1973

Annual Report

Dickinson Experiment Station

Dickinson, North Dakota

Report Of

Agronomic Investigations

At The

Dickinson Experiment Station

Dickinson, North Dakota

1973

By

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Growing Conditions – 1973

Precipitation recorded at the Dickinson Experiment Station for January, February and March was .91 inches, which was more than half an inch below average. April rainfall at 3.21 inches was well above average and balanced the below normal amount of 1.30 falling in May. June rainfall of 3.04 inches, while slightly below average, was sufficient to support good crop development. While the total precipitation for the 12 month period September 1972 – August 1973 was about 3 inches below average, the deficit occurred in July and August, at the end of the growing season. Up to July, precipitation was actually slightly above average.

Temperatures during the growing season were nearly average, with several short periods of 2 to 5 days duration in July and August when 90+ degrees F. were recorded. The mercury reached or exceeded 100 degrees F. on only three days, all being after the middle of August.

Hettinger received nearly 18 inches of precipitation for the 12 month period September 1972 – August 1973. However, an extended dry period during the last half of May and the first part of June affected crop development, and yields were less than would be expected from this amount of precipitation. Oats yields in particular were adversely affected by this dry weather.

In contrast, precipitation at Mandan for the same 12 month period was only 8.35 inches, but moisture reserve and distribution of rainfall during the growing season combined to produce excellent yields from this small amount of moisture.

Precipitation summary : Dickinson

	1972-1973	80 Yr. Avg.
Sept., Oct., Nov., Dec., 1972	3.09	3.04
January, February, March 1973	.91	1.58
April	3.21	1.38
May	1.30	2.35
June	3.04	3.59
July	.91	2.23
August	.47	1.78
Total	12.93	15.96

Temperature summary: Dickinson

Month	Max.	Min.	Avg.	69 Yr Avg.
April	51.2	27.8	39.5	41.7
May	65.7	37.2	51.5	52.8
June	77.7	48.4	63.1	61.8
July	83.6	50.8	67.2	69.0
August	88.7	52.6	70.6	67.0

Precipitation Summary: Hettinger

	1972-1973
Sept., Oct., Nov., Dec., 1972	4.29
January, February, March 1973	.85
April	2.97
May	2.36
June	4.26
July	2.15
August	1.06
Total	17.94

Precipitation Summary: Mandan

	1972-1973	58 Yr. Avg.
Sept., Oct., Nov., Dec., 1972	3.12	3.18
January, February, March 1973	.21	1.49
April	.87	1.50
May	2.48	2.14
June	.71	3.48
July	.76	2.39
August	.20	1.69
Total	8.35	15.87

Seeding Dates & Procedure

Seeding at Mandan was done on April 17. At Dickinson, wheat was seeded on April 17, durum on April 18 and oats and barley on May 2. Trials at Hettinger were seeded on April 18. Heavy rain caused soil crusting which resulted in unsatisfactory emergence. The Hettinger trial was reseeded on May 8. Seeding at Glen Ullin was done on April 16. Heavy rains caused soil crusting which resulted in unsatisfactory emergence at this location also, with necessary reseeding done on May 10. The April 27 seeding at Killdeer was reseeded on May 21 because of heavy wild oats infestation. Trials at Beach were seeded May 2, and at Bowman May 3. Winter wheat seeding were made at Bowman and Hettinger on September 8 and at Beach on September 11, 1972.

All trials were seeded on summerfallow. Fertilizer application was uniform for all varieties at a given location, based on soil tests. Rates of application recommended by the North Dakota State University Soils Testing Laboratory were used for all trials.

Trials with spring grain were seeded with a double disk press drill at the rate of 1 bushel per acre for spring wheat & durum 1-1/4 bushel per acre for barley and 1-1/2 bushel per acre for oats.

Winter grains were seeded with a deep furrow drill equipped with spear point shovels spaced 10 inches apart. Seeding rates were 1 bushel per acre for winter rye and 50 pounds per acre for winter wheat.

Current recommendations for control of broadleaf weeds were followed. In addition, Fargo was used for wild oats control at the Glen Ullin and Killdeer sites in 1973.

Cereal rusts and other plant diseases were extremely light on spring sown grains this year, not affecting production.

Heavy infection of winter wheat with wheat streak mosaic early in the season caused some concern, but the excellent yields of winter finally harvested are the best indication that production was not significantly affected.

Table 1 – Hard red spring wheat variety trial 1973 – Dickinson

Yields in bushels per acre

Variety or treatment	Rep 1	Rep 2	Rep 3	Rep 4	Avg.	Test weight	Heading date	Height inches	Percent protein
Justin	51.7	51.7	55	49.5	52	58.5	3-Jul	26	16.2
Chris	49.5	46.2	51.7	50.6	49.5	60	1-Jul	26	16
Manitou	49.5	53.9	46.2	47.3	49.2	60.5	1-Jul	27	16.7
Waldron	53.9	55	55	49.5	53.4	61	30-Jun	27	16.3
Bonanza	52.8	57.2	58.3	47.3	53.9	62.5	29-Jun	21	14.8
Era	72.6	75.9	77	57.2	70.7	62.5	3-Jul	23	
World Seeds 1809	48.4	53.9	50.6	50.6	50.9	61	27-Jun	25	15.7
Bounty 208	52.8	57.2	56.1	56.1	55.6	64	28-Jun	24	15.2
Nordak	46.2	52.8	47.3	48.4	48.7	61	3-Jul	29	16.3
Lark	60.5	55	62.7	55	58.3	62	29-Jun	23	15.2
Napayo	44	51.7	48.4	46.2	47.6	59	1-Jul	26	
Olaf	56.1	63.8	66	60.5	61.6	60	3-Jul	22	15.6
S 6662	49.5	57.2	45.1	45.1	49.2	62	1-Jul	26	
ND 491	49.5	55	45.1	48.4	49.5	61	2-Jul	28	
ND 507	56.1	60.5	50.6	51.7	54.7	61	1-Jul	25	
ND 510	49.5	51.7	44	50.6	49	60	30-Jun	26	
Fortuna	46.2	51.7	49.5	53.9	50.3	62	30-Jun	28	14.8
Polk	47.3	47.3	41.8	48.4	46.2	62	30-Jun	24	16.3
Glenlea	57.2	62.7	50.6	53.9	56.1	60	3-Jul	27	
Walhalla	47.3	52.8	44	49.5	48.4	60	4-Jul	30	
Nowesta ND 363-1BdV	52.8	44	55	58.3	52.5	61	29-Jun	26	
S 6916	56.1	56.1	56.1	57.2	56.4	63	26-Jun	27	
Norana MT 7042	60.5	61.6	58.3	59.4	60	62	2-Jul	28	
II - 64 - 33	56.1	66	53.9	55	57.8	59	3-Jul	23	
ND 518	48.4	56.1	47.3	53.9	51.4	62	28-Jun	32	
ND 519	59.4	59.4	60.5	52.8	58	62	28-Jun	28	
ND 520	45.1	52.8	45.1	50.6	48.4	61.5	28-Jun	26	
ND 523	53.9	63.8	60.5	55	58.3	64	4-Jul	24	
ND 524	53.9	53.9	48.4	52.8	52.3	62	28-Jun	28	

Standard error of a treatment mean = 1.8747
Least significant difference @ 5% = 5.2494
The c.v. = 7.02 P.C.

Table 2 – Long term yield comparison of hard spring wheat varieties 1973 -Dickinson.

Yields in bushels per acre

Variety	1968	1969	1970	1971	1972	1973	Avg. 1969-73
Justin	33	44	22	23	22	52	33
Chris	25	40	19	28	22	50	32
Manitou	33	43	22	28	21	49	33
Fortuna	33	33	19	27	20	50	30
Polk	35	41	19	21	25	46	30
Waldron	29	43	22	25	25	53	34
Era		55	27	28	35	71	43
Bonanza			21	28	35	54	-
Bounty 208				29	32	56	-
Nordak				22	20	49	-
Lark				27	35	58	-
Napayo					23	48	-
World Seeds 1809					27	51	-
Olaf					27	62	-
ND 507					27	55	-
ND 510					28	49	-
Glenlea						56	-
Walhalla						48	-
Nowesta						53	-
Norana						60	-
L.s.d.@ 5%	5.3	4.1	2.9	5.1	6.1	5.2	

Table 3 – Off-Station hard spring wheat variety trial 1973-Beach

Variety or Treatment	Rep 1	Rep 2	Rep 3	Rep 4	Avg.	Test Weight	Percent protein
Justin	24.2	24.2	22.0	34.1	26.1	60.0	15.1
Chris	35.2	30.8	38.5	36.3	35.2	62.0	14.4
Manitou	31.9	28.6	34.1	34.1	32.2	63.0	14.8
Waldron	27.5	24.2	27.5	34.1	28.3	61.5	15.8
Fortuna	29.7	33.0	34.1	45.1	35.5	64.0	14.2
Olaf	31.9	31.9	41.8	41.8	36.9	62.0	14.3
Bounty 208	35.2	39.6	39.6	49.5	41.0	61.0	13.7
Lark	35.2	37.4	44.0	59.4	44.0	64.0	12.5
Nordak	24.2	23.1	24.2	29.7	25.3	62.5	14.9
World Seeds 1809	33.0	37.4	34.1	44.0	37.1	63.0	14.1
Bonanza	35.2	39.6	48.4	58.3	45.4	63.0	13.2
Polk	29.7	31.9	28.6	38.5	32.2	63.0	14.8
Leeds	19.8	18.7	22.0	20.9	20.4	63.0	
Wells	23.1	22.0	25.3	35.2	26.4	63.0	
Rolette	23.1	24.2	22.0	35.2	26.1	64.0	

Standard error of a treatment mean = 1.7918
Least significant difference @ 5% = 5.0680
The c.v. = 10.93 P.C.

Table 4 – Off-Station hard spring wheat variety trial 1973 – Bowman

Variety or Treatment	Yields in bushels per acre Rep 1	Rep 2	Rep 3	Rep 4	Avg.	Test weight	Percent protein
Justin	33.0	34.1	53.9	51.7	43.2	55.0	14.6
Chris	34.1	33.0	40.7	53.9	40.4	59.0	15.2
Manitou	27.5	30.8	45.1	51.7	38.8	56.0	16.6
Waldron	38.5	39.6	54.5	53.9	46.6	60.5	13.1
Fortuna	38.5	38.5	45.1	51.7	43.5	61.0	13.3
Olaf	40.7	50.6	46.2	59.4	49.2	57.0	13.8
Bounty 208	38.5	46.8	49.5	59.7	47.9	62.0	13.0
Lark	35.2	38.5	44.0	50.6	42.1	61.0	12.8
Nordak	35.2	36.3	53.9	51.7	44.3	61.0	14.1
World Seeds 1809	41.8	39.6	53.9	51.7	46.8	61.5	13.8
Bonanza	40.2	40.7	33.0	49.5	40.9	55.0	14.6
Polk	40.7	35.2	47.3	54.5	44.4	58.0	13.9
Leeds	38.5	35.2	44.0	51.7	42.4	62.0	
Wells	34.1	33.0	43.5	48.4	39.7	60.5	
Rolette	41.8	39.1	53.9	63.3	49.5	64.0	

The standard error of a treatment mean = 2.0307
Least significant difference @ 5% = 5.7438
The c.v. = 9.24 P.C.

Table 5 – Off-Station hard spring wheat variety trial 1973 – Glen Ullin

Variety or Treatment	Yields in bushels per acre					Test weight	Percent protein
	Rep 1	Rep 2	Rep 3	Rep 4	Avg.		
Justin	16.5	25.3	22.0	38.5	25.6	63.0	13.6
Chris	25.3	28.6	20.9	39.6	28.6	64.0	14.6
Manitou	24.2	28.6	24.2	41.8	29.7	61.0	13.8
Waldron	26.4	27.5	26.4	47.3	31.9	62.0	14.0
Fortuna	22.0	25.3	25.3	39.6	28.1	63.0	12.8
Olaf	19.8	26.4	27.5	34.1	27.0	63.0	13.9
Bounty 208	15.4	22.0	20.9	44.0	25.6	64.0	13.5
Lark	19.8	22.0	24.2	41.8	27.0	63.0	12.9
Nordak	14.3	24.2	19.8	41.8	25.0	63.0	13.7
World Seeds 1809	15.4	26.4	26.4	41.8	27.5	62.0	14.6
Bonanza	16.5	25.3	22.0	28.6	23.1	61.0	13.8
Polk	23.1	23.1	22.0	40.7	27.2	63.0	14.2
Leeds	20.9	22.0	17.6	35.2	23.9	64.0	
Wells	22.0	25.3	25.3	39.6	28.1	63.0	
Rolette	20.9	25.3	24.2	35.2	26.4	63.0	

The standard error of a treatment mean = 1.5288
Least significant difference @ 5% = 4.3240
The c.v. = 11.35 P.C.

Table 6 – Off- Station hard spring wheat variety trial 1973 – Hettinger

Variety or Treatment	Yields in bushels per acre					Test weight	Percent protein
	Rep 1	Rep 2	Rep 3	Rep 4	Avg.		
Justin	17.6	36.3	26.4	28.6	27.2	59.5	17.1
Chris	24.2	37.4	39.6	29.7	32.7	58.0	17.0
Manitou	23.7	34.1	34.1	30.8	30.7	60.0	16.6
Waldron	29.7	42.9	34.1	33.0	34.9	59.5	15.7
Fortuna	28.6	38.5	37.4	29.7	33.6	62.5	14.7
Olaf	29.7	42.9	42.9	34.1	37.4	58.0	15.9
Bounty 208	22.0	40.0	25.3	30.8	29.5	61.0	14.5
Lark	23.1	40.0	37.4	28.6	32.3	61.0	14.8
Nordak	26.4	34.1	24.2	29.7	28.6	61.5	16.3
World Seeds 1809	27.0	40.2	28.1	31.4	31.7	60.0	15.4
Bonanza	23.1	33.0	38.5	26.4	30.3	60.5	15.4
Polk	26.4	38.5	29.7	28.1	30.7	62.0	16.0
Leeds	24.2	35.2	36.3	27.5	30.8	60.5	
Wells	28.6	39.6	34.1	30.8	33.3	62.5	
Rolette	27.5	36.3	28.6	29.2	30.4	63.5	

The standard error of a treatment mean = 1.6195
Least significant difference @ 5% = 4.5807
The c.v. = 10.25 P.C.

Table 7 – Off-Station hard spring wheat variety trial 1973 – Killdeer

Variety or Treatment	Yields in bushels per acre					Test weight	Percent protein
	Rep 1	Rep 2	Rep 3	Rep 4	Avg.		
Justin	29.7	35.2	36.3	31.9	33.3	59.5	14.9
Chris	34.1	34.1	39.6	35.2	35.8	62.0	14.3
Manitou	28.6	31.9	35.2	40.7	34.1	61.0	15.2
Waldron	36.3	37.4	38.5	33.0	36.3	62.0	14.4
Fortuna	26.4	27.5	30.8	28.6	28.3	64.0	15.0
Olaf	34.1	39.6	40.7	31.9	36.6	61.0	14.7
Bounty 208	24.2	24.2	30.8	31.9	27.8	64.0	14.6
Lark	26.4	25.3	33.0	31.9	29.2	64.0	13.9
Nordak	29.7	26.3	30.8	38.5	33.8	62.0	15.0
World Seeds 1809	29.7	29.7	27.5	36.3	30.8	64.0	15.0
Bonanza	27.5	28.6	36.3	26.4	29.7	62.0	13.9
Polk	30.8	34.1	33.0	33.0	32.7	64.0	14.1
Leeds	30.8	36.3	34.1	27.5	32.2	64.0	
Wells	35.2	42.9	39.6	35.2	38.2	62.0	
Rolette	22.0	27.5	23.1	29.7	25.6	64.0	

The standard error of a treatment mean = 1.6329
Least significant difference @ 5% = 4.6185
The c.v. = 10.12 P.C.

Table 8 – Off-Station hard spring wheat variety trial 1973 – Mandan

Variety or Treatment	Yields in bushels per acre					Test weight	Percent protein
	Rep 1	Rep 2	Rep 3	Rep 4	Avg.		
Justin	23.1	26.4	24.2	27.5	25.3	60.0	16.4
Chris	29.7	26.4	27.5	27.5	27.8	60.0	15.2
Manitou	31.9	29.7	24.2	31.9	29.4	58.5	15.8
Waldron	36.3	35.2	31.9	33.0	34.1	59.5	15.4
Fortuna	35.2	30.8	29.7	31.9	31.9	60.5	14.5
Olaf	35.2	39.6	29.7	33.0	34.4	60.5	14.9
Bounty 208	29.7	36.3	30.8	30.8	31.9	59.5	14.7
Lark	29.7	33.0	26.4	28.6	29.4	57.5	14.8
Nordak	28.6	34.1	24.2	31.9	29.7	59.5	16.5
World Seeds 1809	29.7	30.8	28.6	30.8	30.0	58.5	15.4
Bonanza	33.0	27.5	25.3	26.4	28.1	60.5	14.5
Polk	31.9	30.8	29.7	28.6	30.2	63.0	15.5
Leeds	35.2	30.8	22.0	28.6	29.2	63.5	
Wells	34.1	29.7	27.5	25.3	29.2	62.5	
Rolette	29.7	28.6	26.4	30.8	28.9	62.0	

The standard error of a treatment mean = 1.2260
Least significant difference @ 5% = 3.4678
The C.V. = 8.19 P.C.

