Annual Report 1978

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Report of
Agronomic Investigations
At the
Dickinson Experiment Station
Dickinson, North Dakota
1978

By

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Growing Conditions – 1978

Exceptionally heavy fall precipitation and good season precipitation provided ample soil water for excellent crop growth and development. Generally, cool temperatures prevailed throughout the growing season. The temperature exceeded 90°F. on only three days in July and six days in August, with the seasonal high of 99°F. occurring on August 13 during a hot spell that lasted only four days. Disease development was low except for widespread wheat streak mosaic, especially in winter wheat. The disease undoubtedly reduced yields appreciably. Oat stem rust was present but its later development caused no serious problem. Hessian fly damage was noted on wheat southwest of Dickinson in the New England area.

Precipitation recorded at the Dickinson station for the period September 1977 through August 1978, and temperatures recorded for the growing season, April through August, 1978, are shown in table 1.

Table 1. Weather data – 1978

	Precipitation – inches	
	1977-1978	86 yr. avg.
September – December	10.31	3.55
January – March	.73	1.55
April – June	7.90	7.44
July – August	4.41	3.87
Total	23.35	16.41

	Temperature – degrees F.			
	Avg. max.	Avg. min.	Avg. Mean	69-yr. avg.
April	50	32	41	42
May	67	43	55	53
June	74	49	61	61
July	80	53	67	69
August	82	50	66	67

Agronomic Procedure

Seeding dates for winter wheat: at Hettinger and Bowman September 12; Beach, September 13 and Glen Ullin September 14th. Winter rye was seeded at Dickinson September 13th. The winter wheat seeding comparison was planted on September 13th.

All winter grain variety trials were seeded with a John Deere deep furrow drill equipped with 10 cm spear point shovels spaced 25.4 cm. The drill is equipped with pneumatic rubber tire packer wheels.

Off station spring grain trials were seeded at Hettinger May 1, Bowman May 2, Mott May 3, Glen Ullin May 16, Beulah May 18, Killdeer May 22 and Beach May 23. Trials at Dickinson were seeded with a double disk press drill on summerfallow. Fertilizer application was made according to soil test for an expected wheat yield goal of 2350 kg/ha.

Seeding rates in kg/ha were: rye 63, winter wheat 56, Spring wheat and barley 67 and oats 54.

Mondak was used for broadleaf weed control, following recommended rates and application procedure.

Table 2. Hard red spring wheat variety trial.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Chris	36.5	60.5	7-10	32
Waldron	45.9	60.0	7-6	32
Era	60.0	60.0	7-14	26
Olaf	49.5	60.5	7-10	28
Prodax	54.5	58.5	7-10	27
Wared	53.9	58.0	7-16	25
Profit 75	55.0	61.0	7-6	28
Kitt	48.7	58.5	7-14	27
Sinton	48.4	60.5	7-6	34
WS 25	55.3	61.0	7-6	28
Butte	52.5	62.5	7-6	31
Eureka	51.2	61.5	7-6	35
Coteau	46.2	60.5	7-13	32
Angus	56.7	63.0	7-10	26
Solar	63.3	62.5	7-13	24
Lew	47.3	62.5	7-11	30
Newana	58.3	63.0	7-10	25
SU 28-1	51.2	61.0	7-10	31
SU 56	53.1	60.0	7-8	32
ND 543	45.1	60.5	7-13	28
ND 550	52.5	60.5	7-10	34
SD 2273	52.5	59.5	7-4	30
ND 556	38.2	58.0	7-8	34
ND 558	47.9	59.0	7-6	35
ND 559	45.7	59.0	7-13	34
ND 562	53.1	60.0	7-9	35
ND 563	41.5	59.0	7-8	35
ND 564	43.2	59.5	7.13	31
ND 565	51.7	59.5	7-6	33
WA 6389	52.0	59.5	7-18	25
WA 6510	59.4	60.5	7-10	24
WA 6511	45.7	60.3	7-17	26

L.s.d. @ 5% = 7.06 bushels per acre.

Table 3. Long term yield comparison – hard spring wheat.

	Yield in bushels per acre				
Variety	1975	1976	1977	1978	4-Yr. avg.
Waldron	37	41	30	46	38
Olaf	42	42	34	50	42
Wared	46	52	43	54	49
Era	51	52	38	60	50
Prodax	48	53	39	55	49
Butte	41	41	25	53	40
Profit 75	37	45	36	55	43
Coteau	42	45	35	51	43
Kitt	40	34	30	49	38
Newana		50	39	58	
Sinton		37	26	48	
Lew		47	34	47	
Len (ND543)		48	35	45	
Angus			25	57	
Eureka			28	51	
L.s.d. @ 5% =	5.4	5.3	4.1	9.6	

Table 4. Hard Spring Wheat Variety Trials – Dickinson and Off-Station Sites – 1978

Yield In Bushels Per Acre

Variety	Dickinson	Beach	Beulah	Bowman	Glen Ullin	Hettinger	Killdeer	Regent	Avg. 8-Station
Butte	52.5	34.1	56.1	41.8	44	20.4	44	34.1	40.9
Waldron	45.9	30.8	50.3	42.1	41.5	20.6	40.2	35.7	38.4
Coteau	46.2	33	48.4	45.4	44.6	23.4	44.6	42.6	41
Olaf	49.5	33	48.1	43.7	43.7	24.2	44.3	41.5	41
Angus	56.7	29.3	35.8	42.1	41.5	18.7	46.8	39.9	38.9
Eureka	51.2	35.2	47	43.1	40.2	17.9	39.1	36.9	38.8
Wared	53.9	33.7	49.5	42.1	50.9	22	47	43.7	42.9
Prodax	54.5	35.6	55.6	50.3	51.4	27	49	47.6	46.4
Profit 75	55	37.4	55.3	44	45.1	26.7	47.6	42.4	44.2
Newana	58.3	32.3	57.5	42.4	44	26.1	46.8	39.3	43.3
Lew	47.3	30.4	38	34.4	31.9	24.5	40.4	39.3	35.8
Solar	63.3	32.3	52.8	45.1	52.3	24.5	52.5	50.3	46.6
L.s.d@5%=	7.1	3.27	4.77	4.85	3.77	2.61	3.93	3.9	4.5

Table 5. Hard Spring Wheat Variety Trials – Dickinson and Off-Station Sites – 1978

Test Weight Per Bushel

Variety	Dickinson	Beach	Beulah	Bowman	Glen Ullin	Hettinger	Killdeer	Regent	Avg, 8-Station
Butte	62.5	64	61	61	62.5	61.5	63.5	61.5	62
Waldron	60	62	60	59	60	60	61.5	59	60
Coteau	60.5	61	60	59	59.5	60.5	62.5	59.5	60
Olaf	60.5	62	58.5	58	61.5	60.5	62.5	60.5	60.5
Angus	63	62	56.5	60	61	60.5	63.5	61	61
Eureka	61.5	61.5	60	59	60.5	59	62	59.5	60
Wared	58	61	56	57.5	60	59.5	62.5	62.5	60
Prodax	58.5	59.5	56.5	57	59	58.5	61.5	59	59
Profit 75	61	61	60	59.5	60.5	60	62	60	60.5
Newana	63	61.5	61	59	61	62	63	60.5	61
Lew	62.5	62	59.5	59.5	61	62	64	61	61
Solar	62.5	61	56	59.5	60.5	60	63.5	61.3	60.5

Table 6. Hard Spring Wheat variety trials – Dickinson and Off-station sites.

Protein percent @ 14% moisture

Variety	Dickinson	Beach	Beulah	Bowman	Glen Ullin	Hettinger	Killdeer	Mott/Regent	Avg. 8-station
Butte	14.9	13.2	15.3	12.7	15.2	13.8	14.6	12.4	14
Waldron	15.1	13.5	15.3	13.2	15.8	14.6	14.9	13.5	14.5
Coteau	15.6	15.5	15.2	13.4	16	15	13.2	13	14.6
Olaf	15	13.8	15.8	13.6	14.9	14.8	14.8	12.8	14.4
Angus	14.3	13.6	14.3	13.4	15	14.2	14.7	12.2	14
Eureka	14.8	14.6	14.3	13.9	16.1	14.9	15.4	13.1	14.6
Wared	13.7	12.9	15.3	12.6	13.9	13.7	13.4	12.4	13.5
Prodax	14.5	12.8	14.8	12.6	14.3	13.4	12.8	11.6	13.4
Profit 75	13.7	12.2	14	12.8	13.8	12.7	15.7	11.7	13.3
Newana	13.5	12.9	14	12.1	13.5	13	13.7	11.3	13
Lew	14.4	12.2	15	13.2	14.6	13.5	14.4	11.9	13.7
Solar	13.1	12	13.9	11.7	13.2	12.8	12.5	10.9	12.5

Table 7. Off Station winter wheat variety trials – 1978

Yield in bushels per acre

Variety	Beach	Bowman	Glen Ullin	Hettinger		Avg. 3-station
Froid	36.1	35.5	Winterkilled	16.9		29.5
Winoka	32.4	31.1		17.7		27.1
Aqate	35.3	36.1		20.6		30.7
Centurk	35.9	35.3		16.7		29.3
Roughrider	41.3	37.7		20.4		33.1
Gent	34.9	34		17.5		28.8
Eklund	35.7	33.2		18.2		29
L.s.d.@5%=	3.2	6.2		2.9		

Table 8. Off station winter wheat variety trials.

Test weight per bushel

Variety	Beach	Bowman	Glen Ullin	Hettinger		Avg. 3-Station
Froid	61.5	62.5	Weatherkilled	60		61.3
Winoka	62	63		62.5		62.5
Agate	62	63.5		61.5		62.3
Centurk	60.5	64		61		61.8
Roughrider	60.5	63.5		61		61.7
Gent	60.5	63.5		61.5		61.8
Eklund	61.5	62.5		60.5		61.5

Table 9. Off station winter wheat variety trials.

Protein percent @ 14% moisture

Variety	Beach	Bowman	Hettinger	Glen Ullin		Avg. 3-station
Froid	11	12.8	12.3	Weatherkilled		12
Winoka	10.9	11.5	11.9			11.4
Agate	10.8	11.8	11.8			11.5
Centurk	10.8	12.7	11.8			11.8
Roughrider	11.9	13	12.4			12.4
Gent	12	12.5	12.4			12.3
Eklund	11.1	13.3	12.6			12.3

Table 10. Durum wheat variety trials.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Rolette	39.9	61.0	7-6	31
Ward	42.6	60.0	7-10	34
Crosby	39.9	60.0	7-10	33
Botno	34.4	60.5	7-10	33
Rugby	42.1	60.5	7-11	34
Coulter	38.2	59.5	7-10	33
Edmore (7175)	37.4	60.5	7-10	34
Cando	39.1	60.0	7-11	26
Calvin (7047)	37.1	61.0	7-11	25
Vic (D74112)	34.1	61.0	7-11	33
D-7224	39.3	60.5	7.14	27
D-74110	34.9	61.0	7-10	35
D-74164	42.4	60.0	7-10	33
D-7483	35.8	60.0	7-11	29
D-74109	40.7	60.5	7-10	33
D-75171	39.1	60.5	7-15	32
D-75209	35.8	60.5	7-8	32
D-761	33.3	61.0	7-11	32
D-762	44.3	60.3	7-10	33
D-763	37.7	60.5	7-11	34
D-764	40.7	60.5	7-10	33
L.s.d. @ 5% =	6.7			

Table 11. Long term yield comparison of durum wheat varieties.

	Yield in bushels per acre					
Variety	1974	1975	1976	1977	1978	5yr.avg.
Rolette	36	38	39	35	40	38
Ward	35	37	31	39	43	37
Crosby	34	37	30	37	40	36
Botno	33	33	31	40	34	34
Rugby	33	38	29	40	42	36
Cando	30	31	33	51	39	37
Calvin	32	37	32	42	37	36
Coulter		37	32	44	38	
Edmore			33	37	37	
Vic (D74112)				42	34	

Table 12. Durum Variety Trials – Dickinson and Off-station sites, 1978

	Yield in bushel per acre								
Variety	Dickinson	Beach	Beulah	Bowman	Glen Ullin	Hettinger	Killdeer	Regent	Avg. 8-station
Ward	42.6	50.1	39.9	45.7	29.2	23.4	47	39.1	39.6
Rolette	39.9	47.9	42.9	47	25.3	21.5	39.9	34.9	37.4
Cando	39.1	54.2	41	49.2	27	24.5	41	43.5	39.9
Calvin	37.1	52.8	36.9	47.3	25	23.1	37.4	41.5	37.6
Coulter	38.2	46.5	41.5	47.3	27.2	23.4	41	37.1	37.8
L.s.d.@5%=	7.1	3.7	11.7	4	2.3	2.6	5.6	3	5.8

Table 13. Durum Variety Trials – Dickinson and off-station sites, 1978

Yield weight per bushel

Variety	Dickinson	Beach	Beulah	Bowman	Glen Ullin	Hettinger	Killdeer	Regent	Avg. 8-station
Ward	60	63.3	59	62	60.3	61	64	58.5	61
Rolette	61	62	62	64	61.5	62	64.5	59.5	62.1
Cando	60	61.5	58	61.5	61.5	61	64	59	60.8
Calvin	61	63.5	60.5	62.5	61.5	61	64.5	59	61.7
Coulter	59.5	61.5	59.5	62	60	60	63	58	60.4

Table 14. Oat variety trials.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Menominee	86.0	41.0	7-11	32
SD 9095	59.7	39.5	7-3	33
Kelsey	95.8	39.5	7-7	34
Lyon	82.4	40.5	7-6	37
Cayuse	113.4	38.5	7-10	32
Garry	88.6	39.5	7-10	38
Hudson	92.2	35.5	7-10	33
Otana	98.9	40.0	7-11	36
Terra (hulless)	61.8	42.0	7-10	34
Harmon	80.9	39.0	7-13	38
Minn 73231	96.3	41.0	7-7	38
Minn 71211	65.4	40.0	7-5	34
Noble	66.4	37.0	7-4	31

L.s.d. @ 5% = 6.23

Table 15. Long term yield comparison – oat varieties.

	Yield in bushels per acre				
Variety	1975	1976	1977	1978	5-yr. avg.
Kelsey	67	120	51	96	79
Cayuse	69	101	58	113	85
Garry	55	96	51	89	73
Hudson	72	89	51	92	76
Harmon	73	92	45	81	73
Lyon		86	39	82	
Otana			52	99	
Menominee				86	
Noble				66	
Minn 73231				96	
Minn 71211				65	
SD 9095				60	
Terra (hulless)				62	

Table 16. Oat variety trial Dickinson and off-station sites.

	Yield in bushels per acre								
Variety	Dickinson	Beach	Beulah	Bowman	Glen Ullin	Hettinger	Killdeer	Regent	Avg. 8-station
Kelsey	95.8	98.9	130.6	113.4	95.8	48.4	118.1	102.1	100.4
Cayuse	113.4	98.2	136.1	109.3	110.4	93.8	113.5	101.5	109.5
Harmon	80.9	92.7	127.2	95.3	82.4	44.3	105.7	89.6	89.8
Hudson	92.2	95.5	134.8	98.9	90.2	52.5	112.4	116	99.1
Otana	98.9	107.2	131.3	103.5	95.8	54.1	111.9	95.8	99.8
Menominee	86	94.8	138.2	100	90.6	60.8	110.9	104.1	98.2
L.s.d.@5%=	8.6	15.7	20.5	15.3	7.3	6.8	5.8	9	12.2

Table 17. Oat variety trial – Dickinson and off-station sites.

Test weight per bushel

Variety	Dickinson	Beach	Beulah	Bowman	Glen Ullin	Hettinger	Killdeer	Regent	Ave. 8-station
Kelsey	39.5	39.5	39	39	36.5	39	39.5	41	39.1
Cayuse	38.5	40	38	37	36.5	34.5	38	42	38.1
Harmon	39	41	42	39	36	40	40.5	42	39.9
Hudson	35.5	38.5	38	36.5	33.5	37	35.5	39.5	36.8
Otana	40	40	41	40.5	38	39.5	40	42.5	40.2
Menominee	41	42.5	40.5	41	37.5	40	42.5	44	41.2

Table 18. Barley variety trials.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Larker	53.7	48.0	7-11	22
Beacon	54.3	44.0	7-4	23
Bonanza	53.7	47.5	7-10	27
Nordic	61.6	49.0	7-10	27
Manker	61.9	50.0	7-10	24
Klondike	74.3	49.5	7-11	26
Park	60.2	49.5	7-10	25
Glenn	65.7	48.0	7-6	25
Morex	61.9	51.5	7-6	27
Hector	71.9	52.0	7-17	25
Klages	71.7	51.0	7-17	24
Vanguard	64.3	53.0	7-17	25
Shabet	64.0	52.0	7-17	24
Summit	76.0	53.0	7-18	26
ND 1156	61.2	51.0	7-7	24
ND 1707	55.0	52.5	7-7	29
ND 2654	66.0	53.0	7-11	28
ND 2674	61.6	52.0	7-10	28
ND 2848	64.7	52.0	7-10	30
ND 2920	59.8	51.5	7-17	29
ND 2679-4	57.8	53.0	7-11	29
Kombar	58.8	45.5	7-18	22
RPB 456-72	63.6	51.0	7-11	24
RPB 268-70	73.2	52.0	7-18	26

L.s.d. @ 5% = 9.31

Table 19. Long term yield comparison – barley varieties

	Yield in bushels per acre					
Variety	1974	1975	1976	1977	1978	5-yr. avg.
Larker	36	50	73	35	54	50
Glenn	41	52	77	34	66	54
Park	38	48	65	33	60	49
Hector	56	61	80	58	72	65
Summit				48	76	
Manker					62	
Morex					62	
L.s.d. @ 5% =	7.1	8.2	7.3	6.3	9.3	

Table 20. Barley variety trials Dickinson and off-station sites, 1978.

	Yield in bushels per acre								
Variety	**Dickinson**	**Beach**	**Beulah**	**Bowman**	**Glen Ullin**	**Hettinger**	**Killdeer**	**Regent**	**Avg. 8-station**
Larker	53.7	73.2	69.2	68.1	53.6	35.1	77	38.2	58.5
Manker	61.9	65.7	74.7	67.4	57.8	35.1	73.9	47.8	60.5
Morex	61.9	73.2	70.1	72.2	59.5	37.8	79.8	46.1	62.6
Glenn	65.7	78	78.9	74.9	60.5	44.7	82.8	47..5	66.6
Park	60.2	68.8	68.3	63.3	54.3	39.9	77.7	45.7	59.8
Hector	71.9	71.2	67.4	79.4	62.2	40.6	74.2	60.2	65.9
Summit	76	76	88	75	63.3	49.9	85.3	64.7	72.3
L.s.d. @ 5% =	7.7	6.8	11.4	6.9	6.5	10	5.2	6.4	7.8

Table 21. Barley variety trials – Dickinson and off-station sites.

	Test weight per bushel								
Variety	**Dickinson**	**Beach**	**Beulah**	**Bowman**	**Glen Ullin**	**Hettinger**	**Killdeer**	**Regent**	**Avg. 8-station**
Larker	48	53	53.5	52	47	48	51.5	52	50.6
Manker	50	53	54	52	47.5	49	51.5	52	51.1
Morex	51.5	53	53	50.5	49	46.5	51.5	51	50.8
Glenn	51	51	52.5	49.5	47	49.5	50	50.5	50.1
Park	49.5	52.5	53	50	47	47.5	51	51.5	50.3
Hector	52	53	52	52.5	50	51	52.5	53.5	52.1
Summit	53	52	53	53	49	48.5	50	54.5	51.6

Table 22. Winter rye variety trial.

Variety	Avg. Yield bu/acre	Test weight
Rymin	70.0	57.0
Cougar	64.9	56.0
Puma	70.7	55.5
Caribou	61.6	56.0

L.s.d. @ 5% = 2.81

Nursery Trial with Small Grain

The cooperative nursery trials grown at Dickinson in 1978, and the leaders responsible for each trial included:

The Uniform Regional Hard Red Spring Wheat Nursery; Dr. R. H. Busch, ARS-USDA, Institute of Agriculture, University of Minnesota, St. Paul, Minnesota.

The Uniform Regional Durum Nursery; Dr. James S. Quick, Department of Agronomy, North Dakota State University, Fargo, North Dakota.

The Uniform Early Oat and the Uniform Midseason Oat Nurseries; Dr. Howard Rines, ARS-USDA, Institute of Agriculture, University of Minnesota, St. Paul, Minnesota.

The Great Plains Barley Nursery; Dr. Phil B. Price, ARS-USDA, Agronomy Department, South Dakota State University, Brookings, South Dakota.

The Western Spring and Western Dryland Spring Barley Nurseries, Dr. E.A. Hockett, ARS-USDA, Plant and Soil Science Department, Montana State University, Bozeman, Montana.

The Uniform Regional Flax Nursery; Dr. James Hammond, Department of Agronomy, North Dakota State University, Fargo, North Dakota.

The Elite Yield and the Advanced Yield Winter Wheat Nurseries; Dr. John Erickson, Department of Agronomy, North Dakota State University, Fargo, North Dakota.

In addition to the uniform nurseries, an interstate safflower yield nursery was also grown.

All nurseries were grown on clean summerfallow which received a broadcast application of 112 kg/ha 18-46-0 commercial fertilizer.

Seeding dates for all cereal grains was May 9. Flax was seeded May 15 and safflower May 16.

All nursery seeding was with a 4-row tractor mounted seeder equipped with double disk openers spaced 30.48 cm.

