrogen rate did not produce an appreciable increase in production over that of check plot yields on any of the range sites.

Total production on the range sites over this 5-year period showed that a substantial amount of the yield from each site at the different rates and kinds of fertilization consisted of forb species. In general, the higher rates of nitrogen fertilization increased the percentage of perennial forbs on the Vebar and Manning sites. The increase in the forb component was due largely to the increase in the sage species. The nitrogen and phosphorus and phosphorus-alone treatments substantially increased the percentage of forbs in the total production on only the Vebar site, while the 48-pound-phosphorus treatment apparently increased the forb production only slightly on the Havre site (table 18).

Table 16. Percent Composition of Yields from Native Grass Range Sites Fertilized with Nitrogen, Nitrogen plus Phosphorus, and Phosphorus Alone – 1968 Season.

		Percent composition of yield		
Site	Treatment	Mid and tall grasses	Short grasses	Forbs
Vebar (Sandy Hills)	Check	29.8	41.3	28.9
	33 lbs. N	20.8	49.4	29.8
	67 lbs. N	20.7	41.7	37.6
	100 lbs. N	23.2	46.5	30.3
	**33 lbs. N + 48 lbs. P	22.4	42.2	35.3
	**48 lbs. P	23.5	48.7	27.8
Havre (Sagebrush Flat)	Check	85.9	1.5	12.6
	33 lbs. N	83.1	0.5	16.4
	67 lbs. N	79.6	0.1	20.3
	100 lbs. N	90.0	1.5	8.5
	**33 lbs. N + 48 lbs. P	93.7	0.1	6.2
	**48 lbs. N	77.9	2.6	19.5
Solonetz* (panspots)	Check	48.5	31.6	19.9
	33 lbs. Nq	62.3	30.7	7.0
	67 lbs. N	63.7	29.1	7.2
	100 lbs. N	66.7	20.9	12.4
	33 lbs. N + 48lbs. P	50.6	36.2	13.2
	48 lbs. P	36.7	49.8	13.5
Manning (River terrace)	Check	24.0	58.5	17.5
	33 lbs. N	29.4	51.0	19.6
	67 lbs. N	30.9	56.4	12.7
	100 lbs. N	41.9	46.8	11.3

*1-year average
**2-year average

Table 17. Average Dry-Weight Yields on Four Native Grass Sites Fertilized with Nitrogen, Nitrogen Plus Phosphorus, and Phosphorus Alone, 1964-1968 Seasons.

			Dry-weight yield – lbs./acre					
Site	Treatment		Mid-grasses	Tall-grasses	Short-grasses	Total grasses	Total Forbes	Total Yield
	Check		235	43	731	1009	314	1323
	33 lbs. N		209	49	993	1251	408	1659
Vebar	67 lbs. N		359	21	1276	1656	632	2288
(Sandy Hills)	100 lbs. N		399	93	1250	1742	575	2317
	**33 lbs.N + 48 P		249	71	526	846	497	1343
	**48 lbs. P		150	22	371	543	313	856
	Check		2033	-	17	2050	412	2462
	33 lbs. N		2197	-	7	2204	351	2555
Havre	67 lbs. N		2813	-	4	2817	390	3207
(Sagebrush flat)	100 lbs. N		2724	-	46	2770	192	2962
	**33 lbs. N + 48 P		2121	-	2	2123	156	2279
	**48 lbs. P		1927	-	33	1960	453	2413
	Check		728	-	475	1202	299	1502
	33 lbs. N		1007	-	496	1503	113	1616
*Solonetz	67 lbs. N		1124	-	514	1637	128	1765
(Panspots)	100 lbs. N		1190	-	372	1561	222	1783
	33 lbs. N + 48 P		670	-	479	1149	175	1324
	48 lbs. P		482	-	653	1135	177	1312
	Check		304	-	966	1270	309	1579
Manning	33 lbs. N		319	-	1045	1364	397	1761
(River terrace)	67 lbs. N		415	-	1430	1845	610	2455
	100 lbs. N		540	-	1585	2125	821	2946

*1-year average

**2-year average

Table 18. Average Percentage Composition of Yields from Native Grass Range Sites Fertilized with Nitrogen, Nitrogen Plus Phosphorus, and Phosphorus Alone, 1964-1968 Seasons.

		Percent compositions of yield		
Site	Treatment	Mid and tall grasses	Short grasses	Forbs
Vebar (Sandy Hills)	Check	21.0	55.3	23.7
	33 lbs. N	15.6	59.8	24.6
	67 lbs. N	16.6	55.8	27.6
	100 lbs. N	21.2	53.9	24.9
	**33 lbs. N + 48 lbs. P	23.3	39.2	37.0
	**48 lbs. P	20.1	43.3	36.6
Havre (Sagebrush Flat)	Check	82.6	0.7	16.7
	33 lbs. N	86.0	0.3	13.7
	67 lbs. N	87.7	0.1	12.2
	100 lbs. N	92.0	1.5	6.5
	**33 lbs. N + 48 lbs. P	93.1	0.1	6.8
	**48 lbs. P	79.9	1.3	18.8
Solonetz (Panspots)	Check	48.5	31.6	19.9
	33 lbs. N	62.3	30.7	7.0
	*67 lbs. N	63.7	29.1	7.2
	100 lbs. N	66.7	20.9	12.4
	33 lbs. N + 48 lbs. P	50.6	36.2	13.2
	48 lbs. P	36.7	49.6	13.5
Manning (River Terrace)	Check	19.2	61.2	19.0
	33 lbs. N	18.1	59.4	22.5
	67 lbs. N	16.9	58.3	24.8
	100 lbs. N	18.3	53.8	27.9

*1-year average
**2-year average

In terms of economical returns from increased grass production due to the application of the nitrogen and phosphorus fertilizers over the 5-year period the following conclusions may be drawn: The 67-pound-nitrogen rate would have been economical on all four range sites. In the 1968 season, the application of nitrogen would have been economically feasible on the Havre, Solonetz and Manning sites but not on the Vebar site. The 33-and 100-pound-nitrogen treatments generally would not have been economical during and years of this study. The native grassland production can be substantially and profitably increased with the use of nitrogen fertilizers at reasonable rates of application. The data thus far show that appreciable increases in forb production generally accompany the increase in grass production, indicating rather high overall total forage production. In general, the major portion of the forb production from the sites studied in non-useable due to the unpalatable nature of species and therefore cannot be considered of importance in the total production of any given fertilizer treatment. Associated closely with the increase in grass production, however, is an increase in the protein content of the grasses due to the fertilization which will further compensate for the increase in forb production and the cost of the nitrogen application. The use of herbicides in conjunction with the nitrogen fertilizer to reduce the forb component may become a distinct possibility in order to obtain maximum production form the fertilizer application.

Results thus far indicate that the fertilization of native grassland to improve forage production can be a profitable land treatment. However, it is also apparent that not all rangeland is equally well suited for fertilization and that only the better sites should be considered. Fertilization should be carried out with a certain degree of caution as shifts in plant species can occur with a resultant high increase in undesirable for species. Knowledge of the individual species response of the vegetation to a given fertilizer treatment on an individual site basis is essential for the realization of maximum benefits from increased production.

Report of

Agronomic Investigations

At the

Dickinson Experiment Station

Dickinson, North Dakota

1968

By

Thomas J. Conlon

Table of Contents

Table of Contents continued.

Variety Trials With Small Grain

The variety trials with small grains are conducted to compare and evaluate the varieties of the several small grains that are available or are soon to become available for use on farms. These tests provide comparative data on yield, disease reaction in the field and data on other agronomic characteristics important to the commercial grower. Grain is also supplies from these trials for milling and baking tests, for test on malting quality and for other quality determinations.

Variety trials have been conducted at the Dickinson Experiment Station since 1908, and have provided much useful information on the varietal performance of the several small grains under western North Dakota conditions. New varieties are being developed periodically, and these need to be compared with the varieties currently in use and evaluated for possible future use in this region.

The variety trials are seeded on summerfallow. First tillage of the summerfallow is with the moldboard plow. Maintenance of the summerfallow is with the duckfoot cultivator. Tillage of the summerfallow before seeding is with the duckfoot cultivator. Seeding is done with a double disk press drill in a randomized block arrangement. Seeding rates are 1 bushel per acre for wheat, durum and rye, 1 ¼ bushel per acre for barley, 1 ½ bushel per acre for oats and ½ bushel per acre for flax.

Fertilizer application is uniform for all varieties and follows recommendations based on soil test. Present recommendations for this site are 5 – 10 lbs. nitrogen per acre and 35 – 40 lbs. P_2O_5 per acre when soil moisture is low at seeding time. The nitrogen will be increased to 15-30 lbs. per acre when the soil moisture at seeding time is medium, and 35-45 lbs. per acre when soil moisture at seeding is high.

Uniform weed control follows the current recommendations of the North Dakota Agricultural Experiment Station.

In 1968 the wheat, durum, barley and oat variety trials were seeded at the Station on April 11. Seed of several varieties being increased in the South, and not available for the April 11 seeding were seeded along with several check varieties on April 26.

Off-station grain variety trials were seeded at Beach on April 17, at Bowman on April 18, at Hettinger on April 23, Killdeer on April 24 and at Glen Ullin on April 25.

Results of all spring seeded small grain variety trials conducted by the Dickinson Experiment Station in 1968 are summarized in the following tables 1 thru 20.

The 1967-68 winter grain variety trials were seeded at Dickinson on September 7, at Beach on September 8, and at Bowman on September 11, 1967. Germination, was excellent, and fall growth was vigorous for all entries. The trials at Dickinson winterkilled completely, with less than a 1% stand survival. The trials at Bowman survived the winter in good condition, and withstood the dry conditions to produce satisfactorily. Growing conditions at Beach, especially with reference to late spring rainfall, were more favorable than at Bowman, and yields at the Beach site were exceptionally good.

Results of the fall seeded small grain variety trials conducted by the Dickinson Experiment Station are summarized in tables 21 thru 23.

Table 1. Wheat Variety Trial.

Variety or Treatment	Entry No.	Yield - Rep 1	in Rep 2	bushels Rep 3	per Rep 4	acre Average	Test weight	Heading date	Diseases	Lodging %	Height inches
Thatcher	1	23.8	22.4	27.7	35	27.23	58.5	6-Jul			35
Selkirk	7	22	22.2	33.4	21.5	24.78	57	5-Jul			34
Justin	8	22.9	28.4	32.3	49.5	33.28	58	7-Jul			31
Chris	15	21.1	22.7	20.5	35.2	24.88	57.5	7-Jul			34
Manitou	34	28.6	28.8	26.4	49.5	33.33	58.5	5-Jul			35
II-55-II	38	29	27.7	36.3	45.3	34.58	61	8-Jul			34
Valley 1/	41	22	25.7	21.3	32.3	25.33	58	26-Jun			34
ND 363-1	45	26.4	30.4	26.8	33	29.15	58	4-Jul			31
Red River 68 1/		29.3	29.7	33.9	39.1	33	60	30-Jun			29
RL 4200		29.9	29.7	35.6	38.5	33.43	59	28-Jun			34
M3-1		26.4	24.2	31.5	42.9	31.25	60	2-Jul			34
M4-1		23.8	23.8	23.3	34.1	26.25	59	5-Jul			34
M4-7		24.6	24.9	24.9	31.5	26.48	59.5	5-Jul			33
M4-9		25.1	25.1	25.5	33	27.18	59	3-Jul			36
Fortuna	54	31.7	27.7	32.5	38.5	32.6	59.5	3-Jul			34
Sel. S659		30.4	34.1	30.3	33.9	32.18	59	28-Jun			36
Sel. S 6579		31.7	28.8	30.4	40.7	32.9	59.5	3-Jul			34
Wisc. 271		31.8	31.7	36.9	41.4	35.45	59	27-Jun			28
Canthatch	10	25.1	25.1	29.2	34.1	28.36	59.5	6-Jul			33
Tobari 66		31.7	28.6	29.7	49.5	34.88	58	27-Jun			32
Sheridan		25.5	24.9	30.1	33.7	28.55	60	8-Jul			35

1/ New seed lots will be finished.

Analysis of Variance

Source	DF	SS	MS	F,/
Replication	3.	1660.74	553.58	39.61
Treatments	20.	1040.91	52.05	3.72
Error	60.	838.59	13.98	
Total	83.	3540.24		

Standard error of a treatment mean = 1.8693

Standard error of a difference among treatment means = 2.6435

The C.V. = 12.36 P.C. The L.S.D. @ 5% is 5.29 bushels per acre.

Table 2. Wheat Varieties Trial. No. 2

Yield – in bushels per acre

Variety of Treatment	Entry No.	Rep 1	Rep 2	Rep3	Rep 4	Average	Test weight	Heading date	Diseases	Lodging %	Height inches
Justin		39.4	28.6	38	37	35.78	56.5	15-Jul			34
Chris		27.5	26.8	35	33.7	30.85	53.5	14-Jul			36
R.R. 68		37	34.5	32	37.5	35.13	61	7-Jul			29
ND 363-1		38.1	40.9	29	27.1	33.65	54	12-Jul			31
Fortuna		38	36.7	30	33.7	34.58	60.5	12-Jul			34
ND 480		34.3	34.4	27	24.4	30.03	56.5	7-Jul			34
Tobari 66		35.4	38.9	31	33.7	34.75	61	4-Jul			28
Ciano 67		30.1	27.1	41	33.6	32.83	61	30-Jun			27

Analysis of Variance

Source	DF	SS	MS	F,/
Replication	3.	28.63	9.54	.39
Treatments	7.	120.35	17.19	.70
Error	21.	513.42	24.45	
Total	31.	662.40		

Standard error of a treatment mean = 2.4723
Standard error of a difference among treatment means = 3.4963
The C.V. = 14.78 P.C. The L.S.D. @ 5% is 7.27 bushels per acre.

Table 3. Off – Station Wheat Varieties – Beach Site.

Variety of Treatment	Entry No.	Yield – bushels per acre				Test Weight
		Rep1	Rep2	Rep3	Average	
Thatcher		30.7	34.5	49.2	38.13	57.5
Selkirk		36.9	35.3	32.6	35.00	56.5
Justin		37.9	34.2	38.7	36.93	56.0
Chris		36.0	30.7	38.7	35.13	54.5
Manitou		40.1	41.7	42.8	41.53	56.5
Valley		32.0	40.6	43.6	38.73	58.0
Red River 68		49.9	43.6	49.9	47.80	61.5
ND 363-1		43.6	41.6	44.9	43.37	58.0
Polk		40.1	41.7	46.0	42.60	58.5
Fortuna		48.3	51.6	56.9	52.27	60.5
Sheridain		43.2	44.3	45.4	44.30	58.5
Canthatch		29.6	36.8	36.3	34.23	54.5
Crim		37.1	36.8	34.4	36.10	55.5
Pembina		35.5	34.2	35.3	35.00	58.0
Tobari 66		43.5	42.8	42.5	42.93	59.0

Analysis of Variance

Source	DF	SS	MS	F
Replication	2.	112.31	56.16	4.67
Treatments	14.	1183.17	84.51	7.02
Error	28.	336.89	12.03	
Total	44.	1632.37		

Standard error of a treatment mean = 2.0026
Standard error of a difference among treatment means = 2.8322
The CV = 8.61 P.C.
The L.S.D. @ 5% is 5.80 bushels per acre.