Table 9 – Wheat variety trials Dickinson and Off-Station sites 1973

Yields in bushels per acre

Variety	Dickinson	Beach	Bowman	Glen Ullin	Hettinger	Killdeer	Mandan	1973 Avg. 7-station
Justin	52	26	43	26	27	33	25	33
Chris	50	35	40	29	33	36	28	36
Manitou	49	32	39	30	31	34	29	35
Waldron	53	28	47	32	35	36	34	38
Fortuna	50	36	44	28	34	28	32	36
Olaf	62	37	49	27	37	37	34	40
Bounty 208	56	41	48	26	30	28	32	37
Lark	58	44	42	27	32	29	29	37
Nordak	49	25	44	25	29	34	30	34
World Seeds 1809	51	37	47	28	32	31	30	37
Bonanza	54	45	41	23	30	30	28	36
Polk	46	32	44	27	31	33	30	35
Leeds	36	20	42	24	31	32	29	31
Ward	35	26	40	28	33	38	29	33
Rolette	41	26	50	26	30	26	29	33
L.s.d. @ 5%	5.2	5	5.7	4.3	4.5	4.6	3.4	

Table 10 – Wheat variety trials Dickinson and Off-Station sites 1973

Test weight in pounds per bushel

Variety or Treatment	Dickinson	Beach	Bowman	Glenn Ullin	Hettinger	Killdeer	Mandan	1973 Ave. 7-station
Justin	58.5	60	55	63	59.5	59.5	60	59.4
Chris	60	62	59	64	58	62	60	60.7
Manitou	60.5	63	56	61	60	61	58.5	60
Waldron	61	61.5	60.5	62	59.5	62	59.5	60.9
Fortuna	62	64	61	63	62.5	64	60.5	62.4
Olaf	60	62	57	63	58	61	60.5	60.2
Bounty 208	64	61	62	64	61	64	59.5	62.2
Lark	62	64	61	63	61	64	57.5	61.8
Nordak	61	62.5	61	63	61.5	62	59.5	61.5
World Seeds 1809	61	63	61.5	62	60	64	58.5	61.4
Bonanza	62.5	63	55	61	60.5	62	60.5	60.6
Polk	62	63	58	63	62	64	63	62.1
Leeds	63	63	62	64	60.5	64	63.5	62.9
Ward	62	63	60.5	63	62.5	62	62.5	62.2
Rolette	63	64	64	63	63.5	64	62	63.4

Table 11 – Wheat variety trials – protein data 1973

Wheat protein at 14.0% moisture basis

Variety	Dickinson	Beach	Bowman	Gen Ullin	Hettinger	Killdeer	Mandan	1973 Avg. 7-Station
Justin	16.2	15.1	14.6	13.6	17.1	14.9	16.4	15.4
Chris	16	14.4	15.2	14.6	17	14.3	15.2	15.2
Manitou	16.7	14.8	16.6	13.8	16.1	15.2	15.8	15.6
Waldron	16.3	15.8	13.1	14	15.7	14.4	15.4	15
Fortuna	14.8	14.2	13.3	12.8	14.7	15	14.5	14.2
Olaf	15.6	14.3	13.8	13.9	15.9	14.7	14.9	14.7
Bounty 208	15.2	13.7	13	13.5	14.5	14.6	14.7	14.2
Lark	15.2	12.5	12.8	12.9	14.8	13.9	14.8	13.8
Nordak	16.3	14.9	14.1	13.7	16.3	15	16.5	15.3
World Seeds 18(	15.7	14.1	13.8	14.6	15.4	15	15.4	14.9
Bonanza	14.8	13.2	14.6	13.8	15.4	13.9	14.5	14.3
Polk	16.3	14.8	13.9	14.2	16	14.1	15.5	15

Table 12 – Off-Station winter wheat variety trial 1973 – Beach

Yields in bushels per acre

Variety or Treatment	Rep 1	Rep 2	Rep 3	Avg.	Test weight	Percent protein
Froid	36.6	35.5	42.9	38.2	61.5	15.3
Hume	31.4	36.3	42.9	36.9	62.0	15.0
Winoka	37.1	44.6	43.7	41.8	62.0	14.6
Trapper	35.5	40.4	47.9	41.3	64.0	14.1
Lancer	32.2	42.1	47.9	40.7	65.0	13.7
Centurk	42.1	38.0	50.3	43.5	64.0	14.1
Sundance	42.1	45.4	47.9	45.1	61.5	14.1
SD 6733 (Bronze)	32.2	42.1	43.7	39.3	61.5	15.5

The standard error of a treatment mean = 1.7313

Least significant difference @ 5% = 5.2519

The c.v. = 7.34 P.C.

Table 13 – Off-Station winter wheat variety trial 1973 – Bowman

Variety or Treatment	Yields in bushels per acre					Test weight	Percent protein
	Rep 1	Rep 2	Rep 3	Rep 4	Avg.		
Froid	34.6	59.4	51.2	52.0	49.3	59.0	13.5
Hume	37.1	51.2	51.2	50.3	47.4	59.0	14.0
Winoka	35.5	38.0	51.2	58.6	45.8	64.0	13.3
Trapper	41.3	52.0	59.4	58.6	52.8	62.0	13.7
Lancer	45.4	61.1	66.8	57.8	57.8	63.0	13.0
Centurk	48.7	54.5	52.0	61.1	54.0	61.0	12.5
Sundance	39.6	58.6	60.2	52.8	52.8	59.0	14.0
SD 6753 (Bronze)	42.9	54.5	60.2	51.2	52.2	61.5	13.6

Standard error of a treatment mean = 2.4183
Least significant difference @ 5% = 7.1136
The c.v. = 9.39 P.C.

Table 14 – Off -Station winter wheat variety trial 1973 – Hettinger

Variety or Treatment	Yields in bushels per acre					Test weight	Percent protein
	Rep 1	Rep 2	Rep 3	Rep 4	Avg.		
Froid	28.1	25.8	31.4	28.1	28.4	57.0	12.7
Hume	34.7	33.0	34.7	33.0	33.8	59.0	12.5
Winoka	33.0	37.1	36.3	38.0	36.1	61.0	12.2
Trapper	33.0	32.2	38.8	36.3	35.1	59.0	11.6
Lancer	35.5	35.5	38.8	39.6	37.3	59.0	11.9
Centurk	39.6	43.7	40.4	44.6	42.1	58.0	12.7
Sundance	29.7	28.1	41.3	31.4	32.6	56.0	12.6
SD 6753 (Bronze)	36.3	35.5	37.1	38.0	36.7	59.0	12.4

Standard error of treatment mean = 1.2301
Least significant difference @ n5% = 3.6184
The c.v. = 6.98 P.C.

Table 15 – Off-Station winter wheat variety trials 1973

Variety	Yields in bushels per acre Beach	Bowman	Hettinger	1973 Avg. 3-Station
Froid	38.2	49.3	28.4	38.6
Hume	36.9	47.4	33.8	39.6
Winoka	41.8	45.8	36.1	40.9
Trapper	41.3	52.8	35.1	43.1
Lancer	40.7	57.8	37.3	45.0
Centurk	43.5	54.0	42.1	46.5
Sundance	45.1	52.8	32.6	43.5
Bronze	39.3	52.2	36.7	42.7
L.s.d. @ 5%	5.2	7.1	3.6	

Table 16 – Off-Station winter wheat variety trials 1973.

Variety	Test weight in pounds per bushel Beach	Bowman	Hettinger	1973-Avg. 3-Station
Froid	61.5	59.0	57.0	59.2
Hume	62.0	59.0	59.0	60.0
Winoka	62.0	64.0	61.0	62.3
Trapper	64.0	62.0	59.0	61.7
Lancer	65.0	63.0	60.0	62.7
Centurk	64.0	61.0	58.0	61.0
Sundance	61.5	59.0	56.0	58.8
Bronze	61.5	61.5	59.0	60.7

Table 17 – Off -Station winter wheat variety trials 1973

Variety	Wheat protein at 14.0% moisture basis Beach	Bowman	Hettinger	1973 Avg. 3-Station
Froid	15.3	13.5	12.7	13.8
Hume	15.0	14.0	12.5	13.8
Winoka	14.6	13.3	12.2	13.4
Trapper	14.1	13.7	11.6	13.1
Lancer	13.7	13.0	11.9	12.9
Centurk	14.1	12.5	12.7	13.1
Sundance	14.1	14.0	12.6	13.6
Bronze	15.5	13.6	12.4	13.8

Table 18 – Durum wheat variety trial 1973 – Dickinson

Variety or Treatment	Yields in bushels per acre Rep1	Rep2	Rep3	Rep4	Avg.	Test weight	Heading date	Height inches
Wells	41.8	51.7	49.5	39.6	45.7	65.0	7-1	28
Leeds	34.1	40.7	36.3	33.0	36.0	63.0	6-30	24
Hercules	29.7	35.2	33.0	35.2	33.3	62.5	6-30	26
Rolette	34.1	46.2	42.9	41.8	41.3	63.0	6-28	28
Wascana	35.2	45.1	41.8	38.5	40.2	62.0	7-3	29
Ward	30.8	38.5	37.4	34.1	35.2	62.0	7-2	25
D 6715	33.0	36.3	35.2	33.0	34.4	63.0	7-1	28
D 6721	29.7	33.0	34.1	34.1	32.7	62.5	6-30	24
D 6722	35.2	41.8	36.3	35.2	37.1	62.5	7-2	26
D 6973	31.9	40.7	37.4	40.7	37.7	63.5	7-2	23
DT 316	41.8	47.3	42.9	44.0	44.0	61.5	7-5	22
DT 332	42.9	44.0	44.0	39.6	42.6	64.0	7-1	23
D 6962*	47.3	46.2	46.2	40.7	45.1	64.0	6-30	20
D 7057*	44.0	49.5	49.5	40.7	45.9	63.5	7-3	19
D 7067*	44.0	40.7	42.9	37.4	41.3	63.0	6-29	24
D 7075*	40.7	51.7	49.5	38.5	45.1	62.0	6-30	23
D 70101	48.4	51.7	49.5	39.6	47.3	62.5	7-2	27

Standard error of a treatment mean = 1.4067
Least significant difference @ 5% = 3.9788
The c.v. = 6.98 P.C.

Table 19 – Durum variety trial 1973 – Dickinson.

Variety	Yields in bushels per acre 1968	1969	1970	1971	1972	1973	Avg. 1969-73
Wells	47	39	22	19	24	46	30
Leeds	42	34	23	18	19	36	26
Hercules		33	23	18	19	33	25
Wascana				19	18	40	---
Rolette					23	41	---
L.S.d. @ 5%	5.3	4.1	2.9	5.2	3.5	3.9	

Table 20 – Oats variety trial 1973 – Dickinson

Variety or Treatment	Yields in bushels per acre Rep1	Rep2	Rep3	Rep4	Avg.	Test weight	Heading date	Height inches
Grundy	66.0	90.8	78.4	74.3	77.4	43.5	6-27	32
Nodaway 70	66.0	78.4	76.3	76.3	74.3	43.0	6-27	31
Burnett	63.9	68.1	68.1	66.0	66.5	41.5	6-29	33
Chief	61.9	78.4	68.1	80.4	72.2	41.0	6-28	31
Kota	63.9	68.1	74.3	80.4	71.7	42.5	6-30	35
Kelsey	70.1	86.6	92.8	107.3	89.2	40.5	6-30	34
Sioux	72.2	84.6	84.6	96.9	84.6	42.0	7-3	32
Garry	72.2	92.8	80.4	101.1	86.6	40.0	7-2	34
Froker	74.3	84.6	78.4	88.7	81.5	42.0	7-1	31
Dal	59.8	72.2	72.2	82.5	71.7	41.0	7-3	32
Random	70.1	82.5	90.8	96.9	85.1	39.5	7-1	25
Cayuse	74.3	92.8	90.8	103.	90.3	38.5	7-3	28
Otter	70.1	78.4	80.4	92.8	80.4	39.0	6-28	31
Lodi	74.3	86.6	92.8	92.8	86.6	38.5	7-2	35
Mariner	76.3	82.5	74.3	94.9	82.0	44.0	6-30	30
Astro	66.0	55.7	72.2	72.2	66.5	39.0	7-5	33

Standard error of a treatment mean = 2.9000
Least significant difference @ 5% 8.2023.
The c.v. = 7.33 P.C.

Table 21 – Long term yield comparison of oat varieties 1973 – Dickinson.

Variety	Yields in bushels per acre 1968	1969	1970	1971	1972	1973	Avg. 1969-73
Burnett	70	107	43	46	40	67	61
Kelsey	65	115	54	58	47	89	73
Sioux	68	110	57	73	41	85	73
Garry	52	107	1/	1/	47	87	--
Lodi	69	112	46	49	43	87	67
Kota	57	104	51	60	38	72	65
Otter		110	47	59	52	80	70
Cayuse		113	56	53	57	90	74
Froker				40	30	82	--
Chief					36	72	--
Random					49	85	--
Mariner						82	--
Astro						67	--
L.s.d. @ 5%	6.9	9.1	3.7	6.2	9.5	8.2	

1/ Not included in 1970-71 trials.

Table 22 – Off-Station oat variety trial 1973 – Beach

Variety or Treatment	Yields in bushels per acre Rep1	Rep2	Rep3	Rep4	Avg.	Test weight
Kelsey	74.3	94.9	94.9	74.3	84.6	40.0
Sioux	61.9	55.7	74.3	61.9	63.5	40.0
Cayuse	78.4	72.2	92.8	82.5	81.5	39.5
Random	59.8	59.8	82.5	72.2	68.6	38.0
Mariner	51.6	55.7	82.5	66.0	64.0	40.0
Kota	41.3	55.7	61.9	70.1	57.3	41.5
Nodaway 70	39.2	45.4	72.2	53.6	52.6	38.5
Chief	35.1	51.6	55.7	59.8	50.6	37.0
Otter	51.6	72.2	84.6	66.0	68.6	41.0
Dal	35.1	53.6	61.9	53.6	51.1	41.0

Standard error of a treatment mean = 3.4195
Least significant difference @ 5% = 9.9234
The c.v. = 10.65 P.C.

Table 23 – Off-Station oat variety trial 1973-Bowman

Variety or	Yields in bushels per acre					Test
Treatment	Rep1	Rep2	Rep3	Rep4	Avg.	weight
Kelsey	103.1	105.2	109.3	112.4	107.5	43.0
Sioux	91.8	94.9	99.0	96.9	95.7	41.5
Cayuse	105.2	111.4	118.6	119.6	113.7	38.0
Random	90.8	96.9	103.1	101.1	98.0	41.5
Mariner	78.4	82.5	87.7	89.6	83.8	43.0
Kota	82.5	79.4	88.7	89.7	85.1	45.0
Nodaway 70	73.2	80.4	84.6	80.4	79.7	44.0
Chief	76.3	84.6	84.6	80.4	84.5	42.0
Otter	90.8	92.8	99.0	103.1	96.4	42.5
Dal	66.0	73.2	77.3	70.1	71.7	40.0

Standard error of a treatment mean = 1.2569
Least significant difference @ 5% = 3.6476
The c.v. = 2.75 P.C.

Table 24 – Off-Station oat variety trial 1973 – Glen Ullin

Variety or	Yields in bushels per acre					Test
Treatment	Rep1	Rep2	Rep3	Rep4	Avg.	weight
Kelsey	66.0	74.3	90.8	101.1	83.1	39.0
Sioux	61.9	66.0	70.1	86.6	71.2	37.0
Cayuse	84.6	84.6	99.0	96.9	91.3	37.0
Random	66.0	74.3	90.8	90.8	80.5	37.0
Mariner	57.8	66.0	76.3	84.6	71.2	37.5
Kota	53.6	53.6	72.2	70.1	62.4	40.0
Nodaway 70	61.9	63.9	68.1	74.3	67.1	39.0
Chief	59.8	61.9	70.1	66.0	64.5	37.0
Otter	82.5	74.3	76.3	82.5	78.9	38.0
Dal	59.8	61.9	72.2	72.2	66.5	39.0

Standard error of a treatment mean = 2.6945
Least significant difference @ 5% = 7.8194
The c.v. = 7.32 P.C.

Table 25 – Off-Station oat variety trial 1973 – Hettinger

Variety or Treatment	Yields in bushels per acre					Test weight
	Rep1	Rep2	Rep3	Rep4	Avg.	
Kelsey	22.7	22.7	30.9	33.0	27.3	40.0
Sioux	26.8	24.8	24.8	33.0	27.4	33.5
Cayuse	49.5	43.3	30.9	42.3	41.5	34.0
Random	30.9	28.9	30.9	43.3	33.5	38.5
Mariner	20.6	28.9	26.8	30.9	26.8	38.0
Kota	26.8	28.9	30.9	30.9	29.4	38.0
Nordway 70	33.0	30.9	33.0	26.8	30.9	41.0
Chief	35.1	34.0	35.1	33.0	34.3	37.0
Otter	40.2	33.0	35.1	43.3	37.9	37.0
Dal	26.8	23.7	24.8	28.9	26.1	35.0

Standard error of a treatment mean = 2.1379
Least significant difference @ 5% = 6.2040
The c.v. = 13.57 P.C.

Table 26 -- Orr-Station oat variety trial 1973 – Killdeer

Variety or Treatment	Yields in bushels per acre					Test weight
	Rep1	Rep2	Rep3	Rep4	Avg.	
Kelsey	55.7	68.1	74.3	57.8	64.0	35.0
Sioux	55.7	70.1	57.8	57.8	60.4	31.0
Cayuse	76.3	82.5	70.1	61.9	72.7	35.0
Random	61.9	66.0	57.8	57.8	60.9	30.0
Mariner	61.9	68.1	63.9	61.9	64.0	37.0
Kota	51.6	57.8	53.6	49.5	53.1	34.0
Nodaway 70	53.6	66.0	55.7	51.6	56.7	31.5
Chief	53.6	59.8	51.6	47.3	53.1	35.5
Otter	59.8	63.9	59.8	61.9	61.4	35.0
Dal	53.6	57.8	59.8	53.6	56.2	37.5

Standard error of a treatment mean = 1.9411
Least significant difference @ 5% = 5.6331
The c.v. = 6.45

Table 27 – Off-Station oat variety trial 1973 – Mandan

Variety or Treatment	Yields in bushels per acre Rep 1	Rep 2	Rep 3	Avg.	Test weight
Kelsey	59.8	74.3	80.4	71.5	39.5
Sioux	61.9	66.3	70.1	66.0	37.5
Cayuse	76.3	76.3	90.8	81.1	31.0
Random	66.0	74.3	78.4	72.9	31.0
Mariner	70.1	76.3	66.0	70.8	41.5
Kota	70.1	66.0	66.0	67.4	40.5
Nordaway 70	61.9	59.8	57.8	59.8	42.5
Chief	70.1	63.9	66.0	66.7	40.0
Otter	76.3	74.3	72.2	74.3	40.0
Dal	59.8	55.7	53.6	56.4	37.5

Standard error of a treatment mean = 3.2113
Least significant difference @ 5% = 9.5416
The c.v. = 8.10 P.C.