Table 23. Uniform regional hard red spring wheat nursery

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Marquis	43.5	59.5	7-1	38
Chris	39.1	62.0	7-2	39
Waldon	45.9	60.0	6-28	38
ND 550	45.5	62.0	6-30	38
ND 557	41.2	62.5	7-2	38
ND 560	45.2	63.0	6-30	40
ND 561	46.3	61.5	7-2	37
ND 563	51.5	61.0	6-30	37
SD 2273	46.1	62.5	6-28	34
SD 2355	45.6	61.0	7-3	39
ND 543	43.5	62.5	6-29	30
MT 749	43.6	62.5	6-30	31
MT 7416	43.1	62.5	6-30	30
Era	51.1	62.5	7-3	28
MN 70170	49.9	62.5	7-3	28
MN 7125	50.3	62.5	6-30	30
MN 7222	53.1	62.5	7-2	29
MN 70181	56.3	57.0	6-30	30
MN 70202	46.5	63.5	7-2	28
MN 7336	53.2	62.5	6-30	28
MN 7378	54.5	64.0	6-29	30
NHS 183-74	56.7	61.0	6-29	29
NHS 1001-75	64.3	64.0	7-5	30
KN 75S 5511	39.8	62.5	6-30	29
WSMP 122	55.1	62.0	7-5	32
WA 6389	52.1	62.0	7-5	29

L.s.d. @ 5% = 10.29

Table 24. Uniform regional durum nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Mindum	39.4	65.5	7-3	44
Rolette	33.9	64.0	6-28	34
Crosby	37.2	63.0	6-29	33
Botno	34.3	64.0	6-28	32
Rugby	36.9	64.0	6-30	34
Cando	42.1	64.5	7-2	27
Calvin	34.9	65.0	7-3	26
Coulter	36.1	64.0	7-1	32
Edmore	32.9	63.0	6-30	33
D 7224	33.0	65.0	7-3	28
D 74110	33.3	64.5	6-30	33
D 74112	33.9	63.5	7-2	33
D 74164	29.0	63.0	7-1	32
DT 427	25.4	64.0	7-1	32
D 7483	41.2	63.5	6-29	30
D 74109	36.0	63.0	6-29	33
D 75111	30.6	62.5	7-1	32
D 75140	47.3	62.0	7-3	34
D 75171	31.1	63.5	7-2	33
D 75209	34.3	63.0	6-29	30
D 761	29.9	62.5	6-30	31
D 762	25.0	63.0	6-29	33
D 763	26.6	63.0	6-29	32
D 764	28.6	63.0	6-29	32

L.s.d. @ 5% = 9.10

Table 25. Uniform early oat performance nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Jaycee	69.3	38.5	6-26	32
IL 73-2186	78.1	37.0	6-27	27
IL 74-5667	86.4	38.0	6-26	30
Lang	84.9	36.5	6-26	29
Clintford	81.4	35.5	6-26	32
IA Y341-41	84.0	38.5	6-26	33
IA Y22-15-9	74.3	39.5	6-26	30
IA B525-2	73.1	38.5	6-27	33
IA Y286-53	81.5	40.5	6-27	32
Grundy	81.2	39.5	6-26	32
Andrew	52.5	41.0	6-26	33
MN 75104	75.6	40.5	6-27	36
MO 06425	73.1	36.0	6-27	27
MO 06637	72.1	38.0	6-26	27
MO 06553	80.9	36.5	6-27	25
MO 06796	52.5	37.0	6-26	29
MO 06767	86.1	39.5	6-26	29
MO 0-205	72.8	40.5	6-26	31

L.s.d. @ 5% = 16.34

Table 26. Uniform midseason oat performance nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Lodi	92.0	36.5	7-2	43
WI X 2456-2	83.1	36.5	7-3	35
WI X 3086-1	77.1	36.0	7-4	35
WI X 2795-2	86.5	37.5	7-3	39
WI X 3530-15	89.1	38.0	7-2	37
Dal	76.2	37.5	7-3	37
Lang	98.1	34.5	6-27	31
IL 73-2664	95.9	34.5	6-28	33
IL 73-2186	85.4	37.5	6-27	30
IL 75-1062	73.7	37.5	6-28	29
MI 64-152-47	113.2	37.0	7-3	37
MI 69-27-403	108.5	37.0	7-3	35
Orbit	112.3	35.0	7-1	32
OA 338	107.7	40.5	6-28	37
NY 6083-26	119.7	34.5	7-2	35
Otee	72.1	40.5	6-27	33
SD 9095	95.5	36.0	6-29	32
SD 740428	93.1	38.5	6-28	38
Clintland 64	67.1	36.0	6-26	35
MN 74230A	61.2	38.5	6-26	32
MN 74230B	74.0	38.5	6-30	34
MN 75134	86.3	38.0	6-26	39
MN 75128	80.0	39.5	6-26	31
MN 76161	70.9	38.5	6-26	34
Gopher	91.1	37.0	6-30	34
P 74148 AI-3-8-2	60.9	38.0	6-27	31
P 7135AI-1-8-4	92.9	39.5	6-26	36
P 7126AI-1-10-4	84.8	37.5	6-26	33
P 70443A2-4-2	87.4	39.0	6-27	34

L.s.d. @ 5% = 25.12

Table 27. Uniform great plains barley nursery

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Firlbecks III	67.5	53.5	7-6	28
Primus II	77.0	52.0	6-27	31
Larker	70.8	52.0	6-30	29
Beacon	70.9	52.0	6-29	31
Klondike	72.2	52.5	7-2	30
SD 69-1781	60.0	51.0	7-1	33
M 25	75.8	52.0	7-1	31
Br A31-1	64.5	53.0	7-2	29
Br C42-1	78.0	51.5	6-30	29
SD 761106	50.8	53.0	6-29	28
SD 77-46	47.1	56.0	6-28	29
SD 77-255	66.3	52.0	6-27	32
ND 1894	73.3	50.0	6-29	31
Br C 4B-1	89.9	51.0	7-3	33
Br CGX-1	75.5	52.5	7-2	31

L.s.d. @ 5% = 16.24

Table 28. Western dryland spring barley nursery

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Munsing	45.0	52.5	7-4	19
Unitan	54.0	50.0	6-28	23
Galt	51.3	49.5	7-2	23
Steptoe	60.8	48.5	6-28	21
Shabet	50.6	50.0	7-9	25
Piroline	39.1	53.0	7-3	24
ID 711180	43.7	52.0	7-4	23
ID 711767	55.3	51.0	7-5	27
WA 11313	46.6	49.0	6-26	22
SD B1-1009	56.1	47.5	7-5	23
MT 547255	54.3	52.0	7-6	25
MT 547263	43.3	51.0	7-8	23
ID 723482	40.4	52.0	7-3	24
CI 3351	52.7	52.0	7-2	21
MT 24641	41.6	53.0	7-2	20
MT 246121	41.5	50.5	7-1	20
MT 246201	43.5	58.0	7-3	21
MT 24661	38.5	53.0	7-1	19

L.s.d. @ 5% = 12.74

Table 29. Western spring barley nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
Trebi	70.6	48.5	6-30	29
Steptoe	92.3	46.5	6-7	23
Shabet	64.6	50.5	7-10	28
Vanguard	66.6	49.5	7-8	27
Larker	72.6	50.5	6-29	29
Klages	59.9	51.0	7-10	27
Kimberly	56.3	51.0	7-15	28
WA 11301	55.6	49.0	6-26	28
WA 11312	58.6	47.0	6-26	26
WA 11313	68.7	46.5	6-26	25
UT 1009	77.2	45.0	7-5	27
Steve	78.5	46.5	7-3	25
ID 723633	60.0	50.0	7-8	25
ID 749845	72.2	53.5	7-2	28
ID 731959	67.6	43.5	7-4	23
MT 547103	57.3	49.0	7-14	28
MT 547143	56.2	49.0	7-11	27
MT 547255	81.0	53.0	7-3	29
MT 547263	54.3	50.0	7-12	26
OR 2015	72.1	43.0	7-11	24
OR 182	55.5	53.0	7-4	23
OR 22113	70.1	50.5	7-3	26
OR 9114	60.5	50.0	7-5	26
OR 73782	66.0	46.5	7-8	25
OR 741209	63.8	43.5	7-4	22

L.s.d @ 5% = 19.17

Table 30. Uniform regional flax nursery.

Variety	Avg. Yield bu/acre	Test weight	Heading date	Height inches
CI 389	16.9	53.0	7-3	25
CI 2292	19.9	54.0	7-5	24
CI 2522	13.6	54.6	6-30	23
CI 2776	20.6	55.0	7-1	22
CI 2814	16.5	54.0	7-7	23
CI 2840	17.8	54.0	7-5	25
CI 2847	20.3	54.0	7-5	24
CI 2851	17.6	54.0	7-6	24
CI 2852	18.4	54.0	7-3	19
CI 2853	17.6	53.0	6-30	24
CI 2854	18.0	54.0	7-4	22
CI 2855	19.6	53.0	7-5	25
CI 2886	20.8	54.0	7-2	25
CI 2887	19.8	54.0	6-29	24
CI 2888	16.5	54.0	7-3	24
CI 2889	16.8	54.0	7-2	21
CI 2890	18.7	53.0	7-3	23
CI 2891	18.6	53.0	7-3	25
CI 2892	18.3	53.0	6-30	24
CI 2893	15.5	53.0	7-2	24
CI 2894	20.2	54.0	6-29	22
CI 2895	18.6	54.0	7-1	25
CI 2896	21.1	54.0	7-2	20
CI 2897	20.7	54.0	6-30	23
CI 2898	17.8	54.0	7-10	24

L.s.d @ 5% = 4.37

Winter Wheat Nursery

The winter wheat nursery data for 1978 have not been made available due to the resignation of Dr. John Erickson, winter wheat project leader.

Interstate Safflower Nursery – 1978

Germination and emergence was very uneven in this planting. Uniform stands were obtained for the 4 lines shown in table 32 where yields are recorded. The rest of the nursery was not harvested.

Table 32. Interstate safflower nursery.

Variety	Avg. Yield lbs/acre	Test weight
Sidwill	--	--
S 208	--	--
US-10	--	--
74B 298	--	--
74B 141	--	--
74B 232	--	--
76B 417	--	--
76B 4412	--	--
76B 4220	1361	41.0
76B 4220-2,6	1906	41.5
76B 4221	1634	38.5
76B 4306	1634	40.5
B 717	--	--

Sunflowers

The National Sunflower Performance trial was planted this year. Excellent stands were obtained, with growth throughout the season. The trial was destroyed by a heavy invasion of blackbirds prior to harvest.

Yields were obtained from an Interstate Sunflower test planted on the Jim Molzahn farm at New England. In this test Treflan was used for weed control. Planting was on June 18 on summer-fallow fertilized with 65 lbs. 18-46-0. A population of 15000 plants per acre was obtained on 30 inch row spacing. Harvest was on October 25. Harvested acreage per plot was 1.74 acres. Yields from this planting were determined by Mr. Robert Wagner, area extension agronomist and are shown in table 33.

Table 33. Interstate sunflower test – Molzahn site. [1/]

Hybrid	Lbs/1.74 acres harvested	Dock.	Test wt.	Moisture	Lbs/acre
891	2000	6%	31	13.17	1,016
893	2440	5%	30	11.80	1,279
903	2480	4%	30	10.31	1,368
7775	2020	3%	29	9.39	1,126
8941	1900	4%	32	10.56	1,027
8943	2240	4%	31	10.96	1,211
8944	1920	3%	30	8.99	1,070
894	2080	5%	29	10.05	1,135

[1/] Data from a single plot only, not a replicated trial.

Dry Bean Production Trial

The dry bean production trial contained three navy, two pinto and one kidney bean varieties. Rep one was planted May 22, reps two, three and four were planted a day later, May 23, due to a rain shower. Planting rates were adjusted to permit38-40 lbs P.l.S./acre for navy beans and 55-57 lbs P.L.S./acre for both pinto and kidney beans. Stands were thinned to desired populations as needed. Plots were four rows, 36 inch spacing between rows, and 50 feet long. Twenty five feet of the center two rows were harvested from each plot. Treflan at three-fourths pound active ingredient per acre was pre-plant incorporated for weed control.

Yields were considered very good in spite of all varieties being infected with bacterial blight. Yields appear in the following table.

Table 34. Dry bean production trial – Dickinson, 1978.

	Yield lbs/acre					
Variety *	Rep I	Rep II	Rep III	Rep IV	Avg.	Test wt.
Kidney UI36	1600	1519	1742	1699	1640	63.0
Pinto WYo166	1348	1336	1269	1812	1441	61.5
Pinto UI114	1223	1394	1687	1461	1441	61.0
Navy Seafarer	1316	1208	1287	1426	1309	64.5
Navy UI76	1350	1101	1455	1708	1403	64.0
Navy Upland	1406	1292	1223	1307	1307	64.0

L.s.d. @ 5% = 225.5
CV = 10.5%

*All varieties infected with bacterial blight.

Wheat Production On Fallow, Second Cropping And Continuous Cropping

In 1976, an excellent year for small grain production on stubble land, in southwestern North Dakota, yields on conventional summerfallow were 43 bushels per acre, on second cropping 27 bushels per acre and on continuous cropping 22 bushels per acre. In 1977, a year when hot, dry spring weather conditions were not particularly favorable to the germination and early growth of the crop, yields were appreciably reduced, even though rainfall in late May and June provided ample soil water for satisfactory crop growth. Yields on fallow were 26.9 bushels per acre, on second cropping 11.5 and on continuous cropping 5.5 bushels per acre. Relative differences between production methods were remarkably similar for both years.

In 1978, wheat on summerfallow averaged 38.5 bushels per acre in this trial compared with 31.4 on second cropping and 30.6 on continuous cropping. High yields on stubble land are a result of the excellent soil water recharge provided by the well above average precipitation coming in the fall of 1977 plus adequate seasonal moisture and cool growing season temperatures.

Table 35. Wheat production on fallow, recrop and continuous cropping.

Treatment	1976	1977	1978	3yr. avg.
Fallow	43.0	26.9	38.5	36.1
Recrop	27.0	11.5	30.2	22.9
Continuous crop	22.0	5.5	30.6	19.4

Minimum Tillage And Seeding, And Double Disking and Conventional Seeding On Second Cropping

In 1976 there was no significant difference in wheat production between minimum tillage and conventional tillage on second cropping. Growing conditions were excellent in 1976 and soil water and other environmental conditions were favorable for good germination and growth throughout the growing season.

In 1977, hot, dry spring weather conditions were not particularly favorable to germination and early crop growth because of dry surface soil. Because of the small diameter of the rotating coulters on the John Deere 1500 Power till seeder, it was not possible to place seed deep enough to get it into moist soil. As a consequence germination was spotty and delayed until later rainfall came. Excessive weed growth was also a problem on this treatment. Yields were very poor averaging 6.4 bushels per acre.

Penetration of the surface soil and satisfactory seed placement was not as difficult with the Melroe 701 minimum tillage drill. Germination and growth was satisfactory and production was double that for Power till seeder.

Conventional disking and seeding was the best production method in the 1977 comparison.

In 1978 only the Melroe 701 and the conventional tillage and seeding treatments were compared. Initial growth was slower on the minimum tillage treatment. This may be partly due to lower surface temperatures caused by the reflective and insulating effects of the straw and stubble on the field surface. Weed problems were also a greater problem on the minimum tillage treatment.

Table 36. Minimum tillage and double disking for wheat production on recrop.

	Yield bushels per acre		
Treatment	1977	1978	2 Yr. Avg.
Minimum tillage & seeding Melroe 701 drill	12.6	10.3	11.5
Double disk and Conventional seeding	15.0	28.5	21.8

Report Of
Livestock Investigations
At The
Dickinson Experiment Station
Dickinson, North Dakota
1978

By

James L. Nelson & Douglas G. Landblom

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Bull Feeding – Phase I
Comparing Backgrounding Performance
Of Steers With Late Castrated Bull Calves

By Douglas G. Landblom and James L. Nelson

Research conducted at this station during the past three years indicated that bull calves fed to slaughter weights gain and are significantly mor efficient than steers fed similar rations. Since the majority of cattle fed in southwestern North Dakota are backgrounded only, this trial was designed to compare the performance of bull calves in which castration has been delayed until the end of the backgrounding phase, with steers handled in a conventional manner.

Hereford x Angus (BWF) steers and bulls averaging five-hundred pounds were randomly allotted twelve head per treatment.

The steer calves were implanted at the start of the trial with 36 mg. Zeranol (Ralgro). Implanting was done according to the manufacturers directions, which specified that the implant was to be placed just under the skin approximately on and one -half inches from the base of the ear using aseptic conditions. Once the needle was properly placed in the ear, pulling back slightly allowed space for the implant to be discharged without crushing. The manufacturer and past research indicates that crushing results in a rapid release of the chemical which is undesirable.

The bulls were castrated three weeks prior to selling, to insure a sufficient amount of time for adequate healing. A heavy duty squeeze chute and emasculator were used to insure the cattle were adequately restrained and blood loss held to an absolute minimum.

Complete mixed rations used in the study were blended in a portable mixing wagon, self-fed, and consisted of mixed hay, oats, salt and minerals. Following a short warm-up ration containing 40% oats and 57.5% mixed hay two adjustments were made in the ration of oats to mixed hay. Those ration adjustments are shown in table 1.

A summary of the data collected is shown in table 2.

Summary:

Feed efficiency and rate of gain among the steers and bulls was very similar. The bull calves consumed and average pound and one-half less feed per day which resulted in a total feed savings of $8.94 per head. In addition to the lower feed bill, buyer appeal was greater for the late castrated bulls and amounted to an additional $.55 per hundred weight when sold.

Bull feeding yielded $12.71 more net return than was received for the implanted steers.

Table 1. Backgrounding rations bull feeding – phase I, winter 1978.

	Warm-up	1st change	2nd change
No. days fed	20	90	30
Oats, %	40	50	75
Mixed hay, %	57.5	47.5	23.5
Di-calcium phosphate, %	.5	.5	.5
Salt, %	2	2	2

Table 2. Weights, gain, feed costs and returns, bull feeding phase I.

	BWF steers		BWF bulls [1/]
No. head	12		12
Days on feed	140		140
Starting wt., lbs.	502		515
Final wt., lbs.	743		753
Gain, lbs.	241		238
ADG, lbs.	1.75		1.70
Feed summary:			
Feed cost/lb., $	.0426		.0426
Feed/hd.,/day,lbs.	21.7		20.2
Feed/lb. gain, lbs.	12.6		11.9
Implant cost/hd., $	.60		--
Feed cost/hd., $	129.41		120.47
Economics:			
Selling wt., lbs.	743		753
Gross return/hd., $ @ 53.70	399.17	@54.25	408.68
Feed + implant cost/hd., $	130.01		120.83
Feeder calf value @ 46, $	230.92		236.90
Net return, $	+38.24		+50.95
Added return, $		12.71	

[1/] Bulls were castrated three weeks before selling to allow for adequate healing.

Bull Feeding – Phase II
Comparing Finishing Performance
Of Steers With Late Castrated Bulls and Bulls

Phase II is a continuation of the bull feeding study summarized in Phase I. The first question asked of castration at approximately seven hundred pounds is: "What effect will it have on finishing performance and carcass quality"? The purpose of Phase II, therefore, is to compare feeding performance, effects of castration stress, labor and overall economics of steers, delayed castrated bulls and bulls.

Hereford x Angus (BWF) steers and bulls were randomly allotted six heads per treatment.

Steers in the trial were implanted at the start of the backgrounding and finishing phases with 36 mg. Zeranol (Ralgro). The late castrated bulls and bulls were not implanted.

Self-fed, complete mixed rations, blended in a portable mixing wagon, and consisting of mixed hay, oats, barley, salt and minerals were used. The ration percentage as they were fed are shown in table 3.

Gains, feed, carcass and economic summaries are shown in table 4.

Summary:

Delayed castration had a very undesirable effect on finish feeding performance. Rate of gain, feed efficiency, carcass quality and net return were depressed substantially. Although ninety five days and lapsed between castration and slaughter three carcasses were graded as stags. Economic returns over feed and calf costs amounted to a net loss of $18.20.

Feedlot performance was intermediary among the implanted steers, and carcass quality was lower than normally expected from Hereford x Angus steers as all of the carcasses were graded USDA good. Returns over feed and calf costs amounted to $1.83.

Black whiteface bulls fed to slaughter in this trial were substantially more efficient in all respects. Carcass grades among the six head were evenly split between good and stag grades. The carcass averaged 674 pounds, which is from 56-80 pounds heavier than the other treatments, and processed a desirable fat to lean meat ratio. Fat thickness of .37 inches was not any different, however loin eye size averaged 1.8 sq. in. larger. Increased pounds of carcass for sale resulted in a higher net return. Net return per head for the bulls amounted to $14.02.

Table 3. Self-fed rations – bull feeding, Phase II.

	Warm-up	1st change	2nd change	3rd change
No. days fed	20	90	30	95
Oats, %	40	50	75	50
Barley, %	--	--	--	25
Mixed hay, %	57.5	47.5	22.5	22.5
Minerals, %	.5	.5	.5	.5
Salt, %	2	2	2	2

Table 4. Weights, gain, feed summary, carcass data and returns, bull feeding phase II.