Table 4. Off – Station Wheat Variety Trials – Bowman Site.

Variety of Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep 3	Rep4	Average	
Thatcher		17.1	28.9	32.9	31.3	27.55	58.5
Selkirk		19.0	18.2	29.9	32.5	24.90	57.0
Justin		27.5	26.5	43.2	36.0	33.30	56.5
Chris		22.7	21.9	38.4	43.8	31.70	57.0
Manitou		22.5	28.0	42.4	37.9	32.70	56.5
Valley		20.9	28.8	48.1	41.9	34.93	55.0
Red River 68		24.9	28.8	50.4	48.3	38.08	60.5
ND 363-1		19.3	37.2	46.5	29.4	33.10	53.5
Polk		21.4	34.7	50.5	49.2	38.95	56.5
Fortuna		24.6	34.9	49.6	52.3	40.35	59.0
Sheridan		17.1	32.0	46.7	43.2	34.75	57.5
Canthatch		16.5	28.9	40.1	42.4	31.98	52.5
Crim		21.7	32.8	41.7	31.3	31.88	57.0
Pembina		16.0	19.2	28.1	37.7	25.25	58.0
Tobari 66		29.7	33.1	40.3	45.2	37.08	59.0

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	4233.86	1411.28	64.46
Treatments	14.	1191.92	85.14	3.89
Error	42.	919.50	21.89	
Total	59.	6345.25		

Standard error of a treatment = 2.3395
Standard error of a difference among treatment means = 3.3085
The CV = 14.14 P.C.
The L.S.D. @ 5% is 6.68 bushels per acre

Table 5. Off – Station Wheat Varieties – Glen Ullin.

Variety of Treatment	Entry No.	Yield – bushels per acre					Test Weight
		Rep1	Rep2	Rep3	Rep4	Average	
Thatcher		37.6	31.5	37.7	39.0	36.46	59.5
Selkirk		42.4	35.3	46.5	39.3	40.88	57.5
Justin		45.2	47.0	38.5	37.4	42.03	55.5
Chris		43.5	33.4	39.2	41.6	39.43	56.5
Manitou		46.4	45.4	38.8	42.7	43.33	55.5
Valley		50.2	37.7	34.4	36.3	39.65	58.5
Red River 68		62.5	33.7	42.0	48.8	46.75	62.0
ND 363-1		51.2	32.8	41.7	37.9	40.90	57.0
Polk		58.8	47.0	42.4	46.5	48.68	59.5
Fortuna		59.5	46.0	40.9	41.1	46.88	61.0
Sheridan		53.9	48.6	54.0	41.6	49.53	58.0
Canthatch		38.4	33.7	42.2	42.7	39.25	55.0
Crim		39.2	28.9	42.0	37.6	36.93	57.0
Pembina		48.3	40.1	45.6	36.1	42.53	60.0
Tobari 66		59.6	38.5	48.4	34.4	45.23	61.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	959.35	319.78	11.36
Treatments	14.	935.95	66.85	2.38
Error	42.	1181.87	28.14	
Total	59.	3077.17		

Standard error of a treatment mean = 2.6523
Standard error of a difference among treatment means = 3.7510
The CV = 12.46 P.C.
The L.S.D. @ 5% is 7.57 bushels per acre.

Table 6. Off-Station Wheat Variety Trials – Hettinger Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Thatcher		21.3	21.6	29.1	19.5	22.88	52.5
Selkirk		16.8	18.5	22.7	24.5	20.63	56.0
Justin		21.7	19.5	25.1	18.7	21.25	54.5
Chris		21.6	22.5	19.7	27.3	22.78	54.5
Manitou		23.5	21.9	29.7	28.0	25.78	53.0
Valley		23.3	16.6	17.9	17.1	18.73	53.0
Red River 68		24.8	21.4	22.7	41.7	27.65	57.5
ND 363-1		20.9	22.5	25.9	41.1	27.60	54.0
Polk		26.1	21.6	23.2	24.5	23.85	57.0
Fortuna		29.4	24.8	21.4	33.6	27.30	57.5
Sheridan		18.7	17.9	19.3	24.5	20.10	53.5
Canthatch		18.4	19.8	24.8	34.4	24.35	55.5
Crim		15.5	20.0	19.7	21.7	19.23	53.0
Pembina		16.1	18.7	22.9	34.5	23.05	53.0
Tobari 66		15.5	16.6	18.5	20.8	17.85	52.0

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	476.04	158.68	8.51
Treatments	14.	589.93	42.14	2.26
Error	42.	782.73	18.64	
Total	59.	1848.69		

Standard error of a treatment mean = 2.1585
Standard error of a difference among treatment means 3.0526
The CV = 18.88 P.C.
The L.S.D. @ 5% is 6.16 bushels per acre

Table 7. Off – Station Wheat Variety Trials – Killdeer site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep 3	Rep4	Average	
Thatcher		49.7	55.9	46.7	40.3	48.15	59.5
Selkirk		44.1	46.7	43.2	37.1	42.78	55.5
Justin		65.1	53.2	45.7	35.5	49.88	56.0
Chris		58.3	56.9	36.9	40.4	48.13	55.5
Manitou		58.0	53.7	41.1	42.0	48.70	55.5
Valley		64.9	45.4	46.4	34.1	47.70	57.0
Red River 68		61.1	60.4	49.2	46.5	54.30	62.0
N.D. 363-1		65.1	70.8	49.9	49.9	58.93	55.0
Polk		55.5	49.1	32.6	35.2	43.10	57.5
Fortuna		55.6	57.1	47.6	45.2	51.38	58.5
Sheridan		57.9	68.9	50.5	44.1	55.35	57.5
Canthatch		49.2	40.1	39.2	31.5	40.00	54.0
Crim		44.0	48.9	37.1	32.9	40.73	55.5
Pembina		50.7	52.0	44.4	39.2	46.58	59.0
Tobari 66		57.2	50.7	44.0	31.5	45.85	59.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	2934.08	978.03	47.14
Treatments	14.	1613.30	115.24	5.55
Error	42.	871.41	20.75	
Total	59.	5418.79		

Standard error of a treatment mean = 2.2775
Standard error of a difference among treatment means 3.2209
The CV = 9.47 P.C.
The L.S.D. @ 5% is 6.50 bushels per acre.

Table 8. Durum Variety Trials.

Variety or Treatment	Entry	Yield – bushels per acre					Test weight	Heading date	Height inches
		Rep1	Rep2	Rep3	Rep4	Average			
Mindum		38.5	43.1	43.8	38.3	40.9	53.0	7-11	43
Wells		42.5	52.1	48.2	44.0	46.7	57.5	7-8	40
Leeds		41.8	40.9	45.3	41.4	42.4	58.0	7-8	39

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	60.68	20.23	3.63
Treatments	2.	77.41	36.20	6.50
Error	6.	33.44	5.57	
Total	11.	166.52		

Standard error of a treatment mean = 1.10804
Standard error of a difference among treatment means = 1.6694
The CV = 5.45 P.C.
The L.S.D. @ 5% is 4.09 bushels per acre.

Table 9. Oat Variety Trial.

Variety or Treatment	Entry No.	Yield – bushels per acre					Heading Date	Height inches
		Rep1	Rep2	Rep3	Rep4	Average		
Burnett	3	53.2	62.3	82.5	81.5	69.88	6-26	32
Russell	5	38.8	49.5	70.6	71.4	57.58	7-5	33
Garry	9	33.8	53.6	59.0	60.9	51.83	7-7	35
Rodney	10	45.0	67.3	80.5	69.7	65.63	7-3	33
Ortley	13	40.4	52.0	71.8	66.8	57.75	7-8	34
Lodi	14	50.6	56.7	90.4	78.0	68.98	7-8	35
Brave	27	49.9	49.5	81.7	73.2	63.58	6-27	30
Harmon	30	37.1	42.3	83.4	64.4	56.80	7-8	34
Kelsey	33	45.0	56.9	86.7	71.4	65.00	7-4	31
Sioux	34	47.5	58.8	84.2	79.4	67.48	7-5	32
Portal	35	44.6	47.0	73.9	65.6	57.78	6-30	32
Holden	36	54.7	62.9	90.0	82.1	72.43	6-28	31
C.I. 8178	37	48.5	44.4	73.0	61.1	56.75	7-3	31

Analysis of Variance

Source	DF	SS	MS	F
Replications	3.	9295.40	3098.47	132.58
Treatments	12.	1941.23	161.77	6.92
Error	36.	841.35	23.37	
Total	51.	12077.98		

Standard error of a treatment mean = 2.4172
Standard error of a difference among treatment means = 3.4184
The CV = 7.75 P.C. The L.S.D. @ 5% is 6.93 bushels per acre.

Table 10. Off -Station Oat Variety Trials – Beach Site.

Variety or Treatment	Entry No.	Yield – bushels per acre				Test weight
		Rep1	Rep2	Rep3	Average	
Lodi		106.1	87.8	98.3	97.40	28.5
Kelsey		102.5	138.5	127.4	122.80	31.5
Sioux		92.9	126.8	199.6	139.77	32.5
Portal		83.9	106.7	120.2	103.60	30.5
Holden		120.5	119.9	121.7	120.70	32.5

Analysis of Variance

Source	DF	SS	MS	F
Replications	2.	2608.02	1304.01	2.15
Treatments	4.	3387.79	846.95	1.39
Error	8.	4859.97	607.50	
Total	14.	10855.78		

Standard error of a treatment mean = 14.2302
Standard error of a difference among treatment means 20.1246
The CV = 21.09 P.C.
The L.S.D. @ 5% is 46.41 bushels per acre

Table 11. Off – Station Oat Variety Trials – Bowman Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Burnett		121.1	87.5	94.7	150.5	113.45	32.5
Russell		143.6	106.1	126.8	155.0	132.88	33.0
Lodi		110.0	99.8	87.2	117.5	103.63	31.0
Ortley		94.7	75.2	68.3	107.9	86.53	34.0
Kelsey		115.1	98.0	106.7	133.7	113.38	34.5
Sioux		111.8	97.4	85.7	124.4	104.83	36.0
Portal		96.5	113.3	84.5	117.8	103.03	32.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	5814.48	1938.16	19.81
Treatments	6.	4768.38	794.73	8.12
Error	18.	1761.13	97.84	
Total	27.	12343.99		

Standard error of a treatment mean = 4.9457
Standard error of a difference among treatment means 6.9943
The CV = 9.14 P.C.
The L.S.D. @ 5% is 14.70 bushels per acre.

Table 12. Off – Station Oat Variety Trials – Glen Ullin Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Burnett		131.2	100.4	89.0	108.2	107.20	33.0
Russell		112.1	119.0	142.7	104.3	119.53	33.5
Minton		111.2	89.9	120.2	108.5	107.45	32.5
Garry		100.4	118.1	97.7	106.1	105.58	32.0
Lodi		66.2	94.1	89.0	107.0	89.08	31.0
Ortley		87.5	110.3	109.4	89.0	99.05	35.5
Kelsey		130.1	125.9	107.0	127.1	122.53	33.0
Sioux		120.8	128.0	118.7	106.7	118.55	33.5
Portal		115.1	94.1	112.1	103.1	106.10	32.5
Holden		107.9	96.5	96.8	105.2	101.60	33.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	20.08	6.69	.04
Treatments	9.	3774.53	419.39	2.38
Error	27.	4765.51	176.50	
Total	39.	8560.12		

Standard error of a treatment mean = 6.6427
Standard error of a difference among treatment means 9.3942
The CV = 12.34 P.C.
The L.S.D. @ 5% is 1928 bushels per acre.

Table 13. Off – Station Oat Variety Trials – Hettinger Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Burnett		33.9	51.9	67.7	84.8	59.58	32.0
Russell		63.8	58.4	82.7	94.1	74.75	30.0
Minton		64.4	66.5	71.0	65.0	66.73	25.0
Garry		60.8	94.1	94.4	66.8	79.03	31.5
Lodi		61.1	49.2	83.6	64.7	64.65	28.5
Ortley		61.4	95.6	66.5	92.3	78.95	33.0
Kelsey		59.3	50.1	63.5	77.9	62.70	27.5
Sioux		59.3	72.5	93.8	75.2	75.20	28.0
Portal		66.8	70.1	74.0	73.7	71.15	30.5
Holden		80.6	80.0	84.5	69.5	78.65	29.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	1823.79	607.93	4.01
Treatments	9.	1902.72	211.41	1.40
Error	27.	4088.59	151.43	
Total	39.	7815.10		

Standard error of a treatment mean = 6.1528
Standard error of a difference among treatment means 8.7014
The CV = 17.0 P.C.
The L.S.D. @ 5% is 17.86 bushels per acre.

Table 14. Off – Station Oat Variety Trials – Killdeer Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Burnett		124.1	144.8	128.0	108.8	126.43	32.5
Russell		125.3	129.5	178.3	154.1	146.80	32.0
Minton		101.9	122.9	152.3	135.5	128.15	30.5
Garry		103.7	181.3	138.2	127.1	137.58	30.5
Lodi		101.9	125.3	140.3	110.3	119.45	29.5
Ortley		121.7	128.0	118.4	112.1	120.05	34.5
Wyndmere		67.7	110.0	116.9	102.2	99.20	32.0
Dawn		74.0	85.4	78.2	68.9	76.63	34.5
Kelsey		103.1	127.1	169.7	145.1	136.25	33.5
Sioux		124.4	132.2	130.4	98.0	121.25	32.5
Portal		92.9	104.9	130.7	124.4	113.23	30.5
Holden		94.7	128.0	97.4	114.8	108.73	34.0

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	5730.93	1910.31	7.33
Treatments	11.	15538.11	1412.56	5.42
Error	33.	8605.49	260.77	
Total	47.	29874.53		

Standard error of a treatment mean = 8.0742
Standard error of a difference among treatment means = 11.4187
The CV = 13.52 P.C.
The L.S.D. @ 5% is 23.23 bushels per acre.