Table 28 – Dickinson and Off-station variety trials 1973

Yields in bushels per acre

Variety	Dickinson	Beach	Bowman	Glen Ullin	Hettinger	Killdeer	Mandan	1973-Avg. 7-station
Kelsey	89	85	108	83	27	64	72	75
Sioux	85	64	96	71	27	60	66	67
Cayuse	90	82	114	91	42	73	81	82
Random	85	69	98	81	34	61	73	72
Mariner	82	64	84	71	27	64	71	66
Kota	72	57	85	62	29	53	67	61
Nodaway 70	74	53	80	67	31	57	60	60
Chief	72	51	82	65	34	53	67	61
Otter	80	69	96	79	38	61	74	71
Dal	72	51	72	67	26	56	56	57
L.s.d. @5%	8.2	9.9	3.6	7.8	6.2	5.6	9.5	

Table 29 – Dickinson and off-station oat variety trials 1973

Test weight in pounds per acre

Variety	Dickinson	Beach	Bowman	Glen Ullin	Hettinger	Killdeer	Mandan	1973-avg. 7-station
Kelsey	40.5	40	43	39	40	35	39.5	39.6
Sioux	42	40	41.5	37	33.5	31	37.5	37.5
Cayuse	38.5	39.5	38	37	34	35	31	36.1
Random	39.5	38	41.5	37	38.5	30	31	36.5
Mariner	44	40	43	37.5	38	37	41.5	40.1
Kota	42.5	41.5	45	40	38	34	40.5	40.2
Nodaway 70	43	38.5	44	39	41	31.5	42.5	39.9
Chief	41	37	42	37	37	35.5	40	38.5
Otter	39	41	42.5	38	37	35	40	38.9
Dal	41	41	40	39	35	37.5	37.5	38.7

Table 30 – Barley variety trial 1973 – Dickinson

Variety or Treatment	Yields in bushels per acre Rep1	Rep2	Rep3	Rep4	Avg.	Test weight	Heading date	Height inches
Steptoe	48.1	50.9	64.6	55.0	54.7	49.5	6-28	26
Dickinson	60.5	60.5	70.1	64.6	63.9	50.5	6-28	30
Conquest	61.9	61.9	70.1	74.3	67.1	51.0	6-27	30
Bonanza	61.9	66.0	71.5	68.8	67.1	50.0	6-27	30
Nordic	61.9	67.4	70.1	67.4	66.7	51.0	6-28	27
Beacon (B 140)	56.4	60.5	67.4	66.0	62.6	50.5	6-28	27
Cree	64.6	64.6	68.8	70.1	67.0	52.5	6-28	27
Burk	63.3	68.8	68.8	72.9	68.5	54.0	6-28	30
Prilar	61.9	64.6	68.8	67.4	65.7	53.0	6-28	30
Firlbecks III	72.9	74.3	78.4	77.0	75.7	52.0	6-29	28
Prioline	63.3	70.1	72.9	74.3	70.2	53.5	6-29	27
Vanguard	72.9	72.9	79.8	74.3	75.0	53.0	6-29	26
Shabet	70.1	71.5	74.3	77.0	73.2	51.0	6-29	26
B 141	64.6	63.3	68.8	66.0	65.7	48.0	6-27	30
ND 231	61.9	61.9	70.1	70.1	66.0	53.0	6-27	30
ND 718	61.9	64.6	67.4	64.6	64.6	50.0	6-27	29
ND 759	67.4	71.5	74.3	75.6	72.2	49.5	6-27	30

Standard error of a treatment mean = 1.0985
Least significant difference @ 5% = 3.1070
The c.v. = 3.26 P.C.

Table 31 – Long term yield comparison of barley varieties 1973 – Dickinson

	Yields in bushels per acre						Avg.
Variety	1968	1969	1970	1971	1972	1973	1969-73
Dickinson	64	72	43	31	57	64	53
Conquest	62	65	36	35	45	67	50
Bonanza		62	35	39	59	67	52
Nordic		63	1/ 38	33	59	67	52
Burk				40	54	69	--
Vanguard				41	63	75	--
Shabet				38	62	73	--
Piroline				42	72	73	--
Cree				36	53	67	--
Beacon (B 140)				33	46	63	--
B 141					50	66	--
Prilar					57	66	--
ND 231					47	66	--
ND 718					48	65	--
Firlbecks III						76	--
Steptoe						55	--
ND 759						72	--
L.s.d. @ 5%	7.1	8.1	5.0	4.6	9.6	3.1	

1/ Calculated yield.

Table 32 – Off-station barley variety trial 1973 – Beach

Variety or	Yields in bushels per acre					Test
Treatment	Rep1	Rep2	Rep3	Rep4	Avg.	weight
Dickinson	52.3	34.4	35.8	35.8	39.6	50.0
Nordic	46.8	38.5	34.4	37.1	39.2	50.0
Beacon	45.4	35.8	31.6	31.6	36.1	48.0
Burk	38.5	41.3	33.0	37.1	37.5	53.0
Vanguard	60.5	50.9	46.8	48.1	51.6	56.0
Piroline	53.6	46.8	41.3	42.6	46.1	55.0
Shabet	55.0	53.6	46.8	48.1	50.9	51.0
Steptoe	59.1	53.6	48.1	45.4	51.6	51.0
Cree	44.0	31.6	33.0	33.0	35.4	50.5
Firlbecks III	55.0	52.3	48.1	52.3	51.9	55.0

Standard error of a treatment mean = 1.3986

Least significant difference @ 5% = 4.0586

The c.v. = 6.36 P.C.

Table 33 – Off-Station barley variety trial 1973 – Bowman

Variety or Treatment	Yields in bushels per acre Rep1	Rep2	Rep3	Rep4	Avg.	Test weight
Dickson	64.6	64.6	68.8	67.4	66.4	48.0
Nordic	60.5	68.8	68.8	71.5	67.4	47.0
Beacon	61.9	70.1	71.5	70.1	68.4	46.5
Burk	55.0	64.6	67.4	67.4	63.6	52.0
Vanguard	78.4	78.4	78.4	74.3	77.4	50.0
Piroline	77.0	77.7	71.5	72.9	74.8	52.0
Shabet	81.1	81.1	83.9	80.4	80.4	50.0
Steptoe	81.1	85.3	83.9	85.3	83.9	46.0
Cree	64.6	64.6	64.6	63.3	64.3	48.0
Firlbecks III	78.4	80.0	83.9	83.9	81.6	51.0

Standard error of a treatment mean = 1.5605
Least significant difference @ 5% = 4.5285
The c.v. = 4.29 P.C.

Table 34 – Off-Station barley variety trial 1973 – Glen Ullin

Variety or Treatment	Yields in bushels per acre Rep1	Rep2	Rep3	Rep4	Avg.	Test weight
Dickson	42.6	48.1	41.3	41.3	43.3	46.0
Nordic	42.6	42.6	34.4	41.3	40.2	46.0
Beacon	34.4	48.1	33.0	35.8	37.8	48.0
Burk	39.9	53.6	46.8	33.0	43.3	51.0
Vanguard	56.4	60.5	53.6	60.5	57.8	51.0
Piroline	46.8	60.5	50.9	46.8	51.3	52.0
Shabet	52.3	57.8	53.6	63.3	56.8	49.0
Steptoe	50.9	55.0	41.3	52.3	49.9	47.0
Cree	30.3	49.5	38.5	42.6	40.2	48.0
Firlbecks III	45.4	67.4	66.0	48.1	56.7	51.0

Standard error of a treatment mean = 2.6987
Least significant difference @5% = 7.8315
The c.v. = 11.31 P.C.

Table 35 – Off-Station barley variety trial 1973 – Hettinger

Variety or Treatment	Yields in bushels per acre					Test weight
	Rep1	Rep2	Rep3	Rep4	Avg.	
Dickson	23.4	39.2	39.9	34.4	34.2	41.5
Nordic	34.4	43.3	33.0	33.0	35.9	43.0
Beacon	37.1	39.9	29.6	39.2	36.5	42.0
Burk	46.8	41.3	35.8	37.1	40.3	45.0
Vanguard	55.0	52.3	51.6	55.0	53.5	49.5
Piroline	50.9	28.9	50.9	46.8	44.4	47.5
Shabet	52.3	52.9	49.5	45.4	50.0	48.0
Steptoe	37.1	54.3	45.4	39.9	44.2	38.0
Cree	50.9	42.6	38.5	41.3	43.3	45.0
Firlbecks III	50.9	49.5	48.1	45.4	48.5	47.0

Standard error of a treatment mean = 3.0253
Least significant difference @ 5% = 8.7792
The c.v. = 14.05 P.C.

Table 36 – Off-station barley variety trial 1973 – Killdeer

Variety or Treatment	Yields in bushel per acre					Test weight
	Rep1	Rep2	Rep3	Rep4	Avg.	
Dickson	34.4	34.4	38.5	35.8	35.8	46.0
Nordic	34.4	38.5	38.5	44.0	38.9	47.0
Beacon	37.1	41.3	37.1	45.4	40.2	48.0
Burk	44.0	42.6	39.9	53.6	45.0	52.0
Vanguard	45.4	50.9	50.9	60.5	51.9	51.0
Piroline	42.6	48.1	41.3	49.5	45.4	54.0
Shabet	48.1	64.6	67.4	66.0	61.5	52.0
Steptoe	50.9	61.9	55.0	66.0	58.5	48.0
Cree	30.3	35.8	38.5	42.6	36.8	50.0
Firlbecks III	50.9	56.4	57.8	67.4	58.1	52.0

Standard error of a treatment mean = 1.7741
Least significant difference @ 5% = 5.1485
The c.v. = 7.52 P.C.

Table 37 – Off-Station barley variety trial 1973 – Mandan

Variety or Treatment	Yields in bushels per acre Rep1	Rep2	Rep3	Rep4	Avg.	Test weight
Dickson	33.0	27.5	35.8	35.8	33.0	48.0
Nordic	38.5	39.9	31.6	45.4	38.9	48.5
Beacon	38.5	52.3	35.8	45.4	43.0	48.0
Burk	37.1	52.3	38.5	49.5	44.4	49.5
Vanguard	37.1	42.6	35.8	39.9	38.9	49.0
Piroline	39.9	41.3	34.4	39.9	38.9	50.0
Shabet	37.1	34.4	45.4	38.5	38.9	46.0
Steptoe	50.9	45.4	37.1	55.0	47.1	46.5
Cree	39.9	44.0	35.8	44.0	40.9	49.5
Firlbecks III	48.4	50.9	45.4	48.1	48.1	50.5

Standard error of ta treatment mean = 2.3127
Least significant difference @ 5% = 6.7112
The c.v. = 11.23 P.C.

Table 38 – Dickinson and off-station barley variety trails 1973

Yields in bushels per acre

Variety	Dickinson	Beach	Bowman	Glen Ullin	Hettinger	Killdeer	Mandan	1973 Avg. 7-Station
Dickson	64	40	66	43	34	36	33	45
Nordic	67	39	67	40	36	39	39	47
Beacon	63	36	68	38	37	40	43	46
Burk	69	38	64	43	40	45	44	49
Vanguard	75	52	77	58	54	52	39	58
Piroline	70	46	75	51	44	45	39	53
Shabet	73	51	80	57	50	62	39	59
Steptoe	55	52	84	50	44	59	47	56
Cree	67	35	64	40	43	37	41	47
Firlbecks III	76	52	82	57	49	58	48	60
L.s.d. @5%	3.1	4	4.5	7.8	8.7	5.1	6.7	

Table 39 – Dickinson and off-station barley variety trials 1973

Test weight in pounds per acre

Variety	Dickinson	Beach	Bowman	Glen Ullin	Hettinger	Killdeer	Mandan	1973-Avg. 7-Station
Dickson	50.5	50.5	48	46	41.5	46	48	47.1
Nordic	51	50	47	46	43	47	48.5	47.5
Beacon	50.5	48	46.5	48	42	48	48	47.3
Burk	54	53	52	51	45	52	49.5	50.9
Vanguard	53	56	50	51	49.5	51	49	51.4
Piroline	53.5	55	52	52	47.5	54	50	52
Shabet	51	51	50	49	48	52	46	49.6
Steptoe	49.5	51	46	47	38	48	46.5	46.6
Cree	52.5	50.5	48	48	45	50	49.5	49.1
Firlbecks III	52	55	51	51	47	52	50.5	51.2

Nursery Trials With Small Grain

The cooperative nursery trial grown at Dickinson in 1973, and the leaders responsible for each trial are:

Uniform Regional Hard Red Spring Wheat Nursery; Dr. R.E. Heiner ARS, USDA, Institute of Agriculture, St. Paul, Minnesota.

Uniform Regional Durum Nursery; Dr. J.S. Quick, Agronomy Department. North Dakota State University.

Uniform Early Oat Nursery, and Uniform Midseason Oat Nursery; Dr. L.W. Briggle, ARS, USDA, Institute of Agriculture, St. Paul Minnesota.

Great Plains Barley Nursery; Dr. P.B. Price, ARS, USDA Agronomy Department, South Dakota State University.

Uniform Regional Flax Nursery; Dr. J.H. Ford, ARS USDA, Institute of Agricultural, of Agriculture, St. Paul, Minnesota.

In addition to the cooperative trials, an F-3 bulk selection nursery was grown for DR. Robert Busch, Agronomy Department, North Dakota State University.

Data from the 1972 nursery trials are summarized in tables 39 to 49.

Table 40 – Uniform regional hard red spring wheat nursery 1973 – Dickinson

Variety or Treatment	Yields in bushels per acre Rep1	Rep2	Rep3	Avg.	Test weight	Seeded 4-16 Heading date	Height inches
Marquis	33.5	31.9	35.3	33.6	59.0	6-30	32
Justin	43.6	34.4	36.8	38.3	56.0	6-29	32
Selkirt	45.6	31.5	38.2	38.4	57.0	6-28	30
Chris	32.7	34.2	38.6	35.2	59.5	6-28	30
Waldron	40.1	35.2	38.6	38.0	60.0	6-25	29
ND 491	39.8	35.3	37.7	37.6	60.0	6-25	29
ND 507	44.6	32.6	47.7	41.6	53.0	6-27	31
ND 510	43.2	36.2	56.7	45.4	59.5	6-26	29
ND 518	39.6	37.5	44.6	40.6	61.0	6-27	35
ND 519	48.2	40.9	52.4	47.2	59.5	6-25	29
ND 520	39.1	32.5	39.2	36.9	62.0	6-25	31
H 681-4-5	38.2	30.5	41.4	36.7	61.0	6-26	31
Era	57.4	42.2	59.1	52.9	56.0	7-3	25
11-64-27**	39.9	42.2	57.0	46.4	60.5	6-29	27
11-64-33**	36.4	41.5	45.7	41.2	56.0	6-29	25
ND 505**	43.8	39.8	42.7	42.1	57.0	6-29	27
ND 521**	47.7	39.8	46.9	44.8	60.5	6-28	28
ND 522**	39.6	45.3	66.6	50.5	57.5	6-28	26
ND 525**	38.5	34.7	45.1	39.4	58.0	6-27	27
H 628-1-6-9**	41.2	35.6	51.4	42.7	58.0	6-25	27
Mt 7150**	42.5	44.8	60.4	49.2	58.5	6-28	27
Mt 7028	45.2	43.2	48.3	45.6	58.0	6-29	27

** Semidwarf
Standard error of a treatment mean = 2.7599
Least significant difference @ 5% = 7.8062
The c.v. = 11.38 P.C.

Table 41 – Uniform regional durum nursery 1973 – Dickinson

Variety or Treatment	Yields in bushels per acre					Test weight	Seeded 4-18 Days to heading	Height cm.	1000 k. wt.
	Rep1	Rep2	Rep3	Rep4	Avg.				
Mindum	23.7	23.2	24.4	37.3	27.2	62.7	80	86	40.4
Wells	33.4	22.5	28.1	33.5	29.4	61.0	77	77	33.8
Leeds	31.2	31.2	42.3	26.3	32.8	62.3	76	79	39.9
Hercules	27.4	22.3	15.1	18.3	20.8	61.2	74	77	40.4
Wascana	33.4	34.1	24.7	43.8	34.0	60.1	78	80	44.0
Rolette	31.1	23.6	32.9	30.6	29.6	62.1	72	74	44.4
Ward	32.3	30.5	33.9	50.0	36.7	61.5	74	76	44.7
Wakooma	39.6	33.0	45.8	45.0	40.9	61.9	78	78	40.9
D 6715	34.6	24.6	25.5	43.7	32.1	61.1	74	80	39.5
D 6721	36.4	25.2	25.5	38.6	31.4	62.0	74	74	38.0
D 6722	33.5	34.4	29.4	45.1	35.6	61.4	77	76	42.8
DT 332	31.1	26.6	26.2	36.0	30.0	61.1	79	76	41.5
D 6962	31.6	45.1	31.9	32.7	35.3	62.9	74	58	43.2
D 6973	29.2	22.9	39.8	28.5	30.1	62.9	73	68	42.2
D 7057	27.7	31.4	29.6	39.7	32.1	61.5	74	58	37.2
D 7067	29.3	27.7	24.2	30.0	27.8	60.9	73	76	36.9
D 7075	24.4	25.2	36.3	31.6	29.4	61.8	73	66	40.4
D 70101	33.1	28.7	28.7	33.7	31.1	61.9	76	76	43.4
D 7019	25.1	31.0	31.7	50.0	34.5	62.8	71	60	39.0
D 7025	25.1	30.2	30.6	50.0	34.0	60.6	76	66	40.5
D 7047	25.6	34.8	31.4	50.0	35.5	62.8	73	57	42.0
D 7099	26.0	32.4	31.0	36.2	31.5	61.8	71	56	40.1
MDS-5	27.2	26.1	23.9	32.7	27.5	60.9	73	76	36.6
MDS-13	26.4	24.4	45.2	39.4	33.9	61.8	71	76	42.1

Standard error of a treatment mean = 2.9533

Least significant difference @ 5% = 8.2697

The c.v. = 18.59 P.C.