			Steers		Late castrated		Bulls
No. head			5[1/]		6		6
Days on feed			235		235		235
Starting wt., lbs.			502		515		541
Final wt., lbs.			1088		1030		1161
Gain, lbs.			586		515		620
ADG., lbs.			2.44		2.18		2.63
Feed summary:							
Feed cost/lb., $			.0436		.0436		.0436
Feed/hd./day, lbs.			23.58		22.75		23.8
Feed/lb., gain, lbs.			9.66		10.43		9.03
Implant cost/hd., $			1.20				
Feed cost/hd., $			241.60		233.43		243.50
Carcass summary:							
Hot carcass wt., lbs.			681		594		674.3
USDA Grade:	Choice			1 @	$83.00		
	Good	5 @	$77.00	2 @	$77.00	3 @	$77.00
	Stag			3 @	$73.00	3 @	$73.00
Dressing percent			57		58		58
Loin eye area, sq. in.			12.5		12.3		14.2
Fat thickness, in.			.39		.37		.37
Avg. carcass value, $			475.55		452.13		506.38
Economics:							
Gross return, $			475.55		452.13		506.38
Implant cost, $			1.20		--		--
Feed cost/hd, $			241.60		233.43		243.50
Feeder calf cost @46, $			230.92		236.90		248.86
Net return/hd., $			+ 1.83		- 18.20		+ 14.02

[1/] One steer died of bloat.

Bull Feeding Phase III
Hereford x Angus Bulls and Simmental x Hereford
Crossbred Steers Compared For The Production Of Hamburger Beef

The fast food trade across the United States is increasing at a tremendous rate because more consumers are eating out than even before. Approximately 40% of the beef consumed today is in the form of hamburger, and analysis projections indicate that by 1980 hamburger consumption could be 60% or more.

The current cattle cycle, which has recently moved into a profit making position for cattlemen, should remain profitable, according to predictions, for at least the next few years. Cull cows of various ages and breeds have been the main source of hamburger cattle in the past and will continue. However, increased consumer demand for hamburger and the changing cattle cycle will put cow beef in short supply. Therefore, another class of cattle will be slaughtered for hamburger as well as the cull cows normally used, which means the number of cattle customarily fed to choice grades will decline.

The purpose of this investigation is to evaluate, when feeding for maximum gains, feed efficiency, carcass type and quality, and overall economics of rapid gaining exotic crossbred steers and conventional crossbred bulls for the production of hamburger beef.

Growth curves among late maturity breed combinations such as the Simmental x Hereford crossbred's used in this experiment differ somewhat from the growth curves of the earlier maturity European breeds. A second trial objective, therefore, is to evaluate growth curves of the late maturity Simmental x Hereford steers and establish target weights at which the growth curves plateau and efficiency start declining.

One-fourth Simmental x three-fourths Hereford feeder steers weighing 550-600 pounds and Hereford x Angus bulls weighing 450-500 pounds were allotted six head per treatment. The exotic crossbred steers were purchased from Jim and Jerry Perdaems, South Heart, North Dakota.

The purchased steers were vaccinated for blackleg, malignant edema, hermorrhagic septecemia, enterotoemia types C & D, implanted with 36 mg. Ralgro and started on the warm-up ration shown in table 5 upon arrival at the station.

While on pasture, and approximately two weeks prior to weaning, the BWF bull calves raised at this station were vaccinated as just described for the exotic crossbred steers and following weaning a booster shot for enterotoxemia was administered. Bulls were not implanted with Ralgro.

Self-fed complete mixed rations blended in a portable mixing wagon were used that consisted of mixed hay, oats, barley, salt and minerals. The ration percentages as they were fed are shown in table 5.

Slaughter target weights of 1075-1100 were selected at the start of the trial.

Summary:

Results of this first year's trial show both animal types to be excellent sources of hamburger beef.

Implanted, one-fourth Simmental x three-fourths Hereford (SxH) steers were the fastest gaining, averaging 2.77 pounds per day as compared to 2.63 pounds per day among the BWF bulls.

Although the crossbred steers gained the fastest they were not the most efficient in this study, requiring one-half pound more feed per pound of gain. Feed cost among the steers was higher and amounted to $26.56 more than for the bulls. These results indicate that slaughtering approximately 100 pounds lighter would have been more desirable. (Lighter slaughter weights were predetermined, however, remodeling of the kill floor at Williston Packing interfered with normal marketing.)

The cattle were finally slaughtered at Fargo Beef Industries, West Fargo, and brought $77.00 per hundred weight for USDA good and $73.00 per hundred weight for stags, which was $10.00 off of choice beef price at the time.

All of the crossbred steers and one-half of the BWF bulls graded USDA good and the remaining one-half were graded as USDA stag.

Assuming an equal calf value of $46.00 per hundred weight, returns over feed and calf costs amounted to $14.02 for the BWF bulls and $4.49 for the (SxH) steers.

Table 5. Percent of ingredients in self-fed rations.

	Warm-up	1st change	2nd change	3rd change
No. days fed	20	90	30	95
Oats, %	40	50	75	50
Barley, %	--	--	--	25
Mixed hay, %	57.5	47.5	22.5	22.5
Minerals, %	.5	.5	.5	.5
Salt, %	2	2	2	2

Table 6. Weights, gain, feed summary, carcass data and returns-bull feeding, phase III.

	BWF bulls	Steers 3/4 Hereford x ¼ Simmental
No. head	6	6
Days on feed	235	235
Starting wt., lbs.	541	548
Final wt., lbs.	1161	1200
Gain, lbs.	620	652
ADG, lbs.	2.63	2.77
Feed summary:		
Feed cost/lb., $	.0436	.0436
Feed/hd./day, lbs.	23.8	26.4
Feed/lbs., gain, lbs.	9.03	9.53
Implant cost/head	--	1.20
Feed cost/head, $	243.50	270.06
Carcass summary:		
Hot carcass wt., lbs.	674.3	685.5
USDA Grade Choice		
Good	3@$77.00	6@$77.00
Stag	3@$73.00	
Dressing percent	58	57
Loin eye area, sq. in.	14.2	12.9
Fat thickness, inc.	.37	.38
Avg. carcass value, $	506.38	527.83
Returns:		
Gross return, $	506.38	527.83
Implant cost, $	--	1.20
Feed cost/head, $	243.50	270.06
Feeder calf cost @ $46, $	248.86	252.08
Net return/head, $	+14.02	+4.49

Least Cost Computer Rations

By James L. Nelson, Douglas G. Landblom and Thomas J. Conlon

North Dakota livestock producers now have computer capability available to them to help formulate nutritionally balanced rations – at the least possible cost.

When this trial was designed, in 1976, the Experiment Station, though the Cooperative Extension Service, had access to a Michigan State University computer program developed by Michigan livestock researchers Dr. Roy Black and Dr. Daniel Fox. The Michigan program was also used for the 1977-78 trial. At the present time AGNET, a Nebraska State University computer is being used on a trial basis in North Dakota, under the auspices of the Old West Regional Commission, to determine its usefulness and capabilities for North Dakota producers. The AGNET computer is being used for the 1978-79 feeding trial.

The program permits the stockman, with the help of the County Agent or Experiment Station personnel, to load the computer with information on: the class of cattle to be fed, cattle prices and percentage at which feeds can be used in the ration. Once these items have been entered, the computer calculates a balanced ration at the lowest possible cost for that particular class of livestock.

This trial was designed to see how the program worked in actual practice; and, to see what modifications would be needed, if any, in order for the Michigan program to fit North Dakota conditions. Working in cooperation with the Stark-Billings County Extension Agent, the program was run according to recommended procedure, just as would be done for any individual area livestock producer, and computer formulated ration was developed. For comparison, an oats-barley-tame hay ration that has been fed successfully at the Station for several years was used as the control. In this trial, twenty four Angus x Hereford heifer calves from the Station hers were divided into four uniform lots, with two lots receiving the “computer” ration beginning on November 17, 1976 and December 1st in 1977.

All heifers were implanted with Synovex-H at the start of the trial. When the heifers reached about 650 pounds, a second “ computer run” was made because of changes in nutrient requirements and feed prices. At this time, the control ration was changed by increasing the amount of grain in the ration.

In May, after a feeding period of 195 days in 1976, and 174 days in 1977, all heifers were shipped for slaughter in a grade and weight basis.

Weights, gains and feed costs are shown in the following tables.

Table 7. Feed inputs and costs entered into the computer for least cost rations formulation.

Feed	Initial run Price/cwt as fed basis	February, 1978 run Price/cwt as fed basis
Barley	3.13	3.64
Corn	4.00	4.30
Oats	3.59	4.06
Spring wheat	2.66	3.40
Linseed meal	9.00	9.00
Soybean oilmeal (44%)	10.00	9.50
Alfalfa	2.75	3.0
Brome-alfalfa	2.25	2.50
Di-calcium phosphate	13.00	13.00
Salt	4.40	4.40
Wheat straw	0.90	1.00
Beet pulp	--	3.50
Limestone	3.00	3.00
Commercial supplement (20%)	6.90	--

Table 8. Least cost computer ration as fed.

Ingredient	Initial run		February, 1978 run
Barley, lbs.	232		256
Wheat, lbs.	367		500
Soybean oilmeal, lbs.	57	Tame hay	100
Alfalfa, lbs.	50		50
Limestone, lbs.	8.5		6.5
Trace mineral salt, lbs.	2.5		2.5
Wheat straw, lbs.	283		85
	1000		1000
	$2.70/cwt		$3.15/cwt

Table 9. Control ration as fed.

Ingredient	Initial run	February, 1978 run
Oats, lbs.	500	750
Tame hay, lbs.	475	225
Di-calcium phosphate, lbs.	5	5
Trace mineral salt, lbs.	20	20
	1000	1000
	$3.02/cwt	$3.76/cwt

Table 10. Weights, gains, feed costs, carcass data and returns, 1977-78.

	Computer Ration		2yr. avg.	Control ration		2yr. avg.
Initial wt., lbs.	488	483	486	487	488	488
Final wt., lbs.	895	898	897	932	888	910
Gain/hd., lbs.	407	415	411	445	400	422
Days fed	195	174	184	195	174	184
ADG, lbs.	2.09	2.38	2.24	2.28	2.30	2.29
Feed efficiency, lbs.	9.98	8.56	9.27	9.52	9.90	9.71
Feed cost/hd., $	171.35	134.59	152.97	179.18	158.88	169.03
Feed cost/cwt gain, $	42.31	32.43	37.37	40.30	39.72	40.01
Hot carcass wt., lbs.	533.5	516.1	524.8	549.5	502.6	526.0
Dressing %	59.6	57.5	58.6	58.5	56.6	57.6
USDA grade	9 Cho	2 Cho	11 Cho	7 Cho	1 Cho	8 Cho
	3 Gd	9 Gd	12 Gd	5 Gd	9 Gd	14 Gd
		1 Std	1 Std		1 Std	1 Std
Carcass value, $	317.42	428.12	372.77	323.41	408.90	366.16
Return over feed, $	146.08	293.53	219.80	144.24	250.02	197.13

Summary:

Returns above feed costs in the 1978-77 trial were about equal.

Feeding results in 1977-78 were comparable between the two ration formulations with regard to average daily gain, however, the least cost ration had the advantage both in feed efficiency and cost per pound of gain. This saving in feed amounted to $7.29 per hundred pounds of gain.

By combining the two years data, we found a savings or advantage of $22.67 per head in favor of the computer rations.

Another feeding trial will be evaluated in 1978-79.

HEI-GRO Device For Feedlot Heifers

By James L. Nelson and Douglas G. Landblom

A relatively new non-chemical growth stimulant known as the Hei-Gro device is being marketed to livestock feeders by Agrophysics Inc. of San Francisco, California. This device, composed of injection molded nylon, looks somewhat like a miniature Christmas tree. It is inserted deep into a feedlot heifer's vagina and left there, where it is supposed to stimulate natural body mechanisms to produce faster growth.

According to company literature, when the device is used as recommended, it should produce additional returns of from seven to nine dollars per head. It is also reported to give faster growth, better feed conversion, reduced bulling, 99% retention, simpler feeding procedures and show no effects of breed or season.

A trial was started in the fall of 1976 and repeated in 1977, to compare the response from weaning to market of heifer calves with or without the device. Heifer calves used in this trial were Angus-Hereford crossbreds averaging about 485 pounds initially. Twenty four head were randomly allotted into four uniform lots. Two lots served as controls and two lots were de-viced with the Hei-Gro at the beginning of the trial, the first week in December. All trial heifers also received a Synovex-H (estrodiol benzoate and testoeterone propionate) implant at the start of trial. The heifers were self-fed completely mixed grain-roughage rations designed to produce gains of from two to two and one-half pounds of gain per head per day.

The heifers were housed in feedlots that were located a minimum of fifty feet from steer or bull lots, as recommended by the Hei-Gro manufacturer.

All heifers were marketed on a grade and yield basis at a slaughter weight of approximately 920 pounds.

Results of the 1977 and 1978 feeding periods are shown in table 11.

Summary:

Two trials with the Hei-Gro device fail to show any advantage for its use. Results of the Dickinson trials are in agreement with findings at South Dakota State University, Kansas State University, Ridgetown College of Agricultural Technology, Ontario, and the University of Guelph in Ontario.

Loss of several of the devices has been observed. One heifer in the trial developed a rectal prolapse in an effort to expel the device. Based on available information the use of the Hei-Gro device be recommended.

Table 11. Weights, gains, feed coats, carcass data and returns.

	Hei-Gro			Control		
	1976-77	1977-78	2-Yr. avg.	1976-77	1977-78	2-Yr. avg.
Number head	12	12	24	12	11	23
Avg. initial wt.,lbs	488	488	488	488	482	485
Final wt., lbs	908	880	894	918	907	912
Avg. gain., lbs	420	392	406	430	425	428
Days fed	195	174	184	195	174	184
ADG, lbs	2.16	2.25	2.21	2.21	2.47	2.34
Feed efficiency	10.06	9.48	9.77	9.38	8.40	8.89
Avg. feed Cost/hd, $	179.17	148.30	163.74	171.36	143.92	157.64
Avg. feed Cost/hd/day,$	0.92	0.85	0.88	0.88	0.83	0.86
Feed cost/cwt Gain, $	42.61	37.84	40.22	39.81	33.94	36.88
Net return, $	140.40	271.76	206.08	149.91	273.78	211.84
Avg. hot carcass Wt., lbs.	540	506	523	543	513	528
Avg. dressing %	59.4	57.5	58.4	59.1	56.6	57.8
USDA grade:						
Choice	8 @ 60.75	2 @ 90.75	10 Ch	8 @ 60.75	1 @ 90.75	9 Ch
Good	4 @ 56.25	9 @ 80.00	13 Gd	4 @ 56.25	9 @ 80.00	13 Gd
Standard		1 @ 77.00	1 St		1 @ 77.00	1 St
Avg. carcass Value, $	319.56	420.06	369.28	321.28	417.70	369.49

Commercial Grower Rations And Home Grown Feeds Compared For Pre-conditioning and Backgrounding

By James L. Nelson, Douglas G. Landblom and Thomas J. Conlon

Cattlemen interested in growing out their calves to backgrounded weights of approximately 700 pounds instead of selling them after weaning have more than one feeding option. Because of the convenience and ease of handling, commercial pelleted rations have become very popular and can be purchased bagged, or bulk and medicated if desired. As an alternative option the cattlemen can rely on his own home-grown feeds. Research conducted at this station has shown that, when mixed and self-fed, home-grown have and oats will promote steady, economical gains. Both systems are being practiced by livestock producers in North Dakota and this station has been asked to evaluate which method results in the greatest net return.

The purpose of this trial is to compare the feed consumption and efficiency, overall economics, and differences in buyer appeal among calves fed either commercial or "home-grown" backgrounding rations.

Purina's Cattle Grower was selected at random from all of the commercial feeds available in the Dickinson area.

Straightbred Hereford steer calves averaging 425 pounds were randomly allotted into two groups and were fed a pre-conditioning ration for 28 days. The commercial group was self-fed Purina's Pre-conditioning Chow and the home-grown group was self-fed a ration consisting of 20% oats and 80% mixed hay at the beginning of the trial. It was changed by gradually increasing the percentage of oats so that the end of the 28 day period the calves were eating a ration of 40% oats and 60% hay. Following the 28 day pre-conditioning the calves were changed to the respective grower rations. Purina's Cattle Grower, which was recommended by the Company for backgrounding, was purchased delivered in bulk form and was self-fed in a creep feeder of station design. No additional feed was recommended. The home-grown ration which was also self-fed was increased from 40% to 50% oats and 50% mixed hay and was unchanged for the remainder of the trial.

The calves were vaccinated with Electroid Seven on October 17th and were later given a booster shot for enterotoxemia.

The steers were sold at Stockmen's Livestock Company at the end of the backgrounding phase on March 30, 1978.

A summary of the pre-conditioning data is given in table 12. Results of the backgrounding phase are shown in table 13.

Summary:

Results of this first year's feeding show that average daily gains and total weight gained was significantly greater among those steers receiving the commercial ration.

Steers fed the commercial rations required less feed per pound of gain with both the pre-conditioner and grower rations. Although feed efficiency was better with the commercial rations, the cost per pound of feed was much higher and resulted in a combined net return for pre-conditioning and backgrounding of $15.19 as compared to a combined net return of $75.98 for the home-grown ration.

Table 12. Home-grown vs. commercial pre-conditioning feed summary 1977-78.

	Purina Pre-conditioner	Home-grown Pre-conditioner
No. head	7	6 [1/]
Start weigt, lbs.	424	428
Finish weight, lbs.	486	478
28 day gain, lbs.	62	50
Average daily gain, lbs.	2.21	1.78
Total gain/lot, lbs.	434	300
Pounds feed fed	2750 [2/]	1959 [3/]
Feed/lb. gain, lbs.	6.32	6.53
Feed/hd/day, lbs.	14.0	11.7
Feed cost/cwt gain, $	36.31	24.50
Feed cost/head, $	22.56	12.25

[1/] One steer died of bloat on November 16, 1977.
[2/] Commercial – Purina Pre-Conditioning Chow Sm-AB (G) medicated (Chlortetracycline & Sulfamethazine)
[3/] Home-Grown Rations: 29% rolled oats, 70% chopped hay, 0.5% di-calcium phosphate, 1% salt.

Table 13. Summary of home-grown vs. commercial backgrounding 1977-78.

		Purina Cattle Grower ration [4/]		Grower ration using home-grown feeds
No. head		7		5 [1/]
Days on feed		119		119
Starting wt., lbs.		486		473
Final wt., lbs.		756		698
Gain, lbs.		270 [2/]		225
ADG, lbs.		2.27		1.89
Feed Summary:				
Cost/lb. feed, cent		6.28		4.12 [3/]
Feed/lb. gain, lbs.		9.22		10.5
Feed cost/lb. gain, cent		57.9		43.3
$ Returns:				
Gross return/hd., $		361.00		351.02
Background feed cost/hd., $		156.33		97.43
Calf cost, $	37cents x 86#	179.82	37cents X 473#	175.01
Net return/hd., $		24.85		78.56

[1/] One steer was lost to bloat at the start of the trial.

[2/] Weight gains were significantly better among those steers receiving Purina's cattle grower ration (P .05).

[3/] Ingredient costs: oats $1.55/bu; mixed hay $45/ton; dicalcium phosphate $.144/lb; trace mineral salt $.038/lb.; mixing and grinding $10/ton.

[4/] Purina Cattle Grower: medicated with chlortetracycline.

Table 14. Economics of Pre-conditioning and backgrounding 1977-78.

		Commercial pelleted Ration		Home-grown ration
Pre-conditioning:				
Feed/lb. gain, lbs.		6.32		6.53
Feed cost/lb., cents		5.75		3.74
Feed cost/hd., $		22.56		12.25
Backgrounding:				
Feed/lb. gain, lbs.		9.22		10.5
Feed cost/lb., cents		6.28		4.12
Feed cost/hd., $		156.33		97.43
Returns:				
Gross return/hd., $		361.00		351.02
Expenses:				
Pre-conditioning feed cost/hd., $		22.56		12.25
Backgrounding feed cost/hd., $		156.33		97.43
Feeder calf cost, $	@ 39centsx428#	166.92	39centsx424#	165.36
Net return, $		15.19		75.98

Feeding Trials With Rumensin, Ralgro, And Rumensin – Ralgro Combination

By James L. Nelson and William E. Dinusson

Feeding trials with steers, comparing Rumensin (R) (monensin sodium), Ralgro (zeranol), Rumensin and Ralgro combined, and an untreated control were begun in November, 1976 and repeated in 1977 starting on December 13.

In this study 24 Angus x Hereford crossbred steer calves were allotted at random into four lots of six steers each. All lots were fed for 333 days in 1976-77 on a high roughage growing-fattening ration of oats, barley and chopped tame hay. The grain was hand fed in meal form on a daily basis with Rumensin added to the oat portion of the ration for those lots receiving Rumensin. Hay was self fed.

In 1977-78 all lots were fed for 317 days on a high roughage growing-fattening ration of oats, barley, 20% custom made supplement and chopped tame hay. The concentrate was fed in meal form on a daily basis with Rumensin added to the supplement portion of the ration for those lots receiving Rumensin. Hay was again self fed. In the 1977-78 feeding period concentrate was fed according to the following schedule:

	Pounds per head per day		
Period fed:	Oats	Barley	Supplement
Dec. 13 – Dec. 18	2	--	1
Dec. 19 – Jan. 9	3	--	1
Jan. 10 – Feb. 20	4	--	1
Feb. 21 – June 17	4	--	.66
June 18 – June 27	4	--	1
June 28 – July 9	4	2	1
July 10 – Aug. 1	4	3	1
Aug. 2 – Aug. 11	4	4	1
Aug. 12 – Oct. 25	6	4	1

For lots receiving Rumensin the supplement was mixed to carry 150 mg. per pound of supplement which was fed at one pound per head per day for the first 70 days, from December 13, 1977 to February 20, 1978. Supplement was then mixed to carry 300 mg. per pound and fed at the rate of two-thirds pound per head per day, to provide 200 mg. Rumensin, for the 117 days from February 21- June, 1978. This same supplement was then fed at one pound per head per day, to provide 300 mg. Rumensin, from June 18 to October 25, 1978 a period of 130 days.