Table 15. Barley Variety Trials.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight	Heading date	Height inches
		Rep1	Rep2	Rep3	Rep4	Average			
Larker		66.6	68.5	65.5	63.3	66.0	50.5	7-3	28
Dickson	15	51.2	79.1	61.3	63.3	63.7	51.5	7-5	30
Conquest	33	50.1	74.5	67.7	56.7	62.3	49.5	6-28	31
Keystone	09	56.1	72.2	66.8	59.7	63.7	49.0	7-5	31
Yukon	18	52.8	64.6	71.2	57.8	61.6	48.0	7-2	33
Primus		52.3	66.8	58.0	64.9	60.5	49.0	6-25	28
Paragon		59.7	64.9	59.1	67.7	62.9	51.0	7-4	29
B-130		63.8	76.5	57.2	60.0	64.4	50.5	7-4	27
Galt	35	61.9	69.3	67.9	71.0	67.5	50.0	7-3	26
B-133		55.8	68.8	56.7	50.6	58.0	52.0	7-4	30
B-134		45.7	53.1	55.0	51.4	51.3	52.0	7-4	33
B-136		45.4	52.3	53.6	46.5	49.5	48.0	7-5	30
B-137		41.3	53.6	43.5	53.6	48.0	44.0	6-29	29
B-138		53.6	67.9	63.3	55.0	60.0	43.5	7-5	27
Betzes	12	57.5	74.3	66.0	56.7	63.6	47.0	7-3	27

Analysis of Variance

Source	DF	SS	MS	F
Replications	3.	1290.61	430.20	17.58
Treatments	14.	2010.97	143.64	5.87
Error	42.	1027.80	24.47	
Total	59.	4329.38		

Standard error of a treatment mean = 2.4734
Standard error of a difference among treatment means = 3.4980
The CB = 8.22 P.C. The L.S.D. @ 5% is 7.06 bushels per acre.

Table 16. Off – Station Barley Variety Trials – Beach Site.

Variety or Treatment	Entry No.	Yield – bushels per acre				Test weight
		Rep1	Rep2	Rep3	Average	
Conquest		101.9	112.7	94.3	102.97	46.5
Keystone		102.3	118.5	84.1	101.63	46.0
Primus		82.5	102.7	78.5	87.90	48.0
Galt		99.1	128.9	84.5	104.17	46.5
Paragon		99.9	136.3	73.3	103.17	48.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	2.	3460.25	1730.13	20.83
Treatments	4.	555.78	138.95	1.67
Error	8.	664.34	83.01	
Total	14.	4680.37		

Standard error of a treatment mean – 5.2613
Standard error of a difference among treatment means 7.4405
The CV = 9.12 P.C.
The L.S.D. @ 5% is 17.16 bushels per acre

Table 17. Off – Station Barley Variety Trials – Bowman Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Conquest		46.8	45.6	44.2	59.3	48.98	43.0
Keystone		46.6	49.0	60.5	55.0	52.78	40.5
Primus		53.2	40.6	52.2	54.8	50.20	41.5
Galt		75.3	57.6	69.5	79.1	70.38	45.0
Paragon		59.1	62.9	63.5	70.7	64.05	44.0
Dickson		52.2	48.4	49.8	62.5	53.23	42.5
Betzes		52.4	55.8	65.7	68.1	60.50	45.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	613.53	204.51	9.10
Treatments	6.	1533.65	255.61	11.37
Error	18.	404.61	22.48	
Total	27.	2551.79		

Standard error of a treatment mean = 2.3706
Standard error of a difference among treatment means = 3.3525
The CV = 8.29 P.C.
The L.S.D. @ 5% is 7.04 bushels per acre.

Table 18. Off – Station Barley Variety Trials – Glen Ullin Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Traill		50.6	77.5	64.0	66.7	64.70	48.5
Dickson		64.8	68.7	71.9	65.3	67.68	46.0
Conquest		63.1	96.3	72.9	72.7	76.25	47.5
Keystone		46.6	88.5	70.5	82.3	71.98	48.0
Yukon		79.5	87.1	70.5	116.3	88.35	46.0
Primus		56.8	90.3	72.3	84.1	75.88	48.5
Galt		63.3	85.1	114.9	71.9	83.80	46.0
Betzes		40.0	75.3	63.3	93.9	68.13	46.0
Jubilee		72.3	88.7	90.5	70.9	80.60	48.0
Paragon		48.4	65.3	67.1	62.5	60.83	48.0
Trophy		64.7	50.2	64.1	89.5	67.13	47.5
Hypana		56.6	77.7	77.9	93.3	76.38	48.5
Unitan		72.9	71.3	64.9	89.1	74.55	47.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	3542.80	1180.93	7.43
Treatments	12.	2973.74	247.81	1.56
Error	36.	5719.63	158.88	
Total	51.	12236.17		

Standard error of a treatment mean = 6.3024
Standard error of a difference among treatment means = 8.9129
The CV = 17.14 P.C.
The L.S.D. @ 5% is 18.08 bushels per acre

Table 19. Off – Station Barley Variety Trials – Hettinger Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Dickson		22.0	44.0	38.2	55.4	39.90	31.0
Conquest		29.4	49.2	40.4	45.8	41.20	36.0
Keystone		38.6	59.9	56.4	74.1	57.25	34.0
Yukon		34.6	67.1	33.0	40.4	43.78	35.0
Primus		40.8	54.8	51.4	53.0	50.0	33.0
Galt		36.4	59.3	53.2	58.8	51.93	32.0
Betzes		44.0	48.4	46.4	43.0	45.45	35.5
Jubilee		41.0	48.4	46.2	61.3	49.23	35.0
Paragon		43.2	62.5	40.0	58.4	51.03	34.5
Hypana		52.0	47.2	54.8	38.4	48.10	34.0

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	1604.41	534.80	7.92
Treatments	9.	1005.48	111.72	1.65
Error	27.	1824.00	67.56	
Total	39.	4433.89		

Standard error of a treatment mean = 4.1096
Standard error of a difference among treatment means = 5.8119
The CV = 17.20 P.C.
The L.S.D. @ 5% is 11.93 bushels per acre.

Table 20. Off – Station Barley Variety Trials – Killdeer Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Traill		60.5	56.6	65.5	88.5	67.78	45.0
Dickson		74.5	59.1	82.9	84.3	75.20	47.0
Conquest		80.9	62.9	89.5	75.1	77.10	45.5
Keystone		62.9	73.7	83.7	72.5	73.20	42.0
Yukon		71.1	72.7	74.5	95.5	78.45	46.0
Primus		51.4	71.1	63.1	41.8	56.85	46.0
Galt		77.3	79.5	78.3	85.3	80.10	45.5
Betzes		67.1	70.1	80.3	79.3	74.20	47.5
Jubilee		86.3	78.5	72.1	79.3	79.05	44.0
Paragon		63.5	87.1	82.7	76.3	77.40	46.5
Trophy		73.7	64.5	71.5	69.3	69.75	46.5
Hypana		56.6	78.7	58.9	54.8	62.25	46.5
Unitan		56.8	71.1	76.9	73.9	69.68	45.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	490.68	163.56	1.81
Treatments	12.	2318.36	193.20	2.14
Error	36.	3246.53	90.18	
Total	51.	6055.57		

Standard error of a treatment mean = 4.7482
Standard error of a difference among treatment means = 6.7150
The CV = 13.12 P.C.
The L.S.D. @ 5% is 13.62 bushels per acre.

Table 21. Off – Station Winter Wheat Variety Trials – Beach site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Minter		51.2	53.9	57.1	55.9	54.53	61.5
Winalta		55.8	49.0	59.1	51.1	56.25	63.0
Cheyenne		58.7	34.5	63.1	56.0	53.08	62.5
Hume		49.0	36.0	54.4	54.6	48.55	62.0
Lancer		54.3	53.1	57.9	55.8	55.28	63.0

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	504.63	168.21	6.13
Treatments	4.	145.76	36.44	1.33
Error	12.	329.31	27.44	
Total	19.	979.71		

Standard error of a treatment mean = 2.6193
Standard error of a difference among treatment means = 3.7042
The CV = 9.79 P.C.
The L.S.D. @ 5% is 8.07 bushels per acre.

Table 22. Off – Station Winter Wheat Variety Trials – Bowman Site.

Variety or Treatment	Entry No.	Yield – in bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Minter		40.6	40.4	41.5	30.9	38.35	60.0
Winalta		29.9	31.4	24.3	23.4	27.25	61.0
Cheyenne		30.3	34.2	29.5	40.0	33.50	60.0
Hume		23.2	34.1	26.9	27.5	27.93	59.5
Lancer		38.7	33.4	26.9	30.5	32.38	60.5

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	73.24	24.41	1.15
Treatments	4.	327.24	81.81	3.86
Error	12.	254.44	21.20	
Total	19.	654.91		

Standard error of a treatment mean = 2.3023
Standard error of a difference among treatment means = 3.2560
The CV = 14.44 P.C.
The L.S.D. @ 5% is 7.09 bushels per acre.

Table 23. Off – Station Rye Variety Trials – Bowman Site.

Variety or Treatment	Entry No.	Yield – bushels per acre					Test weight
		Rep1	Rep2	Rep3	Rep4	Average	
Antelope		30.0	35.4	42.1	31.4	34.73	52.0
Frontier		41.6	36.3	39.8	38.8	39.13	54.0
Caribou		33.0	34.4	40.7	39.7	36.95	53.0
Von Lochow		37.4	43.2	32.1	41.4	38.53	53.0

Analysis of Variance

Source	DF	SS	MS	F
Replication	3.	21.61	7.20	.33
Treatments	3.	46.32	15.44	.70
Error	9.	197.68	21.96	
Total	15.	265.62		

Standard error of a treatment mean = 2.3455
Standard error of a difference among treatment means = 3.3140
The CV – 12.55 P.C.
The L.S.D. @ 5% is 7.50 bushels per acre

Nursery Trials With Small Grain

Small scale nursery trials with small grains are grown each year at the Dickinson Station. Two types of nurseries are grown, the Cooperative Regional nurseries and plantings of material developed by the North Dakota Agricultural Experiment Station at Fargo or Dickinson.

In the regional trials the same varieties and newly developed strains of small grain are grown at many stations in the upper Midwest. This permits a rapid evaluation of these varieties and potential varieties grown under a wide range of climatic and weather conditions. This work is most useful in the evaluation and development of new varieties. It is also one means of getting and early look at a large number of varieties that have been developed in other states, and Canada.

Special nurseries of material developed at North Dakota State University are grown at Dickinson from time to time to aid in the evaluation of this material under western North Dakota climatic and weather conditions.

A limited amount of wheat breeding work is done at Dickinson, and six separate plantings are made with material produced from this work. Selections from the breeding work are grown in short rows for observation and further selection. Material advanced through the F-5 planting is tested in a yield nursery large enough to provide seed for quality tests.

Table 24. uniform Regional Spring Wheat Nursery 1968.

Entry		Yield – bushels per acre				Test	Dates		Height	Leaf
No.	Description	1	2	3	Av.	Wt.	head	ripe	inches	rust
1	Marquis	24.5	21.4	33.7	26.5	59.0	7-3	8-15	32	40
2	Thatcher	28.7	27.7	26.2	27.5	60.5	7-3	8-12	35	25
3	Justin	29.8	32.8	34.1	32.2	60.0	7-5	8-14	36	25
4	Chris	33.2	34.6	46.6	38.1	55.5	7-6	8-14	36	T-10
5	Manitou	33.8	36.1	35.4	35.1	59.0	7-5	8-11	35	T
6	ND 363-1	38.5	38.6	42.1	39.7	57.0	6-29	8-14	36	0
7	Polk-II-55-11	35.5	32.7	40.8	36.3	59.0	7-6	8-16	36	T
8	Wisc. 271**	35.4	34.6	39.8	36.6	60.5	6-28	8-10	31	T
9	RL 4200	38.8	37.4	41.1	39.1	60.0	7-3	8-13	38	T
10	RL 4220	39.3	36.6	35.6	37.2	60.0	7-3	8-11	40	T
11	K 48-44	38.2	38.7	36.4	37.8	59.5	6-30	8-10	38	T-5
12	M 4-1	31.2	31.3	32.6	31.7	60.0	7-4	8-15	37	30
13	M 4-7	34.4	33.8	27.0	31.7	60.5	7-4	8-14	37	10
14	ND 476**	46.8	44.8	45.4	45.7	61.5	7-4	8-13	30	T
15	ND 481**	32.5	39.4	36.2	36.0	60.0	7-2	8-12	32	T-5
16	ND 482	35.2	40.0	30.2	35.1	57.0	7-6	8-14	38	T
17	S 659	37.4	42.2	42.5	40.7	57.0	7-5	8-15	37	T
18	S 6579	40.3	39.4	41.3	40.3	59.5	6-30	8-11	36	0
19	MT 6610	42.2	41.6	30.8	38.2	61.0	7-3	8-15	40	80
20	MT 6661	37.1	32.2	29.4	32.9	60.0	6-26	8-11	36	60
21	II-62-2**	48.5	49.5	31.4	43.1	58.5	7-8	8-16	28	T
22	II-62-61**	51.4	50.6	40.7	47.6	61.5	7-7	8-15	31	10
23	II-62-68**	41.1	45.6	24.2	37.0	60.5	7-8	8-15	30	10
24	Red River 68**	40.7	40.1	28.1	36.3	60.5	6-27	8-10	34	T

**Semi dwarf types.

Table 25. Advanced Station Hard Spring Wheat Nursery – 1968.

Entry No.	Description	Yield – bushels per acre 1	2	3	Avg.	Test wt.	Date head	Height inches
1	Conley x ND 45	41.2	29.2	27.3	32.6	59.5	7-8	39
2	Conley x ND 45	34.1	30.3	30.6	31.7	59.0	7-8	37
3	Conley x ND 45	34.8	28.1	34.4	32.4	60.0	7-10	38
4	Conley x ND 45	35.5	27.6	36.7	33.3	59.0	7-9	36
5	RL 2937 x ND 45	32.4	33.0	30.4	31.9	59.0	7-4	37
6	RL 2937 x ND 45	33.2	28.4	35.1	32.2	58.5	7-6	37
7	RL 2937x ND 45	30.0	32.5	35.4	32.6	60.5	7-6	37
8	RL 2937 x ND 45	38.4	32.5	35.0	35.3	59.0	7-3	38
9	ND 49 x PiPrem-II-44-22	33.5	35.3	40.4	36.4	59.0	7-5	42
10	ND 49 x PiPrem-II-44-22	36.6	29.7	33.7	33.3	59.0	7-7	40
11	ND 49 x PiPrem-II-44-22	30.4	34.6	31.4	32.1	59.0	7-6	38
12	Crim	31.3	30.7	33.4	31.8	60.0	7-5	38
13	Justin	31.7	23.1	28.5	27.8	60.0	7-7	36
14	Chris	22.8	22.5	26.5	23.9	59.5	7-7	37
15	Red River 68	37.7	39.4	40.1	39.1	61.0	6-30	32

Table 26. Station Hard Spring Wheat Nursery 1968.