Table 42 – Uniform early oat nursery 1973 – Dickinson

Variety or State Selection No.	Yields in bushels per acre Rep1	Rep2	Rep3	Avg.	Test weight	Seeded 4-18 Heading date	Height inches	Protein %
Clintford (check)	74.2	70.4	75.6	73.4	39.0	6-21	30	18.9
Mo. 06060	105.4	95.8	73.6	91.6	30.0	6-22	24	19.1
Mo. 06072	120.8	88.8	78.4	96.0	38.5	6-21	29	20.9
Mo. 06035	91.2	77.0	82.2	83.5	40.5	6-21	32	22.5
Mo. 05499	64.2	82.2	76.0	74.1	41.5	6-21	31	22.0
Mo. 0-205 (check)	57.2	54.6	58.2	56.7	43.0	6-22	35	19.7
Multiline E74	49.6	64.4	52.2	55.4	43.0	6-21	32	19.5
Grundy	78.2	75.6	80.4	78.1	39.0	6-21	30	18.8
Otee	86.2	102.8	101.0	96.7	38.5	6-23	31	21.9
Jaycee (check)	81.0	93.6	81.6	85.4	42.0	6-21	29	19.3
I11. 67-1514	77.2	85.8	74.4	79.1	41.0	6-22	29	19.5
I11. 69-6305	96.4	106.4	97.2	100.0	40.0	6-23	29	19.7
I11. 68-1469	70.2	88.8	77.8	78.9	39.5	6-21	30	20.3
I11. 68-1639	104.2	132.8	105.2	114.1	37.5	6-21	30	18.4
Andrew (check)	118.8	96.4	86.2	100.5	34.5	6-23	34	19.3
I11. 68-1643	100.0	102.8	80.8	94.5	41.5	6-22	29	18.6
I11. 69-6059	94.6	72.6	95.4	87.5	35.0	6-23	30	18.3
I11. 69-7520	86.8	118.6	111.6	105.7	38.0	6-22	29	19.1
I 11. 69-7462	83.2	97.6	64.2	81.7	40.0	6-21	29	19.1
Minn. 67113	80.0	74.4	108.4	87.6	42.5	6-22	35	20.5
Minn. 70129	91.2	105.6	75.4	90.7	40.5	6-21	34	20.1

Standard error of a treatment mean = 7.0193
Least significant difference @ 5% = 20.0621
The c.v. = 14.10 P.C.

Table 43 – Uniform midseason oat nursery 1973 – Dickinson

Variety or State Selection No.	Yields in bushels per acre Rep1	Rep2	Rep3	Avg.	Test weight	Seeded 5-2 Heading date	Height inches	Protein %
Clintland 64	82.0	87.6	96.6	88.7	38.0	6-26	35	20.3
I11. 69-7669	88.6	85.0	69.4	81.0	40.0	6-25	35	17.8
I11. 69-6198	87.0	81.6	95.6	88.1	38.5	6-25	31	18.8
I11. 69-5452	79.4	96.2	108.2	94.6	37.0	6-25	33	18.3
I11. 69-7545	96.6	110.6	106.8	104.7	37.0	6-28	33	18.8
I11. 68-1644	72.0	78.2	86.4	78.9	40.5	6-26	33	18.4
Jaycee (check)	83.4	80.8	85.4	83.2	36.5	6-27	32	20.7
OT 186	108.8	101.4	121.6	108.6	32.5	6-30	35	17.2
Scott	93.6	95.6	91.2	93.5	35.0	6-29	40	16.8
Gemini	98.0	88.8	78.4	88.4	35.0	7-3	39	16.6
Pur 5939B1-3-9-3-5	88.2	82.4	84.6	85.1	37.5	6-26	30	17.4
Pur 6215A2-1-2	98.8	91.0	82.8	90.9	36.0	6-26	32	18.8
Pur 61353B3-9-3	67.6	83.6	71.6	74.3	38.0	6-25	32	19.2
Lodi (check)	82.8	82.8	74.6	80.1	37.0	6-26	39	20.0
X 1571-2	97.4	100.6	101.2	99.7	35.0	7-3	39	20.1
X 1625-1	90.6	83.0	72.8	82.1	37.0	6-26	36	18.7
X 1641-2	86.2	78.8	79.8	81.6	39.0	6-29	38	20.2
X 1656-1	120.8	97.4	96.6	104.9	36.0	6-28	32	22.4
Dal	129.6	86.2	78.8	98.2	40.0	6-28	36	22.1
Orbit (check)	106.4	76.2	96.4	93.0	39.0	6-28	34	17.4
NY 6083-1	73.8	98.8	83.2	85.3	39.0	6-25	33	18.4
SD 955 W	84.2	75.2	71.2	76.9	39.0	6-27	34	22.4
M 73	115.4	98.4	75.0	96.3	36.5	6-27	36	20.0
Minn. 674	110.4	115.2	99.4	108.3	36.0	6-29	36	19.0
Minn. 67113	98.2	94.2	85.8	92.7	37.0	6-29	40	19.4
Minn. 67109	100.6	89.8	85.8	92.1	39.0	6-27	36	19.0
Minn. 70216	112.8	91.4	93.2	99.1	40.0	6-26	40	21.1
Minn. 71101	100.4	106.8	80.0	95.7	35.5	6-30	39	20.8

Standard error of a treatment mean = 6.0587
Least significant difference @ 5% = 17.1366
The c.v. = 11.54 P.C.

Table 44 – Uniform great plains barley nursery 1973 – Dickinson

Variety or Selection No.	Yields in bushels per acre Rep1	Rep2	Rep3	Avg.	Test weight	Seeded 4-18 Heading date	Height inches
Munsing	71.5	69.5	81.4	74.1	49.0	6-25	25
Unitan	55.8	48.0	51.5	51.8	41.5	6-28	24
Larker	65.9	54.8	62.5	61.1	51.0	6-27	27
Galt	69.3	54.5	66.5	63.4	45.5	6-29	27
Prilar	66.5	48.1	61.9	58.8	48.0	6-27	25
S.D. 69-1781	56.0	59.5	56.0	57.2	47.5	6-29	26
63AB1434-11	62.5	60.6	70.1	64.4	50.0	6-26	25
Nordic	62.8	55.5	70.1	62.8	49.5	6-28	26
69Ab5275	59.8	69.6	74.4	67.9	50.0	6-27	25
69AB5277	75.9	86.5	73.5	78.6	47.0	6-28	27
Steptoe	78.0	82.4	87.3	82.6	45.5	6-27	26
Compana	59.4	61.4	59.4	60.1	49.5	6-28	25
Mt. 14313	68.0	69.4	65.8	67.7	45.0	6-28	24
Mt. 1436	72.9	68.1	57.1	66.0	50.0	6-28	26
Mt. 04121	67.3	69.6	68.0	68.3	47.0	6-27	24
Mt. 9514	80.6	68.0	91.4	80.0	48.5	6-27	26
Mt. 9513	72.8	69.0	81.8	74.5	49.0	6-26	27
Dekap	71.4	85.1	93.3	83.3	49.0	6-25	26

Standard error of a treatment mean = 3.6330
Least significant difference @ 5% = 10.3837
The c.v. = 9.23 P.C.

Table 45 – Cooperative regional flax nursery 1973 – Dickinson

Variety Selection No.	Yields in bushels per acre Rep1	Rep2	Rep3	Avg.	Test weight	Heading 1st	Heading 50%	Height inches
Bison	7.8	3.8	5.8	5.80	54.1	6-27	6-30	20
Bolley	7.1	2.9	6.5	5.50	54.3	6-24	6-27	20
Windom	6.4	4.5	6.6	5.83	54.1	6-25	6-28	19
Summit	5.3	7.1	7.5	6.63	55.1	6-25	6-28	20
Nored	7.6	6.2	6.2	6.67	55.9	7-1	7-4	22
Windom x 2138	12.4	4.4	6.2	7.67	55.2	6-27	7-1	21.5
Windom x Bison 70	5.5	4.4	5.3	5.07	54.2	6-24	6-27	19.5
Br x Norstar	6.3	5.2	4.5	5.33	54.2	6-25	6-28	22
Br x Nored	5.6	4.7	4.4	4.90	54.5	6-27	6-30	20
(Arny x 954) x (1663 x 656)	8.5	3.5	5.6	5.87	53.4	6-27	7-1	20
(Arny x 954) x (1663 x 1134)	4.5	5.1	5.6	5.07	53.5	6-25	6-27	15
Thgh oil 11x3	4.5	3.8	5.7	4.67	52.4	6-27	6-30	20
H.O. (3x8) x (21x24)	4.4	5.2	7.8	5.80	53.1	6-27	6-30	19.5
H.O. (3x8) x (21x24)	5.9	5.3	4.5	5.23	53.1	6-27	6-30	18.5
346 x H.O. 13	5.8	6.3	6.6	6.23	52.5	6-30	7-3	19
Noralta x Redwood	4.9	5.6	4.7	5.07	53.7	6-30	7-3	15

Standard error of a treatment mean = 0.8650
Least significant difference @ 5% = 2.4979.
The c.v. = 26.25 P.C.

Table 46 – Triticale early seeding trial 1973 – Dickinson

Variety or Treatment	Yields in bushels per acre Rep 1	Rep 2	Rep 3	Avg	Test weight
Nordic barley	42.6	48.1	55.0	48.6	44.0
Kelsey oats	59.8	66.0	70.1	65.3	41.0
Rolette durum	27.5	31.9	28.6	29.3	62.5
Era wheat	37.4	41.8	41.8	40.3	60.5
Triticale 209	35.6	39.6	42.2	39.1	51.0
Triticale 204	46.2	37.0	38.3	40.5	52.0
Triticale 205	40.9	40.9	39.6	40.5	51.0
Triticale 418	39.6	35.6	35.6	36.9	50.0
Rosner	33.0	38.3	31.7	34.3	53.0
Triticale 203	33.0	40.9	39.6	37.8	52.0
Triticale 419	34.3	40.9	35.6	36.9	49.0

Standard error of a treatment mean = 2.1175
Least significant difference @ 5% = 6.2468
The c.v. = 8.97 P.C.

Table 47 – Triticale late seeding trial 1973 – Dickinson

Variety or Treatment	Yields in bushels per acre				Test weight
	Rep 1	Rep 2	Rep 3	Avg.	
Nordic barley	35.8	34.4	30.3	33.5	44.0
Kelsey oats	37.1	33.0	28.9	33.0	29.0
Rolette durum	11.0	20.9	11.0	14.3	61.0
Era wheat	19.8	28.6	27.5	25.3	62.0
Triticale 209	13.2	17.2	14.5	15.0	48.0
Triticale 204	17.2	14.5	13.2	15.0	49.5
Triticale 205	13.2	14.5	14.5	14.1	50.0
Triticale 418	13.2	14.5	14.5	14.1	48.0
Rosner	18.5	14.5	14.5	15.8	51.0
Triticale 203	19.8	15.8	13.2	16.3	50.5
Triticale 419	18.5	15.8	15.8	16.7	49.0

Standard error of a treatment mean = 1.7559

Least significant difference @ 5% = 5.1799

The c.v. = 15.71 P.C.

Table 48 – Yield Data, rate of seeding trial 1973 – Dickinson

Variety	Seeding rate/ Acre Million Plants	Yields in bushels per acre Rep 1	Rep 2	Rep 3	Rep 4	Avg.
World Seeds 1809	½	21.8	24.2	38.7	38.7	30.9
World Seeds 1809	¾	33.9	38.7	26.6	31.5	32.7
World Seeds 1809	1	24.2	26.6	33.9	33.9	29.7
World Seeds 1809	1 ½	19.4	33.9	33.9	36.3	30.9
World Seeds 1809	2	29.0	21.8	29.0	33.9	28.4
Waldron	½	26.6	31.5	38.7	31.5	32.1
Waldron	¾	29.0	41.1	29.0	38.7	34.5
Waldron	1	31.5	36.3	36.3	41.1	36.3
Waldron	1 ½	36.3	26.6	33.9	36.3	33.3
Waldron	2	21.8	26.6	36.3	36.3	30.3
Fortuna	½	21.8	26.6	36.3	33.9	29.7
Fortuna	¾	31.5	41.1	38.7	29.0	35.1
Fortuna	1	21.8	31.5	29.0	38.7	30.3
Fortuna	1 ½	21.8	33.9	36.3	36.3	32.1
Fortuna	2	33.9	33.9	38.7	36.3	35.7
Leeds	½	31.5	21.8	33.9	29.0	29.1
Leeds	¾	21.8	36.3	33.9	31.5	30.9
Leeds	1	24.2	29.0	33.9	31.5	29.7
Leeds	1 ½	21.8	36.3	36.3	29.0	30.9
Leeds	2	21.8	26.6	24.2	31.5	26.0

Table 49 – Yield data, rate of seeding trial 1971-73 – Dickinson

Variety	Seeding rate/ Acre Million plants	Yields in bushels per acre 1971	1972	1973	Avg.
Waldron	½	15.8	25.0	32.1	24.3
Waldron	¾	18.4	30.0	34.5	27.6
Waldron	1	18.9	30.0	36.3	28.4
Waldron	1- ½	18.5	27.5	33.3	26.4
Waldron	2	17.3	30.0	30.3	25.9
Fortuna	½	16.6	27.5	29.7	24.6
Fortuna	¾	17.9	30.6	30.9	26.5
Fortuna	1	17.5	34.4	29.7	27.2
Fortuna	1- ½	18.7	35.0	30.9	28.2
Fortuna	2	18.7	36.3	26.0	27.0
Wis. 271	½	15.1	24.4	30.9	23.5
Wis. 271	¾	14.4	27.5	32.7	24.9
Wis. 271	1	17.0	37.5	29.7	28.1
Wis. 271	1- ½	18.2	36.3	30.9	28.5
Wis. 271	2	17.6	33.8	28.4	26.6
Leeds	½	13.6	38.1	29.1	26.9
Leeds	¾	15.9	38.8	30.9	28.5
Leeds	1	15.2	38.8	29.7	27.9
Leeds	1- ½	16.1	33.1	30.9	26.7
Leeds	2	14.8	40.0	26.0	26.9

Trials With Fertilizer

A trial to determine the effect of urea, DAP and ammonium nitrate on the germination and growth of Waldron hard red spring wheat was conducted under the direction of Dr. W.C. Dahnke, Associate Professor of Soils, N.D.S.U.

Results of this trial are included in the 1973 Annual Report of the Department of soils, N.D.S.U.

A trial to determine results over a period of several years of the practice of applying commercial fertilizer to wheat, using as a basis the nutrient recommendations determined from yield goal expectations, was begun in 1973.

Data from the 1973 trial are shown in tables 50 and 51.

SOIL TESTING LABORATORY - WALDRON HALL
NORTH DAKOTA STATE UNIVERSITY
FARGO, NORTH DAKOTA 58102

Table 50

SOIL SAMPLE INFORMATION

Dickinson Exp. Sta. Box 1117
Dickinson, N. Dak. 58601

COPY TO: Dr. Dahnke
Waldron

COUNTY: Stark DATE: 5/7/73 ACCT. NO.:

OUR SAMPLE NO.	YOUR SAMPLE NO.	TEXTURE	SOLUBLE SALTS (MMHOS)	PH	SOIL TEST RESULTS									
					NITROGEN (N)		PHOSPHORUS (P)		POTASSIUM (K)					
					LBS/A	RATING	LBS/A	RATING	LBS/A	RATING				
16889	R1	M		6.6	96	VH	28	H	360	VH				

NUTRIENT RECOMMENDATIONS

YOUR SAMPLE NO.	CROP TO BE GROWN	STORED SOIL MOISTURE AT SEEDING TIME (SEE CIRCULAR S & F - 1)					
		LOW STORED SOIL MOISTURE		MEDIUM STORED SOIL MOISTURE		HIGH STORED SOIL MOISTURE	
		$N + P_2O_5 + K_2O$ LBS/A	N + P + K LBS/A	$N + P_2O_5 + K_2O$ LBS/A	N + P + K LBS/A	$N + P_2O_5 + K_2O$ LBS/A	N + P + K LBS/A
R1	wheat	30 bushel yield goal				0 + 10 + 0	
R1	wheat	45 bushel yield goal				25 + 20 + 10	

REMARKS:

SF-6

ELEMENTAL ANALYSIS
OXIDE BASIS ⟶ ELEMENTAL BASIS
1.0 LB. P_2O_5 = 0.44 LBS. P
1.0 LB. K_2O = 0.83 LBS. K

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* A KEY FOR THE INTERPRETATION OF THIS REPORT IS ON THE BACK

Table 51 – Yield goal fertilizer trial, 1973

Treatment	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Avg.[1/]	Test weight
#1 Check – No fertilizer	39	51	43	40	42	31	41.0	60.0
#2 Drill application- 0-N, 10-P, 0-K per acre	41	45	40	44	42	37	41.5	59.0
#3 Drill application- 25N, 20-P, 10-K per acre	44	40	36	42	43	39	40.7	60.5

[1/] No significant difference between treatments @ 5% level.

Report of
Livestock Investigations
At The
Dickinson Experiment Station
Dickinson, North Dakota
1973

By
Raymond J. Douglas and James Lee Nelson

Table of Contents

Using Straw In Cow Wintering Rations

Past research at this station has indicated that small grain straw and adequate supplemental protein can replace up to two-thirds of the hay fed in wintering rations to pregnant beef cows.

This trial compares a 10% hay ration with a 50% hay-50% straw ration for wintering pregnant beef cows with no supplemental protein fed in either ration.

The station's commercial Hereford cow herd was used in this trial. After calves were weaned (October 27, 1972) the cow herd was grazed on good to excellent native range until the end of November, 1972. During this month period, despite supplemental feeding of protein blocks, the cows lost an average of 55 pounds of weight and a corresponding loss of body condition.

On December 1, 1972, the cows were randomly allotted by age into two feeding groups. Group A received a ration of mixed brome and crested wheatgrass hay while Group B was fed a ration of 50% hay and 50% oat straw by weight. A salt-mineral mixture and water were available free choice. During the trial, both groups were held in lots with a slatted board fence for protection from the wind and weather.

On February 1, 1973, one month before the first calves were due, the straw feeding was discontinued. At this time the straw was replaced with hay and supplemental grain feeding (1 pound/head/day of rolled barley) was started.

Table 1 shows the average feed consumption, costs and body weight changes.

Table 2 shows the calf birth weights and mortality.

Summary:

It appears that feeding a ration of 50% hay and 50% oat straw for a 60 day feeding period did not adversely affect either calf birth weight or livability when compared to cows fed 100% tame hay. As expected, the young cows wintered on the 50% ha-50% oat straw ration lost the most weight. Normally, this weight loss would not be serious for cows that started the winter feeding period in moderately good condition.