Control steers were fed the same supplement, with no Rumensin added. All lots received trace mineral salt and di-calcium phosphate mineral mixture free choice.

The steers were weighed on a 28 day schedule throughout the trial. They were slaughtered at Flavorland Dressed Beef in West Fargo, North Dakota in 1977 and at Williston Packing Company, Williston, North Dakota in 1978. Steers slaughtered at Williston had a one day stand at the plant due to a breakdown on the kill floor.

Table 15. Weights and gains – Rumensin, Ralgro, combination trial.

	Control	Rumensin	Combination	Ralgro
1976-77 Data on:				
Initial wt., lbs.	412	412	412	414
Final wt., lbs.	1020	1035	1025	1052
Feedlot gain, lbs.	608	623	613	638
Days fed	333	333	333	333
ADG, lbs.	1.82	1.87	1.84	1.91
1977-78 Data on:				
Initial wt., lbs.	488	497	482	493
Final wt., lbs.	1075	1072	1082	1071
Feedlot gain, lbs.	587	575	600	578
Days fed	317	317	317	317
ADG, lbs.	1.85	1.81	1.90	1.82
Two year avg. data on:				
Feedlot gain/hd, lbs.	598	599	606.5	608
ADG/hd/day, lbs.	1.84	1.84	1.87	1.87

Discussion and Summary:

The feeding of Rumensin alone or in combination with Ralgro has in general reduced the pounds of feed required to produce a pound of gain, however the results have not been as consistent as could be hoped for. One possible reason for this, was supplement fed in 1978 did not contain (by laboratory analysis) the level of monensin sodium called for in the trial design. Steers receiving the Ralgro (zeranol) implant alone in 1978 graded almost a grade lower than the control steers. Again this appears to be due to change since steers implanted in 1977 graded as well or better than control steers.

This trial indicates that when using Rumensin, careful attention to levels fed must be closely watched if optimum results are to be obtained.

The trial will be repeated in 1978-79.

Table 16. Carcass data – Rumensin, Ralgro, combination trial.

	Control	Rumensin	Combination	Ralgro
1976-77 Data on:				
Hot carcass wt., lbs.	574	588	573	580
Avg. dressing percent	56	57	56	55
USDA grade--				
Choice @ $63.50	6	3	3	5
Good @ $58.00		3	3	1
Actual carcass value, $	364.17	357.82	347.96	362.89
Calculated value, $				
Based on choice grade	364.17	373.67	363.85	368.30
1977-78 Data on:				
Hot carcass wt., lbs.	568	574	578	565
Avg. dressing percent	52	54	53	52
USDA grade --				
Choice @ $81.00	4	3	4	
Good @ $78.00	1	2	2	4
Standard @ $78.00	1	1		2
Actual carcass value, $	454.02	456.39	463.00	440.83
Calculated value, $				
Based on choice grade	459.68	465.08	468.58	457.78
Two year avg. data on:				
Hot carcass wt., lbs.	571	581	576	572
Dressing percent	54	56	54	54
Actual carcass value, $	409.10	407.10	405.48	401.86
Adjusted carcass value, $	411.92	419.38	416.22	413.04

Table 17. Daily feed consumption – Rumensin, Ralgro, Combination trial.

	Control	Rumensin	Combination	Ralgro
1976-77 data on:				
Oats, lbs.	4.2	4.2	4.2	4.2
Barley, lbs.	1.6	1.6	1.6	1.6
Tame hay, lbs.	13.8	11.9	12.7	13.8
Total, lbs.	19.6	17.8	18.5	19.6
Pounds feed/ Lb, gain	10.74	9.49	10.07	10.22
% feed saving		11.6	6.2	4.8
1977-78 data on:				
Oats, lbs.	4.4	4.4	4.4	4.4
Barley, lbs.	1.36	1.36	1.36	1.36
Supplement, lbs.	0.91	0.91	0.91	0.91
Tame hay, lbs.	15.7	15.4	15.2	15.3
Total, lbs.	22.3	22.0	21.8	21.9
Pounds feed/ Lbs. gain	12.03	12.13	11.50	12.02
% feed saving		0	4.4	0

Table 18. Feed cost and returns – Rumensin, Ralgro, combination trial.

Feed and cost:	Control	Rumensin	Combination	Ralgro
1976-77 data				
Oats @ $1.55/bu.	411.23	411.23	411.23	411.23
Barley @ $2.42/bu.	158.21	158.21	158.21	158.21
Hay @ $40/ton	551.30	477.00	508.40	550.10
Processing @ $10/ton	137.82	119.25	127.10	137.52
Rumensin @ 5cents/gm.	--	18.60	18.60	--
Ralgro @ 60cents/implant	--	--	7.20	7.20
Total cost/lot, $	1258.56	1184.29	1230.74	1264.26
Return/lot, $	2185.02	2146.97	2087.77	2177.34
Net return less feed, $	926.46	962.68	857.03	913.08
Net retun/head, $	154.41	160.45	142.84	152.18
Calculated net based on				
Equal grade of choice, $	154.41	176.28	158.72	157.59
1977-78 data				
Oats @ $1.55/bu.	401.91	401.91	401.91	401.91
Barley @ $1.85/bu.	100.02	100.02	100.02	100.02
Supplement @ $124/ton	106.89	106.89	106.89	106.89
Hay @ $45/ton	670.21	657.56	649.13	653.29
Processing @ $10/ton	203.45	200.64	198.76	199.68
Rumensin @ 5cents/gm.	--	21.87	21.87	--
Ralgro @ 60cents/implant	--	--	7.50	7.50
Total cost/lot, $	1482.48	1488.89	1486.08	1469.29
Return/lot, $	2724.12	2738.34	2778.03	2644.98
Net return less feed, $	1241.64	1249.45	1291.95	1175.69
Net return/head, $	206.94	208.24	215.32	195.95
Calculated net based on				
Equal grade of choice, $	212.60	216.93	220.90	212.90
Two year combined results:				
Avg. feed cost/hd, $	228.42	222.76	226.40	227.80
Avg. carcass return/hd, $	409.10	407.11	405.48	401.86
Avg. net return, $	180.68	184.34	179.08	174.06
Using equal slaughter				
(choice) prices:				
Avg. feed cost/hd, $	228.42	222.76	226.40	227.80
Adjusted avg. carcass value,$	411.92	419.38	416.22	413.04
Avg. net return, $	183.50	196.62	189.82	185.24

Effects Of Supplemental Feeding
Of Cows and Calves On Late Fall Pasture

By James L. Nelson and Thomas J. Conlon

Does creep feeding of calves on late fall pasture improve weaning weight and reduce stress at weaning? Does supplemental feeding of grain to cows on late fall pasture improve cow condition, and is weaning weight of their calves improved?

These questions, asked by the North Dakota Hereford Association provided the basis for a two phase trial started in the fall of 1978.

Phase I of this work seeks to determine:

1. The effect of short term creep feeding of calves on late fall pasture.
2. The effect of supplemental feeding of cows on late fall pasture.
3. Economic advantages or disadvantages of these management systems.

Phase II seeks to evaluate the effect of either form of supplemental feeding on late fall pasture with respect to: reducing stress on calves at weaning; effect on disease frequency associated with calf weaning; and , effect of creep feeding on adaptation of calves to weaning rations.

A request for information on the subject directed to the Current Research Information System data base which includes projects from 56 State Agricultural Experiment Stations, 30 Forestry Schools and other cooperating institutions and three U.S. Department of Agriculture research agencies revealed no information available on these practices under conditions normal to the Northern Great Plains.

In Phase I, 60 uniform Hereford cows and their calves were randomly allotted into three pasture groups of 20 cows each. The calves in each group consisted of equal numbers of Hereford or Angus x Hereford crossbred bull and heifer calves.

Each experimental group grazed on approximately 40 acre reseeded native pastures in excellent condition with easy and uniform access to water.

Group one served as the control and received no supplementation to the pasture other than a salt – dicalcium phosphate mineral mixture.

Group two was the creep feeding treatment. Calves had access to a wooden creep feeder located within 150 feet of their water source. The creep feed was composed of 60% dry rolled barley, 35% oats and 5% liquid Molasses. Salt and dicalcium phosphate were available on a free choice basis.

Cows in group three received a supplemental feeding for six pounds ground oats per head on a daily basis. Bunk space was limited to the extent that competition among cows would not allow calves to eat grain. These cows and calves also had access to a salt – dicalcium phosphate mineral mixture.

Weights of all cows and calves were taken a the start and close of Phase I, a 40 day period that lasted from September 21 to October 31.

Calves on the creep feed appeared to be readily utilizing the creep feeder within five to seven days after exposure. The creep feed was kept fresh by weighing back any old, soiled or spoiled feed in the trough of the self feeder.

Results of Phase I are shown in the following table.

Discussion on Phase I:

During this phase, all groups of cattle grazed on very good to excellent fall pastures without apparent lack of energy. Because of the good grazing during this phase, we did not see any treatment advantage on either the cows or calves as measured by weight gain. However, since both the supplemented cows and the creep fed calves were eating gain they accrued a cost per calf of $7.95 in the cow supplemented lot and $4.67 in the creep fed group just to pay for the grain supplement. Calves on creep feed ate an average of three and one-fourth pounds of feed per calf per day.

In summary, it appears, based on this first year's work, that when adequate fall pasture is available little or no advantage as measured in pounds of gain will be found for either the supplementation of cows or for short term creep feeding of calves. How these calves performed during the weaning phase is reported in Phase II which follows.

Table 19. Gain, feed consumption and economics of cow and calf supplementation on late fall pastures.

	Cows Supplemented	Control	Calves creep fed
No. head (pairs)	20	20	20
Initial wt., (Sept 21,1978), lbs.			
Cows	1054	1024	1063
Calves	392	379	377
Final wt., (Oct 31, 1978), lbs.			
Cows	1124	1140	1124
Calves	478	474	463
Days on trial	40	40	40
Fall weight gain, lbs.			
Cows	70	116	61
Calves	86	95	86
Average daily gain, lbs.			
Cows	1.74	2.90	1.52
Calves	2.15	2.37	2.15
Feed consumption per head			
Oats, lbs.	240	--	43.00
Barley, lbs.	--	--	78.50
Molasses, lbs.	--	--	8.75
Total lbs.	240	0	130.25
Cost of feed, $			
Oats @90cents/bu.	135.00	--	24.18
Barley @$1.40/bu	--	--	45.79
Molasses @6cents/lb.	--	--	10.50
Processing @$10/ton	24.00	--	13.02
Total, $	159.00	0	93.49
Cost/calf, $	7.95	0	4.67
Costs/100lbs. of gain, $	9.24	0	5.44

Phase II – Effect on Weaning:

Phase II was conducted in drylot and started immediately after weaning. Calves were separated by sex, but remained in the same groups they were in on pasture. The steers were used to evaluate effects of late fall pasture supplementation on weaning stress and disease frequency, while the heifer calves were used to evaluate two different feeding management systems when the calves were moved into drylot after weaning.

Steer calves were fed a complete mixed ration of 20% oats; 70.5% chopped hay; .5% di-calcium phosphate; 2% trace mineral salt, and 7% molasses.

Heifer calves from control cows, and cows supplemented with six pounds oats per head on pasture were self-fed the following complete mixed ration in drylot: 20% oatas; 77.5% chopped hay; 5% di-calcium phosphate and 2% salt. Those heifer calves that had been given creep feed on pasture were self-fed the same creep ration in drylot, and were also self-fed chopped mixed hay in a separate feeder. The grain creep ration was dry rolled to just flatten the kernels and was comprised of 62% barley; 32% oats and 6% molasses.

Results of Phase II are shown in table 20.

Table 20. Gains and economics for heifer calves fed two ration types; steers fed a complete mixed ration.

	Heifer Calves			Steer Calves		
	Calves Creep Fed	Control calves	Cows supple-mented	Cows supple-mented	Calves creep fed	Control calves
No. head	10	10	10	10	10	10
Days on feed	21	21	21	21	21	21
Starting wt., lbs.	420	468	452	504	506	480
Finish wt., lbs.	474	489	482	534	551	505
Gain, lbs.	54	21	30	30	45	25
Avg. daily gain, lbs.	2.57	1.0	1.42	1.42	2.1	1.2
Economics:						
Total feed consumed, lbs.	3121	2989	2950	3008	3395	3023
Feed cost/lb., $	.0311	.0254	.0254	.0278	.0256	.0280
Feed/hd/day, lbs.	15.0	14.23	14.04	14.32	16.16	14.40
Creep feed, lbs.	10.2	--	--	--	--	--
Chopped hay, lbs.	4.8	--	--	--	--	--
Feed cost/cwt gain, $	18.10	36.14	25.12	28.02	19.33	33.58
Feed cost/hd, $	9.71	7.61	7.51	8.39	8.70	8.48

Summary – Phase II:

Results of this first year's feeding show an advantage for creep-feeding on late fall pasture. Heifer calves that were creep-fed on pasture and received the same creep ration in drylot with chopped mixed hay available free-choice gained the most at 2.57 pounds per day. Steer calves that had been creep fed on pasture and fed a complete mixed ration in drylot gained 2.1 pounds per day. Slowest gains experienced in drylot were among control calves that had not been supplemented on pasture. Supplementing cows on pasture instead of the calves produced gains that were intermediate when compared to the controls and creep-fed calves.

Diseases and treatments were very minimal throughout the trial. The few infections encountered were upper respiratory pneumonia type and were characterized by rapid breathing, elevated temperatures ranging from 103° to 106° F., nasal discharges and general droopy appearance.

Commercial Weaning Rations and Home Grown Feeds Compared For Pre-Conditioning Calves

By James L. Nelson and Douglas G. Landblom

North Dakota cattlemen have asked this station to evaluate the performance of calves fed commercial weaning rations. Their interest has been in regard to expected daily feed consumption, resistance to stress related health problems, and overall economics of using the commercial program.

Past experience from numerous trials conducted at this station has shown that self-fed rations composed of home grown mixed hay and oats will promote good, steady, economical gains in calves following weaning.

This trial, then, is designed to compare the " Home Grown" ration and the commercial ration with respect to animal response and cost.

On November 2, 1977 Hereford and Hereford X Longhorn crossbred calves from the station herd were weighed, weaned and sorted within breed and sex into six equal feeding groups. Three groups were assigned to be fed the commercial ration, and three groups served as controls and were fed the "Home Grown" ration. Based on the recommendations of the commercial feed distributor the trial was designed to run for not less than 21 days, and preferably for 28 days. The trial as actually completed in 1977 was for the 28 day period.

In 1978 the trial was repeated using home raised Herford of Angus – Hereford heifer calves as well as two lots of Angus calves purchased at the local livestock auction market. These purchased calves were selected to better evaluate the preconditioning program insofar as stress and disease exposure were concerned. All calves on trial were scheduled for a 21 day feeding period. However, in order to fit scheduled local sale dates, the heifers were on trial a period of 27 days while the steers were fed a period of 25 days.

Home Grown ration consisted of 20% oats and 80% mixed hay at the beginning of the trial. It was changed by gradually increasing the percentage of oats so that by the end of the feeding period the calves were eating a ration of 40% oats and 60% hay by weight. This ration also contained 20 pounds of salt and 10 pounds di-calcium phosphate per ton. The commercial ration used both years Purina Preconditioning/Receiving Chow. Both rations were self-fed in straight sided self-feeders designed for feeding high roughage rations. All feed was weighed in during the trial and feed left at the end of the trial was weighed back to give an accurate record of the amount of feed used. Feed waste was monitored throughout the trial, and was very minimal for both rations. In 1978 as in 1977, an effort was made to feed the commercial ration according to recommendations of the feed manufacturer.

All calves in the trial were vaccinated, and were given a booster at the beginning of the trial. Careful daily observations for any health problems were made throughout the trial with treatment made where necessary. All calves were observed daily and those showing signs of lung congestion, heavy nasal discharge or slowness were checked for temperature. Those running a high fever were treated with a combination of penicillin (Combiotic) sulfamethazine (Spanholet) bolus according to label directions.

Two lots of steers were sold at the termination of the trial each year, to evaluate marketability.

Summary:

In 1977 one calf was lost to bloat on the homegrown ration. No other calves required any medication or treatment.

Homegrown feeds used were of excellent quality, with hay averaging 10.7% protein and oats at 12%.

Gains on both rations were very satisfactory averaging 1.75 pounds or more per day.

Again, in 1978, calf gains during the pre-conditioning phase were very acceptable. Feed efficiency was good in all lots except lot 16, (home grown heifers) with efficiency averaging 5.2 to 6.0 pounds feed per pound of gain. Two heifers in lot 16 failed to make satisfactory gains without any apparent reason.

Again in 1978 as in 1977, feed costs favored the home grown feeds. The commercial fed calves sold for $382.98 compared to the home grown fed calves $365.76 a difference of $17.22 in favor of the commercial feed. However, this advantage in selling price was offset by the extra cost of the commercial feed.

It appears that the livestock producer must take a close look at hid operation and facilities.

Commercial feeds offer good feed efficiency and convenience but at a cost considerable higher than typical home grown rations.

Table 21. Calf preconditioning trial results – 1977

	Home-Grown Hereford	Commercial Steers	Home-Grown Longhorn x Hereford	Commercial	Home-Grown Hereford	Commercial Heifers
No. head	6 *	7	10	10	10	10
Nov. 3rd wt. lbs.	428	424	401	393	431	428
Dec. 1st wt. lbs.	478	486	453	446	480	478
28 day gain, lbs.	50	62	52	53	49	50
ADG, lbs.	1.78	2.21	1.86	1.89	1.75	1.78
Total gain/lot, lbs.	300	434	520	530	490	500
Pounds feed fed	1959 2/	2750 1/	2896 2/	4200 1/	3121 2/	3940 1/
Feed/lb. gain	6.53	6.32	5.57	8.0	6.24	7.9
Feed/hd/day, lb.	11.7	14.0	10.3	15.0	11.2	14.1
Cost feed/hd, $	12.25	22.56	10.89	24.12	11.81	22.63
Cost feed/cwt gain, $	24.50	36.31	20.93	45.95	23.62	45.26
Actual selling value	--	--	$148.47	$148.02	--	--

*One steer died of bloat on November 16, 1977.

1/Commercial – Purina Pre-conditioning Chow Sm-AB (G) medicated – chlortetra-cycline and sulfamethazine.

2/Homegrown rations : 29% rolled oats, 70% chopped hay, 0.5% di-calcium phosphate, 1% salt.

Table 22. Calf preconditioning trial results – 1978.

Treatment	Home grown	Purina	Home grown	Purina	Home grown	Purina
Number head	8	8	7	13	9	9
Days fed	25	25	25	25	27	27
Avg. initial wt., lbs.	436	434	383	381	440	437
Avg. final wt., lbs.	489	508	435	433	465	484
Avg. gain, lbs.	53	74	52	52	27	47
Avg. daily gain, lbs.	2.12	2.97	2.08	2.08	0.92	1.73
Selling price, $	76.50	76.50				
Avg. return/steer, $	365.76	382.98				

Table 23. Feed data – calf preconditioning trial – 1978.

Feed data	Home grown	Purina	Home grown	Purina	Home grown	Purina
Purina P.C., lbs.						
@.0638	--	3100	--	3570	--	2370
Hay, lbs.						
@.0175	1786	80	1701	130	2593	125
Oats, lbs.						
@.02812	461	--	439	--	669	--
Salt, lbs.						
@.047	46	--	44	--	67	--
Di-cal, lbs.						
@.130	11	--	11	--	17	--
Grinding, lbs.						
@$10/ton	2304	--	2195	--	3346	--
Feed consumed/hd/						
Day, lbs.	11.5	15.9	12.5	11.4	13.8	10.3
Feed cost/lot, $	59.33	199.18	56.58	230.04	86.28	153.39
Feed cost/hd, $	7.42	24.90	8.08	17.70	9.59	17.04
Feed cost/cwt gain, $	13.96	33.48	15.50	34.08	38.35	36.52

Winter Feeding Of Replacement Heifers For Breeding Success

By James L. Nelson and Douglas G. Landblom

Winter feeding of replacement heifer calves is an important phase of the cow-calf industry. Unless heifer calves are well grown and have adequate condition or weight, they may not cycle and conceive early in the breeding season. Because of normal variation in weights at weaning, the livestock producer has an important management decision to make. If he feeds all replacement heifer calves so the lighter ones will be heavy enough by breeding season, he will more than likely overfeed the larger, growthier heifers. Or, if he feeds so the larger heifers are not over conditioned, the smaller heifers will not be large enough to breed early in the season. However, if it were possible to divide his replacement heifers into uniform groups, he could then feed each group so they would reach puberty prior to actual time of breeding. This would allow all heifers to breed and conceive early in the breeding season. Also, each heifer would have been wintered as economically as possible consistent with reproductive success. Results at this station show that a heifer will more likely continue to calve late as a producing cow. A missed cycle with a late calving female produces a very late calf – with the likelihood that she will continue to calve later than desired.

With these thought in mind, a trial was started to evaluate the economics, performance and reproductive efficiency of heifers managed as previously outlined.

In this trial, a group of 40 Hereford heifer calves, some from the Station herd and some purchased, were divided by weight into four equal lots. A target weight of 650 pounds by the beginning of the breeding season, May 1, was established.