Entry No.	Description	Yield – bushels per acre 1	2	3	Av.	Test wt.	Date head	Height inches
1	ND 152	36.8	29.8	37.0	34.5	61.5	7-7	33
2	Dix 0.97	29.2	23.1	25.7	26.0	59.0	7-2	34
3	ND 152 x Dix 0.97	33.0	25.8	32.3	30.4	58.0	7-8	35
4	ND 152 x Dix 0.97	20.1	19.5	21.3	20.3	59.5	7-8	36
5	ND 42-3-1-5 x Dix 0.97	22.8	15.7	22.5	20.3	60.0	7-8	35
6	Conley x Dix 0.97	22.8	21.7	19.6	21.4	58.5	7-8	36
7	ND 137-2	18.7	16.2	21.3	18.7	60.5	7-6	36
8	ND 137-2x Dix 0.97	31.2	25.2	27.3	27.9	59.5	7-8	33
9	ND 138-1	24.7	23.2	25.4	24.4	60.0	7-8	35
10	Dix 0.97 x Justin	26.4	24.4	28.0	26.3	59.0	7-7	35
11	Dix 0.97 x Justin	29.4	24.2	23.4	25.7	58.5	7-7	35
12	Dix 0.97 x Justin	24.1	29.7	21.0	24.9	59.0	7-7	33
13	Justin x 0.97	18.6	18.5	20.2	19.1	57.0	7-7	36
14	Justin x 0.97	27.5	27.7	34.1	29.8	59.0	7-7	35
15	Pi-Prem-II-44-22xND 102	20.7	26.7	25.3	24.2	59.0	7-7	34
16	ND 102 x Pi-Prem-II-44-22	30.1	28.3	31.5	30.0	60.5	7-6	35
17	ND 102 x Pi-Prem-II-44-22	16.2	19.3	18.5	18.0	59.0	7-6	35
18	Pi-Prem-II-44-22 x II-53-541	25.8	28.4	31.5	28.6	60.0	7-7	34
19	Pi-Prem-II-44-22x II-53-541	26.2	28.8	32.6	29.2	59.0	7-8	34
20	II-53-541 x Pi-Prem II-44-22	28.3	27.2	34.2	29.9	60.5	7-8	35
21	Pi-Prem II-44-22 x ND 102 Sib	29.2	31.2	36.3	32.2	59.5	7-9	33
22	Pi-Prem II-44-22 x ND 102 Sib	26.8	27.4	34.2	29.5	57.0	7-9	34
23	Pi-Prem II-44-22 x ND 102 Sib	31.1	37.5	38.6	35.7	54.5	7-9	34
24	1552-Mida-H44x 1018 Mercury x ND 102 Sib	31.4	30.9	37.5	33.3	59.0	7-8	34
25	1552-Mida H44 x 1018 Mercury x II-53-541	25.3	31.2	35.1	30.5	56.5	7-9	34
26	1552-Mida H44 x 1018 Mercury x II-53-541	28.2	31.8	35.4	31.8	59.5	7-9	32
27	2083-2247 x ND 102 Sib	23.4	28.7	29.7	27.3	59.5	7-7	34
28	2083-2247 x ND 102 Sib	23.7	28.8	29.8	27.4	60.0	7-7	32
29	2083-2247 x II-53-541	14.6	31.6	33.4	26.5	59.5	7-7	34
30	II-53-541 x 2083-2247	26.2	27.4	27.8	27.1	60.0	7-7	34

Table 27. Special Nursery Planting of Krop King Seed Company Wheats 1968.

Variety or Treatment	Entry No.	Yield – bushels per acre Rep1	Rep2	Rep3	Av.	Test weight	Heading date	Diseases % leaf rust	Height inches
Chris		24.1	25.7	21.1	23.6	60.5	7-10	T	29
Kurtzman		26.0	28.5	25.2	26.6	56.5	7-17	30	24
Red River 68		67.5	37.0	25.6	33.4	62.0	7-4	T	24
S.P. 34 x Valley		22.6	18.0	14.1	18.2	56.5	7-14	10	29
Justin		33.7	32.4	27.7	31.3	60.5	7-9	T	30
Barton		26.4	24.0	23.1	24.5	59.0	7-14	20	31

Table 28. Uniform Regional Durum Nursery 1968.

Entry No.	Description	Yield- bushels per acre 1	2	3	Av.	Test Wt.	Dates head	ripe	Height inches	Leaf rust
1	C.I. No. 5296	42.0	39.5	50.6	44.0	60.0	7-9	8-14	44	
2	C.I. No. 13333	46.6	51.1	44.7	47.5	62.0	7-7	8-10	39	T-5
3	C.I. No. 13335	52.2	43.6	51.5	49.1	58.0	7-4	8-8	38	15
4	C.I. No. 13768	40.6	37.3	41.6	39.8	60.0	7-4	8-9	39	T-5
5	Sel. No. 63-3	46.3	53.2	58.4	52.6	56.0	7-6	8-14	38	T
6	Sel. No. DT191	31.3	30.3	32.7	31.4	61.5	7-2	8-8	35	T
7	Sel. No. Dt316	46.3	52.7	32.8	43.9	58.5	7-7	8-15	38	T
8	Sel. No. DT317	41.4	49.1	41.2	43.9	56.5	7-7	8-13	40	T
9	Sel. No. D6517	38.0	49.2	41.1	42.8	60.5	6-27	8-6	36	T
10	Sel. No. D6567	40.0	47.7	41.4	43.0	61.5	7-3	8-8	39	10
11	Sel. No. D6586	40.7	49.0	35.4	41.7	61.5	7-3	8-8	40	T
12	Sel. No. D 6591	43.2	58.5	53.6	51.8	60.0	7-3	8-8	39	T
13	Sel. No. D6599	42.6	44.4	35.0	40.7	60.5	7-3	8-8	40	T
14	Sel. No. D65100	48.5	51.4	37.1	45.7	61.5	6-29	8-7	37	T
15	Sel. No. D65114	40.1	51.0	41.0	44.0	60.5	7-3	8-8	36	T
16	Sel. No. D65134	40.1	42.5	42.4	41.7	61.0	7-3	8-8	37	T
17	Sel. No. D6654*	48.5	46.4	58.7	51.2	59.5	7-3	8-8	32	T
18	Sel. No. D6655*	43.4	62.6	57.3	54.4	59.0	7-4	8-8	27	T

*Semi dwarf types.

Table 29. Uniform Regional Oats Experiment 90, 1968.

Entry No.	Variety or treatment	Yield – bushels per acre Rep1	Rep2	Rep3	Av.	Test wt.	Dates head	ripe	Height inches
1	Jaycee	58.8	56.2	72.2	62.4	37.0	6-25	8-5	31
2	Ill. 63-1062-2	64.8	61.4	78.8	68.3	32.5	6-26	8-5	33
3	Ill. 63-1668-1	57.0	64.6	74.8	65.5	33.0	7-2	8-7	34
4	Iowa M-69	54.6	50.8	70.6	58.7	35.0	6-26	8-5	36
5	Andrew	78.2	78.8	67.6	74.9	33.5	6-28	8-6	35
6	C.I. 8304	73.2	81.6	59.0	71.3	29.0	6-26	8-5	35
7	C.I. 8305	77.0	70.2	63.2	70.1	33.0	6-26	8-7	32
8	Gopher	72.8	73.2	68.2	71.4	33.0	6-28	8-7	35
9	Mo. 0-205	71.6	87.6	56.2	71.8	31.5	6-26	8-6	37
10	Orbit	103.2	67.0	94.6	88.3	30.0	6-29	8-7	32
11	C.I. 7463	67.0	68.2	76.8	70.7	33.0	6-25	8-5	33
12	Clintland 64	61.0	59.6	62.8	61.1	32.5	6-27	8-6	36
13	Diana	60.6	59.6	68.6	62.9	30.0	6-25	8-5	34
14	Purdue 6316A2-1	71.6	79.0	59.0	69.9	33.0	6-29	8-6	32
15	Purdue 6316A2-4	77.6	78.6	56.2	70.8	32.5	6-27	8-6	30
16	C.I. 8178	61.2	72.4	67.2	66.9	33.0	6-30	8-6	36
17	S.Dak. B64PROI-178	73.2	66.8	49.4	63.1	34.5	6-30	8-6	37
18	S.Dak. B65PROI-124	81.4	67.8	48.2	65.8	34.0	6-26	8-5	33
19	S.Dak. B65PROI-469	76.4	90.4	67.2	78.0	34.0	6-25	8-5	36
20	S.Dak. B65PROI-955	73.6	73.4	81.2	76.1	31.5	6-26	8-5	35
21	S.Dak. B65-PROI-1541	77.2	65.2	74.4	72.3	35.5	6-26	8-5	34
22	S.Dak. B65-PROI-1596	63.4	70.6	56.6	63.5	33.0	6-27	8-4	32
23	S.Dak. B65-PRIO-1597	62.2	64.2	53.0	59.8	34.5	6-27	8-5	34
24	Garland C.I. 7453	66.6	64.6	54.4	61.9	32.0	7-6	8-8	35
25	Lodi C.I. 7561	69.0	70.6	59.0	66.2	62.5	6-27	8-5	32
26	Wisc. 995-4-1	99.0	53.8	49.6	67.5	34.0	7-6	8-8	39
27	Wisc. 1181-2	84.2	58.2	78.2	73.5	35.0	7-4	8-8	34
28	Wisc. 1137-5	68.4	64.6	52.4	61.8	33.5	6-27	8-6	31

Table 30. North Dakota State University Oat Nursery Experiment 92, 1968.

Entry No.	Variety or treatment	Yield – bushels per acre Rep1	Rep2	Rep3	Av.	Test wt.	Dates head	ripe	Height inches
1	Dawn	59.6	71.6	55.0	62.1	29.0	6-25	8-2	32
2	Brave	62.2	80.8	66.4	69.8	33.5	6-25	8-3	30
3	Wyndmere	52.0	78.6	51.6	60.7	35.7	6-25	8-3	31
4	Burnett	57.6	73.0	72.4	67.7	31.5	6-27	8-6	31
5	Tyler	59.2	72.6	55.8	62.5	32.3	6-26	8-6	28
6	Russell	67.6	70.8	63.6	67.3	33.0	7-3	8-7	33
7	Ajax	63.6	82.6	55.2	67.1	33.0	6-29	8-8	32
8	Gopher	56.6	83.6	76.4	72.2	36.0	6-28	8-7	32
9	Orbit	65.4	93.4	71.2	76.7	32.0	6-29	8-8	30
10	Lodi	52.8	72.8	66.4	64.0	32.0	7-6	8-8	36
11	Portal	60.2	72.8	65.0	66.0	32.0	6-30	8-6	33
12	C.I. 8151	45.0	63.2	73.4	60.5	31.5	6-24	8-5	30
13	C.I. 8178	55.4	81.4	64.6	67.1	32.3	6-30	8-5	32
14	Holden	54.4	87.2	89.4	77.1	30.0	6-25	8-5	34
15	Kelsey	85.2	71.2	93.6	83.3	33.0	6-29	8-6	33
16	Sioux	77.2	60.4	77.4	71.7	33.0	6-30	8-5	34
17	Harmon	67.8	56.6	84.4	69.6	26.5	7-4	8-6	36
18	Garry	78.8	33.0	78.4	63.4	28.5	6-30	8-5	36
19	C.I. 8304	69.4	60.2	55.0	61.5	32.0	6-27	8-5	32
20	C.I. 8305	61.2	55.2	62.8	59.7	32.7	6-27	8-6	33
21	C.I. 7643	57.6	57.0	66.6	60.4	32.0	6-27	8-6	32
22	C.I. 8178	64.8	56.2	76.2	65.7	32.0	6-29	8-5	34
23	X 1144-3	62.4	59.4	69.6	63.8	29.0	6-28	8-7	32
24	X 1137-2	80.4	29.2	77.6	62.4	30.0	6-27	8-6	32
25	86-3-63	99.0	55.6	89.4	81.3	32.0	6-26	8-6	34
26	Rodney	84.6	39.6	87.4	70.5	30.0	7-6	8-8	37
27	Ortley	71.0	39.0	75.4	61.8	31.0	7-4	8-6	39

Table 31. Uniform Great Plains Barley Nursery, 1968.

Entry No.	Variety or treatment	Yield – bushels per acre Rep1	Rep2	Rep3	Av.	Test wt.	Heading date	Lodging %	Height inches
1	Flynn I	23.3	41.5	22.5	29.1	49.0	6-26	0	25
2	Munsing	39.4	40.4	31.3	37.0	50.0	6-28	0	30
3	Unitan	64.0	51.3	39.4	51.6	47.5	6-26	0	32
4	Larker	52.3	66.6	49.8	56.2	51.0	6-30	0	33
5	62Ab 3786	55.0	72.0	53.0	60.0	50.0	7-4	0	29
6	Galt	64.5	61.6	63.5	63.2	50.0	7-3	0	30
7	Primus	39.1	52.5	55.3	49.0	51.5	6-24	0	29
8	62Ab 3722	38.9	41.6	53.3	44.6	52.0	6-25	0	28
9	63Ab 1434	44.6	65.4	48.8	52.9	52.0	6-29	0	28
10	63Ab 1405	54.0	59.1	40.6	51.2	53.0	6-30	0	28
11	63Ab 1417	60.3	53.4	49.1	54.3	52.0	7-4	0	32
12	Neb. 591035	40.9	42.9	35.9	39.9	48.0	6-26	0	32
13	S.Dak. 67186	45.8	46.9	56.3	49.7	50.0	6-30	0	33
14	S.Dak. 67278	47.0	54.3	58.6	53.3	51.0	7-5	0	31
15	S. Dak. 67381	49.6	48.0	40.6	46.1	51.5	7-5	0	37
16	S. Dak. 67407	58.1	46.4	55.4	53.3	49.5	7-5	0	34
17	S. Dak. 67436	59.5	50.4	52.1	54.0	50.5	7-6	0	33
18	S. Dak. 67535	49.0	30.3	58.0	45.8	49.0	6-24	0	34
19	S. Dak. 67610	66.5	62.5	46.4	58.5	51.0	7-3	0	34
20	S. Dak. 67640	46.9	49.0	54.8	50.2	49.5	6-30	0	34
21	Betzes	63.3	55.1	59.1	59.2	52.0	7-5	0	32
22	MT6462	36.0	39.1	43.5	39.5	51.0	6-25	0	29
23	Trebi VV II	65.5	52.9	61.3	59.9	46.0	7-5	0	31
24	MT 61542	32.0	40.0	31.8	34.6	48.5	7-3	0	32
25	MT 6152	38.0	43.0	39.3	40.1	48.5	7-4	0	38
26	MT 61520	52.3	36.9	64.5	51.2	47.0	6-30	0	35
27	MT 61554	50.1	35.6	65.1	50.3	47.5	6-30	0	31

Table 32. 1968 Summary – Great Plains Barley Nursery.