Using straw in the ration did reduce the cost of wintering by about one dollar per cow per month in this trial. Under conditions of higher feed costs and insufficient feed supplies, this savings could substantially increase.

Table 1 – Cow weight change, feed consumption and cost of wintering

	Hay			Hay & Straw		
	3 Yr.olds	4-5-6 yr. olds	7 Yrs. & older	3 yr. olds	4-5-6 yr. olds	7 Yrs. & older
Average weight:						
Pre trial, Oct.27, lb.	951.7	1084.6	1171.2	971.1	1106.9	1179.0
December 1, lb.	917.2	1042.8	1120.7	923.6	1053.5	1126.0
Wt. change, lb. [1/]	-34.5	-76.3	-50.5	-47.5	-53.4	-53.0
Feb. 1, lb.	921.1	1052.4	1118.3	898.6	1036.9	1118.3
Entire trial wt. Change, lb. (Dec. 1- Feb. 1)	+3.9	+9.6	-2.4	-25.0	-16.6	-7.7
Feed consumption:						
Mixed hay, lb. [2/]		69,300			43,350	
Oat straw, lb.					25,750	
Feed/hd./day, lb.		21.4			21.4	
Feed cost at $18/ton hay, $10/ton straw:						
Per head/day		$0.19			$0.16	
Per head, entire trial		11.71			9.79	

[1/] Weight lost on native grass prior to start of winter trial.

[2/] As analyzed: brome, 8.8% protein; crested wheatgrass, 11.6% protein; oat straw, 4.8% protein.

Table 2 – 1973 Calf birth weights and mortality

	Hay			Hay & Straw		
	3 Yr. olds	4-5-6 yr. olds	7 Yrs. & older	3 yr. olds	4-5-6 yr. olds	7 Yrs. & older
Heifers						
No. of head	6	10	10	8	10	9
Birth weight, lb.	61.0	64.3	65.3	52.5	61.7	65.9
Steers						
No. of head	2	12	8	5	13	6
Birth weight, lb.	56.0	65.8	65.0	67.0	67.9	69.0
Combined average-Weight, lb.						
	26 Heifers		63.9	27 Heifers		60.4
	22 Steers		64.6	24 Steers		68.0
	1/ All calves		64.22	2/ All calves		63.98

1/ 1 cow dies, 2 cows open, 1 cow aborted, 1 calf died.
2/ 1 calf born dead; 2 late calves, no birth weight.

Self Feeding Replacement Heifers

Research from the U.S. Range Livestock Station, Miles City, Montana; South Dakota State University's Antelope Range Field Station, and this station, indicates that replacement heifer calves should be fed to gain from 1.25 to 1.5 pounds per day during their first winter. This rate of gain will promote good, economical growth without causing the heifers to get overly fleshy or fat.

The current interest in self- feeding and excellent past performance of the self-fed complete mixed ration under feedlot conditions here at this station prompted this trial, which was designed to compare a self-fed ration of 25% oats and 75% hay with a hand-fed ration in which the oats and hay were adjusted to give the desired rate of gain of 1.25 pounds per head per day.

In this trial, straight bred Hereford heifer calves averaging 400 pounds were wintered from October 27, 1972 to April 13, 1973, a total of 168 days, in lots at the station having a nine foot slatted board fence shelter for weather protection.

The self-fed ration was prepared by weight through a portable grinder-mixer.

All heifers were provided with straw for bedding on a regular interval and had access to automatic water fountains.

The performance of the heifers is tabulated in Table 3, while Table 4 shows the average ration fed and the feed cost.

Summary:

This year's data indicate the replacement heifers can be successfully self-fed on a ration of 25% oats and 75% tame hay. Rations containing this high a percentage of hay are somewhat difficult to prepare, especially during periods of damp weather. Although the total cost of feeding the self-fed heifers was $1.27 more per head, they made significantly faster gains than those hand-fed. If we look at the cost of feed per pound of gain then the self-fed heifers became more efficient (14.2 cents per lb. gain vs. 18.5 cents per lb. gain) then the heifers hand-fed. Also, the self-fed heifers were able to make better gains on less grain and more hay, which is important to the livestock producer short on grain but with adequate hay supplies.

This trial will be continued for several more years to determine long time effects.

Table 3 – Performance of 1972-73 replacement heifer calves under two feeding systems

	Hand-fed	Self-fed
Number of head	12	12
Days fed, (Oct. 27-April 13)	168	168
Average initial weight, lb.	409.6	408.3
Average final weight, lb.	587.9	649.6
Average winter gain, lb.	178.3	1/ 241.2
Average daily gain, lb.	1.06	1.44

1/ Gain significantly greater. Least significant difference @ 5% = 25 pounds.

Table 4 – Rations fed and cost of feeding of 1972-73 replacement heifer calves under two feeding systems.

	Hand-fed		Self-fed	
	Total Pounds	Cost	Total Pounds	Cost
Ration as fed:				
Oats	10,392	$210.96	7,461.9	$151.48
Tame hay	11,900	107.10	20,324.5	182.92
Alfalfa hay	3,600	45.00	1,413.2	17.66
Mineral mix	400.8	22.85		
DI-cal			282.6	18.65
Trace mineral salt			364.5	10.94
Grinding		10.39		29.85
Ration cost per lot		$396.29		$411.50
Total ration cost:				
Per head		$33.02		$34.29
Per pound gain		18.5		14.2
Per day		19.6		20.4
Average feed consumed/ Head /day, lb.	13.1		14.8	

Early Calving And Late Calving Compared

Beef cows provide the single greatest income from livestock in North Dakota. This income is in direct proportion to the number and weight of marketable calves at weaning. Calf weight at weaning is dependent upon three primary variables, namely; (1) genetic potential, (2) adequate nutritional intake and (3) age at weaning. Early calving is one management tool that allows for colder calves at weaning. It is expected the early calves will be better able to utilize the forage material available during the summer grazing period.

Early calving is not traditional in this area and may require additional feed, labor and housing facilities to be handled successfully. Due to the length of gestation (283 days) in cattle, it requires special care to change a cow's calving interval in a forward manner after she drops her first calf. Therefore it is important that producers make every effort to develop and breed heifers so they will calve a the desired time. We recommend this date to be three weeks before the cow herd.

With these facts in mind, a trial was designed to study the effect of shifting a herd of cows from April 1st to March 1st calving.

The station's cow herd was split into two groups in May, 1972 with calving date uniformly distributed between lots. The early calving lot was exposed to fertile bulls on May 25th, 1972 for March, 1973 calving. The late calving lot was exposed to bulls beginning on June 25th, 1972 for April, 1973 calving.

Replacement heifers were wintered to gain 1.25-1.50 lbs./head/day and were exposed to bulls on May 3rd, 1972 so calving could start about the 10th of February, three weeks before the early calving lot began.

Weather conditions during the calving period February to May at the station were as follows:

Month	Avg. high	Avg. low	Deviation from normal	Precipitation
February	31.6	9.3	+6.8	.42
March	47.2	23.8	+11.2	.39
April	51.2	27.8	-1.5	3.21
May	65.7	37.5	-1.6	1.30

During the summer, May-October, the calves were handled in a uniform manner. All calves were weighed and weaned on November 1, 1973.

Table 5 shows the cow ration as fed and the feed costs from February 1st to May 15th, 1973.

Table 6 gives the calf weights and ages of the calves from each breeding herd.

Table 7 shows the calf weights arranged by date of birth.

Table 5 – Average ration and costs of period February 1, 1973- May 15, 1973

	Early calving	Late calving
Number of head	54	51
Days fed	103	103
Tame hay/cow/day, lb.	23.5	23.2
Cost at 0.009 cents/lb./cow	$21.66	$20.88
Ground barley/cow/day, lb.	3.2	2.3
Cost at 0.0177 cents/lb./cow	$6.25	$4.47
Total feed cost/cow[1/]	$27.91	$25.35
Avg. cost/cow/day	0.27	0.25

[1/] Does not include cost of minerals or vitamin injections.

Table 6 – Calf weights and ages from each breeding herd

	No. Calves	Birth wt.	Weaning wt.	Age	Average daily gain
Early calving cows:					
Heifers	26	63.9	366.5	202	1.50
Steers	26	67.3	386.7	206	1.56
Late calving cows:					
Heifers	27	60.9	339.1	191	1.45
Steers	18	65.4	385.3	193	1.66

Early cows, 54 head started; one cow died, 53 calves born, 52 calves weaned, 2 calves died prior to weaning, 96.3%.

Late cows, 53 head started; two cows sold (open), 1 calf aborted, 1 calf born dead, 2 calves died after birth, 88.2%.

Table 7 – Calf weights arranged by date of birth

	Calves	Birth wt.	Weaning wt.	Summer gain	Age (days)	Avg. daily gain
Calves from 2-yr. old heifers						
Born Feb.-March						
Steers	12	73.7	436.3	362.6	245	1.48
Heifers	9	66.8	393.9	327.1	237	1.38
Avg.		70.7	418.1	347.4	241	1.44
Calves from cows						
Born March 1-April 1:						
Steers	15	66.1	414.4	348.3	222	1.57
Heifers	9	59.3	381.7	322.4	222	1.45
Avg.		63.6	402.1	335.4	222	1.51
Calves from cows						
Born April-May:						
Steers	19	68.2	386.3	318.1	198	1.61
Heifers	36	62.4	357.5	295.1	199	1.48
Avg.		65.6	374.3	308.7	198	1.56
Calves from cows						
Born May-June or later:						
Steers	10	63.9	343.5	279.6	172	1.62
Heifers	8	65.8	297.5	231.7	158	1.47
Avg.		64.7	323.0	258.3	165	1.56

Summary:

Some progress was made in moving the expected calving date forward since the “early” calves averaged 12 days older and 19 pounds heavier than the late calves at weaning with the most weight advantage demonstrated by the 1973 heifer calves. This advantage amounts to 1.58 pounds gain per day and extra age.

It costs $2.56 more to winter the early calving cows ($27.91 vs. $25.35) from February 1 to May 15th, a period of 103 days. Calving percentage at weaning of cows starting the winter trial was 96.3% in the early calving herd and 88.2% in the late calving her.

It is interesting to note that calves from the first calf heifers were 19 days older and averaged 16 pounds heavier than the calves in the early calving herd.

Based on the results of this first year, three of four years will be required to change from April to March calving.

Although the weather was milder than normal during February and March, the early calves did not present any more than normal calf problems.

Effects of Early Castration and Late Castration Of Bull Calves Compared

Is there any advantage to be gained from fall castration of spring calves? Does fall castration affect weight gains at weaning? How does late castration affect performance in the feedlot? What problems are encountered, and are three any risks involved in fall castration of spring calves?

This trial, begun in the spring of 1972, was designed to evaluate and compare the effects of early castration, (at 3 to 8 weeks of age), and late castration, (at 6 months of age). Bull calves from the station herd were assigned by age, at random, to either the early or late castration dates. A total of 112 calves have been included in this trial to date.

All calves were operated on using an approved veterinary procedure which minimized blood loss and stressed strict sanitation.

The calves in the last castration group were allowed to remain with their mothers for approximately thirty days following the operation.

In addition to the record of weight gains for both groups from birth to weaning for 1972 and 1973, as summarized in tables 8,9,10, weight gains in the feedlot for the respective treatment groups in 1972 are presented in table 11.

Summary:

Delaying castration until the calves are about 6 months old was of no value in improving weight at weaning, as shown in table 8. Combined data of 1972 and 1973 also shows no advantage for delayed castration. The small weight difference of 3.6 pounds in favor of early castration is not significant.

Feedlot data presented in table 11 shows not difference of significance in gain, dressed weight, dressing per cent, grade or value.

Although no serious problems were encountered at either time of castration, the job is simpler, easier and offers less risk to the calf when performed at an early age.

Table 8 – Comparison of effect of spring and fall castration on weight gains and calves in 1973

Castration date	Weight gain May 15-Sept. 26	Weight gain Sept. 27- Nov.1	Weighted Avg. gain
May 15 (25 head)	238.0	41.2	279.2
Sept. 26 (25 head)	244.4	34.6	279.0

Table 9 – Effect of spring and fall castration on weight gains of early and late born calves in 1973

		Weight gain		
Castration date	Calves born	May 15- Sept. 26	Sept. 27- Nov. 1	Average gain
May 15	Early (17 hd.)	241.8	36.2	278.0
	Late (8 hd.)	230.8	51.9	281.9
Sept. 26	Early (18 hd.)	243.9	31.9	275.8
	Late (7 hd.)	245.7	41.4	287.1

Table 10 – Comparison of effect of spring and fall castration on weight gains and calves (two year average 1972-1973)

Castration date	May 15- Sept. 26	Sept.27- Nov. 1	Total
Early (57 hd.)	226.7	42.5	269.2
Late (55 hd.)	230.5	35.1	265.6

Table 11 – Gains in the feedlot, carcass data and value of steers castrated early and late in 1972

Castration date	Gain	Dressed weight	Dressing per cent	Grade	Value
Early (20 head)	702.0	650.3	59.3	12.04	$412.38
Late (15 head)	692.3	649.9	59.5	12.08	$408.39

Value of Injecting Calves at Birth With Vitamins A, D_2, And E

Supplementary vitamin sources are readily available to livestock producers in several forms. These include feed additives, tablets and injectable solutions. This trial was designed to evaluate the effects of a vitamin injection to calves at birth, from cows handled in a recommended manner.

In this trial, straight bred calves born at the Dickinson station from February to May were allotted by age to either the treatment group or the untreated control group. Within twenty four hours after birth, every calf in the treatment group was injected intramuscularly with two cubic centimeters of a vitamin A, D_2, and E solution. This solution contained 500,000 I.U. of vitamin A, 75,000 I.U. vitamin D_2 and 50 I.U. of vitamin E per cubic centimeter.

The mothers of these calves had been wintered on a high straw plus protein ration in 1971-72. The cows in 1972-73 were wintered on a half hay-half straw ration. About the first of February both years, each cow received a 5cc injection of the vitamin combination.

A record of all treatments administered for lung congestions and scours was kept until calves were turned on grass, about the first of May. The calves were weighed and weaned on November 1st.

Tables 12, 13 and 14 summarize the results on this study.

Summary:

The administration of injectable vitamins A, D_2, and E combination to calves from cows adequately fed and supplemented had no apparent influence on either the calves disease resistance or on its subsequent summer gains. However, the use of vitamin injections did require additional handling, labor and expense.

Table 12 – Effect on injectable vitamins on weight gains of calves in 1973

	Average weight gains	
	Treatment group	Treatment group
Steers	(29 hd.) 327.7 lbs.	(27 hd.) 330.0 lbs.
Heifers	(32 hd.) 293.8	(31 hd.) 293.3
Average	(61 hd.) 309.9	(58 hd.) 310.4

Table 13 – Effect of injectable vitamins on weight gains of calves in 1972-73

	Average weight gains	
	Treatment group	Untreated group
1972 Steers	(33hd.) 305.1 lbs.	(33 hd.) 304.3 lbs.
1973 Steers	(29 hd.) 327.7	(27 hd.) 330.0
Average	(62 hd.) 315.7	(60 hd.) 315.9
1972 Heifers	(22 hd.) 304.2 lbs.	(23 hd.) 296.4 lbs.
1973 Heifers	(32 hd.) 293.8	(31 hd.) 293.3
Average	(54 hd.) 296.8	(54 hd.) 294.6
Combined total	(116 hd.) 306.9 lbs.	(114 hd.) 305.8 lbs.

Table 14 – Number of calves treated for scours and lung congestions with and without vitamin A

	With Vitamin A	Without vitamin A
1973	6	7
1972	19	10
2- year average	12	8

Crossbreds Vs. Straightbreds

With the current interest in crossbreeding, a trial was started to compare Hereford and Angus X Hereford steers under uniform conditions in western North Dakota. The steers were pastured for six months and then finished in dry lot for five months.

The steers were purchased from one herd at an initial weight of approximately 600 pounds. Ten Hereford (H) and ten Angus X Hereford (BWF) steers were randomly allotted by weight. During the pasture phase (Phase I), the steers were grazed and handled in a similar manner. During the dry lot phase (Phase II), the steers were fed in straight Hereford of BWF groups in order to measure feed efficiency.

All steers were pastured and fed and equal number of days.

Carcass information was obtained on all steers.

During the pasture phase, the steers grazed on three types of pasture, namely crested wheatgrass, native, and Russian wildrye. Table 15 shows the results of the pasture phase.

Discussion:

During the pasture phase, the BWF outgained the Herefords only while grazing crested wheatgrass. Neither group gained well on the native pasture although there was ample forage available. It is believed that protein was limiting for adequate gains. Gains on Russian wildrye pasture were good while they lasts, but limited forage material caused earlier than expected drylotting of steers.

In dry lot, each group of steers was divided into either Hereford or BWF and placed on a grain and corn silage ration. All steers were marketed when average lot weights were between 1050-1100 pounds.

Table 16 shows the average ration fed during the drylot phase.

Table 17 shows the results of drylot feeding, over-all carcass quality and value returned.

Summary:

In this first year's trial the crossbred steers outgained the Herefords on crested wheatgrass pasture, but were no better on native or Russian wildrye pastures.

In dry lot, there was no significant difference between the two groups. The BWF crossbreds returned almost $40 more per animal than the Hereford straightbreds due largely to better grading (9 choice vs. 2 choice) carcasses which sold for $3.50 more per hundred. Feed costs per hundred pounds gain was also in favor of the BWF by $1.23.

This trial is being repeated to determine if the trend will continue over another year.