Starting on February 9th, 1977, 84 days before breeding was to begin, all lots were fed chopped mixed tame hay consisting of brome, crested and alfalfa. In addition, depending on initial weight and rate of gain required, one lot received two pounds, one lot four pounds and one lot six pounds of a grain mixture consisting of 50% oats and 50% wheat. One lot was not fed any grain. In 1978 the feeding period started on December 1st and ran for a period of 151 days. Instead of individually feeding grain as was done in 1977, self-fed complete mixed rations were used that contained oats and wheat at 0, 20, 30 and 40 percent.

Following the winter phase all lots were randomly recombined into two breeding herds. They were turned on pasture, exposed to bulls for a short breeding period of 50 days and continued on grass for the remainder of the summer. At the end of August, 120 days after the start of breeding, the heifers were palpated for pregnancy and age fetus estimated.

Summary:

Dividing Hereford heifers into uniform weight groups and feeding them according to the required gain necessary to reach the 650 pound target weight by May 1st had proven to be a successful method for wintering replacement heifers without them becoming overly conditioned. Feed costs among heifers wintered on all hay were 13 cents less per day then the heifers fed six pounds of grain daily.

Pregnancy test results indicate that there was no difference in breeding success between the four levels of winter feeding.

Table 1. Weights, gains, heifer wintering trial – 1978.

	Group I All hay	Group II Hay + 2# grain	Group III hay + 4# grain	Group IV hay + 6# grain
Days on feed	117	117	117	117
Initial wt., lbs.	552	503	470	446
Final wt., lbs.	653	660	636	626
Gain, lbs.	101	157	166	180
ADG, lbs.	.86	1.34	1.42	1.53

Table 2. Feed consumed and feed costs – 101 day wintering period.

	Group I All hay	Group II Hay + 2# grain	Group III hay + 4# grain	Group IV hay + 6# grain
Avg. feed consumed/day				
Lbs.	15.5	15.6	16	15.2
Feed/lb. gain, lbs.	17.9	11.6	11.6	9.9
Avg. wintering costs, $	52.63	59.35	63.14	68.73
Feed cost/hd/day, cents	42.2	47.6	51.6	55.1

Table 3. Gain on grass and pregnancy test results, 1978.

	Group I All hay	Group II Hay + 2# grain	Group III hay + 4# grain	Group IV hay + 6# grain
Initial wt. on grass,				
May 15, lbs.	648	656	628	621
Weight on grass,				
Sept, 21, lbs.	828	824	794	781
Total summer gain, lbs.	180	168	166	160
ADG, lbs.	1.40	1.30	1.29	1.24
% of heifers pregnant	70	70	70	70
Estimated age of fetus	75	80	80	70

Rumensin For Wintering Beef Cows

By James L. Nelson, Douglas G. Landblom and William E. Dinusson

Rumensin (monensin sodium) improves feed efficiency of feedlot cattle, and according to numerous reports reduces the cost of feeding from seven to twelve percent.

It would be very worthwhile if a similar reduction in winter feed costs could be realized for the brood cow herd, since the cost of wintering the brood cow herd in North Dakota is one of the big expenses facing the cow-calf operator.

To date Rumensin has not received official clearance for use with beef cows.

In this trial, 60 pregnant cows were allotted into four uniform treatment groups. Two groups were bunk fed a mixed ration containing 80% tame hay and 20% wheat straw, and two groups were bunk fed a mixture of 60% tame hay and 40% wheat straw. In addition, the cows were supplemented with a custom "cow cake". One lot on 80% hay and one lot on 60% hay were fed cow cake supplement containing 100 milligrams of monensin sodium per pound. Companion control lots were fed cake which contained no monensin sodium. The supplement was fed at the rate of one pound per head from December 12, 1977 until January 9, 1978, a period of 28 days. From January 9 until April 27, 1978, the supplement was fed at the rate of two pounds per head per day.

Beginning on March 10, 1978, ground barley was fed at the rate of two pounds per head per day in addition to the supplement and roughage previously outlined. All cows had free choice access to a salt mineral combination made up of two parts trace mineral salt to one part of di-calcium phosphate.

All cows were individually weighed on a monthly basis. Each cow was weighed the day following calving, with the first calf arriving on February 27, 1978. All calves were weighed at birth, at the close of the feeding phase on April 27th and again at weaning on September 15th, 1978.

The winter of 1977-78 was long and cold with above average snow-fall. Approximately one-fifth of the cows in each treatment group were removed from trial due to abortions and or dead calves. Because of the crowded lots and muddy conditions, a couple of calves were lost by being laid on.

It was observed during the trial that although there was plenty of bunk space for all cows to eat at the same time, some cows would refuse to eat the supplemental " cow cake". Whether this was due to the size, shape and hardness of the cake or some other factor was not discovered.

The results of this trial are shown in tables 4 and 5.

Summary:

This first year's trial has failed to show any large advantage for using Rumensin with the rations fed. However, due to the inconsistent consumption of the "cake", number of cows removed and length and severity of the winter we can only conclude the need for continued research. More information on how

the treatment cows responded in their breeding groups will be collected next spring during the 1979 calving season.

Table 4. Weights and gain for cows and calves in the beef cow wintering Trial using Rumensin – 1977-78.

	80% Hay & 20% Straw		60% Hay & 40% Straw	
	With Rumensin	without Rumensin	with Rumensin	without Rumensin
No. cows starting	15	15	15	15
No. cows finishing	13	12	12	12
Avg. weight, Dec. 12, 1977	1047	1033	1012	1029
Avg. weight, Apr. 27, 1978	1088	1051	1051	1074
Winter gain/lbs.	41	18	39	45
Post calving weight/day, lbs.	1057	1030	981	1010
Cow weight change –				
Dec. 12-post calving/lbs.	+10	-3	-31	-19
Calf birth weight, lbs.				
Heifers – Avg.	5-76	8-76	4-78	7-75
Bulls – Avg.	8-80	4-81	8-74	5-80
Adjusted weaning weight, lbs.				
Heifers – avg.	5-485	8-492	4-485	7-498
Bulls – avg.	8-498	4-495	7-493	5-519

Table 5. Rations fed and daily consumption – beef cow wintering trial using Rumensin – 1977-78.

	80% Hay & 20% Straw		60% Hay & 40% Straw	
	With	without Rumensin	with	without Rumensin
No, days fed	136	136	136	136
Ration fed/avg. lbs,/day				
Tame hay	23.99	23.4	17.5	17.7
Wheat straw	5.94	5.78	11.5	11.6
Supplement	1.78	1.78	1.78	1.79
Salt	.09	.09	.09	.08
Di-calcium phosphate	.05	.04	.05	.04
Avg. daily consumption	31.85	31.09	30.92	31.21
Plus barley @2lbs/day				
Starting on March 10	2.00	2.00	2.00	2.00

Liquid Non-Protein Nitrogen Supplements For Wintering Pregnant Beef Cows

By James L. Nelson and Douglas G. Landblom

North Dakota livestock producers may choose to use liquid NPN supplements due to their cost advantage and ease of feeding when compared to natural protein supplements. However, there is rather limited information available on use of liquid supplements for beef cows when fed low quality gestation rations.

At the request of one of the beef breed associations, a trial on the use of liquid supplement in the winter feeding of the brood cow herd was designed. The trial seeks to determine: the handling characteristics of liquid supplement under extreme cold; the level of consumption under free choice "lick tank" feeding; the cost per cow for the winter feeding period; the effect of supplemental feeding on cow weight and condition; and, its effect on calf birth weights and weaning weights.

Hereford cows ranging in age from three to ten years were randomly allotted into two uniform wintering herds based on age, weights and expected date of calving. Both herds were housed and fed in a uniform manner, except the treatment herd had access to a "lick tank" containing a 32% liquid NPN protein supplement.

Both herds were bunk fed a chopped mixed ration composed of 60% tame hay and 40% wheat straw for the start of the trial on December 1st until February 15th, a period of 71 days. This ration was fed at the rate of approximately 24 pounds per head per day. On February 15, the straw was removed and straight chopped hay was fed at approximately 26 pounds per head per day. On March 10th, four pounds of ground barley was added to the ration. On April 5th, corn silage was substituted for the chopped hay and fed to appetite until the cows were turned on grass, May 10th,1978. In addition, all cows had access to a salt and mineral box containing trace mineral loose salt plus a calcium-phosphorus supplement recommended by the company that manufactured the liquid protein supplement.

A record was kept on cow weights, calf birth weight, supplement consumption, weather temperatures and total feed intake.

Results are shown in the following tables.

Table 6. Cow weights and calf birth and weaning weights – liquid supplement trial, 1978.

	Supplement fed	No supplement
Number cows starting	32	32
Number cows finishing	29	29
Avg. weight/hd. Dec. 1, lbs.	1070	1063
Avg. weight/hd. May 10, lbs.	1018	994
Avg. weight loss/hd., lbs.	52	69
Avg. wt. off grass, Sept. lbs.	1142	1135
Avg. summer gain, lbs.	124	141
Number calves born	28	28
Avg. birth weight:		
Steers, lbs.	78	77
Heifers, lbs.	71	75
Avg. adjusted weaning weight:		
205 days - Steers, lbs.	456	450
Heifers, lbs.	406	426

Table 7. Winter ration fed and costs – liquid supplement trial, 1979.

	Supplement fed		No supplement	
	Pounds	Cost/$	pounds	Cost/$
Mixed roughage	50,624		50,510	
Straw (40%)	20,250	202.60	20,204	202.04
Hay (60%)	30,374	683.55	30,306	681.88
Chopped tame hay	51,646	1161.90	53,843	1211.47
Corn silage	106,422	798.15	89,335	670.01
Ground barley	7,076	250.61	7076	250.61
Hi-Low minerals	96	11.98	140	19.97
Trace mineral salt	156	7.33	202	9.52
Processing/ton	54.7	547.00	55.7	557.00
Liquid supplement (Golden Flo)	9,032	511.21		
Total feed cost/lot		4174.33		3602.50
Avg. wintering cost/cow		143.94		124.22
Winter cost/cow/day		0.90		0.78

Table 8. Feed summary- supplement feed lot, 1978.

	Mix Hay+straw	Hay	Silage	Barley	Liquid Supplement	Minerals	Salt
Total pounds	50,624	51,646	106,422	7,076	9,032	95.8	156.3
Days fed	71	55	34	61	160	160	160
Cow days	2,059	1,595	986	1,769	4,640	4,640	4,640
Avg/hd/day,lbs.	24.6	32.4	108	4.0	1.95	0.02	0.03

Table 9. Feed summary – no supplement lot, 1978.

	Mix Hay+straw	Hay	Silage	Barley	Minerals	Salt
Total pounds	50,510	53,843	89,335	7,076	140	202
Days fed	71	55	34	61	160	160
Cow days	2,059	1,595	986	1,769	4,640	4,460
Avg/hd/day, lbs.	24.5	33.7	90.6	4.0	0.03	0.04

Summary:

The winter of 1977-78 was tough and long lasting. All cows in this trial lost weight and showed the effects of the weather.

With the level and type of feed available, the cows with access to the liquid feeder were consuming 1.95 pounds of supplement per head per day. This was about 1.5 pounds more than expected.

With the high consumption level of the liquid supplement, the cost per cow for the 160 day wintering period amounted to $19.72 more the with the control cows. We were unable to show any advantage in calf birth weight, calf health and vigor, or weaning weight by using the supplement.

This trial is scheduled to run for several more years to see if these same results will be dublicated.

A Comparison Of Beef Cattle Breeding Methods To Improve Performance

By Douglas G. Landblom and James L. Nelson

Artificial insemination is a management method that is available to livestock producers through various artificial breeding organizations. Superior sires can be selected from a large number of animals on the basis of their weaning and yearling performance as well as progeny records. Crossbreeding has also been shown to be an effective method of increasing the total pounds of calf weaned through the effects of hybrid vigor and the resulting improved performance. At a time when stockmen are faced with an ever increasing price-cost squeeze they must use every management tool at their disposal to produce more pounds of beef at the lowest possible cost. The purpose of this long range study, is to evaluate and compare crossbreeding and straightbreeding management systems where bulls are used, with artificial insemination followed by clean-up bulls.

In the trial, Hereford cows from the Dickinson Station herd were randomly divided by age and date of calving into three breeding groups. Approximately 60 cows were assigned to the artificial breeding system and about 30 cows were assigned to the natural service purebred and crossbred breeding groups. Purebred horned and polled Hereford bulls were used in the straightbred treatment (HxH) and purebred Angus bulls were used in the crossbreeding treatment (AxH).

Cows selected for A.I. breeding in 1976 received two pounds dry rolled oats per head per day during the 25 day breeding season. Since no breeding facility was available in the pastures grazed, the A.I. cows were trailed one-half mile each morning to a holding area where the supplemental grain was fed and those cows that had been detected in standing heat were sorted out. Breeding was done on a twice a day basis and when the cows were no longer in standing heat they were turned in with and Angus clean-up bull. To facilitate heat detection a detector bull equipped with a chin ball marker was used. Breeding among all treatment groups was started on May 27th and ran for 60 days, when the bulls were removed. Fall pregnancy testing identified open bulls were removed. Fall pregnancy testing identified open cows, and any old cows or otherwise poor producers were culled.

The following changes were made in 1977. Prior to the beginning of the breeding season a handling facility and holding area for grain feeding was constructed adjacent to the water supply in the crested wheatgrass pasture used as the breeding pasture. Eight pounds of a mixture of equal parts of grain and chopped hay was fed per head per day. This, and the provision for adequate bunk space eliminated competition for grain between older and younger cows. Twice a day breeding was discontinued in favor of once a day early morning breeding. All breeding groups were grazed on separate crested wheatgrass pastures until approximately July 1st of each year, depending on pasture condition, and were then moved to native pasture. Minerals were fed free choice in a 2:1 salt – di-calcium phosphate mixture to insure adequate phosphorous intake. Also, during the early spring on crested pasture a level of 15% magnesium oxide was added to the mineral mixture as a grass tetany preventative.

A summary of the results to date are shown in tables 10,11,12, and 13.

Summary:

In 1978 the first service conception rate for this A.I. management system, where once a day breeding was employed, amounted to 57%. The combined conception rate for the years 1976-77-78 was 34%. Although conception rate has increased progressively it is still not as good as it should be.

Beef steer calves in the 1978 natural service crossbreeding group were 12 pounds heavier at weaning than the straightbred Hereford calves sired artificially. When the three management systems were compared on an economic basis the highest net return was received from the natural service crossbreeding system. Results accumulated to date indicate that the artificially sired calves obtained are above average in quality. However, they are not enough better and the numbers are too few to offset the loss in weaning weight that can be expected when a cow doesn't settle on the first service. On the average in this trial where Hereford and Angus breeds are represented, a reduction of approximately thirty five pounds can be expected for every heat cycle missed.

As in previous years the natural service Hereford group yielded the lowest net return when compared to the other management systems.

Table 10. Breeding and calving summary, 1978 calf crop.

	A.I. System			
		Angus	Natural Service	
	A.I.	clean-up	Hereford	Crossbred
	(HxH)	(AxH)	(HxH)	(AxH) (HxH)
Total No. cows	51		29	29
Total no. cows inseminated	49		--	--
No. sold for mgmt.. reasons	6		8	2
No. having AI calves	24		--	--
1st service conception				
Rate, %	57[2/]		48	66
No. calves from Angus				
Clean-up bull		19[1/]		
No. dead calves	4	1	3	0
No. of calves:				
Steers	14	12	8	15
Heifers	10	8	10	12

[1/]One cow removed that had a late Hereford calf.
[2/]Once a day breeding at 8:00 a.m.

Table 11. Actual and adjusted weaning weights, 1978.

	A.I.	System	Natural Service	
			Hereford	Crossbred
	(HxH)	(AxH)	(HxH)	(AxH)
Steers : Actual	407	385	383	419
Adjusted	453	474	449	493
Heifers: Actual	386	353	368	367
Adjusted	441	440	422	424

Table 12. 3 Year breeding management systems summary, 1976-77-78.

	A.I. System		Natural Service		
	A.I. (HxH)	Angus clean-up (AxH)	Hereford (HxH)	Crossbred (AxH)	(HxH)
Total no. cows	182		86	85	
Total no. cows inseminated	180		--	--	
No. sold for mgmt.. reasons	35		29	14	
No. having A.I. calves	62		--	--	
1st service conception Rates, %	34		--	--	
No. cows having (AxH) calves From Angus clean-up bull		82	--	--	
No. dead calves	7	4	10	3	
No. and sex of calves obtained					
Steers	30	48	22	31	3
Heifers	29	34	25	30	4

Table 13. Economics for three breeding management systems, 1978.

	A.I. with Angus clean-up				Nat. Service Hereford			Nat. Service Crossbred		
	No. Head	Avg wt.	(HxH) $value	(AxH) $value	No. head	Avg wt.	$ value	No. head	Avg wt.	$ value
Steers	11	407	3447		8	383	2359	15	419	4839
@77cents	11	385		3261						
Heifers	9	386	2571		10	368	2723	12	367	3259
@74cents	8	354		2096						
Total			6081	5357			5082			8098
Gross return, $			11,375			5082			8098	
Total no. cows calved			44			21			27	
Avg. return/cow calved,$			258.52[1/]			242.00[2/]			299.92	
Less breeding expense,$			-17.19			-11.50			-11.00	
Net return, $			241.33			230.50			288.92	

[1/]Includes 5 dead calves.

[2/]Includes 3 dead calves.

Heifer Management Study

North Dakota stockmen can't afford the luxury of keeping a heifer until she is three years old before she has her first calf. However, heifers bred to calve at two years must be properly managed if the calving season is to be successful. They should be fed so they will be well grown but not fat at calving. They should be bred to calve about three weeks earlier than the cow herd; and, they should be bred to bulls known to sire small framed calves having low birth weights.

Identification of "easy-calving" bulls under natural breeding conditions presents a real problem. One breed of cattle, the Texas Longhorn, is reported to minimize calving difficulties when crossed with Hereford or Angus heifers. However, very little research data is available to confirm or disprove these claims. Several area ranchers have used Longhorn Bulls on first calf heifers with apparent success. However, these crossbred calves are often discounted at market time, due to their type, although little or no performance or carcass data are available to justify these discounts. Other area producers report good success by using small framed Angus bulls on Hereford heifers to reduce calving difficulties.

With these ideas in mind, a trial was designed to compare calving difficulty with first calf Hereford heifers bred to either Angus or Longhorn bulls.

In May, 1975, 40 straightbred Hereford heifers weighing approximately 680 pounds were assigned at random to one of two breeding groups. One group of 20 heifers was exposed to a two year old Longhorn bull while the other group was exposed to a two year old registered Angus bull. Both bulls remained with the heifers from May 7th to July 8th, a period of 62 days. During this period the heifers grazed on fertilized tame grass pasture. Upon removal of the Longhorn and Angus bulls, Polled Hereford bulls were run with the heifers. The heifers grazed on native range until October 16th when they were pregnancy checked. This check revealed one heifer not bred because of an infantile reproductive tract, and two suspected late calves.

In 1976, the trial was repeated with another forty Hereford heifers. The Longhorn and Angus bulls were turned in with the heifers on May 3rd and remained with them until July 1st, a period of 59 days. After July 1st, Polled Hereford bulls were with the heifers until the first of August. All heifers were pregnancy tested on September 14, 1976 by a local veterinarian.

In 1977, third replication of the trial was run using 42 Hereford heifers. Longhorn and Angus bulls were turned in with the heifers in drylot on May 3rd and were turned out on crested wheatgrass pastures on May 20th. Following a 48 day breeding period, the bulls were removed on June 20th and the heifers were pregnancy tested the 10th of August.

The heifers ran together and were wintered as a group until they were moved into calving lots in early February. They were wintered on a full feed of tame hay plus salt and minerals free choice. After calving, each heifer received approximately two pounds of ground oats per day in addition to chopped hay free choice.

A close surveillance and record of each birth included; birth date, weight, sex and ease of delivery. Ease of delivery was scored from 1 to 5 as follows: 1 no help, 2 slight pull, 3 hard pull, 4 Caesarian section, 5 born dead.

Summary of results are shown in tables 14, 15 and 16.

Table 14. Calving difficulty score – heifer management trial 1976-78.

	Angus			Longhorn		
	1976	1977	1978	1976	1977	1978
Calving with:						
(1) No difficulty	16	16	11	19	16	9
(2) Light pull	--	1	5	--	1	--
(3) Hard pull	1	2	3	--	--	--
(4) Caesarian section	--	--	1[1/]	--	--	--
(5) Born dead	--	1	--	--	--	--
Possible live calves	18[2/]	19	20	19	17	9
% born without difficulty	89	84	55	100	94	100

[1/] Heifer died following Caesarian section.
[2/] One heifer removed because of abnormal reproductive tract.

Table 15. Three year calving data – heifer management trial 1976-78.

	Angus	Longhorn
No. heifers/breeding group:		
1976	20	20
1977	20	20
1978	22	20
Total heifers	61	60
No. heifers calving:		
1976	18[1/]	19[2/]
1977	20	17[3/]
1978	20	9[4/]
Total	58	45

[1/]One heifer removed because of abnormal reproductive tract.
[2/] One heifer not included, late calving with a Hereford calf.
[3/]Three heifers not included, late calving with straight Hereford calves.
[4/]Eleven heifers removed that were open when pregnancy tested.

Table 16. Three year average calving data and weaning weight results – 1976-1978 calving seasons.