Entry No.	C.I. No.	Variety	Average** acre yield bushels	Average test weight lbs.	Average date headed June	Average plant height
1	5911	Flynn I	44.8	44.8	20.2	24.7
2	6009	Munsing	46.2	48.4	23.4	*22.9
3	10421	Unitan	45.5	45.9	24.7	26.8
4	10648	Larker	46.0	47.8	25.1	28.1
5	------	62Ab3786	49.6	48.3	28.1	24.4
6	11770	Galt	49.2	46.4	25.9	26.3
7	13109	Primus	42.9	48.3	19.6	26.8
8	-----	62Ab3722	*49.8	49.5	20.5	24.7
9	-----	63Ab1434	49.4	48.5	24.2	23.3
10	-----	63Ab1405	47.1	49.2	25.8	24.2
11	-----	63Ab1417	46.2	48.7	28.1	25.6
12	-----	Nebr. 591035	40.5	46.9	21.6	27.4
13	-----	S.D. 67186	41.5	47.5	23.6	27.7
14	-----	S.D. 67278	46.0	47.7	27.0	27.4
15	----	S.D. 67381	41.0	48.4	27.5	30.6
16	-----	S.D. 67407	42.0	45.7	26.7	27.0
17	-----	S.D. 67436	40.3	45.8	26.5	26.7
18	-----	S.D. 67535	40.2	46.9	19.6	27.0
19	-----	S.D. 67610	42.5	48.3	26.2	27.9
20	-----	S.D. 67640	45.3	47.8	24.8	28.5
21	6398	Betzes	49.1	47.8	27.2	25.7
22	-----	Mt. 6462	44.1	*50.5	*19.5	23.2
23	936	Trebi	46.5	45.8	26.0	26.2
24	-----	Mt. 61542	32.2	45.7	25.1	27.4
25	-----	Mt. 6152	35.5	47.3	25.2	29.6
26	-----	Mt. 61520	41.4	46.6	24.8	28.0
27	-----	Mt. 61554	45.2	44.6	25.3	24.8
		Grand average	44.1	47.4	24.5	26.4
		No. of stations	15	15	13	11

*Best value for any particular measurement

**Average value for all stations reporting

Table 33. Uniform Regional Flax, 1968.

Variety or Treatment	C.I. No.	Yield – bushels per acre Rep1	Rep2	Rep3	Av.	Test weight	Heading date	Diseases	Lodging %	Height inches
Bison	389	11.2	15.1	16.4	14.2	55.5	68	0	0	22
Redwood	1130	10.7	14.7	14.2	13.2	56.5	60	0	0	20
Bolley	1475	11.3	12.5	15.5	13.1	55.5	64	0	0	23
Windom	1823	18.8	11.6	16.4	15.6	55.0	60	0	0	21
Summit	1914	15.7	16.8	14.4	15.6	56.0	60	0	0	20
Rwd-Birio	2444	8.4	14.5	13.3	12.1	56.5	67	0	0	19
Rwd-Valuta Raja	2480	10.2	19.6	15.7	15.2	55.0	65	0	0	22
1085- Bolley	2483	14.1	16.1	13.6	14.6	55.0	60	0	0	20
Linott	2522	15.7	16.7	15.4	15.9	56.5	65	0	0	21
1605-Minerva	2523	20.1	15.7	14.3	16.7	55.5	68	0	0	20
Rwd-1455	2524	15.4	14.7	13.1	14.4	56.0	66	0	0	20
Rwd – Mar.	2525	13.1	14.5	12.2	13.3	54.0	65	0	0	21

Hard Red Winter Wheat
Northern Regional Performance Nursery
1968

Entry No.	Pedigree	C.I. or Sel. No.	Source
1	Kharkof	1442	Check
2	Warrior	13190	Check
3	Winalta	13670	Check
4	Wrr x Sk-Cnn^2	NB64322	Nebr.
5	Wrr x SK-Cnn^2	NB64323	Nebr.
6	Selkirk x Cheyenne^2	NB64365	Nebr.
7*	Ky58-Nth-Cnn-Tm-Mi-Hope-Pn-Cnn x Wrr	NB66490	Nebr.
8	Selkirk x Cheyenne^2	NB64334	Nebr.
9*	Selkirk x Cheyenne^3	NB64308	Nebr.
10	BWH1904-7	MT639	Mont.
11*	NT-2 x Cnn-2 8-9-3	MT6326	Mont.
12*	Yogo x Cnn 12-4-2	MT6320	Mont.
13*	Selected Bulk 2-77	MT6319	Mont.
14	So. Dak. Sel.	SD56-758	S. Dak.
15	Winalta Reselection	----------	S. Dak.

*New entry in 1968.

Table 34. Northern Regional Performance Nursery, 1968.

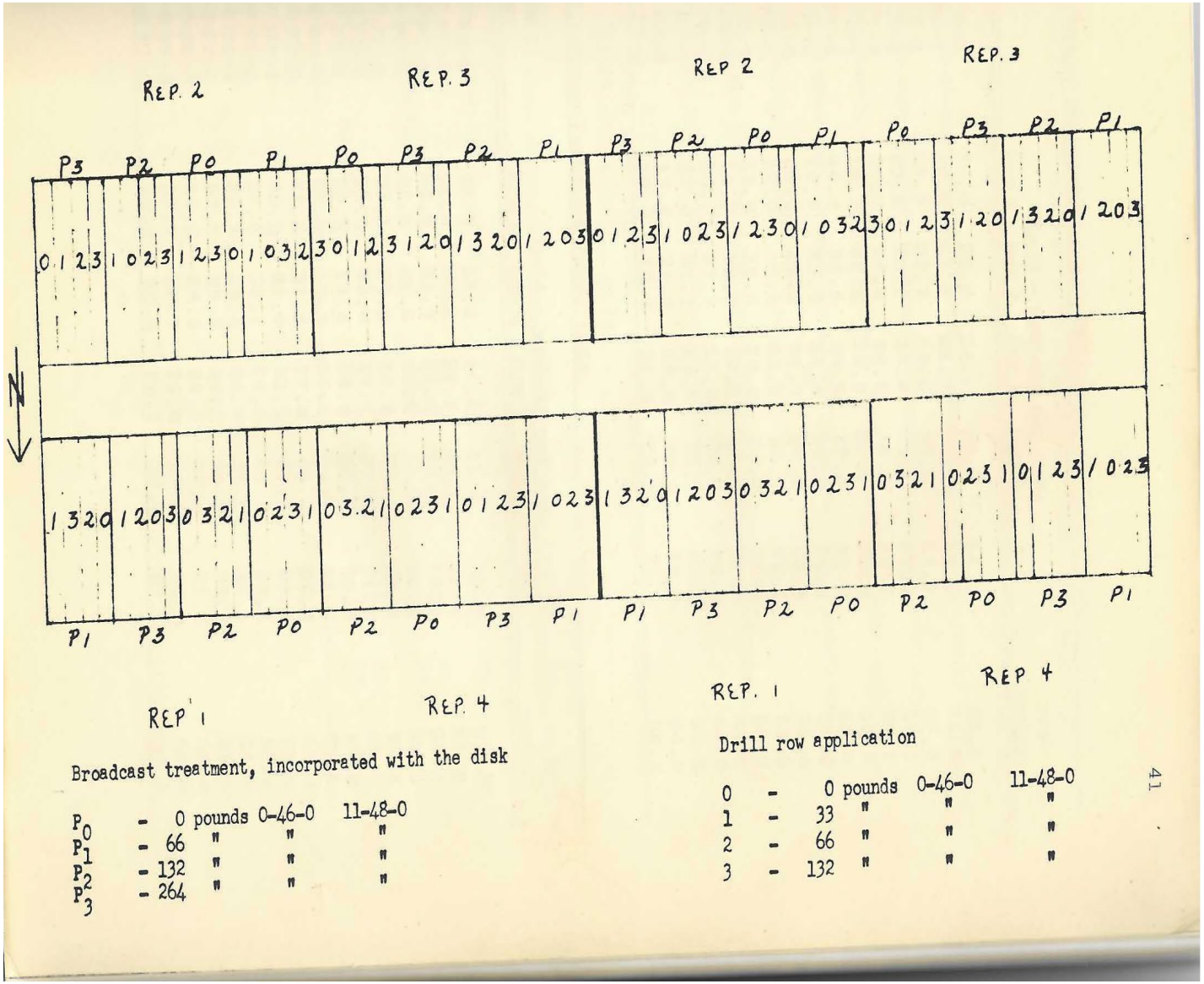
Variety or Treatment	Entry No.	Yield – bushels per acre				Test weight	Heading date	% Rust diseases		Height inches
		Rep1	Rep2	Rep3	Av.			Leaf	Stem	
Kharkof	1	25.8	20.2	26.1	24.0	59.0	6-25	70	50	41
Warrior	2	16.9	22.3	24.6	21.3	60.0	6-26	70	50	36
Winalta	3	19.3	19.9	27.7	22.3	60.5	6-26	70	50	38
Trader	4	18.4	7.9	20.6	15.6	58.0	6-25	20	T	39
Trapper	5	19.8	12.8	22.6	18.4	59.5	6-27	40	T	39
NB64365	6	23.2	16.0	15.2	18.1	60.0	6-23	50	T	38
NB66490	7	16.4	8.2	8.8	11.1	60.5	6-23	40	T	32
NB64334	8	15.2	14.2	11.5	13.6	60.0	6-28	50	T	38
NB64308	9	17.6	22.4	12.2	17.4	59.5	6-28	50	20	34
BWH 1904-7	10	20.0	19.8	14.0	17.9	58.5	6-27	50	20	41
MT6326	11	23.2	21.1	17.1	20.5	59.0	6-28	50	50	37
MT6320	12	24.9	19.3	14.2	19.5	59.5	6-28	40	50	39
MT6319	13	20.8	24.7	15.7	20.4	60.0	6-28	20	20	38
SD56-758	14	24.1	18.2	18.8	20.4	60.0	6-28	T	T	40
Winalta Resel.	15	21.3	23.2	17.2	20.6	62.0	6-27	5	T	38

Fertilizer Formulations, Rates of Application and Methods Of Treatment on Summerfallow

In this trial, broadcast application, drill row applications and combination of broadcast and drill row applications are compared, using three different rates for each application method. Table 35 shows the planting plan used, and also includes the formulations used and the key to rates used for both broadcast and drill row applications.

Table 36 and table 37 summaries the yield data for 1968. Recorded yield data for this trial in 1967 and 1968 show no conclusive trend for method or application or rate of application. There is some indication that the 11-48-C formulation is superior to the 0-45-0 formulation on summerfallow in western North Dakota.

Table 35. Planting plan, formulations and key to rates used in the trial comparing fertilizer formulations, rates of application and methods of treatment on summerfallow, 1968.



Broadcast treatment, incorporated with the disk

P_0	-	0 pounds	0-46-0	11-48-0
P_1	-	66 "	"	"
P_2	-	132 "	"	"
P_3	-	264 "	"	"

Drill row application

0	-	0 pounds	0-46-0	11-48-0
1	-	33 "	"	"
2	-	66 "	"	"
3	-	132 "	"	"

Table 36. Vasey Fertilizer Trial, 1968.

Variety or Treatment	Yield – bushels per acre					Test weight
	Rep1	Rep2	Rep3	Rep4	Av.	
0-45-0 P0-0	29.0	20.3	24.1	23.1	24.2	54.5
0-45-0 P0-1	27.6	23.2	23.2	26.1	25.0	54.0
0-45-0 P0-2	27.3	23.2	20.6	27.3	24.6	53.0
0-45-0 P0-3	23.2	22.6	24.4	25.5	23.9	52.5
0-45-0 P1-0	20.9	24.4	28.4	24.9	24.7	54.5
0-45-0 P1-1	19.7	22.6	25.5	27.3	23.8	56.5
0-45-0 P1-2	24.4	23.8	24.9	27.6	25.2	55.5
0-45-0 P1-3	18.6	29.6	24.4	29.0	25.4	55.0
0-45-0 P2-0	23.8	22.6	24.4	24.4	23.6	55.0
0-45-0 P2-1	22.0	19.1	23.8	28.1	23.3	55.0
0-45-0 P2-2	25.5	22.6	24.9	24.4	24.4	56.0
0-45-0 P2-3	19.7	18.3	23.2	24.9	21.5	54.0
0-45-0 P3-0	26.7	37.7	23.2	23.2	27.7	56.0
0-45-0 P3-1	22.0	21.5	20.3	26.1	22.5	55.5
0-45-0 P3-2	19.4	21.2	25.5	40.6	26.7	54.0
0-45-0 P3-3	22.6	19.7	22.0	27.3	22.9	54.5

Table 37. Vasey Fertilizer Trial, 1968.

Variety or Treatment	Yield – bushels per acre					Test weight
	Rep1	Rep2	Rep3	Rep4	Av.	
11-48-0 P0-0	42.3	34.2	39.4	37.1	38.3	57.0
11-48-0 P0-1	41.8	34.2	38.9	34.2	37.3	55.5
11-48-0 P0-2	44.7	32.5	33.6	36.5	36.8	56.0
11-48-0 P0-3	40.6	32.8	34.2	33.6	35.3	56.0
11-48-0 P1-0	37.1	34.8	20.9	22.6	28.9	56.5
11-48-0 P1-1	33.6	33.4	37.1	23.2	31.8	55.0
11-48-0 P1-2	36.5	39.4	24.9	20.3	30.3	55.0
11-48-0 P1-3	35.4	40.0	26.1	24.9	31.6	55.0
11-48-0 P2-0	41.2	31.3	27.8	40.6	35.2	55.0
11-48-0 P2-1	43.2	31.9	32.5	37.7	36.3	57.0
11-48-0 P2-2	37.1	33.1	29.6	40.6	35.1	56.5
11-48-0 P2-3	39.7	32.5	28.4	36.0	34.2	56.0
11-48-0 P3-1	37.7	30.7	30.2	30.7	32.3	55.0
11-48-0 P3-1	38.9	24.9	33.6	28.4	31.5	56.0
11-48-0 P3-2	37.7	26.7	29.6	27.8	30.5	55.0
11-48-0 P3-3	38.6	29.6	29.6	26.1	31.0	56.0

A Comparison of Wheat Yields On Continuous Cropping, Cornland, and Fallow, Fertilized and Unfertilized.

This trial was begun in 1959 to compare the results of commercial fertilizer application on three different cropping systems over a long period of years. While there is considerable information available on work with commercial fertilizer application on wheat in North Dakota, not very much of it is on sites such at these where data are kept on cropping history and fertilization over a long period of years.