Table 15 – Yearling steer gains on pasture

Pasture grazed:	Hereford	BWF	Difference in favor of Crossbreds
Crested (May 12 to July 7)			
Steer days	560	560	
Total gain, lbs.	1095	1335	+243
Gain per head, lb.	109.5	133.5	+24
Average daily gain, lbs.	1.96	2.38	+.42
L.s.d. average gain @ 1%, lbs.			1/ 24.3
Native (July 7 to Sept. 1)			
Steer days	560	560	
Total gain, lbs.	435	415	-20
Gain per head, lbs.	43.5	41.5	-2.0
Average daily gain, lb.	.78	.74	-.04
L.s.d. average gain @ 1%, lb.			24.4
Russian wildrye – (Sept 1 to Oct. 27)			
Steer days	560	560	
Total gain, lb.	845	810	-35
Gain per head, lb.	84.5	81.0	-3.5
Average daily gain, lb.	1.51	1.45	-.06
L.s.d. average gain @ 1%, lb.			24.6
Combined pasture – (May 12 to Oct. 27)			
Steer days	1680	1680	
Total gain, lb.	2375	2560	+185
Gain per head, lb.	237.5	256.0	-18.5
Average daily gain, lb.	1.41	1.52	+.09
L.s.d. average gain @ 1%, lb.			39.3

1/ Significant at 5%.
Ten steers in each group.

Table 16 – Ration fed in drylot

	Hereford	BWF
Number of head	10	10
Grain:		
60% barley	10,902 lbs.	10,902 lbs.
40% oats	7,268	7,268
Alfalfa hay	2,680	2,680
Corn silage	27,550	27,950
Minerals	274	274
Total feed cost + grinding	$565.46	$566.90

Table 17 – Steer gains in drylot

	Hereford	BWF
Number of head	10	10
Initial weight, lb.	847.0	851.5
Final weight, lb.	1075.0	1092.0
Average gain, lb.	228.0	241.5
Days fed	137	137
Average daily gain, lb.	1.66	1.76
Hot carcass weight, lb.	607.8	640.9
Dressing percent	56.54	58.69
Grade:		
Choice = $73.50	2	9
Good = $70.00	8	1
Average carcass value	$429.66	$468.85
Average feed cost/animal	$56.55	$56.69
Value over feed	373.11	412.16
Feed cost/cwt. Gain	24.80	23.57

Advantage of crossbreds per head = $39.05

Comparison of BWF and Hereford Steer Calves Under Growing Conditions

This trial is a phase of a comparison of crossbred Angus-Hereford (BWF) steers with Hereford steers under both pasture and feedlot conditions.

In this trial, steer calves were wintered to gain approximately 1.5 pounds per day on a limited grain-high roughage growing ration. In this trial, two lots of 13 steers each of BWF and Hereford type were wintered for 92 days, from January 24th to April 26, 1973. During this time, each calf was fed a ration of 4 pounds of oat, 2 pounds alfalfa hay, 0.2 pound mineral mix and corn silage free choice. The calves were weighed monthly and feed consumption per lot was recorded.

Table 18 shows the results of the 1973 winter period.

Table 19 shows the feed consumption and cost per 100 pounds gain.

Table 18 – Results of the 1973 winter growing period with BWF and Hereford Steers

	BWF	Hereford
Number of head	13	13
Initial weight, lb. (Jan.24, 1973)	408.1	407.3
Final weight, lb. (April 26, 1973)	560.4	542.3
Average steer gain, lb.	152.3	135.0
Difference, lb. 1/	+17.3	
Average daily gain, lb.	1.66	1.47

1/ Difference in weight gain not statistically significant.
Required l.s.d. @ 5% is 23.2 pounds.

Table 19 – Ration fed, feed consumption and cost per hundredweight gain

	BWF		Hereford	
	Lbs,/hd. Per day	Total cost	Lbs./hd. per day	Total cost
Ration as fed:				
Oats	4.0	$97.12	4.0	$97.12
Alfalfa hay	2.0	29.90	2.0	29.90
Corn silage	20.8	89.55	19.6	84.33
Mineral mix	0.2	13.63	0.2	13.63
Total feed consumed	27.0		25.8	
Ration cost:				
Per lot		$230.20		$224.98
Per head		17.71		17.31
Per 100 lb. gain		11.63		12.82

Feed costs in this ration figured at:
.0203 for oats
.0125 for alfalfa
.0036 for corn silage
.057 for mineral mix

Summary:

During this wintering phase, the BWF steers were more efficient than the Hereford steers requiring $1.19 less feed per one hundred pounds gain.

The BWF steers gained 17.3 pounds more per head than the Herefords, although this difference was not statistically significant at the 95 percent probability level.

Twelve steers from each group were pastured together and will be finished in dry lot following the summer grazing period.

Is Supplemental Protein Necessary for Fattening Steers on Complete Mixed Rations?

Complete mixed rations which include alfalfa as 5% of the ration have performed well in trials at this station in the past. However, performance on higher levels of alfalfa has not been determined.

There is concern about the problem of bloat, and its relationship to the level of alfalfa in the ration. Some producers have plenty of alfalfa and would like to use as much as is practicable. Others have limited amounts and want to use it to the best possible advantage, in combination with other hay. The value of additional protein in self-fed rations also needs to be determined.

Self-fed rations containing no alfalfa, and alfalfa in the amount of 5%, 15% and 25% of the total ration were fed to steer calves from a starting weight of 425 pounds to slaughter weights of about 1050 pounds.

A 5% alfalfa ration which included soybean oilmeal as a supplemental protein was also included.

The 5% alfalfa ration was fed to both Hereford and crossbred (Angus X Hereford) steers to compare performance.

Five lots of Hereford steers and one lot of crossbred steers were allotted on January 15, 1973. After a two week warm up period, all steers were started on self-feeders. The feeding period extended from February 2 until November 19, 1973, a total of 308 days.

During the feeding period, oats in the ration was shifted to barley as shown in table 20. The trial summary is presented in table 21.

Summary:

All rations were apparently adequate in protein, since the addition of soybean oilmeal did not improve average daily gains. The level of alfalfa did not significantly affect rate of gain.

The cost of feed per 100 pound of gain varied from $16.74 in the 5% alfalfa lot to a high of $27.10 in the lot receiving soybean oilmeal.

There was no significant difference between the straightbred or crossbred steers fed the 5% alfalfa ration as far as gain is concerned. The Hereford steers appeared to be somewhat more efficient, having a lower cost ($16.71 vs. $1941) per hundred weight gain.

Table 20 -- Composition of self-fed rations by weight for the feeding period January 15-November 19, 1973 [1/]

Lot 8- 25% alfalfa, no tame hay	
February 3 – April 25	10% barley, 65% oats
April 25 – June 26	25% barley, 50% oats
June 27 – July 22	40% barley, 35% oats
July 23 – November 19	45% barley, 30% oats
Lot 11 – 5% alfalfa, 20% tame hay and 7.4% soybean oilmeal	
February 3 – April 25	2.6% barley, 65% oats
April 26 – June 26	17.6% barley, 50% oats
June 27 – July 22	32.6% barley, 35% oats
July 23 – November 19	37.6% barley, 30% oats
Lot 10 – no alfalfa, 25% tame hay	
February 3 – April 25	10% barley, 65% oats
April 26 – June 26	25% barley, 50% oats
June 27 – July 22	40% barley, 35% oats
July 23 – November 19	45% barley, 30% oats
Lots 16 & 17 (BWF) – 5% alfalfa, 20% tame hay	
February 3 – April 25	10% barley, 65% oats
April 26 – June 26	25% barley, 50% oats
June 27 – July 22	40% barley, 35% oats
July 23 – November 19	45% barley, 30% oats
Lot 7 – 15% alfalfa, 10% tame hay	
February 3 – April 25	10% barley, 65% oats
April 26 – June 26	25% barley, 50% oats
June 27 – July 22	40% barley, 35% oats
July 23 – November 19	45% barley, 30% oats

[1/] All lots received minerals at the rate of 10 pounds of dicalcium Phosphate per 1000 pounds of feed. Salt was added to the rations At the rate of 10 pounds/1000 during the first period and 20 pounds /1000 during the last three periods.

Table 21 – Data on weights, gains and feed costs in trials comparing alfalfa and soybean oilmeal as a protein supplement

	Herefords No Alfalfa	Herefords 5% alfalfa	BWF 5% alfalfa	Herefords 15% alfalfa	Herefords 25% alfalfa	Herefords SBOM
Initial wt., lb.	429	428	428	429	429	429
Final wt., lb.	1059	1106	1042	1091	1098	1015
Gain/hd., lb.	630	678	614	662	669	586
Days fed	308	308	308	308	308	308
Avg. daily gain., lb.	2.05	2.20	1.99	2.15	2.17	1.90
Lbs. feed/hd./day	17.6	18.4	19.3	21.3	18.6	18.6
Feed cost/100lb. gain	$17.05	$16.74	$19.41	$20.10	$17.60	$27.10
Feed cost/hd./day	$0.35	$0.37	$0.39	$0.43	$0.38	$0.52

Self Feeding Complete Mixed Rations to Calves From Weaning to Slaughter

Steer and heifer calves were fed from weaning to slaughter in 339 days on self-fed complete mixed rations based on oats, barley and hay.

This trial, started in November, 1971, and continued in November, 1972, utilized four lots of Hereford steer calves and two lots of Hereford heifer calves. After a twelve day warm up period on whole oats and hay, all lots were started on their respective self-fed rations, as described below. Minerals force fed in all rations were 10 pounds di-calcium phosphate and 20 pounds of salt added to each 1000 pounds of mixed feed.

Ration 1 – 50% oats, 45% tame hay, 5% alfalfa plus minerals.

Ration 2 – 50% oats, 45% tame hay, 5% alfalfa plus minerals.
When calves reached 650 pounds, barley was substituted for 15% of oats each month until Barley made up 100% of the grain in the ration.

Ration 3 – 75% oats, 20% tame hay, 5% alfalfa plus minerals.

Ration 4 – 75% oats, 20% tame hay, 5% alfalfa plus minerals.
After calves reached 650 pounds, barley was substituted for 15% of the oats each month Until barley made up 60% of the grain in the ration.

A portable grinder-mixer using a 3/16 inch screen for the grain and a one inch screen for the hay was used to process the rations. The mixed rations were fed in straight walled self feeders designed for high roughage mixed rations.

The calves were fed until they reached an average choice slaughter grade, a period of 339 days in 1972-73.

Summary:

The rations used in this trial provided gains of from 2.02 to 2.17 pounds per head per day with steers and 1.74 to 1.81 for heifers. On similar rations (75% grain, 25% hay), the steers outgained the heifers by an average of 110 pounds per head. There was no significant difference in gain between steers fed 75% oats, 25% hay; 75% oats changing to barley, 25% hay; and 50% oats changing to barley and 50% hay. Steers fed the 50% oats changing to barley gained faster than steers fed the 50% oats-50% hay ration. Calves generally ate on an energy basis, consuming more feed on the higher roughage lower energy rations. Highest return was $311 for steers fed both the 75% oat-25% hay rations and the 50% oat changing to barley ration. Two years data suggests that the 50% oat- 50% hay ration is too low in energy to provide optimum gains with steers.

Table 22 – Weights, gain, carcass data, feed cost and return from self-fed complete mixed rations

Ration #	1 Steers	3 Steers	3 Heifers	2 Steers	4 Steers	4 Heifers
Initial wt., lb.	397	396	339	396	396	338
Final wt., lb.	1081	1118	951	1132	1097	929
Gain/hd., lb.	684	722	612	736	701	591
Days fed	339	339	339	339	339	339
Avg. daily gain, lb.	2.02	2.13	1.81	2.17	2.07	1.74
Hot carcass wt., lb.	628	670	572	666	658	562
Avg. grade	11.7	12.4	12.7	12.4	12.7	12.9
Dressing percent	58.0	60.0	60.1	58.8	60.0	60.5
Avg. carcass value	$392	$429	$355	$426	$421	$354
Feed cost/head	$105	$118	$105	$115	$124	$108
Return/hd. Over feed	287	311	250	311	297	246
Avg. cost/cwt gain	15.41	16.29	17.14	15.62	17.63	18.24
Lbs. feed/day	18.9	18.1	16.2	19.8	18.3	16.1

Table 23 – Summary of trials with self-fed complete mixed rations

Ration #	1 2Yrs. Steers	3 2Yrs. Heifers	3 3Yrs. Steers	2 2Yrs. Steers	4 2Yrs. Heifers	4 3Yrs. Steers
Feedlot gain, lb.	636	617	673	688	596	676
Avg. daily gain, lb.	1.98	1.94	2.08	2.14	1.86	2.09
Carcass wt., lb.	612	576	650	645	563	659
Carcass value	$350	$327	$361	$377	$321	$364
Cost/cwt gain	$14.98	$15.74	$14.97	$14.56	$16.36	$15.32
Lbs. feed/day	20.6	16.8	17.8	19.5	16.4	17.8

Hand Feeding & Self-Feeding Compared

How does feeding compare with self-feeding when beef calves are fed oats from weaning to slaughter? What benefits are derived from grinding the oats, and will the substitution of barley for oats improve feedlot performance and returns?

On October 27th, 1972, three lots of steer calves were started on feed to get some answers to these questions. The steers were placed on their respective rations after a 12 day warm up period on whole oats and tame hay.

One lot of steers was started on a self-fed ration of ground oats and minerals with 3 pounds tame hay and 2 pounds alfalfa hay fed daily in long form. When the steers averaged about 650 pounds, 15% of the ground oats was replaced with ground barley. The barley was increased in 15% increments each month until it reached 60% of the total grain being fed. The minerals in the self-fed rations were mixed with the grain and force fed at the rate of 10 pounds of di-calcium phosphate and 20 pounds of salt per 1000 pounds of grain.

Another lot of steers was hand fed daily a ration of whole oats to appetite, 3 pounds tame hay, 2 pounds alfalfa hay, and 0.2 pounds minerals. When the steers averaged about 650 pounds, the oats was ground and fed in that form to the end of the trial.

The third lot of steers was hand fed daily a ration of ground oats to appetite, 3 pounds tame hay, 2 pounds alfalfa hay and 0.2 pounds minerals. When these steers averaged about 650 pounds, barley was substituted for 15% of the oats monthly until the level of barley made up 60% of the grain fed. The mineral mixture fed to both hand fed lots was three parts di-calcium phosphate and one part trace mineral salt.

All three lots were fed until they averaged approximately 1050 pounds and would yield a high good to choice carcass.

Table 24 -- Results of hand feeding vs. self-feeding during the winter phase, October – March

	Whole oats Hand fed	Ground Oats hand fed	Ground oats self-fed
October 27th wt., lb.	396	396	399
March 23rd wt., lb.	639	606	681
Avg. winter gain, lb.	243	210	282
Days fed	147	147	147
Average daily gain, lb.	1.65	1.43	1.90
Avg. ration fed, lbs./hd./day:			
Whole oats	7.1		
Ground oats		7.1	10.6
Tame hay	3.3	3.3	3.3
Alfalfa	1.8	1.8	1.8
Minerals	0.18	0.18	0.32
Feed cost/head			
(* includes grinding)	$30.37	$31.42*	$42.99*
Cost/cwt gain	12.50	14.96	15.24

Table 25 – Results of hand feeding vs. self-feeding during the summer phase, March to finish

	Whole oats Hand fed	Ground oats hand fed	Ground oats self-fed
March 23rd wt., lb.	639	606	681
Finish wt.:			
October 1st			1044
November 19th	1096	1105	
Summer gain, lb.	457	499	363
Days fed	241	241	192
Average daily gain, lb.	1.90	2.07	1.89
Avg. ration fed, lbs./hd./day:			
Ground oats	14.4	6.5	8.6
Ground barley	--	7.9	6.8
Tame hay	3.0	3.0	3.0
Alfalfa hay	2.0	2.0	2.0
Minerals	0.2	0.2	0.41
Feed cost/head	$89.07	$93.99	$79.74
Cost/cwt gain	19.49	18.84	21.97

Table 26 – Summary of hand feeding vs. self-feeding trial

	Whole oats Hand fed	Ground oats hand fed	Ground oats self-fed
Initial wt., lb.	396	396	399
Final wt., lb.	1096	1105	1044
Gain/hd. Lb.	700	709	645
Days fed	388	388	339
Avg. daily gain, lb.	1.80	1.83	1.90
Feed cost/head	$119.44	$125.41	$122.72
Cost/cwt gain	17.06	17.70	19.01

Summary:

During the winter phase, the self-fed steers outgained the steers hand fed ground oats by 0.47 pounds per head per day. In this first year's trial, the whole oat fed steers performed better than the ground oat fed steers, and produced the cheapest gains during the winter phase.

During the summer phase, the steers fed ground oats plus barley made the fastest gains (2.07 lbs./hd./day) and had the lowest cost ($18.84) per 100 pounds gain.

The self-fed steers consumed one pound of grain more per day then the hand fed steers, and were slaughtered after 339 days on feed, 49 days earlier than those hand fed.

An analysis of the daily gains of steers in all lots shows no significant difference.

Based upon the results shown in table 24, whole oats performed as well as ground oats for less cost until the steers weighed 600 to 650 pounds.

The substitution of barley for oats apparently allowed for faster gains when compared to straight oats, although the difference was not great.

Extra salt was fed in the self-fed ration in an effort to reduce over consumption of grain. No steers in the lot showed signs of founder caused by over eating.

Feeding Liquid Whey in Swine Fattening Rations

The disposal of liquid whey, a by-product of cheese manufacture at North Dakota cheese plants, has been a problem. Its resistance to decomposition in sewage systems had made it necessary to find other means of disposal. The use as a fertilizer is of limited value. However, it can be used in swine feeding to provide necessary protein.

This trial was designed to investigate the feasibility of using liquid whey as a supplement in swine fattening rations. In this experiment, whey, soybean oilmeal and lysine-methionine are compared, as supplements to a basic barley and oats fattening ration. Pigs of two starting weights were used, and all lots were fed in concrete dry lot. The pigs were started on whey gradually, and did not develop any scouring or diarrhea.

Liquid whey was self-fed using nipple type waterers. The whey fed pigs received no extra water after the first month, their entire liquid intake coming from the whey. The whey was furnished daily by the Dickinson Cheese Company, stored in fiber glass tanks at the station for twenty four hours, and fed in sour form. The whey was furnished at no cost, but in ration computations, a charge of ½ cent per gallon was made to cover cost of hauling and handling.

Although the utilization of whey was impossible to measure accurately because of waste in feeding, it amounted to approximately 2.8 gallons per pig per day. This is in agreement with figures for liquid consumption as presented by the National Research Council.

Table 1 shows ration composition and costs. Table 2 summarizes weights, gains and feed costs in the 1973 trials.