	Angus				Longhorn X			
	Bulls		Heifers		Bulls		Heifers	
	No. Hd.	Lbs.	No. Hd.	Lbs.	No. Hd.	Lbs.	No. Hd.	Lbs.
Birth weight summary:								
1976	7	70	10	68	13	66	6	58
1977	8	73	12	65	8	63	9	59
1978	11	73	9	69	6	60	3	58
3 yr. avg. wt.	26	72	31	67	27	64	18	58
	Steers		Heifers		Steers		Heifers	
	No. Hd.	Lbs.	No. Hd.	Lbs.	No. Hd.	Lbs.	No. Hd.	Lbs.
Weaning weight summary:								
1976	5	454	10	400	13	407	5	369
1977	7	440	12	425	8	424	7	358
1978	9	510	9	393	4	382	2	385
3 yr. avg. wt.	21	473	31	408	25	408	14	366

Discussion:

Longhorn x Hereford calves during the three year period from 1976-78 have brought an average six dollars less per hundred-weight and have ranged from a three dollar spread in 1976 to a ten dollar spread in 1978.

Summary:

Calving data collected during the past three years indicates the Hereford heifers mated to Longhorn bulls have a minimum of calving difficulty and requires little or no assistance.

Rectal palpation was used during the second week of August each year to identify any late breeding or open heifers. In most instances a high degree of reproductive success has been experienced with both sire types. However, the Longhorn sire used during the 1977 breeding season was sub-fertile and only 45% of the heifers exposed were settled.

Trial results after three years indicate that calving difficulty among Angus sires is highly variable and for those cattlemen with sufficient time and or man power and Angus x Hereford cross is the combination of choice. Although very easy calving, the Longhorn sired steer calves averaged 65 pounds lighter and the heifer calves averaged 42 pounds lighter at weaning than the Black whiteface comparisons.

Because of results with the sub-fertile Longhorn sire in 1977, the trial has been continued for an additional year.

Selling vs. Feeding Open Heifers

By Douglas G. Landblom and James L. Nelson

Heifer management research conducted at this station and others has resulted in the following recommendations: breed 30% more heifers than needed for replacement; start heifers breeding one month before the main cow herd; insure that heifers weigh 650 pounds when breeding starts; use easy calving bulls that are well developed and fertility tested; rely on a short breeding season of 45-50 days; and , pregnancy test in the fall to identify all non-pregnant heifers.

The purpose of this trial is to evaluate the options that cattlemen have in disposing of heifers that have been identified as "open". The first and most obvious option is to sell directly off grass; the second is to feed them to slaughter weight.

In addition to the economic evaluation for selling vs. feeding, the AGNET least cost computer feeding and economic analysis programs, which have not been used for this weight and class of cattle in North Dakota, are also being evaluated.

Hereford heifers averaging 750-800 pounds that were pregnancy tested and determined open were allotted into two groups of six head each. One group was sold at Stockmen's livestock company and the other placed on a finishing ration formulated using the AGNET computer.

While on a starter ration the heifers were given a booster shot for blackleg, malignant edema, hemorrhagic septicemia and enterotoxemia types C & D.

All feeds considered and their prices are shown in table 17, and the ration compositions as they were fed are shown in table 18. The feeds were either chopped or ground, completely mixed and self-fed in feeders of station design. Upon reaching slaughter weights the heifers were sold locally at Stockmen's Livestock Company.

Feeding results and economics are shown in table 19.

Summary:

Heifers were fed to weights which in the past have proven to produce a high percentage of choice carcasses. In this study, local buyer demand was for heavier condition, therefore, the prices received was very disappointing. The amount received came to $43.25 per hundred weight which is approximately $7.00 per hundred weight less than anticipated.

Least cost rations used in this study which were formulated using the AGNET computer service produced good economical gains without and feeding complications being experienced. Feed costs per pound of gain came to 26.7 cents. Although feed costs and daily gains were very acceptable, the high heifer placement cost and low price received resulted in a net loss of $73.73 per head.

Results of this first year's evaluation would certainly favor marketing directly off grass. Future investigations are planned in which marketing grade and yield will be utilized.

Table 17. Feeds and prices considered for least cost ration formulation

Feed	Cost/unit	Feed	Cost/unit
Corn	$2.80/bu.	Oat straw	$20/ton
Wheat	$2.46/bu.	Soybean meal	$240/ton
Barley	$1.40/bu.	Limestone	$50/ton
Oats	$1.00/bu.	Di-calcium phosphorus	$280/ton
Mid bloom alfalfa hay	$45/ton	Salt	$72/ton
Mature alfalfa hay	$40/ton		

Table 18. Raton composition and feed changes used.

		Ration changes [1/]				
Feed	Starter	1	2	3	4	5
Barley, lbs.	150	300	480	630	870	940
Alfalfa, lbs.	425	425	--	200	45	--
Mixed hay, lbs.	418	268	461	--	--	--
Oat straw, lbs.	--	--	50	166	76	50
Di-calcium phosphorus, lbs.	4	4	--	--	--	--
Limestone, lbs.	--	--	6	1	6	7
Salt	3	3	3	3	3	3
Total	1000	1000	1000	1000	1000	1000

[1/]Ration changes were made on a weekly basis with the exception of ration five which was fed for a two week period.

Table 19. Feeding results and economics comparing selling with feeding of open heifers.

	Group I Sold off grass	Group II fed for slaughter
Gain data:		
No. head	6	6
No. days on feed	--	55
Initial weight, lbs.	734	759
Final weight, lbs.	--	905
Gain, lbs.	--	146
Average daily gain, lbs.	--	2.65
Feeding data:		
Feed consumed/head, lbs.	--	1293
Feed/cwt gain, lbs.	--	885
Feed cost/cwt., $	--	3.03
Feed cost/head, $	--	26.82
Returns:		
Heifer value off grass@ $57.75/cwt., $	423.89	438.32
Feed cost/head, $	--	26.82
Heifer cost + feed cost, $		465.14
Value of fat heifer @ $43.25/cwt, $		391.41
Net loss, $		$73.73

Four Feeding Systems For Growing-Finishing Swine

By Douglas G. Landblom, James L. Nelson and Thomas J. Conlon

AGNET computer service which provides the capability of formulating least cost swine rations is available to North Dakota swine producers through their county extensions agents.

This trial is designed to determine the adaptability of the Nebraska based computer for the formulation of rations with North Dakota grown feed grains and for North Dakota climatic conditions; and, to work out the modifications necessary to make the system work for North Dakota producers. The trial compares least cost computer formulated rations with three other feeding options.

Previous work at this station has shown that growing-finishing rations for swine based on two-thirds barley and one-third oats properly supplemented with soybean meal, minerals and vitamins will produce good, economical gains when fed to pigs from 40-230 pounds and formulated to contain 16% protein in the grower phase and 14% protein in the finisher phase.

Crossbred feeder pigs raised at the Dickinson Station weighing 35-60 pounds were allotted by sex and sire into uniform replicated feeding groups of four lots of barrows and four lots of gilts.

Prior to the start of the trial all pigs were wormed with Atgard and vaccinated for erysipelas, and at approximately 100 pounds the pigs were rewormed and continued on feed until finished.

The rations compared were as follows:

a) Grower-finisher rations formulated with the aid of the AGNET computer service.
b) Commercial pelleted grower-finisher ration purchased locally and fed according to the manufacturer's directions. GTA's feed was randomly selected for all of those available in the Dickinson area.
c) Grower-finisher rations formulated using home-grown grains and a commercially prepared protein concentrate. The concentrate used was GTA's "Six-In-One" which was mixed and fed according to GTA's recommendations.
d) Growing-finishing ration recommended by the Dickinson Station, prepared using home-grown grains, soybean meal, vitamins and minerals.

The pigs were housed in concrete floored pens equipped with pole shed shelters, automatic waterers and were self-fed.

Each group of pigs stayed on feed until an average pen weight of 220 pounds was reached at which time all barrows were sold locally at Western Livestock Company. All gilts were retained for breeding purposes.

Table 1. Grower ration composition using home-grown grains. [1/]

Grower	AGNET Ration	Dickinson ration	Six-In-One ration	
			Developer	Grower
Feeding period	40-120 lbs	40-120 lbs	40-70 lbs	70-125 lbs
Alfalfa, lbs.	120	--		
Oats, lbs.	--	285		
Barley, lbs.	--	572	825	875
Hard red spring wheat, lbs.	756	--		
Soybean oilmeal, lbs.	80	120		
Meat and bone meal, lbs.	22	--		
Di-calcium phosphate, lbs.	--	6		
Limestone, bls	2	11		
Trace mineral salt, lbs.	2.5	5		
Vitamin B. complex, lbs.	--	1		
Vitamin A, gms.	--	30		
Vitamin D, gms.	--	14		
Zinc sulfate, gms.	--	180		
GTA's Vita Pack, lbs.	5	--		
GTA's Swine mineral 10, lbs.	12.5	--		
GTA's Six-In-One concentrate, lbs.			175	125
Cost/lbs. inc. processing @$10/ton	.0533	.0562	.0600	.0559

[1/] GTA's complete pelleted swine developer fed from 40-75 lbs. @ $.0788/lb.

Table 2. Finishing ration composition using home-grown grains. [1/]

Finisher:	AGNET ration	Dickinson ration	Six-In-One ration
Feeding period	120-220 lbs	120-220 lbs	125-220 lbs
Alfalfa, lbs.	70	--	--
Oats, lbs.	--	285	--
Barley, lbs.	--	613	912.5
Hard red spring wheat, lbs.	860	--	--
Soybean oilmeal, lbs.	45	80	--
Meat and bonemeal, lbs.	2	--	--
Di-calcium phosphate, lbs.	--	6	--
Limestone, lbs.	2	10	--
Trace mineral salt, lbs.	2.5	5	--
Vitamin B complex, lbs.	--	1	--
Vitamin A, gms.	--	30	--
Vitamin D, gms.	--	14	--
Zinc sulfate, gms.	--	180	--
GTA's Vita Pack, lbs.	5	--	2.5
GTA's Six-In-One concentrate, lbs.	--	--	75
GTA's Swine mineral 10, lbs.	13	--	10
L-Lysine	.6		
Cost/lb. inc. processing @ $10/ton	.04927	.05303	.05391

[1/] GTA's complete pelleted swine finisher fed from 75-220 lbs. @ $.064/lb.

Table 3. Gains, feed data and returns for four rations for growing-finishing hogs.

	Dickinson Ration		GTA Commercial ration		AGNET ration		Six-In-One ration	
	Barrows	Gilts	Barrow	Gilts	Barrow	Gilts	Barrow	Gilts
No. head	6	6	6	5[1/]	6	6	6	6
Days on feed	119	119	105	112	112	126	126	126
Initial wt., lbs.	46	48	48	48	46	48	45	49
Final wt., lbs.	219	230	229	222	227	218	225	222
Gain, lbs.	173	182	181	174	181	170	180	173
ADG, lbs.	1.45	1.53	1.72	1.55	1.61	1.35	1.43	1.37
Feed data:								
Feed/hd/day,lbs.	5.90	5.72	5.70	5.50	6.20	5.80	5.59	5.91
Feed/lbs. of gain Lbs.	4.06	3.74	3.31	3.55	3.85	4.29	4.08	4.13
Feed consumed/ Hd., lbs.	702	681	598	617	719	731	745	704
Economics:								
Feed cost/lb., $	.0546	.0545	.0660	.0659	.0508	.0506	.0551	.0550
Feed cost/hd., $	38.31	37.12	39.50	40.67	36.52	36.97	38.80	41.02
Gross return/hd., $@47.75/cwt	104.57	109.82	109.34	106.00	108.39	104.10	107.43	106.00
Feeder pig Costs, $	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Feed cost, $	38.31	37.12	39.50	40.67	36.52	36.97	38.80	41.02
Net return, $	16.26	22.70	19.84	15.33	21.87	17.13	18.63	14.98
Avg. net return, $	19.48		17.58		19.50		16.80	

[1/] Gilt was removed due to lameness.

Summary:

The results of this trial indicate that feeding the pelleted commercial ration produced faster and more efficient gains than did any of the other rations fed in meal form, which resulted in an average 18 days less feeding time when compared to the poorest performing meal ration formulated using Six-In-One concentrate and home-grown grains.

The least cost computer and the hand calculated home-grown Dickinson Station rations, which were fed in the meal form, were slightly less efficient. However the cost per pound of feed was 1 ½ cents cheaper which resulted in a net return over feed and feeder pig costs of $2 more per head when compared to the pigs fed commercial pellets.

Breeding Gilts And Sows Artificially Using Frozen Semen

By Douglas G. Landblom and James L. Nelson

This trial was designed to further investigate conception rate and litter size, as well as semen handling, timing and insemination techniques according to current recommendations using gilts and second litter sows under typical farm conditions.

In this experiment virgin gilts and second litter sows were randomly assigned to either a natural or A.I. breeding treatment. The naturally bred gilts were pen mated to fertile Yorkshire boars which were rotated on an every other day basis until breeding was completed. Breeding activity was checked twice daily and recorded.

Females used in the A.I. treatment were checked for standing heat twice daily using and intact detector boar. Twelve hours following detection of standing heat the gilts were inseminated with extended thawed semen, using procedures outlined by International Boar Semen, a division of United Suppliers, Inc., of Eldora, Iowa. A second insemination was given 12 hours after the first insemination so that each female would receive two inseminations within 24 hours after having been detected as being in standing heat. Semen used in this breeding study was specially prepared by International Boar Semen so that three swine breeds were represented in each ampule used to reduce sire variability. The following breeds were used for gilts: Duroc, Landrace, Chester White, and for second litter sows: York, Duroc and Landrace.

Following insemination the gilts were checked for return to estrus using a detector boar.

During the last half of 1977 and 1978 three groups of gilts and one group of second litter sows have been compared and the data collected thus far have been summarized in table 4.

Summary:

Three farrowing involving gilts and one farrowing of second litter sows have been completed. Data accumulation among gilts in this A.I. study has resulted in the following trends when compared to natural service: a 10% reduction in conception rate; 1.2 less pigs born alive (8.8 vs 10); and .6 less pigs weaned per gilt (8.1 vs 8.7).

Artificially sired offspring have been superior in quality and well accepted by buyers who have purchased excess feeder pigs from the station.

Results of this study indicate that both purebred and commercial pork producers can capitalize on the advantages of swine A.I. using frozen semen. Just how A.I. is used by the individual pork producer will depend upon his breeding objective. Purebred breeders have the opportunity to sample a large number of bloodlines at a very reasonable cost to produce genetically superior offspring. On the other hand, A.I. enables commercial pork producers to close their herds and thus reduce the risk of importing potentially hazardous disease organisms. Using A.I. on a herd wide basis is not recommended. However, interested commercial hogmen should look to it as a means for producing genetically superior replacement gilts and herd boars to be used under natural breeding conditions.

Although a large genetic pool and breeding flexibility is available through A.I., experience gleaned at this station clearly indicates that above average management is necessary in order for swine A.I. to be a success.

Table 4. Summary A.I. vs natural service 1977-78.

	Gilts		2nd litter sows	
	A.I.	Natural service	A.I.	Natural service
Fall 1977 gilts:				
No. head	11	11		
No. settled	9	11		
Percent conception	90	100		
Pigs born alive	8.8	8.9		
Pigs weaned	7.8	6.5		
Spring 1978 gilts:				
No. head	9	11	10	10
No. settled	7	8	6	8
Percent conception	78	73	60	80
Pigs born alive	9.5	10.8	11.7	12.5
Pigs weaned	8.9	10.1	9.1	10.6
Fall 1978 gilts:				
No. head	12	12		
No. settled	8	10		
Percent conception	67	83		
Pigs born alive	8	10.3		
Pigs weaned	7.6	9.5		
3 Farrowing averages:				
No. head	32	34		
No. settled	24	28		
Percent conception	75	85		
Pigs born alive	8.8	10		
Pigs weaned	8.1	8.7		

Report of
Range and Pasture Management
And other
Grass & Legume Investigations
At the
Dickinson Experiment Station

By

Paul Nyren
Harold Goetz
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Botany Department, NDSU

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1975 New Alfalfa Trial

A second alfalfa trial was established at the Dickinson Experiment Station in the spring of 1975 to test the new varieties in the trial. Thor was included twice, once with the standard inoculant and once with a commercial seed treatment called innonculime. The plots were 12 by 27 feet and replicated four times.

In 1978, because of adequate replenishment of subsoil moisture from heavy snowfall and plentiful spring rains, two harvests were made on the alfalfa plots; the first was done June 6, and the second on July 28. In the first harvest, all varieties showed substantial increases over the previous years production. Increases in production for 1978, when compared to the 1977, 1976 yields, ranged from 1360 to 3535 lbs./acre for the first harvest.

The variety Kane was again the highest producer for the first harvest of 1978 (5468 lbs./acre); Kane produced 2292 lbs. more forage in 1978 than in 1976, and 3260 lbs. more than in 1977. The next highest producing variety, for the first harvest of 1978, was Gladiator with 4914 lbs./acre. The lowest was G-777 with 3786 lbs./acre. The other varieties were similar in production, yielding 4180 to 4788 lbs./acre. Average first harvest of all varieties was 4587 lbs./acre. Production from the second harvest in 1978 ranged from 890 to 1533 lbs./acre; Spredor being the lowest producing and Thor (Noculized) the highest.

In most cases the production was lower for the second harvest of 1978 when compared to 1976 second harvest. The average production of all varieties in 1978 was 1300 lbs./acre.

Total production for 1978 (first and second harvests) ranged from 5259 to 6809 lbs./acre. Four varieties yielded more than 3 ton/acre; SX-10 (6095 lbs./acre). Polar (6104 lbs./acre). Gladiator (6179 lbs./acre), and Kane (6809 lbs./acre). Yields for 1978 were exceptionally good for all varieties. Kane remains the highest producing alfalfa variety when considering total yield and the first harvest. All varieties showed good recovery from two years of spring drought conditions.

Table 1. 1978 New alfalfa trial (yields dry weight – lbs./acre 1st & 2nd harvest.

	Harvest						Total Production			
	1978		1977		1976					3-yr.
	1st	2nd	1st	2nd*	1st	2nd	1978	1977	1976	Avg.
Embro A-57	4180	1460	1411	--	2441	1347	5640	1411	3788	3613
SX-10	4788	1307	1620	--	2573	1561	6095	1620	4143	3950
Polar	4614	1490	1397	--	1764	1601	6104	1397	3365	3622
Spredor	4679	890	1389	--	2529	1031	5569	1389	3560	3506
Thor (N.Liz.)	4382	1533	1354	--	2455	1353	5915	1354	3808	3692
Kane	5468	1341	2208	--	3176	1772	6809	2208	4948	4655
WL- 310	4416	1126	1460	--	2750	1586	5542	1460	4336	3779
Gladiator	4914	1265	1425	--	2647	1443	6179	1425	4090	3898
G-777	3786	1473	1173	--	2426	1641	5259	1173	4067	3500
Thor (N. Lim.)	4517	1295	1055	--	2485	1606	5812	1055	4091	3652
Valor	4717	1119	1182	--	3000	1538	5836	1182	4538	3852
Average	4587	1300	1425	--	2568	1498	5887	1425	4065	3792

*No 2nd harvest in 1977 (lack of regrowth)

Grass Adaptation Trial

The grass adaptation trial seeded in 1972 was harvested for the sixth year in 1978. Production fluctuated when compared to that of the previous year; half of the grass varieties harvested increased and half decreased. Production increases-decreases varied from 975 lbs./acre above to 1397 lbs./acre below production for 1977. Mandan ricegrass and Indian ricegrass, because of poor stand establishment were not harvested during any years of the study. This years forage production shows well the recovery of certain varieties from two years of spring drought conditions.

In 1978 turkey brome was the highest producer with 3274 lbs/ of forage per acre. Durar hard fescue was next highest with 2161 lbs./acre production; Sheep fescue and VInall Russian wildrye were third highest with forage yields of 2099 and 1908 lbs./acre respectively. Basin wildrye (SCS) was fourth in production (1698 lbs./acre) but this is misleading as both varieties of Basin wildrye as well as Altai wildrye are definitely declining in stand vigor and in most cases the plot is not worth harvesting. This decline can also be seen in the production of the other Basin wildrye and Altai wildrye plots that were harvested; their yields were 1147 and 949 lbs./acre respectively, both showing a substantial decrease from 1977 yields (Basin wildrye (pull.) decreased 466 lbs. and Altai wildrye (SCS) decreased 1397 lbs.).

The other varieties ranged in production for 588 to 1482 lbs./acre with seven varieties showing substantial decreases in production with compared to 1977 yields (these are: Pubesent wheatgrass – 759, Sodar wheatgrass, Montana wheatgrass, Basin wildrye (Pull.), Lodorm green stipa, Altai wildrye (SCA), and Mandan wildrye). These decreases ranged from 135 to 1397 lbs./acre. Lincoln brome and western wheatgrass 456 showed small decreases from 1977 yields. Three varieties (Topar busescent wheatgrass, Mandan 404 brome, and Nordan crested wheatgrass) and substantial increases ranging from 202 lbs. to 552 lbs./acre, over 1977 yields with respective yields of 1482, 1245, and 1238 lbs./acre. Green stipa (SCS) showed a small increase from 1977 production.

Turkey brome had the highest average production (a 5 year average) with 3957 lbs./ace. When considering the poor stands of Altai wildrye and Basin Wildrye, Pubescent wheatgrass 759 would have the second highest yield with a forage production of 2952 lbs./acre (a 6 year average). Green stipa (SCS) had the lowest average production with 1751 lbs./acre (a 5 year average).

This year's production data indicates that the bunch grasses (Turkey brome, Durar hard fescue, Sheep fescue, and Vinall Russian Wildrye) show a definite recovery from early spring drought. These four bunch grasses had the largest increases over 1977 yields of all varieties; these increases were 975, 468, 757, and 910 lbs./acre respectively.