Data from the 1968 trial are given in table 38. Table 39 summarizes yields from the trial for the period 1959-1968.

Table 38. Yields from Continuous Cropping, Cornland and Fallow, Fertilized and Unfertilized – 1968.

	Yield – bushels per acre				Test
Treatment	Rep1	Rep 2	Rep 3	Av.	Weight
Continuous cropping	10.2	13.2	11.3	11.6	58.8
Continuous cropping – fertilized	11.8	9.8	8.5	10.0	60.8
Cornland	22.3	19.5	20.3	20.7	58.8
Cornland – fertilized	24.0	22.9	26.6	24.5	60.8
Summerfallow	23.1	22.7	22.7	22.8	59.8
Summerfallow – fertilized	31.7	37.6	31.6	33.6	61.0

Table 39. Summary of Wheat Yields on Continuous Cropping, Cornland and Fallow, Fertilized and Unfertilized, for the period 1959-1968.

Yields in bushels per acre

Treatment	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	Average
Spring plowed											
continuous cropping	6.7	10.8	4.8	-	17.8	8.6	17.3	-	15.4	11.6	11.6
Spring plowed											
continuous cropping, fertilized	8.1	12.5	3.9	-	19.4	10.7	22.3	-	14	10	12.6
Summerfallow	11.1	15.3	6.2	-	28.1	13	31.4	-	25.8	22.8	19.2
Summerfallow, fertilized	12.9	22	8.1	-	33.8	16.1	34	-	23.6	33.6	23
Disked cornland	7.3	10.6	0	-	18.7	10.6	24.6	-	17.2	20.7	13.7
Disked cornland, fertilized	8.6	13.6	0	-	25.7	11.8	31.4	-	21.4	24.5	17.1

Crop destroyed by hail in 1962 and 1966.

Comparison of Rates and Formulations of Commercial Fertilizer Application on Summerfallow in Western North Dakota

The objective of this trial is to provide additional information on use of fertilizer on summerfallow in western North Dakota.

A considerable amount of work has been done in past years and is presently in progress on the use of commercial fertilizer in western North Dakota. We have only scratched the surface of this important subject, and because of the variability of land, climate and other environmental factors, and the various fertilizer formulations available, all of the information that can be gathered will eventually help to answer the main question in the minds of farmers, that being: "How can commercial fertilizer contribute to increasing the income for farmers and ranchers in North Dakota."

The trial is a companion trial designed to make duel use of the plot layout involved in the Maintenance of Summerfallow trial. Fertilizer is applied at planting time by drill attachment according to the plot layout shown in table 40.

The 1968 yield record is summarized in table 41, 42, and 43.

N ↑

Plot	Weeks	Subplot	Treatment	Rep	Adjacent plot
[illegible]	5 wk.	19	check	Rep. 4	[illegible]
		18	50# 18-46-0		
		17	100# 18-46-0		
		16	50# 11-48-0		
166	4 wk.	20	100# 0-46-0	Rep. 4	139
		19	check		
		18	50# 18-46-0		
		17	100# 18-46-0		
		16	50# 0-46-0		
165	6 wk.	20	100# 23-23-0	Rep. 4	140
		19	check		
		18	50# 18-46-0		
		17	100# 18-46-0		
		16	50# 23-23-0		
164	7 wk.	20	150# 10-30-10	Rep. 4	141
		19	check		
		18	50# 18-46-0		
		17	100# 18-46-0		
		16	75# 10-30-10		
163	4 wk.	15	50# 0-46-0	Rep. 3	142
		14	100# 0-46-0		
		13	check		
		12	100# 18-46-0		
		11	50# 18-46-0		
162	6 wk.	15	50# 23-23-0	Rep. 3	143
		14	100# 23-23-0		
		13	check		
		12	100# 18-46-0		
		11	50# 18-46-0		
161	5 wk.	15	50# 11-48-0	Rep. 3	144
		14	100# 11-48-0		
		13	check		
		12	100# 18-46-0		
		11	50# 18-46-0		
160	7 wk	15	75# 10-30-10	Rep. 3	145
		14	150# 10-30-10		
		13	check		
		12	100# 18-46-0		
		11	50# 18-46-0		

Plot	Weeks	Subplot	Treatment	Rep	Adjacent plot
[illegible]	6 wk.	9	50# 23-23-0	Rep. 2	[illegible]
		8	100# 23-23-0		
		7	check		
		6	50# 18-46-0		
136	4 wk.	10	100# 18-46-0	Rep. 2	109
		9	50# 0-46-0		
		8	100# 0-46-0		
		7	check		
		6	50# 18-46-0		
135	7 wk.	10	100# 18-46-0	Rep. 2	110
		9	75# 10-30-10		
		8	150# 10-30-10		
		7	check		
		6	50# 18-46-0		
134	5 wk.	10	100# 18-46-0	Rep. 2	111
		9	50# 11-48-0		
		8	100# 11-48-0		
		7	check		
		6	50# 18-46-0		
133	4 wk	5	100# 0-46-0	Rep. 1	112
		4	50# 0-46-0		
		3	check		
		2	100# 18-46-0		
		1	50# 18-46-0		
132	7 wk.	5	150# 10-30-10	Rep. 1	113
		4	75# 10-30-10		
		3	check		
		2	100# 18-46-0		
		1	50# 18-46-0		
131	5 wk.	5	100# 11-48-0	Rep. 1	114
		4	50# 11-48-0		
		3	check		
		2	100# 18-46-0		
		1	50# 18-46-0		
130	6 wk.	5	100# 23-23-0	Rep. 1	115
		4	50# 23-23-0		
		3	check		
		2	100# 18-46-0		
		1	50# 18-46-0		

Table 41. Grain Yields Recorded in the Trial Comparing Rates and Fertilizer Formulations on the Summerfallow Management Trial – 1968.

	Yields – bushels per acre				
Treatment	1	2	3	4	Average
Check	34.4	35.2	43.2	42.2	38.8
50 lbs. 0-46-0	38.4	35.4	41.2	44.6	39.9
100 lbs. 0-46-0	37.6	37.2	39.8	42.5	39.3
50 lbs. 18-46-0	40.2	42.2	46.8	43.0	43.1
100 lbs. 18-46-0	38.2	36.2	42.8	43.8	40.3
The above yields are from a 4-week cultivation interval.					
Check	35.2	38.8	42.8	32.8	37.4
50 lbs. 11-48-0	41.8	40.6	47.2	52.8	45.6
100 lbs. 11-48-0	36.8	41.6	44.6	36.2	39.8
50 lbs. 18-45-0	43.4	42.2	49.4	37.8	43.2
100 lbs. 18-46-0	38.6	43.0	42.4	37.4	40.4
The above yields are from the 5-week cultivation interval.					

Table 42. Grain Yields Recorded in the Trial Comparing Rates and Fertilizer Formulations on the Summerfallow Management Trial – 1968.

	Yields – bushels per acre				
Treatment	1	2	3	4	Average
Check	39.6	37.0	42.8	35.0	38.6
50 lbs. 23-23-0	40.2	30.6	47.8	37.8	39.1
100 lbs. 23-23-0	41.4	32.6	47.2	39.8	40.3
50 lbs. 18-46-0	41.4	34.4	40.6	40.0	39.1
100 lbs. 18-46-0	43.2	37.6	37.2	35.2	38.3
The above yields are from the 6-week cultivation interval.					
Check	38.2	36.0	43.4	40.4	39.5
75 lbs. 10-30-10	38.8	37.6	42.0	35.0	38.4
150 lbs. 10-30-10	40.0	35.0	46.4	39.2	40.2
50 lbs. 18-46-0	43.4	38.0	43.6	37.8	40.7
100 lbs. 18-46-0	41.8	39.8	43.0	33.4	39.5
The above yields are from the 7 week cultivation interval.					

Table 43. Record of Grain Yields From Check Plots Compared to the 18-46-0 Formulation in the Fertilizer Use on Summerfallow Management Trial – 1968.

Treatment	Grain yield in bushels per acre								Average
Check	34.4	35.2	43.2	42.2	35.2	38.8	42.8	32.8	
									38.6
Check	39.6	37.0	42.8	35.0	38.2	36.0	43.4	40.4	
50 lbs. 18-46-0	40.2	42.2	46.8	43.0	41.8	40.6	47.2	52.8	
									42.1
50 lbs. 18-46-0	41.4	34.4	40.6	40.0	43.4	38.0	43.6	37.8	
100 lbs. 18-46-0	38.2	36.2	42.8	43.8	38.6	43.0	42.4	37.4	
									39.6
100 lbs. 18-46-0	43.2	37.6	37.2	35.2	41.8	39.8	43.0	33.4	

Maintaining Of Summerfallow In Western North Dakota

The principle objective of this trial is to determine the optimum number of cultivations required on summerfallow in western North Dakota, as related to yield and to the cost of operation.

Work on summerfallow at this station previously, has determined the best date for first tillage of fallow, and has compared the production of wheat on plowed fallow and on trashy fallow. Work is presently in progress comparing production on roto-tilled fallow and plowed fallow. Generally, the previous work has aimed at keeping the fallow clean, but has not specified the number of cultivations. The idea has been that whatever number of cultivations were required to keep the fallow clean in any given year would be applied.

Tillage operations in this trial begin as close to May 15 as possible, this date previously determined as the best date for the first tillage of fallow at this station, with the first operation being moldboard plowing. Subsequent tillage operations are with the sweep cultivator at 4 week, 5 week, 6 week and 7 week intervals. The approximate dates of cultivation and the number of operations for each interval are as follows:

4 week – June 15, July 15, August 15, September 15, and October 15.
5 week – June 22, August 1, September 7, and October 21.
6 week – July 1, August 15, and October 1.
7 week – July 7, September 1, and October 21.

Yield data from the first year of cropping are summarized in table 44.

Table 44. Grain Yields Recorded in the Summerfallow Management Study – 1968.

	Yields – Bushels per acre				
Treatment	1	2	3	4	Average
4 week check	34.4	35.2	43.2	42.2	38.8
5 week check	35.2	38.8	42.8	32.8	37.4
6 week check	39.6	37.0	42.8	35.0	38.6
7 week check	38.2	36.0	43.4	40.4	39.5

Table 45. Effect of Frequency of Tillage of Fallow on Accumulation of Available Water and Available Nitrogen at Dickinson, 1967.

	Available Water		Available Nitrogen (N)	
Depth	June 28	Oct. 25	June 28	Oct. 25
Inches	inches		parts per million	
0-6	0.58	0.49	16.1	27.0
6-12	0.55	0.59	8.2	15.4
12-24	1.08	1.03	4.3	7.1
24-36	1.07	1.11	4.4	6.7
36-48	1.22	1.14	4.5	7.9
48-60	1.05	1.04	6.4	7.9
60-72	0.60	---	7.4	---
72-84	0.10	---	7.3	---
84-96	0.57	---	7.7	---

Tillage frequency had no effect on accumulation of available water or available nitrogen during the sampling interval.

Weed Count And Weight Per Three Square Yards.

Table 46. Weed Counts and Weights Per Three Square Yards Recorded in the Summerfallow Management Study in 1968.

Tillage Interval	Tillage date	Weed count					Weight (oven-dry)				
		Plot No.					Plot No.				
							Grams, Oven-dry				
(weeks)		109	112	139	142	Mean	109	112	139	142	Mean
4	6/19	--	--	--	--	--	0.44	0.21	0.62	0.44	0.43
	7/15	16	27	157	39	60	0.33	0.78	7.02	1.20	2.33
	8/14	10	21	51	38	30	0.17	6.25	53.10	35.43	23.74
		111	114	138	144	Mean	111	114	138	144	Mean
5	6/27	201	169	368	223	240	1.11	0.84	1.42	0.80	1.04
	7/29	131	176	317	300	231	4.38	2.35	10.27	10.80	6.95
		108	115	140	143	Mean	108	115	140	143	Mean
6	7/2	185	225	694	306	353	1.25	1.49	6.34	2.88	2.99
	8/14	96	185	328	352	240	26.39	64.51	261.75	324.33	169.24
		110	113	141	145	Mean	110	113	141	145	Mean
7	7/8	299	176	392	573	360	5.12	2.14	11.37	25.19	10.96
	8/30	113	74	203	219	152	371.90	153.43	473.99	497.13	374.11

A Comparison of the Hoe Drill and the Double Disk Press Drill for Seeding Spring Wheat on Summerfallow in Western North Dakota.

This trial, designed to compare the hoe drill and the double disk press drill for the production of spring wheat on summerfallow in western North Dakota has been in progress since 1963.

In two separate trials conducted during the three year period 1963-1965, the double disk press drill produced the higher yields, as was the case in the single trial continued in 1968.

A summary of the two trials conducted from 1963-1965 is found in the annual report of the Dickinson Station for 1965. Data from the trial continued in 1968 are summarized in the Table 47. There are no yields from the trial for 1966 because the crop was destroyed by a severe hailstorm in July of that year.

Table 47. A Comparison of Yields of Spring Wheat Seeded on Summerfallow With the Hoe Drill and With the Press Drill.

	Yields in bushels per acre						
Drill used	1963	1964	1965	1966	1967	1967	Av.
Hoe drill With 10 inch spacing	18.3	15.6	38.5	---	18.1	21.0	22.3
Double disk press drill With 6 inch spacing	25.3	24.7	41.3	---	19.7	34.9	29.2

Continuous Cropping Trials with Wheat, Oats, Barley and Corn

This trial was begun in 1908 as part of the work with crop rotations and tillage on what was then the newly established Dickinson Experiment Station. It was designed to determine yields of the four crops, wheat , oats, barley and corn when grown year after year on the same land. This trial also included a comparison of spring plowing and fall plowing as well as a comparison of continuous cropping with alternate cropping and summerfallow.

The 1968 yields, and the average yields for the first 55 years of the trial are summarized in the following table.

Table 48. Crop Yields in the Continuous Cropping Trial.

	Spring plowed		Fall plowed		Summerfallow	
Crop	1968	55 Yr. Av.	1968	55 Yr. Av.	1968	55 Yr. Av.
			Grain yields in bushels per acre			
Wheat	10.1	11.2	7.5	10.2	34.9	18.5
Oats	16.2	25.7	14.1	23.4	68.8	43.1
Barley	8.0	16.7	8.0	15.3	40.0	23.7
Corn		18.9		18.7		22.5
			Silage yields in tons per acre @ 70% moisture			
Corn	2.8	3.14	2.3	3.05	3.1	3.63

A Comparison on the Moldboard Plow and the Roto Tiller when used As Spring Tillage Implements for the Production of Corn and Wheat In a Two Year Rotation

This trial compares the production of corn and wheat in a two year rotation planted following spring tillage with the roto tiller, and production of corn and wheat planted following spring tillage with the moldboard plow. Yields for the period 1964-1968 are summarized in table 49. While yield differences are small, and probably not significant, the plow maintains a slight advantage in both the production of wheat on cornland, and the production of corn on wheat stubble land.