Summary:

Barley-oats rations supplemented with whey were equal to rations supplemented with either soybean oilmeal or amino acids lysine and methionine. The whey fed pigs were more efficient and had a lower cost of gain than either the soybean oilmeal or the amino acid fed pigs. The whey fed pigs required approximately 100 pounds less dry feed per 100 pounds gain than the other rations. This amounted to a savings of about $3/100 pounds gain over the amino acid fed pigs and $5/100 pounds gain over the soybean oilmeal fed pigs.

IT appears from this trial that whey can be utilized very satisfactorily in a swine feeding program if: the source of whey is adequate and dependable; the pigs weight at least 35 pounds; and , proper liquid feeding devices (stainless steel or PVC plastic) are utilized to minimize contamination, fly and odor problems

Table 1 – Rations fed in swine feeding trials – summer, 1973

Ingredients	Barley + SBOM	Barley + lysine & methionine	Barley + whey
Oats, lb.	200	231	236
Barley, lb.	676	737.5	740
Soybean oilmeal, lb.	100	--	--
Di-calcium phosphate, lb.	9	9	9
Limestone, lb.	9	9	9
Trace mineral salt, lb.	5	5	5
Vitamin B complex, lb.	1	1	1
Lyamine (50%), lb.	--	6	--
Methionine (99%), lb.	--	1.5	--
Vitamin A, gram	30	30	30
Vitamin D_3, gram	14	14	14
Zinc sulphate, gram	180	180	180
Total, lb.	1000	1000	1000
Cost /100 lbs. Feed [1/]	$3.50	$3.00	$2.46

[1/] Includes $1.50/1000lbs. for grinding, and 50 cents/100 gallons for hauling whey.

Table 2 – Weights, gains and feed costs in whey feeding trials – summer, 1973

	Barley + Whey		Barley + lysine & methionine		Barley + SBOM	
Initial wt. lb.	35.7	53.6	36.3	53.3	36.7	54.3
Final wt. lb.	206.9	217.5	211.2	214.0	200.7	220.3
Gain, lb.	171.2	163.9	174.8	160.7	164.0	166.0
Days fed	135	121	135	121	135	121
Avg. daily gain, lb.	1.27	1.35	1.30	1.33	1.21	1.37
Dry feed/cwt gain, lb.	261.2	283.4	361.3	368.9	376.3	353.4
Whey/cwt, gallons	218	207	--	--	--	--
Feed cost/cwt gain	$7.42	$8.00	$10.84	$11.07	$13.53	$12.71

Swine Feeding Trials
Summer – 1973

The summer hog feeding trials included a comparison of triticale and barley, supplemented with soybean oilmeal or the amino acids lysine and methionine. The rations were self-fed in meal form to both barrows and gilts, in groups of seven, on a spring seeded winter wheat pasture.

The pigs fed were purebred Yorkshires farrowed during March and April. Their average starting weight was 36 pounds and they were fed for 126 days. The trials were closed when the pigs averaged 220 pounds.

Table 3 shows the rations as fed and their cost per 100 pounds.

Table 4 gives the performance of pigs by ration and shows feed efficiency and cost per 100 pounds gain.

Summary:

Due to the high cost for soybean oilmeal ($270/ton) the rations supplemented with lysine and methionine were about $0.65/100 pounds cheaper to prepare.

There was no statistically significant difference between the rations, sex, or ration x sex interaction as far as gain was concerned.

It appears that all rations gave good feed efficiency, with the triticale and soybean oilmeal showing up best.

The lowest cost per 100 pounds gain was produced by the triticale plus lysine ration at $9.86 per 100 pound gain.

In summary, it appears that clean ergo-free triticale can substitute for barley on a 1 to 1 basis without adversely affecting gains.

It should also be noted that the amino acids lysine and methionine gave gains equal to soybean oilmeal when used to supplement the barley-oats rations. However, lysine was in very short supply during 1973, and difficult to obtain.

Table 3 – Rations fed in swine feeding trials – summer, 1973

Ingredient	Barley + SBOM	Triticale + SBOM	Triticale + lysine & methionine
Barley, lb.	676	--	--
Triticale, lb.	--	676	769.5
Oats, lb.	200	200	200
Soybean oilmeal, lb.	100	100	--
Lyamine (50%), lb.	--	--	5
Methionine (99%), lb.	--	--	1.5
Di-calcium phosphate, lb.	9	9	9
Limestone, lb.	9	9	9
Trace mineral salt, lb.	5	5	5
Vitamin B complex, lb.	1	1	1
Vitamin A, gram	30	30	30
Vitamin D_3, gram	14	14	14
Zinc sulphate, gram	180	180	180
Total, lb.	1000	1000	1000
Cost/100 lbs. feed [1/]	$3.60	$3.60	$2.95

[1/] Includes $1.50/1000 lbs. for grinding.

Table 4 – Performance of pigs in feeding trials – Summer, 1973

	Barley + SBOM		Triticale + SBOM		Triticale+lysine & methionine	
	Barrows	Gilts	Barrows	Gilts	Barrows	Gilts
Initial wt., lb.	35.4	36.6	36.2	36.9	36.1	36.7
Final wt., lb.	230.0	223.6	231.8	224.4	229.0	224.1
Gain, lb.	194.6	187.0	195.7	187.6	192.9	187.4
Days fed	126	126	126	126	126	126
Avg. daily gain, lb.	1.54	1.48	1.55	1.49	1.53	1.49
Feed/cwt gain, lb.	366.7	337.7	333.5	321.8	338.5	330.8
Feed cost/cwt gain	$13.19	$12.14	$11.99	$11.57	$9.97	$9.75

Swine Feeding Trials
Winter 1972-73

Swine fattening rations in which triticale or barley as the major grain ingredient were used in these trials. Both natural protein (soybean oilmeal) and the amino acids (lysine and methionine) were also tested as suitable ration supplements. Any interaction between sex and ration was also measured.

Hogs started on trial at an initial weight between 40 and 50 pounds, and were fed for a period of 120-148 days depending upon sex and ration. All rations were processed in a portable grinder-mixer and self-fed in meal form. The purebred Yorkshire pigs used in the trial were farrowed during August and September, 1972. All pigs were wormed with dichlorvos at the beginning of the trial.

The ration ingredients, costs and calculated protein levels are shown in table 5.

Table 6 summarized performance of both barrows and gilts.

Table 7 shows the results of barrows fed either the barley ration, triticale ration, triticale plus lysine and methionine or triticale plus barley.

Summary:

The first years' data show no significant difference in gain produced by feeding either barley or triticale based rations. There was no apparent interaction between sex and ration.

Faster and more efficient gains were produced by barrows than the gilts. This is partly because the gilts were fed to slightly heavy final weights and were somewhat lighter at the start. None of the lots were very efficient, requiring 439 to 516 pounds of feed per hundred weight gain. The high cost of soybean oilmeal ($270/ton) caused an increase of almost 50% over previous years feed costs for barley based rations.

No statistically significant difference was measured between gain of barrows fed any of the four rations. The barley and soybean oilmeal ration gave the most efficient gains while the triticale plus lysine and methionine was the least expensive to feed. Feed efficiencies were similar in all rations. The replacement of oats with barley in triticale based rations did not improve rate of gain or feed efficiency.

Table 5 – Average ration composition, cost per 100 lbs. and calculated protein levels

Ingredients	Barley + SBOM	Triticale + SBOM	Triticale + lysine & methionine	Tritical, barley + SBOM
Barley, lb.	678.5	--	--	200
Triticale, lb.	--	678.5	772	678.5
Oats, lb.	200	200	200	--
Soybean oilmeal, lb.	100	100	--	100
Lyamine (50%), lb.	--	--	5	--
Methionine (99%), lb.	--	--	1.5	--
Limestone, lb.	10	10	10	10
Di-calcium phosphate, lb.	5	5	5	5
Trace mineral salt, lb.	5	5	5	5
Vitamin B complex, lb.	1	1	1	1
Vitamin A, gram	30	30	30	30
Vitamin D_3, gram	14	14	14	14
Zinc sulphate, gram	180	180	180	180
Total, lb.	1000	1000	1000	1000
Cost/100 lbs. feed	$3.43	$3.43	$2.78	$3.48
Calculated protein	14.7%	16.3%	13.1%	16.5%

Table 6 – Weights, gains and feed costs in feeding trials – winter 1972-73

	Barley + SBOM Barrows	Gilts	Triticale + SBOM Barrows	Gilts
Initial wt., lb.	52.5	45.2	53.4	45.1
Final wt., lb.	218.4	232.3	216.6	220.7
Gain, lb.	165.9	187.1	163.2	175.6
Days fed	120	148	120	148
Avg. daily gain, lb.	1.38	1.26	1.36	1.19
Feed/cwt gain, lb.	448.8	515.0	438.7	516.5
Feed cost/cwt gain	$15.37	$17.64	$15.03	$17.70

Table 7 – Weights , gain and feed costs in feeding trial with barrows – winter 1972-73

	Barley + SBOM	Triticale + oats	Triticale + lysine	Triticale + barley
Initial wt., lb.	42.7	41.7	44.2	43.9
Final wt., lb.	205.1	201.9	204.7	190.7
Gain, lb. [1/]	162.4	160.2	160.5	146.9
Days fed	120	120	120	120
Avg. daily gain, lb.	1.35	1.34	1.34	1.22
Feed/cwt gain, lb.	417.8	441.3	423.5	447.5
Feed cost/cwt gain	$14.31	$15.12	$11.77	$15.56

[1/] No significant difference at 5% level.

Including Antibiotics in Sow Rations To Reduce Baby Pig Losses

Many baby pigs die before weaning from scours, miscellaneous infections and starvation caused by a sow failing to milk. Feeding high levels of antibiotics two weeks before and for three weeks after farrowing is reported to reduce baby pig losses, improve milk production in the sow and increase numbers of pigs weaned.

In August, 1973, 24 bred sows and gilts were divided into nearly equal groups based on breeding dates. Two weeks before the first litters were due, the antibiotic, neomycin oxytetracycline, was added to the gestation rations at the rate of 7.5 pounds per ton of feed. Each pound of the antibiotic mixture provided 20 grams oxytetracycline and 14 grams of neomycin. This level of medication was also added to the lactation rations and fed for three weeks following farrowing. The control sows were handled in an identical manner except their rations did not include any antibiotic. Individual sows and pigs were treated with antibiotics, serum, and oxytocin only when their condition warranted a specific treatment.

The rations fed are shown in table 8.

The trial summary is tabulated in table 9.

Table 8 – 1973 sow gestation and lactation rations

	Gestation Ration [1/]	Lactation ration [1/]
Alfalfa hay, lb.	600	--
Barley, lb.	--	900
Oats, lb.	1345	880
Soybean oilmeal, lb.	--	180
Limestone, lb.	20	22
Di-calcium phosphate, lb.	20	12
Trace mineral salt, lb.	15	10
Vitamin B complex, lb.	2	1
Vitamin A, gram	150	60
Vitamin D_3, gram	--	20

[1/] 7.5 pounds of neomycin-oxytetracycline added per ton in medicated feeds.

Table 9 – Results of trials with the use of neomycin-oxytetracycline in sow rations

	Treated	Check
Number of litters	12	[1/] 11
Crossbred	8	2
Straightbred	4	9
Number living at birth	129	131
Avg. birth wt., lb.	2.60	2.45
Number living at weaning	113	81
Avg. weaning wt., lb.	28.2	29.9
Avg. age at weaning, days	51	56
Avg. daily gain, birth to weaning, lb.	0.50	0.52
Percent alive at weaning	88	62
Sows requiring additional medication	5	3

[1/] One sow not included because she farrowed unattended in a portable house and lost most of her pigs.

Summary:

The sows fed neomycin weaned 26% more pigs than the control sows' There did not appear to be any consistent difference between treatments with respect to average age at weaning, birth weight, weaning weight or average daily gain from birth to weaning.

Results of this trial could be biased because of unequal numbers of crossbred sows in the medicated group. Additional trials are planned.

Feed Prices and Feed Analysis, 1973

Ingredient	Price/unit	% Protein
Alfalfa hay	$25/ton	14.8
Crested wheatgrass hay	18/ton	11.6
Oat straw	10/ton	4.8
Barley	$1.10/bushel	12.4
Oats	0.65/bushel	11.5
Triticale	1.10/bushel	14.1
Soybean oilmeal	$270/ton	
Di-calcium phosphate	$132/ton	
Trace mineral salt	56/ton	
Limestone	50/ton	
Zinc sulphate	$2.99/pound	
Vitamin A	0.50/pound	
Vitamin D_3	2.42/pound	
Vitamin B complex	0.22/pound	
Lyamine-50 (50% lysine)	0.65/pound	
dl Methionine (99%)	1.10/pound	
Whey (liquid)	50 cents/100 gallons	
101 block (Kedlor)	$11.10/100 pounds	
Grinding	$3.00/ton	

Report of
Grass and Legume Investigations
At the
Dickinson Experiment Station
1973 Crop Season

By
Warren C. Whitman and Harold Goetz

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Three- Pasture System Grazing Trial

The grazing trial using crested wheatgrass for spring and early summer grazing, native grass in mid and late summer, and Russian wildrye for fall grazing was continued for the second year at the Dickinson Station in the 1973 season. The trial has been intended to compare fertilized crested wheatgrass, fertilized native, and fertilized Russian wildrye pastures with unfertilized pastures on the same kinds. However, in the 2 years of the trial the Russian wildrye pastures have all been fertilized, and a comparison with unfertilized pastures for the fall grazing period had not been made. The Russian wildrye pastures have been low in vigor and consequently have been fertilized rather heavily in an attempt to increase their productivity. In 1972 season the Russian wildrye pastures all received a total of 75 lbs nitrogen per acre, and in the 1973 season they were all treated with 150 lbs nitrogen.

The grazing plan for the 1973 season is shown in Table 1. This year 12 yearling steers were used on each pasture, while only 10 were used in the 1972 season. Two of the Russian wildrye pastures were grazed from late August to early October, while the remaining two pastures were grazed in October and November.

Forage production and grazing utilization of the forage on the pastures for the 1973 season are shown in Table 2. Forage production on the crested wheatgrass pastures in 1973 was from 30% lower on the unfertilized to about 50% lower on the fertilized pastures than in the 1972 season, but the supply of forage was satisfactory for both pastures, as shown by a total utilization of 59% on the unfertilized and 68% on the fertilized crested. The grazing period on the crested wheatgrass pastures was 56 days, extending from April 26 to June 21.

Production on both the unfertilized and fertilized native grass pastures in the 1973 season was about 75% of the 1972 production, and this good production was reflected in the final total utilization values of 43% on the unfertilized and 48% on the fertilized pastures. These pastures could have been utilized somewhat heavier than they were. The grazing period on these pastures was from June 21 to August 23, a total of 63 days.

Production on the Russian wildrye pastures in the 1973 season was only about 13% more than in the 1972 season despite the heavy fertilization. Utilization on the first two 8-acre Russian wildrye pastures was very heavy by the end of the grazing period, being virtually complete with the stubble remaining only about 1-2 inches in height. The steers grazed on the first two wildrye pastures from Aug. 23 to Oct. 5, a period of 43 days. The steers were moved to the remaining two wildryes pastures on Oct. 5 and were still grazing there at the time this report was prepared.

The performance of the steers on the pastures is shown in the data of Table 3. The steers did not do as well on the crested wheatgrass pastures as they did last year, averaging 1.66 lbs/head/day on the unfertilized crested and 1.32 lbs on the fertilized crested. Last year gains on both pastures were over 2 lbs/head per day. Gains per acre were down somewhat from last year also, averaging 69.7 lbs on the unfertilized and 110.6 lbs on the fertilized.

This year the steers were moved from the crested wheatgrass pastures to the native grass pastures on June 21, about three weeks earlier than last year, in order to see whether they would make better gains if moved to native grass while it was less mature. The steers did make both better per-head and per-acre gains in the 1973 season on the native grass than they did in 1972. Daily gains per head averaged

1.61 lbs on the unfertilized native grass and 1.81 lbs on the fertilized. Last year gains on both pastures averaged about 0.75 lbs/head/day. Gains per acre were 67.5 lbs on the unfertilized native and 113.8 lbs on the fertilized. In 1972 the respective per acre gains were 23.9 and 35.0 lbs. The steers were on the native grass pastures from June 21 to Aug. 23, a period of 63 days.

Reference to the data of Table 4 shows that the gains per head were especially high on the native grass during the period from June 21-July 24. On the fertilized pasture these gains averaged 2.52 lbs/head/day and 1.97 lbs on the unfertilized. In the following period, July 24-August 23, gains dropped to 1.02 lbs/head/day on the fertilized pasture and 1.21 lbs on the unfertilized. This reduction in gains of the steers seems to be an obvious reflection of decrease in quality of the forage with the advance of the season.

The data given in Table 3 show the steer weights and gains for the Russian wildrye pastures just as they were taken for the period Aug. 23-Oct. 5. However, the distribution of the animals was changed somewhat when they were transferred to the wildrye pastures. The daily gains for the animals on both pastures averaged 0.88 lbs/head. The daily gains for the animals on both pastures averaged 0.88 lbs/head. The per acre gains averaged 56.9 lbs for the same period. The data of Table 3, however, shown that the per head and per acre gains were much less on the #2 Russian wildrye pasture than on the #1 wildrye pasture. Part of the explanation for this difference is shown in Table 4.

Each of the two lots of animals grazed on the pastures consisted of 6 Hereford and 6 black whiteface steers (Angus X Hereford). The average daily gains of both groups of steers in the lot continuously on the fertilized pastures and the gains of the groups in the lot continuously on the fertilized pastures and the gains of the groups in the lot continuously on the unfertilized pastures until going on the Russian wildrye pasture are given in Table 4. There are some inconsistencies in the data, but in general the black whitefaces and the Herefords made about the same daily gains per head on the crested wheatgrass and the native grass pastures. On the Russian wildrye pastures, however, the black whitefaces made somewhat better gains than the Herefords. The black whitefaces grazed previously on the unfertilized pastures averaged 0.83 lbs/head/day over the 43-day grazing period on the wildrye, while the Herefords from the same treatments averaged 0.68 lbs during the same period. The black whitefaces from the fertilized pastures averaged 1.10 lbs/head/day, and the Herefords from the same treatment averaged 0.91 lbs on the Russian wildrye. On the season long basis, however, there seems to have been very little difference between the daily gains of the black whitefaces and the Herefords.