Table 2. Grass adaptation trial (lbs./acre – dry weight yield).

Grass variety	1978	1977	Amount Inc. or dec. from 1977	1976	1975	1974	1973	Average production
Turkey brome	3274	2299	+975	3181	5679	5355	NH	3957 [5/]
Pubescent wheatgrass 759	1464	1599	-135	2056	4999	4042	3551	2952
Lincoln brome	1311	1342	-31	1489	4280	5001	1512	2489
Topar Pub. Wheatgrass	1482	930	+552	1684	4237	3629	1646	2268
Mandan 404 brome	1245	987	+258	1384	3587	3772	1630	2100
Nordan crested	1238	1036	+202	1805	4176	2484	2199	2156
Lodorn green stipa	1005	1356	-351	1781	3309	2418	NH	1974
Sodar wheatgrass	1438	1708	-270	1991	3692	3804	829	2243
Mandan wildrye	588	797	-209	1384	2871	3927	1427	1832
Durar hard fescue	2161	1693	+468	1983	2302	3794	1136	2178
Western wheatgrass 456	1099	1152	-53	1352	3081	2689	1381	1792
Vinall Russian wildrye	1908	998	+910	1449	2766	3891	471	1914
Montana wheatgrass	1161	1468	-307	1443	2724	3679	711	1864
Green stipa (SCS)	1248	1202	+46	1756	2700	1850	NH	1751 [5/]
Sheep fescue	2099	1332	+767	1756	2270	2246	NH	1940 [5/]
Basin wildrye (SCS)	1697	1510	+188	3416	5286	NH	NH	2977 [4/]
Basin wildrye (Pull.)	1147	1613	+466	3003	3706	NH	NH	2367 [4/]
Altai wildrye (SCS)	949	2346	-1397	4258	NH	NH	2614	2542 [4/]
Altai wildrye (Sask.)	NH	NH	NH	4412	NH	NH	1933	3172 [2/]
Mandan ricegrass	NH	NH	NH	NH	NH	NH	NH	NH
Indian ricegrass	NH	NH	NH	NH	NH	NH	NH	NH

NH- not harvested because of insufficient stand or plant invasion.

[2/] 2 year average

[4/] 4 year average

[5/] 5 year average

Interseeding of Native
Mixed Prairie in Western North Dakota

In the fall of 1969 a small plot interseeding trial was seeded a the Dickinson Experiment Station in southwestern North Dakota. The area used for the study was native mixed grass prairie dominated by western wheatgrass and green needlegrass on Morton fine sandy loam soils. Five species of grasses and five legumes were seeded in rows on 50 x 150 foot plots replicated three times. Species used in the trial were western wheatgrass, green needlegrass, crested wheatgrass, Russian Wildrye, smooth bromegrass, crested wheatgrass, Russian wildrye, smooth bromegrass, Ladak, Vernal, Travois alfalfa, Eski sanfoin and Emerald crownvetch. In addition to the above species a check-plowed treatment was also included where the plots were treated with the machine but not seeded.

The plots were seeded with a two row machine which mounted on the standard farm tractor three point hitch. The machine used a lister blade to open and remove the sod from a 14 inch strip. The blade was followed by stationary seed tubes which deposited the seed. The seed was then covered and the seedbed firmed by a metal pack wheel. The seed boxes utilized a fluted seed metering wheel which handled all species satisfactorily. The rate of seeding, however, was difficult to control on the legumes with a heavier than normal rate being applied. The grasses were seeded at a rate of 15 pounds per acre and the legumes at 8 pounds per acre.

All interseeded species germinated well in the spring of 1970 but a week of hot weather caused high mortality among some of the species. Western wheatgrass, Russian wildrye, Eski sainfoin, and Emerald crownvetch never recovered sufficiently to warrant further study.

Forage yields were taken by clipping nine frames 12 by 80 inches in each plot. The samples clipped from each frame were separated into grasses, forbs, and interseeded species. Percent composition of the individual species was estimated and the height of both the seed stalks and leaves of the grasses were measured. Total height measurements were taken for the forbs. Following harvest the samples were dried at 150° F. and oven dried weights recorded.

The above average precipitation in the fall of 1977 helped give above average production in 1978. All the plots harvested produced well above 1977 (see table 3). The highest total producing plot was Lakak with 5802 lbs/A and increase of 3231 lbs/A over 1977 and 2620 over the 8 year average. All the alfalfa interseeded plots produced over 2 ton/A. All the grass plots produced nearly the same amount with smooth brome (Bromis inermis) highest. Table 4 lists the 8 year average forage yields. The total production of all plots was above the 8 year average. Mid grasses increased over the 8 year average on all plots while short grasses decreased in every case. Forb yields were higher on all plots except smooth brome. The increase in forb production was made up of perennial forbs in all cases although the annual forb production did rise slightly on the check plots.

Table 5 gives the percent increases a decrease as compared to the check plowed plots. The check plots show an increase of 0.4 percent indicating that the physical disturbance of the sod by the interseeded has slightly decreased production over the 8 years of the trial. Smooth brome at 6.6% is the only grass which has increased the forage production. Travois and Lakak alfalfa are nearly equal at 38.1% and 37.6% respectively followed by Vernal at 33.9% a close third.

Table 3. 1978 Range interseeding trial.

Treatment	Grasses			Forbes			Inter-seeded spp.	Total Yield
	Mid	Short	Total	Per.	Ann.	Total		
	Dry weight yields in lbs/acre.							
Check plowed	2067b	343bc	2410b	268bed	20cd	388bed	314c	3112c
Check	1589a	686a	2275b	528a	83a	611a	0c	2886c
Crested wheat-Grass	1421c	320bc	1741c	433abc	41bc	474abc	378c	2593c
Smooth brome	2170b	190cd	2360b	201c	19cd	220c	373c	2953c
Green needle-Grass	1643c	382b	2025bc	480ab	54b	534ab	75c	2634c
Ladak	2681a	198cd	2879a	347bcde	10d	357cde	2566a	5802a
Travois	2121b	87d	2208b	325cde	2d	327cde	2181ab	4716b
Vernal	2254b	161d	2415b	261de	6d	267de	1989b	4580b

Table 4. 1971-78 Range interceding trial.

Treatment	Grasses			Forbs			Inter-seeded spp.	Total yield
	Mid	Short	Total	Per.	Ann.	Total		
	Dry weight yields in lbs/acre							
Check plowed	1333	415	1748	320	38	358	206	2313
Check	1179	787	1966	327	30	357	NA	2323
Crested wheat-Grass	1095	478	1573	355	52	407	250	2230
Smooth brome	1584	358	1942	239	23	262	260	2464
Green needle-Grass	1326	456	1782	389	60	449	79	2310
Ladak	1641	375	2016	283	28	311	855	3182
Travois	1436	192	1628	226	47	273	1292	3193
Vernal	1540	373	1913	221	30	250	934	3097

Table 5. 1971-78 Range interseeding trial (% increase (+) or decrease (-) in yield in relation to check-plowed.

Treatment	Grasses			Forbs			Inter-seeded spp.	Total yield
	Mid	Short	Total	Per.	Ann.	Total		
	Dry weight yields in lbs/acre							
Check plowed	1333	415	1748	320	38	358	206	2312
Check	-11.5	-89.6	+12.5	+2.2	-21.0	-0.3	NA	+0.4
Crested wheat-Grass	-17.8	+15.2	-10.0	+10.9	+36.8	+13.7	+21.3	-3.5
Smooth brome	+18.8	-13.7	+11.1	+25.3	-39.5	-26.8	+26.2	+6.6
Green stipa	-0.5	+9.9	+1.9	+21.5	+57.9	+25.4	-61.6	-0.1
Lakak	+23.1	-9.6	+15.3	-11.5	-26.3	-13.1	+315.0	+37.6
Tavois	+7.7	-53.7	-6.8	-29.4	+23.7	-23.7	+527.2	+38.1
Vernal	+15.5	-10.1	+9.4	-30.9	-21.0	-30.1	+353.4	+33.9

Interseeding Pasture Grazing Trial

The pastures interseeded in the spring of 1976-1977 were grazed by 10 cow-calf pairs during the 1978 season. The trial consisted of three interseeded pastures; one seeded to Travois alfalfa one to Russian wildrye and one treated with the interseeded but not seeded (control interseeded). In addition, a pasture fertilized with 50 lbs nitrogen per acre and an unfertilized pasture were also included. In order to maintain an even grazing intensity the size of the pastures and grazing period were varied. (See table 6).

Forage production was very good on all pastures during the 1978 growing season. All the pastures nearly one ton per acre and the fertilized pasture produced almost two tons per acre. Forage utilization varied from a high of 61% on the interseeded Russian wildrye to a low 52% on the control interseeded pasture.

The grazing period ranged from 60 days on the interseeded Russian wildrye to 49 days on both the control and Travois interseeded pastures. The animals were turned on the fertilized native on July 10, 21 days late than on the other four pastures. This delay was due to the added forage available to these animals on the crested wheatgrass pastures used for early spring grazing.

While the amount of beef produced on the cows is not generally sold at the end of the season, it is reflection of their general condition. Cow gains varied considerably between the 5 pastures. Average daily gains (ADG) ranged from a low of -0.9 on the fertilized to a high of 2.1 on the control interseeded pasture. (See Table 7). The small difference between the unfertilized and Russian wildrye is not unexpected. The stand of Russian wildrye is very poor despite repeated attempts to improve it. It seems that even with sod control, Russian wildrye cannot compete with the native plants. Those plants which seemed to be established in the fall of 1977 were hard to find this year. In addition to this we also noted an increase in the amount of physical damage to the interseeded rows by the animals. Grazing in 1977 by heifers to the interseeded rows by the animals. Grazing in 1977 by heifers showed less damage than from cow-calf pairs. It would seem that the calves especially, seek out these rows to walk on avoiding the taller grass and in so doing cause a great deal more damage. The reason for the poor gains on the fertilized pastures is difficult to explain. One reason could be the rapid growth these cows had made on the crested wheatgrass pasture grazed prior to their being turned on the native. During that 56 day period they gained 1.9 pounds per head per day. Gains per acre were similar to the ADG with the control interseeded pastures producing 101 pounds per acre of beef for the 49 day grazing period (see table 7).

Calf gains varied less than the cow gains between the five pastures (see table 8). The control and Travois interseeded pastures were highest with ADG per head of 2.3 pounds. Lowest was the fertilized with 1.3 pounds. Gains per acre were impressive on the control and Travois interseeded pastures both with 113 pounds of gain per acre. While the fertilized native was lowest in ADG per head it was second in gain per acre with 79 pounds. This is dure to the longer grazing period; 69 days compared to 49 for the control and Travois pastures, and smaller size of the fertilized pasture.

Total beef production on the five pastures shows the control interseeded pasture with 17% more beef production than the second highest producer and 210% increase over the lowest producing pasture. The high beef production on the control interseeded pastures cannot be explained dur to the interseeding treatment. It is possible that the mechanical disturbance of the interseeder can improve gains by stimulating forage production. However, this was not the case as we see in table 6. The forage

production on the control pasture was nearly the same as the unfertilized, and Russian wildrye pastures and much lower than the fertilized pasture.

Because of the small pastures, lack of opportunity to replicate pasture treatments and limited numbers of cattle available it will be necessary to continue the trial for several grazing seasons before results can be considered conclusive.

Table 6. Forage production and utilization during the grazing periods on crested wheatgrass, native grass, and Russian wildrye pastures – 1978 season.

Pastures	Pasture Size acres	Period grazed	Days in period	Forage produced lbs/acre	Forage utilized lbs/acre	Forage left on ground lbs/acre	Percent utilization
Unfertilized native	18	6/19-8/14	56	1954	1141	813	58
Fertilized Native 50lbs N/A	12	7/10-9/15	67	3943	2270	1673	58
Interseeded Control	10	6/19-8/7	49	1980	1027	953	52
Interseeded Travois alfalfa	10	6/19-8/7	49	2290	1272	1018	56
Interseeded Russian wildrye	15	6/19-8/14	60	2064	1256	808	61

Table 7. Interseeded pasture grazing trial, weights and gains of cows and one bull on the control, interseeded alfalfa, interseeded Russian wildrye, fertilized and unfertilized pastures. 1978 season.

Pastures	Period Grazed	Days in period	No. of cows & bull	Avg. Initial wt./cow lbs.	Avg. final wt./cow lbs.	Avg. gain/hd lbs.	Avg. daily gain/hd lbs.	Avg. gain/A lbs.
Unfertilized Native	6/19-8/14 (3/19-8/14)	56 (56)	10 (1)	1044 (1115)	1069 (1145)	25 (30)	0.4 (0.5)	14 (2)
Fertilized Native 50# N/A	7/10-9/15 (7/10-8/7)	67 (28)	10 (1)	1066 (1000)	1008 (1040)	-58 (40)	-0.9 (1.4)	-5 (3)
Interseeded Control	6/19-8/7 (6/19-8/7)	49 (49)	10[2/] (1)	1021 (1040)	1122 (1100)	101 (60)	2.1 (1.2)	101 (6)
Interseeded Travois alfalfa	6/19-8/7 (6/19-8/7)	49 (49)	10 (1)	1034 (1145)	1106 (1175)	72 (30)	1.5 (0.6)	72 (3)
Interseeded Russian wildrye	6/19-8/14 (6/19-8/14)	60 (60)	10 (1)	1018 (1215)	1049 (1200)	31 (-15)	0.5 (-0.25)	21 (-1)

1. ( ) indicates data pertaining to bulls.
2. On 7-17 cow number 524 and her calf were removed and replaced due to sickness

Table 8. Interseeded pasture grazing trial, weights and gains of calves on the control, interseeded, alfalfa interseeded Russian wildrye, fertilized and unfertilized pastures. 1978 season.

Pastures	Period Grazed	Days in period	No.of calves	Avg. initial wt./calf lbs.	Avg. final wt./calf lbs.	Avg. gain/hd lbs.	Avg. daily gain/hd lbs.	Avg. gain/A lbs.	Total gain Cows-calves bull, lbs/A
Unfertilized Native	6/19-8/14	56	10	228	328	100	1.8	56	72
Fertilized Native 50 lbs N/A	7/10-9/15	67	10	255	342	87	1.3	73	71
Interseeded Control	6/19-8/7	49	10[1/]	219	332	113	2.3	113	220
Interseeded Travois Alfalfa	6/19-8/7	49	10	227	340	113	2.3	113	188
Interseeded Russian	6/19-8/14	60	10	228	332	104	1.7	69	89

[1/] On 7/17 one calf was replaced with another due to sickness.

Techniques For Interseeding Native Range

In 1977 a study was undertaken to evaluate methods of seeding grasses and legumes into an already established vegetation cover (interseeding). In 1977 small plots were established using the John Deere 1500 Powr-till drill and herbicides to control plant competition. When this method proved to be to expensive and unpredictable the Melroe 701 drill was adapted to interseeding by modifying the seeding assemblies. A Melroe 702 drill was rented in the spring of 1978 and the modifications reworked to fit the new machine.

A small plot trial was undertaken in the spring to study the optimum width of the sod control strip and the benefits of applying nitrogen (N) and phosphorus (P) fertilizer. Three species were seeded in these trials; Green stipa (Stipa viri-dula), Russian wildrye (Elymus juncius), and Travois alfalfa (Medicago sativa var. Travois).

Treatments included in this study were: 1) no sweep which was a straight coulter and the seed shoe which made a on inch furrow. 2) narrow sweep consisting of a double coulter followed by a shank with a two inch sweep attached, followed by a seed shoe assembly. 3) wide sweep which was similar to 2 but with a 12 inch sweep attached. 4) low fertility; number 3 but with 51 lbs N/A and 22 lbs P/A and, 5) high fertility; same as number 3 but with 90 lbs N/A and 40 lbs P applied.

Seedlings counts were taken to determine seedlings survival in the fall of 1978. These data show that alfalfa was by far the most vigorous species (table 9). The alfalfa plots produced an average of 6.6 seedlings per foot of row while the Russian wildrye and green stipa produced 1.4 and 0.73 respectively. The grass seedlings showed no significant difference between any of the fertility rates except on the Russian wildrye, here the low fertility rates except on the Russian wildrye, here the low fertility was significantly better than the unfertilized. On the Travois plots however, the application of fertilizer significantly decreased the number of seedlings.

It was observed that while there were more seedlings on the narrow sweep and no sweep plots they were smaller and less vigorous than those on the wide sweep or fertility plots. Height measurements gave an indication of the amount of vari-ability (table 10). The application of fertilizer significantly increased the height of the alfalfa seedlings while the competition from the native sod on no sweep plots significantly decreased the height.

The benefits of interseeding which will b attained in future years will be offset somewhat by loss of production due to sod control. Table 10 shows the forage production of the 5 treatments. The check plots produced significantly more forage than any of the interseeding treatments with 3600 lbs/A. The addition of fertilizer significantly increased the forage production form the interseeded native range. The unfertilized plots treated with the 12 inch sweep (No. 3) produced significantly less forage than all the other treatments except the no sweep plots.

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Table 9. Number of seedlings per foot of row.

Treatment	Russian wildrye	Green needlegrass	Travois alfalfa
Narrow sweep	2.27 a[1/]	.58 ab	9.38 ab
No sweep	.29 b	.40 b	10.75 a
No fertilizer	.89 b	.64 ab	6.40 bc
Low fertilizer	2.24 a	.66 ab	3.89 c
High fertilizer	1.35 ab	1.35 a	2.87 c
Average	1.41	.72	6.66

[1/] Values followed by the same letter are not significantly different at the .05 level.

Table 10. Seedling height and forage production.

	Seedling height (inches)	Forage Yield (lbs/A)
Narrow sweep	4.8 b [1/]	2856 b
No sweep	4.0 c	2606 bc
No fertilizer	5.0 b	2088 c
Low fertilizer	8.2 a	2823 b
High fertilizer	8.8 a	2722 b
Check	--	3600 a

[1/] Values followed by the same letter are not significantly different at the .05 level.

Three Pasture Grazing System For Cow-Calf Production

The second year of the three pasture grazing system with cow-calf pairs was completed in 1978. Forage production, as well as beef gains on most pastures, were up from the 1977 season.

The cow-calf trial compares animal performance on both fertilized and unfertilized three pasture grazing system. The system consists of crested wheatgrass for spring and early summer, native for mid to late summer, and Russian wildrye for fall grazing. The fertilized system receives 50 lbs N/acre on the crested and native and 50 lbs N and 30 lbs P_2O_5/acre on the Russian wildrye. None of the pastures in the unfertilized system received fertilizer. Ten cow-calf pairs were grazed on each of the two pasture systems.

Precipitation in the fall of 1977 was nearly 7 inches above average. This, along with well disturbed average seasonal precipitation and cool growing season temperatures combined to produce forage yields on all pastures that were well above the yields of 1977. (See table 11) The large increase which occurred on the fertilized crested and native were probably due to some residual N remaining in the soil from the 1977 growing season. This is especially true on the crested where the early growth was severely decreased in 1977 by the lack of spring rain.

Lacking precipitation, the grass cannot make adequate growth to utilize the N applied. If this remaining N is not lost through leaching or volatilization it will be available to the plants the following year.

In addition to the 3426 lbs/acre of forage utilized on the fertilized crested wheatgrass another 625 lbs/acre was removed as baled hay in early September. Under normal circumstances this standing hay would be left on the pasture until spring to catch snow during the winter. This was not done because the unfertilized pasture to which it is compared did not have such vegetation and the added moisture from the trapped snow would have introduced another variable into the trial.

Forage utilization was lower on the Russian wildrye than in previous years. This was caused by the large amount of seed stalks produced by the above average precipitation. The seed stalks dry before the leaves do, become coarse and unpalatable, and are not grazed.

One of the benefits of N fertilizer is that it increases the growth rate of the grasses in the spring. This earlier growth allows an earlier turnout date and therefore a longer grazing season. The cows and their calves on the fertilized crested pastures were turned in on May 15 and those on the unfertilized crested on May 22. Gains, like the forage production, was much higher on the fertilized than unfertilized crested.

The cows has average daily gains (ADG) of 2.0 lbs on the unfertilized and only 1.9 lbs on the fertilized; however, the grazing period was twice as long on the fertilized crested and the pasture only one-half as large. These factors combined to give 297% more beef production per acre on the fertilized pasture (see table 12). The calves on crested had a slightly higher ADG on the fertilized pastures but again the size and time differences made the gains per acre much higher on the fertilized pastures (see table 13.)

Because of the longer grazing period on the fertilized crested the cows and calves were moved to the fertilized native on July 10 while those on the unfertilized system were moved on June 19. Cow gains on

native were much poorer than on crested with ADG of 0.4 lbs on the unfertilized and losses of 0.9 lbs on the fertilized. This poor performance is difficult to explain except that the cows on the crested had made such fast gains that could not be maintained when they were moves to the less nutritious native. The calves showed better performance on the native making ADG of 1.8 lbs on the unfertilized better on the fertilized (73 lbs/acre) than the unfertilized (56 lbs/acre.)

Cow gains on the fertilized Russian wildrye pastures were better then on the unfertilized with ADG of 0.3 and 1.5 lbs respectively. Gains per acre were much higher on the fertilized Russian with 52 lbs/acre compared to 9 lbs/acre for the unfertilized. The calves made better ADG on the unfertilized (1.8 lbs) than on the fertilized (1.5lbs) but again the longer grazing period on the fertilized pastures gave them a slight edge, 51 and 52 lbs respectively.

Total beef production from the pastures was good during the 1978 grazing season. The cows on the fertilized system gained 221% more than those on the unfertilized while the calves from the fertilized pastures gained 85% more. Total gains for the 130 days on the unfertilized system were 65 lbs/acre while those for the 178 days on the fertilized system were 146 lbs/acre.