Table 49. Yields of Wheat and Corn on Roto Tilled Land and on Spring Plowed Land.

Treatment	1964	1965	1966	1967	1968	Average
Wheat on Roto tilled cornland	7.9	22.3	--	16.8	17.5	16.1
Wheat on Spring plowed cornland	8.2	24.9	--	17.2	24.7	18.8
Corn on Roto tilled stubbleland	5.2	5.6	--	3.2	--	4.7
Corn on Spring plowed stubbleland	4.4	6.4	--	4.8	--	5.2

Yield of wheat in bushels per acre. Yield of silage in tons per acre at 70% moisture. Crop destroyed by hail in 1966. Average silage yields include 1964, 1965 and 1967 only.

A Comparison of the Roto Tiller and the Moldboard Plow Duckfoot Cultivator Combination for the Maintenance of Summerfallow

The roto tiller and the moldboard plow have also been used in this trial which compared them as summerfollowing implements. There was no difference in the yield of wheat following either treatment, with the actual average yields being 34.9 bushels per acre on the plowed fallow and 34.9 bushels per acre on the roto tilled fallow. The roto tilled fallow required two more cultivations than was needed for the plowed fallow to maintain it in a satisfactory condition.

Sorghum Management Trial

Yields in the sorghum management trial where the crop was cut at different heights, and at two dates of cutting, are summarized in the following table.

Table 50. Sorghum Management Trial 1967-1968.

		Dry weight yields – lbs. per acre								
	Cutting	August 1 Cutting			September 1 cutting			Total- yield		
Variety	height	1967	1968	Av.	1967	1968	Av.	1967	1968	Av.
	2”	693	718	706	1472	2690	2081	2165	3408	2787
Sweet	6”	539	176	358	1459	2325	1892	2098	2501	2250
Sioux	10”	125	59	92	1403	3161	2282	1528	3220	2374
(maturity)	2’	--	--	--	3081	3608	3345	3081	3608	3345
	2”	607	679	643	2170	2002	2086	2777	2681	2729
DeKalb	6”	265	116	191	2288	1988	2138	2553	2104	2329
SX-11	10”	128	22	75	2321	2540	2431	2449	2562	2506
(maturity)	2’	--	--	--	3450	2984	3217	3450	2984	3217

Included also in this management trial was a rate of seeding study, with the variety NK 145 used throughout. Data from the trial for 1967-1968 are given in the following table.

Table 51. Rate of Seeding Trial with Sorghum 1967-1968.

Rate of	Dry – weight yields – lbs./acre		
Planting – lbs./acre – seed	1967	1968	Average
2	1022	3394	2208
4	1809	5099	3454
6	2725	3950	3338
9	2274	4528	3401
12	2441	4720	3581
15	2801	4636	3719
18	2477	4703	3590
21	3171	4993	4082

Data from the yield trial which compares several varieties of sorghum, Sudan Grass, sorghum and Sudan grass hybrids and corn, are summarized in the following table for the 1967-68 seasons. This trial as well as the two proceeding trials reported in tables 50 and 51, were grown on land that was summerfallowed in the season of 1967.

Table 52. Yield Trial of Several Varieties of Corn, Sorghum and Sudan Grass, and Sorghum and Sudan Grass Hybrids – 1967-1968.

	Dry – weight Yields – lbs./acre		
Variety	1967	1968	Average
Piper sudan	2240	2286	2263
NK-78 corn	2676	2111	2395
HS-50 corn	2871	2849	2860
NK-145 (sudan grass cross)	2283	2981	2632
Pioneer 936 (sorghum hybrid)	2523	3435	2979
DeKalb SX-11	2536	2572	2554
SoKota 250 cron	2108	2196	2152
Trudan I (hybrid sudan grass)	2465	2340	2403

Production of Grain Sorghum at the Dickinson Experiment Station

Grain sorghum has been included in the trials at the Dickinson Station for many years, but has not been very successful because the varieties presently available require a growing season that is longer than what is normal for this area. In 1967, grain sorghum produced an average yield of 13.6 bushels per acre. The test weight of this grain was 33.8 pounds per bushel, and reflects the fact that the crop was killed by frost before it was fully mature. In 1968 the crop was killed by frost before seed was developed.

A grain sorghum variety that would be a higher producer, and early enough to mature in a short growing season would be a valuable crop for the area, and plans are to continue the search for an early grain sorghum.

Uniform Corn Production Trial

This trial is designed to compare corn grain and corn silage production, and how production is influenced by commercial fertilizer application, previous land use, row width and plant population under North Dakota environmental conditions.

Row spacing of 20 inched, 30 inches and 40 inches are used on both summerfallow and on stubbleland, and all treatments are planted both with and without commercial fertilizer.

The trial was begun in 1966 but was hailed out that year at Dickinson.
Data presented below are for 1967and 1968.

Table 53. Yields from the Uniform Corn Production Trial as Influenced by Commercial Fertilizer Application and Previous Land Use.

Treatment	1967	1968	2-Year Average
Grain yield on fallow – bushels per acre			
With commercial fertilizer	39.1	61.3	50.2
No commercial fertilizer	35.3	61.0	48.2
Grain yield on stubbleland – bushels per acre			
With commercial fertilizer	29.4	25.9	27.7
No commercial fertilizer	32.3	26.0	29.2
Silage yield on fallow – tons per acre			
With commercial fertilizer	6.4	5.0	5.7
No commercial fertilizer	5.7	4.9	5.3
Silage yield on stubbleland – tons per acre			
With commercial fertilizer	6.7	2.9	4.8
No commercial fertilizer	7.0	2.5	4.8

In the past two seasons at Dickinson corn grain productions was considerably higher on summerfallow and corn silage production slightly higher. Commercial fertilizer application has not produced more grain or silage on either summerfallow or stubbleland.

A comparison of production from different row spacing shows a trend toward higher grain production from the 20 inch row spacing. Row spacing hasn't influenced silage production very much.

Table 54. Yields from the Uniform Corn Production Trial as Influenced by Row Spacing.

Treatment	1967	1968	2-year Average
Grain yields on fallow – bushels per acre			
20 inch row spacing	39.5	67.5	53.5
30 inch row spacing	37.4	62.2	49.8
40 inch row spacing	34.8	54.0	44.4
Grain yields on stubbleland – bushels per acre			
20 inch row spacing	33.6	26.5	30.1
30 inch row spacing	31.4	24.8	28.1
40 inch row spacing	27.7	26.8	27.3
Silage yields on fallow – tons per acre			
20 inch row spacing	6.1	5.2	5.7
30 inch row spacing	6.1	5.5	5.8
40 inch row spacing	6.0	4.3	27.3
Silage yields on stubbleland – tons per acre			
20 inch row spacing	7.1	2.9	5.0
30 inch row spacing	7.1	2.4	4.8
40 inch row spacing	6.6	2.7	4.7

UNIFORM CORN PRODUCTION TRIAL DATA

ation Dickinson Year 1968 Date Planted: 5-20 Harvested: Silage 9-3 Grain 10-14

pulation: P_1 12,000 P_2 18,000 Fertilizer 210 lbs 0-46-0 Frost Date 10-3

Cols.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Plot No.	Trt. code LRFWP	Date of silk	Height Plant in.	Height Ear in.	Plant lodge %	Weight of Silage Plot Wet	Sample Wet	Sample Dry	Ears Wet	Ears Dry	No. of stalks	Weight of Grain per plot Wet	Weight of Grain per plot Dry	Shell	No. of Ears
1	I I I I I	8-5	63	21	0	10.6	826	132	2215	1035	11	3410	1888	1459	12
2	I I I I I	8-6	68	20	0	9.0	720	107	2314	1062	10	3886	2074	1601	21
3	I I I I I	8-5	67	18	0	10.6	737	112	1961	725	11	2672	1526	1195	12
4	I I I I I	8-5	60	18	0	10.0	651	74	1355	485	11	3298	1863	1469	17
5	I I I I I	8-5	63	24	0	9.0	761	98	2223	976	8	3106	1758	1342	15
6	I I I I I	8-6	64	22	0	8.4	774	111	1641	679	9	2375	1337	1063	12
7	I I I I I	8-5	66	21	0	8.6	631	97	2050	984	13	2843	1627	1268	18
8	I I I I I	8-6	64	21	0	10.4	715	104	1683	738	10	2590	1406	1103	16
9	I I I I I	8-6	58	21	0	8.6	622	88	2167	844	9	3097	1628	1234	18
10	I I I I I	8-6	65	18	0	7.6	833	95	1874	954	8	3255	1912	1544	20
11	I I I I I	8-6	66	20	0	8.6	772	102	1175	635	8	2306	1314	1041	13
12	I I I I I	8-6	64	19	0	12.4	831	75	1713	676	13	2683	1417	1086	15
13	I II I I I	8-6	65	25	0	8.2	767	103	1961	865	7	3121	1751	1343	19
14	I II I I I	8-6	65	17	0	11.4	753	116	1795	827	9	3315	1713	1504	23
15	I II I I I	8-6	64	16	0	11.2	627	92	1674	827	11	2245	1194	898	13
16	I II I I I	8-6	58	23	0	9.2	867	127	983	332	8	2375	1214	908	13
17	I II I I I	8-7	60	20	0	12.0	653	107	1701	714	19	3632	1794	1337	24
18	I II I I I	8-6	48	21	0	12.0	820	124	1250	557	12	3690	1885	1418	24
19	I II I I I	8-7	62	27	0	11.6	782	108	1300	384	12	3085	1646	1257	16
20	I II I I I	8-9	54	14	0	10.6	852	102	1714	573	10	2981	1306	946	14
21	I II I I I	8-7	63	16	0	9.2	512	87	1932	803	17	3050	1567	1242	20
22	I II I I I	8-9	63	19	0	9.4	544	76	1196	386	11	3672	1668	1214	29
23	I II I I I	8-7	68	18	0	12.2	598	75	2185	875	16	2690	1396	1074	15
24	I II I I I	8-9	62	18	0	10.4	697	88	1397	574	12	3410	1739	1165	20

UNIFORM CORN PRODUCTION TRIAL DATA

Station_____ Year____ Date Planted:_____ Harvested: Silage_____ Grain_____

Population: P_1_____ P_2_____ Fertilizer_____ Frost Date_____

Plot	Trt. code LRFWP	Date of silk	Height Plant in.	Height Ear in.	Plant lodge %	Weight of Silage Plot Wet	Weight of Silage Sample Wet	Weight of Silage Sample Dry	Weight of Silage Ears Wet	Weight of Silage Ears Dry	No. of stalks	No. Weight of Grain per plot Wet	No. Weight of Grain per plot Dry	No. Weight of Grain per plot Shell	No. of Ears
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
25	1 III 231	8-6	60	18	0	10.4	761	106	1497	576	16	2432	1309	1026	12
26	1 III 232	8-8	53	19	0	10.2	805	122	1972	693	14	3064	1528	1114	20
27	1 III 212	8-5	61	22	0	10.2	581	92	2344	807	12	3132	1573	1186	23
28	1 III 211	8-8	52	16	0	13.8	835	126	1487	534	27	2938	1465	1107	21
29	1 III 221	8-6	51	23	0	9.6	884	132	2594	923	16	3230	1664	1204	24
30	1 III 222	8-6	65	22	0	12.0	680	96	2214	950	17	3785	1796	1355	24
31	1 III 132	8-8	64	20	0	9.6	679	98	1427	545	14	2255	1043	757	12
32	1 III 131	8-9	62	22	0	9.4	637	87	1068	346	12	2392	1044	738	15
33	1 III 111	8-8	61	15	0	17.8	527	82	2216	732	25	3591	1613	1191	22
34	1 III 112	8-9	65	21	0	10.0	367	41	1931	808	19	4043	1743	1255	26
35	1 III 121	8-8	58	16	0	10.4	728	96	2371	787	11	2537	1347	1046	16
36	1 III 122	8-9	54	16	0	10.2	653	86	2321	939	12	3046	1404	1058	20
37	1 IV 122	8-8	54	23	0	9.4	475	73	2300	1128	10	2300	1197	887	17
38	1 IV 121	8-9	65	13	0	10.6	792	81	2353	805	17	2813	1439	1125	20
39	1 IV 112	8-9	60	20	0	11.4	595	93	2677	1028	22	3940	2095	1576	28
40	1 IV 111	8-9	54	16	0	10.2	372	61	1754	726	23	4416	2194	1646	26
41	1 IV 131	8-9	57	21	0	9.0	714	86	2147	790	10	3202	1642	1234	19
42	1 IV 132	8-9	58	18	0	7.8	655	89	1766	523	10	2925	1354	1008	17
43	1 IV 231	8-9	63	22	0	10.0	651	118	1641	750	14	2315	1432	1138	14
44	1 IV 232	8-7	67	21	0	8.2	510	84	1681	676	14	3606	1816	1364	22
45	1 IV 222	8-7	67	20	0	9.0	546	76	1656	549	9	2721	1625	1268	16
46	1 IV 221	8-7	59	24	0	13.0	666	99	1785	818	12	3050	1712	1353	16
47	1 IV 211	8-7	54	19	0	8.0	710	122	1280	558	8	2843	1582	1217	17
48	1 IV 212	8-7	63	23	0	13.0	561	75	2043	780	20	3333	1695	1308	20