Half of each lot of steers was fed Kedlor (biuret) while the animals were on the native grass pastures. This was done to whether the supplement would compensate for the loss of quality in the forage as it matured. When the animals were moved from the native grass to the Russian wildrye pastures, all the steers that had been fed Kedlor were put in pasture #2, while the animals which had not received the supplement were all placed in pasture #1. The very interesting results obtained from this treatment are shown in Table 5.

Table 5 shows that Kedlor had little or no effect on the gains of the steers on either the fertilized or unfertilized native grass during the first 33-day period from June 221 to July 24. However, during the second period on the native grass, the 30 days from July24-August 23, the gains of the steers receiving the Kedlor supplement were 2.8 times better than the gains of the steers without supplement on both the fertilized and unfertilized pastures. Overall daily gains were somewhat better on the unfertilized pastures than on the fertilized pastures during this perid.

The data of Table 5 indicate that the feeding of the Kedlor supplement on the Russian wildrye pasture during the 43-day period from Aug.23-Oct. 5 had a near disastrous effect on gains. The steers without Kedlor gained 1.38 lbs/head/day during this period, while the steers receiving the Kedlor supplement gained only 0.39 lbs/head/day. The reason for this difference is unknown. The pasture and water facilities in the two Russian wildrye pastures appeared to be nearly identical. It is possible that the consumption of the Kedlor set up some kind of nutritional imbalance in the steers relative to the nutritional characteristics of the Russian wildrye forage available.

A summary of the 1973 results with the 3-pasture grazing system shows that the 12 yearling steers on fertilized pastures gained an average of 231.2 lbs each during a 162-day grazing period each utilizing about 60 percent of the total forage produced on 2.3 acres. This represents an overall average gain of 99.1 lbs/ace. On the unfertilized pastures the steers gained an average of 227.1 lbs each during the same period, utilizing somewhat less than 60 percent of the forage on 3.5 acres. The overall gain per acre on these pastures is thus 64.9 lbs. The use of the Kedlor supplement seemed effective in maintaining gains of the steers on near-mature native grass, but its use may be questionable on late season Russian wildrye.

Table 6 gives a summary of the 2-year results on the trial. The 3-pasture system seems to be fairly well adapted to the conditions existing in the west-river area. The use of fertilizer in the system gives the obvious advantage of greatly increased grazing capacity. A number of management factors must still be worked out before the most efficient way to use the system can be determined.

Table 1. Proposed grazing plan for the three-pasture trial with 12 yearling steers per pasture for the 1973 season.

Pasture	Grazing period	Pasture size Acres	Stocking rate-acres per steer per month
Crested wheatgrass	April-June	16	0.7
Crested wheatgrass + 50 lbs N	April- June	8	0.3
Native grass	July-Aug.	18	0.7
Native grass + 50 lbs N	July-Aug.	12	0.5
#1 – Russian wildrye + 150 lbs N	Sept.	8	0.3
#2 – Russian wildrye + 150 lbs N	Sept.	8	0.3
#3 – Russian wildrye + 150 lbs N	Oct.	8	0.3
#4 – Russian wildrye + 150 lbs N	Oct.	8	0.3

Table 2. Pasture systems grazing trial. Forage production and utilization on pastures grazed by yearling steers – 1973 season.

Pasture	Pasture size-Acres	Period grazed	Days in period	Forage produced-lbs/acre	Forage utilized-lbs/acre	Forage left on ground-lbs/acre	% utilization
Crested Wheatgrass	16	4/26-6/21	56	1637	959	678	59
Crested + 50 lbs N	8	4/26-6/21	56	1988	1355	633	68
Native grass	18	6/21-8/23	63	2367	1005	1362	43
Native + 50 lbs N	12	6/21-8/23	63	3448	1659	1789	48
#1-Russian wildrye + 150 lbs N	8	8/23-10/5	43	1716	1633	83	95
#2-Russian wildrye + 150 lbs N	8	8/23-10/5	43	1742	1683	59	97

Table 3. Pasture systems grazing trial. Weights and gains of yearling steers on crested wheatgrass, native grass, and Russian wildrye pastures – 1973 season.

Pasture	Period grazed	Days in Period	No. of steers	Avg. initial wt/steer lbs	Avg. final wt/steer lbs	Gain per head-lbs	Avg. daily gain per head-lbs	Avg .gain per acre lbs
Crested Wheatgrass	4/26-6/21	56	12	548.3	641.2	92.9	1.66	69.7
Crested + 50 lbs N	4/26-6/21	56	12	556.2	630.0	73.8	1.32	110.6
Native grass	6/21-8/23	63	12	641.7	743.0	101.3	1.61	67.5
Native + 50 lbs N	6/21-8/23	63	12	630.0	743.8	113.8	1.81	113.8
#1 Russian wildrye + 150 lbs N	8/23-10/5	43	12	729.2	788.3	59.1	1.37	88.8
#2 Russian wildrye + 150 lbs N	8/23-10/5	43	12	757.5	774.2	16.7	.39	[1/]25.0

[1/] Steers in this pasture all receiving Kedlor.

Table 4. Average daily gains (lbs) of Herefords and Black Whiteface [1/] steers on unfertilized and fertilized pastures during the 162-day experimental grazing period in the 1973 season.

Pasture Treatment	Steers	Crested wheatgrass 4/26-5/29 33 days	Crested wheatgrass 5/29-6/21 23 days	Native grass 6/21-7/24 33 days	Native grass 7/24-8/23 30 days	Russian wildrye [2/] 8/23-10/5 43 days	Seasonal avg. 162 days
Unfertilized	Hereford	1.82	1.34	1.94	1.28	.68	1.37
	Black WF	1.59	1.85	2.00	1.14	.83	1.43
	AVG.	1.71	1.60	1.97	1.21	.76	1.40
Fertilized	Hereford	1.41	1.20	2.60	1.11	0.91	1.44
	Black WF	1.36	1.23	2.44	.92	1.10	1.41
	AVG.	1.38	1.22	2.52	1.02	1.01	1.42

[1/] Each lot of 12 steers consisted of 6 Herefords and 6 Angus X Hereford steers.

[2/] Both sets of Russian wildrye were fertilized. The gain per head figures represent the weights of the animals distributed as they were on the crested wheatgrass and the native grass pastures.

Table 5. Daily gains per head (lbs) of steers with or without Kedlor supplement on native grass and Russian wildrye pastures in the 1973 season.

Pasture Treatment	Supplement treatment	Native grass 6/21-7/24 (33 days)	Native grass 7/24-8/23 (30 days)	Russian wildrye 8/23-10/5 (43 days)
Unfertilized	With Kedlor	1.94	1.78	--
	W/O Kedlor	2.00	.64	--
Fertilized	With Kedlor	2.42	1.50	.39
	W/O Kedlor	2.62	.53	1.38

Table 6. Two-year average weights and gains of yearling steers on crested wheatgrass, native grass, and Russian wildrye pastures, 1972-1973 seasons.

Pasture	Size of pastures-Acres	Avg.no. days grazed	No. of steers	Avg. initial wt/steer-lbs	Avg. final wt/steer-lbs	Avg. gain per head lbs	Avg. daily gain per head lbs	Avg. gain per acre-lbs
Crested Wheatgrass	16	56	11	575.4	684.4	109.0	1.94	73.9
Crested + 50 lbs N	8	56	11	579.4	675.2	95.8	1.71	129.1
Native grass	18	60	11	684.6	756.8	72.2	1.20	45.7
Native + 50 lbs N	12	60	11	675.2	753.2	78.0	1.30	74.4
#1 Russian wildrye + 150 lbs N	8	34	11	749.9	802.9	53.0	1.56	73.7
#2 Russian wildrye +150 lbs N	8	34	11	760.0	800.8	40.8	1.20	53.2

Pasture-Type Alfalfa Trial

The pasture-type alfalfa seeding made May 22-24, 1972 was clipped for yield for the first time in the 1973 season. Two clippings were made on all alfalfa varieties and on ND-610 Trefoil. Stands on all the alfalfa varieties and on the trefoil were from very good to excellent. Two other legumes which were seeded in the trial, Emerald crownvetch and Latana cicer milkvetch, were not clipped because the stands were to poor to provide a satisfactory estimate of yields.

The clipping yields from the alfalfa and trefoil plots are given in Table 1. Very good yields were obtained with all varieties producing over 2 tons per acre from the two clippings. Production from the first clippings, made on June 11, averaged for all varieties 3,351 lbs per acre, oven-dry, while production from the second clipping made on July 31 averaged 1,531 lbs. The average total yield form all varieties was 4,882 lbs per acre.

Rambler, Roamer, Ladak and Teton were generally somewhat taller than the other alfalfas averaging about 26 inches in height on the first clipping, and about 14 inches on the second clipping. The other varieties, while showing considerable individual differences in height, averaged about 22 inches on the first clipping and about 12 inches on the second clipping. On the second clipping Travois was distinctly shorter than the other alfalfa varieties, averaging about 8 inches. Trefoil, of course, was considerably shorter than the alfalfa varieties on both clippings.

The pasture-type alfalfas will not be evaluated strictly on yield, but rather on persistence under clipping, tendency to develop dense root crowns or to creep, and maintenance of vigor over a period of time. Slow regrowth is also a characteristic which is desirable in alfalfas of this type. The results of the first season’s clipping show that all the varieties have a fairly good potential for production under favorable conditions.

Table 1. Yields of alfalfa varieties and trefoil from the pasture-type alfalfa trial – 1973 season.

Variety	Dry-weight yield – lbs/acre		
	1st clip 6/11	2nd clip 7/31	Total
Rambler	4156	1461	5617
SC- Syn 3703L	3850	1541	5391
Roamer	3685	1569	5254
SC- Syn 37025	3449	1737	5186
Drylander	3395	1596	4991
SC Syn 37045	3526	1440	4966
SC Syn 3701L	3398	1532	4930
Ladak	3418	1466	4884
Travois	3474	1309	4783
Teton	3302	1398	4700
Semi-Palatinsk	2709	1545	4254
SCMF – 3713	2620	1404	4024
Trefoil – ND 610	2582	1910	4492
AVG.	3351	1531	4882

Grass Adaptation Trial

The grass adaptation trial seeded in late summer in the 1972 season was clipped for the first time in the 1973 season. Only one clipping was made on the grass trial with most of the varieties being clipped on July 3. Alti wildrye was clipped on July 19. Stands of several varieties were to poor to be clipped in the 1973 season. Included in the varieties not clipped were Turkey bromegrass, green stipagrass, Basin wildrye, Mandan ricegrass, Indian ricegrass, Londorm green stipagrass, and sheep fescue (Festuca ovina). It s probable that some of these varieties will make acceptable stands by the end of the 1974 growing season.

Average yields of the varieties clipped are given in Table 2. The best yields were obtained from the plots of Topar pubescent wheatgrass, Alti wildrye, Nordan crested wheatgrass, Mandan 404 brome, Lincoln brome, and Mandan wildrye. Vinall Russian wildrye, which would be expected to give a fairly good yield, produced only 471 lbs per acre. This was due to poor stands on the plots of this variety. Sodar streambank wheatgrass plots had very good to excellent stands but average yield at 829 lbs per acre was lower than would have been expected. Topar pubescent wheatgrass, with the seed source from the Mandan nursery, had excellent stands on all plots, averaged over 36 inches in height, and showed a production of 3551 lbs of oven-dry herbage per acre. The same variety with the seed source from the Pullman, Washington nursery yielded only 1646 lbs per acre.

The North Dakota selection of Alti wildrye produced 2614 lbs per acre, while the Saskatchewan selection produced 1933 lbs. These plots were cut as an approximate height of 6 inched, while the other grasses were cut at about a 2-inch height. The Saskatchewan Alti wildrye had a considerable intermixture of Fairway crested wheatgrass, and this material was removed from the plots prior to clipping. This removal damaged the stands somewhat.

Stands of Mandan 404 brome and Lincoln brome, while quite good, were somewhat thin on some of the plots. These stands should thicken up during the 1974 season. Yields of the two brome varieties were approximately the same. It is anticipated that the stands of western wheatgrass and of Montana wheatgrass will show increased development in the coming season.

An adaptation trial of war-season grass varieties was seeded in the 1973 season, but this was judged a failure, and the plots were plowed up. Another warm-season grass trial will he seeded in the 1974 season.

Table 2. Yields of grass varieties from grass adaptation trial seeded in summer 1972 – 1973 season.

Variety	Date clipped	Stand condition	Yield lbs/acre Dry weight
Topar pub. Whtgr. #759	7/3/73	Excellent	3551
Alti wildrye (SCS)	7/19/73	Good	2614
Nordan crested whtgr.	7/3/73	Very good	2199
Alti wildrye (Sask.)	7/19/73	Good	1933
Topar pub. Whtgr. (Pull.)	7/3/73	Good	1646
Mandan 404 brome	"	Good	1630
Lincoln brome	"	Good	1512
Mandan wildrye	"	Very good	1427
Western whtgr. #456	"	Fair	1381
Festuca duriuscula	"	Fair	1136
Sodar streambank whtgr.	"	Very good	829
Montana Wheatgrass	"	Fair	711
Vinall Russian WR	"	Poor	471
Average	------	------	1614

Fertilized Russian Wildrye-Bromegrass Trial

The fertilizer trial comparing responses of Vinall Russian wildrye and Lincoln bromegrass was continued for the second season. Nitrogen fertilizer at rates of 33 lbs N per acre, 67 N, 100N, and 150 N was applied to the plots on April 18, 1973. Check plots with O N were also established. In each plot yield determinations were made by clipping four 1x3-ft sample units. Plots were clipped twice during the season on June 25-26 and on August 27.

The yields of Russian wildrye and Lincoln bromegrass from the fertilized plots are given in Tables 1 and 2. The data for each replication are presented in the tables to show the difference in production in relation to position on the replication. It is apparent from the data that differences in production between replications continues to overshadow differences between fertilizer treatments in the case of both grasses.

The first clipping of Russian wildrye yielded 3,744 lbs/acre from the check and 4,458 lbs from the 67 N treatment, which was the maximum production of any of the fertilized treatments. For the first clipping of bromegrass the range was from 3,568 lbs for the check to 4,514 lbs for the 150 N. As in the case of Russian wildrye, differences between treatments were not consistent. At all levels of fertilizer treatment there was very little differences in production between the two grasses.

Both grasses made substantial regrowth after the first clipping, especially in the first three replications. Insofar as differences between treatments are concerned both grasses show very little fertilizer response and the responses shown are not consistent. Table 3 summarizes the clipping data and gives the total production of each variety from both clippings. This year yields of both grasses were approximately the same for the different treatments. This is in marked contrast to the situation last year as shown by the data in Table 4. In the 1972 season the total production on Lincoln bromegrass was about 30 percent greater than the production of Russian wildrye.

Yields for both grasses in both seasons have continued to be much higher than would normally be expected, with the yields of the check plots being over 3 tons per acre for both varieties. Ad before, the trial shows little difference between fertilizer treatments on this site. It is particularly interesting that the overall production of the bromegrass plots decreased relative to the wildrye plots, and that both varieties are now producing approximately the same at all treatment levels.

Unclipped plots of bromegrass allowed to stand through the summer showed extensive deterioration and losses of leaf and stem material. Unclipped plots of Russian wildrye showed considerable drying of the upper portions of the leaves, but the lower portions remained green to the end of the summer. Losses of plant material were much less on the wildrye plots than on the bromegrass plots.

Table 1. Yields of fertilized Russian wildrye clipped twice during the 1973 season. Yields in lbs per acre of oven-dry herbage.

Clipping	Fertilizer treatment Lbs N/acre	Replication 1	2	3	4	Average Yield – lbs/acre
First (6/25/73)	Check 0-N	4947	4983	3310	1734	3744
	33 N	6213	5366	3140	724	3861
	67 N	5504	4011	2837	4280	4458
	100 N	4692	5283	3683	1951	3902
	150 N	4571	4369	5127	2798	4216
Second (8/27/73)	Check 0-N	3316	3727	3772	1326	3035
	33 N	4153	3749	2322	950	2794
	67 N	3014	3174	2517	2808	2878
	100 N	3109	4263	2821	2272	3116
	150 N	3810	3327	3861	3098	3524

Table 2. Yields of fertilized bromegrass clipped twice during the 1973 season. Yields in lbs per acre of oven-dry herbage.

Clipping	Fertilizer treatment Lbs N/acre	Replication 1	2	3	4	Average yields lbs/acre
First (6/26/73)	Check 0-N	4499	5230	2343	2200	3568
	33 N	3547	5053	3435	2694	3682
	67 N	5030	5303	3641	3140	4279
	100 N	4398	5173	3799	3750	4280
	150 N	4384	5002	4828	3443	4514
Second (8/27/73)	Check 0-N	3004	3090	3469	1575	2785
	33 N	4813	3675	2677	2271	3359
	67 N	2812	2883	4485	1922	3026
	100 N	2228	3267	2284	2046	2456
	150 N	2764	2833	1451	2346	2349

Table 3. Yields from first clipping, second clipping, and total yields of fertilized Russian wildrye and Lincoln bromegrass clipped twice during the 1973 growing season. Yields in lbs per acre oven-dry herbage.

Fertilizer Treatment	Russian wildrye		Lincoln brome		Total Yield	
Lbs N/acre	1st clip	2nd clip	1st clip	2nd clip	Russian wildrye	Lincoln brome
Check 0-N	3744	3035	3568	2785	6779	6353
33 N	3861	3794	3682	3359	6655	7041
67 N	4458	2878	4279	3026	7336	7305
100 N	3902	3116	4280	2456	7018	6736
150 N	4216	3524	4514	2349	7740	6863

Table 4. Total yields of fertilized Russian wildrye and Lincoln brome for the 1972 and 1973 seasons and 2-year average yield for both grasses. Yields in lbs/acre oven-dry herbage.

Fertilizer Treatment- Lbs N/acre	Total yield – 1972		Total yield – 1973		2-year avg. yield	
	Russian wildrye	Lincoln brome	Russian wildrye	Lincoln brome	Russian wildrye	Lincoln brome
Check 0-N	6610	9967	6779	6353	6695	8160
33 N	6706	10024	6655	7041	6681	8533
67 N	8012	11406	7336	7305	7674	9356
100 N	7899	10554	7018	6736	7459	8645
150 N	8290	10258	7740	6863	8015	8561