Table 11. Forage production and utilization during the grazing periods on crested wheatgrass, native grass, and Russian wildrye pastures – 1978.

Pastures	Pasture size Acres	Period grazed	Days in period	Forage produced lbs/acre	Forage utilized lbs/acre	Forage left on ground lbs/acre	Percent utilization
Crested wheatgrass (unfertilized)	16	5/22-6/19	28	2030	1068	962	53
Crested wheatgrass +50 lbs N/A	8	5/15-7/10	56	5060	3426[1/]	1634	68
Native grass (unfertilized)	18	6/19-8/14	56	1954	1141	813	58
Native grass +50 lbs N/A	12	7/10-9/15	67	3943	2270	1673	58
Russian wildrye (unfertilized)	16	8/14-9/29	46	1760	1320	440	75
Russian wildrye +50 lbs N & 30 lbs P_2O_5/A	16	9/15-11/9	55	2727	1963	764	72

[1/] 625 lbs/acre of hay was removed in early September.

Table 12. Pasture systems grazing trial, weights and gains of cows and one bull on crested wheatgrass, native grass, and Russian wildrye pastures – 1978.

Pastures	Period Grazed	Days in period	No.of cows & bull [1/]	Avg. initial wt./cow lbs.	Avg. final wt./cow lbs.	Avg. gain/hd lbs.	Avg. daily gain/hd lbs.	Avg. gain/A lbs..
Crested wheatgrass (unfertilized)	5/22-6/19	28	10 (0)	990	1044	55	2.0	34
Crested wheatgrass +50 lbs. N/A	5/15-7/10 6/12-7/10	56 (28)	10 (1)	958 (885)	1066 (1000)	108 (115)	1.9 (4.1)	135 (14)
Native grass (unfertilized)	6/19-8/14	56 (56)	10 (1)	1044 (115)	1069 (1145)	25 (30)	0.4 (0.5)	14 (2)
Native grass +50 lbs N/A	7/10-9/15 (7/10-8/7)	67 (28)	10 (1)	1066 (1000)	1008 (1040)	-58 (40)	-0.9 (1.4)	-5 (3)
Russian wildrye (unfertilized)	8/14-9/29	46	10	1070	1084	14	0.3	9
Russian wildrye +50 lbs N & 30lbs P_2O_5/A	9/15-11/9	55	10	1008	1092	84	1.5	52

[1/]( ) indicates data pertaining to bulls.

Table 13. Pasture systems grazing trial, weights and gains of calves on crested wheatgrass, native grass, and Russian wildrye pastures – 1978.

Pastures	Period Grazed	Days in period	No.of calves	Avg. initial wt./calf lbs.	Avg. final wt./calf lbs.	Avg. gain/hd lbs.	Avg. daily gain/hd lbs.	Avg. gain/A
Crested wheatgrass (unfertilized)	5/22-6/19	28	10	180	228	48	1.7	30
Crested wheatgrass +50 lbs N/A	5/15-7/10	56	10	152	255	103	1.8	129
Native grass (unfertilized)	6/19-8/14	56	10	228	328	100	1.8	56
Native grass +50 lbs N/A	7/10-9/15	67	10	255	342	87	1.3	73
Russian wildrye (unfertilized)	8/14-9/29[1/]	46	10	328	410	82	1.8	51
Russian wildrye +50 lbs N & 30 lbs P_2O_5/ A	9/15-11/9	55	10	342	426	84	1.5	52

[1/] One calf died 9/24/78.

Fertilization Of Native
Mixed Prairie In Western North Dakota

The native range fertilization and interseeding study initiated in the fall of 1969 was continued in the 1976 growing season. Fertilizer treatments consisted of a one time nitrogen application of 200, 300, and 400 lbs per acre. Every year treatment included 67 and 100 lbs per acre, 67N + 50P, 67N + 50P + 200lbs K per acre, 50lbs P per acre, and 200 lbs K per acre. Nitrogen alone is applied at the 100 lbs per acre rate at biennial intervals as another treatment.

Some of the parameters measured throughout the growing season by treatment at the 0-6, 6-12, 12-24, 24-36, and 36-48 inch soil depths at weekly intervals are available soil moisture, and available N, P, and K are determined at biweekly intervals at the same soil depths previously indicated. Protein content determinations are made from selected species at biweekly intervals. Production clippings are taken at the end of the growing season from all treatments; separated into categories of annual and perennial forbs, mid, short, and tall grasses, and then dried and weighed. Species composition changes are determined be means of a 10-point frame on a percentage basis.

Available nutrient and soil moisture data indicate a cyclic phenomena closely associated with precipitation and plant development. Adequate soil moisture, nitrogen, phosphorus and potassium are available early in the growing season but are depleted to low levels soon after active growth commences. Available nitrogen is depleted more quickly than is apparent with the potassium or phosphorus and responds more closely to the depletion of the available soil moisture, especially in the upper levels of the soil profile. Phosphorus generally shows a decline with the active growing period but exhibits a much narrower range of fluctuation than observed by the nitrogen and potassium nutrients. Other peaks in available nutrients are observable following the late summer increases in soil nutrients occurs during the period immediately following summer dormancy and before active initiation of new growth by many species shortly before winter freeze up. A decline is again evident as winter approaches.

Production in 1978 responded well to the adequate soil moisture supply. All treatments including the check showed increases in production over 1977 (table 14). Four treatments produced over 2 T/A. Of these the 100 N every year was highest with 4980 lbs/A followed closely by the 50P+67N+200K which produced 4895 lbs/A. Fifty P+67N and 67N every year produced 4622 and 4050 lbs/A respectively. The 200N, 400N and 50P plots all produced less than the check with 2489, 2684, and 2646 lbs/A respectively. Table 15 shows the average production for the length of the study. All plots in 1978 showed above average production.

Table 16 shows the percent increase of decrease of each component in relation to the check plot. All plots where N was applied show an increase in midgrasses and a decrease in shortgrasses. Perennial forbs increased on all plots treated while annual forbs decreased on all plots except 200K, 50P and 100N every other year.

Protein content determination along with anticipated digestibility and other proximate analysis data is being summarized at the present time. The data summary for three years of the study show that the addition of 67 lbs N/A every year significantly increased the nitrogen fraction of western wheatgrass (Agropyron smithii), needle-and-thread (Stipa comata), and blue grama (Bouteloua graceilis). The data

also show that every year applications of 100 lbs N/A significantly increased the nitrogen fraction of these grasses over the 67N rate.

Table 14. 1978 Fertility study yields.

Treatment	Grasses			Forbs			Total
	Mid	Short	Total	Per.	Ann.	Total	Yield
	Dry weight yields in lbs/acre						
Check	1874c[1/]	506ab	2380d	238d	71bc	309c	2689d
100N ev. Other yr.	3154b	372abcd	3526bc	357ab	24cde	381bc	3907bc
100N ev. Yr.	4368a	221cde	4589a	380ab	10de	3980bc	4979a
200K	1947c	488ab	2435d	317ab	104b	421bc	2856d
200N	1729c	318bcde	2047d	345ab	98b	443bc	2490d
300N	2140c	592a	2732cd	364ab	69bc	433bc	3165cd
400N	1846c	464abc	2310d	321ab	62bcd	374bc	2684d
50P	1460c	507ab	1967d	399ab	280a	679a	2646d
50P-67N	4156a	91c	4247ab	367ab	7e	374bc	4621ab
50P-67N-200K	4388a	112c	4500a	377ab	18de	395bc	4895a
67N ev.other yr.	2034c	552ab	2586d	513a	25cde	538ab	3124cd
67N ev. yr.	3558ab	157cd	3715ab	317ab	18de	335bc	4050b

[1/] Values followed by the same letter are not significant at the .05 level.

Table 15. 1970-78 Fertility study yields.

Treatment	Grasses			Forbs			Total
	Mid	Short	Total	Per.	Ann.	Total	yield
			Dry weight yields in lbs/acre				
Check	1245	745	1990	209	45	254	2244
100N ev. other yr. [1/]	1659	565	2224	460	54	514	2738
100N ev. year	2111	543	2654	436	29	465	3119
200K [1/]	1173	809	1982	259	60	319	2301
200N	1512	595	2107	278	41	319	2426
300N	1783	691	2474	362	30	392	2866
400N	1745	620	2365	419	33	452	2817
50P	1069	718	1787	338	110	448	2235
50P-67N	2069	664	2733	421	22	443	3176
50P-67N-200K [1/]	2191	394	2585	418	43	461	3046
67N ev. other yr. [1/]	1440	633	2073	417	35	452	2525
67N ev. year	1940	547	2487	451	35	486	2973

[1/] 8 year average – all others are 9 years averages.

Table 16. 1978 Fertility study yields (% increase (+) or % decrease (-) in relation to check (no fertilizer).

Treatment	Grasses			Forbs			Total
	Mid	Short	Total	Per.	Ann.	Total	yield
			Dry weight yields in lbs/acre				
Check	1874	506	2380	238	71	309	2689
100N ev. oth.yr.	+68.3	-26.5	+48.1	+50.0	-66.2	+23.3	+45.3
100N ev. year	+133.1	-56.3	+92.8	+59.6	-85.9	+26.2	+85.1
200K	+3.9	-3.5	+2.3	+33.2	+46.5	+36.2	+6.2
200N	-7.7	-37.1	-14.0	+44.9	+38.0	+43.3	-7.4
300N	+14.2	+17.0	+14.8	+52.9	-2.8	+40.1	+17.7
400N	-1.5	-8.3	-2.9	+31.1	-12.7	+21.0	-0.2
50P	-22.1	+0.2	-17.3	+67.6	+294.3	+119.7	-1.6
50P-67N	+121.8	-82.0	+78.4	+54.2	-90.1	+21.0	+71.8
50P-67N-200K	+134.1	-77.8	+89.1	+58.4	-746	+27.8	+82.0
67N ev. oth yr.	+8.5	+9.1	+8.6	+115.5	-64.8	+74.1	+16.2
67N ev. year	+89.8	-69.0	+56.1	+33.2	-74.6	+8.4	+50.6

Summary of the Yields of the Cool Season Species Adaptation Trial for 1977 and 1978.

Entry Num.	Common Name	Scientific name	Variety name and source	Dickinson 1977 lbs/acre	1978 lbs/acres
1	Montana Wheatgrass	*Agropyron albicans*	SCS PMC Bismarck, ND	1180	1282
2	Fairway Wheatgrass	*Agropyron cristatum*	Ruff U. of Neb. Lincoln, NB	1911	2212
3	Fairway Wheatgrass	*Agropyron cristatum*	Parkway Ag Research Sta. Saskatoon	2154	1999
4	Thickspike Wheatgrass	*Agropyron dasystachyum*	Critana SCS RMC Bridger, Montana	1775	1826
5	Crested Wheatgrass	*Agropyron desertorum*	Nordan USDA ARS Mandan, ND	2223	2307
6	Crested Wheatgrass	*Agropyron desertorum*	Summit Ag. Research Sta. Saskatoon	2036	2666
7	Tall Wheatgrass	*Agropyron elongatum*	Alkar SCS PMC Pullman, Wash.	1486	1488
8	Tall Wheatgrass	*Agropyron elongatum*	Jose SCS PMC Los Lunas, New Mexico	1687	1190
9	Tall Wheatgrass	*Agropyron elongatum*	Luna SCS PMC Lockeford, Calif.	1632	2366
10	Tall Wheatgrass	*Agropyron elongatum*	Orbit Dept. of Ag.Swift Current,Sask.	1660	1285
11	Tall Wheatgrass	*Agropyron elongatum*	Platte U. of Neb. Lincoln, NB	1700	1386
12	Beardless Wheatgrass	*Agropyron inerme*	Whitmar SCS Pullman, Wash.	1411	1926
13	Intermediate Wheatgrass	*Agropyron intermedium*	Chief Dept. of Ag. Saskatoon,Sask.	2270	2055
14	Intermediate Wheatgrass	*Agropyron intermedium*	Greenar SCS PMC Pullman, Wash.	2428	2409
15	Intermediate Wheatgrass	*Agropyron intermedium*	Oahe S.Dak.ARS Brookings, SD	2533	2346
16	Intermediate Wheatgrass	*Agropyron intermedium*	Slate U. Of Neb. Lincon, NB	2880	2752
17	Intermediate Wheatgrass	*Agropyron intermedium*	Tegmar SCS PMC Aberdeen, Idaho	1517	1369
18	Steambank Wheatgrass	*Agropyron riparium*	Sodar SCS PMC Aberdeen, Idaho	1040	1714
19	Siberian Wheatgrass	*Agropyron sibiricum*	P-27 SCS PMC Aberdeen, Idaho	1703	1899
20	Western Wheatgrass	*Agropyron smithii*	Bartoon SCS PMC Manhattan, Kansas	2043	2130
21	Western Wheatgrass	*Agropyron smithii*	Mandan 456 USDA ARS Mandan, ND	1947	2383
22	Western Wheatgrass	*Agropyron smithii*	Rosana SCS PMC Bridger, Montana	1462	1825
23	Slender Wheatgrass	*Agronpyron trachucaulum*	Primar SCS PMC Pullman, Wash.	1714	1586
24	Slender Wheatgrass	*Agropyron trachycaulum*	Revenue Dept. of Ag. Saskatoon,Sask.	1788	1617
25	Pubescent Wheatgrass	*Agropuron trichophorum*	Greenleaf Dept. of Ag. Lethbridge, Albt	2546	1904
26	Pubescent Wheatgrass	*Agropyron trichophorum*	Luna SCS PMC Los Lunas, New Mexico	1795	2174
27	Pubescent Wheatgrass	*Agropyron trichophorum*	Mandan 759 USDA ARS Mandan, ND	2176	2106
28	Pubescent Wheatgrass	*Agropyron trichophorum*	Topar SCS PMC Aberdeen, Idaho	1074	1809
29	Pubescent Wheatgrass	*Agropyron trichophorum*	Trigo SCS PMC Lockeford, Calif.	1374	2587
30	Creeping Foxtail	*Alopecurus arundinaceus*	Garrison SCS PMC Bismarck, ND	1541	1748
31	Creeping Foxtail	*Alopecurus arundinaceous*	P-14762 SCS PMC Pullman, Wash.	969	1321
32	California Brome	*Bromus carinatus*	Cucamonga SCS PMC Lockeford, Calif.	--	--
33	Smooth Brome	*Bromus inermis*	Blair N.Am. Plant Breed. Brookston	2410	3106
34	Smooth Brome	*Bromus inermis*	Carlton Dept.of Ag. Saskatoon, Sask.	1717	1964
35	Smooth Brome	*Bromus inermis*	Fox ARS St. Paul, Minn.	1670	2174
36	Smooth Brome	*Bromus inermis*	Lancaster U.of Neb, Lincoln, NB	1649	3052
37	Smooth Brome	*Bromus inermis*	Lincoln U. of Neb. Lincoln, NB	1571	2327
38	Smooth Brome	*Bromus inermis*	Magna Dept. of Ag. Saskatoon, Sask.	1510	2171
39	Smooth Brome	*Bromus inermis*	Mandan 404 USDA ARS Mandan, ND	1675	2069
40	Prairie Sandreed	*Calamovilfa longifolia*	ND-95 SCS PMC Bismarck, ND	1386	1120
41	Orchardgrass	*Dactylis glomerata*	Avon MacDonald College,Quebec, Can.	--	1363
42	Orchardgrass	*Dactylis glomerata*	Avon USDA ARS Mandan, ND	850	1523
43	Orchardgrass	*Dactylis glomerata*	Chinook Dept. of Ag. Lethbridge,Albta.	--	1302
44	Orchardgrass	*Dactylis glomerata*	Dayton N.Amer.Plant Breed Brookston	2244	1190
45	Orchardgrass	*Dactylis glomerata*	Hercules Dept. of Ag.Ottawa, Ont.	1700	1224
46	Orchardgrass	*Dactylis glomerata*	Kay Dept. of Ag. Ottawa, Ont.	876	1443
47	Orchardgrass	*Dactylis glomerata*	Latar SCS PMC Pullman, Wash.	--	1161
48	Orchardgrass	*Dactylis glomerata*	Napier N. Amer. Plant Breed.Brookston	--	1329
49	Orchardgrass	*Dactylis glomerata*	Nordstern Northrup King, Mpls., Minn.	1479	1108
50	Orchardgrass	*Dactylis glomerata*	Rideau Dept. of Ag. Ottawa, Ont.	748	1152

Summary of the Yields of the Cool Season Species Adaptation Trial for 1977 and 1978 (continued)

Entry Num.	Common name	Scientific Name	Variety name and source	Dickinson 1977 lbs/acre	Dickinson 1978 lbs/acre
51	Altai Wildrye	*Elymus angustus*	ND-323 SCS PMC Bismarck,ND	1607	748
52	Canada Wildrye	*Elymus canadensis*	Mandan USDA ARS Mandan, ND	2587	1476
53	Basin Wildrye	*Elymus cinereus*	P-5797 SCS PMC Aberdeen, Idaho	--	1233
54	Basin Wildrye	*Elymus cinereus*	P-15590 SCS PMC Bridger, Mont.	1054	--
55	Mammoth Wildrye	*Elymus giganteus*	Volga SCS PMC Aberdden, Idaho	1700	2074
56	Blue Wildrye	*Elymus glaucus*	P-2662 SCS PMC Pullman, Wash.	--	--
57	Russian Wildrye	*Elymus junceus*	Mayak Dept. of Ag.Swiftcurrent,Sask.	1390	1258
58	Russian Wildrye	*Elymus junceus*	Sawki Dept. of Ag.Swiftcurrent,Sask.	999	1040
59	Russian Wildrye	*Elymus junceus*	Vinall USDA ARS Mandan, ND	1152	1346
60	Beardless Wildrye	*Elymus triticoides*	P-15594 SCS PMC Bridger, Mont.	1938	--
61	Tall Fescue	*Festuca arundinacea*	Fawn U. of Ore. Corvallis, Ore.	714	1134
62	Tall Fescue	*Festuca arundinacea*	Goar SCS PMC Lockeford, Calif.	1088	1020
63	Tall Fescue	*Festuca arundinacea*	Kenhy ARS Lexington, Kentucky	774	1304
64	Tall Fescue	*Festuca arundinacea*	Kentucky 31 ARS Lexington, Ky	952	1188
65	Tall Fescue	*Festuca arundinacea*	Kenwall ARS Lexington, Kentucky	--	986
66	Meadow Fescue	*Festuca elatior*	Ensign Dept. of Ag. Ottawa, Ont.	1216	1323
67	Meadow Fescue	*Festuca elatior*	Trader Dept. of Ag. Ottawa, Ont.	570	1396
68	Sheep Fescue	*Festuca ovina*	P-274 SCS PMC Pullman, Wash.	--	2437
69	Hard Fescue	*Festuca ovina var:durulscula*	Durar SCS PMC Pullman, Wash.	1568	2171
70	Perennial Ryegrass	*Lolium perenne*	Norlea Dept. of AG. Ottawa, Ont.	1513	595
71	Perennial Ryegrass	*Lolium perenne*	NK-100 Northrup King, Minneapolis	--	--
72	Perennial Ryegrass	*Lolium perenne*	NK-200 Northrup King, Minneapolis	--	--
73	Perennial Ryegrass	*Lolium perenne*	P-313 SCS PMC Pullman, Wash.	--	--
74	Indian Ricegrass	*Oryzopsis hymenoides*	P-2575 SCS PMC Aberdeen, Idaho	--	1054
75	Reed Canarygrass	*Phalaris arundinacea*	Cana SCS PMC Lockeford, Calf.	--	--
76	Reed Canarygrass	*Phalaris arundinacea*	Castor research station Beaver Lodge,A	1400	912
77	Reed Canarygrass	*Phalaris arundinacea*	Frontier Dept.of Ag. Ottawa, Ont.	995	820
78	Reed Canarygrass	*Phalaris arundinacea*	Grove Dept. of Ag. Ottawa, Ont.	1207	1547
79	Reed Canarygrass	*Phalaris arundinacea*	Ioreed FDTN. Seed Div.Lincoln, NB	2414	1840
80	Reed Cararygrass	*Phalaris arundinacea*	MN-72 USDA ARS St. Paul, MN	1488	1509
81	Reed Canarygrass	*Phalaris arundinacea*	Rise N.Am. Plant Breeders Brookston	1615	1415
82	Timothy	*Phleum pratense*	Bounty Dept. of Ag. Ottawa, Ont.	1360	1428
83	Timothy	*Phleum pratense*	Champ Dept. of Ag. Ottawa, Ont.	1233	1471
84	Timothy	*Phleum pratense*	Climax Dept. of Ag. Ottawa, Ont.	--	--
85	Timothy	*Phleum pratense*	Itasca USDA ARS St. Paul, MN	1485	1602
86	Canby Bluegrass	*Poa canbyi*	P-851 SCS PMC Pullman, Wash.	867	1469
87	Kentucky Bluegrass	*Poa pratensis*	Park USDA ARS St. Paul, MN	1250	1135
88	Alkali Sacaton	*Sporobolus airoides*	PM-ND-264 SCS PMC Bismarck, ND	--	--
89	Green Needlegrass	*Stipa viridula*	Green Stipagrass USDA ARS Mandan,ND	935	1822
90	Green Needlegrass	*Stipa viridul*	Lodorm USDA ARS Mandan, ND	1832	1715
91	Mandan Ricegrass	*Stipa viridula x Oryzopsis Hymenoides (Stiporyzopsis caduca)*	Mandan'72+'73 USDA ARS Mandan,ND	--	1613