UNIFORM CORN PRODUCTION TRIAL DATA

tion Dickinson Year 1968 Date Planted: 5-20 Harvested: Silage 9-3 Grain 10-14

ulation: P_1 12,000 P_2 18,000 Fertilizer 200 lbs 11-48-0 Frost Date 10-3

Cols.		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Plot	Trt. code LRFWP	Date of silk	Height Plant in.	Ear in.	Plant lodge %	Weight of Silage Plot Wet	Sample Wet	Sample Dry	Ears Wet	Ears Dry	No. of stalks	Weight of Grain per plot Wet	Dry	Shell	No. of Ears
49	2 I 111	8-7	62	18	0	8.4	582	97	1856	787	19	3320	1691	1312	22
50	2 I 112	8-7	50	18	0	13.0	617	84	1867	873	19	2910	1616	1230	21
51	2 I 121	8-7	55	17	0	6.0	726	105	1414	627	6	2253	1198	894	14
52	2 I 122	8-6	63	18	0	8.0	451	86	1633	696	15	2797	1524	1160	18
53	2 I 131	8-6	54	9	0	7.4	964	126	1030	318	7	1441	769	613	10
54	2 I 132	8-6	64	22	0	9.2	1092	122	1930	802	10	2132	1178	926	12
55	2 I 211	8-6	58	21	0	7.6	1164	115	2215	1073	17	3050	1645	1274	18
56	2 I 212	8-6	64	24	0	8.4	1144	172	856	338	15	954	494	361	6
57	2 I 221	8-6	60	18	0	8.0	823	152	1091	478	8	2195	1086	868	10
58	2 I 222	8-6	66	25	0	6.0	642	108	1818	847	5	3394	1802	1412	18
59	2 I 231	8-6	66	23	0	8.0	847	125	1267	533	6	2423	1292	974	16
60	2 I 232	8-6	65	26	0	11.0	672	93	1944	800	10	2438	1253	967	14
61	2 II 232	8-9	66	26	0	8.0	760	109	1654	676	8	1645	812	608	9
62	2 II 231	8-6	56	19	0	7.8	556	83	1197	425	10	1355	584	415	12
63	2 II 212	8-9	59	22	0	10.2	414	66	885	355	20	2032	911	697	19
64	2 II 211	8-7	60	21	0	10.0	607	77	717	250	11	1416	646	433	12
65	2 II 221	8-7	48	21	0	5.8	827	92	1004	376	10	707	343	245	6
66	2 II 222	8-7	54	26	0	7.2	664	82	630	156	11	1275	605	432	11
67	2 II 131	8-7	45	16	0	5.2	850	108	1255	396	12	1700	752	565	16
68	2 II 132	8-9	57	14	0	5.6	434	66	771	167	8	1012	393	286	10
69	2 II 122	8-9	51	18	0	6.6	575	85	1181	398	12	1275	573	405	9
70	2 II 121	8-9	52	15	0	4.4	586	73	1105	277	10	870	296	188	10
71	2 II 111	8-9	56	22	0	9.0	720	98	1290	408	12	1421	574	341	13
72	2 II 112	8-9	50	19	0	6.0	794	84	513	91	18	644	175	76	10

UNIFORM CORN PRODUCTION TRIAL DATA

tion_____ Year_____ Date Planted:_____ Harvested: Silage_____ Grain_____

ulation: P_1_____ P_2_____ Fertilizer_____ Frost Date_____

Plot No.	Trt. code LRFWP	Date of silk	Height Plant in.	Height Ear in.	Plant lodge %	Weight of Silage Plot Wet	Weight of Silage Sample Wet	Weight of Silage Sample Dry	Weight of Silage Ears Wet	Weight of Silage Ears Dry	No. of stalks	Weight of Grain per plot Wet	Weight of Grain per plot Dry	Weight of Grain per plot Shell	No. of Ears
(Cols.)		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
73	2 III 111	8-9	50	17	0	6.4	585	102	1314	276	8	1360	597	408	11
74	2 III 112	8-8	53	21	0	6.0	755	101	681	151	15	1196	308	155	16
75	2 III 132	8-9	50	15	0	5.2	810	85	1564	442	10	850	357	272	8
76	2 III 131	8-9	53	18	0	7.2	636	86	1235	343	9	1663	686	420	8
77	2 III 121	8-9	51	14	0	7.2	834	79	782	183	16	1090	386	251	9
78	2 III 122	8-9	49	17	0	6.2	620	83	521	116	10	942	362	242	13
79	2 III 212	8-9	53	14	0	7.2	590	75	1062	287	20	1377	585	382	14
80	2 III 211	8-9	51	12	0	5.6	713	65	784	208	12	1040	325	196	8
81	2 III 232	8-7	54	16	0	6.0	917	107	683	254	9	1393	613	405	13
82	2 III 231	8-8	50	13	0	6.2	620	94	1255	331	12	1392	525	323	12
83	2 III 222	8-8	49	27	0	8.0	907	92	650	136	11	1080	431	273	8
84	2 III 221	8-8	53	24	0	6.0	995	101	950	357	6	1085	428	298	10
85	2 IV 111	8-9	56	25	0	7.2	773	102	1414	491	22	1271	542	396	11
86	2 IV 112	8-8	40	14	0	5.4	734	75	592	124	15	1102	358	221	14
87	2 IV 131	8-8	55	14	0	5.8	470	55	765	185	9	1321	568	389	12
88	2 IV 132	8-8	53	21	0	5.8	655	75	844	223	14	1684	684	459	13
89	2 IV 122	8-8	48	19	0	5.6	587	85	371	86	10	597	244	174	7
90	2 IV 121	8-8	50	19	0	6.0	868	94	866	273	10	1215	585	413	9
91	2 IV 221	8-8	48	18	0	6.0	721	92	942	367	8	1342	742	595	10
92	2 IV 222	8-8	54	20	0	5.0	620	67	391	114	9	434	196	151	5
93	2 IV 231	8-8	47	22	0	6.0	712	73	711	204	11	843	419	316	7
94	2 IV 232	8-8	57	18	0	6.6	615	81	714	203	12	534	187	117	10
95	2 IV 211	8-8	50	19	0	6.0	726	97	763	258	14	1222	567	395	9
96	2 IV 212	8-9	50	21	0	6.4	601	111	340	89	15	502	206	150	6

Seeding Rate Trials with Wheat and Oats

Numerous seeding rate trials have been conducted with small grains by many experiment stations in past years, and these trials, combined with local farm experience have served in a general wat to establish the approximate rates best suited to specific localities. Generally, however, these experiences and the recommendations resulting from them have as their basis total weight or total volume of seeds sown, with the germination and purity of the seed coming into consideration only in a general way. The assumption is, of course, that only "good" seed will be used. This assumption has been proven faulty by numerous drill box surveys made in recent years which have shown that far too much poor quality seed is actually used. In addition, the term "good" seed is a general term, which perhaps could well be refined in terms of germination and purity, and from which can be calculated the "pure live seed" percentage. The amount of "pure live seed" used per acre is actually the only meaningful way to measure seeding rates, and is also the basis which should be used to determine the comparative value of seed of different lots. For example, a seed lot testing 95% pure and with a germination of 95% has a pure live seed percentage of 90.25%. A 60 lbs. bushel of this seed lot will contain 54.15 lbs. of pure live seed. Another lot of seed testing 90% pure and with a germination of 90% would have a pure live seed percentage of 81%. This is considered to be good seed by present standards, but this second lot would have to be seeded at a rate of 66.7 lbs. per acre to equal live seed percentage in a 60 lb. bushel of the seed testing 95% pure and with a 95% germination. Perhaps the traditional tendency to seed fairly heavy rates of small grain has been necessary to make up for lack of high purity and germination, and has been the only way to get satisfactory stand. It is rather fortunate that the small grains are adaptable enough to be able to adjust themselves to rather wide variations in seeding rate with no sacrifice to yield.

This subject is perhaps only of moderate importance at present because of the relatively low price of seed of most of the small grains. However, it will become increasingly important if the development of hybrid wheat becomes a reality for the commercial producer. Hybrid seed wheat will undoubtedly cost a great deal more than common seed wheat, and in addition, new hybrid seed will have to be bought each year.

Table 56. Rate of Seeding Trial with Oats – 1968.

Rate of seeding	Yield bushels per acre				
Pounds per acre	1	2	3	4	Average
40 pounds	61.9	103.6	100.1	57.8	80.9
48 pounds	55.3	112.6	102.7	60.2	82.7
64 pounds	60.7	111.8	109.3	60.2	85.5

Analysis of Variance Summary

Source	df	Sums of squares	Mean Square	F-Value
Total	11	6921	629	---
Replication	3	6764	2255	121
Treatment	2	45	23	.12
Error	6	112	18.6	

F – value required for significance @ 5% level is 5.14

Table 57. Rate of Seeding Trial with Wheat – 1968.

Rates of seeding	Yield in bushels per acre				
Pounds per acre	1	2	3	4	Average
45 lbs. per acre	35.2	40.7	25.1	55.7	39.2
60 lbs. per acre	36.3	39.4	22.0	50.6	37.1
75 lbs. per acre	34.3	40.9	24.4	52.3	38.0

Analysis of Variance Summary

Source	df	Sums of squares	Mean square	F-value
Total	11	1326	--	--
Replication	3	1304	435	218
Treatment	2	10	5.0	2.5
Error	6	12	2.0	

F – value required for significance of 5% level is 5.14

Table 59. Summary of the Seeding Rate Trials with Wheat and Oats.

Crop	Rate of seeding	Average yield bushels per acre 1964	1965	1966*	1967	1968	4-year Average
Wheat	45 lbs. per acre	10.4	25.2	---	25.8	39.2	25.2
	60 lbs. per acre	12.8	25.9	---	26.3	37.1	25.5
	75 lbs. per acre	12.9	26.2	---	27.2	38.0	26.1
	L.S.D. @ 5%	2.75	4.80	---	4.10	2.5	1.8
	% germination	90.0	92.0	---	93.0	96.0	
	% purity	99.3	96.0	---	89.3	65.0	
	% pure live seed	89.4	88.3	---	89.3	95.0	
Oats	40 lbs. per acre	36.5	76.7	---	37.7	80.9	58.0
	48 lbs. per acre	34.9	82.4	---	39.0	82.7	59.8
	64 lbs. per acre	39.8	73.6	---	37.9	85.5	59.2
	L.S.D. @ 5%	4.34	5.90	---	5.35	7.6	2.96
	% germination	96.0	98.0	---	96.0	95.0	
	% purity	99.3	99.9	---	99.5	99.0	
	% pure live seed	95.3	98.0	---	92.5	94.1	

*Hailed out in 1966.

Potato Variety Demonstrations and Yield Trial

While potatoes are a crop of limited importance to western North Dakota, there is a great deal of interest in new potato varieties, especially with regard to the appearance and table quality of new potato varieties. A limited planting of new varieties as well as some of the older varieties is made each year, and people interested in potatoes are invited to come to the Station in the fall on the day the potatoes are dug, to inspect the crop and talk about potatoes.

The yields recorded in the 1968 potato trial summarized in table 59.

Table 59. Potato Variety Trial – 1968.

	Pounds per plot Gross yield			Pounds per plot Net Yield			Net per pounds			
Description	1	2	3	1	2	3	1	2	3	Average
Viking	34	47	63	32	43	58	5440	7310	9860	7536.7
#6584-6R	54	72	72	51	68	66	8670	11560	11220	10483.3
Norgold	40	50	50	34	41	42	5780	6970	7140	6630.0
Cheiftan	70	72	75	59	58	66	10030	9860	11220	10460.0
#6127-10R	56	61	84	51	54	73	8670	9180	12410	10086.7
Kennebec	63	99	71	57	94	66	9690	15980	11220	12296.7
No Chip	65	71	78	57	61	63	9690	10370	11560	10540.0
Norchief	37	26	25	30	22	22	5100	3740	3740	4193.3
Cobbler	52	54	64	45	42	52	7650	7140	8840	7876.7
#5761-5	61	70	74	50	59	61	8500	10030	10370	9633.3
Norland	52	51	65	47	47	59	7990	7990	10030	8670.0
Russet Burbank	43	52	40	34	41	29	5780	6970	4930	5893.3
#6925-1B	33	40	47	21	28	32	3570	4760	5440	4590.0
Red Pontiac	60	77	73	50	71	65	8500	12070	11050	10540.0

Meetings and Tours
1968

Date		Attendance
January 10	John Deere Day – Dickinson Presentation on Variety Trials	300
January 17	Stark County Agricultural Improvement Association	50
January 18	John Deere Day – Bowman Presentation on Variety Trials	250
January 26	John Deere Day – Hettinger Presentation on Variety Trials	150
January 31	Branch Station Conference	Attended
February 1-2	Branch Station Conference	
February 20	John Deere Farming Frontiers Day – Beach	200
February 26	John Deere Farming Fronters Day – Mott	200
February 26	John Deere Farming Frontiers Day – Elgin	150
February 26	Burleigh County Livestock Forum	200
March 1	Valley City Winter Show – Judging	10
March 29	Cub Scout Troop – Tour of Station	
May 29	Dickinson Rotary Club Attended to hear Representative of World Seeds Inc.	
July 10	Williston Station Field Day	300
July 17	Crops Field Day – Dickinson Branch Station	300
July 19	Hettinger Station Field Day	25
July 25	Killdeer Off-Station Field Day	30
July 28	Golden Valley County – Off-Station Field Day	75
August 21	Stark County 4-H Achievement Day	Crops Judge
September 14	4-H Achievement Day – Golden Valley County	Grains Judge
September 20	4-H Achievement Day – Grants County	Grains Judge
October 10	Patrons Meeting – Farmers Union Elevator-Dickinson	300
October 16	Rotary- Farmers and Ranchers Night	Attended
October 28	Agriculture Committee- G.N.D.A. – State Convention Dickinson	20
November 6	Trojan Company – Corn Meeting	125
November 19	Western Branch Stations	4
November 25	North Dakota Crop Improvement Conference	375
December 5	Golden Valley County Crop Improvement Association-	Attended
December 11	19th Annual Livestock Research Roundup	

Radio
1968

Date	Programs
January 5	Results of Oat Variety Trials in 1967 and New Oat Varieties that Appear to be Promising for Southwestern North Dakota.
February 9	Rate of Seeding Trials with Wheat and Oats at Dickinson.
March 22	Stimulated Hail Research Project at Dickinson Experiment Station in 1968
April 12	Discussion of Summerfallowing Trial Using Different Following Intervals at Dickinson Experiment Station.
May 17	Review of Canadian Seeding Rate Trials and Seeding Rate Trials at Dickinson Experiment Station.
June 7	Weed Spraying Recommendations.
July 5	Dickinson Experiment Station Field Day and Off Station Field Days.
July 27	Results of Sainfoin Trials in 1968.
August 16	Results of Crop Variety Trials in 1968.
September 6	Results in the Regional HRS and Durum Nurseries in 1968.
September 27	Results of Winter Wheat Trials at Dickinson Experiment Station and Off-Station Sites 1968.
October 25	Oat Variety Trials in 1968 and Variety Recommendations.
November 9	Economics of Winter Wheat in North Dakota.
November 29	Completion of above topic, and discussion of New Wheats in Regional Nursery Trials.
December 6	Livestock Research Roundup Program for 1968.
December 20	Comparison of Six and Seven Inch Double Disk Drill for seeding small Grains in Western North Dakota.

General Summary

	Farm Visits	No. tours	Attendance at meetings	Station calls	Radio talks	News articles	Meetings attended
January	0	0	750	8	1	0	5
February	0	0	750	3	1	0	4
March	0	1	10	4	1	0	2
April	0	0	0	0	1	0	0
May	1	0	0	6	1	0	1
June	8	0	0	1	1	0	0
July	7	0	730	5	2	1	5
August	1	0	0	7	1	0	1
September	0	0	0	3	2	0	2
October	0	0	320	9	1	0	3
November	0	0	504	1	2	0	3
December	1	0	1000	1	2	0	2
Total	18	1	4064	48	16	1	28